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SINCLAIR WEEKS, SECRETARY
U.S. COAST AND GEODETIC SURVEY
ROBERT F. A. STUDDS, *Director*

NOVEMBER 6, 1954 SERIAL NO. 779

UNITED STATES COAST PILOT 9

Alaska

Cape Spencer to Arctic Ocean

Sixth (1954) Edition

UNITED STATES GOVERNMENT PRINTING OFFICE, WASHINGTON : 1955
For sale by the Coast and Geodetic Survey and its sales agents ---------- $2.50

National Oceanic and Atmospheric Administration

Climate Data Modernization Program

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Preface

THIS is the sixth edition of United States Coast Pilot 9, Alaska, Cape Spencer to Arctic Ocean. It is based mainly upon the work of the United States Coast and Geodetic Survey. In the unsurveyed areas it is a compilation of data from a wide variety of sources. The book was reviewed for weather information by the Climatological Services Division of the United States Weather Bureau.

This sixth edition of the Coast Pilot is corrected through Notice to Mariners 45 of November 6, 1954. It cancels the fifth edition, published in 1947.

Supplements to this Coast Pilot, containing corrections and additions from various sources, are issued early each year. Each supplement is complete in itself and cancels all previous issues. The latest supplement, together with Notices to Mariners subsequent to it, will correct the book to date. Supplements may be obtained free upon application to the United States Coast and Geodetic Survey.

Mariners and other interested parties are requested to send to the Director, United States Coast and Geodetic Survey, Washington 25, D. C., any information affecting this Coast Pilot that may come to their attention.

ROBERT F. A. STUDDS, *Director*

November 6, 1954

United States Coast Pilot 9

Alaska, Cape Spencer to Arctic Ocean

1954

Indexes of Coast Pilots and Nautical Charts

NUMERICAL LIST OF CHARTS

No.	Price	Scale	No.	Price	Scale	No.	Price	Scale
5002	$1.00	1:1,412,349	8532	$0.75	1:77,062	9009	$0.50	1:10,000
5020	1.00	1:868,003	8533	1.00	1:78,000	9010	1.00	1:20,000
5021	1.00	1:811,980	8534	1.00	1:78,900	9018	1.00	1:40,000
5022	1.00	1:736,560	8535	.75	1:80,000	9019	1.00	1:40,000
5052	1.00	1:1,200,000	8536	1.00	1:80,728	9020	1.00	1:40,000
5101	1.00	1:234,270	8537	1.00	1:81,529	9021	1.00	1:40,000
5202	1.00	1:232,188	8540	.50	1:80,905	9022	1.00	1:40,000
5302	1.00	1:216,116	8541	.75	1:80,000	9023	1.00	1:40,000
5402	1.00	1:210,668	8542	1.00	1:80,000	9024	1.00	1:40,000
5502	1.00	1:207,840	8545	.75	1:20,000	9025	1.00	1:40,000
5602	1.00	1:200,000	8546	.75	1:10,000	9030	1.00	1:80,000
5702	1.00	1:196,948	8551	1.00	1:200,000	9051	1.00	1:100,000
5802	1.00	1:191,730	8552	.75	1:200,000	9052	1.00	1:100,000
5902	1.00	1:185,238	8553	1.00	1:194,154	9102	1.00	1:1,126,303
6002	1.00	1:180,789	8554	1.00	1:200,000	9103	.50	1:200,000
6102	1.00	1:176,253	8556	1.00	1:350,000	9104	.50	1:100,000
6300	1.00	1:200,000	8557	.75	1:40,000	9119	1.00	1:10,000
6401	.75	1:150,000	8573	.75	1:20,000	9120	.75	1:12,000
8002	.75	1:969,756	8575	1.00	1:20,000	9121	.75	1:30,000
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8201	1.00	1:217,828	8665	.75	1:20,000	9125	1.00	1:20,000
8202	1.00	1:209,978	8666	.75	1:50,000	9127	1.00	1:20,000
8229	.50	1:20,000	8700	.75	1:100,000	9128	1.00	1:20,000
8235	1.00	1:40,000	8701	.75	1:80,660	9129	.75	1:20,000
8252	1.00	1:217,828	8703	1.00	1:80,000	9130	1.00	1:20,000
8302	.75	1:80,000	8704	1.00	1:80,000	9136	1.00	1:40,000
8303	.75	1:80,000	8705	1.00	1:81,326	9137	1.00	1:40,000
8304	.75	1:80,000	8710	1.00	1:77,477	9138	1.00	1:30,000
8306	.50	1:160,000	8720	1.00	1:80,000	9139	1.00	1:30,000
8402	.75	1:300,000	8802	1.00	1:1,023,188	9140	1.00	1:30,000
8410	.75	1:40,000	8822	.25	1:20,000	9141	1.00	1:30,000
8455	.75	1:80,000	8833	.50	1:79,798	9145	1.00	1:40,000
8457	.75	1:40,000	8841	.25	1:20,000	9146	1.00	1:40,000
8500	1.00	1:2,100,000	8851	.75	1:80,000	9147	1.00	1:40,000
8502	1.00	1:969,761	8859	1.00	1:300,000	9149	.75	1:40,000
8505	.50	1:20,000	8860	1.00	1:300,000	9180	.75	1:80,000
8513	.75	1:100,000	8861	1.00	1:300,000	9193	1.00	1:120,000
8515	1.00	1:81,436	8862	1.00	1:300,000	9198	1.00	1:160,000
8517	1.00	1:80,000	8863	1.00	1:300,000	9302	.75	1:1,534,076
8519	1.00	1:79,291	8864	1.00	1:300,000	9370	.75	1:300,000
8520	1.00	1:80,000	8865	1.00	1:300,000	9372	.75	1:80,000
8521	.75	1:20,000	8993	1.00	1:50,000	9373	.75	1:80,000
8523	1.00	1:40,000	8994	1.00	1:50,000	9375	.75	1:20,000
8524	.75	1:20,000	8995	.75	1:200,000	9380	1.00	1:400,000
8525	.25	1:30,000	9000	1.00	1:4,860,700	9381	.25	1:15,000
8528	.75	1:81,436	9005	1.00	1:20,000	9382	.75	1:40,000
8529	.75	1:81,847	9006	1.00	1:10,000	9383	.75	1:20,000
8530	.75	1:83,074	9007	1.00	1:40,000	9385	.25	1:80,000
8531	1.00	1:82,662	9008	.75	1:10,000	9400	.75	1:1,587,870

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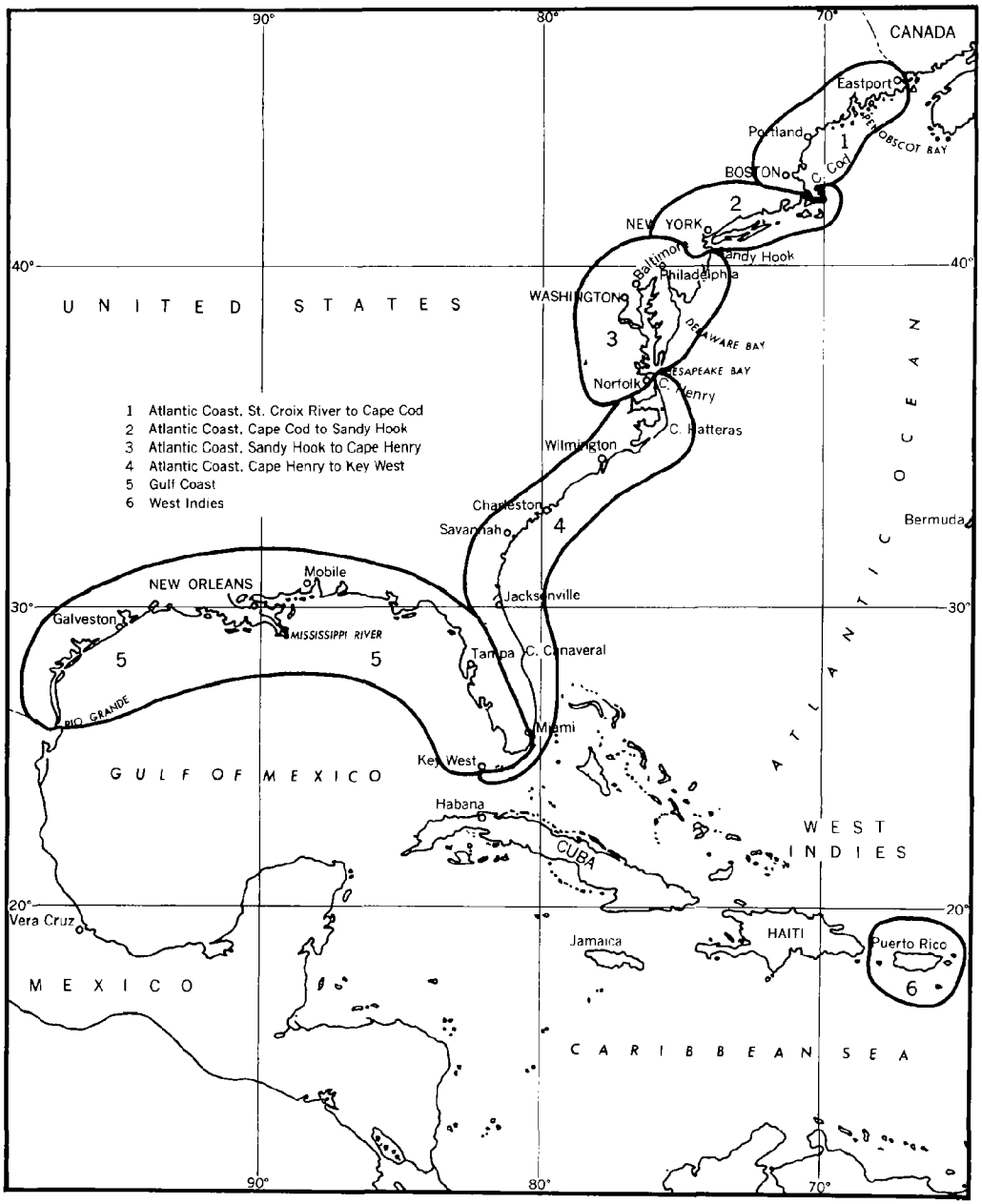
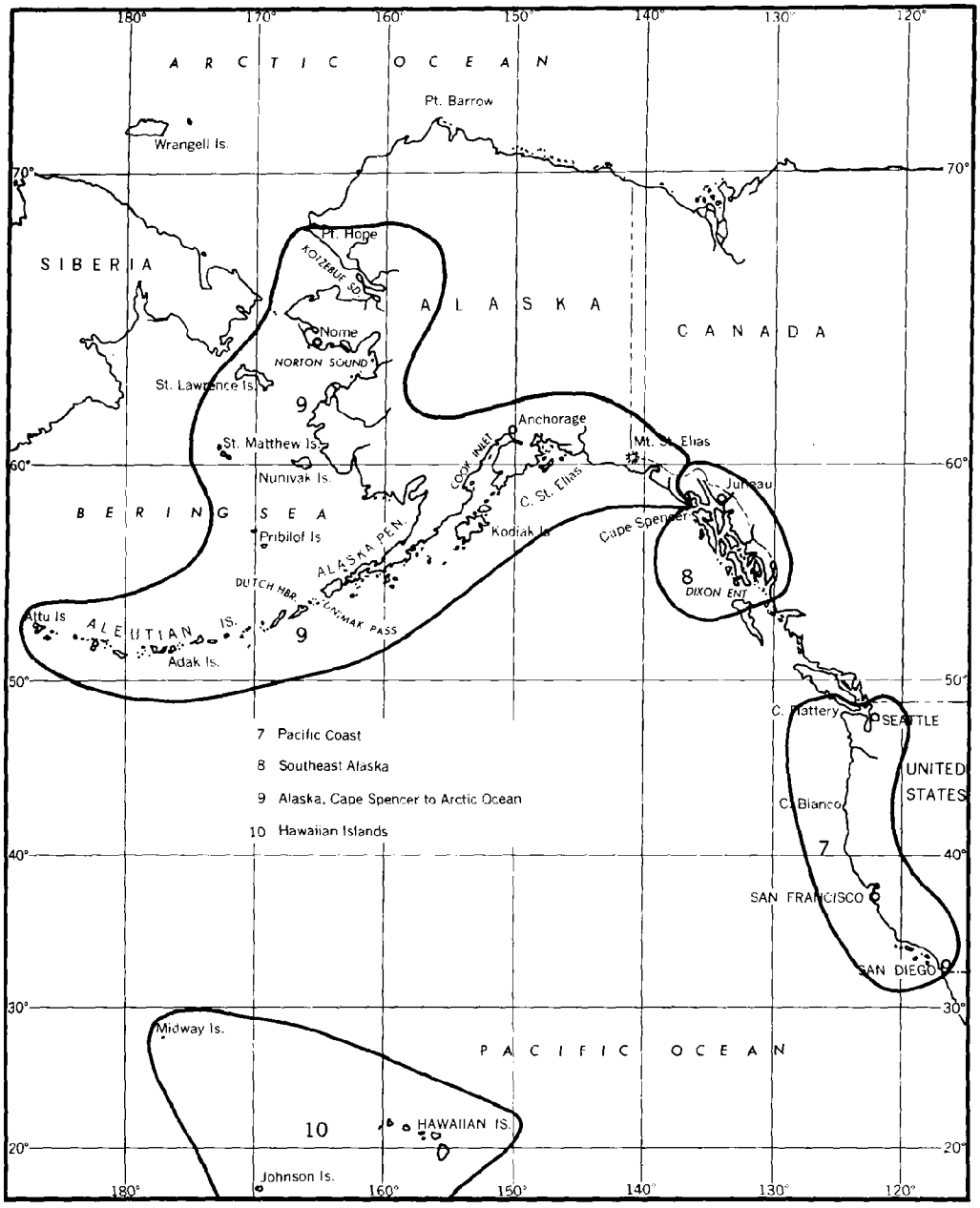
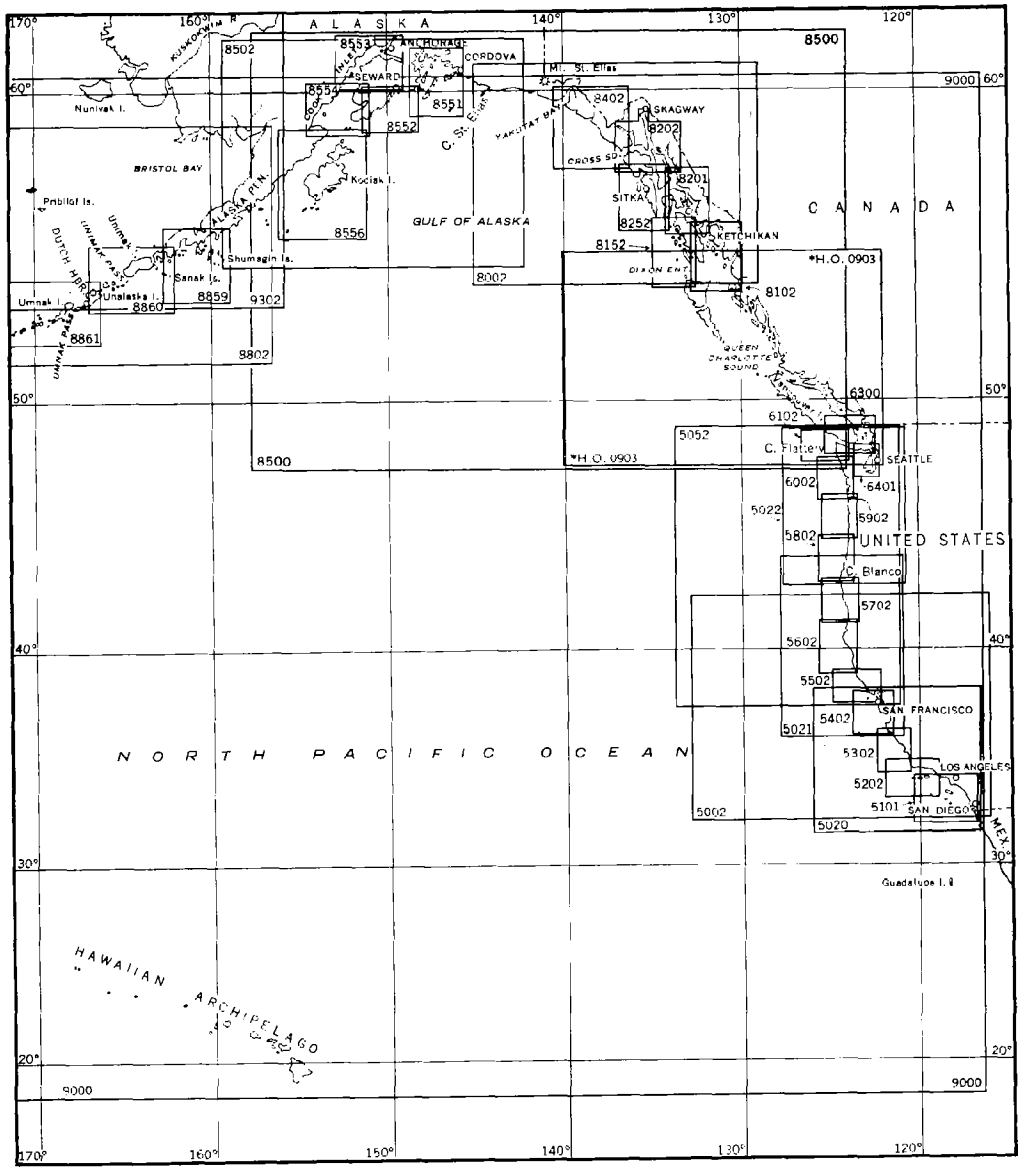
COAST PILOTS – ATLANTIC AND GULF COASTS



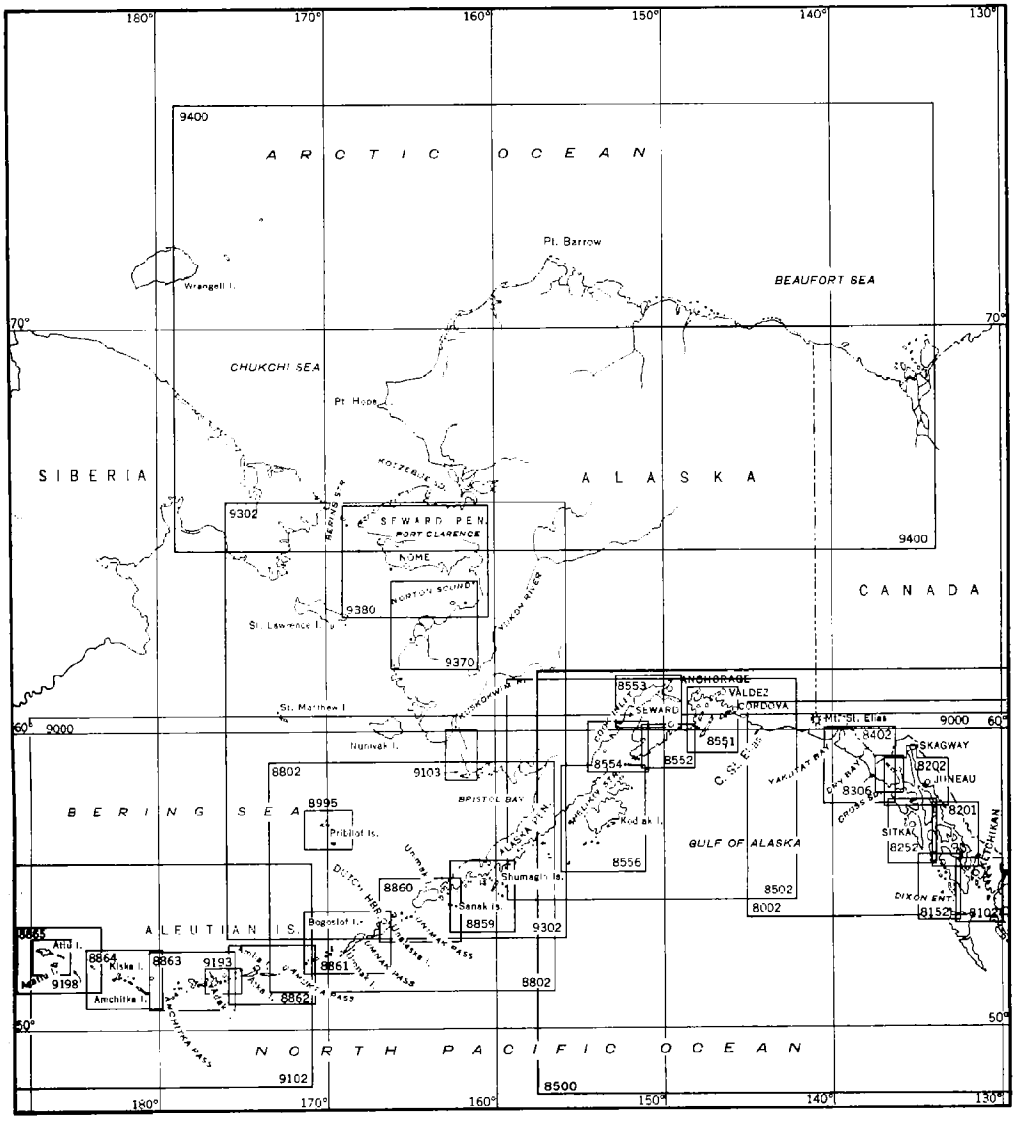
COAST PILOTS - PACIFIC COAST AND ALASKA



SAILING AND GENERAL CHARTS - PACIFIC COAST



SAILING AND GENERAL CHARTS - ALASKA



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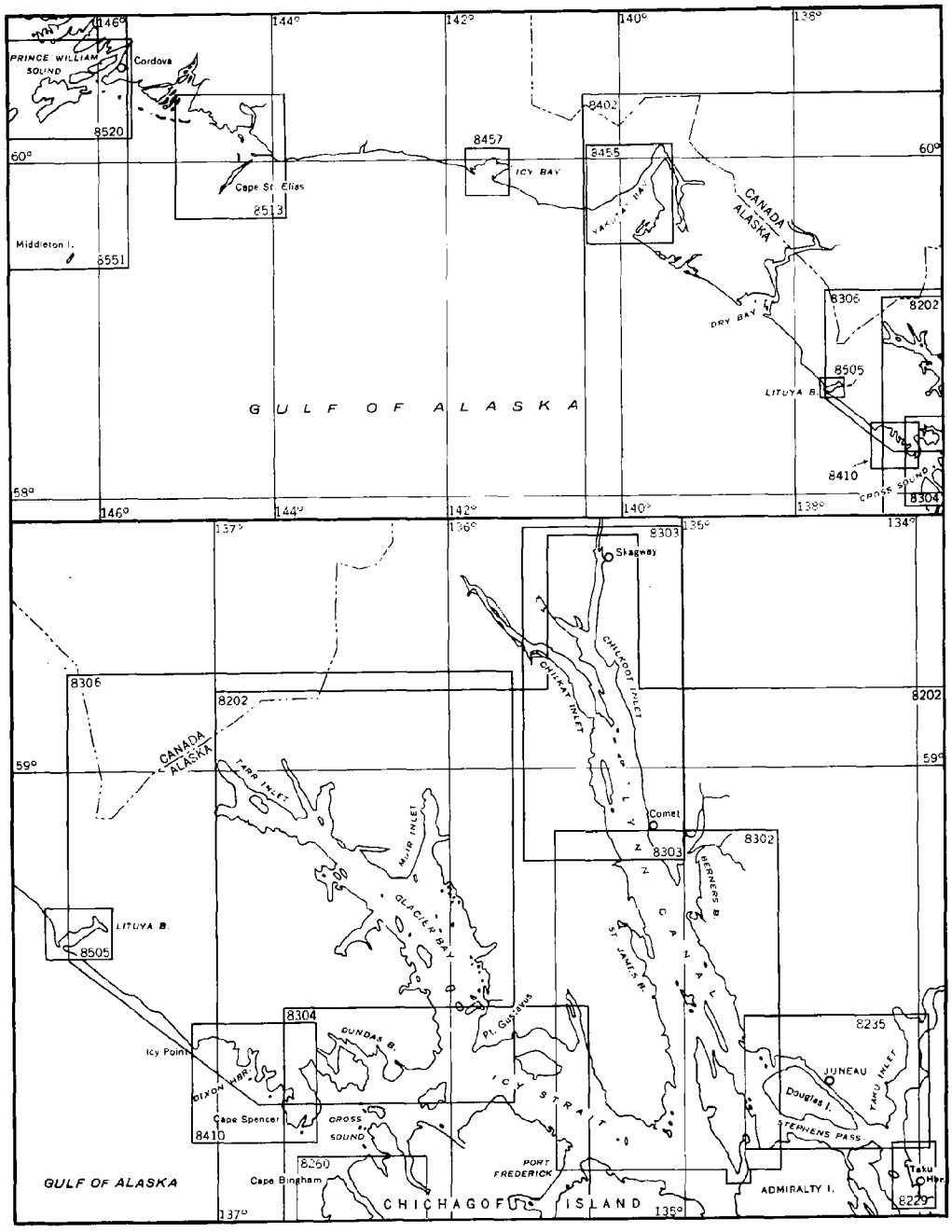

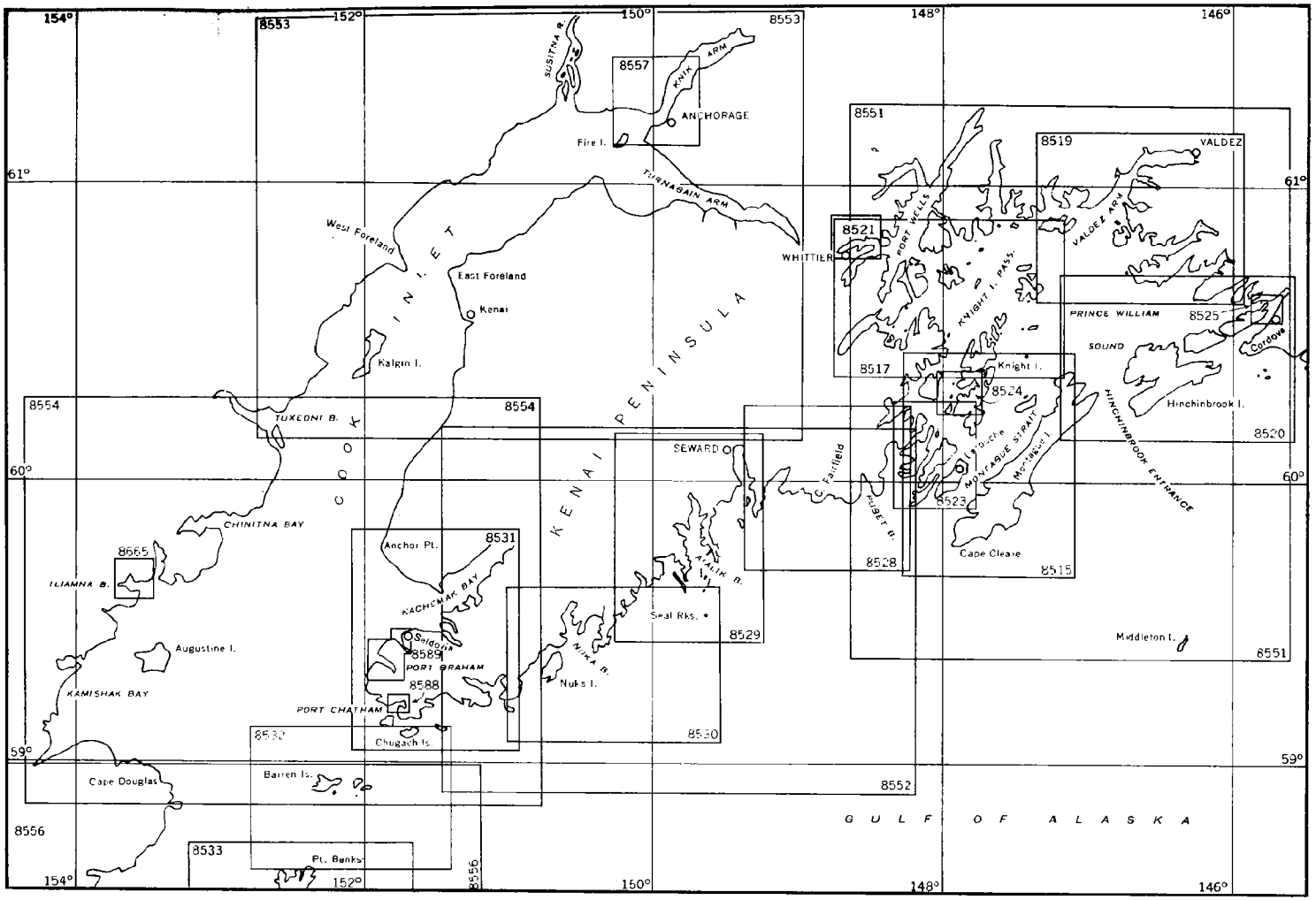

GENERAL, COAST AND HARBOR CHARTS · ALASKA

PRINCE WILLIAM SOUND TO COOK INLET

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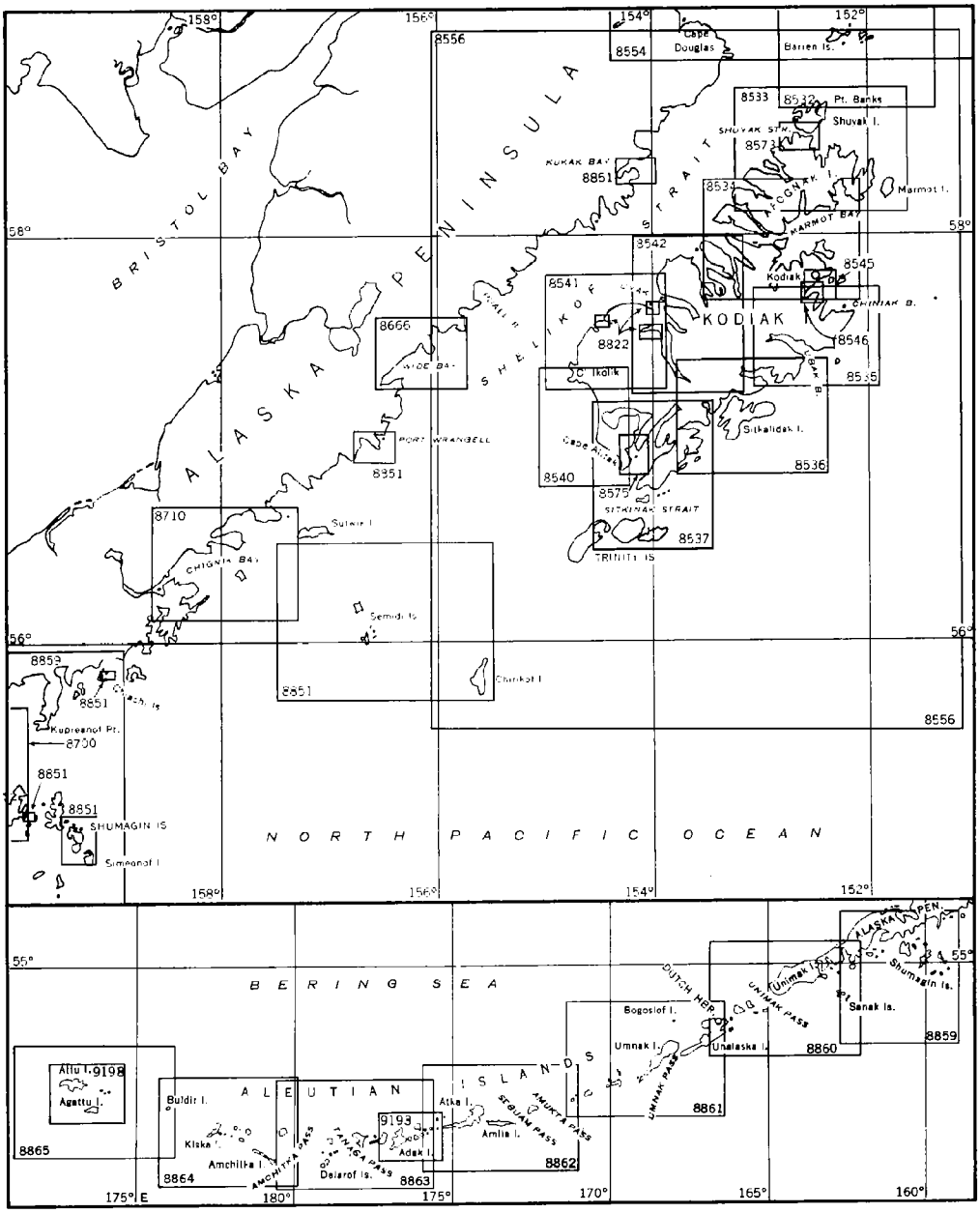
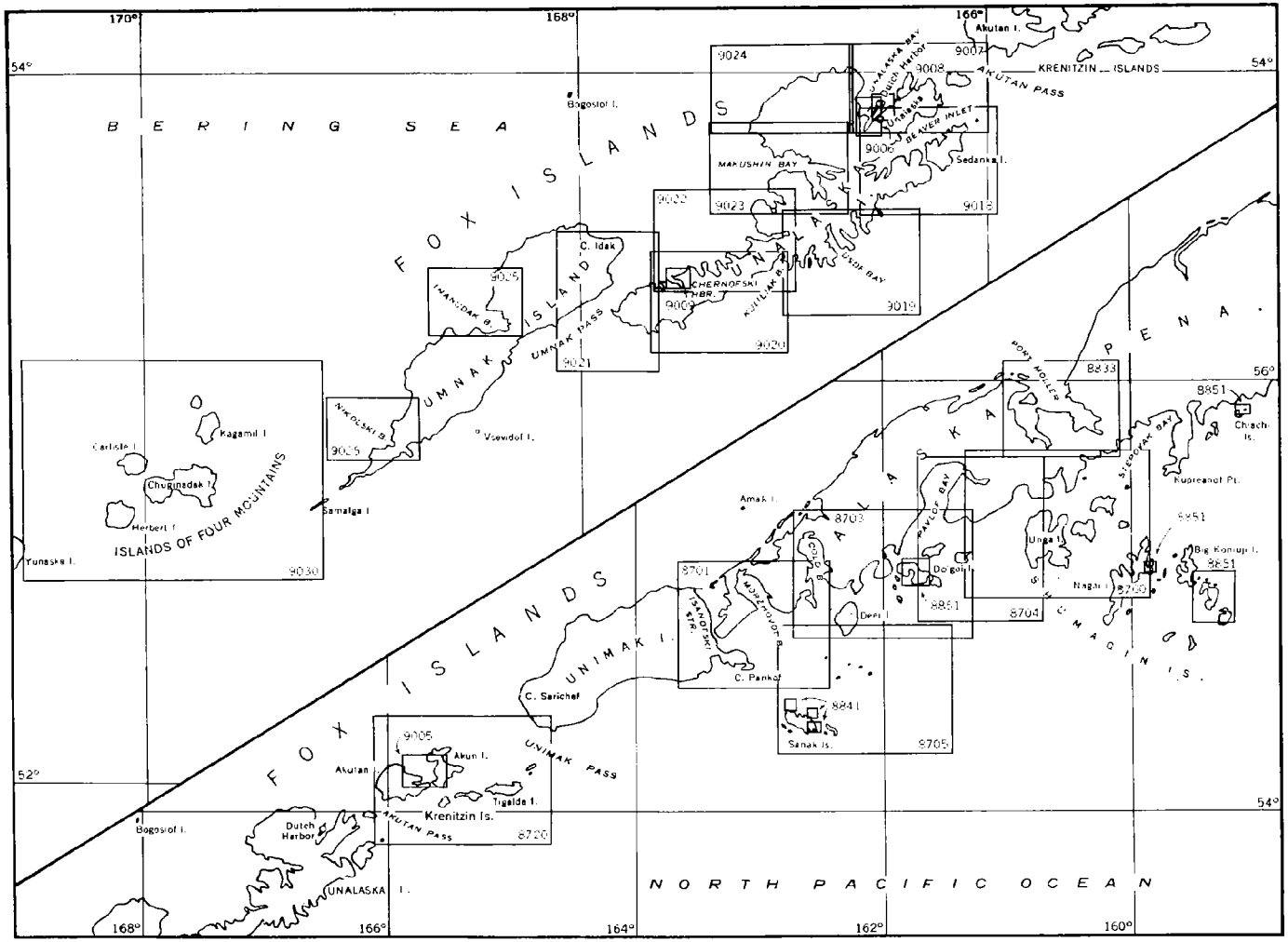
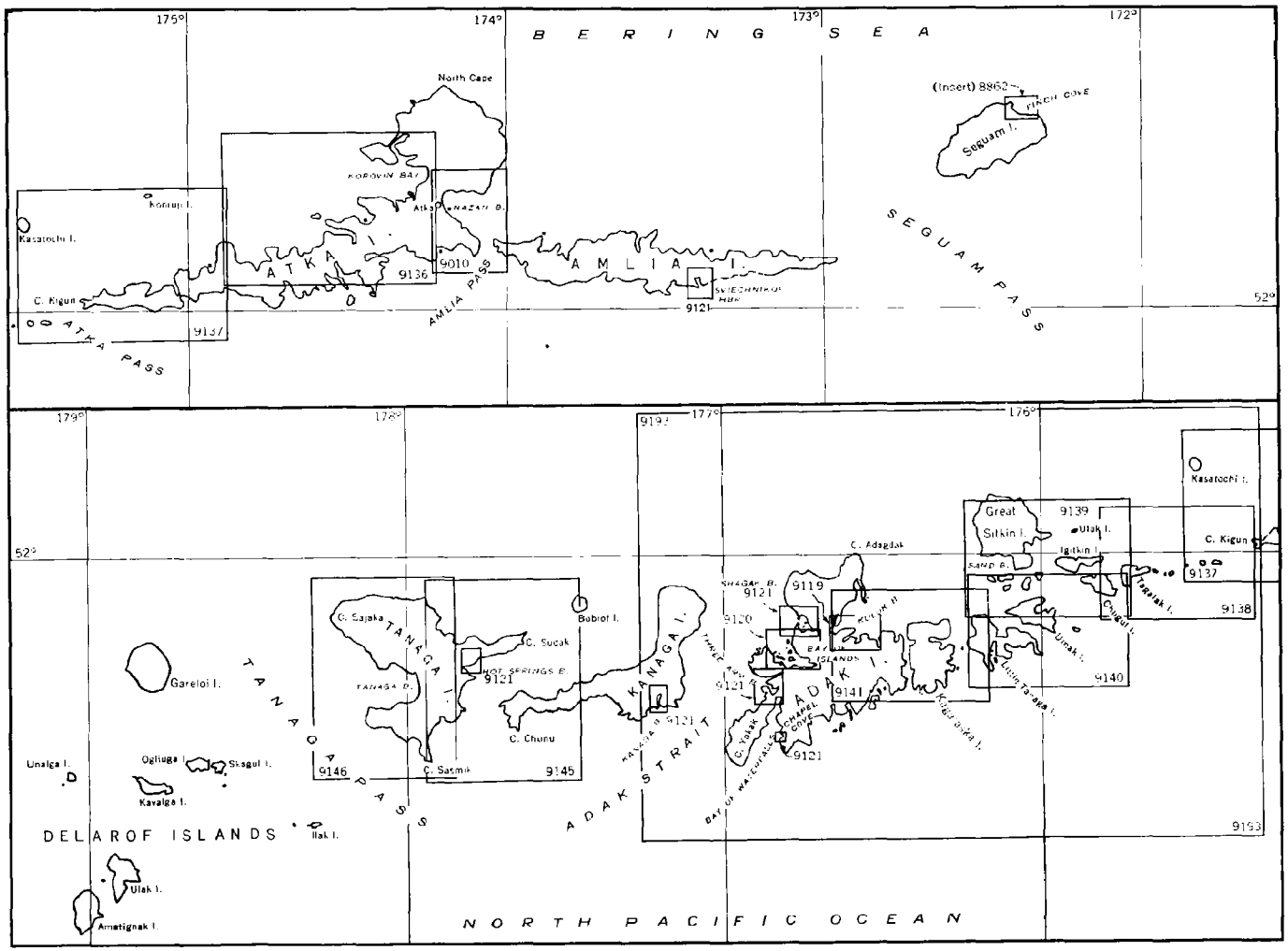




COAST AND HARBOR CHARTS - ALASKA

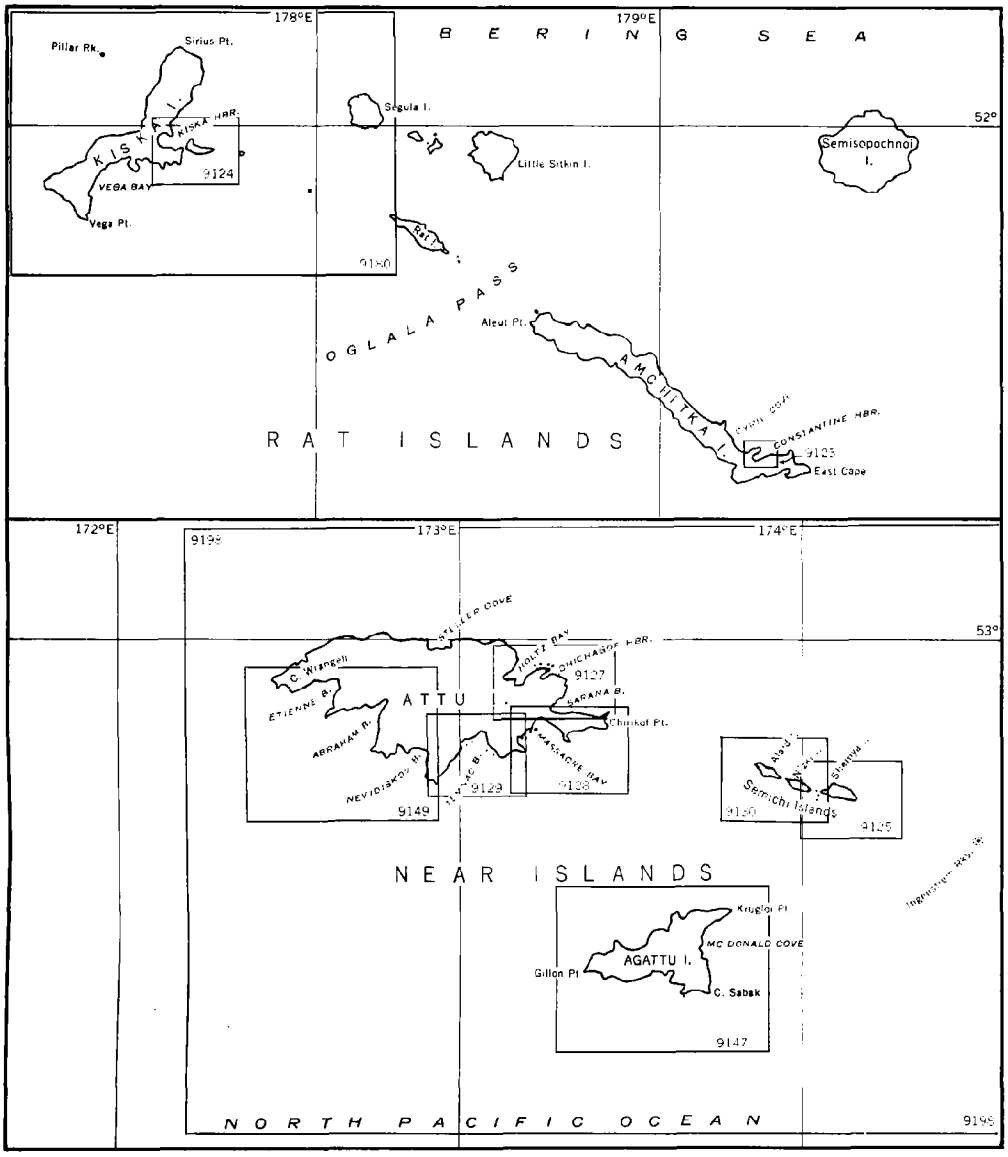
SHUMAGIN ISLANDS TO ISLANDS OF FOUR MOUNTAINS



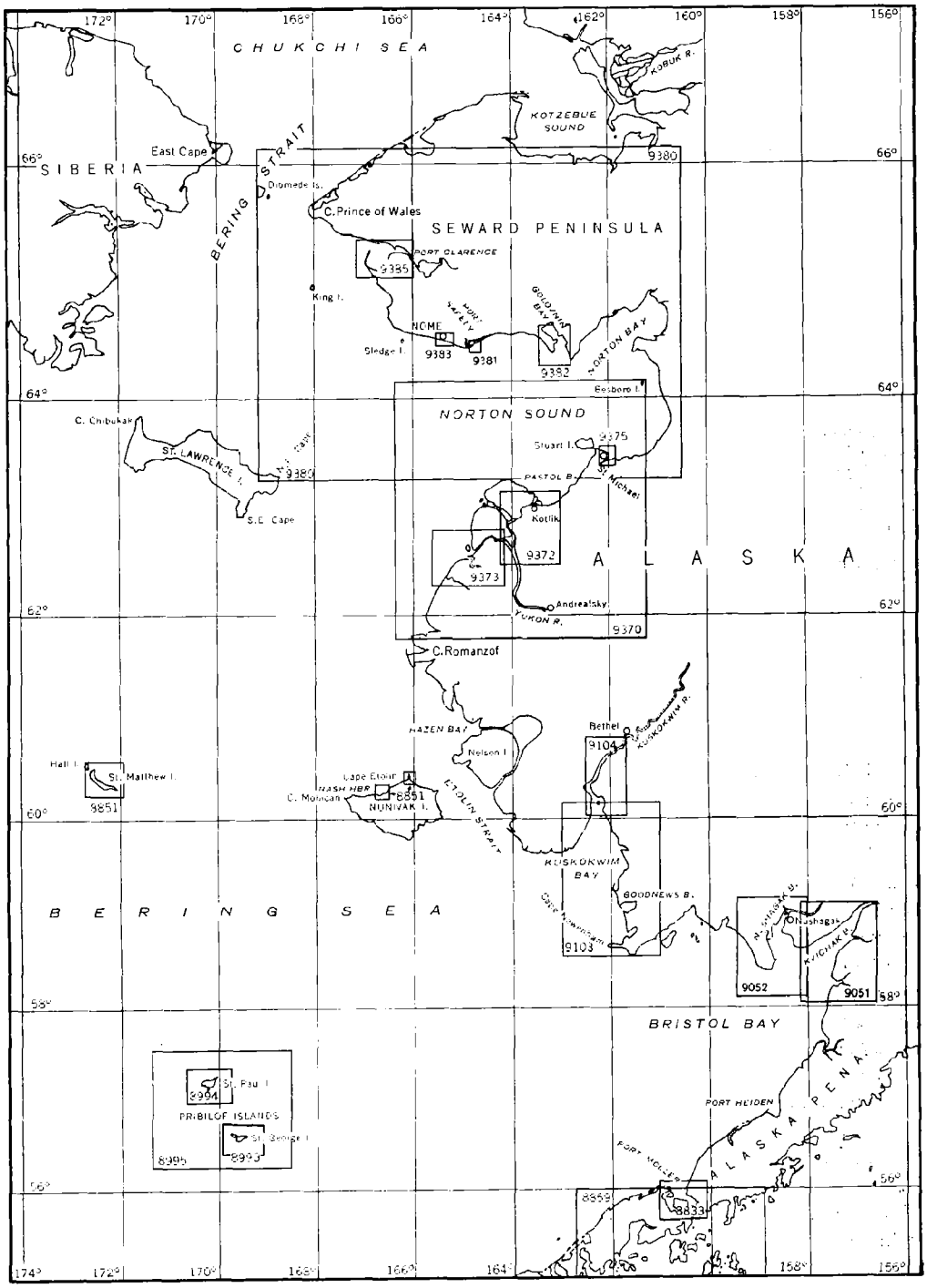
COAST AND HARBOR CHARTS - ALASKA

ANDREANOF ISLANDS

RAT ISLANDS AND NEAR ISLANDS



BERING SEA


CHUKCHI SEA
KOBUK R.
KOTZEBUE SOUND
9380
SIBERIA
East Cape
BERING STRAIT
Diomede Is.
C. Prince of Wales
SEWARD PENINSULA
PORT CLARENCE
9385
King I.
NOME
Sledge I.
9383
9381
GOODHOPE BAY
NORTON BAY
9382
Besboro I.
NORTON SOUND
C. Chibukak
ST. LAWRENCE I.
S.E. Cape
9380
Stuart I.
9375
PASTOL B.
St. Michael
Kotlik
9372
9373
A L A S K A
Andreafsky
YUKON R.
9370
C. Romanzof
HAZEN BAY
Nelson I.
Bethel
KUSKOKWIM R.
9104
Hall I.
St. Matthew I.
9851
Cape Etolin
NASH HBR.
8851
C. Mohican
NUNIVAK I.
ETOLIN STRAIT
KUSKOKWIM BAY
GOODNEWS B.
9103
B E R I N G S E A
NUNIVAK B.
Quinhagak
NUNIVAK I.
9052
9051
BRISTOL BAY
ST. PAUL I.
8994
PRIBILOF ISLANDS
ST. GEORGE I.
8995
8993
PORT HEIDEN
ALASKA PEN.
PORT MOLLER
8859
8833
174°
172°
170°
168°
166°
164°
162°
160°
158°
156°
66°
64°
62°
60°
58°
56°

CHAPTER 1

General Information

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THE COAST AND GEODETIC SURVEY is charged with (1) the survey of the coasts of the United States and its possessions to insure the safe navigation of coastal and intracoastal waters; (2) the compilation and publication of **nautical charts, Coast Pilots, tables of predicted tides and currents, and tidal current charts** to meet the needs of the mariner; (3) the determination of geographical positions and elevations in the interior of the country to coordinate the coastal surveys and provide a framework for mapping and other engineering work; (4) the compilation and publication of aeronautical charts for use in air navigation; (5) observations of the earth's magnetism in all parts of the country to furnish magnetic information essential to the mariner, aviator, land surveyor, radio engineer, and others; and (6) seismological observations and investigations to supply earthquake data required in designing structures.

District Offices of the Coast and Geodetic Survey are located at some of the principal ports in the United States; see Appendix. Files of charts, Coast Pilots, and other publications are maintained at these offices for the use of mariners, who are invited to avail themselves of the facilities afforded.

Sales agents for Charts, Coast Pilots, Tide Tables, Current Tables, and Tidal Current Charts of the Coast and Geodetic Survey are located in many ports of the United

States and in some foreign ports; see Appendix for agents in the area covered by this Coast Pilot. The charts and publications can also be purchased from the Washington Office and from the District Offices. Orders mailed to Washington, D. C., should be accompanied by check or money order, made payable to the "C&GS, Department of Commerce"; postage stamps or Superintendent of Documents coupons cannot be accepted. Indexes of nautical charts and related publications can be obtained free of charge from the Coast and Geodetic Survey or any of its agencies.

Important.—Mariners and other interested parties are requested to send to the Director, United States Coast and Geodetic Survey, Washington 25, D. C., any information affecting this Coast Pilot or the charts that may come to their attention, as well as any suggestions they may have for improving these publications. Reports of an urgent character should be sent by radio or telegraph.

Special signals for surveying vessels.—International Pilot Rules state that a vessel engaged in laying or in picking up a submarine cable or navigation mark, or a vessel engaged in surveying or underwater operations when from the nature of her work she is unable to get out of the way of approaching vessels, shall carry, in lieu of the usual white lights, three lights in a vertical line one over the other not less than 6 feet apart. The highest and lowest of these lights shall be red, and the middle light shall be white, and they shall be of such a character as to be visible all round the horizon at a distance of at least 2 miles. By day, she shall carry in a vertical line one over the other not less than 6 feet apart, where they can best be seen, three shapes each not less than 2 feet in diameter, of which the highest and lowest shall be globular in shape and red in color, and the middle one diamond in shape and white.

The **wire drags** used by the Coast and Geodetic Survey in sweeping for dangers to navigation may be crossed by vessels without danger of fouling at any point except between the towing launches and the large buoys near them, where the towline approaches the surface of the water. Vessels passing over the drag are requested to change course so as to cross it approximately at right angles, as a diagonal course may cause the propeller to foul the supporting buoys and attached wires. No attempt should be made to pass between the drag launches while the wire is being set out or taken in, unless it would endanger a vessel to do otherwise, because the bottom wire is slack and the floats at each 100-foot section may lift it nearly to the surface; at this time the launches usually are headed directly toward or away from each other and the operation may be clearly seen.

Nautical charts are published primarily for the use of the mariner but serve the public interest in many other ways. They are compiled principally from Coast and Geodetic Survey basic field surveys, supplemented by data from other Government organizations, and include all available information necessary for safe navgation.

The **scales of nautical charts** range from 1:2,500 to about 1:5,000,000. Graphic scales are generally shown on charts with scales of 1:80,000 or larger, and numerical scales are given in the upper right border for smaller-scale charts. For convenience of reference, Coast and Geodetic Survey charts are classified according to scale as follows:

Sailing charts, scales 1:600,000 and smaller, are for use in fixing the mariner's position as he approaches the coast from the open ocean, or for sailing between distant coastwise ports. On such charts the shoreline and topography are generalized and only

offshore soundings, the principal lights, outer buoys, and landmarks visible at considerable distances are shown.

General charts, scales 1:100,000 to 1:600,000, are for coastwise navigation outside of outlying reefs and shoals.

Coast charts, scales 1:50,000 to 1:100,000, are for inshore navigation leading to bays and harbors of considerable width, and for navigating large inland waterways.

Harbor charts, scales larger than 1:50,000, are for harbors, anchorage areas, and the smaller waterways.

Intracoastal Waterway (inside route) charts, scale 1:40,000, are a special series covering the inside route in New Jersey, the route from Norfolk, Virginia, to Key West, Florida, on the Atlantic coast, and from Key West, Florida, to the Mexican boundary on the Gulf coast.

Caution in using small-scale charts.—It is obvious that dangers to navigation cannot be shown with the same amount of detail on small-scale charts as on those of larger scale; therefore, in approaching the land or dangerous banks, the largest scale chart available should be used. A small error in laying down a position means only yards on a large-scale chart, but on a small scale the same amount of displacement means large fractions of a mile. For the same reason, near objects should be used for bearings in preference to objects farther off, although the latter may be more prominent, as a small error in a bearing or in laying it down on the chart has greater effect in misplacing the position, the longer the line to be drawn.

The **date of a chart** is of vital importance to the navigator. When charted information becomes obsolete, further use of the chart for navigation may be dangerous. Natural and artificial changes, many of them critical, are occurring constantly, and it is important that navigators obtain up-to-date charts at regular intervals, or hand-correct their copies for changes listed in the *Notice to Mariners*.

Nautical charts bear three dates which are important to persons using them. The **edition date** (month and year) of the publication note is **printed** centrally below the lower border. The **print date** (year, month, and day) is the lastest date **printed** in the lower left-hand corner below the border and is the date of correction to the printing plate. The **date of issue** is **stamped** below the right lower border and just to the left of the subtitle. Charts are hand-corrected to show all essential changes for lights, buoys, daybeacons, recently reported dangers, and other critical information received to date of issue from the Washington, D. C., office. All important corrections subsequent to the date of issue are published in the *Notice to Mariners* and should be immediately applied by the mariner to charts on hand or purchased from agents.

The **Mercator projection** used on most nautical charts has straight-line meridians and parallels that intersect at right angles. On any particular chart the distances between meridians are equal throughout, but distances between parallels increase progressively from the equator toward the poles, so that a straight line between any two points is a rhumb line. This unique property of the Mercator projection is one of the main reasons why it is preferred by the mariner.

Accuracy of charts.—Each charted depth represents a survey location of an actual sounding. Important changes may have occurred in sand and mud areas since the last surveys, especially at bay and river entrances exposed to strong currents and heavy seas. Where changes are known to be frequent and radical, notes to that effect are printed on the charts.

In rocky areas, soundings, however detailed, may not find every small obstruction. The customary routes and channels should be followed when navigating such waters, and areas should be avoided where irregular and sudden changes in depth indicate conditions associated with pinnacle rocks, boulders, or coral heads.

Echo soundings.—Most of the various types of echo sounder, or **fathometer**, are calibrated for a velocity of sound in water of 800 fathoms per second, but the actual velocity may differ from the calibrated value by as much as 5 percent, depending upon the temperature and salinity of the waters in which the vessel is operating; the highest velocities are found in warm, highly saline water, and the lowest in icy, fresh water. Variation in line voltage can also cause errors of 10 percent or more in readings of the fathometer. Echoes can be obtained from schools of fish; in fact, trawlers are using the fathometer for that purpose. The most serious error in reading the fathometer commonly occurs where the depth is greater than the scale range of the instrument; a 400-fathom scale indicates 15 fathoms visually and graphically when the depth is 415 fathoms. Where possible, wide variations from charted depths should be checked by wire soundings.

Depth curves.—Since the installation of fathometers on most ships, the Coast and Geodetic Survey has been giving special prominence to depth curves on nautical charts of areas where modern hydrographic surveys have been made. Deep-water submarine relief has become important to the navigator, and the more faithfully the chart depicts this relief, the closer the navigator can relate his depth readings to the chart. The older charts showed many soundings and few depth curves; the newer charts show more depth curves and fewer soundings.

The **plane of reference** for charted depths is the mean of all low waters for the Atlantic coast of the United States, including the West Indies, and the mean of the lower low waters for the Pacific coast, including Alaska and the Hawaiian Islands. For foreign charts, the plane most frequently used is mean low water springs.

The effect of strong winds, in combination with the regular tidal action, may at times cause the water to fall considerably below the plane of reference of the chart. The level may also rise considerably above mean high water due to similar causes.

Dredged channels are shown on the charts by broken lines that represent the side limits of the improvement. Controlling depths in major channels are given in tabular form for the four quarters of the project width when the information is available. When the tabular form is not used, a note gives the controlling depth, the available width, and the date determined; if the width is not stated, the depth given is for the middle half. Revisions of tabulations and notes are published in the *Notice to Mariners*.

Compass roses on charts.—The annual change in variation gradually introduces an error in the magnetic compass roses on charts. The compass roses are replotted for every new edition of the chart if the error is appreciable; and the amount and date of the variation and the amount of annual change are stated for each compass rose. On some of the sailing and general charts the magnetic variation is shown by isogonic lines.

Magnetic disturbance of the compass.—The charts show areas where local magnetic disturbance of the compass, or **local attraction**, is caused by magnetic masses external to the ship. Such disturbances are fairly common in shallow waters but are never encountered over oceanic depths. Magnetic force diminishes so rapidly with

distance that a magnetic center on land would have to be of unprecedented intensity to be capable of affecting the compass of a vessel 0.5 mile from shore.

It is unlikely that all the areas of magnetic disturbance have been located. When such an area is discovered, the position should be fixed and the facts reported as far as they can be ascertained. It is particularly important to note the time at which the disturbance was encountered, so as to rule out the possibility that the effects were caused by a magnetic storm rather than by local irregularity.

Deviation of the compass.—The magnetic effect of the ship itself combines with any instrumental error of the compass to cause the deviation, which varies with the heading of the ship and with the magnetic latitude. It is customary to counteract the deviation as far as possible with soft iron and permanent magnets, suitably placed in or on the binnacle.

Determination of compass error by the use of navigational ranges.—The azimuths of channel ranges which have been determined with sufficient accuracy for compass error determination are indicated in degrees and minutes in the *Light List* and in the *Notice to Mariners*. Azimuths given only in degrees should not be used for this purpose.

Use of electrical equipment affecting magnetic compasses.—Experiments with portable electric megaphones show that when such instruments are within 6 feet of a compass an error of 2° to 4° will result; closer proximity increases this greatly. Emergency lights and portable telephones have similar effects. Such electrical equipment should not be stowed within 10 feet of magnetic compasses nor used nearer the compasses for a time greater than necessary. Serious deflection of a ship's compass has been caused by the helmsman wearing an electric suit of the type used by airmen; masters are advised to prohibit the wearing of such garments in the vicinity of the compass.

Overhead cables are shown on the charts and described in the Coast Pilots; the clearances given are for the lowest wires at high water. Vessels with masts, stacks, booms, or aerials should allow for an additional clearance under power cables equal to the distance between adjacent cables

The areas in which **submarine cables** are laid are shown on the charts by dashed lines. Because of the serious consequences resulting from damaged cables, vessels should take special care to avoid anchoring or fishing in cable areas.

If a vessel does foul a submarine cable, every effort should be made to clear the anchor or gear by normal methods: should these fail, the anchor or gear should be slipped and abandoned without attempting to cut the cable. High voltages are, or may be, fed into certain cables, and there is serious risk of severe burns or loss of life if any attempt is made to cut the cable. Damaging a submarine cable is a Federal offense.

The International Conference for the Protection of Submarine Cables, Paris, 1884, provided that the owners of vessels who are able to prove that they have sacrificed an anchor, a net, or other fishing gear, in order not to damage a submarine cable, may be compensated by the owner of the cable.

Tide Tables are issued annually by the Coast and Geodetic Survey in advance of the year for which they are prepared; see *Publications* at the end of this chapter. These tables include predicted times and heights of high and low waters for every day in the year for a number of reference stations and differences for obtaining similar predictions

for numerous other places. They also include other useful information such as a method for obtaining heights of tide at any time, local civil time of sunrise and sunset for various latitudes, reduction of local civil time to standard time, and time of moonrise and moonset for various ports.

Caution.—In using the Tide Tables, slack water should not be confused with high or low water. For ocean stations there is usually little difference between the time of high or low water and the beginning of ebb or flood currents; but for places in narrow channels, land-locked harbors, or on tidal rivers, the time of slack current may differ by several hours from the time of high or low water. The relation of the times of high or low water to the turning of the current depends upon a number of factors, so that no simple general rule can be given. To obtain the times of slack water, reference should be made to the Current Tables or to information given in the Coast Pilot.

Current Tables for the Atlantic coast and for the Pacific coast of the United States are issued annually by the Coast and Geodetic Survey in advance of the year for which they are prepared; see *Publications* at the end of this chapter. These tables include daily predictions of the times of slack water and the times and velocities of strength of flood and ebb currents for a number of waterways, together with differences for obtaining predictions for numerous other places. Also included is other useful information such as a method for obtaining the velocity of current at any time, duration of slack, coastal tidal currents, wind currents, combination of currents, and current diagrams. Some information on the Gulf Stream is included in the tables for the Atlantic coast.

Tidal Current Charts are published by the Coast and Geodetic Survey for various localities; see *Publications* at the end of this chapter. These charts depict the direction and velocity of the current for each hour of the tidal cycle. They present a comprehensive view of the tidal current movement in the respective waterways as a whole and when used with the proper current tables or tide tables supply a means for readily determining for any time the direction and velocity of the current at various localities throughout the areas covered.

THE COAST GUARD has among its duties (1) enforcement of the laws of the United States on the high seas, in harbors, bays, sounds, roadsteads, and other like bodies of water along the coasts of the United States, its territories and possessions; (2) enforcement of navigation laws, of neutrality laws and regulations, of rules and regulations in relation to anchorage grounds, and of the Oil Pollution Act; (3) inspection of all vessels to insure safety to passengers and crews; (4) aid to distressed mariners and saving of life and property from shipwreck; (5) issuance of marine licenses and certificates; (6) investigation of circumstances connected with shipwreck or collision at sea; (7) destruction of derelicts; (8) construction, operation, maintenance, and inspection of aids to navigation; and (9) publication of Local Notices to Mariners and Light Lists.

The **Local Notices to Mariners** issued for each Coast Guard district include the changes and deficiencies in aids to navigation within that district. These notices contain sufficient information to serve the needs of the local navigator and may be obtained free of charge from the appropriate District Commander.

Light Lists.—All aids to navigation, such as lights, radiobeacons, fog signals, buoys, and daymarks, are described in these publications which are for sale by the Superin-

tendent of Documents, Government Printing Office, Washington 25, D. C., and by the various sales agencies. Mariners are referred to the above publications for detailed information regarding the characteristics, power, and visibility of lights, as well as descriptions of light structures and daymarks, buoys, and fog signals. Such detailed information is not given in this Coast Pilot; see *Publications* at the end of this chapter.

The Light List is corrected to the date of publication printed on the title page. The mariner is cautioned that the latest list must be used; he should keep his Light Lists as well as his charts corrected from changes announced in the weekly *Notice to Mariners*.

Aids to Navigation.—The distances at which **lights** may be seen in clear weather, given in Light Lists and on charts, are the geographic ranges computed in nautical miles for a height of the observer's eye of 15 feet above sea level; the luminous range is given when the light is not of sufficient power to be seen to the limit of its geographic range. These distances may at times be increased by abnormal atmospheric refraction and, of course, may be greatly lessened by unfavorable weather conditions, such as fog, rain, haze, or smoke. All except the most powerful lights are easily obscured by such conditions.

The navigator who expects to make a light of considerable power should find the geographic range corresponding to his own height of eye by reference to the Visibillty Table in the *Light Lists*. For lights of small luminous power it is obvious that the increased geographic range is of no interest.

If, when first sighted, a light can be made to dip below the horizon by at once lowering the eye several feet, it is evident that the vessel is at the limit of the geographic range and that the light is of considerable luminous power. If, under the same circumstances, the light cannot be made to dip, it is evident that the vessel is well within the geographic range and may, in fact, be very close to the light, and that the light is of relatively small power. This same maneuver will also aid in distinguishing the lights of another vessel from the more powerful navigational lights, as a vessel's lights are usually so limited in intensity that they do not carry far enough to be intercepted by the horizon. The distance of a light cannot be estimated by its dimness or brilliance. See inside back cover for *Distance of Visibility of Objects at Sea*.

Buoys.—Buoyage of the United States, with color, shape, numbering, and light characteristics, is described in the introductions to the *Light Lists*. Buoys are liable to be carried away, shifted, or capsized; lighted buoys may be extinguished; or audible buoys may not sound because of storm, ice, or collision. The navigator should, if possible, check his position by shore bearings, soundings, or other means.

Vessel operators are required by law to notify the nearest Coast Guard office of collisions with aids to navigation. Such collisions frequently are not reported as promptly as desirable, and repair or replacement of aids is thereby delayed.

Fog signals that depend upon the transmission of sound through the air have, as aids to navigation, certain inherent defects that should be considered. Sound travels through the air in a variable manner, even in the absence of wind, and its behavior cannot be predicted or guarded against. The distance at which a fog signal can be heard may vary with the bearing of the signal and may be different on different occasions. The intensity of the sound may be greater at a distance than close-to. There are sometimes areas, perhaps close to the signal, where the sound is entirely inaudible. Mariners must not judge their distance from a fog signal by the intensity of the sound and must not assume that a signal is not sounding because they do not hear it.

Echoes.—When a vessel is in the vicinity of a high rocky shore the navigator may find it advantageous to time the echo of his own signal and thus obtain a rough estimate of the distance offshore. The velocity of sound in air can be taken as 1,100 feet per second. In some localities **echo boards** have been erected to facilitate this operation. Two general types are in use. The first is specially constructed so that the echo will be heard at a specified distance off. The second is a flat surface which will reflect any sound striking it. See the *Light List* for the construction details of each echo board before using it.

Radiobeacons are operated continuously during fog and low visibility and also at scheduled intervals during clear weather, night and day. The more powerful stations have an effective range far greater than is possible with light and fog signals, and bearings of them will furnish the navigator with a valuable indication of his position long before the land is in sight.

A list and descriptive details of all marine radiobeacons are given in the *Light List* and H. O. Publication No. 205, *Radio Navigational Aids*. Radio aircraft ranges and standard broadcast stations that may be received on marine radio compasses are listed in the Appendix. Conversion of radio bearings to Mercator bearings is discussed later.

A vessel steering a course for a radiobeacon should observe the same precautions as when steering for a light or any other mark. If the radiobeacon is aboard a lightship, particular care should be exercised to avoid the possibility of collision, and sole reliance should never be placed on sighting the lightship or hearing her fog signal. If there are no dependable means by which the vessel's position may be fixed and the course changed well before reaching the lightship, a course should be selected that will insure passing the lightship at a distance, rather than close aboard, and repeated bearings of the radiobeacon should show an increasing change in the same direction.

During a period of radio propagation disturbance, radiobeacon observations may be unreliable. See later discussion under *Time Signals*.

Special operation of radiobeacon stations for calibration of direction-finders.—Certain United States radiobeacons will broadcast for the purpose of enabling vessels to calibrate their radio direction-finders upon request. Special calibration operation will be made only upon request in advance to the district commander in whose district the calibration station is located, the address and district limits of which are listed in the Appendix. The day, time, and frequenty on which special calibration service is desired must be stated. If service is desired on both frequencies listed, the time that transmission on each frequency is desired must be specified. Upon the arrival at the station on the date and hour specified, station personnel may be contacted by means of the usual whistle signal or flag hoist. At stations that also have radiobeacons, when previous arrangements have not been made, the regular radiobeacon transmitter will be operated for calibration purposes in answer to the usual whistle signal or flag hoist for calibration as given below. If it is not practicable to determine the time of calibration sufficiently in advance to contact the district commander, or if the calibration is desired from a remote station where communication is difficult, request may be made directly to the station by means of telephone, telegraph, or a whistle signal consisting of three long blasts followed by three short blasts, this whistle signal to be repeated until same is acknowledged by the station through the starting of the transmitter. The same group of signals will be sounded at the termination of calibration.

If attention of station or lightship is not attracted by the whistle signals, hoist the International Code signal, **J** over **K**, to indicate request for radio direction-finder calibration.

The work of the station personnel is not confined to standing watch and there may be times when the whistle request for calibration is not immediately heard, due to the noise of the operating station, etc. Usually, a repeated signal not too far from the station will attract attention.

Transmission for calibration purposes will be continuous without the 2 minute silent interval unless another station in the same frequency group is in operation at the time, in which case calibration operation will be "1 minute on, 2 minutes off." No continuous transmission for calibration will be undertaken during regular schedule periods of operation.

In addition to the special operation of regular radiobeacon transmitters for calibration of direction-finders, special radio direction-finder calibration transmitters of short range are also operated at certain localities to provide continuous service These stations with information as to position, frequency, and characteristic are given in the *Light Lists*.

Radio bearings.—No exact data can be given as to the **accuracy** to be expected in radio bearings taken by a ship, since the accuracy depends to a large extent upon the skill of the ship's operator, the condition of the ship's equipment, and the accuracy of the ship's calibration curve. Mariners are urged to obtain this information for themselves by taking frequent radio bearings, when their ship's position is accurately known and recording the results. United States radiobeacons are operated on hourly schedules regardless of weather conditions and at other times upon request (see special operation of radiobeacon stations given in *Light Lists*), giving mariners opportunity to make such frequent observations and often to check the results directly with visual bearings.

Skill in the operation of the radio direction-finder can be obtained only by practice and by observing the technical instructions for the set in question. For these reasons the operator should study carefully the instructions issued with the set and should practice taking bearings frequently so that when bearings are needed he can obtain them rapidly and accurately.

As the bearings are obtained by revolving the direction-finder coil until the signal disappears or becomes a minimum, the operator can tell by the size of the arc of silence or of minimum strength approximately how accurately he has taken the bearing. For instance, if the minimum is broad and the residual signal covers about 10° with equal strength, it is doubtful if the bearing can be accurately estimated within 3° or 4°. Where direction-finder bearings are not taken by the navigating officer, it will frequently be advantageous for the mariner to have his ship's operator report the probable operator's error of the bearing taken.

Radio bearings from other vessels.—Any vessel with a radio direction-finder can give a bearing to a vessel equipped with a radio transmitter. Such service will generally be furnished when requested, particularly by Government vessels. These bearings, however, should be used only as a check, as comparatively large errors may be introduced by local conditions surrounding the radio direction-finder unless known and accounted for. Any radio station, for which the position of the transmitter is definitely known, may serve as a radiobeacon for vessels equipped with a radio direction-finder. However,

mariners are cautioned that stations established especially for maritime service are more reliable.

Conversion of radio bearings to Mercator bearings.—The increasing use of radio directional bearings for locations of ships' positions at sea, especially during foggy weather, has made it particularly desirable to be able to apply these radio bearings directly to the nautical chart. These radio bearings are the bearings of the great circles passing through the radio stations and the ship, and, unless in the plane of the Equator or of a meridian, would be represented on a Mercator chart as curved lines. Obviously it is impracticable for a navigator to plot such lines on a Mercator chart, so it is necessary to apply a correction to a radio bearing to convert it into a Mercator bearing, that is, the bearing of a straight line on a Mercator chart laid off from the sending station and passing through the receiving station.

A table of corrections is given in the Appendix for the conversion of a radio bearing into a Mercator bearing. It is sufficiently accurate for practical purposes for distances up to 1,000 miles.

The only data required are the latitudes and longitudes of the radiobeacons and of the ship by dead reckoning. The latter is scaled from the chart, and the former is either scaled from the chart or taken from the list of radiobeacons in the *Light List* or H. O. Publication No. 205, *Radio Navigational Aids.*

The table is entered with the differences of longitude in degrees between the ship and station (the nearest tabulated value being used), and opposite the middle latitude between the ship and station, the correction to be applied is read.

The sign of the correction (bearings read clockwise from the north) will be as follows: In north latitude, the minus sign is used when the ship is east of the radiobeacon and the plus sign used when the ship is west of the radiobeacon. In south latitude, the plus sign is used when the ship is east of the radiobeacon, and the minus sign is used when the ship is west of the radiobeacon.

To facilitate plotting, 180 degrees should be added to or subtracted from the corrected bearing, and the result plotted from the radiobeacon.

Should the position by dead reckoning differ greatly from the true position of the ship as determined by plotting the corrected bearings, a retrial should be made, using the new value as the position of the ship.

Numbering and recording of undocumented vessels.—Under the act of June 7, 1918, as amended, and the regulations issued thereunder, every undocumented vessel operated in whole or in part by machinery, owned in the United States and found on the navigable waters thereof, except public vessels and vessels not exceeding 16 feet in length, measured from end to end over the deck excluding sheer, temporarily equipped with detachable motors, shall be numbered. The requirements contemplate that machinery propelled undocumented vessels of less than 5 net tons used for commercial purposes, which are owned in the United States and found on such waters, be numbered under the provisions of the act as such vessels, by reason of tonnage, are exempt from documentation. The Numbering Act, however, is for the purpose of identification only and the certificate of award of number which is issued to any such vessel is solely for such purpose. It is not an authorization, license, or permit for any such vessel to engage in trade.

Vessels of 5 net tons and over, used exclusively for pleasure purposes, and otherwise entitled to be documented may be licensed or enrolled and licensed as yachts by

the Bureau of Customs. The documentation of such vessels as yachts is not a mandatory requirement, however, and where such vessels are machinery propelled and found on United States waters, if not documented, they must be numbered under the provisions of the act. There is no restriction as to length, tonnage, or size of such vessels and the provisions of the Numbering Act should not be confused with those of the Motorboat Act of 1940 providing for the equipment of motorboats not exceeding 65 feet in length and with other machinery propelled vessels. The regulations issued by the Commandant of the Coast Guard under authority of the Numbering Act clarify the language of the statute requiring the following undocumented vessels to be numbered:

(a) All boats equipped with permanently installed motors.

(b) All boats over 16 feet in length equipped with detachable motors.

The following undocumented vessels are not required to be numbered:

(a) Public vessels.

(b) All boats not exceeding 16 feet in length temporarily equipped with detachable motors.

(c) Motor lifeboats carried as lifesaving equipment on inspected vessels.

The words *temporarily equipped with detachable motors* shall be construed to mean outboard motors which are clamped or otherwise temporarily fastened as distinguished from outboard motors bolted or otherwise permanently secured. The controlling principle shall be whether or not the vessel has permanently installed motors rather than the design or construction of the vessel. A boat designed specifically for the use of an outboard motor as the ordinary means of propulsion, if not exceeding 16 feet in length, is nevertheless exempt for the requirements of the act if temporarily equipped with an outboard motor.

Applications and issuance of numbers.—Upon the purchase of an undocumented vessel which has been issued a certificate of award of number under the provisions of the act of June 7, 1918, as amended, and after completion of the bill of sale on the reverse side of the certificate by the vendor or the former owner, the purchaser should execute the application for number for undocumented motor vessel, which is incorporated on the reverse side of the certificate of award of number (CG 1513) and surrender the certificate, bill of sale, and application for a new number to the Officer in Charge, Marine Inspection, U. S. Coast Guard, having jurisdiction over the area in which the vessel is owned, within the statutory period of 10 days. That officer upon receipt of the certificate with the bill of sale and application properly executed, and upon being satisfied with the evidence of ownership, will assign a number to the vessel and forward the certificate and accompanying papers to the District Commander for processing. He will at the same time issue to the new owner a letter authorizing the operation of the vessel for a limited period, without the certificate of award of number on board, pending the issuance of such papers by the District Commander,

In the case of such vessels which are new or which have never been numbered under the provisions of the act of June 7, 1918, as amended, or which are operating under the old form of certificate of award of number, application should be made to the Officer in Charge, Marine Inspection, U. S. Coast Guard, having jurisdiction over the area in which the vessel is owned, for a certificate of award of number by presenting proper evidence of ownership such as a bill of sale, or builder's certificate, and by the execution of Form CG 1512, application for number for undocumented motor vessel. Upon the execution of these cards in duplicate and the presentation of evidence of ownership, the Officer in

Charge, Marine Inspection, U. S. Coast Guard, will accept the application and accompanying papers, transmitting same to the District Commander for processing and will thereupon assign a number to the vessel, at the same time issuing a letter authorizing the operation of the vessel for a temporary period under the numbers assigned and pending the issuance of a certificate of award of number by the District Commander.

Number required on bows of vessels.—Upon assignment of a number by the Officer in Charge, Marine Inspection, U. S. Coast Guard, or upon receipt of the certificate of award of number, the number awarded shall be painted or attached to each bow of the vessel and shall be in block characters of good proportion and not less than 3 inches in height, reading from left to right and parallel with the waterline, as near the forward end of the bow as legibility of the entire number for surface and aerial identification permits. The number shall also be of a color in contrast with the color of the hull so as to be distinctly visible and legible.

Carrying certificate of award of number.—The certificate of award of number must be kept on board at all times (unless in the custody of the Coast Guard), except in the case of vessels not exceeding 17 feet in length, or vessels whose design or fittings are such that the carrying of such certificate on board would render it imperfect, illegible, or would otherwise tend to destroy its usefulness as a means of ready identification.

Search and rescue operations.—The Coast Guard maintains and operates an established rescue organization of surface craft, aircraft, lifeboat stations, bases, and radio stations, together with operation and rescue coordination centers, along the coasts of the United States, Bermuda, Alaska, Newfoundland, Puerto Rico, Guam, and the Philippines, for the promotion of safety of vessels and aircraft on and over the high seas and waters subject to the jurisdiction of the United States.

Operators of disabled wooden craft that are, or may consider themselves to be, the object of a search should hoist on a halyard or otherwise place aloft any metallic object that would assist their detection by radar. All Coast Guard patrol vessels, planes, and some buoy tenders utilize this equipment and thus can continue searches in darkness and during other periods of low visibility if it can be assumed that the object of the search can be detected through the use of this aid.

Actual observations have shown that wooden hulls or other nonmetallic objects are suited as radar targets according to the size, orientation, shape, and other radar-reflecting qualities of the object. Their value as radar targets may be enhanced by the use of special radar-reflecting devices properly oriented and placed as high above the waterline as possible. The largest metallic object available should be used.

Ships in distress.—Radio-equipped vessels in need of assistance to save life and property may obtain the services of the Coast Guard by transmitting a request on the international distress and calling frequency 500 kc. to "Any Coast Guard Unit" (radio call NCU), or to any shore radio station addressed to "COGUARD." Shore radio stations will forward to the Coast Guard all information regarding vessels requiring assistance unless such information is contained in a message specifically addressed elsewhere.

The following information should be included in the first request for assistance, as it will provide a means of proper evaluation of the incident and facilitate the work of the Coast Guard in avoiding any unnecessary delay in dispatching of rescue craft:

1. Name, type, and nationality of vessel; color, size, and shape.
2. Position, course, and speed (including drift).
3. Nature of casualty and assistance required; and condition of vessel, sea, and wind. Local action taken.

Small craft in distress.—Small commercial and private craft equipped only with radiotelephone apparatus and authorized to operate in the 1605–2850 kc/s band, in need of assistance, may communicate with the United States Coast Guard by transmitting the distress signal or call and the message on the international calling and distress frequency 2182 kc/s or on the Coast Guard calling and emergency frequency 2670 kc/s if unable to operate on 2182 kc/s. Numerous Coast Guard units maintain a continuous watch on 2182 kc/s and 2670 kc/s and will answer emergency calls thereon, if heard.

Submarine emergency identification signals.—The following smoke-bomb or flare signals are made by submarines of the United States in cases of necessity:

Black or green indicates torpedo has been fired; will be used to simulate torpedo firing on special exercises such as convoy exercises.

Yellow indicates that submarine is about to come to periscope depth from below periscope depth. Surface craft terminate antisubmarine counterattacks and clear vicinity of submarine. Do not stop propellers!

Red indicates an emergency condition within the submarine and she will surface immediately if possible. Surface vessels clear the area and stand by to give assistance after the submarine has surfaced. In case of repeated red signals, or if the submarine fails to surface within a reasonable time, she may be assumed to be disabled. Buoy the location, look for submarine marker buoy, and attempt to establish sonar communications. Advise naval authorities.

The foregoing, all of which mark the submarine's position, are fired from a submerged signal ejector into the air to a height of about 300 feet, then float downward slowly, suspended from a small parachute, and give colored illumination for about 30 seconds.

Submarines are also equipped with marker buoys which are about 3 feet in diameter, painted yellow, and equipped with telephones for communication with the interior of the submarine. A submarine on the bottom in distress and unable to surface, will, if possible, release this buoy. An object of this description which is sighted on the surface of the water should be investigated and naval authorities advised.

Signals for aid of aircraft in distress.—The information below is quoted from Annex 12 to International Civil Aviation Organization (S. A. R.) (Annex), Search and rescue signals.

6.1—Signals with surface craft.

6.1.1—When it is necessary for an aircraft to direct a surface craft to the place where an aircraft or a surface craft is in distress, the aircraft shall do so by transmitting precise instructions by any means at its disposal. If such precise instructions cannot be transmitted or when necessary for any other reason, the instructions shall be given by using the procedure prescribed in 6.1.2.

NOTE.—Normally a change of heading will be made by a surface craft as an acknowledgement that the direction has been received and will be complied with. If the surface craft is unable to comply it will so indicate by hoisting the International flag N, or by other visual or radio means.

6.1.2—The following procedures performed in sequence by an aircraft shall mean that an aircraft is directing a surface craft toward an aircraft or a surface craft in distress:

(a) Circling the surface craft at least once.

(b) Crossing the projected course of the vessel close ahead at a low altitude, opening and closing the throttle, or changing the propeller pitch.

(c) Heading in the direction in which the surface craft is to be directed. Repetition of such procedures shall have the same meaning.

6.1.3—The following procedure performed by an aircraft shall mean that the assistance of the surface craft to which the signal is directed is no longer required:

Crossing the wake of the vessel close astern at a low altitude, opening and closing the throttle, or changing the propeller pitch.

Mariners are advised that while U. S. Government vessels or planes in distress may exhibit the recognized International Distress signals, as set forth under the International Rules of the Road, they may be equipped with an additional distress signalling device intended to supplement the regular distress signals. This apparatus emits an orange smoke visible by day and red flames which can be seen at night.

Rescue operations for ditching (landing at sea) and disabled aircraft.—Mariners may from time to time be called upon to assist aircraft transiting the oceans which may be forced to discontinue flight for many reasons such as engine casualty or fuel starvation. Prior to the ditching (landing in the ocean) of the aircraft and the subsequent rescue of the personnel aboard the aircraft, the mariner should attempt to communicate with the aircraft by any means and attempt to rendezvous as close together as time permits before the actual forced landing (ditching) takes place. Describe to the pilot of the aircraft the force and direction of the surface wind and the condition of the sea and swells as accurately as possible. These factors will influence the decision of the pilot and this knowledge beforehand contributes to the safety of the operation. If the ditching operation is attempted at night, use of the searchlight, water lights, and ships lighting is of considerable benefit, but care should be exercised that the pilot of the aircraft is not blinded by the direct rays of the searchlights.

The ship should be maneuvered smartly into position where the aircraft is down, exercising care with the ship and ship's boats, to prevent puncturing or further damaging the buoyancy of the aircraft. In many instances the aircraft will be severely damaged upon impact, even to the extent of the engines and tail breaking off and passengers thrown into the water, so it is imperative that the rescue operation be handled with dispatch. There are instances, however, where an aircraft, after a forced landing on the water, has floated for as long as three or four hours.

Aircraft operating over the oceans carry rubber inflatable lifeboats and lifejackets, and it is to be expected that if the personnel are capable they will attempt to launch these rafts from the disabled aircraft.

In addition to the regular lifeboat equipment in the ship's boat, it has been proved that the following items are also useful:

Blankets, several flashlights, two pairs of heavy gloves, pliers, bolt cutters, metal shears, two fire axes, extra life jackets, an inflatable rubber or cork liferaft, and several 10-fathom lengths of nine-thread line.

The rubber or cork liferaft can be used to lay alongside the ditched aircraft in cases where the metal lifeboat might become damaged.

After rescue operations are completed, the mariner should make every effort to recover or destroy all equipment or wreckage to preclude future sightings and reporting.

Searching for disabled vessels and aircraft survivors.—During daylight hours when a vessel enters an area where the presence of survivors is suspected, heavy black smoke should normally be made for prolonged periods if possible. Survivors, upon sighting the vessel or the smoke, will normally make every attempt by all signalling devices, e. g., smoke signal, reflecting mirror, to try to attract the attention of the vessel.

At night green Very star signals should be fired occasionally by the searching vessel and a searchlight trained vertically and rotated in a small circle. A survivor, seeing either of these signals, should reply with a red Very star, if he had one, or by any means available, such as a flashlight and the like. The searching vessel will normally acknowledge with two green Very stars or two flashes of searchlight pointed at survivors.

Reports of accidents or casualties.—The licensed officer in command of any vessel involved in a marine casualty shall give notice as soon as possible to the nearest marine inspection office of the United States Coast Guard and shall also report in writing and in person to the Officer in Charge, Marine Inspection, United States Coast Guard, at or nearest the port of first arrival, any casualty or accident involving loss of life, or damage to property in excess of $1,500, or material damage affecting the seaworthiness or efficiency of the vessel, or any stranding or grounding or any injury causing any person to remain incapacitated for a period in excess of 72 hours except injury to a harbor worker not resulting in death and not resulting from vessel casualty or vessel equipment casualty. The notice required by the licensed officer in command shall show the name and official number of the vessel involved, the owner or agent thereof, the nature and probable cause of the casualty, the locality in which it occurred, the nature and extent of the injury to persons, and the damage to property.

THE CORPS OF ENGINEERS, United States Army, has charge of the improvement of the rivers and harbors of the United States and of miscellaneous other civil works which include the administration of the Federal laws enacted for the protection and preservation of navigable waters of the United States, the establishment of regulations for the use, administration, and navigation of navigable waters, the approval of plans of bridges, the alteration of obstructive bridges, the establishment of anchorage grounds and harbor lines, the removal of sunken vessels obstructing or endangering navigation, and the granting of permits for structures or operations in navigable waters.

Information concerning the various ports, improvements, channel depths, navigable waters, and the condition of the Intracoastal Waterways in the areas under their jurisdiction may be obtained direct from the District Engineer offices; see Appendix.

Anchorage areas and restricted areas in most places are defined and regulations governing them are established by the Corps of Engineers. The regulations are enforced by the United States Coast Guard, and the areas are shown on the large-scale charts of the Coast and Geodetic Survey. Copies of the regulations may be obtained at the offices of the Corps of Engineers. The regulations also are copied into the appropriate Coast Pilots.

The **Port Series,** prepared jointly by the Corps of Engineers and the Maritime Administration and sold by the Superintendent of Documents, are complete reports on the principal seaports of the United States and are primarily of interest to commercial

and industrial concerns. They cover the subjects of particular interest to the shipping world, such as the physical features of each port, its organization and practices, regulations regarding the movement of ships and goods, port dues and charges, fuel and water, rail connections, and commerce.

Protection of navigable waters.—Given below are extracts from the laws of the United States for the protection and preservation of the navigable waters of the United States.

That it shall not be lawful to throw, discharge, or deposit, or cause, suffer, or procure to be thrown, discharged, or deposited either from or out of any ship, barge, or other floating craft of any kind, or from the shore, wharf, manufacturing establishment, or mill of any kind, any refuse matter of any kind or description whatever, other than that flowing from streets and sewers and passing therefrom in a liquid state, into any navigable water of the United States, or into any tributary of any navigable water from which the same shall float or be washed into such navigable waters; and it shall not be lawful to deposit, or cause, suffer or procure to be deposited material of any kind in any place on the bank of any navigable water, or on the bank of any tributary of any navigable water, where the same shall be liable to be washed into such navigable water, either by ordinary or high tides, or by storms or floods, or otherwise, whereby navigation shall or may be impeded or obstructed.

That it shall not be lawful to tie up or anchor vessels or other craft in navigable channels in such a manner as to prevent or obstruct the passage of other vessels or craft; or to voluntarily or carelessly sink, or permit or cause to be sunk, vessels or other craft in navigable channels; or to float loose timber and logs, or to float what is known as sack rafts of timber and logs in streams or channels actually navigated by steamboats in such a manner as to obstruct, impede, or endanger navigation. And whenever a vessel, raft, or other craft is wrecked and sunk in a navigable channel, accidentally or otherwise, it shall be the duty of the owner of such sunken craft to immediately mark it with a buoy or beacon during the day and a lighted lantern at night, and to maintain such marks until the sunken craft is removed or abandoned, and the neglect or failure of said owner so to do shall be unlawful; and it shall be the duty of the owner of such sunken craft to commence the immediate removal of the same and prosecute such removal diligently, and failure to do so shall be considered as an abandonment of such craft, and subject the same to removal by the United States as hereinafter provided for.

That, except in case of emergency imperiling life or property, or unavoidable accident, collision, or stranding, and except as otherwise permitted by regulations prescribed by the Secretary as hereinafter authorized, it shall be unlawful for any person to discharge, or suffer, or permit the discharge of oil by any method, means, or manner into or upon the coastal navigable waters of the United States from any vessel using oil as fuel for the generation of propulsion power, or any vessel carrying or having oil thereon in excess of that necessary for its lubricating requirements and such as may be required under the laws of the United States and the rules and regulations prescribed thereunder. The Secretary is authorized and empowered to prescribe regulations permitting the discharge of oil from vessels in such quantities, under such conditions, and at such times and places as in his opinion will not be deleterious to health or sea food, or a menance to navigation, or dangerous to persons or property engaged in commerce on such waters, and for the loading, handling, and unloading of oil.

WEATHER BUREAU.—Weather forecasts and warnings of the approach of storms over land and ocean areas are among services of the Weather Bureau to navigation, commerce, agriculture, and the general public. Other warnings cover cold waves, frost, forest-fire hazard, floods, and many types of weather conditions affecting the nation's economy.

Meteorological information is collected and transmitted at hourly, 3-hourly and 6-hourly intervals from land stations, ships at sea, and aircraft. These reports form a basis for the forecasting service, for summarization and publication of climatological data having general value and applicability, and for research basic to improvement of the national weather service.

Weather Bureau offices are located in many ports and other places throughout the continental United States and possessions. Stations in the area of concern to this Coast Pilot, at which the public may compare barometers against Weather Bureau barometers and discuss matters of weather service with Weather Bureau officials, are listed in the Appendix. By international agreement, the Weather Bureau also bears a share in the maintenance and operation of certain weather ships on the free oceans.

Marine meteorological service.—The collection of observations from ships at sea is conducted on a purely voluntary and cooperative basis. The Weather Bureau supplies shipmasters with blank forms, printed instructions, and such other material as is essential to the making and recording of observations. In the course of an average peace-time year, more than 100,000 observations are received from vessels representing every maritime nation and reaching every quarter of the globe. Among the publications that include reports based on this cooperative service are the *United States Coast Pilots*, which contain sections on weather and climate, storm charts, and meteorological tables. The *Pilot Charts* of the Hydrographic Office contain ocean meteorological data prepared in the Weather Bureau; *Sailing Directions* and *Naval Air Pilots* also contain summaries of weather information prepared by the Weather Bureau for various parts of the world from reports rendered chiefly by officers of merchant ships.

The **hurricane and storm warning service** was established primarily to aid marine interests. Storm warnings are prepared at regular district forecast centers and at special hurricane forecast centers. The warnings are distributed to the public through all neighboring Weather Bureau offices by radio, the press, and every other available means. During the West Indian hurricane season, June to November, inclusive, special teletype circuits expedite the exchange of special reports from the Atlantic and Gulf coasts. Special ship reports are described later under the heading of *Reports from Ships*. Special aircraft reports are obtained during the hurricane season from weather reconnaissance planes which fly near the storms and sometimes into the storm centers.

Storm warning signals are displayed by the United States Weather Bureau from about 400 towers or flagstaffs on the Atlantic, Gulf, and Pacific coasts and on the shores of the Great Lakes. No displays are made in Alaska since distribution of the messages usually is effected by local radio broadcasts. Day and night displays are illustrated in the front of this Coast Pilot.

These storm signals are used to warn of the approach of a storm of marked violence with the wind beginning to blow from the indicated direction. The mariner must bear in mind that the storm signals do not necessarily mean that a storm will occur at the place where the signal is displayed, but that one is expected either there or within such a distance that vessels leaving port would be liable to be caught in it.

Other means by which weather information of public concern is circulated are described under the headings of *Weather Broadcasts* and *Reports from Ships* in this chapter. A table of commercial radio stations which broadcast directly from Weather Bureau microphones is contained in the Appendix. Additional information pertaining to weather radio or teletype services may be requested from the Weather Bureau, Washington 25, D. C.

Weather Bureau publications may be obtained from the Superintendent of Documents, Government Printing Office, Washington 25, D. C., upon payment of list price. The current *Price List of Weather Bureau Publications* may be requested from the Weather Bureau, Washington 25, D. C. Certain publications, such as *Annual Meteoro-*

logical Summaries, may be obtained free of charge, ordinarily from the individual Weather Bureau offices which prepare them.

THE HYDROGRAPHIC OFFICE of the United States Navy exists for the improvement of the means of navigating safely the vessels of the United States Navy and the Merchant Marine by providing accurate nautical charts, light lists, and sailing directions (pilots) of foreign navigable waters, navigator's tables and manuals of instruction for the use of all vessels of the United States and for the benefit and use of navigators generally.

Publications issued by the Hydrographic Office include Charts of the high seas and all foreign waters, Sailing Directions and Light Lists for the same areas, Table of Distances Between Ports, Radio Navigational Aids, Radio Weather Aids to Navigation, International Code of Signals, the American Practical Navigator (Bowditch), and the Notice to Mariners; see *Publications* at the end of this chapter.

The weekly **Notice to Mariners**, published in two parts, contains corrections to Charts, Coast Pilots, Sailing Directions, Light Lists, and other publications. Part I (Western Hemisphere), prepared jointly by the U. S. Coast Guard and the U. S. Navy Hydrographic Office, covers North and South America, Greenland, and the Hawaiian Islands and also includes general information of world interest. Part II (Eastern Hemisphere) covers only notices to mariners and light lists for the rest of the world and is prepared by the Hydrographic Office mostly from foreign Notices to Mariners and from reports submitted by officers of vessels. Part I is mailed free on application to the Commandant (OAN), U. S. Coast Guard, Washington 25, D. C., or to the U. S. Navy Hydrographic Office, Washington 25, D. C.; Part II is mailed only from the Hydrographic Office. Single copies of the Notice to Mariners may be obtained or consulted at Branch Hydrographic Offices, District offices of the Coast and Geodetic Survey, or District offices of the Coast Guard.

THE BUREAU OF CUSTOMS enters and clears vessels; supervises the discharge of cargo; ascertains the quantities of imported merchandise, appraises and classifies such merchandise, and assesses and collects the duties thereon; controls the custom warehousing of imported merchandise; and enforces customs and other laws by inspecting international traffic by vessels.

The Bureau of Customs administers the navigation laws pertaining to registry, enrollment, and licensing of vessels, including the issuing of commissions to yachts and the assignment of signal letters; the measurement of vessels, administration of tonnage duties, and the collection of tolls; the regulation of vessels in the coasting and fishing trade and limitation of the use of foreign vessels in waters under the jurisdiction of the United States; the recording of sales, conveyances, and mortgages of vessels; the protection of steerage passengers; and the remission of fines, penalties, and forfeitures incurred under the laws governing these matters. Collection districts and ports of entry located within the area covered by this Coast Pilot are tabulated in the Appendix.

Documentation.—Vessels of 5 net tons and over, owned and operated by citizens of the United States, may be documented as vessels of the United States in the discretion of the Commissioner of Customs. The documents which are issued to vessels

by that Bureau are of five forms, namely: registers, enrollments and licenses, licenses, yacht enrollments and licenses, and yacht licenses.

A vessel under a **register** which is not limited by a prohibitive endorsement on its face may engage in any trade, including the foreign trade, the coastwise trade, and the American fisheries. Registered vessels, however, may be subject to the requirement for payment of certain pilotage fees and other charges upon arrival in a port of the United States to which other documented vessels are not generally subject.

An **enrollment and license** may be issued to a vessel of 20 net tons or more and, if the vessel is entitled to be so documented, may authorize it to engage in the coasting trade, the mackerel fishery, the cod fishery, the whale fishery, or the coasting trade and mackerel fishery. A vessel so authorized to engage in the mackerel fishery may be used in the taking of fish of any description. Special enrollments and licenses are issued on the frontiers, authorizing vessels to engage in the foreign and coasting trades.

A **license** may be issued to a vessel of 5 net tons or over but of less than 20 net tons and, if the vessel is entitled to be so documented, may authorize the vessel to engage in any one of the employments for which an enrollment and license may be issued.

A **yacht enrollment and license** may be issued to a vessel used exclusively for pleasure of more than 20 net tons and a **yacht license** may be issued to such a vessel of 5 net tons or over but of less than 20 net tons. Important privileges extended by documentation of vessels as yachts are: (1) Authority to fly the yacht ensign, which authority is not granted to other boats; (2) right to voyage to a foreign port without clearing the vessel through United States customs; (3) in the case of yachts of 15 gross tons or less, the right to return to a port of the United States from a foreign port or ports without entering the vessel through United States customs; (4) the privilege of recording bills of sale, mortgages, and other instruments of title for the vessel in the office of the collector of customs at the vessel's home port, giving constructive notice to all of the effect of such instruments and permitting the attainment of the status of preferred mortgages by mortgage instruments which are so recorded, thus giving additional security to the mortgagee and facilitating financing and transfers of title for such vessels. A **yacht commission** may be issued to the owner of a documented yacht to identify the yacht and its owner during a foreign voyage.

The master of a documented vessel, other than one under register, must renew the document annually and any changes of master (except in the case of a licensed yacht or ferryboat) must be reported to a collector of customs.

The name of every documented vessel, yachts excepted, is required to be marked in full upon each bow and upon the stern and the hailing port is required to be marked upon the stern. A yacht is required to have its name and hailing port marked on some conspicuous part of its hull.

However, the documentation of yachts is not mandatory and it is entirely discretionary with the owner as to whether he should document his craft as a yacht. If the vessel is not documented, however, as indicated above, it may become subject to the requirements for numbering as a motorboat.

On the other hand, vessels which are engaged in trade and which are of 5 net tons or over will become subject to penalties provided by law if not documented for the employment in which they are engaged.

Foreign-built vessels, except in special circumstances, may be documented only to

engage in the foreign trade, in trade with certain island possessions of the United States, or as yachts when used exclusively for pleasure. Such vessels may not be documented for the coastwise trade nor the American fisheries. In addition, vessels sold foreign or placed under foreign flag cannot thereafter be documented, as a general proposition, for the coastwise trade but are otherwise unrestricted as to documentation.

Before a vessel may be issued a document, it must be admeasured by the office of the collector of customs in whose district the vessel is at the time to determine the gross and net tonnages of the vessel. The gross tonnage is the internal cubic capcity of all permanently enclosed spaces on the vessel with the exception of certain permissible exemptions, expressed in tons of 100 cubic feet. The net or registered tonnage is the remainder after deducting from the gross certain permissible allowances for the tonnage of crew spaces, master's accommodations, navigation spaces, propelling machinery spaces, and others.

The license granted to a vessel by the Bureau of Customs should not be confused with any licenses required for the officers or operators of vessels, which are issued by the United States Coast Guard.

THE IMMIGRATION AND NATURALIZATION SERVICE administers the laws relating to the admission, exclusion, and deportation of aliens, the registration and fingerprinting of aliens, and the naturalization of aliens lawfully resident in the United States.

The primary function of the Immigration Border Patrol is to detect and prevent the smuggling and surreptitious entry of aliens into the United States in violation of the immigration laws, and to apprehend smugglers of aliens and aliens who have effected unlawful entry.

The immigration laws provide that there shall be paid to the collector of the customs by the master, agent, owner, or consignee of a vessel arriving at a United States port from a foreign port a head tax of $8 for, with certain exceptions, every alien passenger entering the United States.

The designated ports of entry for aliens are divided into three classes. Class A is for all aliens. Class B is only for aliens who at the time of applying for admission are lawfully in possession of valid and unexpired resident aliens' border-crossing identification cards or valid nonresident aliens' border-crossing identification cards. Class C is only for aliens who are arriving in the United States as seamen as that term is defined in the last sentence of section 1 of the Immigration Act of 1917 (39 Stat. 874; 8 U. S. C. 173). [That the term *seaman* as used in this Act shall include every person signed on the ship's articles and employed in any capacity on board any vessel arriving in the United States from any foreign port or place.] No alien may enter the United States until he has been inspected by an immigration officer. A list of the ports of entry for aliens is given in the Appendix.

THE PUBLIC HEALTH SERVICE, in addition to its other duties, administers hospitalization and outpatient treatment to legal beneficiaries of the Government; it also administers the foreign and domestic quarantine laws, supervising the medical examination of immigrants and enforcing interstate laws.

Radio report of disease aboard.—The master of the vessel shall report promptly by radio, to the medical officer in charge at the port of entry, the occurrence or suspected occurrence on board of any of the following communicable diseases: *anthrax, chancroid, *chickenpox, *cholera, *dengue, *diphtheria, favus, gonorrhea, granuloma, impetigo contagiosa, *infectious encephalitis, inguinale, leprosy, lymphogranuloma venereum, *measles, *meningococcus meningitis, *plague, *poliomyelitis, *psittacosis, ringworm of the scalp, *scarlet fever, *smallpox, *streptococcic sore throat, syphilis, trahoma, tuberculosis, *typhoid fever, *typhus, *yellow fever, or other diseases characterized by fever or skin rash.

Quarantine.—A vessel arriving at a port under the control of the United States shall undergo quarantine inspection prior to entry unless: (1) In the current voyage the vessel has not touched at any port other than those under the control of the United States, or in Canada, the Islands of St. Pierre and Miquelon, Iceland, Greenland, the West Coast of Lower California, Cuba, the Bahama Islands, the Canal Zone, the Bermuda Islands, and the Islands of Aruba and Curacao; or (2) in the current voyage the vessel has received pratique at a port under the control of the United States and since receiving same has not touched at a port other than those listed in (1); or (3) the vessel possesses a duplicate of a pratique issued at a port in Canada or the Canal Zone and since receiving same has not touched at ports other than those listed in (1).

A vessel otherwise exempt from quarantine inspection shall undergo such inspection prior to entering a port under the control of the United States if the vessel has aboard a person infected or suspected of being infected with any of the communicable diseases asterisked (*) in the radio report list above; or if the vessel arrives from a port where at the time of departure there was present or suspected of being present cholera, plague, or yellow fever, or there was a significant increase in the prevalence of smallpox or typhus.

Vessels subject to quarantine inspection shall upon arrival at ports under the control of the United States fly a yellow flag (International Code Flag **Q**—Queen), anchor in the quarantine anchorage, and await inspection. Only the quarantine officer, quarantine employees, or pilots shall be permitted to board any vessel subject to quarantine inspection until after it has been inspected by the quarantine officer and granted pratique, except with the permission of the quarantine officer. A person boarding such vessel shall be subject to the same restrictions as those imposed on the persons on the vessel.

Sanitary inspection.—Vessels arriving at a port under the control of the United States from a foreign port shall be subject to sanitary inspection to ascertain whether there exists rodent, vermin, or insect infestation or other unsanitary condition requiring measures for the prevention of the introduction, transmission, or spread of communicable disease.

In general, where State quarantine is in force, the minimum requirements of quarantine are in accordance with the regulations of the Public Health Service. National quarantine regulations will be found at the stations of the service and at United States consulates, and will be furnished to vessels uppon application to officers of the service or to the Bureau in Washington, D. C.

Medical service.—United States merchant seamen are entitled to medical relief obtainable through the Public Health Service. A United States seaman is one engaged on

board in care, preservation, or navigation of any registered, enrolled, or licensed vessel of the United States, or in the service, on board, of those so engaged. **Hospitals, outpatient clinics, and outpatient offices** of the Public Health Service are located at the addresses given in the Appendix. Free medical advice is furnished to seamen by radio; see H. O. Publication 205, *Radio Navigational Aids.*

AGRICULTURAL RESEARCH SERVICE.—The **Plant Quarantine Branch** of the Agricultural Research Service administers statutory authorities and related regulations and in cooperation with the States, and other Federal agencies as appropriate, conducts a national program of plant quarantine to prevent the spread of injurious plant pests through the enforcement of quarantines affecting the entry into the United States of plants and plant products from foreign countries, the movement of such products between United States possessions and the mainland, the interstate shipment of products restricted by domestic plant quarantines, and the inspection and certification of plants and plant products for export to meet plant quarantine import requirements of countries of destination.

The **Animal Quarantine Branch** administers statutory authorities and related regulations governing the inspection, humane treatment, and safe transport of animals for exportation and laws and regulations designed to prevent the introduction and dissemination of livestock and poultry diseases of foreign origin and the certification for free entry of pure-bred livestock for breeding purposes. *(FR-1/29/54)*

RADIO.—The radio communications in the United States and its possessions, except the Panama Canal Zone, are controlled by the **Federal Communications Commission,** Washington 25, D. C.

Responsibility of shipmasters.—Shipmasters have the responsibility of seeing that the general radio regulations are carried out by the radio operators.

Radio inspectors.—Inspectors of the Federal Communications Commission have authority to board ships at United States ports for the inspection of the radio station to determine whether it complies with international treaties, Federal laws, and such rules and regulations of the Federal Communications Commission which may apply. In general, these inspectors operate at the following ports where field offices of the Commission are located and where information concerning radio regulations and communications may be obtained:

Boston, Mass.	San Juan, P. R.	Los Angeles, Calif.
New York, N. Y.	Tampa, Fla.	San Francisco, Calif.
Philadelphia, Pa.	New Orleans, La.	Portland, Oreg.
Baltimore, Md.	Beaumont, Tex.	Seattle, Wash.
Norfolk, Va.	Galveston, Tex.	Juneau, Alaska.
Savannah, Ga.	Houston, Tex.	Honolulu, T. H.
Miami, Fla.	San Diego, Calif.	

Service documents.—The rules and regulations of the International Telecommunication Convention require that when a radio-transmitting installation is compulsory equipment on board a ship, the latter must be provided with the following service documents:

1. The radio license.
2. The operators' certificates.
3. Register (radio service log) in which shall be noted, at the time they occur, service incidents of all kinds, as well as the communications exchanged with land stations or mobile stations and relating to reports of disaster. If the regulations on board permit, the position of the ship shall be indicated once a day in the said register.
4. Alphabetical list of call letters.
5. List of coast and ship stations.
6. List of stations performing special services.
7. The general radio regulations and the additional radio regulations as well as the provisions of the convention necessary for the operations of radio-communication service on board ships.
8. The telegraph rates of the countries for which the station (ship) most frequently accepts radiotelegrams.

The rules and regulations of the United States Federal Communications Commission require certain vessels to have additional service documents, a complete list of which may be obtained from the Federal Communications Commission, Washington 25, D. C., or from its suboffices. For further details concerning the above rules and regulations, consult *Ship Radiotelegraph Safety Rules*, *The Communications Act of 1934*, with amendments, and H. O. 205, *Radio Navigational Aids*.

Weather broadcasts.—Marine Weather Bulletins covering North Atlantic and North Pacific waters are issued by the Weather Bureau for broadcast by commercial and Government radio stations. Bulletins for Western North Atlantic waters are broadcast by U. S. Navy Radio Station NSS, Washington, D. C., while those applicable to Eastern North Pacific waters are transmitted by Stations KPH, Bolinas, Calif., and KTK, San Francisco, Calif. A separate Marine Bulletin for Central Pacific waters is broadcast by KHK, Kahuku, T. H. The marine bulletins contain Storm Warnings and a combined Weather Summary and Forecast for the next 24 hours, beginning from the time of broadcast. A selection of ship and coast station reports in abbreviated codes is included in the NSS, KTK, and KHK bulletins for use in preparing shipboard weather maps. Marine Storm Warnings and Forecasts are also broadcast by U. S. Navy Stations NBA, Balboa, C. Z.; NPG, San Francisco, Calif.; NHB, Kodiak, Alaska; and NPM, Honolulu, T. H., principally for fleet use.

For those ships desiring additional surface and upper air data for preparation of weather maps at sea, Synoptic Weather Bulletins are broadcast via Civil Aeronautics Administration Stations WSY, New York, N. Y., and WEK, New Orleans, La.

Areas covered by warnings and forecasts in the marine bulletins, together with time schedules of the broadcasts, are:

NSS, Washington, D. C.: North Atlantic north of latitude 3° N. and west of longitude 35° W., including Gulf of Mexico and Caribbean Sea—0200, 0800, 1400, and 2000 G. M. T.

NBA, Balboa, C. Z.: North Atlantic south of latitude 20° N. and west of longitude 35° W.; Pacific waters north of the Equator and eastward of line from 0° N., 106° W. to coast of Central America at 14° N.—0530, 1030, 1700, and 2230 G. M. T.

KPH, Bolinas, Calif.: North Pacific waters north of the Equator and east of the 180th meridian—0500 and 1700 G. M. T.

NPG, San Francisco, Calif.: Eastern North Pacific area from the coast of North America at 55° N. to 55° N., 150° W. to 40° N., 150° W. to 0° N., 113° W., to 0° N., 106° W. to coast of Central America at 14° N.—0420, 0940, 1620, and 2140 G. M. T.

KTK, San Francisco, Calif.: North Pacific waters north of the Equator and east of the 180th meridian—0420 and 1620 G. M. T.

NHB, Kodiak, Alaska: North Pacific between latitude 40° N. and 70° N. and from longitude 150° E. to 140° W.—0500, 1100, 1700, and 2300 G. M. T.

NPM, Honolulu, T. H.: North Pacific from the Equator to latitude 40° N. and between longitude 160° E. and line running from 40° N., 150° W. to 0° N., 113° W.—0420, 0940, 1620, and 2140 G. M. T.

KHK, Kahuku, T. H.: North Pacific waters from the Equator to latitude 50° N. and from longitude 140° W. to 160° E.—0530 and 2030 G. M. T.; however, the 0530 broadcast is not made on Saturdays, Sundays, or holidays, Hawaiian time.

Local weather bulletins containing coastal area forecasts, storm warnings when issued, and weather summaries for specified areas are broadcast on regular schedules by many Government and commercial marine shore radio stations.

Storm warnings, whenever they are issued by the United States Weather Bureau, are the subject of special broadcasts by many Government and commercial radiotelegraph and radiotelephone stations of the mobile service.

Emergency broadcasts by United States Naval radio stations.—Storm warnings and notices of an urgent nature concerning the safety of navigation at sea are broadcast by United States naval radio stations in accordance with the degree of urgency, as follows:

A. Notices of tidal waves, hurricanes, typhoons, cyclones, etc., so imminent as to warrant immediate broadcasting:

1. One transmission immediately on receipt.
2. One transmission at the end of the first ensuing silent period.
3. One transmission during the first ensuing on-watch period for ships with one operator, in case both previous transmissions were made during the off-watch period.

B. Storm warnings and notices of less urgency than those specified in (A) and other than those normally included in scheduled hydrographic broadcasts:

1. One transmission at the end of the first ensuing silent period.
2. One transmission during the on-watch period for ships with one operator in case the previous transmission was made during an off-watch period.

These broadcasts are preceded by transmission of the Urgent Signal (XXX) or Safety Signal (TTT) and a preliminary announcement on 500 kcs. of the message to follow on the station working frequency.

Emergency broadcasts by United States Coast Guard radio stations.—Storm and hurricane warnings, advisories, and other urgent marine information are broadcast by Coast Guard radio stations:

A. By radiotelegraph on the station's medium frequency immediately following the first silent period after receipt of the message at the radio station (HH+18 or HH+48) preceded by an initial call on 500 kc. Whenever this transmission occurs outside the watch hours for single radio operator ships, the message will be repeated at the end of the next silent period falling within the radio watch hours for such vessels. If a station makes daily broadcasts of marine information, the message will also be included in its next scheduled transmission.

B. By radiotelephone on the District Voice Working frequency immediately following receipt of the message at the radio station preceded by an initial call on 2670 kc. and repeated at the station's next scheduled broadcast.

Radiotelephone broadcasts of weather information (United States).—Transmission by voice of weather information from the Weather Bureau is made through certain radio stations of the Coast Guard and of the commercial coastal harbor radiotelephone service.

These broadcasts are followed immediately by reports of dangerous obstructions and changes in aids to navigation.

This service gives to yachts, fishing craft, tugboats, and other vessels equipped with a radio receiving set having a band covering the frequency range of 2 to 3 megacycles, official weather information from the Weather Bureau in plain language and on regular schedules.

These radiotelephone broadcasts are made twice and, in some cases, four times daily at definite times and include marine forecasts, and storm warnings whenever they are issued, for coastal waters in or adjacent to the areas served by the radio stations.

Warnings of winds likely to interfere with the safe operation of small craft are included in the broadcasts.

Certain local radio stations in the standard broadcast band have microphones installed in nearby Weather Bureau offices. From these stations forecasts, weather summaries, and warnings are broadcast on regular schedule. For stations and schedules in the area covered by this volume, see the Appendix.

West Indies.—Coast Guard station NMR, San Juan, P. R., broadcasts twice daily by radiotelephone and radiotelegraph a weather bulletin consisting of marine forecasts and weather summary for the Caribbean Sea area and small-craft, storm, and hurricane warnings when applicable.

Mexico and Canada.—Scheduled broadcasts of weather information affecting the coasts of Mexico and Canada are made by designated stations of those countries on marine frequencies by both radiotelegraph and radiotelephone.

Alaska.—Weather broadcasts are made by radiotelegraph by Naval station NHB, Kodiak, and Coast Guard station NMJ, Ketchikan. Radiotelephone broadcasts are made by NMJ and by various stations of the Alaska Communication System operating operating in the 2-megacycle band.

Circulars giving complete details relating to the broadcasting of weather information, including times and frequencies, are available on request to the Weather Bureau. Similar information is also given in H. O. 206, *Radio Weather Aids*, including decoding tables and station index numbers.

Reports from ships.—The master of every ship of the United States equipped with radio transmitting apparatus, on meeting with a tropical storm, dangerous ice, derelict, or any other direct danger to navigation, is required to cause to be transmitted a report of these dangers to ships in the vicinity and to the appropriate Government agencies.

Weather reports (United States).—Weather reports should not be sent regularly except from ships with which specific arrangements have been made by the United States Weather Bureau, but masters of all ships encountering tropical or other severe storms should send special observations by radio.

These reports should be sent in the International Meteorological Code, unsigned and checked PREPAID, UNITED STATES GOVERNMENT. They should be given Safety Message priority and addressed OBSERVER WASHINGTON from Atlantic waters and OBSERVER SAN FRANCISCO from Pacific waters.

If a copy of the code is not available on shipboard, the message may be sent in plain language. Copies of the *International Meteorological Code for Ships* may be obtained free on application to the United States Weather Bureau, Washington 25, D. C. It may also be found in H. O. 206, *Radio Weather Aids*.

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During the West Indies hurricane season, June 1 to November 30, ships in the Gulf of Mexico, Caribbean Sea area, southern North Atlantic Ocean, and the Pacific waters west of Central America and Mexico are urged to cooperate with the Weather Bureau in furnishing these special reports in order that warnings to shipping and coastal areas may be issued.

Time signals.—The **United States system** of broadcasting time signals begins at 55 minutes 0 seconds of some hour and continues for 5 minutes. Signals are transmitted on every second during that time, except that there is no signal on the 29th second of any minute, nor on certain seconds at the ends of the minutes, as shown in the following diagram:

Minute	Second										
	50	51	52	53	54	55	56	57	58	59	60
55	—		—	—	—	—					—
56	—	—		—	—	—					—
57	—	—	—		—	—					—
58	—	—	—	—		—					—
59	—										—

The dashes in the above diagram indicate seconds on which signals are transmitted. The seconds marked "60" are the zero seconds of the following minutes. All seconds from 0 to 50, inclusive, are transmitted except the 29th second. The dash on the beginning of the hour (shown as 59 minutes 60 seconds) is much longer than the others, i. e., 1.3 seconds. In all cases the beginnings of the dashes indicate the beginnings of the seconds, and the ends of the dashes are without significance. It will be noted that the number of dashes sounded in the group at the end of any minute indicates the number of minutes of the signal yet to be sent. In the event of a failure or an error occurring in any of the time signals another time signal will be transmitted 1 hour later on the same frequency.

The **National Bureau of Standards** broadcasts time signals from its radio station **WWV** near Washington, D. C., on radio frequencies of 2.5, 5, 10, 15, 20, and 25 megacycles, which are on the air at all times, day and night. This insures reliable coverage of the United States and extensive coverage of other parts of the world. The services include time announcements, standard time intervals, standard audio frequencies, and radio-propagation disturbance-warning notices.

Time announcements.—The audio frequencies are interrupted at precisely 1 minute before each hour and each 5 minutes thereafter. They are resumed precisely on the hour and each 5 minutes thereafter. The beginnings of the periods, when the audio frequencies are resumed, are in agreement with the basic service of the United States Naval Observatory, and accordingly they accurately mark the hour and successive 5-minute periods.

Greenwich Mean Time is announced in telegraphic code each 5 minutes. The zero- to 24-hour system is used. This announcement refers to the end of the announcement interval. A voice announcement of eastern standard time is given following each telegraphic code announcement.

Standard time intervals.—On each carrier frequency is a pulse which occurs at intervals of precisely 1 second. The pulse is omitted at the beginning of the last second of every minute. The 1-minute, 4-minute, and 5-minute intervals, synchronized with the second pulses, are marked by the beginning or ending of the periods when the audio frequencies are off.

A **radio propagation disturbance warning** forecast is transmitted in Morse code twice each hour at 19½ and 49½ minutes past the hour. These warnings tell users of radio transmission paths over the North Atlantic the condition of the ionosphere at the time of the announcement and how good or bad communication conditions are expected to be for the next 12 hours. During a period of radio-propagation disturbance, direction-finder observations may be unreliable; the letters "N", "U", and "W" signify that radio propagation conditions are, respectively, normal, unsettled, or disturbed.

Radio station **WWVH** is on the island of Maui, Territory of Hawaii, and broadcasts on 5, 10, and 15 megacycles. The schedule of broadcasts is the same as that of station WWV for standard time intervals, time announcements in code, standard audio frequencies, and accuracy. Simultaneous reception of WWV and WWVH does not interfere with ordinary use of the standard frequency and time signals.

The WWVH broadcast is interrupted for 4 minutes following each hour and half hour and for periods of 34 minutes each day beginning at 1900 GMT.

Additional information on the operations of stations WWV and WWVH may be obtained from the Central Radio Propagation Laboratory, National Bureau of Standards, Washington 25, D. C.

LORAN is a system of position finding by reception of radio signals from specially designed transmitting stations of known position. The name is derived by combining the first two letters of **long,** the first two letters of **range,** and the first letter of **navigation.** It is designed to furnish reliable positions to navigators at greater distances from the transmitting stations than is possible by other methods of radio navigation.

The principle of the Loran system is the determination of the difference of the distances of two radio transmitting stations from the observer, though not the actual distance of either station. This is accomplished by determining how much more time a signal or pulse from one station takes to reach him than a signal or pulse from the other. Upon a chart a curve is drawn through all points whose distances from these stations differ by the amount found from the observation. The vessel must be somewhere on this curve, which is the Loran line of position with reference to these stations. Similarly, another line of position is obtained by comparing the signals received from another pair of stations. Since the vessel must be on both lines, the point of their intersection is its position.

Because of the velocity of propagation of radio waves, 162,000 nautical miles per second, the time differences are extremely small, being measured in millionths of a second. These small time intervals are determined visually by measuring on the luminous time scale of the receiver aboard ship or aircraft the separation between reference marks made by the reception of the pulses from the transmitting stations. This time scale is formed by the motion of a point of light, which is the tip of a ray of electrons, controlled by electrical circuits in the receiver. The components of this motion take place in a few millionths of a second and are not visually perceptible, but the complete

cycle in the formation of the time scale is repeated over and over at the rate of approximately 25 times per second. Due to persistence of vision, the eye sees a continuous pattern as in motion pictures. It is on this microsecond time scale that the time difference is measured.

The position of the vessel is found from the time difference by the use of Loran charts or tables. For the service area of each pair of transmitting stations the time differences which a vessel would observe are laid down in a pattern of lines. Each line is labeled with the time difference which is common to all points on it. The navigator has only to select the line of position indicated by the reading of the Loran receiver. Loran tables are used to determine positions of greater accuracy than is possible with the average small-scale Loran chart. The tables furnish the data necessary to plot, on any chart, the required segment of the line of position.

Caution.—Loran Position determinations on or near the base-line extensions are subject to considerable error and therefore should be avoided whenever possible. For accurate position determinations in the base-line extension area, the use of a radio bearing, or other means, along with Loran lines from another rate is recommended.

Loran charts and tables are compiled and distributed by the Hydrographic Office. They are available for all effective Loran service areas, which include the more frequented portions of the North Atlantic, North Pacific, South Pacific, and Indian Oceans.

The Coast and Geodetic Survey prints Loran lines of position on various sailing, general, and coast charts.

The Hydrographic Office distributes H. O. Misc. 15308, *Loran Accuracy Diagram*, which shows, for the regions of the world where Loran is available, the limits of areas within which Loran ground wave lines of position have average errors of 1 mile or less, and areas within which sky wave lines of position have average errors of 2 miles or less. In addition, there are outlined all areas where two or more Loran lines of position intersect at angles greater than 15 degrees.

Ships using Loran in areas of dependable ground wave reception occasionally experience apparent Loran errors of 10, 20, or more miles. When sufficient fix data accompany such reported errors, it usually can be determined that a skywave match has been made, or that a ground wave has been paired with a skywave. If the navigator in either case plots his reading as a ground wave match, a sizable position error will result.

The techniques for identifying Loran signals are explained in the introductory pages of all *Loran Tables*, H. O. 221 series, and in various equipment manuals. A familiarity with these techniques is necessary to avoid troubles and to make the most of the Loran system potentialities. In general, it may be helpful for navigators who experience large apparent Loran errors to preset the Loran indicator to the expected reading when matching pulses. Then, if master or slave pulse fails to appear, adjustment of amplitude balance controls may bring the desired signal into view at the expected setting. Usually, a consideration of distance over land or sea from the Loran transmitter, plus time of day, receiver sensitivity, and local atmospheric interference, will enable the navigator to predict reception of ground waves or sky waves, and to anticipate which he must use.

Mariners and aviators are requested to notify the Commandant (OAN), Coast Guard Headquarters, Washington 25, D. C., or the nearest Coast Guard District Commander, of any defect observed in the operation of the Loran System (blinking is **not** a

defect). The notification should include information as to the Loran rate involved, whether signals observed are ground waves or sky waves, the nature of the defect, the approximate position of the craft, and the date and time (GMT) of observation of the defective operation. Suggestions for improvement of Loran service are also requested.

RADAR (Radio Detection and Ranging) is an anticollision and piloting device that may be used during darkness and low visibility to detect most objects and to furnish an accurate measurement of range under all conditions. However, it has many limitations as well as advantages. Radar is merely a supplement and a highly valuable adjunct to other navigational methods.

Radar works on the principle of echoes. Instead of sound, a radar transmits a radio signal. The radar equipment is basically an instrument for measuring the distance from the transmitter to an object which will reflect electromagnetic energy of radio frequencies.

The accuracy of a position obtained by radar varies considerably with different types of radar and the skill of the operator. In general, the accuracy of radar fixes compares favorably with, and sometimes exceeds, those obtained by other methods.

Advantages.—1. Radar can be used at night and during periods of low visibility, when most other methods are not available.

2. Radar navigation is often more accurate than other methods of piloting. The limitations of accuracy of each set should be determined.

3. Radar fixes can be obtained rapidly. With the PPI (Plan Position Indicator) scope a continuous position is available.

4. A fix can be obtained from a single object, since both range and bearing are provided.

5. Radar may be available at greater distances from land than most methods of piloting.

6. Radar is a reliable anticollision device, permitting higher speeds, with relative safety, during periods of low visibility.

Failure on the part of a Government vessel to make use of radar while under way in low visibility has been held by a court to be directly contributory to a collision in which the vessel was involved. Article 29 of both International Rules of the Road and Inland Rules of the Road are applicable. This decision places an additional burden on vessels which are equipped and manned to use radar to do so while under way during periods of reduced visibility without in any way relieving commanding officers of the responsibility of carrying out normal precautionary measures.

7. Radar can be used to locate and track violent tropical storms.

8. Radar reception is not affected by the same factors that cause interference and poor reception in radio communication. Consequently, radar's use is insured when normal radio communication is impossible.

Limitations.—1. Radar is subject to mechanical failure. Also, as radar sets are sensitive instruments requiring accurate and precise adjustment, any error in the adjustment or synchronization will cause an error in the result.

2. There are both minimum and maximum range limitations. The minimum range is dependent on several factors. Inasmuch as the receiver is disconnected while a pulse is being sent out, any echo returning during transmission of the pulse will not

be indicated. Excessive sea return, or echo from nearby water, and other obstructions nearby also affect the minimum effective range. Sea return becomes less with increased range because of the change in the angle of incidence, more of the signal is reflected away from the ship and less is returned in the form of echo. A good practical minimum range is 100 yards.

Maximum range is usually limited by the curvature of the earth to the line-of-sight, or slightly more (about 15 percent), because high frequency radio waves travel in a straight line and do not follow the earth's curvature except under the abnormal atmospheric conditions heretofore mentioned. The approximate maximum range at which any given target will return an echo can be determined by means of the table of *Distance of Visibility of Objects at Sea* in the same manner used for determining the distance at which a light can be expected to be seen at sea. This assumes, of course, that the radar is of sufficient power to extend to such a distance, that the scope is graduated for range to this distance, and that the target is of a nature that it will return a good echo.

3. Radar may be unreliable or unavailable during certain atmospheric conditions. Rain, snow, sleet, and clouds generally have the same effect on the picture observed on the scope. If the ship is in the midst of a light rain, radar operation is usually near normal, but there might be a slight haze on the screen. In the case of heavy concentrations of precipitation, the scope will be blanked out to some degree. However, during this time, the radar will detect normally in the other areas of the scope if the heavy precipitation is local in nature. Also, targets may be seen on the same azimuth as the storm, but either closer to or beyond it.

The operation of radar in fog is usually good and usually can be relied upon, although there may be a reduction in the range at which targets are first detected.

Wind, though not a condition of poor visibility, is even more important a factor in the operation of radar. The effects of wind are more pronounced in open water. The wind by itself gives no trouble, but the attendant sea results in an obscuration of the radar known as **sea return,** which can obscure smaller targets. The waves resulting from the wind blowing over the surface present myriad targets for the radar signals to detect, with the most pronounced effect being in the direction of the sea. Depending on sea conditions, sea return may obscure the scope up to the 10-mile range ring.

Marine radar sets are equipped with devices to minimize the effect of sea return and permit more or less normal operation of the set. Although such devices are quite effective, they do not wholly remove the sea clutter in bad weather. It is usually possible to pick up large targets, such as ships, before they get close enough to get into the sea return. Also it is possible to manipulate the various controls of the set to detect ships inside the range of the sea return, because a ship normally gives a larger concentrated echo than do waves. This depends a great deal on the human element. A radar set in this condition will be operating at reduced sensitivity and will miss small targets obscured by sea return which may still be a source of potential danger to the ship.

4. Radar cannot distinguish the *nature* of a small target. One small object capable of returning an echo looks to radar just about the same as any other. When additional electronic devices (radar aids) are used in conjunction with the radar, identification can quite often be accomplished by implication, such as movement, relation to other objects, shape (coastlines), and sometimes initial range of detection. Small

boats and buoys may not be detected if they are near the shore or lack sufficient elevation to produce an echo.

5. Radar chart presentation on the scope requires interpretation due to the line-of-sight characteristics which give shadow effects, that is to say, larger intervening objects may blank out objects behind them.

6. Certain types of objects, due to their characteristics or motion, may go undetected. For example, ice and some other things, because of their physical characteristics and reflecting properties, are relatively poor targets. So is a low-lying point of land. Most icebergs can be detected at distances equal to that at which a similar land mass can be seen, but *radar is not wholly reliable in the detection of growlers and floe ice large enough to damage or sink ships.* The motion of small objects, such as small buoys and boats bobbing up and down in a seaway, tends to reduce the echo returned to the radar. These considerations become particularly important when such things as sea return and rain are present to reduce the radar visibility.

7. Radar may be less accurate than other methods of piloting. A visual bearing, for instance, is usually more accurate than the radar bearing.

8. Radar requires transmission from the ship.

WAVES.—The most common type of wave is caused by the **wind.** The size of ocean waves depends on the strength of the wind, its duration, and the extent of open water over which it blows. As they travel across the ocean, their height continually decreases, their length increases, and several days later they roll toward the coast as a long, low **swell,** or **ground swell,** which may be all but hidden by short irregular wind waves until it enters shallow water.

Waves from deep water are modified when they get into shoal water. Where the swell approaches a shoreline at an angle it tends to parallel the shore and bends into bays and around outlying points. When the depth is reduced to less than half the wave length, the waves become higher and shorter, the crest arches forward and dashes downward, breaking into **surf.** An individual breaking wave, either on a beach, an isolated rock, or a shoal, is a **breaker.**

When viewed from a vessel, especially a small boat, the surf or breaker never appears as dangerous as it is, and often when comparatively smooth at sea a dangerous surf is running which is not perceptible 400 yards offshore. Many lives have been lost unnecessarily by the crews of stranded vessels being thus deceived and attempting to land in the ship's boats.

When large swells encounter the seaward margin of a submarine terrace they break and form smaller waves, or **rollers,** which differ from the usual waves found in deep water in that they are entirely above the normal mean level. They may cross the shallow water to the shore without change until they break as surf on the beach. Rollers often carry shingle and other material shoreward along the bottom. They do not break until the depth of the water is less than the height of the wave.

Seiche is a stationary vertical wave oscillation with a period varying from a few minutes to an hour or more, but somewhat less than the tidal periods. It is usually attributed to external forces such as strong winds, changes in barometric pressure, swells, or seismic sea waves disturbing the equilibrium of the water surface. Seiche is found both in enclosed bodies of water and superimposed upon the tides of the open

ocean. When the external forces cause a short-period horizontal oscillation of the water, it is called **surge.**

The combined effect of seiche and surge sometimes makes it difficult to maintain a ship in its position alongside a pier even though the water may appear to be completely undisturbed, and heavy mooring lines have been parted repeatedly under such conditions. Pilots advise taut lines to reduce the effect of the surge.

Destructive waves.—Unusual sudden changes in height of water level can be caused by seismic sea waves or violent storms. These two types of destructive waves have become commonly known as **tidal waves,** a name which is technically incorrect as they are not the result of tide-producing forces.

Seismic sea waves are set up by submarine earthquakes. Many such seismic disturbances do not produce sea waves and often those produced are small, but the occasional large waves can be very damaging to shore installations and dangerous to ships in harbors.

These waves travel great distances and can cause tremendous damage on coasts far from their source. The wave of April 1, 1946, that originated in the Aleutian Trench demolished nearby Scotch Cap Lighthouse and also caused $25,000,000 damage in the Hawaiian Islands 2,200 miles away.

The speed of seismic sea waves varies with the depth of the water, reaching 300 to 500 knots in the deep water of the open ocean. In the open sea they cannot be detected from a ship or from the air because their length is so great, sometimes a hundred miles, as compared to their height, which is usually only a few feet. Only on certain types of shelving coasts do they build up into waves of disastrous proportions.

There is usually a series of waves with crests 10 to 40 minutes apart, and the highest may occur several hours after the first wave. Sometimes the first noticeable part of the wave is the trough which causes a recession of the water from shore, and people who have gone out to investigate this unusual exposure of the beach have been engulfed by the oncoming crest. Such an unexplained withdrawal of the sea should be considered as nature's warning of an approaching wave.

Improvements have been and are being made in the quick determination and reporting of earthquake epicenters, but no method has yet been perfected for determining whether a sea wave will result from a given earthquake. The problem of detecting and reporting the existence of seismic sea waves when they do occur is being studied. A reporting system has been organized in the Pacific with its center in the Hawaiian Islands.

When an advance warning is available, water-front areas should be vacated for higher ground and ships in the vicinity of land should head for the deep water of the open sea.

Storm waves.—A considerable rise or fall in the level of the sea along a particular coast may result from strong winds and a sharp change in barometric pressure. In cases where the water level is raised, higher waves can form with greater depth and the combination can be destructive to low regions, particularly at high stages of tide. Extreme low levels can result in depths which are considerably less than those shown on nautical charts. This type of wave occurs especially in coastal regions bordering on shallow waters which are subject to tropical storms.

Use of oil on breaking waves.—Experience has proved the usefulness of oil in

modifying the effect of breaking waves and has developed simple and effective methods of using it. The principal facts developed are:

1. The heaviest and thickest oils, notably animal and vegetable oils, are the most effective. Crude petroleum is serviceable and should be used when no better oil is available; it may be improved by mixing with other oils. Refined kerosene is of little value.

2. In cold weather oils thicken and do not spread freely. This tendency to thicken may be reduced by thinning a heavy, sticky oil with petroleum.

3. A small quantity of oil suffices if it can be made to spread to windward.

4. Oil spreads very slowly so a vessel with engines stopped or running slowly before a sea can make a slick to windward but not to leeward, except perhaps close alongside, for the vessel's drift or speed will exceed the rate of spread of the oil.

5. The effect of oil on free waves—that is, on waves in deep water—is greatest.

6. The effect of oil on a surf or waves breaking on a bar where a mass of shallow water is in actual motion is less than on free waves, but oil is of some service under these conditions.

7. A vessel at sea will get the best results by drifting or running slowly before the sea and distributing oil either from canvas bags filled with oakum saturated with oil and slung over the side into the sea or from the waste pipes.

8. In crossing a bar in heavy weather oil in considerable quantities is needed on both sides of the vessel for a short time. A convenient method in this situation is to trail a hose over the bow and pour oil freely through it.

9. In crossing a bar with flood current pour oil overboard and allow the oil to float in ahead of the vessel. To an entering vessel crossing a bar with an ebb current oil is of little use.

10. Oil is useful to vessels and boats when running, lying to, or wearing.

11. A vessel riding to a sea anchor can fasten an oil bag to an endless line rove through a block on the sea anchor. This method distributes the oil ahead and provides a means to haul the bag aboard for refilling.

12. Before boarding a wreck have the wreck use oil freely on both sides, if able to do so. If the wreck cannot use oil, the rescuing vessel should first pass to leeward of the wreck, using oil freely to form a slick into which the wreck will drift. If the wreck is aground, the attending circumstances will indicate the methods to be used.

13. In lowering or hoisting boats in heavy weather, in port or at sea, oil will greatly assist the operation.

14. In towing another vessel in a heavy sea, oil should be distributed from the towing vessel forward and on both sides; if it is only distributed from the after part of the towing vessel, only the tow is benefited.

DANGER SIGNAL.—Many American masters and officers, when on the high seas and danger of collision appears imminent, use the danger signal of four or more short blasts of the whistle as provided by the Inland Pilot Rules. The revised International Rules for the Prevention of Collision, effective January 1, 1954, provide for a signal of at least five short and rapid blasts on the whistle or siren, which may be given by a power-driven vessel that is required under the Rules to keep course and speed if, when she is in sight of another vessel, she is in doubt whether that other vessel is taking sufficient action to avert collision. This signal gives the **stand-on vessel** the opportunity of calling the attention of the **give-way vessel** to its obligations under the Collision Regulations. In addition, the International Code of Signals provides a special signal, the letter **U**, which may be transmitted visually or by means of Morse Code (. . —), using a flashing light or a whistle or siren, which signifies *you are standing into danger*. The International Code Signal **D** which may be transmitted visually or by means of Morse Code (— . .), using a whistle or siren, signifies *keep clear of me—I am maneuvering with difficulty*, and can be used as a warning.

Ship fire signal.—In many ports a standard signal of five prolonged blasts of the whistle or siren has been adopted for use as an alarm in the event of a fire occurring on board the vessel, except vessels underway, or at the dock to which the vessel is moored. Such signal may be used in addition to other means of reporting a fire. The words **prolonged blast** shall mean a blast of from 4 to 6 seconds' duration. The signal is not to be used for other purposes. On hearing the 5-blast whistle signal persons on shore should pull a fire alarm box or turn in an alarm to the Fire Department by the most convenient means.

Note.—The U. S. Coast Guard states that the five-blast signal should not be relied upon as a means of indicating a ship fire, and suggests use of the **International** and **Inland distress signal,** a continuous sounding of the whistle or siren.

Minesweeper signals.—United States vessels engaged in minesweeping operations have their maneuvering powers considerably hampered. All other vessels, whether steamers or sailing craft, should keep out of the way of the sweepers, remembering especially that it is dangerous to pass between the vessels of a pair or group sweeping together.

All vessels towing sweeps are to show a black ball at the foremasthead and at each yardarm **by day** and green lights instead of the black balls **by night;** the lights may only be exhibited when necessary to warn approaching friendly vessels. Other vessels are not to approach the sweepers nearer than 500 yards on either beam or 1,000 yards astern; under no circumstances is a vessel to pass through a formation of mine sweepers. The sweepers should be prepared to warn other vessels who persist in approaching too close by means of any of the appropriate signals from the International Code of Signals.

Signals to be made by vessels inconvenienced by searchlights.—When navigation of a vessel is inconvenienced by the glare from searchlights near a port, she should make the International Code Signal **ZO** (— — . . — — —) by lamp and by whistle, siren, or foghorn. Both the light and sound signals should be employed, whenever possible, and should be repeated until the inconvenience is removed. Only real urgency should dictate the use of this signal, as it is not possible for the searchlight operator to know which projector is affected unless the vessel is actually in the rays. This signal is designed to assist mariners; no liability whatever will be admitted.

PUBLICATIONS.—The following résumé of the United States Government publications of navigational value is included for the ready reference of the mariner.

Certain libraries have been designated by the Congress of the United States to receive prints, as issued, of all publications printed by the Government for public distribution. These publications may be consulted by anyone during business hours.

Sales agencies have been established in various ports by the Coast and Geodetic Survey, Hydrographic Office, and Superintendent of Documents. District Offices of the Coast and Geodetic Survey sell all publications of that Bureau. Branch Hydrographic Offices do not sell any publications.

The mailing address of the Coast and Geodetic Survey, Hydrographic Office, Superintendent of Documents, Weather Bureau, Coast Guard, and Federal Communications Commission is Washington 25, D. C.

Indexes of U. S. Coast and Geodetic Survey Nautical Charts, Coast Pilots, Tide Tables, Current Tables, and Tidal Current Charts may be obtained free of charge from the Coast and Geodetic Survey and its agents.

Nautical Charts.—Coast of the United States, Territories, and Possessions:
Published by the U. S. Coast and Geodetic Survey.
For sale by C&GS and its sales agents.
Mississippi River from the Head of Passes to Cairo:
Published and for sale by the Mississippi River Commission, Vicksburg, Miss.
Illinois Waterway System:
Published and for sale by the Corps of Engineers, U. S. Army, Chicago, Ill.
Ohio River:
Published and for sale by the Corps of Engineers, U. S. Army, Cincinnati, Ohio.
Great Lakes, Lake Champlain, New York State Canals, and the St. Lawrence River, St. Regis to Cornwall, Canada:
Published and for sale by the U. S. Lake Survey, Detroit, Mich.
New York State Canal System:
Published and for sale by the Superintendent of Public Works, Albany, N. Y.
Foreign Countries:
Published by the U. S. Navy Hydrographic Office.
For sale by HO and its sales agents.

Coast Pilots.—Coasts of the United States, Territories, and Possessions:
Published by the U. S. Coast and Geodetic Survey.
For sale by C&GS and its sales agents.
Foreign Countries:
Published by the U. S. Navy Hydrographic Office.
For sale by HO and its sales agents.

Tide and Current Tables.—Tide Tables, East Coast, North and South America (including Greenland):
Tide Tables, West Coast, North and South America (Including Hawaiian Islands):
Tide Tables, Europe and West Coast of Africa (Including Mediterranean Sea):
Tide Tables, Central and Western Pacific Ocean and Indian Ocean:
Current Tables, Atlantic Coast, North America:
Current Tables, Pacific Coast, North America and Asia:
Published by the U. S. Coast and Geodetic Survey.
For sale by C&GS and its sales agents.

Tidal Current Charts.—Boston Harbor, Narragansett Bay to Nantucket Sound, Long Island and Block Island Sounds, New York Harbor, Delaware Bay and River, Tampa Bay, San Francisco Bay, Puget Sound Northern Part, Puget Sound Southern Part—Nine Volumes:
Published by the U. S. Coast and Geodetic Survey.
For sale by C&GS and its sales agents.

Notice to Mariners.—Notices to Mariners are published weekly and may be obtained free of charge from the U. S. Navy Hydrographic Office.

Light Lists.—Coast of the United States, Territories, and possessions:
Published by the U. S. Coast Guard.
For sale by the Superintendent of Documents and his sales agents.
Foreign Countries:
Published by the U. S. Navy Hydrographic Office.
For sale by HO and its sales agents.

Radio.—Radio Circulars giving schedules, frequencies, and data included in weather broadcasts.
Free on application to the Chief, U. S. Weather Bureau.
Radio Navigational Aids (H. O. Pub. No. 205).
Radio Weather Aids to Navigation (H. O. Pub. No. 206).
Published by the U. S. Navy Hydrographic Office.
For sale by HO and its sales agents.
International Code of Signals (American Edition) Vol. II—Radio (H. O. Pub. No. 88):
Published by the U. S. Navy Hydrographic Office.
For sale by HO and its sales agents.
International Convention for the Safety of Life at Sea, London, 1929 (affecting radio), Extracts from:
May be obtained from U. S. Federal Communications Commission.
Communications Act of 1934:
For sale by Superintendent of Documents.
Ship Radio Telegraph Safety Rules:
From the U. S. Federal Communications Commission or the Superintendent of Documents.
The International Bureau of Telecommunication Union, Berne, Switzerland, publishes and sells the following:

1. List of Frequencies.
2. List of Coast Stations and Ship Stations.
3. List of Aircraft and Aeronautical Stations.
4. List of Broadcasting Stations.
5. List of Stations Performing Special Services.
6. List of Call Letters of Fixed Land and Mobile Stations.
7. List of Fixed Stations.
8. The Telegraph Rates.

Radio Service Bulletin:
Issued by U. S. Federal Communications Commission.

Weather.—Manual of Marine Meteorological Observations (W. B. Circular M):
Preparation and Use of Weather Maps at Sea (W. B. Circular R):
Manual of Cloud Forms and Codes for States of the Sky (W. B. Circular S):
International Code for Radio Weather Reports from Ships (W. B. 1046, Revised):
Published by the U. S. Weather Bureau.
For sale by Superintendent of Documents. These publications will also be furnished free of charge on request of ships' officers cooperating with the Weather Bureau.
Weather Messages for Shipping, IMO Publication No. 9, Volume IV:
Published and for sale by World Meteorological Organization, Geneva, Switzerland.

Miscellaneous.—American Ephemeris and Nautical Almanac:
American Nautical Almanac:
Published by the U. S. Naval Observatory.
For sale by the Superintendent of Documents and his sales agents.
American Practical Navigator (Bowditch) (H. O. Pub. No. 9):
Published by the U. S. Navy Hydrographic Office.
For sale by HO, the Superintendent of Documents, and their agents.
Annual Report of the Chief of Engineers, U. S. Army:
For sale by Superintendent of Documents.
Laws Governing Marine Inspection (CG–227):
Published by and free on application to the U. S. Coast Guard.
International Conventions and Conferences on Marine Safety (CG–242):
Published by the U. S. Coast Guard.
For sale by the Superintendent of Documents.
Marine Engineering Regulations and Material Specifications (CG–115):
Published by and free on application to the U. S. Coast Guard.
Rules and Regulations for Tank Vessels (CG–123):
Published by and free on application to the U. S. Coast Guard.

Rules and Regulations for Passenger Vessels (CG–256):
Published by and free on application to the U. S. Coast Guard.
Rules and Regulations for Cargo and Miscellaneous Vessels (CG–257):
Published by and free on application to the U. S. Coast Guard.
Rules and Regulations for Licensing and Certificating of Merchant Marine Personnel (CG–191):
Published by and free on application to the U. S. Coast Guard.
International Code of Signals (American Edition) Vol. 1—Visual (H. O. Pub. No. 87):
Published by the U. S. Navy Hydrographic Office.
For sale by HO and its sales agents.
Rules to Prevent Collisions of Vessels and Pilot Rules for Certain Inland Waters of the Atlantic and Pacific Coasts and of the Coast of the Gulf of Mexico (CG–169):
Published by and free on application to the U. S. Coast Guard.
Pilot Rules for the Western Rivers and the Red River of the North (CG–184):
Published by and free on application to the U. S. Coast Guard.
Pilot Rules for the Great Lakes and Their Connecting and Tributary Waters and the St. Marys River (CG–172):
Published by and free on application to the U. S. Coast Guard.
Port Series—of the United States:
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CHAPTER 2

Regional Information

ALASKA, the United States Territory that forms the northwestern extremity of the North American continent, has an area of nearly 600,000 square statute miles, about one-fifth of the total for the 48 States. The Territory also has about 34,000 statute miles of tidal shoreline as compared with the total of about 54,000 for the States. The official date of Alaska's discovery is July 16, 1741, when Vitus Bering, a Danish captain in the service of the Russian Navy, sighted Mount St. Elias; in 1867, Russia sold Alaska to the United States for $7,200,000.

In 1884, Congress established the District of Alaska; prior to that year, Alaska had been administered by the United States Army and the United States Navy. In 1912, Alaska was made a Territory and the capital was established at Juneau. Now, in 1954, a bill is before the Congress to make Alaska a State.

The Governor and Secretary of Alaska are appointed for 4 years by the President with the advice and consent of the Senate of the United States. The legislature of the Territory consists of a Senate and a House of Representatives, consisting respectively of 16 and 24 members who are elected by the qualified voters of the Territory. The Territory is represented in the Congress of the United States by a Delegate who is elected by the qualified voters for a term of 2 years. There are four Judiciary Divisions in Alaska, with headquarters at Juneau, Nome, Anchorage, and Fairbanks. A Federal District Judge, United States Attorney, and United States Marshal—all presidentially appointed—preside over each. United States Commissioners, appointed by the Judges, act as local court magistrates, probate judges, and coroners in the larger communities.

The original natives of Alaska are the Eskimos, Aleuts, and Indians. The Eskimos inhabit the northern and western parts of the Alaska mainland, the major concentration being along the coasts of the Bering Sea and Arctic Ocean. Aleuts are found principally on the Aleutian Islands, and the Athapascan Indians are native to the interior.

Fishing is Alaska's largest industrial activity. The Territory's trade is principally with the States. The main exports are fish, minerals, furs, and forest products; imports are foodstuffs, clothing, machinery, and other manufacturers.

This volume describes the coast of Alaska from Cape Spencer, on the east side of the Gulf of Alaska, to Point Hope, on the Arctic Ocean. Included are Prince William Sound, Cook Inlet, the islands along the southeast side of the Alaska Peninsula, the Aleutian Islands, and Bristol Bay.

Between Cape Spencer and Cape St. Elias, the coast is fairly regular. Along this stretch are Lituya Bay, Yakutat Bay, and Icy Bay. The great Malaspina Glacier comes down to the ocean westward of Yakutat Bay.

From Cape St. Elias to Cook Inlet, the characteristic formation is generally rocky; the waters are mostly deep, but there are also great variations in depth. The visible topographic features, such as the mountains and the rugged islands, probably are duplicated under water. The principal ports are Cordova, Valdez, and Whittier in Prince William Sound and Seward in Resurrection Bay.

In Cook Inlet, the characteristic formation is the result of glacial action. The shores are strewn with boulders, some of great size, and soundings indicate the existence under water of similar boulders, particularly in areas of hard bottom where the boulders have not been buried by silt. The principal port in Cook Inlet is Anchorage.

Westward from Cook Inlet, and throughout the islands off the southeast side of the Alaska Peninsula, rock formation is again found. The principal harbors are Kodiak on Kodiak Island, Unga and Sand Point in the Shumagin Islands, and King Cove and False Pass on the southeast side of the Peninsula.

The Aleutian Islands are rugged and mountainous, with numerous off-lying islets, rocks, and reefs. Some of the larger islands provide more or less sheltered anchorage. The principal ports are Unalaska and Kuluk Bay.

Bering Sea is characterized in general by shallow waters, with extensive sand and mud flats along the shores, particularly in the approaches to the various bays and rivers. There is little rock formation, and its occurrence, where found, is limited in area. The principal ports are Naknek in Kvichak Bay, Dillingham on Nushagak Bay, Bethel on Kuskokwim River, and Nome on Norton Sound.

Many of the harbors, particularly in mountainous areas such as the Aleutian Islands, are subject to violent williwaws. These severe gusts may come from any direction and should be considered when selecting an anchorage.

Rules of the road.—At all buoyed entrances from seaward to bays, sounds, rivers, or other estuaries for which specific lines are not described, **Inland Pilot Rules** apply shoreward of the outermost buoys or other aid to navigation of any system of aids; **International Pilot Rules** apply outside the aids. No specific lines have been established for the areas covered by this Coast Pilot.

Coast landings.—Many bold and precipitous sections of the open coast of Alaska are inaccessible. A surf boat should be used in making landings on stretches of sand beach. On a rocky shore, the locality selected for landing should be free from nearby breakers and back of some rock or small point if available, but a small area partially enclosed and subject to violent to-and-from movement of the sea should, of course, be avoided. The best landing place is one having a fairly steep-to face, where covered and uncovered by the swell, and at the same time offering adequate foothold. The swell here has less tendency to break or may not break at all.

The boat used for landings on a rocky shore should be moderately light so that it can be readily handled, and it should be of the square stern type. Approach is made stern-first under control of oars and having a line from the bow to an anchor some distance offshore if practicable. The line is manned so that the boat may be hauled away quickly at any time. The stern is brought within jumping or stepping distance of the selected spot immediately following the end of a break and a landing is made pre-

ceeding the approach of the next break if there is time to do so. Several attempts may be necessary before a quiet spell of sufficient duration occurs.

Fish traps are numerous along the outside coast and among the inside passages. The piles often become broken off and form a danger to navigation, especially at night. Regulations limiting the areas within which fish weirs may be established have been prescribed by the Secretary of the Army and the supervision of the fishing structures is controlled by the Chief of Engineers, United States Army. Strangers should proceed with caution when crossing areas of possible fish weirs, and should avoid crossing such areas at night whenever possible.

Regulations prescribe that fishing structures and appliances in navigable waters of the United States shall be lighted for the safety of navigation as follows:

Lighting fishing structures. (1) Fishing structures and appliances in navigable waters of the United States will be lighted for the safety of navigation as follows:

The lights will be displayed between sunset and sunrise. They will be placed at each end of the structure, excepting where the inner end terminates in such situation that there is no practicable navigation between it and the high-water line of the adjacent coast, in which case no inner light will be displayed. The outer light will be white, and the inner light will be red. The size, capacity, and manner of maintenance of the light will be such as may be specified in the Department of the Army permit authorizing the erection of the structure or appliance. When several structures or appliances are placed on one line with no navigable passage between them, they will be considered for lighting purposes as one structure.

(2) By authority of the Secretary of the Army conditions in form as follows will be included in all permits for fishing structures and appliances in navigable waters of the United States, issued by the Chief of Engineers or by District Engineers specially authorized by him to issue such permits:

That the weir, trap, or pound will be lighted between sunset and sunrise, by and at the expense of the permittee, for the safety of navigation. The lights will be displayed at each end, the outer end of the structure, and at an elevation of not less than ____ feet above high water. The outer light will be white, the inner light will be red, and both will be equal to ____ with a capacity to burn ____ days untended. They will be subject to the inspection of the aforesaid District Engineer before use. (Additions may be made to this condition and superfluous words deleted as may be necessary to provide for lighting the particular structure.)

That there will be installed and maintained on the weir, trap, or pound, by and at the expense of the permittee, such additional lights and signals, if any, as may be prescribed by the United States Coast Guard, and that provision will be made for proper attendance by watchman or otherwise of all lights and signals, so that they will at all times be in effective condition.

Kelp grows on nearly every danger having a rocky bottom and will be seen on the surface of the water during the summer and autumn months; during the winter and spring it is not always to be seen, especially where it is exposed to a heavy sea. Kelp should always be considered a sign of danger, and no vessel should pass through it unless it is known that extensive sounding or a wire drag survey have definitely determined that no dangers exist. There are, however, many rocks not marked by it. Boulder patches are generally not marked by kelp. A heavy sea will occasionally tear kelp away from rocks, and a moderate current will ride it under water so that it will not be seen. It is well to note that dead, detached kelp floats on the water in masses, while live kelp attached to rocks streams away level with the surface.

Graphic records of inshore surveys in the Aleutian Islands show traces of kelp in 16 fathoms, but the kelp is only about 5 fathoms long and does not reach the surface. The same records show a greatest depth of 11 to 12 fathoms for kelp reaching the surface.

Tides.—In this part of Alaska are found some of the highest tides in the United States, and also some of the lowest. Turnagain Arm, in Cook Inlet, has a diurnal range of tide of 33 feet; Nome, in Norton Sound, has a diurnal range of 1½ feet. Most places have two high and two low waters each day, but at some, particularly in the outer Aleutian Islands and in the vicinity of Yukon River, the tide is chiefly diurnal, that is, only one high and one low water each day.

For daily predictions of tides in Alaska, reference should be made to the *Tide Tables, West Coast of North and South America,* issued annually by the Coast and Geodetic Survey in advance of the year for which they are prepared; see *Publications* at the end of chapter 1.

Currents.—A prevailing current sets northward and westward along the coast of British Columbia and Alaska. The distance it extends offshore is not known but it is believed to be strongest near the coast and inside the 100-fathom curve. The estimated velocity of the current is 0 to 1½ knots. It is greatly affected by strong winds.

From theoretical considerations wind currents in the northern hemisphere should set to the right of the wind direction, but near the coast this is considerably modified by the effect of the coastline. In general it may be said that along the Pacific coast of the United States, at a distance of 5 to 10 miles offshore, the wind brings about a current with a velocity about 2 percent that of the wind.

For daily predictions of currents in Alaska, reference should be made to the *Current Tables, Pacific Coast, North America and Asia,* issued annually by the Coast and Geodetic Survey in advance of the year for which they are prepared; see *Publications* at the end of chapter 1.

Tide rips and **swirls** in regions of strong currents are usually encountered in the vicinity of shoals or islands and points of land, and they are therefore generally a positive indication of danger. The backwash of seas striking steep cliffs of a bold coast may often be felt at a considerable distance to seaward. Any change in the feel of the vessel proceeding in thick weather should be considered an indication of danger near at hand.

Weather and climate.—The following description of climate and general weather conditions in western Alaska was prepared by the Climatological Services Division of the United States Weather Bureau; available details of local weather are included in subsequent chapters, and the *Appendix* contains climatological tables for many land stations and ocean areas.

The area covered by this Coast Pilot is one of the stormiest regions of the world. This is particularly true of the middle and outer Aleutian Islands. Heavy weather with rain or snow is a common occurrence. Clouds are often very low and dense fogs are frequent. Temperatures are moderated, however, to the southern edge of the Bering Sea by the transport of warm water into this area through the Japan Current system.

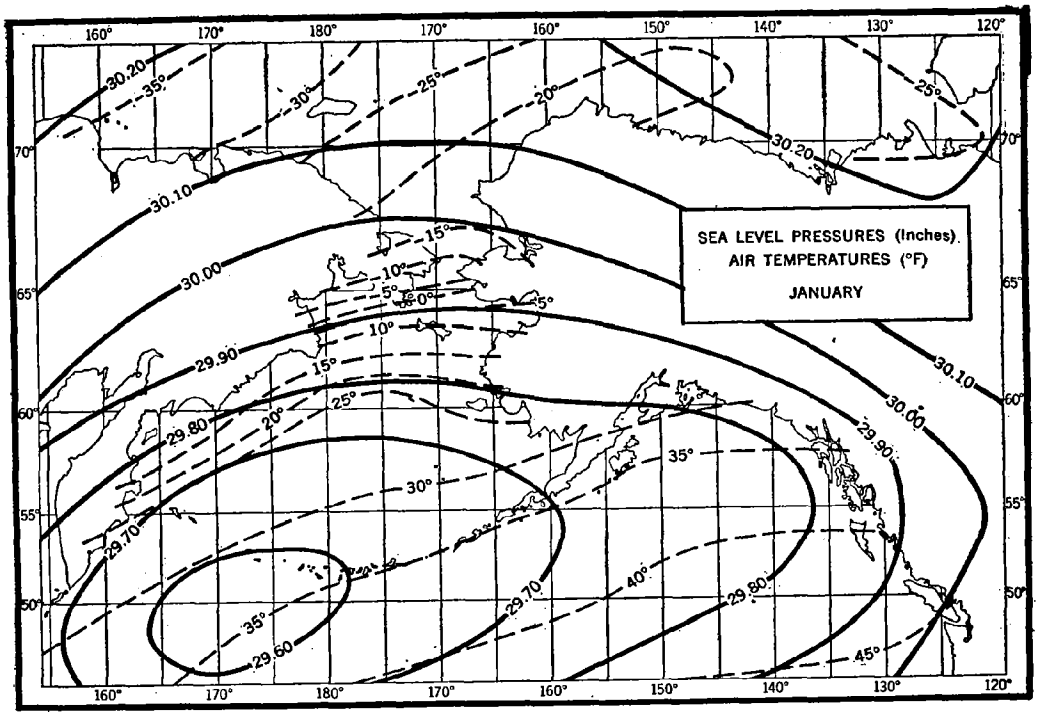
Pressure Systems.—On the mean pressure charts, the gradients over this area are steep, especially in the late fall, winter, and early spring. This is due to the deepness of the semi-permanent Aleutian LOW centered near Atka, which is in sharp contrast to the continental HIGH covering Siberia and a considerable part of the Arctic Ocean area to the northward and to the well established Pacific anti-cyclone to the southeastward. The January normal pressures in the western Aleutians, for example, are

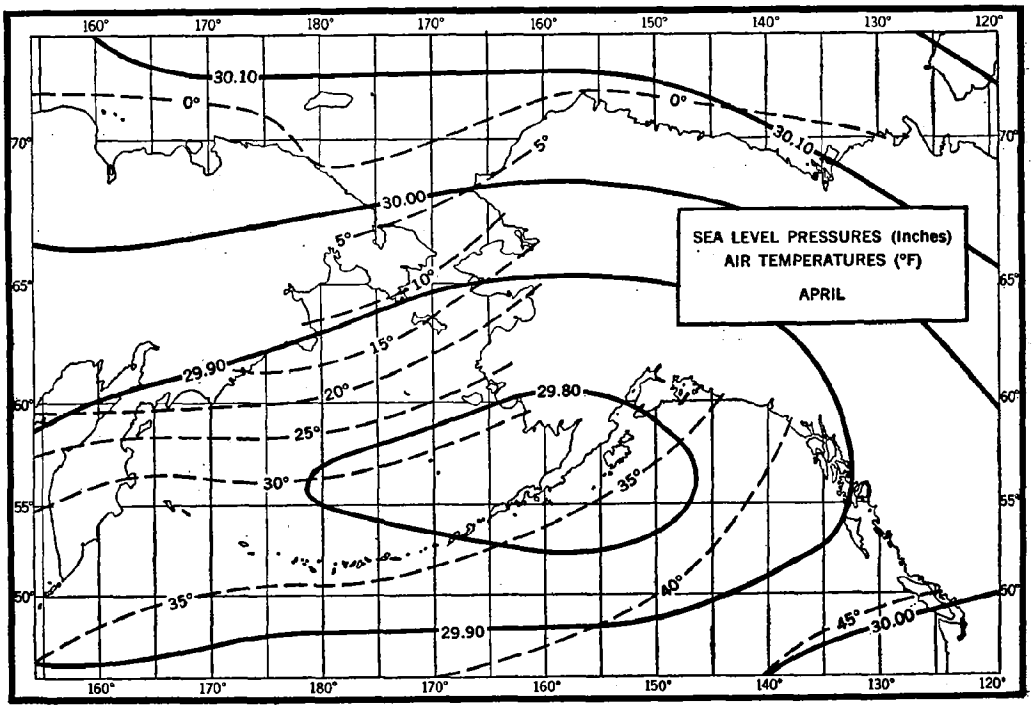
somewhat below 29.60 inches (1002.4 mb.). There are frequent occurrences of pressures from 29.00 to 28.50 inches (982.1 mb. to 965.1 mb.), occasional cases of pressure below 28.50 inches, and a few instances of values lower than 28.00 inches. The pressure over the Arctic Ocean south to about latitude 70° N. averages 30.15 inches (1021.0 mb.) during January, with frequent surges of pressures above 31.00 inches (1049.8 mb.). The normal central pressure of the Pacific HIGH, which lies off the California coast in January, is 30.22 inches (1023.4 mb.).

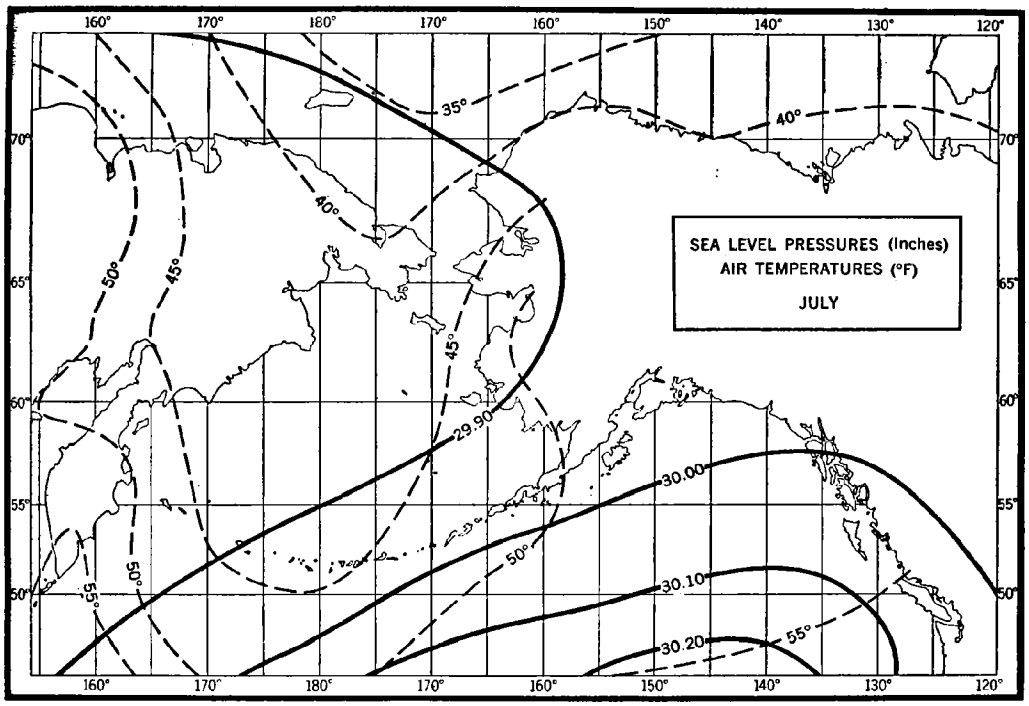
An example of an unusual surge of high pressure occurred at St. Paul Island in December of 1937 when a pressure of 31.10 inches (1053.2 mb.) was recorded. Rapid changes in pressure occur during winter in all parts of this area. The Greenwich noon pressure reading at Dutch Harbor, for example, was 29.68 inches on January 4, 1922, while 24 hours later the barometer had fallen to 28.40 inches.

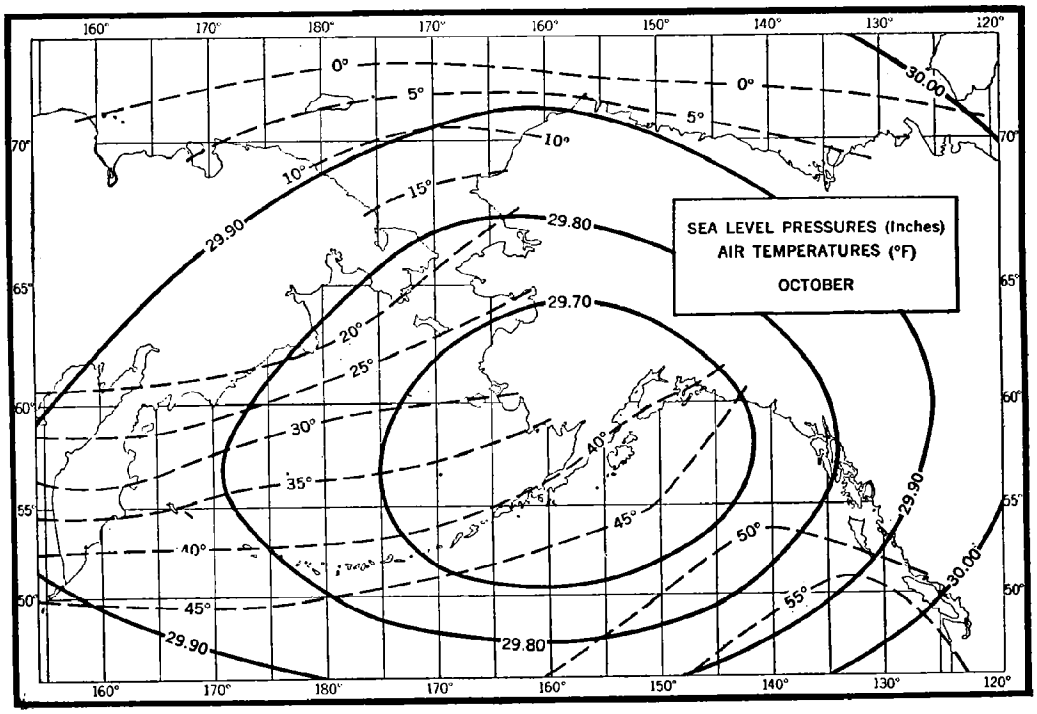
The season of least storm activity, with corresponding decrease in pressure gradients, is well represented by the month of July. In this month the Aleutian LOW has largely disappeared, the normal pressure for the month in the western Aleutian area being about 29.95 inches (1014.2 mb.) and the day to day changes in pressure varying much less than is the case in the winter season. The powerful northern anti-cyclone has disappeared over Siberia and is replaced by a low pressure area. The North Pacific HIGH, which during the winter had centered off the California coast at about 32° N. latitude with a central pressure of 30.20 inches, moves northward about 10° during the early summer, strengthening to a central pressure of about 30.27 inches, and more than doubling in area of influence until most of the eastern North Pacific between the 10° N. parallel and the Aleutians is dominated by this pressure system. This high pressure area also extends westward from the west coast of the United States to 165° E. longitude. The stormy spring and fall months make up the two transition periods.

Storm occurrence.—The frequency and severity of storms over the Aleutians and adjoining waters vary considerably from year to year. The storms of this area can be roughly divided into those of oceanic origin and those of continental origin. The oceanic storms usually form over the Pacific north and northeast from Japan, the area of genesis occasionally occurring as far east as Midway. These storms most frequently move northward or northeastward, and either cross the Aleutians into the Bering Sea or pass along the islands and into the Gulf of Alaska. In either case they often stagnate and disappear due to the resistance of an established high pressure area over the land to the eastward, but they sometimes move on into Alaska as active storms. Rarely do storms which form over the ocean east of Midway reach the Aleutian or Central Alaskan area. The continental storms form over Mongolia or Siberia and move into the outer Aleutian Pacific area by way of either the Okhotsk Sea or the Japan Sea. They often move along the Aleutian Island chain and frequently are associated with and are replaced by one or more secondary storms which develop over the ocean area in the southern edges of the original disturbance. A characteristic of the storm movements of the area then is that the individual storms are often not clearly separated from each other by well defined high pressure areas, but occur in a close series as one or more secondaries develop and follow the original depression. Thus it frequently happens that each of the successive secondaries appears to increase in force over the preceding storms until the storm system has moved inland, or until it has stagnated over the eastern part of either the Bering Sea or the Gulf of Alaska.


SEA LEVEL PRESSURES (Inches).
AIR TEMPERATURES (°F)
JANUARY
160° 170° 180° 170° 160° 150° 140° 130° 120°
70° 65° 60° 55° 50°
30.20
30.10
30.00
29.90
29.80
29.70
29.60
35°
30°
25°
20°
15°
10°
5°
0°
40°
45°


SEA LEVEL PRESSURES (Inches)
AIR TEMPERATURES (°F)
APRIL
160° 170° 180° 170° 160° 150° 140° 130° 120°
70° 65° 60° 55° 50°
30.10
30.00
29.90
29.80
0°
5°
10°
15°
20°
25°
30°
35°
40°
45°


SEA LEVEL PRESSURES (Inches)
AIR TEMPERATURES (°F)
JULY
160° 170° 180° 170° 160° 150° 140° 130° 120°
70° 65° 60° 55° 50°
35° 40° 45° 50° 55°
29.90 30.00 30.10 30.20


SEA LEVEL PRESSURES (Inches)
AIR TEMPERATURES (°F)
OCTOBER
160° 170° 180° 170° 160° 150° 140° 130° 120°
70° 65° 60° 55° 50°
0° 5° 10° 15° 20° 25° 30° 35° 40° 45° 50° 55°
29.90 29.80 29.70 30.00

Wind Force and State of Sea Surface with Specifications and Equivalents

Beaufort No.	Description of wind	Sea area			Specifications for use on land	Nautical miles per hour	Terms used in U. S. Weather Bureau forecasts
		State of sea surface	Description of sea	Scale			
0	Calm	Sea like a mirror—smooth	Glassy-calm	0	Calm; smoke rises vertically	Less than 1	
1	Light air	Ripples with the appearance of scales are formed but without foam crests.	Rippled	1	Direction of wind shown by smoke drift, but not by wind vanes	1 to 3	Light.
2	Light breeze	Small wavelets, still short but more pronounced. Crests have a glassy appearance and do not break.		2	Wind felt on face; leaves rustle; ordinary vane moved by wind.	4 to 6	
3	Gentle breeze	Large wavelets; crests begin to break; foam is not white but of glassy appearance, perhaps scattered whitecaps.	Smooth	3	Leaves and small twigs in constant motion; wind extends light flag.	7 to 10	Gentle.
4	Moderate breeze	Small waves, becoming longer; fairly frequent whitecaps.	Slight	4	Raise dust and loose paper; small branches are moved.	11 to 16	Moderate.
5	Fresh breeze	Moderate waves, taking a more pronounced long form; many whitecaps are formed. (Chance of some spray.)	Moderate	5	Small trees in leaf begin to sway; crested wavelets form on inland waters.	17 to 21	Fresh.
6	Strong breeze	Large waves begin to form; white foam crests are more extensive everywhere. (Probably some spray.)	Rough	6	Large branches in motion; whistling heard in telegraph wires; umbrellas used with difficulty.	22 to 27	
7	Moderate gale (high wind)	Sea piles up and white foam from breaking waves begins to be blown in streaks along the direction of the wind.	Very rough	7	Whole trees in motion; inconvenience felt in walking against wind.	28 to 33	Strong.
8	Fresh gale	Moderately high waves of greater length; edges of crest begin to break into the spindrift. The foam is blown in well-marked streaks along the direction of the wind.		8	Breaks twigs off trees; generally impedes progress.	34 to 40	
9	Strong gale	High waves. Dense streaks of foam along the direction of the wind. Sea begins to "roll." Spray may affect visibility.	High	9	Slight structural damage occurs (chimney pots and slate removed).	41 to 47	Gale.
10	Whole gale (heavy gale)	Very high waves with long overhanging crests. The resulting foam, in great patches, is blown in dense white streaks along the direction of the wind. On the whole, the surface of the sea takes a white appearance. The rolling of the sea becomes heavy and shock-like. Visibility affected.	Very high	10	Seldom experienced inland; trees uprooted; considerable structural damage occurs.	48 to 55	Whole gale.
11	Storm	Exceptionally high waves (small and medium-sized ships might be for a time lost to view behind the waves). The sea is completely covered with long white patches of foam along the direction of the wind. Everywhere the edges of the wave crests are blown into froth. Visibility affected.	Phenomenal [1]	11	Very rarely experienced; accompanied by widespread damage.	55 to 65	
12	Hurricane	The air is filled with foam and spray. Sea completely white with driving spray; visibility very seriously affected.		12		Above 65	Hurricane.

[1] As might exist at the center of a hurricane.

Wind conditions.—In winter the winds over the Aleutians are most frequently from westerly and southwesterly directions. There is, however, a considerable variation in direction during the season with strong gales occurring from all the different directions, but in general the strongest gales are from the north. The average wind force in the Aleutian Island latitude strip from 50° to 55° N. for January is Beaufort force 5. The high velocities of the winds in this region is shown by the fact that 21 percent of all the Greenwich noon ship observations recorded gales of force 7 or higher, 11 percent gales force 8 or higher, and 4½ percent gales of force 9 or more. The ocean area from latitude 45° to 50° N., lying just south of the Aleutians, has exactly similar conditions in winter except that 5½ percent of the observations record gales higher than force 8.

Winds along the Alaskan coast from Yakutat Bay to the eastern end of the Aleutians are more frequently from east or southeast during the winter season, and have an average velocity of Beaufort force 4; about 12 percent of the observations show a velocity of force 7 or greater, with possibly 5 percent recording over force 7 and 1 to 2 percent over force 8. Ship observations along the coast north of the Alaskan Peninsula are too few during the months of winter to determine wind conditions; however, the few observations available in the Bristol Bay area indicate that east-northeast winds are most frequent and that high wind velocities are of common occurrence.

In spring, as indicated by the month of April, the winds over the Aleutians are more westerly than in January, with a higher percentage of the winds blowing from the northwestern quadrant. The average velocity of somewhat above force 4 Beaufort is slightly lower than in winter. The higher velocities are also somewhat less frequent, the gales of force 7 or higher occurring on only 17 percent of all Greenwich noon ship observations, gales of force 8 or more on 9 percent, and those of force 9 or higher on only 3 percent of these observations. Over the open water from Yakutat to the Alaskan Peninsula and in Bristol Bay the winds are quite variable, with average velocities lower and gales less frequent than is the case over the Aleutians during this season.

In July the winds over the Aleutians are again most frequently from the southwest. The velocities generally range from force 3 to force 4, with gales force 7 or higher on 5 percent of the Greenwich noon ship observations, and less than 2 percent showing gales force 8 or higher; a gale of force 9 or higher is a rare occurrence. Winds over the ocean from Yakutat to Dutch Harbor are quite variable in direction and lower in velocity in midsummer, with most of the observations recording velocities of force 2 or force 3, but with a few observations of velocities greater than force 6, and no velocities as high as force 9. In the summer ships have made a considerable number of observations in the Bering Sea and up through the Bering Strait, and a few observations in the Arctic Ocean north of 70° N. latitude. Winds blow with about the same frequency from all points of the compass over the Bering Sea and the Arctic Ocean during the warm months with average velocities of about force 3. Gales of force 7 occur rather frequently, however, and higher gales are occasionally encountered during the summer.

In October winds over the Aleutian area are most frequently from westerly directions, with a considerable frequency from northwest and north. Velocities are most frequently force 4 or force 5, with gales above force 6 occurring on 21 percent of the Greenwich noon ship observations, those of more than force 7 on 11 percent, and 6 percent of such readings showing velocities higher than force 8. It is therefore evident that violent winds over the Aleutians in the fall and winter frequently make navigation extremely hazardous.

Mountain and gorge winds occur over the harbors and along the coasts quite frequently during the late fall, winter, and early spring, but the occurrence of such winds in midsummer is exceptional. The flume or funnel effect, which occurs in gorges and narrow channels, gives these winds unusually high velocities.

The **williwaw** is the name given to the violent wind which frequently occurs on the leeward side of the mountains of the Aleutians and western Alaska. The williwaw is an especially dangerous wind due to the suddenness of its occurrence as well as to its violence and extreme gustiness; it occurs when the air dams up in great quantity on the windward side of a mountain and then spills over suddenly as an overwhelming surge. The local topography determines the direction from which williwaws will blow, and the probability of occurrence of such a wind at a particular station is governed by the pressure pattern at the time. When, for example, a well developed low pressure area lies near and just south of Dutch Harbor or just south of Adak Island and a large high pressure area dominates the Bering Sea, then the strong northerly and northwesterly winds are likely to cause williwaws over many of the leeward coasts of the Aleutian chain. The violence and exact direction of these winds will depend both on the steepness of the mountainous elevations and on the exact position of such elevation relative to the coast affected.

Temperatures.—The mean temperatures in winter are quite uniform over the Aleutians, being within a few degrees of freezing over the whole chain of islands. Temperatures seldom go as low as 0° F. except at the extreme eastern end where they occasionally drop to −10° F. From Yakutat to Dutch Harbor the lowest winter mean monthly temperatures range from a low of 12° F. at Anchorage in January to a corresponding January mean of 28° F. at Yakutat and 32° F. at Dutch Harbor. The absolute minima in this area are frequently much below zero, an absolute low of −36° F., for example, having been recorded in December at Anchorage. Winter temperatures over the Bering Sea are lower, and those along the coast north of Bristol Bay are much lower than the corresponding temperatures over the areas to the southward. In the Bering Sea proper the lowest winter mean monthly temperature ranges from 23° F. in February on St. Paul Island to 3° F. at Gambell on St. Lawrence Island; the corresponding extreme low temperatures for the winter season at these two locations, however, are −26° F. and −30° F., respectively. The lowest mean monthly temperature along the coast northward from the Alaskan Peninsula varies from 7° F. in January at Bethel to −1° F. at Teller on the Seward Peninsula in January, and to −18° F. in February at Point Barrow. Temperatures lower than −40° F. occur occasionally at almost all locations along this coast; a temperature of −52° F., for example, has been recorded at Bethel.

Cold comes early in the fall at these northern latitudes and lasts well into the spring months. The summer season is pleasant with cool nights. Along the Aleutians the mean temperature of the warmest month (usually August) ranges from 52° to 57°, with extreme maxima from 71° to 80°, and with the monthly average of the daily minimum values about 46° F. Along the Alaskan coast from Yakutat to Dutch Harbor the highest mean monthly temperatures range from 53° at Yakutat in July and August to 57° at Anchorage in July. Temperatures along this coast rarely exceed 85° F. on the hottest day of summer, while the mean of the daily minimum values for the hottest summer months falls in the upper forties. Northward from the Alaskan Peninsula the monthly mean values for the warmest summer months vary from 54° F. at Bethel

in July to 40° F. at Barrow in the same month. Temperatures as high as 90° F. have been recorded at Bethel while 78° F, is the absolute high at Barrow. The average lowest night temperature for the warmest month along all of this coast is about 46° F.

Precipitation.—The annual rainfall recorded in the Aleutians shows considerable variation between stations due to local topography. Most Aleutian stations with any sizable length of record, however, indicate that the fall months of October and November generally have the largest amount of precipitation. Rainfall is in general much heavier along the coast from Yakutat to Dutch Harbor than it is over the Aleutians; however, the topography exerts an important control on the amount of precipitation which falls at the various locations along this coast. As an example of this, the average annual rainfall at Yakutat, well exposed to the moist southerly and southeasterly winds, is 94 inches, while at Anchorage, well protected by high mountains to the east and south, the corresponding value is only 14 inches. Precipitation is generally less over the Bering Sea than over the areas to the southward. The annual rainfall ranges from a maximum of about 24 inches on St. Paul Island to a minimum of slightly over 4 inches at Point Barrow. The precipitation of the coastal area from the Alaskan Peninsula to the Bering Strait is about 17 inches per year, with the coastal areas north of Seward Peninsula averaging less than 10 inches.

In the Aleutians only a small proportion of the measured precipitation (liquid water) occurs in the form of snow. At Atka the normal total snowfall is 49 inches (approximately 4.5 inches of water), of which 13 inches falls in the month of December. The heaviest snowfall along the coastal area from Yakutat to Dutch Harbor usually occurs at those stations which have the largest annual amount of precipitation. Yakutat, for example, has a normal total annual snowfall of 179 inches which, when melted and measured, constitutes 14 percent of the 131 inches of annual precipitation. The snowfall at well protected stations, however, frequently accounts for nearly one half of all precipitated moisture. Such is the case at Anchorage where the normal snowfall is 66 inches (approximately 6 inches of water) out of a total precipitation of 14 inches. The annual amount of rainfall decreases and the proportional amount of snowfall increases rapidly with increasing latitude along the coast above the Alaskan Peninsula. At Bethel nearly a fourth of the annual precipitation of 18 inches is represented by the 42 inches of snow. At Nome, with an annual precipitation of 18 inches, 61 inches is the normal annual snowfall, and Teller has 53 inches as annual snowfall with only 11 inches as total precipitation. At Point Barrow about all of the moisture from September through May falls in a frozen form, and measurable snowfall usually occurs also in each month from June through August so that, although the total annual precipitation is only 4 inches, there is normally 29 inches of snowfall during the year.

Thunderstorms are rare, with occurrences averaging no more than 1 to 3 annually. They have been known to attend heavy snowfall, and thus may occur in the cold as well as in the warm season.

Fog and cloudiness.—In general the area has an unusually high frequency of violent storms with overcast conditions and either rain or snow, whole some parts of the area have a large amount of fog. The details of cloud and fog conditions are largely controlled by local topography and will be discussed under the separate localities.

However, the summer *advection* or *sea* fog is common to much of the area. This type of fog results from the cooling effect of a relatively cold water surface upon a warm, moist air mass flowing over it. It settles down on an area, and sometimes winds even of

gale force do not dissipate it. Often thick and extensive fog areas are associated with the limits of ice in the Bering and Chukchi Seas.

The onshore movement of sea fog is largely dependent on the local wind flow and its intensity is usually associated with the contrast between air and sea temperatures and the general pressure pattern over the area. Often the fog will lift or dissipate a short distance inland, and will tend to remain in the vicinity of a bay or particular parts of a bay.

When navigation among the islands or along the Alaskan coast is necessary, it should be realized that even on the foggiest days of summer there is always a chance that there will be clear areas, breaks, or a slight lifting on the leeward sides of mountainous islands if there is any kind of consistent wind movement. Zero to near zero visibility occurs on the windward side of an island more often than on the leeward side because of these three possible situations:

1. A shallow advection fog may flow around an island, leaving a clear space on the leeward side.

2. A thick fog may flow over (as well as around) an island, but the slight heating produced by the downdraft on the lee side of the island permits the fog to rise and for a low stratus cloud layer, and breaks in this low stratus overcast may occur.

3. The fog flowing over an island may be too thick for the heating on the lee side to develop breaks, yet the heating may still be sufficient to permit the fog to rise a short distance off the water.

Like the summer fogs, additional visibility hazards such as other types of fog, blowing and falling snow or rain, haze, etc., are generally worse on windward coasts.

Ice will seldom be encountered south of Unimak Pass. It occurs locally where discharged from glaciers, and in winter is formed at the head of the various inlets, but seldom gets far from its source. Its occurrence, and also the ice in Bering Sea, are discussed in detail under the headings of the various localities.

All ports in Alaska except those in Bering Sea and at the upper end of Cook Inlet, are ice free and open to navigation the year around.

Refraction phenomena, due to irregularities in the density of the atmosphere, are comparatively common in the Arctic region. It is well known that the atmosphere, generally, is so stratified that with increase of elevation many more or less abrupt changes occur in temperature, composition, density, and therefore, refrangibility. As such layers glide over each other, billows are formed, and the adjacent layers thereby appear corrugated. The several layers frequently also heat unequally, largely because of disproportionate vapor contents, and thereby develop, both day and night, and at various levels, innumerable vertical convections; each moving mass differing, of course, in density from the surrounding air, and by the changing velocity being drawn out into dissolving filaments.

Terrestrial refraction.—The curving of rays of light is not confined to those that come from a celestial object, but applies to those that pass between any points within the atmosphere, whether at the same or different levels. This latter phenomenon, known as terrestrial refraction, causes all objects on the earth or in the atmosphere to appear to be at greater altitudes than they actually are, except when the surface air is so strongly heated as to cause an increase of density with elevation.

The distance to the horizon, corresponding to a given altitude, therefore obviously depends upon the rate of vertical density decrease.

Looming.—When there is an increase over the normal rate of vertical density decrease, and as often happens over water in the middle to high latitudes, it gives rise to the phenomenon known as looming, or the coming into sight of objects normally below the horizon.

Towering.—This phenomenon is similar to looming, and sometimes is so designated. It occurs, as occasionally happens, when the inversion layer is so located that rays to the observer from the top of an object are more curved than those from the bottom. The effect is to make the top appear more elevated—it will tower and seem to draw near.

Sinking.—A phenomenon, exactly the reverse of looming, also is frequently observed at sea. It is caused by a decrease below the normal in the rate of vertical density decrease of the atmosphere.

Stooping.—The reverse of towering. Occasionally rays from the base of an object may be curved downward much more rapidly than those from the top, with the obvious result of apparent vertical contraction, and the production of effects quite as odd and grotesque as those due to towering.

Mirage.—The mirage is a refraction phenomenon occasioned when the air is calm and the change of density with increase of height unusual. It includes looming, towering, sinking, and stooping.

Superior mirage.—When the density of the air decreases from the ground upward more rapdily than the normal rate, as it does when the ground is covered with a layer of very cold air and the temperature increases with elevation above the ground for some height (i. e., an inversion of temperature exists), the rays of light are bent more than normally toward the earth and the mirage is seen raised above the object, which may be below the horizon at the time. This form of the phenomenon, in which the mirage appears as if reflected from an overhead plane mirror, is known as the superior mirage. At sea, during the occurrence of this condition, a ship may appear normally on the surface of the sea, while its image shows upside down, with masts or funnels of the real and unreal images at or near contact.

Inferior mirage.—When the density of the air increases from the ground upward, as it does over highly heated deserts, the rays are bent upward and the image appears as if reflected from a plane mirror below the observer. This is the inferior mirage, common to flat desert regions, especially during the warmer hours of the day. The phenomenon closely simulates, even to the quivering of the images, the reflection by a quiet body of water of objects on the distant shore, the water being the image of the distant low sky. When seen over the sea, it tends to occur most frequently in straits or other narrow bodies at sea and along warm coasts. If a ship is near land on one side and there are other ships lying in different directions and at different distances seaward, very striking mirages may be witnessed. At a distance ships may appear normal, while nearby they may be partly hidden, divided, distorted, or inverted. The coastline itself may be badly jumbled, with the heights exaggerated or misshapen, and sometimes with the bases of the hills apparently superimposed upon their summits.

Lateral mirage.—Occasionally mirage is observed bordering on the side of a cliff or steep ridge, whence it may be seen from a ship close inshore, and occurs when the air adjacent to such a shore is of different density than the air a short distance from it. A condition of this sort may result in the appearance of an object's image, reversed in direction, and alongside the object it mirrors, this procedure following in principle that of the superior mirage, with the raised and inverted image.

Fata Morgana.—In addition to these simpler forms of mirage, there is one of complex displacements and distortions known as the Fata Morgana, which apparently results from the coexistence of the temperature disturbances peculiar to both superior and inferior mirage. The name Fata Morgana has become generic for all such multiple images wherever they occur.

The illusionary displacement of the horizon in a vertical direction resulting from refraction above the tabular value may result in navigational errors. Objects become visible from a distance two or three times greater than usual, and coastlines normally below the horizon often appear so distinct that there is a tendency to mistrust the accuracy of reckoning. The appearance of a coast may also become so distorted through mirage that it cannot be identified until dangerously close-to. Wavering or the appearance of undulating lines near the horizon is an indication that mirage is present.

Aurora borealis (aurora polaris, northern lights) is a well-known but imperfectly understood luminous phenomenon of the upper atmosphere.

While no two auroras are exactly alike, several types have been recognized, such as arcs, bands, rays, curtains or draperies, coronas, luminous patches, and diffuse glows. The arcs normal to the magnetic meridian, often, but not always, reach the horizon. Their under edge is rather sharply defined, so that by contrast the adjacent portion of the sky appears exceptionally dark. The rays, sometimes extending upward from an arch, at other times isolated, are parallel to the lines of magnetic force. Many auroras are quiescent, others exceedingly changeable, flitting from side to side like wandering searchlights, and in some cases even waving like giant tongues of flame.

The aurora borealis occurs most frequently along a zone which forms an approximate oval, of average radius 23°, with its center in the extreme northwest of Greenland. A portion of this zone of maximum frequency lies just north of Wrangel Island and into the north of Alaska. Along this zone aurora of some kind can probably be seen every suitable night when the sky is clear; 250 miles outside this maximum zone to the southward the auroral frequency decreases sharply to about 70–100 nights a year on the average, and to 20–25 nights 500 miles south of the maximum zone.

On the zone of maximum frequency itself aurora appears as frequently to the south of the zenith as to the north, but with increasing distance outside the zone the appearances concentrate more into the northern sky.

It is well established that on the average auroras are more numerous during years of sun-spot maxima than during years of spot minima. They also appear to be more numerous before midnight than after.

Many auroras are practically white. Red, yellow, and green are also common auroral colors. Some streaks and bands are reddish throughout their lower or northern portion, then yellowish and finally greenish through the higher portions.

The absolute intensity of the light of the aurora is seldom great, and the brighter stars are usually seen through it. In the most vivid and intense displays, the light may be equal, but rarely surpasses, that of the full moon in a cloudless sky. It may give enough light to read by. It should be borne in mind that aurora light comes from many directions in contrast to sunlight or moonlight and therefore does not cast shadows which may be a hindrance at times.

The problem of the height of auroras has often been investigated, but only recently solved. The upper limits of auroral light vary from about 55 miles to over 270 miles;

and the lower limits from perhaps 45 miles to 92 miles, with two well-defined maxima, one at 54 miles and the other at 57 miles.

Pilotage.—Pilotage is not compulsory for the inland passage through British Columbia, nor for ports in Alaska. Reliable licensed pilots can be had at Seattle on inquiry, or communication by radio to marine station KPE. All vessels navigating the inland waters of British Columbia and Alaska should carry a pilot or pilots.

Vessels making canneries, mines, and other settlements in unsurveyed areas can usually obtain the services of someone with local knowledge, although not a pilot. Nearly all canneries in Alaska now have radio stations, telegraphic or radio telephonic, and vessels desiring a pilot should arrange by radio for one of the cannery men to come out and pilot the ship in.

Towboats are stationed at the principal ports of Washington and British Columbia. In the absence of able tugs in southeastern Alaska, any towing that is required is done by small cannery tenders and other small local craft. Vessels requiring this service are those that go to Alaska in the interests of the canneries, and the towboat is sent to meet them when expected.

Standard time.—The standard time of the meridian 135° west, 9 hours slow of Greenwich time, is used from Cape Spencer to longitude 141°, westward of Yakutat Bay. The meridian 150° west, 10 hours slow, is used from longitude 141° to 162°. The meridian 165° west, 11 hours slow, is used west of longitude 162°.

Holidays in Alaska are as follows: January 1, New Year's Day; February 12, Lincoln's Birthday; February 22, Washington's Birthday; March 30, Seward's Day; May 30, Memorial Day; July 4, Independence Day; first Monday in September, Labor day; October 18, Alaska Day; November 11, Veterans Day; fourth Thursday in November, Thanksgiving Day; December 25, Christmas Day.

Supplies.—Vessels usually obtain their supply of provisions and ship-chandler's stores at Puget Sound ports. The principal towns and settlements in western Alaska can furnish a limited supply of ship's stores.

Regular stocks of fuel, motor, and lubricating oils are maintained at the larger ports.

Water can be obtained through pipe and hose at most of the ports and canneries (during operating season) in Alaska.

For further information on availability of supplies, see description of various places.

Repairs.—There are facilities for minor emergency repairs to machinery or small boats at the principal ports in western Alaska. The canneries maintain fairly well-equipped machine shops and usually minor emergency repairs can be made. There are no commercial dry docks or large marine railways, but the great range of tide permits the beaching of small- to moderate-sized vessels. At several canneries there are slipways capable of hauling out vessels up to 75 tons.

Transportation.—Regular lines of steamers operate from Seattle to ports in western Alaska. These main ports have limited service with nearby smaller ports. Airplane service is maintained to points in southeastern Alaska and the interior.

Communication in Alaska is conducted mainly by radiotelegraph and radiotelephone. There is also cable connection between Seattle, the principal ports of southeastern Alaska, and Valdez and Seward.

The Signal Corps of the United States Army operates the **Alaska Communication System,** which consists of a network of radio stations in Alaska with the net control station located in Seattle, Washington. This system constitutes the backbone of radio communications in Alaska. Practically all of the canneries and mining activities operate radio stations and, in addition, serveral stations are operated by the Territory of Alaska and other Government agencies, all of which have connections with the Alaska Communication System. Many of the shore stations of these various interests as well as certain stations of the Alaska Communication System listen on 500 kc., have ship-to-shore service, and are open to public correspondence. Most shore stations, except the Alaska Communication System, have no fixed hours of service and some are closed between the normal periods of Alaskan fishing operations. For a list of Alaskan radio stations, hours, and nature of service concerned, consult the *List of Coast Stations and Ship Stations*, published by the International Telecommunication Union. A list of commercial radio stations located in Alaska may be obtained from the Federal Communications Commission, Washington 25, D. C.

CHAPTER 3

Sailing Directions

THE TABLES that follow give courses and distances for the usually traveled routes in western Alaska. Unless otherwise noted, depths along the tabular courses are as great as, or greater than, the depths at the ports to which the courses lead. The navigator must make his own allowances for wind and current. Chapter 2 discusses generally the tides, currents, winds, and obstructions of the region, and chapters 4 to 8 discuss them in some detail. The continual current setting northward and westward along the coast of Alaska should be given special attention.

The geographic positions given are those of the turning points and not of the reference objects. Where a course extends across two or more charts, the position of a junction point also is given. Courses and bearings are in degrees, true, clockwise from 000° at north to 359°. Bearings are from seaward, and distances are in nautical miles.

Table 1.—From Strait of Juan de Fuca

Position (Reverse directions in *italics*—read upward)	Course	Distance	Distance from origin
To Cape Hinchinbrook			
1. Swiftsure Bank Lightship, 1.3 miles 030°; 48°31′.4 N., 125°00′.6 W. Chart 6102:			0. 0
Direct	306	31. 0	
Reverse	*126*	*31. 0*	
2. Amphitrite Point Light, 7.0 miles 036°; 48°49′.6 N., 125°38′.6 W. Chart H. O. 5362 (*6102*):			31. 0
Direct	307	118. 3	
Reverse	*127*	*118. 3*	
3. Cape Cook Light, 7.0 miles 037°; 50°01′.2 N., 128°03′.0 W. Chart H. O. 5361 (*H. O. 5362*):			149. 3
Direct	312	160. 6	
Reverse	*132*	*160. 6*	
4. Cape St. James Light, 10.0 miles 042°; 51°48′.8 N., 131°11′.8 W. Chart H. O. 0903 (*H. O. 5361*):			309. 9
Direct	314	723. 0	
Change to Chart 8002 (*H. O. 0903*) at 54°37′.2 N., 136°00′.0 W. Change to Chart 8502 (*8002*) at 58°53′.9 N., 144°00′.0 W. Change to Chart 8551 (*8502*) at 59°43′.6 N., 145°40′.0 W.			
Reverse	*134*	*723. 0*	
5. Cape Hinchinbrook Light, 1.5 miles 045°; 60°13′.3 N., 146°40′.9 W. Chart 8520. Continue to Cordova via Table 4. Continue to Valdez via Table 5. Continue to Whittier via Table 6.			1, 032. 9

Table 1.—From Strait of Juan de Fuca—Continued

Position (Reverse directions in *italics*—read upward)	Course	Distance	Distance from origin
To Resurrection Bay			
1. Swiftsure Bank Lightship, 1.3 miles 030°; 48°31′.4 N., 125°00′.6 W. Chart 6102:			0. 0
Direct	306	31. 0	
Reverse	*126*	*31. 0*	
2. Amphitrite Point Light, 7.0 miles 036°; 48°49′.6 N., 125°38′.6 W. Chart H. O. 5362 (*6102*):			31. 0
Direct	307	118. 3	
Reverse	*127*	*118. 3*	
3. Cape Cook Light, 7.0 miles 037°; 50°01′.2 N., 128°03′.0 W. Chart H. O. 5361 (*H. O. 5362*):			149. 3
Direct	312	160. 8	
Reverse	*132*	*160. 8*	
4. Cape St. James Light, 10.0 miles 042°; 51°48′.8 N., 131°11′.8 W. Chart H. O. 0903 (*H. O. 5361*):			310. 1
Direct (Initial Great Circle course)	315½		
(Final Great Circle course)	300½		
Change to Chart 8002 (*H. O. 0903*) at 54°33′.9 N., 136°00′.0 W.			
Change to Chart 8502 (*8002*) at 58°05′.4 N., 144°00′.0 W.			
Change to Chart 8552 (*8502*) at 59°33′.7 N., 148°20′.0 W.			
Reverse (Initial Great Circle course)	*120½*		
(Final Great Circle course)	*135½*		
Great Circle distance		773. 0	
5. Barwell Island Light, 0.6 mile 020°; 59°51′.0 N., 149°17′.2 W.			1, 083. 1
To Kodiak via Woody Island Channel			
1. Swiftsure Bank Lightship, 1.3 miles 030°; 48°31′.4 N., 125°00′.6 W. Chart 6102:			0. 0
Direct	306	31. 0	
Reverse	*126*	*31. 0*	
2. Amphitrite Point Light, 7.0 miles 036°; 48°49′.6 N., 125°38′.6 W. Chart H. O. 5362 (*6102*):			31. 0
Direct	307	118. 3	
Reverse	*127*	*118. 3*	
3. Cape Cook Light, 7.0 miles 037°; 50°01′.2 N., 128°03′.0 W. Chart H. O. 5361 (*H. O. 5362*):			149. 3
Direct (Initial Great Circle course)	308		
(Final Great Circle course)	288		
Change to Chart 9000 (*H. O. 5361*) at 50°29′.0 N., 129°00′.0 W.			
Change to Chart 8535 (*9000*) at 57°40′.6 N., 152°00′.0 W.			
Reverse (Initial Great Circle course)	*108*		
(Final Great Circle course)	*128*		
Great Circle distance		962. 0	
4. Chiniak Island Light, 4.5 miles 180°; 57°42′.3 N., 152°09′.1 W.:			1, 111. 3
Direct	285	8. 3	
Reverse	*105*	*8. 3*	
5. St. Paul Harbor lighted bell buoy 10, 200 yards 270°; 57°44′.5 N., 152°24′.1 W. Chart 8545 (*8535*):			1, 119. 6
Direct	027	3. 2	
Pass 300 yards north of Humpback Rock lighted whistle buoy 1 and 0.7 mile north of Humpback Rock.			
Reverse	*207*	*3. 2*	
6. Woody Island Channel buoy 6, 250 yards 245°; 57°47′.2 N., 152°21′.4 W.:			1, 122. 8
Direct	342	0. 3	
Reverse	*162*	*0. 3*	
7. Cyane Rock lighted bell buoy 3, 0.8 mile 265°; **Woody Island Light** 0. 8 mile 070°; 57°47′.5 N., 152°21′.6 W.:			1, 123. 1
Direct	265	0. 8	
Reverse	*085*	*0. 8*	

Table 1.—From Strait of Juan de Fuca—Continued

Position (Reverse directions in *italics*—read upward)	Course	Distance	Distance from origin
8. Cyane Rock lighted bell buoy 3, close aboard 180°; 57°47′.5 N., 152°23′.1 W.:			1,123.9
Direct	254	0.2	
Reverse	*074*	*0.2*	
9. Near Island, north tangent, 75 yards 180°; **South Radio Mast,** 450 yards 294°; 57°47′.4 N., 152°23′.4 W.:			1,124.1
Direct	Various	0.7	
Reverse	*Various*	*0.7*	
10. Kodiak Harbor buoy 4, 50 yards 315°; 57°47′.0 N., 152°24′.6 W.:			1,124.8
Direct	Various	0.3	
Reverse	*Various*	*0.3*	
11. Midway between Gull Island lighted bell buoy 5 and **Cannery Wharf,** 57°47′.1 N., 152°25′.1 W.			1,125.1
To Kodiak via St. Paul Harbor			
1. Swiftsure Bank Lightship, 1.3 miles 030°; 48°31′.4 N., 125°00′.6 W. Chart 6102:			0.0
Direct	306	31.0	
Reverse	*126*	*31.0*	
2. Amphitrite Point Light, 7.0 miles 036°; 48°49′.6 N., 125°38′.6 W. Chart H. O. 5362 (*6102*):			31.0
Direct	307	118.3	
Reverse	*127*	*118.3*	
3. Cape Cook Light, 7.0 miles 037°; 50°01′.2 N., 128°03′.0 W. Chart H. O. 5361 (*H. O. 5362*):			149.3
Direct (Initial Great Circle course)	308		
(Final Great Circle course)	288		
Change to Chart 9000 (*H. O. 5361*) at 50°29′.0 N., 129°00′.0W. Change to Chart 8535 (*9000*) at 57°40′.6 N., 152°00′.0 W.:			
Reverse (Initial Great Circle course)	*108*		
(Final Great Circle course)	*128*		
Great Circle distance		962.0	
4. Chiniak Island Light, 4.5 miles 180°; 57°42′.3 N., 152°09′.1 W.:			1,111.3
Direct	285	8.3	
Reverse	*105*	*8.3*	
5. St. Paul Harbor lighted bell buoy 10, close aboard 090°; 57°44′.5 N., 152°24′.3 W.:			1,119.6
Direct	277	0.9	
Pass 300 yards north of Humpback Rock lighted whistle buoy.			
Reverse	*097*	*0.9*	
6. St. Paul Harbor lighted whistle buoy 13, 125 yards 180°; 57°44′.6 N., 152°26′.0 W. Chart 8545 (*8535*):			1,120.5
Direct	320	0.7	
Reverse	*140*	*0.7*	
7. Puffin Island Reef lighted bell buoy 6, 100 yards 090°; 57°45′.2 N., 152°26′.9 W.:			1,121.2
Direct	018	1.5	
Reverse	*198*	*1.5*	
8. Gull Island Rocks daybeacon, 300 yards 090°; 57°46′.6 N., 152°26′.0 W.:			1,122.7
Direct	046	0.6	
Reverse	*226*	*0.6*	
9. Midway between Gull Island lighted bell buoy 5 and Cannery Wharf, 57°47′.1 N., 152°25′.1 W.			1,123.3

Table 1.—From Strait of Juan de Fuca—Continued

Position (Reverse directions in *italics*—read upward)	Course	Distance	Distance from origin
To Unimak Pass			
1. Swiftsure Bank Lightship, 1.3 miles 030°; 48°31′.4 N., 125°00′.6 W. Chart 5022:			0.0
Direct (Initial Great Circle course)	297½		
(Final Great Circle course)	267½		
Change to Chart H. O. 0903 (*5022*) at 48°58′.0 N., 126°20′.0 W.			
Change to Chart 9000 (*H. O. 0903*) at 52°16′.0 N., 139°30′.0 W.			
Change to Chart 8802 (*9000*) at 54°00′.4 N., 157°00′.0 W.:			
Reverse (Initial Great Circle course)	*087½*		
(Final Great Circle course)	*117½*		
Great Circle distance		1,445.2	
2. Position 54°00′.0 N., 163°00′.0 W. Chart 8860 (*8802*):			1,445.2
Direct	288½	64.7	
Reverse	*108½*	*64.7*	
3. Scotch Cap Light, 3.2 miles 000°; 54°20′.5 N., 164°44′.5 W.			1,509.9
To Yokohama, Japan via south of Aleutians Islands			
These tracks are also used in whole or in part for various other ports on the west side of the North Pacific. Information for their safe navigation in the vicinity of the Aleutian Islands is found in chapter 7.			
1. Swiftsure Bank Lightship, 1.3 miles 030°; 48°31′.4 N., 125°00′.6 W. Chart 5022:			0.0
Direct (Initial Great Circle course)	292		
(Final Great Circle course)	280½		
Change to Chart 5052 at 48°50′.0 N., 126°12′.4 W.			
Change to Chart 9000 at 49°16′.3 N., 128°00′.0 W.			
Great Circle distance		602.0	
2. Latitude 51°21′.0 N., longitude 140°00′.0 W.			602.0
Direct (Initial Great Circle course)	281		
(Final Great Circle course)	265		
Change to Chart 8802 at 52°05′.3 N., 157°00′.0 W.			
Great Circle distance		743.0	
3. Latitude 52°00′.0 N., longitude 160°00′.0 W.			1,345.0
Direct	263	758.5	
Change to Chart 9000 at 51°33′.3 N., 166°00′.0 W.			
Change to Chart 9102 at 51°08′.6 N., 171°30′.0 W.			
4. Latitude 50°30′.0 N., longitude 180°00′.0 W.			2,103.5
Direct (Initial Great Circle course)	259		
(Final Great Circle course)	237		
Leave Chart 9102 at 48°54′.9 N., 170°30′.0 E.:			
Great Circle distance		1,333.5	
5. Latitude 42°00′.0 N., longitude 150°00′.0 E.:			3,436.0
Direct	227½	638.8	
6. Latitude 34°49′.0 N., longitude 140°00′.0 E. Continue to Yokohama by directions given in H. O. Publication No. 123A, *Sailing Directions for Japan, Vol. I.*			4,074.8
To Yokohama via Unimak Pass and Bering Sea			
1. Swiftsure Bank Lightship 1.3 miles 030°; 48°31′4 N., 125°00′6 N. Chart 5022:			0.0
Direct (Initial Great Circle course)	297½		
(Final Great Circle course)	267½		
Change to Chart H. O. 0903 at 48°58′.0 N., 126°20′.0 W.			
Change to Chart 9000 at 52°16′.0 N., 139°30′.0 W.			
Change to Chart 8802 at 54°00′.4 N., 157°00′.0 W.			
Great Circle distance		1,445.2	
2. Latitude 54°00′.0 N., longitude 163°00′.0 W. Chart 8860:			1,445.2
Direct	288½	64.7	

Table 1.—From Strait of Juan de Fuca—Continued

Position (Reverse directions in *italics*—read upward)	Course	Distance	Distance from origin
3. Scotch Cap Light, 3.2 miles 000°; 54°20′.5 N., 164°44′.5 W.:			1, 509. 9
Direct	279½	27. 0	
4. Latitude 54°25′.0 N., longitude 165°30′.0 W.			1, 536. 9
Direct (Initial Great Circle course)	268		
(Final Great Circle course)	252½		
Change to Chart 8802 at 54°24′.0 N., 166°30′.0 W.			
Change to Chart 9102 at 54°05′.5 N., 173°00′.0 W.:			
Great Circle distance		705. 0	
5. Latitude 52°25′.0 N., longitude 175°00′.0 E.			2, 241. 9
Direct (Initial Great Circle course)	248		
(Final Great Circle course)	229½		
Leave Chart 9102 at 51°22′.8 N., 171°00′.0 E.			
Great Circle distance		1, 186. 4	
6. Latitude 42°00′.0 N., longitude 150°00′.0 E.			3, 428. 3
Direct	227½	638. 8	
7. Latitude 34°49′.0 N., longitude 140°00′.0 E. Continue to Yokohama by directions given in H. O. Publication No. 123A, *Sailing Directions for Japan, Vol. I.*			4, 067. 1

Table 2.—Cape Spencer to Cape Hinchinbrook

Continued from U. S. Coast Pilot, *Southeast Alaska*, Table 1, Position 159			
1. Cape Spencer Light, 2.0 miles 000°; 58°10′.0 N., 136°38′.3 W.			0. 0
Chart 8002:			
Direct	290½	265. 1	
Reverse	*110½*	*265. 1*	
2. Cape St. Elias lighted whistle buoy 2, 1.0 mile 000°; 59°43′.7 N., 144°38′.4 W. Chart 8502 (*8002*):			265. 1
Direct	295½	68. 2	
Reverse	*115½*	*68. 2*	
3. Cape Hinchinbrook Light, 1.5 miles 045°; 60°13′.3 N., 146°40′.9 W.			333. 3

Table 3.—Cape Spencer to Seward

1. Cape Spencer Light, 2.0 miles 000°; 58°10′.0 N., 136°38′.3 W.			0. 0
Chart 8002:			
Direct	283	309. 7	
Change to Chart 8502 (*8002*) at 59°04′.4 N., 144°00′.0 W.:			
Reverse	*103*	*309. 7*	
2. Middleton Island, north end aviation light, 6.0 miles 000°; 59°21′.2 N., 146°18′.7 W.:			309. 7
Direct	288	95. 4	
Reverse	*108*	*95. 4*	
3. Barwell Island Light, 0.6 mile 020°; 59°51′.0 N., 149°17′.2 W.			405. 1
Chart 8529 (*8502*):			
Direct	318	4. 3	
Reverse	*138*	*4. 3*	
4. Hive Island Light, 0.9 mile 150°; 59°54′.3 N., 149°22′.9 W.:			409. 5
Direct	005	4. 9	
Pass midway between Hive and Renard Islands.			
Reverse	*185*	*4. 9*	
5. Caines Head Light, 0.5 mile 270°; 59°59′.0 N., 149°22′.1 W.:			414. 3
Direct	343	7. 2	
Reverse	*163*	*7. 2*	
6. Seward, Railroad Wharf, 60°06′.0 N., 149°26′.3 W.			421. 5

Table 4.—Cape Hinchinbrook to Cordova

Position (Reverse directions in *italics*—read upward)	Course	Distance	Distance from origin
1. Cape Hinchinbrook Light, 1.5 miles 045°; 60°13′.3 N., 146°40′.9 W. Chart 8520:			0.0
Direct	330	6.9	
Reverse	*150*	*6.9*	
2. Porpoise Rocks, 3.2 miles 090°; 60°19′.2 N., 146°48′.0 W.:			6.9
Direct	007	6.1	
Reverse	*187*	*6.1*	
3. Johnstone Point Light, 6.1 miles 052°; 60°25′.2 N., 146°46′.5 W.:			13.0
Direct	042	7.1	
Reverse	*222*	*7.1*	
The light is obscured south of 052°.			
4. Johnstone Point Light, 1.5 miles 180°; 60°30′.5 N., 146°36′.6 W.:			20.1
Direct	070	7.5	
Reverse	*250*	*7.5*	
5. Middle Ground Shoal lighted bell buoy 2, 0.5 mile 180°; 60°33′.1 N., 146°22′.4 W.:			27.6
Direct	078	11.5	
Reverse	*258*	*11.5*	
6. Hanks Island Rock lighted bell buoy 1, 0.5 mile 000°; 60°35′.5 N., 145°59′.4 W.:			39.1
Direct	082	5.2	
Reverse	*262*	*5.2*	
7. Channel Island Rock buoy 3, 0.2 mile 000°; **Channel Island Light** 0.6 mile 039°; 60°36′.3 N., 145°48′.8 W. Chart 8525 (*8520*):			44.3
Direct	058	3.6	
Reverse	*238*	*3.6*	
8. North Island Rock Daybeacon, 0.5 mile 180°; 60°38′.2 N., 145°42′.6 W.:			47.9
Direct	129	1.0	
Reverse	*309*	*1.0*	
Shoaling has been reported on this and the next course.			
9. North Rock Shoal lighted buoy 2, 0.2 mile 270°; 60°37′.6 N., 145°41′.0 W.:			48.9
Direct	203	1.6	
Reverse	*023*	*1.6*	
10. Orca Inlet buoy 4, 200 yards 270°; 60°36′.1 N., 145°42′.3 W.:			50.5
Direct	211	2.7	
Reverse	*031*	*2.7*	
11. Orca Inlet buoy 8, 350 yards 270°; 60°33′.8 N., 145°45′.1 W.:			53.2
Direct	197	0.4	
Reverse	*017*	*0.4*	
12. Cordova, off Ocean Dock, 60°33′.4 N., 145°45′.3 W.			53.6

Table 5.—Cape Hinchinbrook to Valdez

1. Cape Hinchinbrook Light, 1.5 miles 045°; 60°13′.3 N., 146°40′.9 W. Chart 8520:			0.0
Direct	330	6.9	
Reverse	*150*	*6.9*	
2. Porpoise Rocks, 3.2 miles 090°; 60°19′.2 N., 146°48′.0 W.:			6.9
Direct	352	31.4	
Johnstone Point Light 6.9 miles 090°.			16.8
Change to Chart 8519 (*8520*) at 60°40′.0 N., 146°53′.6 W.			
Reverse	*172*	*31.4*	
3. Bligh Reef lighted buoy 2, 1.5 miles 090°; 60°50′.3 N., 146°56′.4 W.:			38.3
Direct	030	15.6	
Busby Island Light 1.4 miles 120°.			43.2
Reverse	*210*	*15.6*	

Table 5.—Cape Hinchinbrook to Valdez—Continued

Position (Reverse directions in *italics*—read upward)	Course	Distance	Distance from origin
4. Entrance Point Daybeacon, 0.3 mile 090°; 61°03′.8 N., 146°40′.2 W.:			53.9
Direct	041	2.2	
Keep to mid-channel east of Middle Rock Light.			
Reverse	*221*	*2.2*	
5. Middle Rock Light, 1.0 mile 240°; 61°05′.4 N., 146°37′.3 W.:			56.1
Direct	083	10.3	
Reverse	*263*	*10.3*	
6. Valdez, public dock, 61°06′.7 N., 146°16′.3 W.			66.4

Table 6.—Cape Hinchinbrook to Whittier

1. Cape Hinchinbrook Light, 1.5 miles 045°; 60°13′.3 N., 146°40′.9 W. Chart 8520:			0.0
Direct	318	25.3	
Change to Chart 8517 (*8520*) at 60°29′.4 N., 147°10′.0 W.			
Reverse	*138*	*25.3*	
2. Smith Island lighted bell buoy 1, 1.0 mile 270°; 60°32′.1 N., 147°15′.0 W.:			25.3
Direct	295	10.2	
Reverse	*115*	*10.2*	
3. Point Eleanor Light, 1.5 miles 180°; 60°36′.4 N., 147°33′.7 W.:			35.5
Direct	279	12.1	
Reverse	*099*	*12.1*	
4. Perry Island Light, 1.5 miles 045°; 60°38′.3 N., 147°58′.0 W.:			47.6
Direct	334	8.2	
Reverse	*154*	*8.2*	
5. Culross Island Light, 1.0 mile 225°; 60°45′.6 N., 148°05′.3 W.:			55.8
Direct	285	8.1	
Reverse	*105*	*8.1*	
6. Point Pigot Light, 0.5 mile 000°; 60°47′.6 N., 148°21′.3 W.:			63.9
Direct	294	3.2	
Reverse	*114*	*3.2*	
7. Decision Point Light, 0.5 mile 180°; 60°48′.9 N., 148°27′.2 W. Chart 8521 (*8517*):			67.1
Direct	271	3.3	
Reverse	*091*	*3.3*	
8. Trinity Point Light, 0.5 mile 180°; 60°48′.9 N., 148°33′.9 W.:			70.4
Direct	238	3.1	
Reverse	*058*	*3.1*	
9. Tank southwest of Railroad Wharf, 0.7 mile 212°; 60°47′.3 N., 148°39′.4 W.:			73.5
Direct	205	0.5	
Reverse	*025*	*0.5*	
10. Whittier Railroad Wharf, 60°46′.8 N., 148°39′.9 W.			74.0

Table 7.—Cordova to Latouche

1. Cordova, off Ocean Dock, 60°33′.4 N., 145°45′.3 W. Chart 8525:			0.0
Direct	017	0.4	
Reverse	*197*	*0.4*	
2. Orca Inlet buoy 8, 350 yards 270°; 60°33′.8 N., 145°45′.1 W.:			0.4
Direct	031	2.7	
Reverse	*211*	*2.7*	
3. Orca Inlet buoy 4, 200 yards 270°; 60°36′.1 N., 145°42′.3 W.:			3.1
Direct	023	1.6	
Reverse	*203*	*1.6*	
Shoaling has been reported on this and the following course.			

Table 7.—Cordova to Latouche—Continued

Position (Reverse directions in *italics*—read upward)	Course	Distance	Distance from origin
4. North Rock Shoal lighted buoy 2, 0.2 mile 270°; 60°37′.6 N., 145°41′.0 W.:			4.7
Direct	309	1.0	
Reverse	*129*	*1.0*	
5. North Island Rock Daybeacon, 0.5 mile 180°; 60°38′.2 N., 145°42′.6 W.:			5.7
Direct	238	3.6	
Reverse	*058*	*3.6*	
6. Channel Island Rock buoy 3, 0.2 mile 000°; **Channel Island Light,** 0.6 mile 039°; 60°36′.3 N., 145°48′.7 W. Chart 8520 (*8525*):			9.3
Direct	262	5.2	
Reverse	*082*	*5.2*	
7. Hanks Island Rock lighted bell buoy 1, 0.5 mile 000°; 60°35′.5 N., 145°59′.4 W.:			14.5
Direct	258	11.5	
Reverse	*078*	*11.5*	
8. Middle Ground Shoal lighted bell buoy 2, 0.5 mile 180°; 60°33′.1 N., 146°22′.4 W.:			26.0
Direct	259	31.5	
Change to Chart 8517 (*8520*) at 60°28′.7 N., 147°10′.0 W.			
Reverse	*079*	*31.5*	
9. Sea Island Light, 1.5 miles 180°; 60°27′.3 N., 147°24′.8 W.:			57.5
Direct	226	2.1	
Reverse	*046*	*2.1*	
10. Sea Island Light, 1.5 miles 090°; 60°25′.8 N., 147°27′.9 W. Chart 8515 (*8517*):			59.6
Direct	206	18.5	
Reverse	*026*	*18.5*	
11. Point Helen Light, 1.0 mile 270°; 60°09′.2 N., 147°43′.9 W.:			78.1
Direct	225	6.3	
Reverse	*045*	*6.3*	
12. Point Grace, north extremity, 1.0 mile 090°; 60°04′.8 N., 147°52′.9 W. Chart 8523 (*8515*):			84.4
Direct	Various	1.6	
Reverse	*Various*	*1.6*	
13. Latouche, wharf, 60°03′.3 N., 147°54′.1 W.			86.0

Table 8.—Valdez to Latouche Passage

1. Valdez, public dock, 61°06′.7 N., 146°16′.3 W. Chart 8519:			0.0
Direct	263	10.3	
Reverse	*083*	*10.3*	
2. Middle Rock Light, 1.0 mile 240°; 61°05′.4 N., 146°37′.3 W.:			10.3
Direct	221	2.2	
Reverse	*041*	*2.2*	
3. Entrance Point Daybeacon, 0.3 mile0 90°; 61°03′.8 N., 146°40′.2 W.			12.5
Direct	210	15.6	
Reverse	*030*	*15.6*	
4. Bligh Reef lighted buoy 2, 1.5 miles 090°; 60°50′.3 N., 146°56′.4 W.:			28.1
Direct	206	20.4	
Change to Chart 8517 (*8519*) at 60°33′.1 N., 147°14′.0 W.			
Reverse	*026*	*20.4*	
5. Smith Island lighted bell buoy 1, 1.0 mile 270°; 60°32′.1 N., 147°15′.0 W.:			48.5
Direct	226	8.9	
Reverse	*046*	*8.9*	
6. Seal Island Light, 1.5 miles 090°; 60°25′.8 N., 147°27′.9 W. Chart 8515 (*8517*):			57.4
Direct	206	18.5	
Reverse	*026*	*18.5*	

Table 8.—Valdez to Latouche Passage—Continued

Position (Reverse directions in *italics*—read upward)	Course	Distance	Distance from origin
7. Point Helen Light, 1.0 mile 270°; 60°09′.2 N., 147°43′.9 W.:			75. 9
Direct	225	6. 3	
Reverse	*045*	*6. 3*	
8. Point Grace, north extremity, 1.0 mile 090°; 60°04′.8 N., 147°52′.9 W.			82. 2

Table 9.—Latouche Passage to Whittier

1. Point Grace, north extremity, 1.0 mile 090°; 60°04′.8 N., 147°52′.9 W. Chart 8523:			0. 0
Direct	016	2. 6	
Reverse	*196*	*2. 6*	
2. Point Helen Light, 3.4 miles 055°; 60°07′.3 N., 147°51′.4 W.:			2. 6
Direct	331	8. 1	
Reverse	*151*	*8. 1*	
3. Pleiades Islands Light, 0.5 mile 270°; 60°14′.4 N., 147°59′.5 W. Chart 8524 (*8523*):			10. 7
Direct	013	16. 8	
Reverse	*193*	*16. 8*	
4. Grafton Island Light, 2.0 miles 270°; 60°30′.8 N., 147°51′.8 W. Chart 8517 (*8524*):			27. 5
Direct	338	8. 1	
Reverse	*158*	*8. 1*	
5. Perry Island Light, 1.5 miles 045°; 60°38′.2 N., 145°58′.0 W.:			35. 6
Direct	334	8. 2	
Reverse	*154*	*8. 2*	
6. Culross Island Light, 1.0 mile 225°; 60°45′.6 N., 148°05′.2 W.:			43. 8
Direct	285	8. 1	
Reverse	*105*	*8. 1*	
7. Point Pigot Light, 0.5 mile 000°; 60°47′.6 N., 148°21′.3 W.:			51. 9
Direct	294	3. 2	
Reverse	*114*	*3. 2*	
8. Decision Point Light, 0.5 mile 180°; 60°48′.9 N., 148°27′.2 W. Chart 8521 (*8517*):			55. 1
Direct	271	3. 3	
Reverse	*091*	*3. 3*	
9. Trinity Point Light, 0.5 mile 180°; 60°48′.9 N., 148°33′.9 W.:			58. 4
Direct	238	3. 1	
Reverse	*058*	*3. 1*	
10. Tank, southwest of railroad wharf, 0.7 mile 212°; 60°47′.3 N., 148°39′.4 W.:			61. 5
Direct	205	0. 5	
Reverse	*025*	*0. 5*	
11. Whittier, Railroad Wharf, 60°46′.8 N., 148°39′.9 W.			62. 0

Table 10.—Seward to Cordova, via Latouche

1. Seward, Railroad wharf, 60°06′.0 N., 149°26′.3 W. Chart 8529:			0. 0
Direct	163	7. 2	
Reverse	*343*	*7. 2*	
2. Caines Head Light, 0.5 mile 270°; 59°59′.0 N., 149°22′.1 W.:			7. 2
Direct	185	4. 8	
Reverse	*005*	*4. 8*	
3. Hive Island Light, 1.0 mile 156°; 59°54′.3 N., 149°22′.9 W.:			12. 0
Direct	139	4. 4	
Reverse	*319*	*4. 4*	
4. Barwell Island Light, 0.6 mile 020°; 59°51′.0 N., 149°17′.2 W. Chart 8528 (*8529*):			16. 4
Direct	081	20. 0	
Reverse	*261*	*20. 0*	

Table 10.—Seward to Cordova, via Latouche—Continued

Position (Reverse directions in *italics*—read upward)	Course	Distance	Distance from origin
5. Cape Junken, south extremity, 1.0 mile 000°; 59°54.0′ N., 148°38.0′ W.:			36.4
Direct	074	6.0	
Reverse	*254*	*6.0*	
6. Cape Puget, south extremity, 1.0 mile 000°; 59°55.6′ N., 148°26.6′ W.:			42.4
Direct	063	8.3	
Reverse	*243*	*8.3*	
7. Lonetree Point Light, 0.3 mile 180°; 59°59.3′ N., 148°11.9′ W. Chart 8523 (*8528*):			50.7
Direct	098	2.5	
Reverse	*278*	*2.5*	
8. Evans Island Light, 0.3 mile 315°; 59°58.9′ N., 148°06.9′ W.:			53.2
Direct	041	4.9	
Reverse	*221*	*4.9*	
9. Elrington Passage Light, 0.2 mile 000°; 60°02.6′ N., 148°00.6′ W.:			58.1
Direct	090	0.8	
Reverse	*270*	*0.8*	
10. Elrington Passage Light, 0.8 mile 285°; 60°02.6′ N., 147°59.0′ W.:			58.9
Direct	054	3.8	
Reverse	*234*	*3.8*	
11. Point Grace, north extremity, 1.0 mile 090°; 60°04.8′ N., 147°52.9′ W. Chart 8515 (*8523*):			62.7
Direct	045	6.3	
Reverse	*225*	*6.3*	
12. Point Helen Light, 1.0 mile 270°; 60°09.2′ N., 147°43.9′ W.:			69.0
Direct	026	18.5	
Reverse	*206*	*18.5*	
13. Seal Island Light, 1.5 miles 090°; 60°25.8′ N., 147°27.9′ W. Chart 8517 (*8515*):			87.5
Direct	046	2.1	
Reverse	*226*	*2.1*	
14. Seal Island Light, 1.5 miles 180°; 60°27.3′ N., 147°24.8′ W.:			89.6
Direct	079	31.3	
Change to Chart 8520 (*8517*) at 60°28.7′ N., 147°10.0′ W.			
Reverse	*259*	*31.3*	
15. Middle Ground Shoal lighted bell buoy 2, 0.5 mile 180°; 60°33.1′ N., 146°22.4′ W.:			120.9
Direct	078	11.5	
Reverse	*258*	*11.5*	
16. Hanks Island Rock lighted bell buoy 1, 0.5 mile 000°; 60°35.5′ N., 145°59.4′ W.:			132.4
Direct	082	5.2	
Reverse	*262*	*5.2*	
17. Channel Island Rock buoy 3, 0.2 mile 000°; **Channel Island Light,** 0.6 mile 039°; 60°36.3′ N., 145°48.7′ W. Chart 8525 (*8520*):			137.6
Direct	058	3.6	
Reverse	*238*	*3.6*	
18. North Island Rock Daybeacon, 0.5 mile 180°; 60°38.2′ N., 145°42.6′ W.:			141.2
Direct	129	1.0	
Reverse	*209*	*1.0*	
19. North Rock Shoal lighted buoy 2, 0.2 mile 270°; 60°37.6′ N., 145°41.0′ W.:			142.2
Direct	203	1.6	
Reverse	*023*	*1.6*	
Shoaling has been reported on this and the following course.			
20. Orca Inlet buoy 4, 200 yards 270°; 60°36.1′ N., 145°42.3′ W.:			143.8
Direct	211	2.7	
Reverse	*031*	*2.7*	
21. Orca Inlet buoy 8, 350 yards 270°; 60°33.8′ N., 145°45.1′ W.:			146.5
Direct	197	0.4	
Reverse	*017*	*0.4*	

Table 10.—Seward to Cordova, via Latouche—Continued

Position (Reverse directions in *italics*—read upward)	Course	Distance	Distance from origin
22. Cordova, off Ocean Dock, 60°33′.4 N., 145°45′.3 W. Except at slack water, strong currents will be experienced in Orca Inlet.			146. 9

Table 11.—Seward to Kodiak

1. Seward, Railroad Wharf, 60°06′.0 N., 149°26′.3 W. Chart 8529:			0. 0
Direct	163	7. 2	
Reverse	*343*	*7. 2*	
2. Caines Head Light, 0.5 mile 270°; 59°59′.0 N., 149°22′.1 W.:			7. 2
Direct	198	9. 4	
Reverse	*018*	*9. 4*	
3. Rugged Island, south extremity, 2.5 miles 090°; 59°50′.1 N., 149°27′.9 W.:			16. 6
Direct	171	5. 6	
Reverse	*351*	*5. 6*	
4. Pilot Rock Light, 1.0 mile 270°; 59°44′.6 N., 149°26′.1 W.:			22. 2
Direct	200	9. 2	
Reverse	*020*	*9. 2*	
5. Chiswell Island, southern extremity, 0.8 mile 270°; 59°35′.9 N., 149°32′.4 W.:			31. 4
Direct	218	6. 0	
Reverse	*038*	*6. 0*	
6. Seal Rocks Light, 1.0 mile 090°; 59°31′.3 N., 149°39′.6 W. Chart 8502 (*8529*):			37. 4
Direct	225	98. 8	
Reverse	*045*	*98. 8*	
7. Tonki Cape Light, 2.5 miles 270°; 58°21′.2 N., 151°54′.2 W.:			136. 2
Direct	187	8. 0	
Reverse	*007*	*8. 0*	
See remarks on Currents in Chapter 5.			
8. Afognak Island, 1,420-foot peak on southeast end, 2.2 miles 260°; 58°13′.2 N., 151°56′.0 W.:			144. 2
Direct	206	25. 7	
Change to Chart 8556 (*8502*) at 58°08′.0 N., 152°00′.9 W.			
Reverse	*026*	*25. 7*	
9. Hutchinson Reef Lighted whistle buoy 2, 250 yards 090°; 57°50′.0 N., 152°17′.1 W. Chart 8545 (*8556*):			169. 9
Direct	219	1. 5	
Reverse	*039*	*1. 5*	
10. Kodiak Entrance lighted whistle buoy 1B, 200 yards 090°; 57°48′.9 N., 152°18′.8 W.:			171. 4
Direct	226	1. 3	
Reverse	046	1. 3	
11. Woody Island Light, 500 yards 135°; 57°48′.0 N., 152°20′.5 W.:			172. 7
Direct	233	0. 7	
Reverse	*053*	*0. 7*	
12. Cyane Rock lighted bell buoy 3, 0.8 mile 265°; **Woody Island Light** 0.8 mile, 070°; 57°47′.5 N., 152°21′.6 W.:			173. 4
Direct	265	0. 8	
Reverse	*085*	*0. 8*	
13. Cyane Rock lighted bell buoy 3, close aboard 180°; 57°47′.5 N., 152°23′.1 W.:			174. 2
Direct	254	0. 2	
Reverse	*074*	*0. 2*	
14. Near Island north tangent, 75 yards 180°; **South Radio Mast,** 450 yards 294°; 57°47′.4 N., 152°23′.4 W.:			174. 4
Direct	Various	0. 7	
Reverse	*Various*	*0. 7*	
15. Kodiak Harbor buoy 4, 50 yards 315°; 57°47′.0 N., 152°24′.6 W.:			175. 1
Direct	Various	0. 3	
Reverse	*Various*	*0. 3*	
16. Midway between Gull Island lighted bell buoy 5 and Cannery Wharf, 57°47′.1 N., 152°25′.1 W.			175. 4

Table 12.—Seward to Unalaska via Shelikof Strait

Position (Reverse directions in *italics*—read upward)	Course	Distance	Distance from origin
1. Seward, Railroad wharf, 60°06′.0 N., 149°26′.3 W. Chart 8529:			0.0
Direct	163	7.2	
Reverse	*343*	*7.2*	
2. Caines Head Light, 0.5 mile 270°; 59°59′.0 N., 149°22′.1 W.:			7.2
Direct	198	9.4	
Reverse	*018*	*9.4*	
3. Rugged Island, south extremity, 2.5 miles 090°; 59°50′.1 N., 149°27′.9 W.:			16.6
Direct	171	5.6	
Reverse	*351*	*5.6*	
4. Pilot Rock Light, 1.0 mile 270°; 59°44′.6 N., 149°26′.1 W.:			22.2
Direct	200	9.2	
Reverse	*020*	*9.2*	
5. Chiswell Island, southern extremity, 0.8 mile 270°; 59°35′.9 N., 149°32′.4 W.:			31.4
Direct	218	6.0	
Reverse	*038*	*6.0*	
6. Seal Rocks Light, 1.0 mile 090°; 59°31′.3 N., 149°39′.6 W. Chart 8530 (*8529*):			37.4
Direct	239	20.2	
Reverse	*059*	*20.2*	
7. Outer Island, center of 1,316-foot peak, 5.0 miles 270°; 59°21′.0 N., 150°13′.7 W.:			57.6
Direct	243	25.1	
Reverse	*063*	*25.1*	
8. Gore Point, eastern extremity, 2.5 miles 000°; 59°09′.5 N., 150°57′.5 W. Chart 8531 (*8530*):			82.7
Direct	248	16.1	
Reverse	*068*	*16.1*	
9. East Chugach Island Light, 3.0 miles 000°; 59°03′.4 N., 151°26′.5 W. Chart 8532 (*8531*):			98.8
Direct	266	27.2	
Reverse	*086*	*27.2*	
10. Ushagat Island, northwestern extremity, 4.0 miles 180°; 59°01′.6 N., 152°19′.0 W. Chart 8556 (*8532*):			126.0
Direct	220½	109.3	
Reverse	*040½*	*109.3*	
11. Cape Uyak Light, 7.0 miles 090°; 57°38′.5 N., 154°33′.8 W. Chart 8502 (*8556*):			235.3
Direct	225½	102.2	
Reverse	*045½*	*102.2*	
12. Foggy Cape Light, 8.0 miles 315°; 56°27′.0 N., 156°48′.0 W.:			337.5
Direct	236	73.8	
Reverse	*056*	*73.8*	
13. Mitrofania Island Light, 5.0 miles 325°; 55°46′.0 N., 158°37′.8 W. Chart 8802 (*8502*):			411.3
Direct	243	54.4	
Reverse	*063*	*54.4*	
14. Andronica Island Light, 0.8 mile 180°; 55°21′.6 N., 160°03′.6 W. Chart 8700 (*8802*):			465.7
Direct	276	10.4	
Reverse	*096*	*10.4*	
15. Pirate Cove Light, 1.0 mile 180°; 55°22′.8 N., 160°21′.7. W.:			476.1
Direct	285	12.9	
Reverse	*105*	*12.9*	
16. Unga Spit Light, 1.5 miles 180°; 55°26′.0 N., 160°43′.5 W.:			489.0
Direct	245	20.0	
Reverse	*065*	*20.0*	
17. Seal Cape Light, 3.5 miles 000°; 55°17′.5 N., 161°15′.2 W. Chart 8704 (*8700*):			509.0
Direct	269	13.9	
Reverse	*089*	*13.9*	

Table 12.—Seward to Unalaska via Shelikof Strait—Continued

Position (Reverse directions in *italics*—read upward)	Course	Distance	Distance from origin
18. Ukolnoi Island Light, 2.5 miles 180°; 55°17′.2 N., 161°39′.5 W. Chart 8703 (*8704*):			522. 9
Direct	233	10. 6	
Reverse	*053*	*10. 6*	
19. Arch Point Light, 1.5 miles 000°; 55°10′.9 N., 161°54′.2 W.:			533. 5
Direct	194	3. 5	
Reverse	*014*	*3. 5*	
There is local magnetic attraction at Arch Point.			
20. Moss Cape Daybeacon, 0.5 mile 270°; 55°07′.5 N., 161°55′.6 W.:			537. 0
Direct	203	0. 9	
Reverse	*023*	*0. 9*	
21. Goloi Sandspit Light, 0.5 mile 090°; 55°06′.7 N., 161°56′.2 W.:			537. 9
Direct	167	4. 2	
Reverse	*347*	*4. 2*	
22. Iliasik Islands Light, 1.0 mile 255°; 55°02′.6 N., 161°54′.5 W.:			542. 1
Direct	227	0. 8	
Reverse	*047*	*0. 8*	
23. Iliasik Islands Light, 0.5 mile 310°; 55°02′.0 N., 161°55′.5 W.:			542. 9
Direct	264	14. 2	
Reverse	*084*	*14. 2*	
24. Morgan Point Light, 2.0 miles 000°; 55°00′.5 N., 162°20′.1 W.:			557. 1
Direct	235	5. 3	
There is magnetic attraction at Vodapoini Point.			
Reverse	*055*	*5. 3*	
25. Fox Island Light, 1.0 mile 090°; 54°57′.4 N., 162°27′.6 W.:			562. 4
Direct	227	13. 5	
Thin Point lighted whistle buoy, 0.1 mile 270°.			565. 9
Reverse	*047*	*13. 5*	
26. Unga Island Light, 0.7 mile 090°; 54°48′.1 N., 162°44′.6 W. Chart 8701 (*8703*):			575. 9
Direct	227	15. 1	
Reverse	*047*	*15. 1*	
27. Cape Pankof Light, 1.8 miles 000°; 54°37′.8 N., 163°03′.6 W. Chart 8860 (*8701*):			591. 0
Direct	253½	61. 1	
Reverse	*073½*	*61. 1*	
28. Scotch Cap Light, 3.2 miles 000°; 54°20′.5 N., 164°44′.5 W.:			652. 1
Direct	269	31. 2	
Reverse	*089*	*31. 2*	
29. Northwest tangent Akun Head, 2.0 miles 180°; **Billings Head Light,** 4.7 miles 112°; 54°19′.8 N., 165°38′.1 W.:			683. 3
Direct	252	13. 7	
Reverse	*072*	*13. 7*	
30. North Head Light, 2.5 miles 160°; 54°15′.7 N., 166°00′.5 W.:			697. 0
Direct	225	19. 8	
Reverse	*045*	*19. 8*	
31. Priest Rock Light, 1.2 miles 135°; 54°01′.4 N., 166°24′.0 W. Chart 9007 (*8860*):			716. 8
Direct	206	6. 6	
Reverse	*026*	*6. 6*	
32. Ulakta Head Light, 0.9 mile 270°; 53°55′.5 N., 166°28′.9 W.:			723. 4
Direct	180	0. 8	
Reverse	*000*	*0. 8*	
33. Ulakta Head Light, 1.2 miles 310°; 53°54′.7 N., 166°28′.9 W. Chart 9008 (*9007*):			724. 2
Direct	220	2. 7	
Reverse	*040*	*2. 7*	
34. Iliuliuk Reef lighted buoy 2, 0.1 mile 270°; 53°52′.7 N., 166°31′.8 W.			726. 9

Table 13.—Kodiak to Shelikof Strait via Narrow Strait and Whale Passage

Position (Reverse directions in *italics*—read upward)	Course	Distance	Distance from origin
1. Midway between Gull Island lighted bell buoy 5 and Cannery Wharf, Inner Anchorage, 57°47′.1 N., 152°25′.1 W. Chart 8545:			0. 0
Direct	092	0. 3	
Reverse	*272*	*0. 3*	
2. Kodiak Harbor buoy 4, 50 yards 315°; 57°47′.0 N., 152°24′.6 W.:			0. 3
Direct (The shore tangent of the mainland, northeastward from Cyane Rock, ahead and appearing one-third the way from the Near Island shore to the opposite shore—before approaching the narrowest part of the passage. At narrowest part of the passage, favor the Near Island shore)	058	0. 7	
Reverse (Pass midway between the water front westward of the main wharf and the opposite shore)	*238*	*0. 7*	
3. East end of Narrows, south radio mast, 450 yards 294°; **Cyane Rock lighted bell buoy 3,** 0.2 mile 074°; 57°47′.4 N., 152°23′.4 W.:			1. 0
Direct	069	0. 2	
Reverse	*249*	*0. 2*	
4. Cyane Rock lighted bell buoy, 3, 30 yards 180°; 57°47′.5 N., 152°23′.1 W.:			1. 2
Direct (Cyane Rock buoy astern after leaving it)	085	0. 8	
Reverse (Cyane Rock buoy ahead)	*265*	*0. 8*	
5. Bird Island, east end, 0.5 mile 211°; 57°47′.5 N., 152°21′.6 W.:			2. 0
Direct (Holiday Island 131-foot summit astern)	052	0. 7	
Reverse (Holiday Island 131-foot summit ahead)	*232*	*0. 7*	
6. Woody Island Light, 500 yards 135°; 57°48′.0 N., 152°20′.5 W.:			2. 7
Direct (Bird Island east end astern. Pass 400 yards east of Channel Rock (see text) and 300 yards west of lighted whistle buoy 1B	042	2. 7	
Reverse (Bird Island east end ahead)	*222*	*2. 7*	
7. Hutchinson Reef lighted whistle buoy 2, 250 yards 270°; 57°50′.0 N., 152°17′.1 W. Chart 8534 (*8545*):			5. 4
Direct (Long Island northeastern end astern)	324	1. 0	
Reverse (Long Island northeastern end ahead)	*144*	*1. 0*	
8. Hanin Rocks Light, 0.8 mile 200°; 57°50′.8 N., 152°18′.3 W.:			6. 4
Direct (Uzinki Point just open from southern shore of Narrow Strait ahead)	300	4. 5	
Reverse (Uzinki Point, as above, astern)	*120*	*4. 5*	
9. Nelson Island, west tangent, 0.6 mile 030°; 57°53′.2 N., 152°25′.5 W.:			10. 9
Direct (Prokoda Island north point ahead)	304	2. 5	
Reverse (Prokoda Island north point astern)	*124*	*2. 5*	
10. Black Point, 0.3 mile 035°; 57°54′.6 N., 152°29′.4 W.:			13. 4
Direct (Rock 12 feet high near shore, 0.6 mile eastward of Black Point, astern; Otmeloi Point ¼ point on starboard bow)	272	0. 3	
Reverse (Rock, as above, ahead; Otmeloi Point a little to port astern)	*092*	*0. 3*	
11. Midway between Prokoda Island southeast point and small mainland point to the southeastward, 57°54′.6 N., 152°30′.0 W.:			13. 7
Direct (Mid-channel)	Turning	0. 2	
Reverse (Mid-channel)	*Turning*	*0. 2*	
12. Midway between Prokoda Island Light and shore opposite, 57°54′.6 N., 152°30′.4 W.:			13. 9
Direct (Pass 80 yards southward of Uzinki Narrows Daybeacon, off Otmeloi Point)	290	0. 5	
Reverse (Pass Daybeacon as above)	*110*	*0. 5*	
13. Uzinki Point, 125 yards 032°; 57°55′.8 N., 152°31′.5 W.:			14. 4
Direct (Three Brothers Light ahead)	306	0. 3	
Reverse (Three Brothers Light astern)	*126*	*0. 3*	

Table 13.—Kodiak to Shelikof Strait via Narrow Strait and Whale Passage—Continued

Position (Reverse directions in *italics*—read upward)	Course	Distance	Distance from origin
14. Entrance Point, 0.25 mile 180°; 57°54′.9 N., 152°31′.7 W.:			**14. 7**
Direct (Prokoda Island Light just open on the nearly vertical bluffs that form Uzinki Point, astern; this is a safe range for crossing the bank between Three Brothers Reef buoy 2 and Low Island Reef buoy 1. See text)	286	0. 9	
Reverse (Prokoda Island Light, as above, ahead)	*106*	*0. 9*	
15. Three Brothers Light, 0.3 mile 025°; 57°55′.2 N., 152°33′.3 W.:			**15. 6**
Direct	315	1. 1	
Reverse	*135*	*1. 1*	
16. Shakmanof Point, 0.5 mile 205°; 57°56′.1 N., 152°34′.8 W.:			**16. 7**
Direct (On the approach to Whale Passage, the southeast end of Whale Island appears as a wooded head, and a rock awash at high water is close-to. Put this end of the island abeam distant about 350 yards, pass close to southward of Yuzhni Point buoy 2, and pass 0.25 mile northward of Ilkognak Rock Light. Strict attention to steering is essential because of heavy swirls)	262	6. 9	
Reverse (The course passes 0. 25 mile northward of Ilkognak Rock Light, close to southward of Yuzhni Point buoy 2, and about 350 yards off the southeast shore of Whale Island)	*082*	*6. 9*	
17. Ilkognak Rock Light, 0.5 mile 118°; Inner Point bearing 180°; 57°55′.1 N., 152°47′.6 W.:			**23. 6**
Direct (Gori Point in range with, or open a little southward of, the south end of Koniuji Island, ahead. See text)	298	0. 8	
Reverse (Gori Point, as above, astern; Ilkognak Rock Light ahead)	*118*	*0. 8*	
18. Uzkosti Point, 0.3 mile 023°; 57°55′.4 N., 152°49′.0 W.:			**24. 4**
Direct (Southwest end of Whale Island ahead)	317	1. 0	
Reverse (Southwest end of Whale Island astern)	*137*	*1. 0*	
19. Koniuji Island, 0.3 mile 180°; 57°56′.2 N., 152°50′.3 W.:			**25. 4**
Direct (The course passes 0.4 mile off Chernoff Point)	292	7. 7	
Reverse	*112*	*7. 7*	
20. Gori Point, 0.4 mile 022°; 57°59′.0 N., 153°03′.7 W.:			**33. 1**
Direct: Summit of Whale Island astern. The course passes 0.9 mile off Outlet Cape and 0.4 mile north of Kupreanof Strait buoy; see text concerning mid-strait rock)	286	10. 0	
Reverse (As above, summit of Whale Island ahead)	*106*	*10. 0*	
21. Malina Point Light, 0.5 mile 000°; 58°01′.8 N., 153°21′.8 W. If bound southward in Shelikof Strait, make good a **245°** course for 18 miles, which leads 1.5 miles westward of Cape Uganik and to a position 2 miles westward of Cape Ugat. Then a **240°** course for 23 miles will lead to a position 6.8 miles westward of Cape Uyak Light. For directions from Shelikof Strait westward, see table 12.			**43. 1**

Table 14.—Sitkalidak Strait

1. Dangerous Cape Light, 3.5 miles 000°; 57°13′.2 N., 152°42′.6 W. (On the approach from northward, give Dangerous Cape a berth of 2 miles). Chart 8536:			**0. 0**
Direct	275	6. 6	
Reverse	*095*	*6. 6*	
2. Table Island Light, 2.4 miles 185°; 57°13′.8 N., 152°54′.7 W.:			**6. 6**
Direct	252	7. 3	
Reverse	*072*	*7. 3*	

Table 14.—Sitkalidak Strait—Continued

Position (Reverse directions in *italics*—read upward)	Course	Distance	Distance from origin
3. East end Cathedral Island, 0.5 mile 163°; 57°11′.6 N., 153°07′.5 W.:			13. 9
Direct (Pass 200 yards southward of Nut Island Light and 400 yards southward of Aberdeen Rock)	300	3. 0	
Reverse	*120*	*3. 0*	
4. Shag Rock, 150 yards 180°; keep in mid-channel:			16. 9
Direct	276	0. 4	
Reverse	*096*	*0. 4*	
5. Bush Point Light, 175 yards 000°;			17. 3
Direct	254	0. 9	
Reverse	*074*	*0. 9*	
6. Sheep Island Light, 475 yards 290°; west end of Sheep Island 400 yards 335°:			18. 2
Direct (Pass 75 yards eastward of Sheep Island Light. Make slow left turn to enter narrows; in turning avoid shoals westward of Sheep Island)	Various	0. 4	
Reverse (As above, make slow right turn)	*Various*	*0. 4*	
7. Sheep Island Light, 450 yards 099°; north entrance Sitkalidak Passage:			18. 6
Direct (Keep in mid-channel, favoring southeast side opposite Sitkalidak Passage Light)	238	1. 1	
Reverse (As above)	*058*	*1. 1*	
8. Sitkalidak Passage Light, 0.4 mile 045°; 57°12′.3 N., 153°16′.9 W.:			19. 7
Direct (Sitkalidak Passage Light astern)	225	0. 7	
Reverse (Sitkdalidak Passage Light ahead)	*045*	*0. 7*	
9. Old Harbor Church spire, 0.4 mile 315°; 57°11′.8 N., 153°17′.8 W.:			20. 4
Direct	218	7. 4	
Reverse	*038*	*7. 4*	
10. John Island, 0.8 mile 300°; 57°06′.1 N., 153°26′.1 W			27. 8

Table 15.—Wide Bay to Sutwik Island

From Shelikof Strait, Cape Igvak, or the entrance to Wide Bay, head directly for Kilokak Rocks until those rocks are 1.0 mile distant, and then alter course to the right to pass 600 yards to the west of the highest rock.			
1. Kilokak Rocks, 600 yards 090°. Chart 8502:			0. 0
Direct	221	6. 3	
Reverse	*041*	*6. 3*	
2. Ashiiak Island, 500 yards 131°:			6. 3
Direct	232	3. 9	
Reverse	*052*	*3. 9*	
3. David Island, 400 yards 142°:			10. 2
Direct	206	0. 9	
Reverse	*026*	*0. 9*	
4. David Island, 600 yards 116°:			11. 1
Direct	181	3. 4	
Reverse	*001*	*3. 4*	
5. Cape Providence, outer rock, 0.5 mile 271°:			14. 5
Direct	218	4. 7	
Reverse	*038*	*4. 7*	
6. Southernmost of two islands 0.5 mile 308°; highest **Aiugnak Column,** 2.0 miles:			19. 2
Direct	248	5. 8	
Reverse	*068*	*5. 8*	
7. Cape Kuyuyukak, west tangent, 2.0 miles 315°:			25. 0
Direct	257	7. 0	
Pass Beehive Island 0.4 mile distant.			
Reverse	*077*	*7. 0*	
8. Small island, 0.7 mile 122°:			32. 0
Direct	226	8. 3	
Small Island, white tripod, 0.5 mile 316°.			34. 3
Reverse	*046*	*8. 3*	

Table 15.—Wide Bay to Sutwik Island—Continued

Position (Reverse directions in *italics*—read upward)	Course	Distance	Distance from origin
9. Cape Kunmik, southwest tip, 1.1 miles 316°; west tangent of Cape Kunmik opening on point:			40. 3
Direct	226	10. 0	
Reverse	*046*	*10. 0*	
10. Kumlik Island, 0.5 mile 136°.			50. 3
9. Cape Kunmik, southwest tip, 1.1 miles 316°; west tangent of Cape Kunmik opening on point:			40. 3
Direct	198	10. 0	
Reverse	*018*	*10. 0*	
10A. Sutwik Island, northwest point, 1.0 mile 225°.			50. 3

Table 16.—Unimak Pass to St. Michael, Golovnin Bay, Nome, Port Clarence, and Point Hope

Departure from the following recommended courses may be necessary due to ice conditions in the Arctic Ocean. If no observations can be obtained on account of thick weather, soundings must be taken constantly, as the currents are liable to set a vessel off its course.			
1. Scotch Cap Light, 3.2 miles 000°; 54°20′.5 N., 164°44′.5 W. Chart 8860:			0. 0
Direct	292	8. 8	
Reverse	*112*	*8. 8*	
2. Scotch Cap Light, 8.2 miles 090°; 54°23′.7 N., 164°58′.9 W.:			8. 8
Direct	345	12. 5	
Reverse	*165*	*12. 5*	
3. Cape Sarichef Light, 5.0 miles 090°; 54°35′.9 N., 165°04′.3 W. Chart 9302 (*8860*):			21. 3
Direct	343½	352. 3	
Reverse	*163½*	*352. 3*	
4. Cape Mohican Light, 18.0 miles 095°; 60°14′.0 N., 168°04′.0 W.:			373. 6
Direct	004	166. 4	
Reverse	*184*	*166. 4*	
On the above courses little can be said of the currents except with a strong wind from any direction a current is likely to set with it. A slight northerly set will sometimes be experienced. Thick weather is the rule in the Bering Sea during the season of navigation, and care should be observed when in the vicinity of Nunivak Island; see also the description of Nunivak Island.			
5. Northeast Cape, St. Lawrence Island, 1,462-foot peak, 40.0 miles 296°; 63°00′.0 N., 167°40′.0 W.			540. 0
To St. Michael			
5. Northeast Cape, St. Lawrence Island, 1,462-foot peak, 40.0 miles 296°; 63°00′.0 N., 167°40′.0 W. Chart 9302:			540. 0
Direct	053	76. 4	
Reverse	*233*	*76. 4*	
6A. Position, 63°46′.0 N., 165°24′.0 W. Chart 9380 (*9302*):			616. 4
Direct	093½	81. 2	
Reverse	*273½*	*81. 2*	
7A. Stuart Mountain, 483 feet high, 5.4 miles 204°; 63°41′.0 N., 162°21′.0 W.:			697. 6
Direct	126	14. 4	
Reverse	*306*	*14. 4*	

ble 16.—Unimak Pass to St. Michael, Golovnin Bay, Nome, Port Clarence, and Point Hope—Continued

Position (Reverse directions in *italics*—read upward)	Course	Distance	Distance from origin
8A. Whale Island Light, 3.5 miles 215°; 63°32′.4 N., 161°54′.8 W. This is the recommended anchorage for deep-draft vessels. See text for additional anchorage instructions. On the above 093° course, soundings should be taken frequently and if the water is shoaled to less than 8 fathoms while westward of Stuart Island, it is pretty safe to assume that the vessel is southward of her course. Thick weather is not as prevalent in Norton Sound as in the Bering Sea, and it is seldom that Stuart Island and the mountains southeastward of St. Michael cannot be seen and used as landmarks.			712.0
To Golovnin Bay			
5. Northeast Cape, St. Lawrence Island, 1,462-foot peak, 40.0 miles 296°; 63°00′.0 N., 167°40′.0 W. Chart 9302:			540.0
Direct	053	76.4	
Reverse	*233*	*76.4*	
6B. Position, 63°46′.0 N., 165°24′.0 W. Chart 9380 (*9302*):			616.4
Direct	059	70.2	
Reverse	*239*	*70.2*	
7B. Rocky Point Light, 2.0 miles 330°; 64°22′.3 N., 163°06′.7 W			686.6
To Nome			
5. Northeast Cape, St. Lawrence Island, 1,462-foot peak, 40.0 miles 296°; 63°00′.0 N., 167°40′.0 W. Chart 9302:			540.0
Direct	033½	107.0	
Reverse	*213½*	*107.0*	
6C. Nome anchorage, 64°29′.0 N., 165°26′.0 W.			647.0
5. Northeast Cape, St. Lawrence Island, 1,462-foot peak, 40.0 miles 296°; 63°00′.0 N., 167°40′.0 W. Chart 9302:			540.0
Direct	000	118.3	
Reverse	*180*	*118.3*	
6. King Island, 8.5 miles 270°; 64°58′.3 N., 167°40′.0 W. A northerly or northwesterly set of the current may be found after the vessel has stood about 90 miles on the above course. In clear weather the mountains back of Cape York should be sighted after King Island has been passed and the cape should be made on the starboard bow. The depths until abeam of King Island range from 15 to 20 fathoms, but northward of King Island the soundings are irregular and care should be taken not to be set eastward toward the shoals which lie off the coast between Cape Douglas and Point Spencer.			658.3
To Port Clarence			
6. King Island, 8.5 miles 270°; 64°58′.3 N., 167°40′.0 W. Chart 9380:			658.3
Direct	000	20.5	
Reverse	*180*	*20.5*	
7D. Cape York, 7.5 miles 034°; 65°18′.7 N., 167°40′.0 W.			678.8
Direct	090	20.5	
Reverse	*270*	*20.5*	
8D. Point Spencer Light, 1.5 miles 180°; 65°18′.5 N., 166°51′.0 W. Chart 9385 (*9380*):			699.3
Direct	096	11.0	
Reverse	*276*	*11.0*	
9D. Anchorage off Teller and Grantley Harbor Channel, 65°17′.1 N., 166°24′.5 W.			710.3

Table 16.—Unimak Pass to St. Michael, Golovnin Bay, Nome, Port Clarence, and Point Hope—Continued

Position (Reverse directions in *italics*—read upward)	Course	Distance	Distance from origin
To Point Hope			
6. King Island, 8.5 miles 270°; 64°58′.3 N., 167°40′.0 W. Chart 9380:			658. 3
Direct	330	61. 9	
Reverse	*150*	*61. 9*	
7. Big Diomede Island Light, 5.0 miles 240°; 65°52′.0 N., 168°54′.0 W. Chart 9400 (*9380*):			720. 2
Direct	018	155. 5	
Reverse	*198*	*155. 5*	
8. Point Hope Light, 1.5 miles 324°; 68°20′.3 N., 166°48′.4 W.			877. 7

Table 17.—Unimak Pass to Kuluk Bay, Kiska Harbor, Alcan Harbor, and Massacre Bay

1. Scotch Cap Light, 3.2 miles 000°; 54°20′.5 N., 164°44′.5 W. Chart 8860:			0. 0
Direct	269	31. 2	
Reverse	*089*	*31. 2*	
2. Akun Head, northwest tangent, 2.0 miles 180°; 54°19′.8 N., 165°38′.2 W.:			31. 2
Direct	252	38. 0	
Reverse	*072*	*38. 0*	
3. Cape Cheerful, north tangent, 6.8 miles 180°; 54°08′.0 N., 166°40′.1 W. Chart 8861 (*8860*):			69. 2
Direct	240	64. 3	
Reverse	*060*	*64. 3*	
4. Reindeer Point, 4.2 miles 135°; 53°35′.9 N., 168°14′.5 W.:			133. 5
Direct	246	166. 2	
Change to Chart 8862 (*8861*) at 52°46′.2 N., 171°20′.0 W.			
Reverse	*066*	*166. 2*	
5. Seguam Island Light, 5.0 miles 180°; 52°28′.3 N., 172°26′.3 W.:			299. 7
Direct	269	62. 9	
Reverse	*089*	*62. 9*	
6. North Cape Light, (Atka Island) 2.0 miles 180°; 52°27′.5 N., 174°09′.5 W.:			362. 6
Direct	256	75. 3	
Change to Chart 8863 (*8862*) at 52°10′.8 N., 176°00′.0 W.			
Reverse	*076*	*75. 3*	
7. Swallow Head Light (Great Sitkin Island), 2.3 miles 180°; 52°09′.5 N., 176°08′.9 W. Chart 9193 (*8863*).			437. 9
To Kuluk Bay			
7. Swallow Head Light (Great Sitkin Island), 2.3 miles 180°; 52°09′.5 N., 176°08′.9 W. Chart 9193:			437. 9
Direct	221	19. 8	
Reverse	*041*	*19. 8*	
8A. Kuluk Shoal lighted whistle buoy 2, 500 yards 315°; 51°54′.6 N., 176°30′.2 W. Chart 9141 (*9193*):			457. 7
Direct	235	4. 7	
Reverse	*055*	*4. 7*	
9A. Gannet Rocks Light, 500 yards 000°; 51°51′.8 N., 176°36′.4 W. Chart 9119 (*9141*):			462. 4
Direct	250	0. 8	
Reverse	*070*	*0. 8*	
10A. Sweeper Cove Jetty Light, 200 yards 000°; 51°51′.6 N., 176°37′.6 W.			463. 2

Table 17.—Unimak Pass to Kuluk Bay, Kiska Harbor, Alcan Harbor, and Massacre Bay—Continued

Position (Reverse directions in *italics*—read upward)	Course	Distance	Distance from origin
7. Swallow Head Light (Great Sitkin Island), 2.3 miles 180°; 52°09′.5 N., 176°08′.9 W. Chart 8863:			437. 9
Direct	269	150. 1	
Reverse	*089*	*150. 1*	
8. Semisopochnoi Island, east tangent, 9.5 miles 180°; 52°07′.3 N., 179°46′.5 E. Chart 8864 (*8863*):			588. 0
Direct	271	62. 0	
Reverse	*091*	*62. 0*	
9. Segula Island, west tangent, 6.2 miles 180°; 52°08′.5 N., 178°05′.3 E.			650. 0
To Kiska			
9. Segula Island, west tangent, 6.2 miles 180°; 52°08′.5 N., 178°05′.3 E. Chart 8864:			650. 0
Direct	253	12. 7	
Reverse	*073*	*12. 7*	
10B. Haycock Rock, 3.0 miles 270°; 52°04′.9 N., 177°45′.6 E.:			662. 7
Direct	224	9. 3	
Reverse	*044*	*9. 3*	
11B. North Head, 0.7 mile 315°; 51°58′.3 N., 177°35′.2 E. Chart 9124 (*8864*):			672. 0
Direct	270	0. 5	
Reverse	*090*	*0. 5*	
12B. North Head, 0.5 mile 000°; 51°58′.3 N., 177°34′.5 E			672. 5
9. Segula Island, west tangent, 6.2 miles 180°; 52°08′.5 N., 178°05′.3 E. Chart 8864:			650. 0
Direct	285	17. 3	
Reverse	*105*	*17. 3*	
10. Sirius Point (Kiska Island), 4.8 miles 195°; 52°12′.8 N., 177°38′.3 E.:			667. 3
Direct	284½	135. 0	
Change to Chart 8865 (*8864*) at 52°28′.6 N., 176°00′.0 E.			
Reverse	*104½*	*135. 0*	
11. Shemya Island, northernmost point, 2.4 miles 160°; 52°47′.0 N., 174°04′.4 E.			802. 3
To Alcan Harbor			
11. Shemya Island, northernmost point, 2.4 miles 160°; 52°47′.0 N., 174°04′.4 E. Chart 9125:			802. 3
Direct	180	2. 4	
Reverse	*000*	*2. 4*	
12C. Alcan Harbor, west point, 0.3 mile 232°; 52°44′.3 N., 174°04′.4 E.:			804. 7
Direct	Various	0. 6	
Reverse	*Various*	*0. 6*	
13C. Alcan Harbor, main pier, 52°43′.8 N., 174°04′.1 E.			805. 3

Table 17.—Unimak Pass to Kuluk Bay, Kiska Harbor, Alcan Harbor, and Massacre Bay—Continued

Position (Reverse directions in *italics*—read upward)	Course	Distance	Distance from origin
To Massacre Bay			
11. Shemya Island, northernmost point, 2.4 miles 160°; 52°47′.0 N., 174°04′.4 E. Chart 9198:			802. 3
Direct	284	7. 3	
Reverse	*104*	*7. 3*	
12. Alaid Island, west tangent, 2.4 miles 195°; 52°48′.8 N., 173°52′.7 E.:			809. 6
Direct	265	21. 0	
Reverse	*085*	*21. 0*	
13. Alexai Point, east tangent, 1.7 miles 000°; 52°46′.9 N., 173°18′.7 E.:			830. 6
Direct	316	2. 7	
Reverse	*136*	*2. 7*	
14. Waterfall northwest of Alexai Point, 1.4 miles 030°; 52°48′.9 N., 173°15′.6 E.			833. 3

Table 18.—Unimak Pass to Massacre Bay

1. Scotch Cap Light, 3.2 miles 000°; 54°20′.5 N., 164°44′.5 W. Chart 8860:			0. 0
Direct (Initial Great Circle course)	272		
(Final Great Circle course)	254½		
Change to Chart 8802 (*8860*) at 54°22′.1 N., 166°30′.0 W.			
Change to Chart 9102 (*8802*) at 54°14′.5 N., 173°00′.0 W.			
Change to Chart 9198 (*9102*) at 53°01′.1 N., 174°40′.0 E.			
Reverse (Initial Great Circle course)	*074½*		
(Final Great Circle course)	*092*		
Great Circle distance		784. 5	
2. Alexai Point, east tangent, 1.7 miles 000°; 52°46′.9 N., 173°18′.7 E.:			784. 5
Direct	316	2. 7	
Reverse	*136*	*2. 7*	
3. Waterfall northwest of Alexai Point, 1.4 miles 030°; 52°48′.9 N., 173°15′.6 E.			787. 2

Table 19.—Unalaska and Dutch Harbor to St. Michael, Golovnin Bay, Nome, Port Clarence, and Point Hope

1. Iliuliuk Reef lighted buoy 2, 0.1 mile 270°; 53°52′.7 N., 166°31′.8 W. Chart 9008:			0. 0
Direct	040	2. 7	
Reverse	*220*	*2. 7*	
2. Ulakta Head Light, 1.2 miles 310°; 53°54′.7 N., 166°28′.9 W. Chart 9007 (*9008*):			2. 7
Direct	352	382. 8	
Change to Chart 9302 (*9007*) abeam of Cape Kalekta.			
Reverse	*172*	*382. 8*	
3. Cape Mohican Light, 18.0 miles 095°; 60°14′.0 N., 168°04′.0 W.:			385. 5
Direct	004	166. 4	
Reverse	*184*	*166. 4*	
4. Northeast Cape, St. Lawrence Island, 1,462-foot peak, 40.0 miles 296°; 63°00′.0 N., 167°40′.0 W.			551. 9

Continue by Table 16, Position 5, for courses to St. Michael, Golovnin Bay, Nome, Port Clarence, and Point Hope.

Table 20.—Unalaska and Dutch Harbor to Westward

Position (Reverse directions in *italics*—read upward)	Course	Distance	Distance from origin
1. Iliuliuk Reef lighted buoy 2, 0.1 mile 270°; 53°52′.7 N., 166°31′.8 W. Chart 9008:			0. 0
Direct	040	2. 7	
Reverse	*220*	*2. 7*	
2. Ulakta Head Light, 1.2 miles 310°; 53°54′.7 N., 166°28′.9 W. Chart 9007 (*9008*):			2. 7
Direct	000	0. 8	
Reverse	*180*	*0. 8*	
3. Ulakta Head Light, 0.9 mile 270°; 53°55′.5 N., 166°28′.9 W.:			3. 5
Direct	324	8. 4	
Reverse	*104*	*8. 4*	
4. Tangent of Eider Point, 4.6 miles 165°; 54°02′.3 N., 166°35′.3 W.:			11. 9
Direct	296	1. 8	
Reverse	*116*	*1. 8*	
5. Cape Cheerful, north tangent, 2.0 miles 180°; 54°03′.1 N., 166°40′.1 W. Chart 8861 (*9007*):			13. 7
Direct	270	7. 5	
Reverse	*090*	*7. 5*	
6. Point Tebenkof, 3.7 miles 180°; 54°03′.1 N., 166°53′.0 W.:			21. 2
Direct	240	55. 2	
Reverse	*060*	*55. 2*	
7. Reindeer Point, 4.2 miles 135°; 53°35′.9 N., 168°14′.5 W. Continue by Table 17, Position 4.			76. 4

CHAPTER 4

Cape Spencer to Cook Inlet

Charts 8002, 8502

WEATHER.—From **Cape Spencer to Cape St. Elias** the coast is backed by mountains up to 18,000 feet in height. The numerous glaciers on the slopes have a decided effect on the local weather. In this part of the Gulf of Alaska, southeast winds are the most prevalent, averaging 19 percent, followed by east winds with 14 percent. Westerly winds are common in summer and easterly winds in winter. The yearly average wind velocity over the area is 8.6 knots. Ship observations show 10 to 12 percent squally weather for October and from January through April. July is the quiet month with no squalls observed, and the other months show 2 to 8 percent squally weather. Brief squalls, or williwaws, are encountered in windy weather along the mountainous parts of the coast and are especially dangerous because they may follow one another in quick succession from different directions.

At Cape Spencer, there is a decided prevalence of northeast winds in all seasons except summer, when the directions are about equally divided between northeast and west; the strongest winds occur in autumn, the maximum velocity observed being 74 knots from the northeast. At Yakutat, east winds prevail in all seasons, occurring 40 percent of the time in autumn and winter, but only 22 percent in summer; northeast winds are also frequent in autumn and winter, and southeast and west winds in summer. The strongest winds at Yakutat occur in winter, the maximum velocity observed being 50 knots from the southeast.

Gales are most frequent on Cape Spencer from November through March, being observed on 6 to 9 days a month. At Yakutat the frequency is 3 to 5 days a month from October through March. At both places the average in summer is less than 1 day a month.

Precipitation is extremely heavy along this part of the coast; the average annual total is 109 inches at Cape Spencer, 132 inches at Yakutat, and 110 inches at Cape St. Elias. Fall and winter are the wettest seasons and summer is the driest. Precipitation falls on an average, about 220 days a year. As would be expected in these latitudes, much of the precipitation during the colder months is in the form of snow. The average annual total snowfall is 34 inches at Cape Spencer, 179 inches at Yakutat, and 71 inches at Cape St. Elias.

Temperatures are mild for these latitudes, with an average annual mean of about 41° F. The summer maximum seldom exceeds 75° F., and only occasionally is the winter minimum as low as 0° F. Sea-water temperatures average about 4° F. higher than air temperatures in winter and about 1° F. lower in summer. This section of the

coast is never considered closed to navigation because of ice. The rivers and bays may partially freeze over beginning about the first of December, but the ice clears out by the middle of May and does not usually prevent coastwise shipping from entering the available harbors.

Poor visibility due to advection or "sea" fog is greatest over the open sea from June through September, ranging from 16 to 25 percent of all observations; in the other months the average is 4 to 10 percent. Ship observations along the coast and its inlets show a greatest frequency of fog in August with 9 percent. During the summer the coastal fog usually comes in after midnight and remains until the following noon or later. Continuous fogs of varying densities have been known to last 2 to 10 days. During severe winter gales from the north, or northeast, spindrift and falling or drifting snow usually result in poor visibility.

Over the sea area the annual cloud cover averages about 60 percent and is generally greater in summer than in winter. In all parts of the area the percentage of sunshine is low, and the cloudy days exceed the combined clear and partly cloudy days.

Cape Saint Elias to the Kenai Peninsula.—This section of the coast includes the ragged indentation of Prince William Sound and is bordered completely by high mountains. The location of the stations on these shores relative to the mountains varies greatly and the details of climate vary accordingly.

Winds over this section of the coast are quite variable. Over Controller Bay, just north of Kayak Island, the prevailing winds in summer range from east through south and into the southwest at times. At Cordova winds are recorded as blowing from the northeast, east or southeast about 52 percent of the time, most frequently from the east, with an average velocity of 5 knots. At Valdez winds blow from the southwest about half of the time from May through August, while from October through March they are from the northeast about half of the time. At Seward the prevailing wind direction is south from April through September and north during the other months of the year. The Seward region is subject to violent williwaws. Gales are recorded frequently over the open water along this coast. Greenwich noon ship observations show about 6 percent of all winds with force 8 or more, with one-third of these gales force 9 or higher. In mid-summer over these waters the winds are rarely as strong as force 7.

At Cordova the average annual total precipitation is 94 inches, with a maximum of 18 inches in September and a minimum of 5 inches in June. The corresponding values for Valdez are 60 inches with 9 inches in September and 2 inches in June, and for Ft. Liscum 73 inches with 9 inches in September and 2½ inches in June. The average annual precipitation at Latouche is 184 inches, with the largest monthly total of 23 inches occurring in October. This location is well protected from the winds which generally prevail in this area by mountainous Montague Island, about 50 miles in length, which lies in a southwest-northeasterly direction directly east of Latouche. The elevations on Montague Island rise to over 2,000 feet for most of its length. This position results in a purely local shift of the moist wind currents so that the prevailing wind direction is north at Latouche for every month of the year.

Cordova is fully exposed to the prevailing winds during all seasons of the year. The lighter rainfall during the summer is due partly to the lower wind velocity, which gives a smaller mass movement of air at this season, but more particularly to the higher temperatures which permit the air to retain a greater quantity of moisture as it travels

upward over the nearby mountain slopes. Valdez, Ft. Liscum, and Seward are all protected from the prevailing winds by high mountain ranges.

Snowfall is generally heavy but quite variable in amount over this area with an annual total of 369 inches at Ft. Liscum, 292 inches at Valdez, 153 inches at Latouche, 117 inches at Cordova, and 78 inches at Seward. It is interesting to note that almost one-half of the total annual precipitation at Valdez and at Ft. Liscum falls in the form of snow while at Latouche and at Cordova only about one-tenth of the total precipitation is snow.

Temperatures are considerably lower in this area than they are at Cape Saint Elias and eastward. The mean annual temperature ranges from 36° F. at Valdez to 42° at Latouche. Temperatures above 80° have been recorded at all points along this coast with an extreme of 84° having occurred in July at Cordova. Temperatures fall to much below 0° F. with an extreme of −24° F. having been recorded in February at Valdez. This station is quite well protected from the comparatively warm waters of the Gulf of Alaska. At Latouche, completely surrounded by the water of the Gulf, the lowest temperature recorded for a 15-year period was 1° F. Ocean water temperatures average about 2° F. higher than the air temperatures in late fall, winter, and early spring and are about the same as air temperatures in mid-summer. Ice can be expected to form in the upper part of Prince William Sound and in the rivers after December 1st during the coldest weather and floating ice can be seen at times in the sound until late spring. The ice which forms in this area does not usually interfere with navigation into the sound by the ordinary coastwise vessel.

An eight-year record at Cordova reported an average annual total of 10 days with light fog and 4 days with dense fog. Fogs were most frequent during the three months, July, August, and September. A similar record of nine years at Seward gives the corresponding annual total values, 6 days of light fog and 2 days of dense fog with the maximum fogginess during the same three months. A 17-year record at the fog signal station, Cape Hinchinbrook, recorded an average of 783 hours of fog each year. This indicates that fog can be expected at this location approximately 9 percent of the time. Fog rather frequently hangs over the headlands and entrances even after the fog has cleared from over bays.

Cordova averages 67 percent of the sky covered with clouds for the year, with slightly more clouds during the summer season. Valdez reports an annual average of 16 cloudy days per month, with August and October the two cloudiest months. Seward reports 15 days as the annual average number of cloudy days, with September the cloudiest month.

Cook Inlet.—Winds are most frequently from the north, with topographical features causing shifts of the prevailing direction to northwest and northeast at certain locations. The prevailing wind direction also varies somewhat with the season at most stations. At Anchorage, for example, the prevalent north winds shift to northwesterly in mid-summer and to northeasterly in mid-winter. The average wind velocity at Anchorage is about 5 knots, but an extreme velocity of 66 knots has been recorded at this location. At Kenai, on the east side of Cook Inlet, the winds are southerly and southwesterly during summer and northerly during the remainder of the year. Easterly gales, however, are frequent at Kenai in the fall, with gales most frequently from the southeast in winter. At Homer, on Kachemak Bay, northeasterly winds prevail from the late fall to early spring, with southwesterly winds most frequent during the

remainder of the year. Winds are strongest during late summer and early fall over Kachemak Bay.

The annual amount of rainfall at Anchorage averages 15 inches. Kenai, on the eastern shore of Cook Inlet, agrees with Anchorage in deficiency of rainfall with an annual total of 19 inches. Fall is the season of most rainfall, approximately half of the annual total for Anchorage falling in August, September, and October. Snowfall in Cook Inlet averages between 50 and 60 inches annually.

Annual mean temperatures in Cook Inlet average about 35° F. July and August are usually the months of highest temperature. The highest temperature noted in the area was 89° at Kenai in June; the lowest was −46° at Kenai in February. Water temperatures are from 1° to 2° above air temperature in late fall, winter, and early spring, and about 1° lower in mid-summer.

Information on icing conditions is quite meager. Knik Arm, the upper end of Cook Inlet is usually closed to surface navigation from November to April. Most of the upper half of Cook Inlet is usually closed to all except heavily-built vessels from December until late March.

Fogs are common over this area. At Anchorage heavy fog is reported on an average of 30 days each year. Ground fogs occur most frequently in winter, with the heaviest fogginess in the month of January. The fogs most frequently occur during the late night and early morning and are usually entirely dissipated by noon. At Kenai, Homer, and at Seldovia fog is occasionally reported and occurs most frequently in the summer when it sometimes lasts for days. Fog banks frequently hang over the open water after the harbors have been cleared.

There is considerable cloudiness over this area. Anchorage has an average of 14 cloudy days per month. At Homer is is reported that when cloud caps form about the nearby high mountain peaks, easterly winds and rains can be expected. Six-tenths is the average sky cover at Homer. Late summer and early fall, with seven-tenths of the sky covered, is the cloudiest period of the year at Kenai while the winter cloudiness averages about 40 percent.

From Cape Spencer, the coast extends northwestward for about 130 miles to Yakutat Bay. The Fairweather Range begins about 20 miles from Cape Spencer and extends to Alsek River. The mountains are snowcapped and have elevations of 10,000 to more than 15,000 feet. From Alsek River to Yakutat Bay, the mountains are 4,000 to nearly 6,000 feet high. Along the coast are numerous glaciers with terminal moraines. The most conspicuous are La Perouse Glacier, with a sea face that is partly vertical and 200 to 300 feet high; Yakutat Glacier, 25 miles eastward of the bay; and the great Malaspina Glacier, westward of Yakutat Bay. There are no known outlying dangers along this stretch of coast.

Chart 8410.—Cape Spencer is a conspicuous headland on the northwest side of the entrance to **Cross Sound.** The large shoal area that extends about a mile southward from the cape has rocky islets, some of the inner ones wooded, and rocks, the outermost of which break. The cape rises rapidly to timbered ridges about 1,800 feet high.

Cape Spencer Light (lat. 58°11′.9 N., long. 136°38′.3 W.), 105 feet above the water and visible 16 miles, is shown from a white square tower on a rectangular concrete

building on the largest rocky islet south of the cape; the light has a fog signal and a radiobeacon.

Cape Spencer bearing E by S, distant 6 miles (Sketch made before 1883)

Cross Sound, between Cape Spencer and Cape Bingham, 8 miles to the southeastward, is the northernmost passage to the inside waters of Southeast Alaska. The sound is described in the *United States Coast Pilot, Southeast Alaska.*

Dicks Arm, a narrow inlet less than 200 yards wide in places, extends northeastward for about 2 miles along the southeast side of Cape Spencer. A valley extends from the head of the arm to Taylor Bay in Cross Sound. A narrow channel leads between off-lying rocks and islets to the arm, which has depths of 3½ to 8 fathoms to within 0.5 mile of its head. The approach is made on a course of about **045°** until **Zip Rock,** 20 feet high, is about 300 yards abeam to the northwest, thence a course of about **030°** leads in mid-channel into the arm.

Polka Rock, 20 feet high, is 2 miles northwestward of Cape Spencer and at the outer edge of the foul ground, marked by kelp, which extends about 0.5 mile from shore in this general vicinity. Small craft approaching Graves Harbor from southeastward usually pass between Polka Rock and Graves Rocks.

Graves Rocks are a group of islets about 3.5 miles northwestward of Cape Spencer and a mile from shore. Near the north end of the group is a wooded islet about 125 feet high. Rocks and kelp patches extend to the mainland and along the shore to Cape Spencer.

Libby Island, 5 miles northwestward of Cape Spencer and 0.7 mile from the mainland, is about 0.3 mile in diameter, 175 feet high, and wooded. Bare rocks and rocks that cover extend about 0.3 mile southward from the island. **Libby Island Light (lat. 58°16′.4 N., long. 136°46′.3 W.),** 50 feet above the water, is shown from a small white house on an islet southeastward of the island. **Horn Mountain,** 2,160 feet high, is a sharp, bare peak on the mainland north of Libby Island.

Graves Harbor has an entrance about 1.2 miles wide between Graves Rocks and Libby Island and extends inland for about 2 miles. Depths in the outer harbor are 25 to 85 fathoms. **Murphy Cove,** on the southeast side of Graves Harbor 1.7 miles above Graves Rocks, has depths of 10 fathoms or more in its outer part and affords snug anchorage for small vessels. **Murk Bay,** opposite Murphy Cove, is clear but too deep and open for good anchorage. The cove which makes off to the southward from the head of Graves Harbor is a good, landlocked anchorage that is easily entered; a fish-buying scow anchors along the west shore from May to September and supplies gasoline, diesel and fuel oil, provisions, and fresh water to fishermen.

Torch Bay, 7 miles northwestward of Cape Spencer, extends inland more than 3 miles in a northerly direction and varies in width from 1 mile at the entrance to 0.3 mile at the head of the western arm. Rocks, awash at ¼ tide and always marked by breakers, lie a mile south of **Venisa Point,** on the west side of the entrance; vessels can

pass on either side of these rocks when entering the bay. The bay has depths of 20 to 60 fathoms and is not a good anchorage for large vessels; small vessels can find protected anchorage in the northeastern arm.

Sugarloaf Island, 9 miles northwestward of Cape Spencer, was named from its shape as seen from southward, from which direction it appears barely detached from the isletlike point projecting from the mainland. The island is 715 feet high and well wooded. From westward, it has a uniform north slope; the south slope has a step and is separated from the narrow southern extremity by a deep V-shaped ravine. Bare rocks and some that cover fringe the shore from south around to west. A mile south of the island are submerged rocks and shoals that usually break. With moderate easterly gales temporary anchorage is possible in depths of 10 to 18 fathoms, rocky bottom, in the cove northeast of the island. The cove is 0.3 mile wide and open to the northwestward.

Astrolabe Point, 11 miles northwestward of Cape Spencer, is rugged and has bare cliffs on its western side; the south face of the point is moderately wooded halfway up. **Astrolabe Rocks,** some covered and some uncovered, are 0.3 mile south of the point.

Dixon Harbor, with its entrance between Sugarloaf Island and Astrolabe Point, has depths of 60 to 20 fathoms over an average width of 0.8 mile for 2 miles northward to Thistle Cove, the northwestern arm. A glacier above the head of the harbor is visible from the entrance.

Thistle Cove is a mile long in a northerly direction and 0.3 to 0.2 mile wide. At the point on the northeast side of the entrance is a grass-covered rock, 20 feet high, from which a shoal extends southwestward across the entrance, leaving a channel 200 yards wide and about 2 fathoms deep close along the southwest shore. The sea and swell from outside are well broken before reaching the cove and vessels have no difficulty in entering. The head of the cove is a secure anchorage with depths of 7 fathoms, muddy bottom. A fish-buying scow anchors each year from May to September on the west side of the cove just above the entrance; gasoline, diesel oil, and provisions are available on the scow, and fresh water can be obtained nearby.

Palma Bay lies between Astrolabe Point and Icy Point, 6 miles to the northwestward. This large body of water, sometimes called **Icy Bay,** has depths of 20 to 60 fathoms; large vessels have anchored close inshore in 15 to 20 fathoms.

In the extreme southeastern part of Palma Bay is **Boussole Head,** a prominent, wooded peninsula 650 feet high, which extends about a mile into the bay; the outer end of the head is a natural arch which rises about 60 feet above the water and is quite prominent from the south. About 0.3 mile south of Boussole Head is **Alder Rock,** bare 4 feet at low water.

Astrolabe Bay, southeast of Boussole Head, and **Boussole Bay,** on the northwest side of the head, are open to southward but afford protection to small vessels in northerly or easterly weather. Anchorage is possible in depths of 6 to 8 fathoms, sand bottom, near the head of each bay; the best is in Boussole Bay.

Another anchorage, which affords some protection for small craft in westerly weather, is off the mouth of **Kaknau Creek,** a large stream which empties into Palma Bay on the northeastern side of Icy Point; recommended anchorage is close inshore in depths of 6 to 10 fathoms, sand bottom.

Icy Point, on the west side of Palma Bay and 17 miles northwestward of Cape Spencer, is low and wooded; from southward La Perouse Glacier can be seen over the

point. Many rocks fringe the point but deep water is only 0.3 mile offshore. There is a hot spring at the tree line on the southeast side of Icy Point.

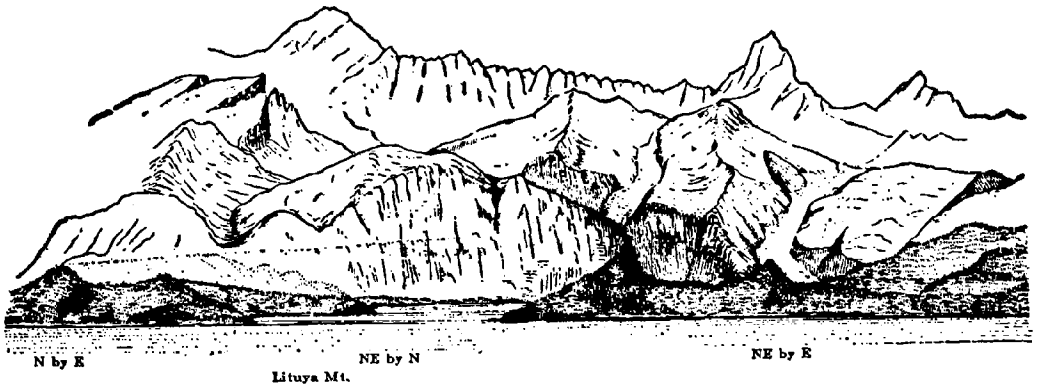
Chart 8402.—From Icy Point to La Perouse Glacier, a distance of about 8 miles, the coast is low and wooded, with rolling hills that gradually increase in height to the bare mountain peaks. Rocks extend along the coast about halfway from the point to the glacier; the rest of the way is mostly smooth sand beach.

La Perouse Glacier, 24 miles northwestward of Cape Spencer, is the outstanding landmark along this coast because the mountains are often covered by clouds. The face of the glacier is 200 to 300 feet high and is nearly perpendicular; at the foot of the glacier is a narrow strip of sand beach strewn with boulders.

Between La Perouse Glacier and Lituya Bay, 15 miles northwestward, the coast is low and densely wooded. About 2 miles inland are hills that rise in a succession of terraces to the snowcapped peaks of the **Fairweather Range.** Most of the shore is sandy, with occasional boulders; huge boulders cover the last 1.5 miles to Lituya Bay.

Chart 8505.—Lituya Bay, 39 miles northwestward of Cape Spencer, affords protected anchorage in all weather, but the entrance is dangerous and should never be attempted except at slack water because of the strong current. The bay extends about 6 miles in a northeasterly direction and has widths of 1 to 2 miles.

At the head of Lituya Bay are two arms, each leading to a glacier. **Gilbert Inlet,** on the northwest, has **Lituya Glacier** at its head; **Crillon Inlet,** on the southeast, has **North Crillon Glacier** at its head. **Cascade Glacier,** which discharges into the head of the bay between the two arms, can be seen far at sea. Depths in the bay are as much as 100 fathoms. Vessels can obtain fresh water from streams near the head.



Entrance to Lituya Bay

Harbor Point, on the east side of the entrance to Lituya Bay, can easily be identified from offshore by **The Paps,** two conical, wooded hills a mile to the northeastward; the northwesterly hill is the higher and rises 540 feet. Large boulders, 20 to 35 feet high, are strewn along the beach. **Cormorant Rock,** 16 feet high, is the largest of three bare rocks off the south side of Harbor Point.

La Chaussee Spit, on the northwest side of the entrance to Lituya Bay, is 200 to 300 yards wide and about 0.7 mile long. The spit is 2 to 12 feet high and is bare except

for a few scattered scrubby trees near its outer end and two clumps near its inner end; the outer side of the spit is covered with large boulders.

Between Harbor Point and La Chaussee Spit, the entrance to Lituya Bay is about 500 yards wide but is mostly foul. The channel has depths of 5 to 7 fathoms but is only about 50 yards wide; the water shoals abruptly on either side and there are many rocks.

Anchorage Cove, behind La Chaussee Spit, has depths of 4 to 6 fathoms, hard sand bottom. On a flood tide, with southerly weather, this anchorage has considerable swell and small vessels usually go farther up the bay.

Cenotaph Island, in mid-bay and about 3 miles from the entrance, is densely wooded and has several hills, the highest rising about 320 feet. The north and west sides of the island slope gently, but the south side is an abrupt, high cliff with depths of 100 fathoms only 100 yards away. The island is named for a wooden monument, or cenotaph, which was erected by La Perouse in 1786 in memory of officers and men who were lost in the entrance to the bay..

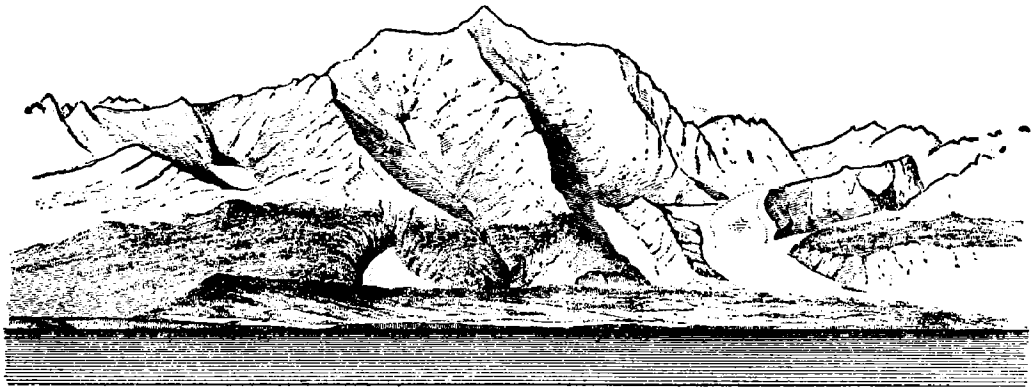
Directions.—Enter Lituya Bay only at slack water after careful inspection of the entrance; high-water slack is the better. The entrance channel is straight but only about 50 yards wide and favors the east side. Steer **012°**, passing 150 yards westward of the smallest of the three bare rocks, of which Cormorant Rock is the largest, on the east side. This course leads to deep water in the bay, but tide rips can very easily set the vessel out of the channel. If going to the head of the bay, the deeper water will be found eastward of Cenotaph Island.

Currents.—At the entrance to Lituya Bay, the currents have an estimated velocity of about 8 to 12 knots on spring tides. Ebb currents, running against a southwest swell, cause bad topping seas or combers in which no small boat can live. Small-powered vessels in the bay should stay away from the entrance on the ebb to avoid being swept through. The ebb current follows a narrow path for several miles out to sea and can be seen for some distance. On the flood, the entrance is smooth and local fishing boats often negotiate it with a calm sea but are quickly swept through the channel by the powerful current. Strangers should not attempt to enter except at slack water which lasts only 10 to 20 minutes; the high-water slack is about 45 minutes after high water at Sitka, and the low-water slack is about 1½ hours after low water at Sitka.

Ice.—The bay has never been known to freeze over but icebergs can always be found in the upper part. With northeasterly breezes these icebergs often reach the entrance to the bay before melting. Ice is usually heaviest during the month of October. The many streams flowing from the glaciers at the head of the bay give the water a murky, discolored appearance.

Chart 8402.—Northwestward to Dry Bay, the shore is mostly gently curving sand beaches but boulders are found in the vicinity of Cape Fairweather and at some other places. Prevailing **currents** set northwestward about parallel to the shore, but it has been observed that winds have a great influence on directions and strengths.

Cape Fairweather, 54 miles northwestward of Cape Spencer, is an evenly rounded point sloping gently to the sea and abruptly back to the mountains. The summit of the cape is bare of vegetation but is covered with large piles of glacial drift, some of a bright iron-rust color. **Mount Fairweather,** 15,320 feet high, is 15 miles inland from the cape and is on the Alaska-Canada boundary.



Mt. Fairweather bearing ENE, distant 24 miles

Protection from southeasterly weather can be had northward of Cape Fairweather, which appreciably breaks both wind and swell. Small-boat landings can be made on the sand beach in moderate southeasterly or southwesterly weather. Just northward is a high rocky slide, with a cataract several hundred feet high, which is prominent from offshore.

Dry Bay, 80 miles northwestward of Cape Spencer, is the delta of **Alsek River;** 8 miles back of the coast is **Alsek Glacier.** The bay is filled with bars and small islands between which are constantly changing channels. The only feature in the delta which appears to be permanent is a wooded island about 200 feet high near mid-bay. The westernmost of the three entrances to the bay is about 400 yards wide, has depths of about 6 feet at low water, and has been used to some extent by small craft. The **current** has a velocity of about 2½ knots on the ebb. The best time to enter Dry Bay is on a rising tide near high water, and a smooth sea is essential; during heavy weather, the sea breaks fully 2 miles offshore.

From Dry Bay to Yakutat Bay, the mountains are 5 to 15 miles from the coast, and between is a low wooded plain cut by numerous streams. A canoe can be taken from Dry Bay to Yakutat Bay at high water, but there are several portages and the route is impracticable for a boat of any size. The principal rivers between Dry Bay and Yakutat Bay have shifting bars at their entrances and lagoons or tidal basins inside; they can be used only by small boats or launches at high water and with a smooth sea. The mountains back of the coastal plain carry numerous glaciers; **Yakutat Glacier,** about 100 miles northwestward of Cape Spencer and 30 miles eastward of Yakutat Bay, is 3 miles wide and very prominent.

Chart 8455.—Yakutat Bay, 130 miles northwestward of Cape Spencer, has a 15-mile-wide entrance between Ocean Cape on the southeast and Point Manby on the northwest; the bay is 7 miles wide at **Blizhni Point,** 15 miles above the entrance, and 2 miles wide a few miles farther up. Yakutat Bay, the best anchorage between Cape Spencer and Prince William Sound, is mostly clear of islands and dangerous shoals. Depths in the bay range from 6 fathoms 2.5 miles westward of Khantaak Island to 166 fathoms off **Point Latouche,** 23 miles above the entrance. Two to three miles outside the line between Ocean Cape and Point Manby is a submarine ridge, very narrow on top, with depths of 8½ to 16 fathoms; the water deepens rapidly to more than 30 fathoms

on either side except near Point Manby, and the ridge curves northeastward near Ocean Cape to join the shallower water. During very heavy weather it has been observed that breakers or pronounced increase in height of swell occur across the entire entrance to Yakutat Bay; at such times entrance is dangerous.

Ocean Cape, on the southeast side of the entrance to Yakutat Bay, is low and well wooded. Three bare light-colored bluffs 50 to 70 feet high, the westernmost the point of the cape, are unmistakable landmarks. **Ocean Cape Light (lat. 59°32.2 N., long. 139°51.3 W.),** 131 feet above the water and visible 10 miles, is shown from a small white house on a skeleton structure on one of the bluffs.

Point Manby, on the northwest side of the entrance to Yakutat Bay, is low and wooded. There is usually a heavy surf on the beach, making it dangerous for boats to land.

Point Carrew is on the east side of Yakutat Bay 1.5 miles above Ocean Cape. **Point Munoz,** westernmost extremity of **Khantaak Island,** is 3.5 miles above Ocean Cape. The island is about 5 miles long in a northeast-southwest direction and the greatest width is between Point Munoz and **Point Turner,** 2 miles to the southeastward. Khantaak Island is low and wooded except at Point Turner, which is a tongue of sand covered with grass and bushes.

Monti Bay, entered between Point Carrew and Point Munoz, extends about 3 miles southeastward to Yakutat, then turns northward to Yakutat Roads anchorage. Depths in Monti Bay are 20 to 40 fathoms; the south side is clear but the Khantaak Island side is foul.

Ankau Creek, on the south side of Monti Bay a mile southeastward of Point Carrew, is the outlet of an intricate system of shallow lagoons within the peninsula between the bay and the ocean. A depth of 9 feet can be carried through the entrance to Ankau Creek near the east side; **currents** are strong and entrance should not be attempted except at or near slack water.

Southeast Shoal, about midway between Point Turner and the Yakutat mainland, has on its north side a bare rock with an elevation of 5 feet; at low water, the bare shoal is about 300 yards in diameter. Two rocks, awash at lowest tide, are about 0.2 mile north of the shoal.

Yakutat (*pop. 298 in 1950; P. O.*), a village at the eastern end of Monti Bay, has a small hospital supervised by a registered nurse, a Government school, and two general stores. A United States Commissioner is stationed in the town. Steamship service is irregular, stops being made only as the movement of freight demands.

The Government wharf, on the south side of the head of Monti Bay, has a 250-foot face with depths alongside of about 35 feet. Gasoline, diesel oil, and other petroleum products can be delivered by truck from stock carried at the airfield; this service can be arranged for by phone through the cannery storekeeper. Water is not available at this wharf.

The Yakutat cannery wharf, 300 yards across the head of Monti Bay from the Government wharf, has a 225-foot face with depths of about 18 feet alongside; fresh water is available only during the canning season but the cannery store operates the year around. The local radio station has the call letters KWJ–56, Yakutat.

The Yakutat airfield is south of the village. Scheduled service is three times weekly to Anchorage, Cordova, and Juneau, and other stops are made for two or more passengers or in emergencies.

Yakutat Roads, between Yakutat and the shoals extending southeastward from Khantaak Island, has a clear width of 0.4 mile, a length of nearly a mile, and depths of 5 to 25 fathoms, muddy bottom. The best anchorage for large vessels is in depths of 23 fathoms 700 yards northwestward of the point at the north end of the village.

Port Mulgrave, on the west side of Yakutat Roads behind Point Turner, Khantaak Island, is a mile long and about 200 yards wide; on the side opposite Point Turner is **Village Shoal,** parts of which show at high water. The entrance to Port Mulgrave is 60 feet wide and 16 feet deep; the arm is usable only by small boats.

Rurik Harbor, the next arm indenting the inner side of Khantaak Island northeastward of Port Mulgrave, has depths of 9 to 15 fathoms in its entrance. **Prince Shoal,** partly bare at low water, extends out 0.4 mile from the point on the northeast side of the entrance. Small vessels can anchor in the entrance to Rurik Harbor.

At its northeast end, Yakutat Roads connects, through **Johnstone Passage,** with several bays and arms between the numerous islands and rocks behind Khantaak Island. The channels are navigable only for small craft at low water, though the enclosed bodies of water have depths of 20 to more than 100 fathoms.

Just northward of Point Latouche, in the upper bay and mentioned earlier, temporary anchorage can be had in depths of 20 fathoms about 400 yards off the sand beach; heavy **ice** probably will be troublesome at times. **Haenke Island** is near the east side of Yakutat Bay 5 miles above Point Latouche; anchorage in depths of 6 fathoms is reported available behind the island.

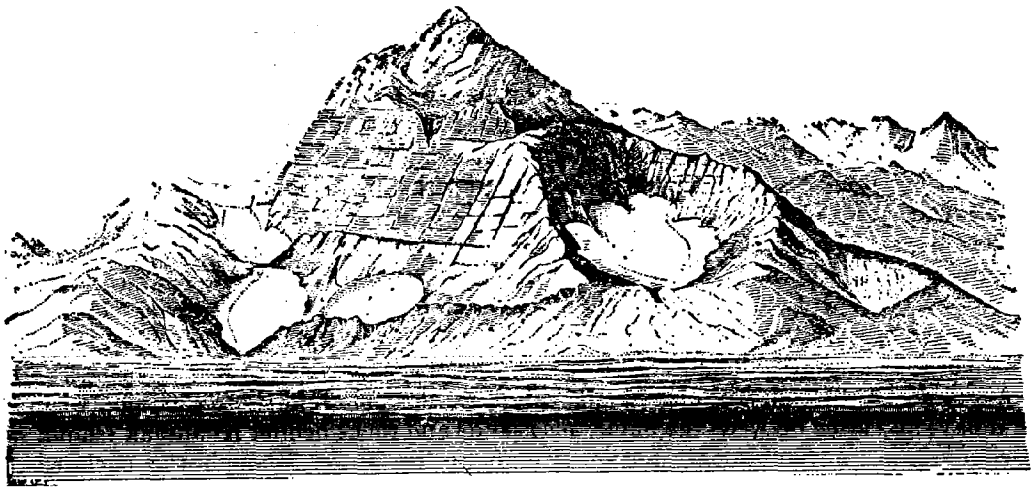
Northward of Haenke Island, Yakutat Bay becomes **Disenchantment Bay.** Reefs and rocks, some reported to show at some stage of the tide, are said to lie in mid-bay; reported positions are shown on the chart and it is quite probable that there are others.

At the head of Disenchantment Bay, 4 miles above Haenke Island, is **Hubbard Glacier.** On the south side, opposite the glacier, is **Osier Island,** 95 feet high. Extending 30 miles southward from Hubbard Glacier and Osier Island is **Russell Fiord,** with depths of well over 100 fathoms. **Nunatak Fiord** (*see chart 8402*) extends eastward for 8 miles from Russell Fiord about 12 miles southeastward of Osier Island.

Ice.—The ice in Yakutat Bay comes from the glaciers at the head of Disenchantment Bay and from **Nunatak Glacier,** at the head of Nunatak Fiord. It is usually quite thick from Nunatak Fiord to Point Latouche, but at times is scarce. Ordinarily, the ice banks on the west side of Yakutat Bay ar far south as Blizhni Point. Scattered bergs usually are found in the bay proper, and occasional drifts find their way as far south as Ocean Cape and Point Manby.

Chart 8002.—Between Yakutat Bay and Cape Suckling, the coast is formed by river and glacier deposit and is relatively regular. Coastal currents are discussed in Chapter 2.

A short way inland, the St. Elias Range rises to 18,008 feet at **Mount St. Elias,** on the Alaska-Canada boundary, and culminates in the 19,850-foot **Mount Logan** in Canada. These towering snow-clad peaks, only 25 miles apart, are surpassed in all Canada and the United States only by central Alaska's 20,300-foot Mount McKinley.



Mt. St. Elias bearing NNW, distant 53 miles

Stretching from Yakutat Bay to the Bering River in one continuous ice field are the tremendous **Malaspina** and **Bering Glaciers.** Malaspina's 80-mile front barely reaches salt water at Icy Bay and **Sitkagi Bluffs,** the latter a cliff of ice 5 miles long on the open coast.

Chart 8457.—Icy Bay has been formed by the recession of **Guyot Glacier,** a part of Malaspina. The bay is about 5 miles wide and 6 miles long, its northwest and southeast sides being nearly parallel. Oil prospects have been reported in the vicinity. The bay has no settlements.

A bar extends across the entrance of Icy Bay, roughly in the shape of a crescent, at depths, in mid-channel, of 7 to 10 fathoms. Breakers extend out from each entrance point along the crest of the bar, varying with the size of the seas, but have never been observed to encroach on the channel.

Both entrance points are low sand spits. Behind the eastern spit is **Riou Bay** which affords protected anchorage in 6 fathoms, hard, sandy bottom. The western spit forms **Guyot Bay,** a shallow lagoon whose entrance is obstructed by a bar nearly bare at low water. The mud flats in Guyot Bay are good places for beaching launches or scows.

Weather.—The prevailing winds are east and northeast. A breeze off the glacier usually brings rain. Winds from other quarters were seldom observed, although offshore winds are known to blow at times. Breakers on the outside coast are generally heavy and plainly audible on either side in entering. Within the bay, west of **Claybluff Point,** breakers are frequently heavy enough to make landing difficult in small boats. There is no surf along the eastern shore of the bay.

Currents.—Currents in the bay are weak. The combined effect of the ebb current and the discharge from the glacial streams is most pronounced in the northwest part of the bay. In the entrance to Guyot Bay, the ebb current attains a velocity of 2 knots or more. The tidal current at the entrance to Icy Bay floods northward and ebbs southward, with a velocity of about ½ knot.

Ice.—In the southern part of the bay ice is never thick enough to menace naviga-

tion. Large bergs either melt or ground before getting very far from the face of the glacier. The eastern shore is generally free from ice except during the spring tides. The shore north of Claybluff Point is invariably covered with stranded ice. Riou Bay usually is free from ice.

Fresh water.—Water suitable for drinking is not available in quantity. Small streams and ponds can be found in the northeast arm behind **Moraine Island.** Ice from the bergs, taken on board and melted, provides good potable water.

Anchorage.—Partially protected anchorage can be had in 8 fathoms about 0.5 mile off the entrance to Guyot Bay. Possibly the best anchorage in Icy Bay is east of Moraine Island. Protection is afforded from all winds in 9 fathoms, mud bottom, but caution must be used in approaching the anchorage because of lack of surveys and on account of the drift ice. Do not anchor between Moraine Island and the small island eastward, as bergs drift through this area, sometimes with considerable velocity. Anchorage can also be had in the entrance to Riou Bay.

Chart 8002.—From Icy Bay to Cape Yakataga, the coast is backed by a continuous ridge of stratified mountains 3,000 to 6,000 feet high. Numerous streams cut the foothills, and a dense growth of alders and bushes lines the shore.

Yakataga Reef extends about 0.5 mile from shore at **Cape Yakataga,** and parts of it show above high water. This is the best landing place between Icy Bay and Controller Bay, but landing is possible only with occasionally smooth seas. Cape Yakataga has a post office and a few houses.

Chart 8513.—**Cape Suckling** is low and wooded. Two miles north of the cape a prominent mountain ridge extends about 8 miles northeastward, with elevations of 1,500 to 2,500 feet. Three bluffs about 100 feet high are 1.5 to 2.9 miles westward of Cape Suckling. From the eastern bluff a sunken reef extends 0.6 mile southwestward to three rocks, close together and bare at low water.

Southwest Breaker is a rock bare at low water, 3.8 miles 260° from Cape Suckling.

Okalee Spit, forming the south side of Controller Bay, is low, with bare sand dunes, and is 7 miles long in an east and west direction. The entrance to Controller Bay between the north end of Kayak Island and Okalee Spit is of little use except for very small vessels that can cross the flats eastward of Wingham Island.

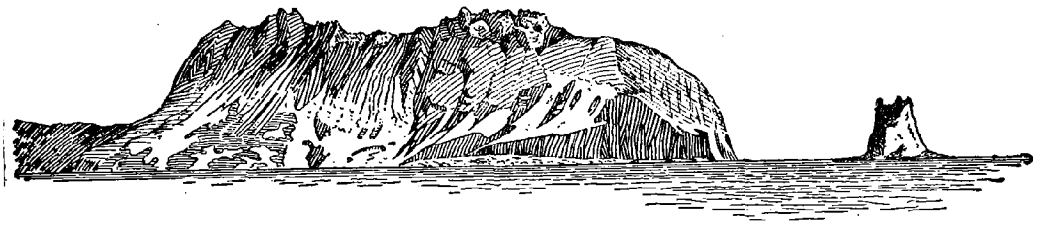
Two prominent rocks about 75 feet high are in the approach, 1.5 miles east by north from Lemesurier Point at the northeast end of Kayak Island, and 1.2 miles south of Okalee Spit. Ledges bare at low water between the two rocks, and extend about 300 yards eastward and westward from them. Foul ground with 13 feet over its outer half extends from **Lemesurier Point** almost to the shoal surrounding the rocks.

The channel is over a bar with least depths of 17 to 19 feet, then between Okalee Spit and the two rocks. Northward from the rocks, the channel has depths of 5 to 6 fathoms until about 1 mile inside the north end of Kayak Island. Thence, through the flats, about 12 feet can be carried to Kayak Entrance, and 6 feet to Okalee Channel.

Kayak Island is 17.5 miles long, has peaks 1,110 to 1,390 feet high in the central portion, and slopes gradually to its northern part, which is low and wooded.

Cape St. Elias, the south end of Kayak Island, is an important and unmistakable landmark. It is a precipitous, sharp, rocky ridge, about 1 mile long and 1,665 feet high,

with a low, wooded neck between it and the high parts of the island farther north. About 0.2 mile off the cape is the remarkable **Pinnacle Rock,** 494 feet high.



Cape St. Elias from westward

Cape St. Elias Light (lat. 59°47.8 N., long. 144°36.3 W.) is 85 feet above the water and visible 15 miles. It is shown from a white square tower at the corner of a rectangular building. A fog signal is sounded on a siren. A radiobeacon is operated at the light station; see *Light List.* Cape St. Elias lighted whistle buoy is 2.9 miles 200° from Pinnacle Rock.

Boats generally can land on the south side of Cape St. Elias just east of a small point which extends toward Pinnacle Rock. The better approach is from westward, keeping close to the island to clear a ledge which extends 0.2 mile northwestward from Pinnacle Rock. In approaching, care should be exercised in crossing the shoal extending from the cape to Pinnacle Rock. The depths here are reported to be shoaling.

The eastern coast of Kayak Island is strewn with boulders, and landing is impracticable. Rocky shoals with 11 feet over them are 1.8 miles 172° from Lemesurier Point. Lying 2.3 miles southward of the point and 1 mile offshore is a reef 0.5 mile long. Its northern end is a rock 10 feet high, and its south end is bare at half tide. For 6 miles northward from Cape St. Elias, boulders bare at low water, and breakers extend 0.8 mile off the eastern coast of the island.

Breakers extend 2 miles southward from Cape St. Elias to **Southeast Rock,** which is awash. A ridge with 10 to 15 fathoms over it, not closely developed, extends 1.5 miles westward from Southeast Rock. The 50-fathom curve is about 7 miles southwestward from Southeast Rock, but is only 0.5 miles southeastward. The tidal currents have considerable velocity across the reef.

East of Cape St. Elias, another reef on which the sea breaks extends 1.5 miles from Kayak Island. Its outer end is awash and is about 1.7 miles 035° from Southeast Rock.

Sea Ranger Reef is off the western coast of Kayak Island 3.3 miles northward of Cape St. Elias. The inner shoal is 1 mile from shore, has 11 feet over it and often breaks. The outer shoal is 1.5 miles from shore, has a least known depth of 24 feet, and seldom breaks. Tide rips occur around it at times.

The tidal currents on the western side of Kayak Island set northward on the flood and southward on the ebb, with an estimated velocity at strength of ½ to ¾ knot.

Anchorage.—Good protection from all except westerly winds can be found on the west side of Kayak Island. The smoothest water usually will be found between Sea Ranger Reef and Kayak Entrance, an anchorage which is used by fishing vessels during the halibut season. Indifferent anchorage can be had on the east side of Kayak Island in 15 to 20 fathoms, about 1.5 miles offshore midway between Cape St. Elias and Lemesurier Point. The holding ground is poor and a vessel should be ready to move on short notice.

Controller Bay is formed by Okalee Spit and Kayak Island on the south and Wingham and Kanak Islands on the west. For some distance back from the eastern shore the land is but slightly above high water, and is broken by many streams. Quicksand has been found in the channel at the mouth of Edwardes River. The bay is mostly flats through which are two principal channels, one from Kayak Entrance to the northern end of Kayak Island; the other, Okalee Channel.

Kayak Entrance, between Kayak and Wingham Islands, is rocky and foul with shoals on which the least depth found is about 2 fathoms. The channel is 0.5 mile wide between spits, largely bare at low water, projecting out from Kayak and Wingham Islands. Kayak Entrance should be used with caution and only at high water.

Anchorage can be made in 3 to 4 fathoms, bottom soft in places, anywhere in the channel from the southeast end of Wingham Island to the northern end of Kayak Island. There is some local chop with strong winds, but no outside swell enters the bay either through Kayak Entrance or around the northern end of Kayak Island.

Wingham Island is 4 miles long and wooded, and has three hills, the highest, near its northern end, having an elevation of 832 feet. The western shore of the island is precipitous. With heavy easterly winds, anchorage and shelter can be found in 16 to 18 fathoms 0.5 mile off the western side of Wingham Island. Both Wingham and Kanak Islands are fox farms, the keepers living throughout the year on the eastern sides of the islands.

Small vessels can anchor in the narrow channel close to the eastern side of Wingham Island. This channel is about 300 yards wide and has depths of 7 to 12 fathoms for 1 mile, then shoals gradually southward. The flats on the eastern edge of the channel have depths of 7 to 11 feet. At times the tidal currents in the channel have a velocity of 3 knots or more.

Okalee Channel, between Wingham and Kanak Islands, is 0.6 mile wide at the entrance, and has depths of 6 fathoms or more throughout most of its length. The channel is a secure harbor, and is marked by five buoys. It is reported that the buoys are hard to pick up in approaching from seaward.

The shoal on the south side of Okalee Channel 1.5 miles northeastward from Wingham Island is bare shortly after high water, and this shoal and the one on the opposite side of the channel are usually indicated by breakers. The shoal extending southward from Kanak Island is mostly uncovered at low water. Above these shoals the flats bordering Okalee Channel are partly bare at low water only, and there is nothing to indicate the channel when the flats are covered.

Vessels sometimes anchor in Okalee Channel about 2 miles above the northern end of Wingham Island. This part of the channel is generally easy of access in clear weather. Above this point Okalee Channel should be navigated at low water only, in the absence of aids or local knowledge.

Kanak Island is 3.2 miles long, very low and flat, and wooded in the middle. Breakers mark the extensive shoal which makes out from the west side of the island. The southern edge of the shoal is within 1 mile of the north end of Wingham Island.

The passage between Kanak Island and Strawberry Point is used only by small boats at high water. A mid-channel buoy has been established in the westerly approach to the passage, which is not as shown on the chart and should not be used without local knowledge.

Point Hey is a projecting and prominent point, high and narrow, on the northwest side of Controller Bay 1 mile northward of Kanak Island. **Chilkat** is on the west side of the mouth of **Bering River,** which flows into the northeast end of Controller Bay.

Weather.—During the summer the prevailing winds are from the east around through south to southwest. During the early spring and fall, northwest winds blow with great force over the flats. There is a great deal of cloudy misty weather during the summer. Fog is infrequent and usually clears off before noon.

Tides.—The diurnal range of tide is 10 feet. For daily predictions see the *Tide Tables.*

The tidal currents set into Controller Bay through all the entrances on the flood and out on the ebb. In Kayak Entrance the ebb has greater velocity than the flood, and it is estimated that the greatest velocity at strength does not exceed 3 knots. Tide rips occur at times in the channel abreast the southern end of Wingham Island. The velocity of the current in the channel north of Kayak Island does not exceed 2 knots.

In Okalee Channel southeastward of Kanak Island, observations show an average velocity of about 2 knots at strength of current. Predicted times and velocities can be obtained from the *Current Tables.* Small tide rips occur when the wind is against the current. Around the north end of Wingham Island the current strengths have velocities of about 1½ knots.

Katalla Bay, 23 miles northward from Cape St. Elias, is between Strawberry Point on the east and Martin Islands on the west, a distance of 5 miles, and indents the coast about 2 miles to the mouth of Katalla River. The bay is a roadstead sheltered from offshore winds, but exposed to winds from southeast, south, and southwest.

Strawberry Point is low and bare at the end and wooded toward the foot of the hill. A prominent hill on the point has a low break between it and the higher land northward. A shoal with little water over it, and on which the sea generally breaks at low water, extends nearly 1.5 miles southward from the point.

The northeastern shore of the bay from Strawberry Point to the mouth of Katalla River is a steep sand beach. The northwestern shore from Katalla to Martin Islands is foul and should be given a berth of about 0.8 mile.

Palm Point is 1.5 miles southwest of Katalla. A boulder reef, bare at low water, extends 0.4 mile southward from it.

Martin Islands are two in number, about 60 feet high, have steep rocky sides, and are 0.5 mile from shore. The northern island is joined to the shore by a flat, bare at extreme low water.

Martin Islands Light, (lat. 60°09′.7 N., long. 144°36′.7 W.), 150 feet above the water and visible 9 miles, is shown from a white house on the southwest point of **Kiktak Island,** the outer island of the Martin group.

Katalla is a village at the head of the bay, on the western side of **Katalla River.** A landing is available for lighters, which can be towed over the bar except at low water. The bar at the mouth of the river has a depth of about 3 feet at low water, and the sea generally breaks on it. The entrance, which is narrow and rocky, requires local knowledge. With a smooth sea, lighters formerly landed in the bight on the northeast side of Palm Point. The beach always has some surf, and with southeasterly or southwesterly winds, landing is impracticable.

The engine of the steamer *Portland,* wrecked on the Katalla beach in 1910, is

reported to lie in the vicinity of the 5-fathom curve, about 1 mile northeastward of Palm Point. Shoals make out on both sides of the river mouth to the wreck.

The anchorage in the bay is 1.5 to 2 miles southward of Katalla, in 6 to 7½ fathoms, hard sand bottom. The holding ground is generally good, but quicksand southward of Palm Point has caused the loss of many anchors. There are no dangers if the shore be given a berth of over 0.8 mile, but the wreck of the *Portland* and the shoal extending 1.5 miles southward from Strawberry Point should be kept in mind.

Chart 8502.—Copper River emerges from the mountains between **Miles** and **Childs Glaciers,** above which are rapids. Below the rapids, the river flows through broad flats in many changeable channels which vary in depth from 5 to 20 feet at high stages. It is not navigable; the current is swift, and tidal effect is felt only near the mouth.

The delta is low and marshy except for sand dunes, 50 to 150 feet high, on the islands and banks of the main channel. From seaward, the vicinity of Copper River shows as a vast, rugged mountain range, with numerous glaciers filling its gorges. From Point Martin to Hinchinbrook Island is a chain of low sand islets, 4 to 5 miles from shore. Back of the islets are tidal flats of mud and sand, intersected by sloughs which drain into the Copper River passes and into Glacier and Eyak Rivers.

The shoals extending seaward from the islets off the Copper River Delta have not been surveyed; however, danger can be avoided by giving the islets a berth of more than 3 miles and by avoiding depths less than 10 fathoms.

Alaganik Slough, the westernmost and main outlet of Copper River, is 0.5 to 1 mile wide, with depths from 5 to 15 feet depending upon the stages of tide and river. The mean rise and fall of the tide is about 9 feet at the mouth, and is reported to be 2 to 3 feet at **Alaganik.** The flood current is felt to the village.

Eyak River, 6 miles northeastward of Point Whitshed, flows from Eyak Lake and has a swift current. At favorable stages of the tide it is navigable for small, light-draft craft to the lake. **Mountain Slough** is 1.5 miles westward from the mouth of Eyak River. There are two clam canneries on this slough.

Chart 8520.—The **Egg Islands,** about 5 miles southeastward of mainland Point Whitshed and 10 miles eastward of large **Hinchinbrook Island,** are low and partly grass-covered. Just eastward of the islands is a channel which leads northeastward between sand and mud flats to Alaganik Slough. The seaward approach to the channel is marked by a lighted whistle buoy.

The current in the channel is strong. East of Egg Islands, flood and ebb velocities of 3 to 3½ knots respectively, setting in the direction of the channel, have been observed. Northward of the islands a current of 1½ knots, flooding northwestward and ebbing southeastward, was found. Southeastward of Point Whitshed a westward flood of 1½ knots was observed.

Navigation in this area is limited to small craft with local knowledge. Anchorage can be found in the wider parts of the sloughs northward of the Egg Islands. There is no protection from prevailing winds but seas are broken up by the surrounding flats.

Point Whitshed is at the southern extremity of the **Heney Range,** the steep eastern side of which flanks the alluvial coastal region of the Copper River. The waterfall, 1 mile from the point on the coastal side of the ridge, is a prominent landmark, seen for

several miles over the mud flats, and shows well when the peaks and higher land are cloud-covered. The higher peaks on Heney Range, as well as those on Hinchinbrook Island, are generally sharp and bare-topped. The end of the peninsula westward from Heney Range is covered with rolling hills. **Government Rock,** at Point Whitshed, is 30 feet high and rounded in outline.

The irregular slough, marked by stakes, trending east and west near Point Whitshed and **Twin Rocks** has a ruling depth of about 1 foot at low water. When the Twin Rocks are just covered, the depth in the slough is increased to about 6 feet. Twin Rocks can be avoided by bringing the summit of Mummy Island, a rounded wooded knoll, in range with the 1,845-foot mountain peak on Hawkins Island.

An unused radio tower is near **Gravel Point,** on the mainland about 1 mile eastward from Mummy Island. Two clam canneries are at Gravel Point.

Mummy Island is about 425 feet high and wooded. There is a clam cannery on the island. A light is established on one of the islets east of Mummy Island, where there is an approach through a slough. The islet 0.2 mile southwest of Mummy Island has two steep ends, 75 feet high, with a low flat strip between.

Little Mummy Island is rounded in outline and profile.

Orca Inlet is described later in this chapter.

About 1 mile southward of Mummy Island is **Pinnacle Rock,** 75 feet high, on the the edge of a slough extending from Point Bentinck to Mummy Island.

Point Bentinck is low, sandy, and grass-covered, with sand dunes and brush 0.5 mile back. The brush covers a ridge extending southwest from **Strawberry Hill** at the south shore of Boswell Bay. The 798-foot knoll northward of Boswell Bay is prominent.

At low tide, sand flats bare for 2 miles off Point Bentinck. Part of this area is above ordinary high tide, offering a footing for sparse grass and a lodging place for driftwood. Shoal water continues off the point in a southeasterly direction, and about 4 miles from the point the shoal drops off into deeper water.

A lighted bell buoy southeastward of Point Bentinck marks the seaward approach to the channel, between the flats, a mile eastward of the point. After crossing the bar the channel becomes deep and narrow abreast of Point Bentinck. Low water is the best time to negotiate the entrance as the flats are bare and of some aid. A stranger should not attempt this entrance.

Current velocities up to 3 knots on the flood and 2 knots on the ebb were observed in this channel. On the bar, flood and ebb velocities of about 1 knot were found setting northeastward and southward, respectively. South of the flats which extend westward from Egg Islands, a northwestward flood of ½ knot and a southeastward ebb of 1 knot were observed.

A ¼-fathom rock, in mid-channel about 1 mile northward of Point Bentinck, stands squarely in a swift current and is often indicated by surface ripples. It can be avoided by choosing a safe range on the northeast point of Hinchinbrook Island.

Boswell Bay, indenting the eastern end of Hinchinbrook Island, affords anchorage for small craft just inside the entrance. Massive **Boswell Rock** is 100 yards off the northern point. Immediately adjacent to the point itself is an under-cut rock. A very small rock is 100 yards outside of Boswell Rock.

To enter bring the 65-foot rock, brown in color and near the southern shore of the bay, just clear of the southernmost pinnacle inside the entrance, and steer **210°** on this range until abreast of Boswell Rock. Then haul southward a little and anchor when

the northeast point of Hinchinbrook Island is just shut in on the undercut rock. Flood and ebb velocities of 1½ knots and 2 knots respectively have been observed in the narrow entrance.

Hinchinbrook Island, southeast coast.—A mountain ridge parallels the southeast coast. The tree line is about 1,000 feet above sea level, and the summits of the islands are bare. The peaks are not prominent and from offshore they are difficult to identify.

The promontory between **Point Steele** and **Hook Point** is 2 miles broad and is faced with 200-foot bluffs; back of the bluffs is swamp land. Low land and sand beaches are adjacent to the promontory on either side. A boat can land in good weather on the northwest side of Hook Point and 0.5 mile northward of Point Steele. Reefs make out 0.4 mile from the promontory.

Northeastward of Cape Hinchinbrook, the seaward face of Hinchinbrook Island is steep, with rocky bluffs at the water, for 12 miles to an open bight with a broad sand beach on the west side of Hook Point.

Hinchinbrook Entrance is described later.

Chart 8551.—Prince William Sound is an extensive body of water with an area of about 2,500 square miles. It is very irregular in outline, with great arms spreading in all directions. The entrance, from Cape Hinchinbrook to Cape Puget, is 58 miles across, but is almost closed off by islands. The largest is Montague Island which extends well out into the ocean.

Many of the islands and peninsulas in the sound are low and tree-covered, but behind these rise eternal barriers of ice and snow. The **Chugach Mountains** stretch northwestward from the St. Elias Range and inclose the sound round through north and west. On the north shore glaciers come down to the heads of the bays.

The waters of the sound are very deep and are chilled by large amounts of ice from the surrounding glaciers. The meeting of cold water and the colder air from the mountains with the warmer waters and vapor-laden airs of the Gulf of Alaska causes changeable weather, and sudden wind squalls and thick fogs are common.

Tides.—In Prince William Sound high and low water occur about the same time as at Cordova. The diurnal range of tide at Cordova is about 12½ feet. Daily tide predictions for Cordova are given in the *Tide Tables*.

Glacial ice is rarely found in the open waters of Prince William Sound. Ice is discharged by Columbia Glacier, northward of Glacier Island, and is driven into the sound by northerly winds; it may be expected, depending on the winds, from Bligh Island to Bald Head Chris Island and as far south as Storey Island.

There are numerous discharging glaciers in Port Wells, the northwest arm of the sound, but the ice rarely reaches the entrance of the arm. There is a discharging glacier at the head of Blackstone Bay, but the ice is confined to the bay. Ice is discharged by Chenega Glacier on the southwest side of the sound, and occasionally drifts eastward as far as Point Helen and the north entrance to Latouche Passage.

During very cold weather ice sometimes forms in the arms of the sound which reach well into the mountains, and is at times heavy enough to impede navigation.

Vessels bound for ports on Prince William Sound from eastward use Hinchinbrook Entrance, between Montague and Hinchinbrook Islands, described later. Vessels approaching from southwestward use Elrington Passage, described later.

The offlying dangers in the approaches to the sound are Middleton Island, Wessels Reef, and Seal Rocks.

It has been found convenient to approach Hinchinbrook Entrance on a radio bearing using the radiobeacon station at Cape Hinchinbrook, and taking cross bearings on the radiobeacon at Cape St. Elias as an aid in clearing Wessels Reef and Seal Rocks. It is reported that the currents along this approach set southwesterly invariably, and occasionally with a velocity of 2½ knots; accordingly, extreme caution is required in approaching Hinchinbrook Entrance in thick weather.

Middleton Island, about 60 miles southwestward of Cape St. Elias, is 4.5 miles long in a north and south direction, and 1 mile wide. Its comparatively low grass-covered surface is difficult to pick up when making a landfall. An aviation light, 180 feet above the water, is shown from the northern end of the island; a radiobeacon is 0.4 mile south-southwestward of the light.

From a few miles offshore the island appears flat. The highest ground, on the south, has an elevation of 126 feet. A pinnacle rock at the extreme southern end is conspicuous from eastward and westward. The northern end slopes to a sand spit.

The eastern and southern sides of the island are bold hard-clay cliffs upon which great numbers of sea fowl nest. The steepest and highest section of cliff, on the west side, extends for 1 mile from the southern end. There is also a short section of cliff midway along the western shore.

Driftwood in large quantities was found buried in the gravel layer underlying the humus formed by decayed grasses. It is much in evidence along the cliff's walls at an elevation of 25 to 40 feet above high water, particularly on the east side of the island.

A small sand islet about 0.7 mile northwestward of the northern end is about 4 feet high. This islet and the northern spit change shape after each storm. The channel between the islet and the main island has a depth of 2½ fathoms in the middle, but strong rips occur and it is dangerous to navigate.

Middleton Island formerly was used as a fox ranch, but is now uninhabited and the few buildings are in a bad state of repair. The island is fringed with reefs and rocks and heavy kelp to a distance of 0.4 mile. Breakers occur at greater distances. Foul ground extends 2 miles southward of the island, terminating in breakers except in very smooth weather. Seaward of these breakers, the bottom falls off rapidly into deep water. Broken bottom extends 3 miles to the eastward, terminating in breakers which first begin to appear when a moderate swell is running. This side of the island should be given a wide berth.

The waters westward of Middleton Island are clear of offlying dangers, giving an easy approach to the anchorage from this direction. The best anchorage is about 1.2 miles west of the middle of the island in 10 to 12 fathoms, sand bottom. The anchorage furnishes fair protection from the prevailing easterly gales. A survey ship rode out several severe blows here. The tidal currents at the anchorage have an estimated velocity of 2 knots, setting northward along the shore on the flood and southward on the ebb.

The best landing place on Middleton Island, in the bight on the western side, is marked by the detached short section of cliff. At low water the shore 100 yards south

of this spot is calm, due to the protection of a small hooked gravel spit which bares at low water. The S. S. *Coldbrook* was wrecked about 0.5 mile offshore in this vicinity in 1942.

At the northern and southern ends of the island the current is irregular and sets eastward and westward. Tide rips are visible several miles to the south of the island, and to the northward in the vicinity of Fountain Rock.

Fountain Rock, 4 miles 350° from the northern end of Middleton Island, breaks only in heavy weather. The least depth found on it is 4½ fathoms although shoaler water may exist. It should be given a good berth.

Wessels Reef, awash at low water, 2 miles long northeast and southwest, is about 19 miles 001° from the north end of Middleton Island. Depths of 30 fathoms or more are close to the reef, and with smooth seas it can hardly be detected.

Wessels Reef lighted whistle buoy is moored in 162 feet of water on the north side of the reef.

Chart 8515.—Montague Island is high and mountainous and wooded to an elevation of about 1,000 feet. There are no distinctive peaks, although Montague Peak, the most northerly one of the range, can be distinguished from the southward. A striking characteristic of the eastern part of the north half of the island is the regularity of the succession of spurs reaching from the mountain range to the coast, where the spurs terminate in dirt bluffs with comparatively steep slopes. **Purple Bluff,** the southernmost of this series, is 20 miles from Zaikof Point. This bluff has a purple hue especially in the afternoon. Southward of Purple Bluff, a conspicuous valley, drained by a river, trends far inshore.

A constant current southwestward is reported along the east coast of Montague Island; see remarks on Currents in Chapter 2.

There are no settlements on Montague Island, but a number of fish traps are operated on the western shore. Brown bears are numerous on the island; they are said to be ferocious.

From Zaikof Point to Purple Bluff, the outer coast of Montague Island is unbroken and free from outlying dangers excepting Seal Rocks. About 3.5 miles southward of Purple Bluff, a spit extends 0.5 mile offshore, terminating in a group of rocks awash at low water.

Box Point, about 5 miles southward of Purple Bluff, is about 130 feet high and comparatively level, with steep bluffs, giving a rectangular appearance. Two box-shaped islets about 35 feet high are off the point, and foul ground extends 1.5 miles eastward. Convenient fair-weather anchorage can be found northward of Box Point.

Patton Bay indents the coast of Montague Island between Box Point and Wooded Islands. It is about 4.5 miles wide and, being open to the eastward, offers little protection from the prevailing easterly gales. A comparatively large river which empties into the bay has depths of 1 foot over the bar but deeper water inside. The bay has not been surveyed but no dangers have been reported. The small bight in the southern shore just inside the bay has depths of 3 to 10 fathoms, gravel bottom, and fair shelter.

Wooded Islands are 16 miles northeastward from Cape Cleare, the southwestern extremity of Montague Island. They extend from 1 to 3 miles offshore. The largest island is about 1 mile long and is wooded, flat-topped, and about 150 feet in height. **Tanker Island,** 0.4 mile eastward from the largest island, is 75 feet high. When viewed

from the southwestward it has the appearance of a tanker heading inshore, a small clump of trees showing as the smokestack and deckhouse. The northeasternmost island of the group is small and has a tree-covered summit. From the southwestward its profile has the appearance of a whale on the surface of the water, heading inshore. A reef was observed extending a short distance northeastward from this island.

Good anchorage for small craft may be had in southerly weather in the bight on the north side of the largest island. The bay is unsurveyed, but there are no known dangers. It can be approached from the south on a mid-channel course through the pass between the island and Montague Island, using care to avoid the reefs which project from each shoreline. These reefs bare at a minus tide. Anchor toward the head of the bight in 4 to 10 fathoms, mud bottom. This anchorage can also be approached from the eastward.

The area around Wooded Islands is unsurveyed, and there are many submerged dangers which usually are marked by heavy kelp. It should be approached with extreme caution.

The survey of the coast from Wooded Islands to Cape Cleare disclosed no outlying dangers, but there are areas of broken bottom near the shore and vessels are advised to give the coast a berth of 3 miles.

Jeanie Cove, a bight 10 miles northeastward from Cape Cleare, is exposed to the southward and affords no protected anchorage. There are numerous reefs and rocky patches in this vicinity which should be avoided if possible.

A rock bares 2 feet at low water 0.8 mile off the western entrance point, and a reef bares at low water 0.8 mile off Jeanie Point, the eastern entrance point. A distance of 1.8 miles separates the two dangers.

Jeanie Point is bold with rock cliffs. Back of the cliffs the land is timbered and rolling. A prominent detached rock is a short distance southward of Jeanie Point.

The first prominent point northeastward from Cape Cleare is bold, with eroded bluffs. A prominent pinnacle rock is about 100 yards off the point and deep water extends close to shore. The point is separated from the higher peaks back of it by a neck of land somewhat lower than the outside point.

Exposed anchorage can be had in the bight about 2 miles southwestward from the above point in 10 to 20 fathoms, sand and gravel bottom.

Cape Cleare is the southwestern extremity of Montague Island. It is gently rounding and consists of eroded bluffs with rocky beaches. Back of the cliffs the cape is timbered and undulating with the ground gradually rising to the mountain masses nearby. The headland 7 miles northeastward of Cape Cleare and the 1,900-foot peak near the headland are separated from the main ridge by a deep valley. When viewed from a position southwestward of the cape, the peak has the appearance of a detached conical island. A detached rock with a double head 25 feet high is about 75 yards off the southwest extremity of the cape.

A breaker was seen about 0.4 mile off the south side of Cape Cleare. The least depth found was 6 fathoms, but there may be less. Except for a fringe of rocks near the beach and the above breaker, there are no known outlying dangers. There is considerable uneven bottom, however, and dangers may exist. For this reason the cape should be given a berth of at least 1 mile. Strong tidal currents sweep around the cape and tide rips are frequently encountered.

The west and north coasts of Montague Island are described later.

Cape Cleare from the southwest, distant 1 mile

Chart 8520.—Hinchinbrook Entrance is about 6 miles wide, and clear with the exception of Seal Rocks.

Seal Rocks, off the entrance, are 6 to 7 miles southwestward from Cape Hinchinbrook and over 6 miles from Montague Island. They are two bare rocks, 30 and 37 feet high, surrounded by low rocks. Sunken rocks extend 1 mile northeastward and a short distance southwestward from them. The entire reef within the 10-fathom curve forms an obstruction nearly 2.5 miles long.

The tidal currents in the entrance set directly in or out of the sound. In Hinchinbrook Entrance, Montague Strait, and Latouche Passage, slack water occurs about the time of high water or low water within Prince William Sound; the mean velocity of the current at strength is about 1 knot. The ebb current running out against a large swell causes overfalls, especially in the deep water 2 or 3 miles eastward of Zaikof Point, which have been mistaken for breakers. There are also tide rips on the broken ground around Cape Hinchinbrook. The flood entering westward of Montague Island sets northeastward past Montague Point and causes rips between it and Johnstone Point.

Outside the entrance along the southeast coast of Hinchinbrook Island the current sets southwestward almost constantly. See remarks on current in Chapter 2. Current observations in Elrington Passage indicate an average velocity at strength of 1½ knots. For predicted times and velocities, see the *Current Tables.*

With a strong southerly gale and ebb tide, very heavy overfalls and tide rips occur in Hinchinbrook Entrance, and are very dangerous to small craft. Tremendous seas, steep and breaking, are sometimes encountered just outside the entrance. During heavy weather, there are tide rips and confused seas in the vicinity of Wessels Reef. Many halibut schooners have foundered between Cape St. Elias and Montague Island.

Cape Hinchinbrook is on the eastern side of Hinchinbrook Entrance, the principal entrance to Prince William Sound from the eastward.

A few rocky islets are close to the southeast side of the cape, and sunken reefs on which the sea breaks in a moderate swell are 0.4 mile southeastward and southward from the cape. The cape should be given a berth of over 0.8 mile.

Cape Hinchinbrook Light (lat. 60°14′.3 N., long. 146°38′.8 W.) is on the southwest point of Cape Hinchinbrook, 235 feet above the sea and visible 22 miles. The light is shown from a white square tower 67 feet high on the corner of a building. The fog signal is a diaphone. A radiobeacon is operated at the light station. Records over a period of 17 years show an average of 783 hours of fog per year at the lighthouse.

Zaikof Point is on the western side of Hinchinbrook Entrance and on the northeastern end of Montague Island. **Schooner Rock,** a pinnacle 75 feet high, is about 0.3 mile off Zaikof Point.

At the northern end of Montague Island are three prominent points forming

Zaikof and Rocky Bays, and low depressions run through from the heads of these bays to the western side of Montague Island.

Zaikof Bay is clear, but exposed to northeast winds. Anchorage can be selected with the aid of the chart along the southeast shore, from 2 miles inside Schooner Rock to the head, also on a bar with 10 to 15 fathoms which extends across the bay 2.5 miles from the head. A good berth is in 7 to 12 fathoms, depending on the swinging room required, in the cove on the southeast side 2.5 miles inside Schooner Rock, with Middle Point bearing 352°. It is between the western point and the middle of the cove, where two rocks bare at half tide close to shore. This anchorage is exposed to winds from north to east, and a swell makes in during southeast gales.

A small vessel can anchor in the cove on the southeast side 1.6 miles from the head, with shelter from northeast winds. Anchor close to the southern side of the point, about 200 yards from the short spit making out from it, in 8 to 10 fathoms. There is no swell, but the williwaws blow with great force over the lower land inside the point. When the wind hauls southeastward or southward the williwaws come from all directions, and it is well to shift anchorage farther from the spit. A small shallow lagoon is at the head of the cove, and the bank is steep-to.

Middle Point separates Zaikof and Rocky Bays. An old wreck of a steel steamer is grounded on Middle Point.

Rocky Bay is deep, and is exposed to northerly and easterly winds. A small vessel can anchor in good weather about 0.6 mile from the head and 400 yards from the northwest side, in 8 to 10 fathoms. Small craft can anchor in the lagoon, on the southern side 1 mile from the head, where a small area has a depth of 10 feet. When entering the lagoon care should be taken to avoid a reef, partly bare at low water, extending westward and northwestward from the north point.

Two ledges, bare at low water and marked by kelp, are about 0.5 mile off the southern side of Rocky Bay, 0.4 to 0.8 mile inside Middle Point. Kelp extends northeastward to a 3¾-fathom patch. Foul ground marked by kelp extends 0.3 mile off Middle Point.

A reef, the higher part bare at half tide, extends nearly 0.8 mile northeastward from Montague Point.

Port Etches, an inlet in the southwest end of Hinchinbrook Island, has secure anchorage, the best in Hinchinbrook Entrance, and is easy of access. The strongest gales are northeast and are not steady, but descend from the surrounding mountains in heavy williwaws of varied direction, and sometimes blow hard in Port Etches when comparatively light winds prevail outside. Fresh water can be obtained from streams in Garden Cove and on the northwest side of Constantine Harbor.

The best anchorage for large vessels is abreast Garden Cove, in 12 to 15 fathoms, muddy bottom. A flat extends 1.5 miles from the head, but can easily be avoided. The swell is quite perceptible in heavy southerly weather.

Garden Cove, on the southeast side 2 to 2.5 miles from the head of Port Etches, is the best anchorage for small vessels. **Garden Island,** wooded and having a break through it, is in the middle of the entrance; there is no safe passage northeastward of it. **Point Horn,** the southwest point of the cove, is the most prominent of the projecting points on the southeast shore of Port Etches.

To enter Garden Cove, pass 400 to 500 yards northward of Point Horn and steer **093°**. Anchor with Point Horn in line with the southernmost of the Porpoise Rocks,

and about 250 yards southeastward of Garden Island in 4 to 5 fathoms, sticky bottom. No ocean swell reaches the anchorage, but, as elsewhere in Port Etches, the williwaws are bad in easterly gales.

English Bay, on the south side of the entrance to Port Etches, is a bight about 0.4 mile wide. It can be used as a temporary anchorage by small vessels, but is exposed to the ocean swell in heavy weather and is open to northerly and westerly winds. Easterly gales blow in williwaws from all directions but do not raise much sea in the inner cove. The holding ground is good. The chart shows a sunken rock, position doubtful, in the center of the cove, and for that reason it should be used with caution.

The two bights on the southeast shore of Port Etches, 1.2 and 3.5 miles northeastward of English Bay, are rocky and should be avoided.

Porpoise Rocks, on the northwest side of the entrance to Port Etches, are three principal rocks about 48 feet high, with numerous small rocks among and eastward of them. The westernmost and largest is flat on top and grass-covered, and has a rock covered at high water 200 yards westward from it. Deep water is close to the rocks except on their northeast side where foul ground extends to Point Barber at Nuchek, a distance of 1 mile, with no safe channel between. Kelp surrounds Porpoise Rocks and extends 0.4 mile southwestward of Point Barber.

In good weather steamers have anchored off the shingle spit northwestward of Nuchek to land or receive passengers and freight. It is an uncomfortable anchorage because of the swell. The best anchorage is abreast the spit midway between the village and the rocky wooded knob on the middle of the spit, with the village bearing 095°, and the southeast one of the three largest Porpoise Rocks in line with the end of Hinchinbrook Island, bearing 191°, in about 10 fathoms, sandy bottom.

Nuchek is an abandoned Indian village on the southeast end of the shingle spit at the southwest end of Constantine Harbor.

Constantine Harbor is the lagoon on the northwest side of Port Etches, its entrance being at **Phipps Point.** It is suitable only for small craft on account of the very narrow entrance channel, which is 50 to 100 yards wide with depths of 18 to 19 feet. The tidal currents have considerable velocity in the entrance. The best time to enter is at high water, preferably near slack. The harbor is mostly shallow, but has an area 0.5 mile long and 0.4 mile wide with depths of 3 to 4¼ fathoms, sticky bottom, but exposed to williwaws.

On the northeast side of the entrance are three small rocky wooded islets with overhanging sides. Among them are rocks bare at low water, and 60 yards south-southeastward from the western islet is a sunken rock, all marked by kelp at slack water. The channel is close to the western islet, between the foul ground at the islets and a shoal of 9 to 10 feet extending 600 yards eastward from Phipps Point.

Temporary anchorage can be had about 0.5 mile southeastward of the rocky islets in the entrance of Constantine Harbor, in 10 to 12 fathoms, sticky bottom, but there is considerable swell in heavy weather.

Tides.—High and low water occur about the same time as at Cordova. The diurnal range of tide in Port Etches is 11 feet.

Bear Cape, steep and high, is the southwest end of the northwest mountain ridge of Hinchinbrook Island. A small cove, 3 miles northward of Bear Cape, has anchorage a little southward of the middle of the entrance in 8 to 10 fathoms, with shelter from easterly and southeasterly winds.

Shelter Bay has a shallow entrance with strong currents, and can not be used

even by small craft. Temporary anchorage, with shelter from offshore winds, can be had about 0.5 mile from shore, off the middle of the bight at the entrance of Shelter Bay, in 5 to 10 fathoms, sandy and muddy bottom. A shoal, with rocks in places, extends about 0.3 mile from the shore in the bight.

A vessel has anchored in 10 fathoms, about 0.3 mile northwestward of **The Seven Sisters,** and found the williwaws less strong with southeast winds than at the anchorage 3 miles northward of Bear Cape.

Temporary anchorage, with shelter from offshore winds, can be had southward of the sharp point, with two rocks about 30 feet high close-to, 0.4 mile southward of Johnstone Point. The anchorage is about 0.5 mile off the sand beach, in 10 fathoms, sandy bottom.

Johnstone Point, the northwest end of Hinchinbrook Island, is low and wooded, has a small bluff at the water's edge, and is marked by a **light,** 57 feet above the water and visible 8 miles, shown from a small red house on the pillar rock off the point. The obscured sector is from 256° to 052°.

Eastward of Johnstone Point the shore is low, and is broken by two shallow bays or lagoons. The easterly bay has secure anchorage for small craft. The entrance, 4 miles eastward of Johnstone Point, is westward of a large island, and leads between two rocks. The one on the west side is bare at half tide and is at the end of a sand spit making out from the shore; it should be given a berth of about 40 yards. The rock on the east side is bare at extreme low water. When inside the rocks, head for the cove in the southwest side of the bay, and anchor in about 3 fathoms, sticky bottom, about 250 to 300 yards from shore, and about halfway between the sand spit mentioned above and the south shore of the bay.

Anchorage can be selected off the shore, southwestward of Middle Ground Shoal, in 12 to 20 fathoms, soft bottom, with shelter from southerly and easterly winds.

Middle Ground Shoal fills the opening between Hinchinbrook and Hawkins Islands and extends into Orca Bay 3 miles. General depths are 2 to 6 feet on the shoal which is a danger for vessels entering Orca Bay from southward. A lighted bell buoy marks its northwest end.

Hawkins Island Cutoff, between Hinchinbrook and Hawkins Islands, is navigable only for small craft with local knowledge. It is full of shoals, and in its eastern end are extensive flats bare at low water and largely covered at high water. Strong tidal currents are in its narrower parts.

Orca Bay is the eastern arm of Prince William Sound, northward of Hinchinbrook and Hawkins Islands. From its entrance between Johnstone Point and Knowles Head, Orca Bay extends about 30 miles in a general easterly direction. Its principal importance is derived from the city of Cordova on Orca Inlet at its head. The southern side is clear with the exception of Middle Ground Shoal. The northern side is indented by large bays, which are of no present commercial importance.

Knowles Head, the southwest end of the mountainous peninsula between Port Gravina and Fidalgo Bay, is a steep massive headland, 1,502 feet high, with a prominent yellowish landslide down its southern face. There are numerous rocks close to shore and a 4-fathom shoal is about 3 miles westward of Knowles Head.

Red Head, 4 miles east-southeastward of Knowles Head, is a high hill with a long, low, wooded neck behind it.

Port Gravina has its entrace between Red Head and Gravina Point. Port Gravina is described later.

Gravina Point is low and wooded, and at its southern end is a bare spit with a large and a small clump of trees on it. It is marked by a **light,** shown from a white wooden house on white skeleton tower, 27 feet above the water, and visible 8 miles.

Gravina Island, low and wooded, is 1.5 miles northwestward of the point and 0.6 mile from shore. Anchorage with shelter from northeast winds can be had about 0.5 mile from shore between the island and Gravina Point, in about 10 fathoms.

Sheep Bay has its entrance between Gravina and Sheep Points, and extends northward about 7 miles. The bay has not been closely surveyed, the bottom is exceedingly broken, and vessels should proceed with caution. Foul ground extends 0.2 to 0.4 mile from the eastern shore for 2 miles northward of Sheep Point. Indifferent anchorage in 18 to 20 fathoms can be selected in the middle about 3 miles above Sheep Point and 0.4 mile below the point where the bay contracts. Proceeding with care and preferably at low water, small vessels can follow the deep channel among the islands in the upper part of the bay and select anchorage in 6 to 15 fathoms.

Sheep Point is moderately low and wooded at the end, and backed by high land. A wooded islet is 0.3 mile westward of the point with bare rocks between, and foul ground extends 0.3 mile southward and westward from the islet.

Hanks Island, small and wooded, is 0.8 mile eastward of Sheep Point and 0.5 mile from shore. **Gatherer Rock,** 0.6 mile 124° from Hanks Island, is a pinnacle with 13 feet over it and deep water close-to. Broken ground on which the least depth found is 8 feet extends 0.8 mile southward from Hanks Island, and is marked at its south end by a lighted bell buoy.

Simpson Bay is just eastward of Sheep Bay. The shores are fringed with numerous rocks and islets. In navigating the northerly arm, avoid the rock awash at extreme low tide 400 yards southward of the eastern entrance point of the inner part of the bay. Anchorage can be had at the head of the arm in about 15 fathoms.

The east arm of Simpson Bay is clear except near the shores. Good anchorage can be had on either side of the twin islands in the upper part of the arm in 12 to 15 fathoms.

Bomb Point is the eastern entrance point to Simpson Bay.

Hawkins Island is about 20 miles long and mountainous, with elevations up to 2,050 feet. **Canoe Passage,** dividing the island about 8 miles from its southwest end, is navigable only at high water. The northwest shore westward of Canoe Passage is low tundra with patches of trees. Northeastward of Canoe Passage the high land is nearer the northwest shore of the island; there are bluffs in places, and it is more densely wooded.

With the aid of the chart, anchorage can be selected in places along the northwest shore of Hawkins Island with shelter from easterly and southerly winds. The best anchorage is 0.2 to 0.4 mile off the spit at the south end of **Cedar Bay** in 9 to 12 fathoms, soft bottom. A round, wooded islet is at the north end of this spit, and a larger wooded one is 0.5 mile northward. Small craft, entering at high water and passing northward of the awash and sunken rocks inside, can anchor east of the spit, where there is a limited area with a depth of 7 feet.

Windy Bay is a small inlet on the northwest coast of Hawkins Island about 5 miles northeastward from Canoe Passage.

Chart 8525.—Channel Islands, wooded and nearly 1 mile long, are on the northwest side of the bay 6 miles above Sheep Point. The channel at the islands, 0.5 mile wide, is called **The Narrows.** A rock with 12 feet over it, 0.4 mile southwestward of the southwest end of Channel Islands, is marked by a buoy. The southeastern point of the larger island is marked by a **light,** 26 feet above the water and visible 8 miles, and shown from a white wooden house. The light is obscured from 093° to 242°.

Orca Inlet extends in a southerly direction from the head of Orca Bay to Mummy Island. From North Island to Spike Island, the western side of the inlet is shoal, and southward of Spike Island the inlet is largely blocked by flats. Northward of North Island it has depths of 25 to 30 fathoms, and a flat extends 1 mile from the head at its north end.

Salmo Point, the northern extremity of Hawkins Island, is just above Channel Islands. **Knot Point,** the northeast end of Hawkins Island, is 1.5 miles south of Salmo Point, with a bay 1.5 miles long and 0.5 mile wide between. This bay has depths of 20 to 40 feet, but a shoal with 9 to 12 feet over it lies in the entrance. The bay can be used as an anchorage by vessels able to cross the shoal.

Observation Island, 0.8 mile long, high and wooded, is 0.4 mile northeastward of Knot Point. A cable is laid in the channel between.

North Island, 0.4 mile long, low and wooded, is 1 mile northeastward of Salmo Point.

Shepard Point is a sandspit 1.5 miles eastward of North Island and 6 miles northward of Cordova. Ruins of a cannery and wharf are on the point. A marine railway capable of hauling out craft up to 65 tons in weight, 8 feet draft forward and 12 feet aft, is maintained by the Western Fish Co. There is telephone communication with Cordova.

The ruins of a cannery and wharf are on the south shore of Orca Inlet about 1.5 miles northeastward of Shepard Point.

From Salmo Point three channels extend to Orca Cannery and Cordova. The deepest channel, and the one used by the larger vessels, is north of North Island, and then follows the eastern shore with a least width of 350 yards and a ruling depth of about 26 feet, and is marked by buoys. Shoaling has been reported in the channel, rendering passage for vessels of 22-foot draft inadvisable during minus tides. A rock bare at three-quarters ebb is 650 yards northeastward of the north end of North Island; this rock is marked with a daybeacon.

Orca Channel, between North and Observation Islands, has a depth of about 18 feet and a width of about 300 yards between shoals with 10 to 12 feet over them. It is used by small vessels with local knowledge, but should be avoided by strangers. **South Rock,** bare at half tide, is 250 yards northward from Observation Island. **North Rock,** covered only at high water, is midway between Observation and North Islands.

Odiak Channel leads westward of Observation Island and southward between shoals that almost bare at low water. About 1.2 miles southward of the island, the depth is 16 feet. A Fish and Wildlife Service vessel, drawing 11 feet, reported, in 1954, striking bottom in this vicinity; the stage of the tide was not reported. The channel is marked by buoys.

At **Orca,** on the eastern shore 2.5 miles northeastward from Cordova, is one of the most modern canneries in Alaska. The wharf has a face 200 feet long, along which the controlling depth was 24 feet in 1951. Large vessels make port landings, the

dock heading being 224°. Docking on the flood is difficult as the current tends to set off the wharf.

Cordova (*pop. 1,165 in 1950; P. O.*) on the east shore of Orca Inlet opposite Spike Island, is one of the important towns of Southwestern Alaska. It has stores, hotels, a hospital, and all the conveniences of a much larger town in the States. The town employs a harbormaster.

A United States deputy marshal is stationed in Cordova; the Public Health Service maintains an out-patient office; and the Coast and Geodetic Survey has a chart agency in the town. For other Government services see *Appendix*.

Cordova is the supply and distributing point for numerous outlying fishing and fur-farming localities. Provisions of all kinds can be obtained; water and fuel oil are available at the wharves. Coal can usually be purchased in limited quantities, and in larger quantities if sufficient notice be given. Radio and cable communication is maintained with other Alaska ports and Seattle. Cordova is a regular port of call for freight and passenger steamers to and from Seattle. These vessels berth at Ocean Dock. There is daily air service with Anchorage, Valdez, and Juneau, and three times weekly with Yakutat. All other local Prince William Sound ports, and certain Kenai Peninsula and eastern Alaska Peninsula ports, are also scheduled.

The **City Dock** extends from the town of Cordova over the flats toward Spike Island. The 300-foot face had controlling depths of 20 feet alongside its northern half and 25 feet alongside its southern half in 1951. It is used chiefly by fishing vessels. There are several crab and clam canneries and a cold storage plant. Water is available without charge.

A small-craft basin, used as an operating base for commercial fishing, is on the south side of City Dock. A Federal project provides for a sheltered harbor for small boats, 10 feet deep and about 8.26 acres in area, protected by a north breakwater about 1,100 feet long and a south breakwater about 1,400 feet long. The controlling depth in the basin was 10 feet in June 1951.

A light is shown from a dolphin near the outer extremity of the southern breakwater. Several grids are maintained; the largest will handle craft up to 110 feet in length and 250 tons in weight. The U. S. Forest Service and the Fish and Wildlife Service maintain a float here. Several machine shops can handle minor engine repairs.

The **Ocean Dock,** 0.6 mile northeast of City Dock, is the former terminus of the Copper River and Northwestern Railroad which suspended operations in 1938. The dock has a 565-foot face with depths alongside ranging from 17 feet 165 feet from the south end to 19 feet at the north end. Water can be obtained. Wharfage charges are made.

Good anchorage can be had in the channel westward of Ocean Dock and Spike Island in 8 to 10 fathoms. Buoys mark the edge of the flats on the west side of the channel.

Spike Island is about 300 yards wide and wooded.

Orca Inlet southward of Cordova to Mummy Island is filled largely with flats. The channels through the flats are subject to change and have not been surveyed in recent years.

Tides.—The diurnal range of tide at Cordova is about 12½ feet. For predicted times, see the *Tide Tables*.

Currents, Orca Inlet.—The flood current enters the northeast end of Orca Inlet

and sets southwestward past Orca and Cordova. Off Orca the average velocity of the strengths is about 1 knot, but a flood of nearly 2½ knots has been observed. Strengths of flood and ebb occur about 1¼ hours before high and low water respectively.

The current sets directly off the face of Ocean Dock on both flood and ebb, due to the fact that the dock is built off a small point with a decided bight in the shore on either side.

Off Cordova the average velocity of the strengths is about 1½ knots. For predicted times and strengths see the *Current Tables*.

In the channel west of Big and Gravel Points, velocities up to 2 knots have been observed setting along the channel. A northeastward current can be expected at low tide and a southwestward current at high tide.

Chart 8519.—Port Gravina has its entrance between Gravina Point and Red Head. A 5½-fathom bank is near the middle of Port Gravina, between Gravina Rocks and St. Matthews Bay.

Gravina Rocks are about 0.8 mile offshore near the southeastern entrance point.

Comfort Cove is a small inlet on the southeast shore about 6 miles from Gravina Rocks. The entrance is narrow and the cove is suitable for small craft only.

Beartrap Bay is a narrow inlet near the head of Port Gravina. There are rocks awash and areas of broken bottom in mid-channel just within the entrance. About 1.2 miles from the entrance, an island nearly blocks the deep channel on the north side of the island. Depths of 28 to 30 fathoms, mud bottom, will be found in the upper basin.

The upper end of Port Gravina is deep, and terminates in mud flats which extend for 1.3 miles to the head of the bay.

Parshas Bay is a small bay on the north side of Port Gravina. Depths of 40 to 30 fathoms extend nearly to the head of the bay, but there is no suitable anchorage. An extensive area of rocks, islets, and foul ground extends about 1 mile southwestward from Parshas Bay.

Olsen Bay, 1.5 miles westward from Parshas Bay, shoals gradually from 20 fathoms at the entrance to mud flats at the head. In entering, the western shore should be followed at a distance of 0.5 mile or less to avoid the foul ground extending southwestward from Parshas Bay.

St. Matthews Bay, about 3 miles long and 0.5 mile wide, indents the northern shore of Port Gravina 5.5 miles northeastward from Red Head. The only known dangers are a reef extending 0.4 mile off the eastern entrance point and a rock awash 200 yards south of the prominent point on the west side of the bay, 1 mile within the entrance. Good anchorage can be had near the head of the bay in 14 fathoms, mud bottom.

Between Red Head and St. Matthews Bay is a series of lagoons. **Hells Hole** is the local name for the northeasternmost one. This shore should be given a berth of 0.8 mile or more.

Port Fidalgo, an eastern arm of Prince William Sound, has its entrance between Goose and Bligh Islands and extends eastward about 22 miles. There are abandoned mines on the shores of Boulder and Landlocked Bays and on the south shore of Port Fidalgo, between Irish Cove and Whalen Bay.

The waters of the main arm of Port Fidalgo are deep and free from outlying dangers. Toward the head are a number of small islets with good water close-to on the channel

sides. Vessels can navigate with safety as far as the southeasterly arm at the head of the bay by keeping over 0.3 mile offshore.

Goose Island, on the south side of the entrance to Port Fidalgo, is wooded, and has two prominent knolls. **Gull Island,** small and rocky, is midway between Goose Island and the shore. The passages between the islands and the shore should be avoided by strangers.

Goose Island Light (lat. 60°42′8 N., long. 146°43′6 W.), on the west side of the island, is shown from a small white house. The light is 41 feet above the water, is obscured from 151° to 313°, and is visible 8 miles.

Porcupine Point is a round wooded bluff, 894 feet high, with a low depression between it and Knowles Head. A rock, bare at low water and marked by kelp, is 350 yards north of the point.

Snug Corner Cove, on the northeast side of Porcupine Point, has good anchorage except with northwest winds, but the bottom is irregular and should be avoided by large vessels. A rocky patch with 4¼ fathoms, possibly less, lies in the entrance 0.5 mile off the northeast side of Porcupine Point. A low divide is at the head of the cove and another is across Porcupine Point.

To enter Snug Corner Cove, avoid the rock off Porcupine Point and follow the southwest shore at a distance of about 0.3 mile. Anchor about 0.3 mile off the bight in the southwest shore in 10 to 11 fathoms, soft bottom. Small vessels can find better shelter from northerly winds in the basin at the head of the cove, in a depth of 5 fathoms. Favor the southwest shore slightly when entering and anchoring. The shores of the basin should be given a berth of over 0.2 mile.

Two Moon Bay indents the southeast shore of Port Fidalgo. Low divides cut the peninsula from the heads of its two arms. Good anchorage can be had in the bay at the entrance to either arm, and vessels of moderate size can anchor in the arms, depths moderate and bottom generally sticky. A mid-channel course should be followed in the arms. At the head of the southeast arm is a basin trending southwestward where small vessels can anchor in 6 to 8 fathoms. The channel is between the west point and a reef bare at low water near the middle of the entrance.

Irish Cove, on the south shore of Port Fidalgo, is a narrow inlet about 1 mile long. Small craft can find secure anchorage in the widest part near its head in 5 fathoms. To enter, favor the eastern side of the narrows and then keep in mid-channel.

In **Whalen Bay** mud flats, bare at low water, extend across the bay for a distance of 0.5 mile from the head. Small vessels can enter the bay on a mid-channel course, and find anchorage in 7 to 10 fathoms 1 mile inside the entrance.

A group of islands 180 to 190 feet high is near the head of Port Fidalgo. A single islet lies about 900 yards southwestward of this group, the passage to the bight northward lying between the two. This bight is not recommended as an anchorage. Its head is obstructed by mud flats, and it is reported that strong williwaws are encountered.

The entrance to the east arm at the head of Port Fidalgo is 2 miles southeastward of the group of islands. A dangerous rock, bare at half tide, is 460 yards off the northeasterly entrance point. The head of the arm terminates in a narrow passage which opens out into a circular lagoon. It is reported that this passage is foul and should not be attempted.

Anchorage for vessels of any size, well sheltered, can be found in mid-channel 0.6

mile westward from the rock bare at half tide, described above. The anchorage is in 15 fathoms, mud bottom. Small vessels can find anchorage near the head of the southeast arm in mid-channel, 0.8 mile beyond the rock, in about 7 fathoms.

Fish Bay, on the north shore of Port Fidalgo 9 miles above Porcupine Point, is an indifferent anchorage and should be avoided by large vessels. The williwaws are very heavy with northeast winds, drawing through the bay from the high mountains above its head. A small wooded island is just inside the entrance and 0.2 mile from the west side. The channel is eastward of the island and is obstructed near the middle by a rock covered 3½ fathoms, possibly less. Rocks bare at low water 200 yards off the eastern point at the entrance. Anchorage can be had in the middle, 0.3 to 1 mile above the island, in 8 to 13 fathoms, with soft bottom in places.

Landlocked Bay is on the north shore of Port Fidalgo between Bidarka Point and **Graveyard Point.** Secure anchorage is afforded in the widest part above the narrows, in 14 to 15 fathoms, sticky bottom. The bay is easily entered during daylight, but the shadows cast by the hills at night obscure the narrow entrance, rendering it difficult for vessels not equipped with searchlights.

The islands on the eastern side below the narrows have covering rocks near them. Near the middle of the narrows is a rock with 12 feet over it. The channel is northwest of the rock, but the northwest shore abreast it should be given a berth of about 100 yards. There is a flat at the head of the bay with an islet at its lower edge. Water can be obtained from a fall on the south side of the bay southeastward of the old mine.

There are no commercial enterprises in this bay. The mines are abandoned and the wharves have fallen into ruins.

Bidarka Point is a wooded hill 912 feet high with a lower strip at its south end. A shoal extends 0.3 mile southward from the point.

Boulder Bay, between Bligh Island and Bidarka Point, is about 4 miles long and 2 miles wide at the entrance. The bay has several dangers, the depths are very irregular, and the anchorage is not desirable.

In the approach to Boulder Bay, a reef bare at the lowest tide lies 0.6 mile from Bligh Island. About 0.3 mile eastward of this reef is a spot with 2½ fathoms on it. A sunken rock, nearly awash at low water, is 0.4 mile from a point on the eastern shore and 1.6 miles northwestward from Bidarka Point. A reef, partly bare at low water, lies 400 to 800 yards southeastward from the small wooded island in the middle near the head of Boulder Bay.

Bligh Island, on the eastern shore of Prince William Sound, is 4.5 miles long, 3 miles wide, and mountainous. The southwest end of the island is a steep, wooded head, 1,634 feet high with yellow landslides near the water. On its northwest side are islands with foul ground between.

Reef Island, off the west side of Bligh Island, is 1 mile long, level and wooded, and has a single knoll, 338 feet high, in the middle. A rock, bare at low water, is 0.3 mile 208° from the southwest end of the island.

Bligh Reef, 0.8 mile long with depths from 7 to 28 feet, is marked at its south end by a lighted buoy. The passage between the reef and Reef Island is deep and is used at times by vessels rounding Bligh Island; the line of Busby Island Light and Rocky Point Daybeacon, bearing 023°, leads through the middle of the channel. The steamship *Olympia* was lost on Bligh Reef in 1910.

Busby Island, off the northwest end of Bligh Island, is 1.3 miles long, 275 feet

high, and partly wooded. Its western point is long, level, and wooded, and is surrounded by a reef to a distance of nearly 0.3 mile. The point is marked by a light.

Currents.—At the entrance to Port Fidalgo, north of Goose Island, the average velocity at strength of current is about ½ knot.

Tatitlek Narrows separates Busby and Bligh Islands from the main shore, and offers a more direct route for small craft between Port Valdez or Ellamar and points on Port Fidalgo. The channel has a depth of about 4 fathoms, but it is narrow with foul ground on both sides and should not be used by vessels in the absence of aids.

Tatitlek (*pop. 89 in 1950; P. O.*), an Indian village on the northeast shore at the southeast end of the narrows, has a Bureau of Indian Affairs school and a small store. The mail boat from Cordova calls twice monthly.

Virgin Bay is a shallow bight 0.5 to 0.8 mile long on the northeast shore of Tatitlek Narrows. There is little water in the bay, and on the north side of the entrance is a long reef bare at low water.

Ellamar (*pop. 46 in 1950*), on the northeast side of Virgin Bay, has a cannery with a wharf. The long, narrow inner part of the wharf crosses shallow water; the face is 170 feet long and has depths of 33 feet alongside. Large vessels make port landings on face heading of 150°. Small craft find shelter south of the cannery; the approach is marked by buoys.

Anchorage can be had 0.3 to 0.4 mile from the northeast shore of Tatitlek Narrows, and 0.5 to 0.8 mile northwestward of the old ore dock at Ellamar, in 12 to 16 fathoms sticky bottom.

Valdez Arm, the main northern arm of Prince William Sound, extends about 13 miles northeastward from Busby Island and **Point Freemantle** to the northern end of Valdez Narrows, then turns east for 11 miles to the town of Valdez at its head. The water is very deep and there are no outlying dangers except Middle Rock. Anchorages are few on account of the great depths.

Sawmill Bay, on the western shore of Valdez Arm 9 miles from Point Freemantle, has depths of about 6 fathoms in its 0.4-mile-wide entrance. Secure anchorage, with a clear width of over 0.2 mile, can be had behind the west entrance point, in 9 fathoms, sticky bottom. The south and west ends of the basin forming the anchorage are shoal, and a flat fills the head of the bay down to the narrows at the north end of the basin.

Rocky Point is the western end of the peninsula between Tatitlek Narrows and Galena Bay. A rocky grass-covered islet is 0.2 mile north of the point. A daybeacon is located on a small island west of the point.

Galena Bay is about 5 miles long in a general easterly direction. The depths are great throughout except for flats off the mouths of streams. Care should be observed in the vicinity of **The Narrows** about 3 miles from the entrance as that area has not been thoroughly surveyed. The only anchorage is about 0.2 mile southward of the islets on the north side at the head of the bay, in about 15 fathoms, bottom soft in places.

A group of rocky grass-covered islets extends 0.5 mile off the north point at the entrance of Galena Bay. Anchorage can be had in the middle of the cove northeast of the islets, in 10 to 12 fathoms, sticky bottom.

Jack Bay, on the eastern shore southward of Valdez Narrows, is 0.8 mile wide at the entrance and 0.2 to 0.4 mile wide in the upper 3 miles. Anchorage can be had in mid-channel or closer to the southern shore 1.5 miles inside the entrance in 10 to 12 fathoms, sticky bottom in places; also for small vessels in the entrance of the short arm,

northeastward of the islands in the bay, in the same depths. The passages northward of the islands and between the islands and the point eastward have not been thoroughly surveyed and should be used with caution. The first cove on the south side is foul. A small vessel can anchor about 300 yards westward of the islet near the lower end of the flat at the head, and the same distance from the south shore in about 15 fathoms.

Valdez Narrows is about 0.8 mile wide, with deep water and bold shores. A wooded islet is 300 yards from the western shore at the north end of the narrows. **Middle Rock,** a pinnacle barely covered at extreme high tides, is in the middle of the north end and is marked by a **light** shown from a white house on a cylindrical base, the lower part black and the upper part white. The light is 30 feet above the water and is visible 8 miles.

Entrance Point, 1 mile northward of Jack Bay, and **Entrance Island,** eastward of Middle Rock, are marked by daybeacons.

Port Valdez is the designation given the body of water extending from Valdez Narrows to the head of the bay.

Shoup Bay, at the face of **Shoup Glacier,** is closed by a sand spit nearly all dry at low water and over which the best depth is about 7 feet. This bay is often filled with floating ice, some of which escape into Port Valdez when the wind and tide are favorable.

Swanport is a small anchorage under **Jackson Point,** the west end of the easterly of two islands on the south side of Port Valdez. The bottom drops off abruptly, but a small vessel will have swinging room if anchored in 10 fathoms, 350 yards 242° from Jackson Point and the same distance from the south shore. This is the best anchorage between Valdez Narrows and Valdez. The cove inside the island is nearly filled by a flat on which vessels can be beached.

On the north shore of the anchorage is a small cannery. Depths at the wharf are reported sufficient for vessels of such size as normally call in this vicinity.

About 0.5 mile east of Jackson Point, another cannery wharf extends out from the main shore. It is reported to have a face 100 feet long. Just east of this wharf was **Fort Liscum,** an abandoned army post which was destroyed by fire. Ruins of the Midas mine wharf are 2.3 miles eastward of Jackson Point. The mine is not in operation.

Valdez (*pop. 554 in 1950; P. O.*), at the head of Valdez Arm, is at the southern end of **Richardson Highway,** which connects with Fairbanks, 374 miles distant. Open all year, the highway also serves Anchorage and Seward and links with the **Alcan Highway,** which connects with the States. Valdez has stores, hotels, schools, a hospital, and an Alaska Communication System radio station. The large asphalt and steam plant operated at Valdez by the Alaska Road Commission supplies a large part of the asphalt for the Alaska Highway system. Most commercial vessels entering Prince William Sound call at Valdez, and small local craft furnish transportation to other points on the sound. The diurnal range of **tide** is about 12 feet at Valdez; daily predictions are given in the *Tide Tables.* The average velocity of **current** at strength is about ½ knot in Valdez Arm west of Rocky Point.

The Valdez city wharf has two faces, each about 300 feet long; the northwest-southeast face has depths of 30 feet alongside, and the northface has 18 feet near the inner end. Large vessels dock port-side-to at the front face and starboard-side-to on the north side. The cannery wharf has a face about 200 feet long with depths of 30 feet alongside, and vessels dock either-side-to; the area off the northwest corner of the wharf has been dredged to give outgoing vessels swinging room.

The city wharf has a 70-ton crane, and petroleum products are available. Fresh water can be obtained at either wharf. Marine supplies are available locally, and repairs can be made to small craft.

A Federal project provides for dredging a small-boat and seaplane basin 12 feet deep in the tide flats between the Valdez wharves. The basin, used as an operating base for commercial fishing, had a controlling depth of 12 feet in June 1951.

Glacier Island is on the north side of Prince William Sound, westward of the entrance to Valdez Arm. It is mountainous and indented by a number of bays, of which Chamberlain Bay and Jackson Cove are the only ones that have been sounded.

Chamberlain Bay, on the south side of Glacier Island, is exposed southward but affords anchorage for small vessels about 0.4 mile from the head, in about 15 fathoms, muddy bottom. Rocks, partly bare at low water, extend 400 yards from the western side of the bay about 0.6 mile from the head.

Jackson Cove, on the west side of Chamberlain Bay, is a secure harbor for small craft. The entrance has a least width of about 50 yards and a depth of about 12 feet; at the narrowest part of the entrance favor the north side. The upper half of the cove has rocks on both sides, and a careful mid-channel course should be followed. Anchorage can be selected in the lower part of the cove, in 10 to 15 fathoms, also about 350 yards from the head, in about 5 fathoms. A divide about 75 feet high extends through to **Jackson Hole.**

Columbia Bay is westward of Point Freemantle. It is unsurveyed, but is known to be deep. **Columbia Glacier** discharges into the head of the bay at a rate which, though varying greatly, at times is sufficient to block passage north of Glacier Island for short periods. Sometimes the tide and wind will combine to fill all the bays on the north side of the island with ice. Large bergs may be expected at any time along the north shore from Point Freemantle to Fairmount Island. Summer excursion vessels often enter the bay to let their passengers view the glacier. Good small-craft anchorage may be had in **Emerald Cove** on the east side 1 mile northeast of **Elf Point;** fresh water can be taken from a small cascade at its eastern extremity.

Long Bay, 3.5 miles west of Columbia Bay, extends in a northerly direction for about 6 miles and at its head divides into two arms, each about 2 miles long. There are numerous islands and rocks that bare at various stages of tide. The bay is unsurveyed, but the bottom is known to be very broken. There are no apparent secure anchorages. The small cove on the eastern side 0.5 mile north of the entrance is foul.

Moderate-size vessels find good anchorage in depths of 8 to 12 fathoms, mud bottom, in the small cove just west of the western entrance point to Long Bay. Commercial fishermen use this cove as a transfer point. Just west of this cove is a small unsurveyed bay about 2 miles long with a depth of 4 fathoms, possibly less, near the middle of the entrance.

Chart 8517.—The northwestern part of Prince William Sound has long, deep bays and passages ranging in depth from 100 to 250 fathoms. The shores are mostly bold, rising abruptly to elevations of 2,000 to 4,000 feet, and timbered to about 1,000 feet. The rugged peaks are a gray rock formation, the higher ones being covered with snow the year around. There are many glaciers in this area, but most of them are inactive.

The bottom of the entire area is a bluish-gray glacial silt of very fine texture, and

often quite sticky even though the deposit is only a few inches thick over rock. In selecting an anchorage, care should be exercised to determine the true character of the bottom, for it is often difficult to get an anchor to hold on the underlying rock, even though the sounding lead shows a sticky bottom.

Naked, Peak, and **Storey Islands,** near the center of Prince William Sound, form a group about 8 miles long north and south, with a greatest width of 6 miles. They are 700 to 1,317 feet high, and are wooded to the summits.

The bottom in the vicinity of the islands, including the passages among them, is rocky and exceedingly broken. As a measure of safety it is advisable for vessels, especially large ones, to avoid areas with depths less than about 20 fathoms in the vicinity of the islands and to avoid the passages between the islands.

It is safer for vessels to keep in the deeper part of the passage between Naked and Smith Islands, preferably between the 50-fathom curves.

The best anchorages about Naked Island are in the southerly part of the large bay on the north side of the island in depths of 20 to 30 fathoms for large ships and in the easterly bight of this bay in depths of 10 to 20 fathoms for vessels up to 500 tons. The bottom is rock and mud.

Small craft can anchor in the small bight on the north side of Naked Island and in the small bight on the southwest side of Peak Island. They may also anchor in the bay on the north side of the eastern part of Storey Island with protection from all except northerly winds. Anchorage with depths of 6 to 10 fathoms on the east side of Naked Island affords protection only from the north and west.

Wells Bay (Chart 8551) is a large bay just eastward of Unakwik Inlet and separated from it by a narrow peninsula. The bay extends 8 miles northward, terminating in a forked head, and is about 2 miles wide at the mouth, narrowing to 0.6 mile wide 4 miles north of the entrance. The eastern side is indented by two bays. **Granite Bay,** 1.3 miles from the mouth, extends east-northeasterly about 2.3 miles and is about 0.3 mile wide at the entrance. A constricted passage about 100 yards wide is about a mile from its head. The sides are unusually bold. **Cedar Bay,** 2.5 miles from the mouth, extends about 3.5 miles in a northeasterly direction and averages 0.5 mile in width; an island near its head nearly blocks the upper part of the bay.

A group of islands and bare rocks between Granite and Cedar Bays extends westward to well past the center of Wells Bay. A prominent point juts out about 0.5 mile on the east side of this bay 1.3 miles north of the entrance; an island is on the southeastern side of the point. Temporary anchorage for moderate-size vessels may be had about 0.2 mile north of the point and 0.2 mile east of the west shore in 17 to 20 fathoms, mud bottom. The bay is unsurveyed, but it is known that the entrance is deep.

Fairmount Island, 1 mile south of the eastern side of Wells Bay, is 850 feet high. Buildings of a former fox farm are on the gravel beach on the southwest side but they are not prominent. The channel between the island and the mainland is about 0.6 mile wide at its narrowest part, but has numerous rocks that bare at various stages of tide; passage should not be attempted without local knowledge. Foul ground extends about 2 miles from southeast through south-southwest of the south shore of the island.

Unakwik Inlet (Chart 8551) is unsurveyed. Its entrance is 6 miles west of the west point of Glacier Island, 2 miles west of Wells Bay. The inlet extends about 18 miles in a northerly direction and averages 1.5 miles in width, narrowing to 0.5 mile at

its northern end at **Meares Glacier.** **Olsen Island** is on the western side of the entrance; between it and the western shore there is foul ground. A rock awash at low tide is reported about 1,200 yards east of the island. In entering, a 000° course heading for the bold point separating Unakwik Inlet from Wells Bay was found to carry depths greater than 100 fathoms. Those depths continued in mid-channel for 8 miles past the north tangent of Olsen Island.

A bar at the midpoint of the inlet, just north of Jonah Bay extends from shore to shore, blocking discharged glacier ice from passing south. The bar is marked by a small grass-covered islet about a third of the width of the channel west of the eastern shore. The best water over the bar appears to be just west of the islet, but the depth is not known. A reef bare at low water extends from the islet to the eastern shore. The ruins of an abandoned cannery are on the east shore just south of the bar. Only a few scattered wharf piling remain; the buildings have disappeared. A rock, depth unknown, lies at the entrance to the cove south of the cannery ruins.

The west side of the inlet is indented by two coves and two bays. **Olsen Cove** is east of Olsen Island. An unnamed cove, 1 mile north of Olsen Cove, affords good anchorage for small craft near its south shore just west of the two small wooded islets marking the southern entrance point. Depths shoal gradually from 25 to 8 fathoms, sand and gravel bottom. This anchorage is exposed to the northeast.

Siwash Bay, on the west side of Unakwik Inlet 6 miles north of Olsen Island, affords excellent anchorage in 10 to 15 fathoms, mud bottom, about 0.2 mile west of the entrance island. This bay is about 2 miles long, 0.5 mile wide, and has a wooded island near the south shore at the entrance; the deep channel is to the north of the island. Entering on a mid-channel course, the depth shoaled rapidly to 10 fathoms just north of the island, continuing at that depth until well inside. Sheltered from all directions, this anchorage appears suitable for large vessels.

Jonah Bay, on the west side 9 miles north of Olsen Island, is crescent-shaped and about 2.5 miles long. A glacial stream discharges at its head. The entrance is narrow and is nearly blocked by a small island. The best water appears to be south of the island, but the depths are not known.

On the east side of the inlet 10 miles north of Olsen Island is a series of small coves known collectively as **The Cow Pens.** A small ragged island lies about 0.5 mile offshore.

Eaglek Bay, midway between Unakwik Inlet and Esther Passage, is a large irregularly shaped bay extending 7 miles in a northerly direction. The southerly half is about 2.5 miles wide and the northerly half about a mile wide. There are two coves on the western side, each extending westward about 1.5 miles. One large and several smaller coves are on the eastern side. The shores are extremely ragged and there are many wooded islets, bare rocks, and rocks awash. The large cove on the eastern side has numerous good anchorages for small craft. The bay, however, is unsurveyed, and caution should be used because of the irregularity of the bottom. In entering, the best water appears to be about 0.2 mile west of the small prominent wooded islet 0.5 mile southwest of **Point Pellew.**

Axel Lind Island, 2.5 miles south-southwest of the entrance to Eaglek Bay, is 532 feet high. The buildings of a fox farm are prominent on a stretch of gravel beach on the north side. Passage to the north is deep, but there are several off-lying dangers.

Fishing craft use this passage and the one north of Bald Head Chris Island when bound for Port Wells via Esther Passage.

Squaw Bay, a mile east of Esther Passage and 1.5 miles north of Bald Head Chris Island, extends 2 miles in a northeasterly direction and averages 0.5 mile in width. Its eastern side is irregular, with numerous islands and rocks baring at various stages of the tide. The western side has no visible dangers and is unbroken except for a small cove about midway in. The cove affords excellent anchorage for small craft in 8 to 10 fathoms, sticky mud bottom. Fresh water may be obtained from a 15-foot waterfall at the head of the cove. The bay is unsurveyed. The best water appears to be near the western shore.

Lone Island, about 3 miles eastward of Perry Island, is 2.2 miles long, wooded, comparatively level, and 553 feet high. Foul ground extends nearly 0.5 mile northward. A 3¾-fathom shoal 1.4 miles southward of the island is marked by a lighted bell buoy.

Dutch Group consists of several wooded islands and bare rocks 4.3 miles north-northwest of Lone Island, the largest having elevations up to 150 feet. Foul ground extends 1.3 miles southward of the group to two prominent rocks about 5 to 10 feet high.

Fool Island is wooded and about 50 feet high. A rock bare at low water is 600 yards southward of Fool Island.

Egg Rocks are prominent bare rocks 1.5 miles westward of Fool Island.

Perry Island, in the northwestern corner of Prince William Sound, is wooded to a height of about 1,000 feet. It is prominently marked on its northeast side by a round peak 1,618 feet high, the summit of which is small, bare, and dome-shaped. The bays indenting the island are anchorages for small craft only, on account of the foul, rocky, and broken bottom.

Foul ground extends 0.5 mile eastward from the easterly end of Perry Island, and nearly 1 mile southeastward and southward from the southeast point of the island.

A light marks the southernmost point of Perry Island. A rock 14 feet high is about 150 yards south of the light, and a rock that bares at minus tides is reported to be about 100 yards farther southward.

On the east side of Perry Island Light is a bay that is known locally as **South Bay.** Good anchorage is available for moderate-sized vessels in depths of 10 to 24 fathoms, sand and mud bottom, in the cove at the head of the bay; the only known off-lying danger in the cove is a rock that is awash near low tide about 50 yards off the point on the eastern side of entrance. The buildings at the head of the cove are prominent from southward; the cove is a port of call for the biweekly mail boat from Cordova. South Bay should be entered with caution because of the irregularity of the bottom in the outer part.

East Twin Bay, indenting the north side of Perry Island, has anchorage for small craft on the southwest side of the head, in about 11 fathoms, the area of soft bottom being small. A mid-channel course should be followed until up with a prominent rock about 20 feet high, which lies near the middle 0.7 mile from the head. Pass northeastward of that rock and follow the northeast shore at a distance of about 150 yards. A rock with 1 fathom over it lies 450 yards 135° from the prominent rock and 275 yards from the northeast shore.

West Twin Bay, on the northwest side of Perry Island, is not an achorage on account of the rocky, broken bottom. Small craft entering should favor the northeast

side to the narrow part 1.3 miles from the head, and then favor the southwest side, passing westward of a rock, about 25 feet high, which lies near the middle 0.6 mile from the head.

From the point on the west side of the entrance to West Twin Bay a chain of islets and foul ground extends over 1 mile northward.

Perry Passage is between Perry Island and Culross Island, 2.5 miles to the westward. **Wells Passage,** between Perry and Culross Islands on the south and Esther Island on the north, has widths of more than 2 miles. The two passages have depths of 100 to 250 fathoms.

Esther Island is mountainous, wooded to a height of about 1,000 feet, and the summits are bare rock. The peak on the southeast point of Esther Island, and the sharp, twin peaks on the southwest point, are prominent. An unwatched **light** 48 feet above water and visible 8 miles, on a small white house, marks the southwest point of the island. Between this light and Esther Passage to the eastward are three unnamed and unsurvyed bays. The easternmost, 3.5 miles eastward of Point Esther Light, extends about 2 miles in a northerly direction. The entrance, 0.7 mile wide, is partly blocked by several wooded islets and bare rocks and rocks awash. The interior of the bay is dotted with islets and rocks.

The middle bay, 1.3 miles eastward of Point Esther Light, extends 1.7 miles north-northeastward, and averages about 0.2 mile in width. The entrance is constricted to a width of 0.1 mile. Toward the head are two rocks awash, and about a third of the way in is an islet. The shores are steep-to.

The westernmost bay, 0.7 mile eastward of Point Esther Light, extends 1.2 miles northwestward and averages about 0.1 mile in width. Fishing craft find indifferent anchorage near the east shore southeast of the narrowest part where the bay widens to its maximum of 0.3 mile. Rocks awash extend about 100 yards southeast of the point forming the northwest extremity of this anchorage bight. A sunken rock is near the head of the bay. In general, the shores are steep-to and depths are too great for convenient anchorage. About 0.5 mile from the head on the eastern side is a fresh-water stream that discharges from **Lake Esther.**

Esther Passage separates Esther Island from the mainland. The southern entrance, 7.5 miles east of Point Esther and 1.8 miles northwest of **Bald Head Chris Island,** is about 1.5 miles wide. The entrance is flanked by two wooded islets, one on either side. A rock awash at about half tide is about 0.3 mile east of the western islet. The bottom of the entrance is extremely irregular, varying in depth from 9 to 60 fathoms. Once inside, the water deepens rapidly to more than 100 fathoms for 2 miles or more. The passage trends in a northwesterly direction for about 10 miles, entering Port Wells about 8.5 miles north of Point Esther and 3.5 miles south of Golden; it is sharply constricted at its mid-point. The southern half averages 0.7 mile in width and the northern half, 400 to 250 yards. The passage is unsurveyed but appears to be clear; fishing craft use it regularly.

Esther Rock, 1 mile westward of **Point Esther,** is about 15 feet high and bare except for some grass. A rocky area with depths less than 50 fathoms surrounds Esther Rock, extending 0.2 to 0.5 mile from it. A rock, bare at lowest tides, is reported to lie about 0.8 mile off the south point of the bay, locally called **Granite Bay,** on the west side of Esther Island.

Culross Island is mountainous and wooded to a height of about 1,000 feet. An

unwatched light 40 feet above water and visible 8 miles, shown from a small white house, marks the northeast point of the island.

Culross Bay, on the north side of Culross Island, is clear but a poor anchorage. The prevailing northeast winds send considerable swell up the bay. A small area of mud bottom is found near the head; it appears to be a soft, thin layer over rock, and anchors do not hold well in it. There is an abandoned mine at the head of the bay.

Culross Passage, between Culross Island and the mainland to the westward, is used occasionally by fishing craft and cannery tenders. The narrow passage is unsurveyed but there are no known dangers other than those charted. The small bay on the east side a mile from the northern entrance affords good anchorage in depths of 3 to 8 fathoms, mud bottom; fresh water can be obtained from the streams at the head of the bay.

Chart 8551.—Port Wells extends northward from Wells Passage past the west side of Esther Island for 13 miles to **Point Pakenham** where it divides into **Barry Arm** to westward and **College Fiord** to eastward. Offshore depths in Port Wells are 100 to 200 fathoms.

Gravel bars, bare at low tide, block the western half of the entrance to Barry Arm. A depth of about 10 fathoms can be carried to deeper water in the arm by favoring the Point Pakenham shore.

Bettles Bay, on the west side of Port Wells 7 miles above Wells Passage, is reported free from dangers in mid-channel. Good anchorage is available in depths of 25 fathoms, mud bottom, in mid-bay 1 mile above the entrance, and 22 fathoms, mud bottom, in the northeast corner of the bay.

There is good shelter in the lagoon at the head of the bay for small craft. The lagoon can be entered by boats drawing not more than 6 feet, on the upper three-fourths of tide. Anchor in 5 to 10 fathoms, mud bottom.

Hobo Bay is on the west side of Port Wells just northward of Bettles Bay. A bar, covered about 3½ fathoms, extends across the entrance of Hobo Bay. Vessels entering follow the north side of the bay at a reported distance of 100 yards. There are several rocks bare at low tide along the southern shore of the bay. A grassy rock lies a short distance offshore. A vessel entering this bay has reported anchoring off the grassy rock in 5 fathoms.

Golden is a mining camp on the eastern shore of Port Wells, about 3 miles northeastward of Esther Passage. Steamers anchor 200 by 300 yards southward of the little island off Golden, in about 20 fathoms, rocky bottom. It is regarded as a poor anchorage and it is probable that the anchor will not hold with strong winds drawing down Port Wells. The area between the island and the shore is bare at low water.

Pigot Bay, on the west side of Port Wells just north of Passage Canal, has a rocky shore except at its head where sand and mud flats extend offshore about 0.2 mile and bare at low water. Bottom in Pigot Bay is heavy blue clay with good holding qualities. Depths near the entrance to Pigot Bay are too great for anchoring, but good anchorage is available for large vessels near the head of the bay in depths of 30 fathoms. A small area 1 mile from the head of the bay affords good anchorage in depths of 12 fathoms, but is a little difficult to find because of its limited extent. A similar area 0.2 mile from the head of the bay affords excellent anchorage for small vessels in depths of 13 fathoms.

Good anchorage is available for small boats in the northeast corner of the bay and in **Ziegler Cove,** on the north side of the bay immediately inside the entrance.

The ruins of an abandoned logging camp are at the head of Pigot Bay, and an abandoned mine is a short distance up the river that empties into the bay.

Point Pigot is the southeastern end of the peninsula between Pigot Bay and Passage Canal. Low valleys extend across the peninsula from Entry Cove and **Logging Camp Bay.** The south end of Point Pigot is a wooded, rocky headland with a ground elevation of 22 feet. This headland is joined to the mainland by a sandy neck 6 feet above high water. A **light** is shown from the southern tip of Point Pigot. A rock bares at lowest tides 0.8 mile eastward of the light. A similar rock is 200 yards west-northwestward of the light.

Immediately westward of Point Pigot is **Entry Cove** which affords good anchorage in depths of 13 fathoms, soft bottom, with swinging room for one vessel up to 200 feet in length.

Cochrane Bay empties into the south end of Port Wells opposite Point Pigot. The middle of the bay has depths of 100 to 200 fathoms and the shores are steep-to.

Surprise Cove is on the west side of Cochrane Bay just south of the entrance. The southwest arm of the cove appears clear of dangers with depths of 33 fathoms in the middle decreasing toward the head, near which indifferent anchorage is available in depths of 12 to 15 fathoms. The thin layer of glacial silt over the rocky bottom is poor holding ground. The western arm of Surprise Cove has a restricted entrance and can be entered only by small craft.

Blackstone Bay empties into the south side of Passage Canal southwest of Point Pigot. The middle of the bay has depths of 100 to 200 fathoms as far as **Willard Island,** a large island about 450 feet high near the head of the bay. A rock, bare at low tides, is 200 yards north of the island. There are no known anchorages in the bay.

Depths along the west side of Willard Island range from 50 to 80 fathoms. Glacial moraines, with little water over them at low tides, extend from both shores of Blackstone Bay to Willard Island midway of the island's length. **Blackstone Glacier** is active, and there are generally numerous small icebergs in the head of the bay.

Passage Canal has its entrance at the southwest end of Port Wells between Point Pigot and **Blackstone Point,** the northern extremity of the peninsula separating Cochrane and Blackstone Bays. The canal trends northwestward for 4 miles, then westward for 8 miles.

The principal approaches to Passage Canal and the canal itself have been surveyed and offer little difficulty for navigation with the aid of the chart. These waters, including the Knight Island group and both shores of Knight Island Passage, are characterized by rocky and exceedingly broken bottom. Differences of 50 fathoms between adjacent soundings are not uncommon, and it is probable that on the broken areas there may be less water and possibly dangers not disclosed by the survey. As a measure of safety, vessels should avoid broken areas where abrupt changes are indicated by the chart to depths less than 50 fathoms.

The canal is 1 to 1.5 miles wide, has great depth and is clear except in a very few places near the shores. The shores rise abruptly to elevations of 2,000 to 4,000 feet, and are wooded to an elevation of about 1,000 feet. The higher peaks are bare or snow-covered rock.

Chart 8521.—Decision Point is on the south side of Passage Canal about 3 miles westward of Point Pigot. A **light** is shown from the point.

Whittier Defensive Sea Area.—Executive Order 10361 of June 11, 1952, establishes and reserves for purposes of national defense an area to be known as Whittier Defensive Sea Area, which shall include all territorial waters of Passage Canal, Alaska, lying westward of a line extending from Decision Point true north to the north shore of Passage Canal east of Poe Bay.

Regulations. 1. No persons, other than persons on public vessels of the United States, shall enter the Whittier Defensive Sea Area, and no vessels or other craft, other than public vessels of the United States, shall be navigated into that area, unless authorized by the Secretary of Defense, or such officer as he may designate.

2. While in this defensive sea area vessels or other craft shall obey such instructions as may be issued by the Secretary of Defense, or such officer as he may designate. Movement of vessels or other craft within this area shall be at their own risk and shall be subject to supervision by controlling surface craft or aircraft. Controlling surface craft or aircraft shall be identified by a prominent display of the Union Jack.

3. The Secretary of Defense, or such officer as he may designate, with the cooperation of the local law-enforcement officers of the United States, including the Territory of Alaska, shall enforce the foregoing provisions of this order.

4. The Secretary of Defense, or such officer as he may designate, is hereby authorized to prescribe such regulations as he may consider necessary to carry out the provisions of this order.

5. Any person violating any of the provisions of this order shall be subject to the penalties provided by section 2152 of Title 18 of the United States Code.

The Secretary of Defense, pursuant to Executive Order 10361 and Sec. 202 (f) of the National Security Act of 1947, as amended, 5 USC 171a, made designation and delegation of authority effective August 5, 1952, as follows:

1. The Chairman of the Joint Chiefs of Staff shall exercise the functions, duties, and powers (including the power of designation) conferred upon me by Paragraphs 1, 2, 3 and 4 of said Executive Order 10361.

2. The Chairman of the Joint Chiefs of Staff, as he deems necessary, may designate any officer or employee, military or civilian, of the Department of Defense to exercise in whole or in part the authority conferred upon said Chairman of the Joint Chiefs of Staff under Paragraph 1, hereof.

3. The chairman of the Joint Chiefs of Staff shall have published in the *Federal Register* any designation made under Paragraph 2, hereof.

Shotgun Cove, on the south side of the canal 6 miles above Point Pigot, has depths of 30 to 35 fathoms, muddy bottom, through the middle. Foul ground fills the narrow parts of the head of the bay; approaching slowly, a small vessel can select anchorage just below this foul ground, in 15 to 20 fathoms.

The bight on the southeast side of Shotgun Cove is obstructed near the middle by a rock with 4 feet over it, which is marked on its north side by a buoy. Anchorage with a clear width of 0.3 mile can be had in the northeasterly part of this bight, in 15 to 20 fathoms, muddy bottom.

Trinity Point is on the south side of Passage Canal 3 miles west of Decision Point. Tiny **Emerald Island** is 0.4 mile west of Trinity Point. A **light (lat. 60°48′.4 N., long. 148°34′.0 W.)**, 39 feet above water and visible 8 miles, is shown from the outer end of a narrow point between Trinity Point and the island. Small **Emerald Bay,** which extends southwestward from the island, offers good shelter and anchorage for small craft in depths of 3 to 5 fathoms, mud bottom; the entrance is narrow but clear of dangers.

Anchorage in 15 to 20 fathoms, sticky bottom, can be had on the shoal which extends 0.3 mile from the south side of the canal at a point 1 mile above Emerald Island and 3.5 miles from the head. The least depth found by a careful examination is 29 feet at the southwest end of the shoal.

Small craft can anchor in the cove at the northwest end of the head of the canal, in 6 to 12 fathoms.

The **currents** in Passage Canal have little velocity.

Whittier (*pop. 627 in 1950*; *P. O.*) is the Alaska Railroad terminus on the south side of Passage Canal 1.5 miles from the head. Much of the military traffic for the interior moves through the port; commercial traffic is not handled. The town has a large sawmill, and emergency hospital service is available.

The Whittier railroad wharf, destroyed by fire in 1953, was replaced by installations that will accommodate conventional-size ships. Tugs are available for berthing. West of the railroad wharf are two T-shaped piers with depths of 35 feet alongside; gasoline, diesel oil, fuel oil, and fresh water are piped to these piers.

Vessels bound for Passage Canal and Whittier usually go by way of Perry Passage, even when coming from Valdez. Large vessels sometimes anchor near the 4½-fathom shoal 2 miles northeastward of the Whittier railroad wharf or in Pigot Bay, described earlier.

Chart 8517.—Port Nellie Juan extends 23 miles in a southwesterly direction from its entrance between Culross Island and the mainland to the south. **Applegate Island,** on the northwest side of the entrance, is low, flat, and wooded. A **light** is shown on the southeast side of the entrance.

The bay is divided into three right-angled reaches into which many glaciers discharge. The middle of the bay has depths of 100 to 250 fathoms to the head. In general, the bay is deep close to the beach. Numerous small inlets indent the shores of the bay.

Areas in front of the glaciers should be approached with care. The moraines are often of great extent, and the water over them shoals rapidly to a fathom or less. This is particularly true at the head of the bay where the water is shoal 0.2 to 0.5 mile from shore, then deepens rapidly to more than 50 fathoms.

Nellie Juan Glacier, at the head of the first reach in Port Nellie Juan, is the most active in the area, and the bight into which it discharges is often filled with small icebergs. **Blue Fiord,** the easternmost arm at the head of the first reach, extends about 4 miles in a southerly direction to the moraine of **Ultramarine Glacier.** The shores of the fiord are steep-to and depths in mid-channel are 50 to 100 fathoms.

Because of the great depths, there are no good anchorages in Port Nellie Juan. Indifferent anchorage for large vessels can be found in the bight just inside the point on the southeast side of the entrance. The southerly of the two coves in this bight has a wide, even, gravel shore that is excellent for beaching a small vessel.

Another indifferent anchorage is available for vessels up to 250 tons 0.7 mile southwest of the point between Blue Fiord and the bight into which Nellie Juan Glacier discharges. Depths of 18 fathoms can be found 300 yards off the entrance to a small indentation. The thin layer of mud over rocky bottom is only fair holding ground.

Small craft can find indifferent anchorage in some of the bights on the western side of the first reach. Good anchorage is available in the small bight between two larger ones along the north shore of the second reach; depths are 14 fathoms in the middle to 8 fathoms near the head, and the bottom is mud.

McClure Bay is a deep, narrow bay on the east side of Port Nellie Juan about 3 miles inside the entrance and extends in a southerly direction for about 5 miles. It is

from 80 to 100 fathoms deep, free from hidden dangers, and has bold shores. The upper part of the eastern arm at the head of the bay is foul. Vessels requiring little swinging room may anchor at the entrance of this arm in 18 fathoms, mud bottom.

The western arm is clear in mid-channel and affords perfect shelter in 15 to 20 fathoms for vessels up to 250 tons.

In the cove on the east side of McClure Bay near the entrance is Port Nellie Juan cannery and wharf. The main face of the wharf is 325 feet long. Large vessels dock port-side-to. There is 16 feet at the face of the wharf near the break, and 31 feet at the face near the corner. Fresh water is available. The Copper River Packing Company operates a radio station during the fishing season.

Two rocks with but little water over them are in the cove, one on the north side just east of the wharf, and the other in mid-entrance and marked by a buoy. The cove is so small that it affords anchorage only for small craft.

Main Bay, 4 miles southeastward of Port Nellie Juan, is deep and generally clear away from the shores, but affords no anchorage. Foul ground makes off both entrance points.

Falls Bay affords no anchorage and is open to the prevailing northeasterly weather. The main part of the bay is clear and deep. Rocks make out from the points at the entrance, contracting it to a width of 0.2 mile in which the least depth found is about 12 fathoms.

Crafton Island is a mile long and wooded. At its north end are rocky bluffs about 100 feet high, while its southern part is lower and has sandy beaches in places. Two low islets with sandy beaches are off its south end. An unwatched **light,** 70 feet above the water and visible 8 miles, is shown from a small white house at the northeast end of the island.

Crafton Island is surrounded by foul ground to a distance of about 0.5 mile on its east and south sides, where no sounding has been done. An exceedingly broken area extends over 2 miles southeastward from the island; a rock bares at about half tide, 1 mile southeastward from the south end of the islands. Vessels should avoid all broken areas in this vicinity where depths less than about 50 fathoms have been found.

The passage westward of Crafton Island is foul along the shore of the islands, and three rocks bare at low water in the middle of the south entrance. This passage should be used only by small craft, proceeding with care and preferably at low water. The channel favors the west shore from the south entrance until abreast the middle of Crafton Island.

The clearer channel to Eshamy Bay follows the shore northward from Point Nowell and has a width of about 0.8 mile. Differences of 50 fathoms between adjacent soundings are not uncommon in this locality. Foul ground extends 350 yards northward, and rocky broken ground of 14 fathoms, or possibly less, extends 0.6 mile northward from the south point at the entrance of Eshamy Bay.

Eshamy Bay, between Point Nowell and Crafton Island, affords anchorage only for small craft in 8 to 11 fathoms, in the small cove back of the islands and rocks in the southeast corner of the bay. The better entrance is through the middle of the deep, narrow channel between the small islands and the eastern shore. **Eshamy Lagoon,** with a saltery at its head, extends westward from Eshamy Bay, but its foul entrance with strong currents makes it inaccessible for strangers.

Point Nowell, 4.5 miles from Crafton Island, is a small wooded hook, about 50 feet

high, back of which the land rises abruptly to about 1,600 feet. The cove formed by the hook is about 300 yards in diameter and apparently clear, and affords anchorage for small craft in about 5 fathoms.

Knight Island is 22 miles long and very rugged, the peaks having elevations up to 3,261 feet. It is wooded to an elevation of about 1,000 feet, and above this is grass covered. Three mountainous, sparsely wooded islands, called Disk, Ingot, and Eleanor, extend 6 miles northward from Knight Island to Point Eleanor, the north end of the group.

Eleanor Island is about 4 miles long, has elevations up to 834 feet, and bluff, rugged shores. Broken ground extends 0.4 mile northward and northwestward from **Point Eleanor.** An unwatched **light,** 45 feet above water and visible 8 miles, shown from a small white house, marks Point Eleanor. The southern sector of the light is obscured from 301° to 091°. **Northwest Bay,** on the northwest side of Eleanor Island, is deep and clear. There is anchorage for small vessels in the south arm, about 0.4 mile from the head, in about 20 fathoms.

Near the eastern point of Eleanor Island, 2 miles southward of Point Eleanor, is a rocky islet with a few trees and with foul ground on its shore side. A bare rock 0.2 mile south of the islet should be given a berth of 0.3 mile. A group of prominent bare rocks, close together and about 12 feet high, is 0.6 mile off the southeastern point of Eleanor Island. Between them and Eleanor Island is broken ground with depths of 6 to 7 fathoms. A bare rock about 5 feet high is 0.6 mile southwest of the group; it should be given a berth of over 0.2 mile from the southeast.

Upper Passage, separating Eleanor and Ingot Islands, is generally deep and is suitable for small craft. **Block Island,** 1 mile long with its northern end joined at low water to Eleanor Island, narrows the southern part of the passage to about 400 yards. About 600 yards southeast of Block Island is a ledge with 5 fathoms over it, possibly less.

Entrance Island, 269 feet high and wooded, is 600 yards south of Eleanor Island and on the north side of the southern approach to Upper Passage. It is surrounded by deep water.

Sphinx Island, on the south side of the southern approach to Upper Passage and 0.4 mile east of Ingot Island, is 328 feet high and wooded, and has deep water around it. About 0.9 mile southeast of Sphinx Island is a rocky area with a least known depth of 18 fathoms.

Ingot Island. between Upper and Lower Passages, rises to 1,114 feet. A prominent wooded island 246 feet high is 0.2 mile off the northwest end of Ingot Island. Two small bare rocks, close together and nearly awash at high tide, are 0.5 mile southeastward from the south point of Ingot Island. Broken ground extends 0.5 mile southwestward from the rock to a ledge covered 3¾ fathoms.

Disk Island, 677 feet high and about 1 mile in diameter, is separated from Ingot Island on the east by **Foul Pass,** a narrow passage blocked by reefs. A landlocked bay with two narrow entrances makes into the southwest side of the island. An excellent anchorage for small craft can be found in the bay in 5 to 13 fathoms, mud bottom, good shelter from all wind. Enter through the south entrance which is 50 yards wide and has a least depth of 3 fathoms.

Lower Passage is a deep navigable channel, suitable for small vessels, between Ingot Island and the northern end of Knight Island. Broken ground, on which the least known depth is 6½ fathoms, extends into the passage 400 yards from the western

entrance point of Louis Bay. A rock bares at half tide 350 yards from the western shore, 0.8 mile inside the northwest end of the passage. From this rock to the head of the cove, 0.5 mile southward, is foul ground.

A rock covered 4½ fathoms, possibly less, is nearly 0.4 mile northwestward from the northern end of Disk Island. Another rock with 5 fathoms over it lies nearly 0.5 mile from Ingot Island and over 0.7 mile 042° from **Passage Point.** These rocks are well out of the usual track of vessels going through Lower Passage.

Louis Bay, indenting Knight Island about halfway through Lower Passage, affords anchorage for small vessels 250 to 300 yards from the head of either of its two arms, in about 15 fathoms. The western arm is clear so far as known.

The eastern arm of Louis Bay has a very broken bottom, and small vessels entering should proceed with caution. A rock covered 5 feet is 175 yards from the eastern shore and 350 yards northward from the entrance of the eastern arm. The arm is 0.1 to 0.2 mile wide; a ledge makes out about 30 yards from the wooded islet on the west side of the entrance. When inside the entrance, favor the western side to avoid three rocks which bare at lowest tides.

Herring Bay, at the northwest end of Knight Island, has no desirable anchorage, and is characterized by much foul ground and very broken bottom, with deep water close to the shores and dangers. Vessels navigating the bay should proceed with caution, especially in the vicinity of broken areas with depths less than about 20 fathoms, and preferable at low water. The entrance is clear except along the eastern shore, which is foul. A prominent rock about 4 feet high is near the center of the bay; the best channel to the upper part of the bay is eastward of the rock. Water can be obtained from a fall in the southeast arm.

Herring Point is the north end of a narrow ridge, about 1,000 feet high, forming the west side of Herring Bay.

Smith Island, near the center of Prince William Sound, is 3 miles long and about 0.5 mile wide. It is about 490 feet high and wooded, and is lowest at its southwest end. Broken rocky bottom extends 3 miles northeastward from Smith Island, and a lighted buoy is moored near a depth of 8 fathoms 1 mile from the island. An abandoned pier and two houses are on the north side of the island and 0.8 mile from the east end. The pier, in poor condition, is bare at low water.

Little Smith Island, close westward of Smith Island, is bluff, wooded and about 330 feet high. Rocky patches of 7 to 18 fathoms lie about 1.5 miles northward of the island. A rocky area of 9 to 10 fathoms extends 1 mile southward from the island.

Seal Island is about 0.4 mile in diameter, wooded, about 350 feet high, and rounded in outline. On the northwest side of the island is a **light** 45 feet above the water and visible 8 miles. Close to the east end of the island are two bare rocky islets, and about 200 yards off the west end is a small rock which bares 8 feet at low water.

Rocky, broken areas extend 1 mile northeastward and northward from Seal Island. **Pennsylvania Rock,** 1 mile northward of the island and marked by a buoy, is covered 2¼ fathoms. About 0.8 mile southwestward of the island is a 5¾-fathom rocky area.

Vessels generally use the channel between Seal and Smith Islands rather than the channels to the southeastward.

Chart 8515.—The western entrance of Prince William Sound between Cape Cleare and Cape Puget is divided into a number of passages between the islands. They are

described in the following order: Montague Strait, Latouche Passage, Elrington Passage, Prince of Wales Passage, and Knight Island Passage.

Montague Strait, between Montague Island on the east and Latouche and Knight Islands on the west, is the broadest of the passages westward of Montague Island leading from the sea to Prince William Sound. The strait affords an unrestricted channel 4.5 miles wide. Below the northern end of Latouche Island the strait is seldom used as vessels generally proceed via Elrington Passage. Above that point the regular steamer route to the eastern part of Prince William Sound is by way of the passage westward of The Needle, Green Island, and Seal Island, thence through the passage between Seal and Smith Islands.

Cape Cleare is described earlier.

The western side of Montague Island is heavily wooded to an elevation of 900 feet. Generally rugged with many deep, steep-walled recesses near its high levels, it retains numerous patches of snow and ice throughout the summer months.

San Juan Bay is an open bight just northward of Cape Cleare. The sand beach at the head of the bight is backed by a large tidal swamp which drains through a small stream. Landings in this bight are usually difficult due to the surf.

Stair Mountain, just north of San Juan Bay, is a prominent conical-shaped peak 1,595 feet high, which shows unmistakably from the south and southwest. The summit is bare; the slopes have a scattering growth of trees.

Point Bryant is a rounding point of high eroded bluffs, about 3 miles north of San Juan Bay. A rock, awash at extreme low tide, is about 300 yards off the point. The rocky shore is fringed with a heavy growth of kelp.

Macleod Harbor, on the east side of Montague Strait, 6.5 miles northward from Cape Cleare, is free from dangers and is an excellent anchorage, protected from all directions except southwest. **Point Woodcock,** at the northern entrance, is a rocky bluff about 50 feet high and wooded on top. The point is fringed by a rocky, kelp-covered reef. The southern entrance point is gently rounding. The head of the harbor is marked by extensive mud flats.

Large vessels entering favor the northern shore and anchor in 14 to 17 fathoms, muddy bottom, about 0.3 mile off the shingle beach 1 mile from the head of the bay. In making this anchorage, care should be taken to avoid the mud flats which come up very sharply. Severe williwaws draw down through Macleod Harbor, but the holding ground is good and the anchorage is safe. Small craft find anchorage farther in close to the northern shore and to the head of the bay in 4 to 10 fathoms, mud bottom. Mooring piles are driven near the head of the harbor and may be used by small craft.

Hanning Bay, indenting the west side of Montague Island, is 13 miles northward of Cape Cleare. It is a good anchorage with easterly winds. Shoals extend nearly 0.4 mile off from the streams at the northeast and southeast parts of the bay, and a reef extends 0.2 mile from the point on the eastern side. The best anchorage with southerly winds is about 0.4 mile from the south side, with Danger Island open from the south point at the entrance bearing 258°, and **Point Bazil,** the north point at the entrance, bearing between 005° and 348°, in 15 to 16 fathoms, sticky bottom. With northwest winds, a better berth can be had 0.3 to 0.4 mile off the cove on the north side, 0.6 mile inside the entrance, in 5 to 8 fathoms, hard bottom. When entering, give the points at the entrance a berth of 0.4 mile.

The Needle is a flat-topped, steep-sided rock about 45 feet high, in Montague Strait 3.8 miles from the nearest point of Montague Island and 5.5 miles eastward from Point Helen. A depth of 4¾ fathoms is 1 mile northeastward of The Needle.

Little Green Island, heavily wooded and 100 feet high, is 6 miles northward of The Needle. A fringe of rocks surrounds the island. A kelp-marked reef, baring at various stages of the tide, extends 1 mile off the southern end of the island and terminates in a 1-foot rock.

A rock bares 8 feet 1.5 miles eastward of Little Green Island. The rock is close to the 50-fathom curve, and has little kelp on it.

Green Island, between Knight Island and the northern part of Montague Island, is wooded and about 6 miles long. The highest elevations, 494 to 520 feet, are near the eastern side of the island, and slope gradually to the north and south ends. Very foul ground surrounds the island. Two wooded islets 100 feet high, several small islets, and numerous rock and shoal spots are along the northwest shore of Green Island. These include a prominent outlying rock, 25 feet high, 1.2 miles off Putnam Point. A small rocky islet is about 1 mile southwestward from the sharp point forming the western end of Green Island.

Gibbon Anchorage is a secure harbor for craft up to 500 tons in the cove about the middle of the northwest side of Green Island. Passing 600 yards southward of the outlying prominent 25-foot rock which lies 1.4 miles westward of the cover, steer **126°** for **Putnam Point,** the prominent wooded point with a small bluff on the southwest side of the cove. When about 0.2 mile from shore, steer more eastward and pass midway between Putnam Point and the rock, awash at high water, 400 yards northward of the point. Anchor in the cove southeastward of the rock, in 6 to 8 fathoms. A rock bares at half tide 175 yards northeastward of the point west of Putnam Point, and the southerly of two rocks, bare at extreme low water, lies 0.6 mile 133° from the outlying bare rock.

Passage between Green and Montague Islands.—The middle of the eastern side of Green Island is characterized by a prominent sand and gravel point, sparsely wooded. A group of five rocky islets, the highest being 62 feet and tree covered, is 1 mile off this point. A sand spit, terminating in low rocks, extends 0.4 mile northeast from the group.

Between the 62-foot islet and Montague Island, the bottom is very irregular. Several 5- to 10-fathom spots on which there may be less water were found in this area. The best water apparently is about 0.3 mile southeastward of the islet.

Port Chalmers, on Montague Island 5 miles south of Graveyard Point, lies southward of **Gilmour Point** and extends 1.2 miles in a northeast direction. At its northeast end are two small lagoons, the outer one having about 3½ feet of water along its southerly shore.

A small wooded island, 165 feet high, is 1 mile southwestward of Gilmour Point. A rock 10 feet high is southeast of the island. A kelp-marked rock baring 4 feet and a 1¼-fathom rocky shoal are about 0.5 mile northward of the island.

The approach to Port Chalmers is between the island and the 1¼-fathom shoal. A group of kelp-marked rocks baring 3 feet is 0.4 mile inside the island, on line with the head of the port. The group is passed to the northward in entering. A reef, covered at extreme high tide, makes out 150 yards from the northern shore, 0.6 mile northeast of Gilmour Point.

Anchorage for small craft can be had in all weather at the head of Port Chalmers,

between the reef and the lagoon entrance. There is excellent holding bottom of mud in 6 to 10 fathoms of water. A range (astern) of the 62-foot islet off Green Island with Horn Mountain on Knight Island, course **080°**, can be used to pass 400 yards northward of the 165-foot island and avoid the dangers in the approach. The rock 0.4 mile northeastward of **Wilby Island** bares 2 feet at low water.

Small cannery tenders frequently anchor about 0.2 mile inside the first island southwestward of the 165-foot island in 12 to 14 fathoms. To enter this area pass midway between the two islands. On the upper half of the tide small craft drawing not more than 5 feet enter mid-channel into the lagoon at the head of the port; they can lay in the lagoon in any weather and at all times except during extreme ranges of tide.

The small bay just north of Gilmour Point offers good protection and anchorage in 2 to 8 fathoms, mud bottom. The entrance is clear of dangers and a mid-channel course is followed in.

Stockdale Harbor, just south of **Graveyard Point,** has two small tree-covered islets in the southern part of the harbor. Its northern half is clear except for a kelp-marked 1¼-fathom shoal 0.5 mile off the northern entrance point. Anchorage can be had in 15 to 20 fathoms near the first bight in the north side of the harbor. Small boats can anchor at the head of the harbor. The chain of detached shoals and rocks extending along the middle of the harbor northward of the islets, must be avoided.

A 2¼-fathom rock, lightly marked by kelp, is 1.3 miles southwest of Graveyard Point.

Montague Point is the large rounded northern end of the west side of Montague Island. The shoreline is foul.

A rock, 2 feet high, is the highest part of the extensive, kelp-marked reef area midway between Seal and Green Islands. The area contains several rocks almost bare at low water and should be avoided. At the northeastern end of this area is a 4½-fathom spot 3.5 miles 162° from the summit of Seal Island. Detached from the area's western limit is a 2½-fathom spot 5.2 miles 196° from Seal Island summit.

The passage between Seal Island and the reef area has ample depth of water for a width of about 2 miles. The broken bottom within 1.5 miles of Seal Island and that adjacent to the reef area should be avoided.

The passage between the reef area and Green Island has ample depth for a width of about 1 mile. The 9-fathom spot and the broken bottom in its vicinity, about 2 miles northwestward of Green Island, should be avoided. The 25-foot rock 1.2 miles off Putnam Point is a good leading mark in entering the passage from the northward. Heading for this rock on course **222°** until about halfway through the passage, a vessel will be assured of deep water.

Latouche Island, on the western side of Montague Strait, is 10 miles long and has elevations up to 2,255 feet. It is wooded to an elevation of about 500 feet, and above this is covered with moss and bushes, except the highest peaks, which are bare. The eastern shore is precipitous and the 100-fathom curve is less than 0.3 mile off in places.

Danger Island, 1.4 miles southward of Latouche Island, is 0.4 mile in diameter, low and wooded. There is a prominent lone tree on the southeast point of the island which is surrounded by a complex group of reefs and rocks. The channel between Danger Island and Latouche Island has a least known depth of 2¾ fathoms. This channel is used by fishing boats but is not recommended for large vessels.

Knight Island Passage is described later.

Point Helen, the southeastern extremity of Knight Island, is marked by a **light**

35 feet above the water and visible 8 miles. The light is shown from a white wooden house and is obscured from 066° to 227°.

Hogan Bay, on the east side of Knight Island, 2.5 miles northward of Point Helen, has anchorage in the middle, 0.6 mile inside the entrance, in 16 to 20 fathoms. The bottom is rocky and uneven, and the anchorage is exposed eastward. Small craft can pass through the narrow channel at the head of the bay and find secure anchorage in the inner cover in 12 fathoms or less. The spit on the west side of the channel is bold, and should be favored when entering the inner cove.

Snug Harbor is on the east side of Knight Island, 6 to 7 miles northward of Point Helen. Its western arm is 0.3 mile wide and clear near mid-channel, and has secure anchorage at its head in 12 to 17 fathoms. Anchorage, exposed to northerly and northeasterly winds, can be had in the broad cove on the south side of the harbor in 12 to 15 fathoms, rocky bottom.

Discovery Point, the southern entrance point to Snug Harbor, is bold and high.

Marsha Bay, 5 miles northward of Discovery Point, has a crooked narrow entrance, and is suitable only for small craft. The depths are great except at its north end, where anchorage can be selected in 15 fathoms or less. The entrance is between two sunken rocks, and the channel then leads southward of the islands which choke the mouth of the bay. Enter in mid-channel between the outer island and the south point of the bay on a **252°** course, then favor the south point of the islands when passing through the narrowest part of the channel.

Manning Rocks are about 2 miles off the entrance to Bay of Isles. They are three pinnacles, with depths of 5, 9, and 23 feet, on the south, middle, and north, respectively; the distance south to north being 0.9 mile. They are surrounded by deep water and are the worst dangers on the east side of Knight Island. Between Manning Rocks and the foul ground in the entrance to Bay of Isles the bottom is very irregular, although the least depth found is 8 fathoms. This area should be avoided.

Bay of Isles, on the eastern side of Knight Island, has numerous islets and pinnacle rocks, sunken and awash, and is suitable only for small vessels proceeding with caution and preferably at low water. There is secure anchorage in the **South** and **West Arms,** the latter being easier of access. The depths in the bay are great, and the deep water extends close to the rocks, which are not marked by kelp.

To enter Bay of Isles, steer **260°** with Seal Island astern, and pass in mid-channel northward of the islets in the middle of the bay. Continue the course 0.5 mile past the islets, then steer **221°**, and pass in mid-channel westward of the islands near the southern shore. Then steer about **269°**, and keep the northern shore distant about 150 yards in entering West Arm. Anchor in the middle of the broad part of the arm in 9 to 11 fathoms.

Foul ground extends 0.5 mile southeastward from the northern point in the approach to Bay of Isles. At the end of the foul ground is a rock with 10 feet over it, 0.9 mile 073° from an island near the northern shore.

Chart 8523.—Latouche Passage has its seaward entrance between Danger Island and Elrington Island. The entrance bar, with depths of 6 to 11 fathoms, has sometimes been crossed by steamers proceeding westward from Latouche. The recommended steamer route, however, is by way of Elrington Passage and the northern part of Latouche Passage.

Occasionally with westerly winds large pieces of glacial ice drift into Latouche Passage from Knight Passage.

From Point Grace to the north end of Elrington Island, a distance of 5 miles, Latouche Passage is about 1.8 miles wide, with deep water. A wooded islet, with a grass-covered rock close to its north end, is near **Evans Island** and 0.8 mile northward of **Bishop Rock.**

Latouche Passage, east of Elrington Island, is 7 miles long and 0.8 to 1 mile wide with depths under 30 fathoms in most places. Anchorage can be selected nearly anywhere in this channel where the depth is suitable. Avoid the eastern part of the passage in the vicinity of the crescent-shaped islet 2.2 miles southwest of Chicken Island. Much kelp lies in the passage back of the islet.

Latouche, on the west side of Latouche Island 2.3 miles southward of **Point Grace,** is the site of the abandoned copper mine of the Kennecott Copper Corp. The buildings were in ruins in 1951 but they were still prominent from seaward. A commercial cold storage plant is the only remaining activity.

The wharf is not being maintained and is not safe to approach nor secure to. The face of the wharf is marked at its southern end by a red light, in the middle by a white light, and at the northern end by a green light. On the southern side of the wharf is a float-landing with a least depth of 10 feet alongside. A reef, 300 yards northward of the wharf, is marked by a daybeacon. Several sunken rocks, about 80 yards north of the wharf, have a least depth of 7 feet over them. These rocks are inshore from the wharf line and can be avoided by using the face of the wharf as a danger range. Passenger steamers call at Latouche only when traffic warrants.

The cove southward of the wharf is shoal, and a reef makes out 100 yards from **Powder Point.** Anchorage can be had 300 to 500 yards northwestward from the wharf in 10 to 15 fathoms.

A rock with 2½ fathoms over it lies 300 yards off the point next southward from Powder Point.

Chicken Island, 3.5 miles southwestward of Point Grace, is separated from Latouche Island by a pass 350 yards wide with a depth of only 4 feet.

Horseshoe Bay is on the west side of Latouche Island, 4.5 miles southwestward of Point Grace. Its southern half is shoal; small craft, entering close to the north point of the bay, can anchor in its north end in 18 to 20 feet of water. Just northward of the south point of the bay is a rock, covered at high water. Vessels can anchor about 0.3 mile off the entrance in 16 to 18 fathoms.

Elrington Passage, westward of Elrington Island, is the passage in general use by vessels proceeding between Prince William Sound and points to the westward. It is 8 miles long, 0.5 to 1 mile wide, deep and clear. Anchorage is not easily found on account of the great depths.

The aids to navigation include a light and daybeacon marking the entrance between Elrington Island and Bettles Island, a light marking the turn at the south end of Evans Island, and Lonetree Point Light marking the entrance from seaward. A grass-covered rock, about 10 feet high and with some brush on its summit, is near the angular mountain point on the east side of the passage, 4 miles from the north entrance. In the southeast angle of the passage, 1.4 miles southward of the grass-covered rock, anchorage can be had in 5 to 20 fathoms, muddy bottom, depending on the swinging room required.

An island 0.6 mile in diameter and 500 feet high is in the bend at the south end of

the passage close to Elrington Island, from which its southeast point is separated by a narrow pass dry at low water.

A pyramidal pinnacle rock, about 8 feet high and with grass on top, is about 250 yards off the north point at the southwest entrance to Elrington Passage.

Currents.—The average velocity at strength of current is about 1½ knots. Predictions for Elrington Passage can be obtained from the *Current Tables*.

Elrington Island.—The southwest end of the island, 2.5 miles across in a north and south direction, has three prominent points between which are North Twin and South Twin Bays.

South Twin Bay is free from dangers and affords convenient anchorage in 17 to 20 fathoms. The bottom is hard, with patches of sand and gravel. It is exposed to westerly and southwesterly winds.

North Twin Bay is free from dangers except for a rock awash at low tide about 250 yards off the south shore 0.5 mile northeastward of the southern entrance point. Anchorage can be found in the center of the bay in 13 to 17 fathoms. Of the two bays, the best shelter is usually found in the southern one.

Point Elrington, the southwest end of Elrington Island, is a small hill, 515 feet high and wooded, with cliffs at the water, and is joined to the island by a sand and gravel neck just above high water. A hill 1,050 feet high, 1.4 miles eastward of the point, has a low divide about 100 feet high at the east end. The point is marked at its westerly end by **Point Elrington Light (lat. 59°56′.2 N., long. 148°14′.9 W.),** 85 feet above the water and visible 12 miles. It is shown from a white house; the obscured sector is from 197° to 004°.

The north point at the southwest end of Elrington Island is a hill 1,116 feet high and 1.4 miles long. At its southeast end it is connected with the island by a long, low, wooded neck.

Lonetree Point, the most northerly point at the western extremity of Elrington Island, is marked by a prominent lone tree and a **light,** 34 feet above the water and visible 8 miles. It is shown from a white house on a skeleton tower; the obscured sector if from 280° to 063°.

On the southeasterly end of Evans Island is a **light,** 25 feet above the water and visible 7 miles, shown from a red house; it is obscured from 084° to 249°.

Sawmill Bay indents the east side of **Evans Island** near the northern entrance to Elrington Passage. Considerable development has taken place in the bay. Five wharves, including the oil wharf at Port Ashton, are maintained by various cannery and saltery companies. The San Juan Cannery and Reduction Plant has a wharf with a face 200 feet long, alongside which is a controlling depth of 29 feet. Large vessels make port dockings, the dock heading being 354°.

The end of the long peninsula on the southeast side of the inner part of Sawmill Bay is marked by a **light,** 12 feet above the water and visible 8 miles, visible through the entrance northward of Bettles Island. The light is obscured from 287° to 080°. The entrance from Elrington Passage is between two islands; a buoy marks the end of the shoal ground extending 0.3 mile northward from the western island.

The bay has been surveyed and wire dragged. In the northeastern entrance a reef, covered a little over 5 fathoms, was cleared by a drag set at 30 feet. All dangers found are marked by buoys.

Johnson Cove is a small inlet with an abandoned saltery at its head. The cove is foul, with 8 feet in the basin at its head.

Bettles Island is the largest of the high wooded islands at the entrances to Sawmill Bay. The north shore of this island is foul.

Crab Bay is a small indentation on the northern shore of Sawmill Bay. A saltery just inside the western entrance point has a wharf with a face 142 feet long and controlling depth alongside of 27 feet. Large vessels make port dockings, the dock heading being 333°. Fresh water is available and fuel oil is stored for cannery use. A small marine railway is capable of hauling out a vessel 70 feet in length with a draft of 7 feet forward and 8 feet aft. A short distance off the wharf is a reef with a least known depth of 2½ fathoms. The reef is marked by a buoy at its southwestern end. Vessels should make a port landing and back out into Sawmill Bay when leaving the wharf.

Port Benney was formerly the site of a saltery just west of Crab Bay.

Port Ashton (*P. O.*) is on the northwestern shore of Sawmill Bay. A saltery has a wharf with a least depth of 29 feet, and an oil wharf has 20 feet at its southwest corner and 30 feet at the southeast corner. Diesel oil, gasoline, and lubricating oils are available. Port Ashton also has a cannery and wharf with a face 104 feet long and a controlling depth alongside of 27 feet. Large vessels make port dockings, the dock heading being 051°.

A group of rocks, awash at extreme low tide, 115 yards offshore and about 260 yards northeastward from the wharves, is marked by a buoy. In approaching from the northeastward, the small island should be favored.

San Juan is a cannery and saltery at the southwestern end of the bay. The San Juan Fishing and Packing Co. operates a radiotelephone. The wharf has a least depth of about 30 feet. A good supply of fresh water is available.

A rock, with 1½ fathoms over it, is 700 yards eastward from the wharf. A buoy is moored 100 yards northward from it.

Another rock, with 2¼ fathoms over it, is 325 yards northeastward from the wharf and is marked by a buoy. In the approach to this wharf are some spots with less than 27 feet over them. The wire drag, set at 24 feet, cleared them.

Careful maneuvering is required for a large vessel to get away from this wharf safely. The practice is to swing the stern out and back toward the island before turning. Little or no current exists in Sawmill Bay. The wharves, except as above mentioned, are easily approached. The bay has no good anchorages. Vessels sometimes anchor between the oval-shaped island and the San Juan cannery, but the holding ground is poor.

Directions.—Sawmill Bay can be entered by either the northeastern or the southwestern entrance. The former is recommended because of its greater width. In proceeding toward the southwestern end of the bay, vessels can pass on either side of the small oval-shaped island. If passing on the northern side, the island should be favored to avoid the rocks off Port Ashton.

Prince of Wales Passage, between Evans and **Bainbridge Islands,** is between 10 and 11 miles long and from 0.5 to 2 miles wide. It offers a direct route from Knight Island Passage for vessels bound southwestward along the coast; otherwise Elrington Passage is more direct and is generally used.

Prince of Wales Passage has several dangers. The principal channel at the northern entrance is eastward of Flemming Island, then westward of Iktua Rocks. When

passing the broken ground 4 miles southward of Flemming Island, follow the western shore at a distance of 300 to 500 yards and head for **Amerk Point,** the prominent low, sandy point, with a fringe of trees, 3 miles farther southward on Bainbridge Island.

The channel westward of **Flemming Island** has considerable foul ground and should be avoided by strangers, except possibly small craft proceeding with caution and preferably at low water.

Gage Island, wooded and with a group of partly bare rocks off its south side, is 0.5 mile northward of Flemming Island and is a good mark for the north entrance of Prince of Wales Passage.

Ship Islet, with a few trees, is the southerly of two on the east side of Flemming Island. A reef bare at low water extends 225 yards southeastward.

Iktua Rocks, a group of bare rocks, highest about 3 feet, are 0.4 to 0.5 mile off Evans Island and 1.5 miles south of Flemming Island.

About 1 mile southward of these rocks is a lagoon with a narrow entrance almost closed with rocks. It is a secure harbor for small, light-draft craft, in about 8 fathoms, but the entrance requires local knowledge.

Several wooded islands are on the east side of the passage from 3 to 5 miles southward of Flemming Island. The area between them and Evans Island is foul and the tidal currents have a velocity of 2 to 3 knots. Nearly in mid-channel westward of the middle island is an area of broken ground nearly 0.5 mile long on which the least depth found is 11 fathoms. It should be avoided by vessels, the better channel following the western shore. The broken area with depths less than 15 fathoms, 1 mile farther southward and extending 0.3 mile from the western shore, should be avoided.

The only good anchorage in Prince of Wales Passage is in **Squirrel Bay,** the circular bay at the southwest point of Evans Island. Anchorage can be found near the center of the bay in 12 to 22 fathoms, sand and gravel bottom of fair holding qualities.

Glacial ice is sometimes discharged through Prince of Wales Passage.

Currents.—With the large tides, the currents have a velocity of 2 to 3 knots at strength among the islands and in the narrower parts of the passage. Between Flemming and Evans Islands the tidal currents have a velocity of 1½ to 2 knots at strength. The flood current sets northward and the ebb southward through the passage.

Chart 8515.—Knight Island Passage, on the west and south sides of Knight Island, is used by vessels calling at Drier and other Bays on the west side of Knight Island. With easterly winds it offers a smoother channel from Latouche Passage to the northern end of the Naked Island group than the generally used route eastward of Knight Island.

From its northern entrance between Herring Point and Crafton Island, where it is 5 miles wide, the passage extends 16 miles in a southerly direction to Pleiades Islands, with a least width of 2 miles at the southeast end of Chenega Island. The channel leads eastward of the Pleiades, where it is 1.2 miles wide between them and Point of Rocks. From these islands the passage has a southeasterly direction for 10 miles, with widths of 3 to 4 miles, to Montague Strait between Point Helen and the north end of Latouche Island.

The depths in the passage range from 150 to 400 fathoms. The west side is generally bold, with the exception of the bight between Crafton Island and Point Nowell. From Pleiades Islands to Lower Herring Bay, the eastern shore is foul for 0.8 mile off,

with islands, rocks and reefs. The bays on the west side of Knight Island are not good anchorages. Small craft can anchor in nearly all the arms of the bays, but the bottom is generally rocky.

Pleiades Islands, in the middle of the bend in Knight Island Passage, are a chain of 7 wooded islands 1 mile long. The southernmost and largest is about 90 feet high. The rock, about 400 yards westward of the middle of the chain, bares at low water. The northern island of the Pleiades is marked by a **light** obscured on its southwest side between the bearings 343° and 128°. The light is 30 feet above the water and visible 8 miles.

Ice.—Considerable glacial ice has been seen in the passage south of Pleiades Islands. It comes eastward between Point Countess and Chenega Island, and drifts as far as Latouche Passage with the ebb.

The tidal currents in Knight Island Passage have a velocity of 1 to 2 knots at strength.

Point Helen is described previously.

Chart 8523.—Little Bay, on the south side of Knight Island, 1.8 miles westward of Point Helen, is clear so far as known. The depths are 13 to 18 fathoms, rocky bottom, and it is a fair anchorage except with southerly winds.

Mummy Bay, in the south end of Knight Island, is deep and clear, but rocks extend 0.3 mile from the head. Small vessels can anchor 0.5 mile from the head in 15 to 20 fathoms. **Northeast Arm** is an anchorage for small craft.

Thumb Bay is a small inlet opening into the southern part of Mummy Bay. The saltery wharf on the south side of the bay has a face 221 feet long but only 200 feet of it can be used by a large vessel. A submerged rock is just off the face of the wharf and 210 feet from its corner. The controlling depth at the face is 20 feet. A large vessel lies port-side-to, with the bow near the submerged rock in 13½ feet of water. Diesel oil and fuel oil are stored for saltery use. Radio communication is available and fresh water can be obtained during the summer while the plant is in operation. The bay affords anchorage for small vessels in 12 to 15 fathoms. The point on the south side of the entrance is marked by a light.

Lucky Bay and **Italian Bay** are unimportant inlets on the south shore of Knight Island between Long Channel and Mummy Bay.

Chart 8524.—Squire Island and Mummy Island, two large islands on the east side of Knight Island Passage, are separated from Knight Island by Long Channel. Squire Island, the southern one, is 3 miles long and about 900 feet high. A ledge, bare at low water, is 0.3 mile southward from **Squire Point,** the south end of the island. Two small islands are 0.3 mile off the west side of Squire Island, and from these islands a large reef extends 0.4 mile westward to **Point of Rocks,** the latter awash at high water. The channel between Mummy and Squire Islands leading into Long Channel has rocky, broken bottom, and should be used with caution.

Long Channel is a deep inside passage for small craft from Drier Bay to the southern part of Knight Island Passage. It is 4.5 miles long and the mid-channel is clear so far as known. The channel is generally 0.3 to 0.4 mile wide, but narrows to 175 yards abreast Mummy Island and to 50 yards 0.8 mile from the north end of Squire Island.

A rock, covered at high water, lies in the northern entrance 0.3 mile eastward from the north end of Mummy Island. The tidal currents have little velocity.

Copper Bay, on the east side of Long Channel, is abreast the north end of Squire Island. Its entrance is very narrow and foul, and suitable only for small craft with local knowledge. The tidal currents have considerable velocity in the entrance.

Mummy Island, on the south side of the entrance to Drier Bay, is 543 feet high, and wooded; on the southern half of the island are patches of grass. Reefs extend 0.3 mile southwestward from the north end of the island, and wooded islets with reefs around them extend 0.6 mile westward from the middle of the island.

New Year Islands are on the northern side of the approach to Drier Bay. They are wooded, and the largest is 200 feet high. **A light,** 20 feet above the water and visible 8 miles, is located on the most southerly timbered island of the group. Bare reefs extend 250 yards southwestward from the light. A rock bares at low water 500 yards 019° from the north island, and is a serious danger in the channel between New Year Islands and the islands northward.

Drier Bay has its main approach between New Year Islands and Mummy Island. The southeast shore of the bay is indented by a number of smaller bays and coves. Drier Bay has been examined by wire drag from the 50-fathom curve at the entrance to the head of the northern arm and found to be clear of dangers except those charted.

Clam Islands, two in number, low and wooded, are between New Year Islands and **Rocky Point,** the north point of Drier Bay. A rocky patch with 3¾ fathoms over it lies 600 yards southward from Clam Islands.

Range Isle, small and wooded, is close to the north side of Drier Bay and 2 miles eastward of New Year Islands. The line of Range Isle just clear of the north shore eastward of it, bearing 075°, leads about midway between Mummy Island and New Year Islands, and is sometimes used as a range for entering the bay.

Cathead Bay, on the south side of Drier Bay, 2 miles from Mummy Island, is 0.2 to 0.4 mile wide. Two islands are in the upper part of the bay. The soundings taken indicate deep water, but it has not been thoroughly surveyed. In the entrance of the bay, 200 yards from the west side, is a rock with ¾ fathom over it.

Cathead Shoal, with a least known depth of 3½ fathoms, is about 500 yards northeastward from **Cat Head,** the point on the west side of Cathead Bay entrance. When entering Cathead Bay, favor the east side to avoid Cathead Shoal and the ¾-fathom rock, then proceed with caution on either side of the islands at its head.

Mallard Bay, on the south side, 2.5 miles inside Mummy Island, is 0.4 to 0.5 mile wide. The bay is foul for a distance of 0.2 mile from its head. Approaching with care, anchorage can be made 0.4 to 0.5 mile from the head in 17 to 20 fathoms.

Barnes Cove is obstructed by ledges at its entrance, and shoals make out from the shores. Small craft entering with care can find good anchorage in 8 fathoms. Vessels can anchor 300 to 500 yards off the entrance in 20 to 22 fathoms.

The point on the northeast side of Barnes Cove is prominent and high, with bare rocky sides. A reef extends 150 yards off the northwest side of this point.

Chase Island, small and wooded, is 700 yards from the northwest side of Drier Bay and 1.8 miles east of Range Isle. A ledge bare at low water extends 300 yards southward from Chase Island.

A rock awash at half tide is 0.4 miles northeast by east of Chase Island. Another rock bares at lowest tides between the half-tide rock and Mountain Point.

Port Audrey is the northern arm of Drier Bay. A rock 1¾ fathoms deep is about 500 yards south of the entrance to the lagoon at the head of the arm. The lagoon has depths of 7 feet in the entrance and good anchorage inside for small craft in depths of 6 to 10 fathoms. A flat extends out 250 yards from the head of the lagoon. Violent winds blow in and out of Port Audrey.

Northeast Cove, at the head of Drier Bay, is small and has shoals at its entrance and also inside for 200 yards from its head. Small craft entering with care can find good anchorage in 4 to 5 fathoms. Vessels can anchor 300 to 500 yards off the entrance in 17 to 20 fathoms. A rock with 2¾ fathoms over it is about 300 yards offshore, 500 yards westward from the entrance. Anchorage can be selected about 0.3 mile from shore in the north end of Drier Bay, in about 20 fathoms.

Directions, Drier Bay.—Strangers may have some difficulty in recognizing the entrance to Drier Bay, as there are several groups of islands on the east side of Knight Island Passage, both north and south of the entrance. Approaching from northward, the island in the mouth of Johnson Bay is a good mark.

From northward, follow the directions for Knight Island Passage, and when 7 miles past Point Nowell the position should be midway between New Year Islands and the south end of a sand beach on the east side of Chenega Island. Then steer **129°** for the north end of Mummy Island and pass about 0.5 mile southwestward of New Year Islands Light. When the light is a little abaft the beam, steer **084°** and pass about 0.4 mile northward of Mummy Island into the bay.

From the southward, steer **016°**, with Pleiades Islands astern until about 1 mile past the southeast point of Chenega Island. Then steer **064°** with the southeast point of Chenega Island astern and pass about 0.4 mile northward of Mummy Island.

Entering about midway between Mummy Island and New Year Islands, steer **084°** for 3.2 miles, passing 0.3 mile southward of Range Isle. When 400 yards from the southeast shore above Mallard Bay, steer **050°** until Chase Island is abeam, distant about 600 yards.

Squirrel Island, 9.5 miles southward of Herring Point and 0.5 mile from the eastern shore, is the northernmost of the islands extending 1.5 miles northward of the entrance to Drier Bay. It is 180 feet high and wooded.

Johnson Bay is suitable only for small craft; strangers should enter at low water only, and proceed with caution in the vicinity of all broken ground. A wooded island is in the mouth of the bay. The entrance, northward of the island, is about 125 yards wide between reefs bare at low water. The axis of the channel is about 125 yards from the north shore on a **125°** course. From Knight Island Passage, a **098°** course for the north point at the entrance in range with a pyramidal peak of black rock 2,090 feet high, above the head of the bay, will lead between the outlying dangers to the entrance. Water can be obtained from a fall near the head.

A sunken rock, dangerous for small craft, is 200 yards southward of **Aguliak Island.**

Chart 8515.—Channel Rock, a prominent, bare, black rock about 6 feet high, lies nearly 1 mile off the entrance of Lower Herring Bay, and is a good mark for Knight Island Passage. A rock bare at low water is 1.4 miles 025° from Channel Rock and 0.6 mile from the shore of Knight Island. From this rock southward the eastern side of Knight Island Passage is very broken and foul, with deep water extending close to the dangers.

Lower Herring Bay, is suitable only for small craft. The best entrance is eastward of Channel Rock, avoiding the rocky patch with depth of 17 fathoms between Channel Rock and the south point of the bay. The principal danger in the bay is a rock bare at three-quarters ebb which lies in the middle, 600 yards from the eastern end of the bay. The passage between this rock and the point northward, between the two arms, should be used with caution. A mid-channel course should be followed in the arms. Small craft can anchor in the cove on the south side 1.2 miles inside the entrance of the bay, in not less than about 10 fathoms. Water can be conveniently obtained in this cove from a fall.

A narrow deep passage, suitable for small craft, follows the shore inside the islands between Lower Herring and Johnson Bays. Strangers should take it at low water and exercise care.

Bainbridge Passage, described later, enters Knight Island Passage between **Bainbridge Point,** the northern end of Bainbridge Island, and **Point Countess** on the mainland.

Chenega Island has a bold but fairly regular shore bordering on Knight Island Passage. Its highest summit, near the center, is 2,330 feet. The south shore of Chenega Island is indented by several small bays where small vessels can find anchorage and shelter from the prevailing northeast storms. **Chenega** (*pop. 96 in 1950; P. O.*) is at the head of a cove marked by three small wooded islets. A rock bares 4 feet at low water 150 yards north of the northernmost islet. A school and church are located at the village, but practically no supplies are available. There is a prominent landslide back of the village.

Small vessels can anchor in the cove fronting Chenega, in 5 to 15 fathoms, soft bottom. The anchorage is only partly protected from the south by the entrance islets and is not recommended in southerly weather. To enter, pass 300 yards west of the entrance islets on a **000°** course until within 300 yards of the shore, then swing sharply to the right and head for the cross on the church, a white, green-roofed structure. Anchor in a suitable depth.

Whale Bay is 4 miles westward of Bainbridge Point. A low portage at the head of the western arm connects with the head of Port Bainbridge.

Whale Bay has not been surveyed but there are no known dangers other than those charted. The bay is deep but small craft can find anchorage along the eastern shore of the south arm and in depths of 6 to 10 fathoms, mud bottom, in the small bight in the north side of the western arm; the latter is a very good anchorage and is directly off a high bare cliff that is visible for some distance. Ice from Icy Bay often obstructs the entrance to Whale Bay.

Dangerous Passage separates Chenega Island from the mainland. The northern entrance of the passage is obstructed for a distance of about 0.6 mile off the north end of Chenega Island by a group of islets and rocks, including **Junction Island,** which is 120 feet high and wooded. The northernmost obstruction of the group is a rock awash at low water. It is difficult to pick up the northern entrance at night.

About 5.5 miles from the northern entrance, Dangerous Passage is restricted by a group of islets. **Delenia Islet,** the largest, is in the middle of the passage and is wooded. A small grassy islet is 350 yards northward of Delenia Islet; a 3½-fathom shoal is 450 yards north of the grassy islet. The deepest and straightest channel is between this shoal and the nearby western shore of Dangerous Passage, and is only 225 yards wide.

The channel to the eastward and southward of Delenia Islet is wider, but a rock, bare only at lowest tides, must be avoided. The rock is 250 yards eastward from the grassy islet.

The best anchorage in Dangerous Passage is in the vicinity of Delenia Islet. There is good holding ground about 0.3 mile westward of the islet in 15 to 20 fathoms.

Granite Bay is on the north side of the northern entrance to Dangerous Passage. Depths are irregular; it is not recommended for anchorage.

Paddy Bay is about 3 miles southwestward of Granite Bay. A rock awash at low water is 330 yards west of the southern end of the island near the head of the bay, and near the middle of the entrance to the northwestern arm. The bay affords anchorage for moderate-sized vessels in either of the two arms at the head.

Masked Bay indents the Chenega Island shore of Dangerous Passage opposite Paddy Bay. The wooded islets in the entrance leave a channel only 100 yards wide. Small vessels will find excellent anchorage in the bay, but local knowledge is required for entering.

Ewan Bay indents the north shore of Dangerous Passage about 5 miles from the north entrance. Several rocks and islets fringe both shores of the bay, but mid-channel is deep and clear. The entrance to the lagoon at the head of the bay is obstructed by rapids. Small vessels can anchor at the head of the bay, but it is rather deep.

Jackpot Bay is about 3 miles southward of Ewan Bay. **Jackpot Island,** 80 feet high and wooded, is near the middle of the entrance. The narrows, 1.5 miles above the entrance, have a width of 250 yards. At the upper end of the narrows is a mid-channel rock baring 8 feet at low water. This rock is on range with the eastern tangent of the narrows and the highest point of Jackpot Island. Depths in the bay are generally too deep for anchoring. Small craft can find good all-weather anchorage in either of the two basins in the northern part of the bay; the entrances are narrow but free of dangers.

Chart 8551.—**Icy Bay** is at the southwestern extremity of Dangerous Passage. It is separated from Port Bainbridge by a narrow neck of land of moderate height. **Verdant Island,** a precipitous wooded island 310 feet high, is off the east entrance point. Active glaciers in **Nassau Fiord** and at the head of Icy Bay keep the bay filled with ice at most times and make it dangerous for small boats to enter. Anchorage and good shelter from ice can be found in the bight on the west shore of Icy Bay, 0.8 mile northward of the entrance to Nassau Fiord. Icy Bay has not been surveyed.

Ice.—All the bays in this vicinity are likely to freeze over in cold weather. The ice flows from Icy Bay at times make navigation difficult west of the Pleiades Islands and extend northward into Dangerous Passage. The discharge is continuous but irregular in volume, and the ice flow is mainly southeastward. When heavy it blocks the entrance to Whale Bay and passes southward of the Pleiades Islands. Isolated bergs of considerable size frequently drift eastward as far as Latouche and are a menace to navigation. A considerable ice flow has been known to pass southward through Bainbridge Passage and then northward into Prince of Wales Passage. No ice has been observed east of Delenia Island.

Chart 8528.—Point Elrington is described earlier in this chapter.

Procession Rocks, 4.3 miles north of Point Elrington Light, are a group of jagged rocks, the highest rising to about 70 feet. There are four principal rocks, with a number of smaller rocks and reefs surrounding them. Deep water extends close up to the

rocks. The survey of 1927 showed a good channel between the rocks and the shore of Bainbridge Island.

Port Bainbridge is a deep body of water extending about 12 miles northward from a line joining Cape Puget and Procession Rocks. Depths of over 100 fathoms are carried nearly to the head of the bay. There are no habitations in Port Bainbridge, and in 1941 there was no commercial fishing.

Point Pyke, the eastern entrance point to Port Bainbridge, is a prominent headland rising almost vertically to a height of 985 feet.

At the head of Port Bainbridge, the western arm extends nearly 2 miles to the northward. The water is this arm is deep, but the entrance is blocked by a gravel bar with a least depth of about 1½ fathoms. The best water is close to the eastern entrance point.

Bainbridge Glacier, nearly 1 mile in width, discharges into Port Bainbridge opposite Bainbridge Passage.

Auk Bay, on the western side of Port Bainbridge, opposite Point Pyke, is a small bay affording good anchorage in 20 fathoms, muddy bottom. A rock, bare at low tide, is about 150 yards off the northern shore, 1 mile inside the entrance. The southern entrance point is marked by a prominent pinnacle rock.

A prominent brown rock about 10 feet high is 0.3 mile offshore, 2.5 miles northward of Cape Puget.

Chart 8523.—Swanson Bay is a long narrow bay lying just north of Point Pyke and extending 3 miles to the eastward. The bay is deep, and no good anchorages are available. Indifferent anchorage can be found near the head of the bay in 28 to 30 fathoms, mud bottom.

Hogg Bay, about 2 miles northward from Point Pyke, is the largest bay in Port Bainbridge. It is free from dangers except for a rock awash 0.2 mile off the northern shore about 1 mile inside the entrance, and a rock awash 180 yards off the south shore 1.5 miles from **Swanson Point.**

Fair anchorage can be had near the head of the bay at the entrance to the northern arm, in 25 fathoms, hard bottom, with patches of sand and gravel. Small craft can find excellent shelter at the head of the northern arm. A beach suitable for beaching small craft is behind the northern island near the entrance to the north arm.

Bainbridge Passage, between Bainbridge Island and the mainland, extends northeastward for 10 miles from Port Bainbridge to Knight Island Passage. Bold **Point Waters,** 5 miles northward of Point Pyke, is on the mainland side of the entrance from Port Bainbridge. Bainbridge Passage has not been surveyed but is used extensively by fishing craft.

About 0.2 mile off the most southerly part of Point Waters is a pinnacle rock that rises from deep water and bares at lowest tides; the rock is not marked by kelp.

About 0.2 mile off the northwest shore midway along Bainbridge Passage is a ledge that bares at lowest tides. The ledge is marked by kelp but the kelp tows under with the strong currents. A small islet with a few trees on it is about 0.1 mile from the shore on the opposite side of the passage from the ledge; the islet resembles a ship when seen from up or down the passage.

Boats bound southwestward through Bainbridge Passage have followed the starboard shore at a distance of 100 yards or less until well clear of the rock awash charted

in mid-passage 3 miles from the northeastern entrance; thence the heading was for the shiplike islet, which was left about 75 yards to port, and the southeastern shore was favored for the rest of the distance to Port Bainbridge.

Chart 8528.—The coast between Cape Puget and Cape Resurrection is high and rugged, with numerous glaciers showing in the valleys. No shelter is available except in Day Harbor, where the anchorage is very good. The coast is clear except for a few rocks extending not more than 0.3 mile offshore. The first range of mountains varies from 2,000 to 3,500 feet in height, while the back range is about 5,000 feet in elevation. Much of the hinterland is covered by an ice cap.

A constant current sets southwestward along the Kenai Peninsula. See remarks on currents in Chapter 2.

Cape Puget is a prominent headland with an eroded bluff. At the foot of the slope is a conical rock which is prominent from an east or west direction. Several bare rocks are off the cape, the farthest being about 0.2 mile distant.

Puget Bay, the first indentation to the westward of Cape Puget, is a funnel-shaped bay extending to the northward for about 6 miles. The bay is deep throughout and free from dangers except for rocks and reefs close inshore.

Goat Harbor is an inlet on the eastern side of the bay about 4 miles from Cape Puget. It affords good anchorage in 12 to 14 fathoms, sticky mud bottom, but is exposed to the swell from the southwest. A gravel and shingle bar with a least known depth of 5½ fathoms extends across the entrance. Near the head of Puget Bay, and on the eastern side, is a small cove which affords shelter for small craft. A rock awash is about 100 yards off the southern entrance point.

Cape Junken is a bold, rounding headland with eroded bluffs and landslides. At the foot of Cape Junken are two steps which show up prominently from along shore. In thick weather this feature is valuable in identifying the cape.

Johnstone Bay is a large open bight west of Cape Junken. Across the head of the bay is a black sand beach. Deep water extends close up, there being 50 fathoms within 0.5 mile of the beach. **Excelsior Glacier** terminates in Johnstone Bay and drains through a stream at the eastern end of the sand beach. A small cove with a shingle beach is at the eastern entrance to the bay, but it is wide open to the southwest and affords little shelter. A black rock 35 feet high marks the western entrance, and there is a low rock nearly awash at the eastern entrance.

Cape Fairfield is a bold, rounding cape with eroded bluffs and many rock slides. A large pinnacle rock 126 feet high is off the southeast pitch of the cape. The bow of the wrecked steamer *Yukon* lies on the beach of the cove just westward of the pinnacle. The wreck is visible for a distance of 2 miles offshore.

Whidbey Bay is a large open bight just westward of Cape Fairfield. A black sand beach is at the head of the bay. About 3 miles up the valley is a prominent hanging glacier.

Depths shoal to 12 fathoms about 1 mile from the sand beach, and anchorage can be had in black sand and glacial silt. Both sides of the bay are foul, with numerous rocks and reefs extending 100 to 200 yards off the rocky beaches. A stream enters at the west end of the sand beach.

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Cape Mansfield is bold, with high eroded bluffs and rock slides. A small pinnacle rock, awash at ordinary high water, is about 0.3 mile off the cape. Deep water is close up to this rock.

Just westward of Cape Mansfield is a small cove with a sand beach at its head. Except for this sand beach, the shore between Cape Mansfield and Day Harbor is rugged, with high bluffs and rock slides. There are numerous rocks at the foot of the bluffs and a short distance offshore.

Day Harbor, a spacious body of water just eastward of Resurrection Bay, is free from dangers except close inshore. Deep water extends to the head of the bay which is formed by the moraine of **Ellsworth Glacier.** This glacier shows up prominently when entering the bay.

Fault Point is the eastern entrance point to Day Harbor. It terminates in a narrow point showing several remarkable faults in the rock formation.

Anchor Cove, about 2 miles northward from Fault Point, is a small cove affording excellent shelter for small craft. A short distance off the eastern shore of the cove near its head is a reef, awash at high water. The shores are heavily wooded.

Bowen Anchorage, which affords the best anchorage in Day Harbor, is 4 miles northward from Fault Point. It is about 500 yards wide at the entrance, and narrows gradually to the head of the cove. Anchorage can be had in the center in 15 fathoms, sticky mud bottom. In the entrance is a small reef with a least known depth of 5½ fathoms. This reef was cleared by a wire drag set at 25½ feet. Bowen Anchorage is suitable for a vessel up to about 400 feet in length.

Deep water extends close up to the head of Day Harbor, the 50-fathom curve being only about 350 yards offshore. A flat in the northwest corner of the bay, northwest of Bowen Anchorage, affords anchorage 0.4 mile offshore in from 15 to 18 fathoms.

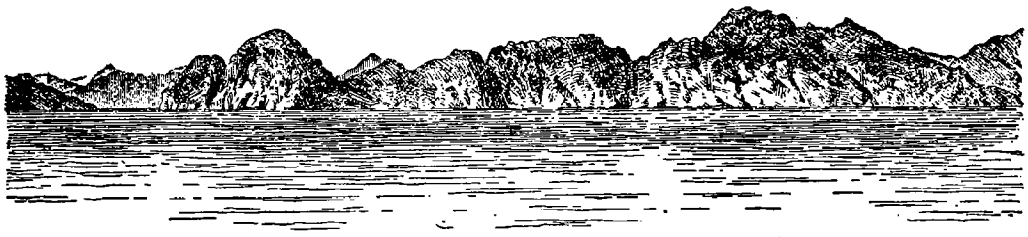
Talus Bay is a small cove on the west shore of Day Harbor, affording anchorage in 10 to 15 fathoms, but it is exposed to the southeast. A rock bare at low water is about 100 yards off the eastern entrance point.

Safety Cove is a small deep cove about 1 mile south of Talus Bay. Anchorage can be had in the center of the cove in 25 to 30 fathoms.

Killer Bay, a small cove about 2 miles south of Safety Cove, is too deep for convenient anchorage, with depths of 32 to 39 fathoms in the middle of the bay. A rock 15 feet high is about 100 yards off the southern entrance point.

Driftwood Bay is about 3 miles northward from Cape Resurrection. It is about 0.5 mile wide at the entrance and is free from dangers. Anchorage can be had in the middle of the bay in depths of 25 to 30 fathoms, hard bottom. Small craft will find excellent shelter in a bight in the south shore of the bay.

Chart 8529.—Cape Resurrection, at the eastern entrance to Resurrection Bay, is a precipitous headland of sold rock, with little vegetation except some trees on the lower slopes. From the eastward two dome-shaped peaks, the north one the higher, show at the end of the cape, and a low saddle back of peaks rises to higher mountains farther north. These are the only dome-shaped peaks in the vicinity, which assures easy recognition of the cape.



Cape Resurrection from the eastward

Barwell Island, 0.4 miles southeastward from Cape Resurrection, is small, bare, rounded, precipitous, and 414 feet high. A **light,** 412 feet above water and visible 11 miles, is shown from a small white house on the south side of the island.

The passage between Barwell Island and Cape Resurrection is deep and clear, mid-channel depths ranging from 45 to 48 fathoms.

Resurrection Bay extends about 16 miles inland north from Cape Resurrection. The depths are great throughout, and there are no dangers in the usual track of vessels. A flat extends 0.5 to 0.6 mile from the entire northern shore at the head of the bay. The shores and islands are steep and high, with precipitous slopes in many places. The valleys are wooded up to an elevation of about 1,000 feet. Anchorages are few and indifferent on account of the great depths, and are subject to strong williwaws.

Harding Gateway, the southern entrance to Resurrection Bay, is between Cheval and Rugged Islands.

Seal Rocks, the southernmost land feature in the approach to the bay, are a group of four small, rocky islets. The northernmost and largest is 278 feet high and has an arch through the middle. **Seal Rocks Light (lat. 59°31′.1 N., long. 149°38′.1 W.)** on the summit of the largest island, is 285 feet above the water and visible 12 miles.

Lone Rock stands well southwestward of Chiswell Islands and is a good mark. It is a round rock, 154 feet high, and has a rock covered at high water about 0.1 mile northward of it. The passage between Seal Rocks and Lone Rock is clear and is frequently used by vessels between Resurrection Bay and the coast southwestward.

Chiswell Islands, a group of high, precipitous, rocky islands, are the southeasterly of those in the entrance to Aialik Bay. The islands are sparsely wooded, most have off-lying rocks, and there are strong tidal currents between them.

Pilot Rock, 2.7 miles 037½° from Aialik Cape, is a bare, rounded, rocky islet about 100 feet high, marked by a **light,** 100 feet above the water and visible 12 miles.

Agnes Cove, just westward of **Cheval Island,** is sheltered from the southeast, but is too deep for convenient anchorage.

Porcupine Cove, about 4 miles southward from Bear Glacier, offers a good anchorage for small craft in all except southeasterly weather. At the head of the cove is a gray sand beach with stumps below the high-water line which indicates that there has been a subsidence of the beach. A detached rock about 30 feet high is 200 yards off the western shore.

Bulldog Cove, the first cove southward from Bear Glacier, affords a good anchorage for small craft in southwesterly weather. In northerly weather it is exposed to winds sweeping off the glacier. The best anchorage is in the southern bight in about 10 fathoms, sticky mud bottom.

Bear Glacier, large and prominent, is on the western shore westward of Cape Resurrection. It is not discharging, and has an earthy appearance.

Toward the eastern shore in the entrance of Resurrection Bay are three large, high, rugged islands, named in order from southward Rugged, Hive, and Renard. The passages between the islands are deep. Their shores are generally bold, but two rocks bare at low water 200 yards southward from the southeast end of Renard Island. **Hive Island** is marked by a **light** 80 feet high on its northern side.

The large cove indenting the southern shore of **Rugged Island** affords fair anchorage in easterly weather. Anchor in the easterly cove with Pilot Rock about on range with the southern entrance point.

Sunny Cove, the southern bight on the west side of **Renard Island,** is the best anchorage in Resurrection Bay. No ocean swell makes into the cove, and it is sheltered from all but westerly winds. The williwaws are bad with easterly winds. The cove is 0.4 to 0.5 mile wide and clear. The anchorage is in the middle, 300 to 800 yards from its head, in 15 to 25 fathoms, muddy bottom.

Small craft can also anchor in the southeast arm of the two-arm bay on the eastern shore 1.5 miles northward of Renard Island. In the wintertime this bay affords better protection than Sunny Cove, which is bad for small craft in northwesterly weather. The anchorage is in 7 to 8 fathoms, sandy bottom. The narrow bight extending to eastward is filled with a sand flat which bares at low water.

Thumb Cove, on the eastern shore northeastward from **Caines Head,** is 0.8 mile wide. Anchorage can be selected 0.4 to 0.5 mile from its head in 25 to 30 fathoms, soft bottom. A flat makes out 200 to 300 yards from the northern shore for a distance of 0.4 mile from its head. The point on the north side of the entrance is marked by **a light.**

Seward (*pop. 2,114 in 1950; P. O.*) is on the west side of the north end of Resurrection Bay. The town is the southern terminus of the Government-owned Alaska Railroad and has hotels and well-stocked stores.

The approach to Seward is over depths of 50 to 150 fathoms. **Anchorage** off the town is over good holding ground but the 30-fathom curve is only 100 to 400 yards from the docks. Tabular sailing **directions** are given in Chapter 3. The diurnal range of **tide** is 10½ feet at Seward. Winter **gales** strike suddenly, and considerable sea makes into the bay with southerly winds.

The Public Health Service maintains an **outpatient office** at Seward, and there is a private hospital where marine cases are treated. A United States deputy marshal is stationed in the town.

The principal docking facilities at Seward are, in order from the south, the Alaska Railroad wharf, the oil wharf, the Army wharf, the cold-storage plant wharf, and the dredged small-boat basin.

The railroad wharf has an 800-foot face with depths alongside of 30 feet or more decreasing to 22½ feet near the eastern end. The wharf is available to public use on payment of the usual wharfage charges and has a good supply of fresh water. Vessels cannot lie at this wharf during strong southeast winds because it is exposed to the sweep of the bay. A vessel is held broadside-to the wharf by southerly winds and may have difficulty in leaving, particularly if large, because there is little maneuvering room at either end.

The oil wharf has a 340-foot face with depths of 28 to 36 feet alongside. The

Army wharf has an 875-foot face with minimum depths of 32 feet along the southern 650 feet and 24 feet along the northern 225 feet. The cold-storage plant wharf has a 175-foot face with a least depth of 24 feet alongside.

The small-boat basin is used as an operating base for commercial fishing. The Federal project provides for protective breakwaters and for dredging an area of about 5 acres between them to a depth of 12½ feet. The controlling depth in the basin was 12½ feet in September 1951. In the basin are a wharf, a finger float that will accommodate about 50 boats, and a grid suitable for boats about 40 feet in length. The south breakwater is marked by a light.

Fuel oil, diesel oil, lubricating oil, gasoline, and distillate can be obtained at Seward. A marine railway at Seward has a capacity of 800 tons and can handle general repairs; local shops can make most machine repairs but complicated jobs are sent by rail to the Anchorage shops.

The Alaska Railroad maintains service throughout the year from Seward to Anchorage and Fairbanks; large amounts of supplies and equipment bound for all parts of northern Alaska are moved over the railroad. The town is a year-round port of call for the regular coasting vessels from Seattle. Scheduled air service operates daily to Anchorage, and nonscheduled flights are made to other areas. Seward has highway connections with Anchorage and Fairbanks.

Seward has radio and cable communication with other Alaska ports and Seattle. An Alaska Communications System radio and telephone station operates in the town, and a commercial radio station, KIBH, broadcasts from 5 a. m. to 10:30 p. m. daily.

Aialik Bay extends 16 miles inland from the north end of Harbor Island. It is inclosed by rugged mountains and glaciers and is of no importance except occasionally as an anchorage. The shores are steep and high, with precipitous slopes in many places, and are partly wooded in the southern part of the bay to an elevation of about 1,000 feet. The northern shores are covered with alders in places.

Aialik Bay is deep except for rocks near the shores, and a bar which crosses the bay from the glacial flat fronting **Pederson Glacier.** The least depth found on the bar in mid-channel is 13 feet, but it and the broken ground near the shores at the entrance of Holgate Arm are likely to have boulders and less water than charted. As a measure of caution vessels should avoid the passages among the islands in the mouth of the bay. To take advantage of smoother water, small vessels coasting southwestward from Resurrection Bay sometimes enter the bay at Aialik Cape, pass south of Chat Island, round the north end of Harbor Island, and pass out at Granite Cape.

Chat Island is a steep, rocky, wooded island, 470 feet high; two conspicuous pinnacles are close to its south shore. Between it and **Aialik Cape** are a smaller island and a number of rocks.

Harbor Island is the largest of a group of high, precipitous, rocky, partly wooded islands in the mouth of the bay and northwest of Chiswell Islands. The shores in many places are sheer cliffs, especially the east shore of **Natoa Island.** Lying midway in the channel betweeen **Beehive Island** and the small island at the southeast end of the Harbor Island group is a rock which is bare at lowest tides.

Small vessels proceeding along the coast use the pass locally known as **Petes Pass,** between Harbor Island and the first island to the east. A rock, baring at minus tides, has been reported in the narrowest part of this passage close to eastward of the center.

Vessels using this passage should favor Harbor Island when passing through this narrow opening.

Granite Cape, the southern end of Granite Island, is bold, with almost vertical rocky bluffs. Rocks awash lie a short distance off the cape. Between Granite Cape and the main shore are two small wooded islands about 200 feet high, with a rock about 10 feet high between them.

Twin Islands, in Dora Passage, resemble each other in contour and are 400 and 550 feet high. They are wooded, and the arch off the south end of the northern island is conspicuous.

Holgate Arm is the largest indentation on the west side of Aialik Bay. The arm is too deep for anchorage and terminates in **Holgate Glacier.**

Slate Island, long and narrow and about 270 feet high, is close to the west shore near the head of the bay. The head of Aialik Bay consists of sunken rocks and icebergs which are discharged from the glaciers feeding into the bay.

Coleman Bay, Tooth Cove, and **Bear Cove,** are bays on the east side of Aialik Bay. None of them afford good anchorage.

Anchorages.—The anchorages are few and indifferent due to the great depth. With southerly weather a swell makes well into the bay.

The best anchorage is in 30 fathoms, good holding bottom, near the head of **Paradise Cove** in **Three Hole Bay,** on the east side of Aialik Bay about 3 miles north of Harbor Island. Small craft find good shelter along the southern shore of Paradise Cove in 3 to 10 fathoms, mud bottom.

Anchorage can be had in the cove on the west side of the bay, westward of the north end of Harbor Island. The anchorage is in 28 fathoms near the center of the cove. On each side of the entrance to this cove is a sharp conical wooded hill about 800 feet high. Close inshore off the point at the north entrance is a sharp pinnacle rock about 12 feet high; about 600 yards northeastward of this pinnacle is **Hub Rock** which covers at about half tide.

Vessels can find convenient anchorage in the area about 1 mile southeast of the south end of Harbor Island. There is good shelter here with winds from north around to southeast.

Ice.—There are discharging glaciers at the heads of Aialik Bay and Holgate Arm, and ice is frequently driven to Harbor Island by northerly winds. Holgate Arm and the entire bay above the bar are frequently filled with ice.

Harris Bay is about 5 miles northwestward of the peninsula terminating in **Aligo Point.** The bay is deep throughout. The 50-fathom curve extends to within 0.5 mile of the head of the bay.

Granite Island is a long narrow island reaching a height of 1,650 feet. Its shores are bold and its slopes are very steep except at the northern end.

Taz Basin is a remarkable cliff-walled harbor on the southwest side of Granite Island about 2 miles from its northwest end. It has depths of 18 to 20 fathoms and is an ideal shelter for launches. The entrance is narrow and has a rock 5 feet high in the middle. The best entrance is to southward of the rock, where there is a depth of about 2½ fathoms in a channel about 30 yards wide. Once inside, there is plenty of room.

Granite Passage, which leads from Aialik Bay to Harris Bay, is deep and free from dangers. At the narrowest part of the passage, just north of Fire Cove, a ridge with

depths from 6¼ to 18 fathoms extends across the passage. This ridge affords convenient anchorage in any but heavy weather.

Fire Cove is the southernmost of three coves in the mainland opposite Granite Island. It is deep throughout and affords no satisfactory anchorage. The shores are precipitous and rocky.

Ripple Cove, the next cove to the northward, is also deep and affords no anchorage except in 28 to 30 fathoms, hard bottom. The third cove is also deep and not suitable as an anchorage.

Crater Bay is a large inlet about 1 mile northward from the north end of Granite Island. A good anchorage will be found in the bight just eastward of the projecting point on the south shore, in 25 fathoms, sticky bottom. This anchorage is well protected but is subjected to severe williwaws. In the southerly cove at the head of Crater Bay is a stream where fresh water can be obtained handily.

Cataract Cove, just northward from Crater Bay, is another of the characteristic small deep bays of this region. It is exposed to the southwest, and is not inviting as an anchorage. Fresh water can be obtained from cascades at the head of the bay.

The northern part of Harris Bay is usually filled with ice discharged from **Northwestern Glacier**, which occupies the valley at the head of the bay. **Northwestern Lagoon** is at the northwestern corner of Harris Bay. Shoal and foul, its entrance is blocked by rocks, bars, and usually by large cakes of ice.

Harris Point, a prominent point on the west side of the entrance to Harris Bay, is easily recognized by a succession of rocks and islets that extend 0.3 mile off. The outer rock of this group is 78 feet high.

Cup Cove is a small indentation just north of Harris Point. It has depths of 7 to 9 fathoms, mud bottom, and affords good anchorage for small craft except that it is exposed to easterly winds.

Sandy Bay is an indentation about 1 mile in extent between Harris Point and Two Arm Bay. The depths decrease gradually from 20 fathoms at the entrance to 3 fathoms at the head with sand bottom throughout. It is exposed to the southward and is suitable for anchorage in fine weather only.

Two Arm Bay has Paguna Arm on the north and Taroka Arm on the west.

Surok Point is on the east side of the entrance to Two Arm Bay. It is bold and high, with deep water extending close up.

Paguna Arm is deep and affords no anchorage except at the very head, where vessels may anchor in 20 to 25 fathoms, hard bottom. There are several coves along the eastern shore where small craft can find anchorage close to the beach. The shores are steep and precipitous except for a small sand spit on the east shore near the head. There are numerous places in Paguna Arm where fresh water can be obtained.

Bear Point is a bold, high point separating Paguna and Taroka Arms. A group of rocks extends 100 yards off the point.

Taroka Arm is deep but affords anchorage near the head in 20 to 25 fathoms, hard bottom with occasional patches of sand and mud. Small craft can find shelter in several of the bights along the southern shore.

Chart 8530.—Cloudy Cape, on the south side of the entrance to Two Arm Bay, is bold and high. On the coast about midway between Cloudy Cape and Thunder Bay are lines of corrugated strata on two light-gray cliffs.

Thunder Bay is 2 miles wide at the entrance, and about 2.5 miles long with the upper end extending in an easterly direction. Safe anchorage for small craft can be had in the cove at the head of the bay in 10 to 20 fathoms, mud bottom. Fresh water is available from several waterfalls at the head of Thunder Bay. A cup-shaped bight on the north side of the entrance to Thunder Bay affords anchorage in 12 fathoms, gray sand and rock bottom. A landslide is on the coast about 0.5 mile southwestward from Thunder Bay.

Black Mountain (lat. 59°32′ N., long. 150°12′ W.), the highest peak between Thunder and Black Bays, has a large granite boulder at its summit. The peak is 2,075 feet in height.

The point on the northern side of the entrance to **Black Bay** is marked by a 660-foot hill; reddish-brown tinted cliffs form the base on its seaward side. The island immediately adjacent to the point is wooded, 150 yards in diameter and 165 feet high.

The northwest arm of Black Bay is not recommended as an anchorage as it is too deep and narrow. The northeast arm of Black Bay is nearly 0.5 mile wide. There is safe anchorage close in near the head in 16 to 20 fathoms, mud bottom. A shoal of gravel and boulders extends 100 yards offshore on the east side of the head of this arm. The anchorage is subjected to usual williwaws. A light gray granite peak 2,060 feet high separates the two arms of Black Bay.

The point 1.2 miles southward of Black Bay has a large granite rock about 150 feet high close to the southeastern side. The rock makes a good mark when it is seen clear of the point. Between this point and Black Bay is a low grassy wooded ravine extending inland from the coast. Between the ravine and Black Bay are rocky, almost perpendicular cliffs several hundred feet high and light gray in color.

The open bay to the westward of the point 1.2 miles southward of Black Bay is not recommended as an anchorage.

Chance Cove is described in connection with McArthur Pass.

Nuka Bay has its main entrance between Pye Reef and Nuka Point. The bay may be entered from the eastward through McArthur Pass and Wildcat Pass and from the westward through Nuka Passage. It extends into the mainland above the passes in two long arms. Good protected anchorage can be found in several small bays and coves. There are several small gold mines in the West Arm and North Arm.

Nuka Bay is generally deep throughout. There is, however, a considerable area of irregular depths, less than 25 fathoms, adjacent to the western shores of the lower bay. Several abrupt rocky patches of 8 fathoms were found more than a mile offshore in this area.

Pye Islands, on the eastern side of Nuka Bay, are three rugged mountainous islands, densely wooded on the lower slopes. **Outer Island,** the outermost and smallest, has a prominent peak 1,316 feet high at its eastern end. A good landmark, this peak is part of a ridge whose top is covered with huge granite boulders. A prominent bare rock, 70 feet high, is 20 yards off the southeastern shore of the island. A large reef, part of which shows at all stages of the tide, is 300 yards south of the rock. A large, bare, granite rock, 82 feet high, is close to the southwestern point of the island.

A 2½-fathom shoal that breaks is 0.4 mile southeast of the eastern point of Outer Island. A 10-fathom shoal is 1.8 miles 130° from the point, and a 9-fathom shoal is 0.9 mile 200° from the same point.

Pye Reef, awash at high water, is 2.1 miles 205° from the high peak of Outer Island.

The line of the western ends of Outer Island and Rabbit Island leads 250 yards westward of the reef, and the line of the eastern ends of Outer and Ragged Islands leads 0.4 mile eastward of it.

Rabbit Island, the second of the Pye Islands, is densely wooded; its highest mountain has an elevation of only 808 feet. The eastern shore of the island is bold and rocky, with no dangers except close inshore.

Between Outer and Rabbit Islands is a deep body of water with no good anchorage. At its eastern end is a small opening called **Kitten Pass.** The pass is between a small islet and a group of three bare rocks to northward. The islet has a few scrub trees on it. A rock, covered 13 feet and marked by kelp, lies in the pass; it is nearer to the islet than to the rocks.

Kitten Pass is only 65 yards wide. By favoring the group of rocks on the northern side, a depth of 5 fathoms can be carried through; but due to strong tidal currents and the narrowness of the pass, it should be attempted only by very small craft, at slack water and with a smooth sea. In rough weather, breakers obstruct the pass.

Ragged Island, the third and largest of the Pye Islands, is very mountainous, the highest peak rising to 1,587 feet, and is partly wooded on the lower slopes. The island is broken by numerous coves and bights, most of which are too deep to afford good anchorage. The few known dangers around this island are the rocks close inshore: a rock awash at high water 200 yards off the rounding point 1.2 miles north of Wildcat Pass, and the rocks off Hoof Point, described below.

Hoof Point 3.5 miles northeast of Wildcat Pass, is the southeastern end of the eastern part of Ragged Island. Bold and rocky, it is at the base of a detached 650-foot hill. A bare granite rock, 105 feet high, 60 yards off the point, makes a good mark. Bare ledges lie 400 yards southward of the point. A rock, covered at high water, is 0.5 mile southward of Hoof Point. It can be cleared to the southward by keeping open water showing through Wildcat Pass. Fair anchorage for small craft can be had in the cove behind Hoof Point, in 10 to 20 fathoms.

Wildcat Pass, between Rabbit and Ragged Islands, is about 400 yards wide in its narrowest part, and is deep and free from danger. A shoal marked by kelp with a least depth of 6 fathoms over it is in the center of the western approach to the pass, 400 yards westward of the line of the western ends of Rabbit and Ragged Islands. This shoal has deep water all around it. In the eastern approach the only known dangers are the rocks off Hoof Point. In the narrow part of the pass a bank, with 8 fathoms over it, extends from the northern point to the center of the pass, but 20 fathoms and over can be found 100 yards off the southern point. The tidal currents in Wildcat Pass have an estimated velocity of 4 to 5 knots at strength. Slack water is believed to occur about 1½ hours before the corresponding low and high waters at Kodiak. Anchorage can be found in the cove just south of the pass, in 24 to 27 fathoms, rocky bottom. Small vessels can find indifferent anchorage in the cove in the western end of Rabbit Island, close inshore, in 8 to 10 fathoms, rocky bottom.

Wildcat Cove is a large arm in the southeastern shore of Ragged Island, 2 miles northward from Wildcat Pass, and is the second cove to westward from Hoof Point. Protected anchorage for small craft can be had about 100 yards from the head of this cove in 11 fathoms, mud bottom. There is also anchorage in 22 fathoms, mud bottom, opposite the indentation on the east shore of the cove.

Roaring Cove is a small bight in the western shore of Ragged Island, 2 miles north-

ward from the western approach to Wildcat Pass. A small wooded island is on the northern side of the entrance, and a wooded point, resembling an island, is on the southern side. Partially protected anchorage for small craft can be found in the center of this cove in 4 to 5 fathoms, mud bottom.

McArthur Pass, between Ragged Island and the mainland, is about 120 yards wide in its narrowest part but is straight and easily navigated. A light is located on the north side of the pass at the west end of the narrows.

There are no known dangers in the approaches, and a clear channel 60 yards wide is in the center of the narrowest part of the pass, with depths of 5 fathoms and over. Both shores of the pass are lined with thick kelp which extends approximately out to the 5-fathom curve. The bottom is composed of smooth rock and small boulders. A spit of gravel and boulders makes out from the southern shore, in the narrowest part, with deep water close-to.

The currents in McArthur Pass have an estimated velocity of 3 to 4 knots at strength, slack water occurring about 2 hours before the corresponding high and low waters at Kodiak. All except very low-powered vessels will have little difficulty through the pass at any stage of tide, but easterly weather and ebb tide may cause dangerous seas in the entrance.

Extensively used by small vessels proceeding along the coast McArthur Pass affords a shorter and more protected route than the route outside the Pye Islands, and is especially valuable when used in connection with the route through Nuka Passage.

McArthur Cove is a large cove in the northern side of Ragged Island, 1 mile southwestward from the narrowest part of McArthur Pass. Large vessels can find good anchorage near the head of this cove in 28 to 30 fathoms, mud bottom; small craft anchor closer inshore in 5 to 10 fathoms, good holding bottom and good shelter. The two small coves on the northern side of Ragged Island, westward of McArthur Cove, are deep and clear of dangers but are subject to strong williwaws in stormy weather. Indifferent anchorage for small craft can be found in the first cove to westward, in the center of the bight near its head, in 16 to 18 fathoms, rock and gravel bottom; or in 11 to 12 fathoms in the bight on the southern side of the cove, near the center.

Morning Cove, on the southern side of the eastern approach to McArthur Pass, affords protected anchorage for small craft near its head in 10 to 12 fathoms, rocky bottom.

Chance Cove, on the northern side of the eastern approach to McArthur Pass, is deep, a poor anchorage. **Chance Lagoon,** at the head, has a large flat rock in its entrance. The passage eastward of this rock is foul, but a depth of 8 feet can be carried into the lagoon through the passage westward of the rock, the best water being found by favoring the western side of the passage. Protected anchorage for small craft can be had in this lagoon in 8 to 12 fathoms, mud and rock bottom, but anchors will not hold well in heavy weather.

Small vessels can find good anchorage in the small bight on the south side of McArthur Pass, close to westward of the narrowest part, in 7 to 11 fathoms, mud bottom. This anchorage is subject to strong williwaws, and local fishermen prefer to anchor close inshore, in the open bight on the northern side of the pass, northwestward from McArthur Cove, in 10 to 15 fathoms, rocky bottom.

East Arm of Nuka Bay has an average depth of over 100 fathoms. A small rocky bank, with a least known depth of 10 fathoms, is 0.3 mile off the western shore and about

0.5 mile southward of a prominent pinnacle rock, 22 feet high and close off the rounding point in the middle of that shore.

McCarty Glacier discharges into the head of East Arm. The perpendicular face of the glacier is several miles back from the edge of the terminal moraine where depths are about 1 fathom or less. Between the edge of the moraine and the face of the glacier the water, carrying an ice pack, is much deeper, no bottom at 10 fathoms being found in one place. The drifting ice from the pack is lifted over the terminal moraine at high tides. On the flood a strong current sets northward across this moraine, and vessels should use caution to keep from being set onto or across it, and into the grinding ice pack. The depths at the head shoal very rapidly.

Ice in East Arm is thickest after spring tides and with northerly breezes will be set into the main part of Nuka Bay, into the entrance of West Arm and even into Nuka Passage, often interfering with navigation. With southerly breezes, the ice will pack up at the head of East Arm, leaving the main part of the arm clear. With easterly or westerly breezes, the ice will pack along the opposite shore, leaving the main part of the bay and the lee shore free.

The square-shaped bay on the eastern side of East Arm, 2 miles northward from the western entrance of McArthur Pass, affords indifferent anchorage off its southeastern side in 12 to 15 fathoms, rocky bottom. The small bight on the northeastern side of the bay is foul.

Moonlight Bay, on the eastern side of East Arm, about 1.8 miles from the head, is deep and clear. Large vessels can find good anchorage near its head in 15 to 30 fathoms, sticky mud bottom. Small vessels can find better protection in **Midnight Cove,** a long bight making off to eastward from the northern side of Moonlight Bay, but they must avoid a 5-foot shoal about 200 yards off the north side of the entrance. Good anchorage is available in the middle of the cove, just past the turn, in 9 to 10 fathoms, mud bottom, or near the head of the cove in 14 to 16 fathoms, mud bottom. A spit, bare at low water and covered with boulders, extends out from the head of the cove 150 yards. This cove is the best anchorage for small vessels in East Arm, as it is doubtful that ice would drift in here in quantity.

The small cove just northward from Moonlight Bay has depths of from 5 to 8 fathoms, mud bottom, but with westerly winds is apt to be filled with ice. A narrow spit, bare at low tide and covered with boulders, extends out from the head of the cove for 75 yards.

McCarty Lagoon, on the eastern side of East Arm at its head, has not been surveyed. The entrance nearly bares at low water, but shallow-draft vessels can enter at high tide. The tidal currents in the entrance have an estimated velocity of 8 to 12 knots at strength, so that high-water slack is the only time to enter. Depths of 15 to 20 fathoms, mud bottom, are reported inside the lagoon. The entrance is narrow, with sand and mud bottom. The lagoon probably freezes over in the winter.

James Lagoon, on the western side of East Arm at its head, is about 1 mile long and 0.8 mile wide. There is a prominent dirt cone, 90 feet high, on the northeastern side of the entrance. The entrance, about 0.8 mile long, has a least depth in the center of the channel of 4 feet at low water. In entering, favor the western shore to avoid a long sand spit, partly bare at low water, which makes out to southward for about 300 yards from the western end of the large, flat, sandy island on the eastern side of the channel. The tidal currents in the entrance have an estimated velocity of 6 to 10 knots

at strength, high-water slack occurring about 20 minutes before high water and low-water slack about 50 minutes after low water at Kodiak. Vessels should not attempt to enter except at slack water; high-water slack is the best. The entrance is often obstructed by ice, and ice is carried through the entrance into the lagoon. The lagoon has general depths of 12 to 15 fathoms, mud bottom. Vessels should approach the shore with caution, since large mud flats make off for considerable distance, especially along the northern shore. The lagoon probably freezes over in the winter.

Harrington Point, the southern tip of the peninsula separating East and West Arms, is bold and rocky, with rocks close inshore. A bank with a least depth of 10 fathoms is 0.6 mile south of the point. Another bank, with a least found depth of 11 fashoms, is 0.5 mile westward of a large rock, 35 feet high, close to the southwestern side of the peninsula.

West Arm of Nuka Bay is about 7 miles long in a northwesterly direction from Harrington Point. **Nuka River** and **Ferrum Creek** empty into **Beauty Bay,** the head of West Arm. A large mud flat makes out from the head of Beauty Bay with deep water close-to.

Shelter Cove, on the southern side of Beauty Bay, is small but affords anchorage with moderate swinging room in 14 to 16 fathoms, mud bottom. At the head of the cove is a grassy flat, in front of which is a large mud flat that covers at high tide.

Diablo Peak, on the west side of Beauty Bay, is 3,555 feet high and is a good mark.

Yalik Bay, on the western side of West Arm, opposite Harrington Point, has a shoal with a least found depth of 3½ fathoms in mid-bay, 1.2 miles from the entrance. Depths of over 20 fathoms can be found all around this shoal, the better channel lying to southward. This shoal is the only danger in the bay except rocks close inshore and two rocks, bare at low water, 150 yards off the northern shore 0.6 mile from the head.

Anchorage can be had in the center near the head in 14 to 16 fathoms, mud and gravel bottom, but there is limited swinging room for large vessels. Small vessels can find partially protected anchorage in the small bight on the northern side of the bay, 0.5 mile from the entrance, in 3 to 5 fathoms, sand bottom. A reef makes out for 0.2 mile eastward from **Yalik Point,** the southern entrance point to Yalik Bay. A least depth of 2 fathoms was found at the outer end of this reef. A rock with a depth of 1 foot over it is about 0.2 mile off the northern entrance point to Yalik Bay. At the time of its discovery the rock was marked by kelp. It is possible that at certain times there is no kelp on it.

Surprise Bay indents the eastern side of West Arm. Anchorage can be had 0.3 mile from the entrance to the lagoon at its head, in 17 to 20 fathoms, mud bottom.

Palisade Lagoon, at the head of Surprise Bay, has a narrow entrance 40 yards wide and 350 yards long. This entrance is too narrow and crooked to be attempted by any except very small vessels. A depth of about 4 fathoms can be carried through in accordance with the following directions: Favor the eastern side of the entrance until past the point on the western side, to avoid a rock lying close to eastward of this point. Then favor the western side of the channel into the lagoon. A large sand spit with boulders on it is on the eastern side of the entrance of the inner end. The general depths in the lagoon range between 18 and 22 fathoms, mud and rock bottom, and afford secure anchorage, but the lagoon sometimes freezes over in the winter. A large sand flat, bare at low water, is at the head of the lagoon. A small stream, locally known as **Babcock Creek,** empties into the head of the lagoon.

Ariadne Cove is behind **Ariadne Island** on the south side of the entrance to Surprise Bay. The island is 90 feet high and prominent. There is good anchorage for small vessels in this cove in from 5 to 10 fathoms, mud bottom, but in wintertime, with northwesterly winds, the cove becomes quite rough. There are two entrance channels, one on each side of Ariadne Island. The north entrance has a rock, bare at low water, near midchannel southeastward of the island; the best water is to eastward of this rock, but care should be taken to avoid reefs which make out from the northern shore of the cove.

The western entrance has a shoal of 2½ fathoms in mid-approach. A reef bare at low water makes off for 125 yards from the point on the southern side of the entrance. The best water in this entrance is found by favoring the island, being careful to avoid a reef awash at high water extending 60 yards southward from the second point from the entrance on the southern side of the island.

Quartz Bay is on the eastern side of West Arm, 4 miles northwestward from Harrington Point. **Beautiful Isle,** a wooded islet with a cluster of bare rocks, is on the southern side of the entrance. A shoal with a least depth of 31 feet is 300 yards westward. Another shoal, with a least depth of 24 feet, is 250 yards off the northern shore of the entrance. Anchorage can be found in the center of the bay, 0.3 mile from its head, in 14 to 18 fathoms, mud bottom. The 10-fathom curve is about 325 yards from shore at the head of the bay. The water shoals very rapidly inside this curve.

Moss Point separates Beauty Bay from North Arm. It has a number of grass-covered rocks and wooded islets close-to.

North Arm branches off for 5 miles to northward from West Arm. A large flat back of the head of the arm is covered with grass and alders, in front of which is a mud flat which covers. Deep water approaches to within 250 yards of the head of the arm and to within 100 yards of the low water line.

Pilot Harbor is on the eastern side of North Arm about 1 mile from its head. A bare rock, 3 feet high, is 275 yards off the southern point of the entrance and a submerged rock lies 100 yards northeastward. A large bare rock, 4 feet high, is 125 yards southward of a wooded islet close off the northern point of the entrance. There is a clear entrance between these rocks. A large shoal area, 200 to 300 yards wide and mostly bare at low water, extends across the head of the bay. Entering in mid-channel, a secure anchorage will be found in the middle in 14 to 16 fathoms, mud bottom.

Small vessels can anchor 100 yards to westward of the point that resembles a small wooded islet, on the northeastern side of Pilot Harbor in 5 to 8 fathoms, mud bottom. This is the best anchorage for small craft in North and West Arms in stormy weather.

A small cove is on the western side of North Arm, about 1 mile from its head. This cove is very deep, and has no anchorage. A large, prominent waterfall, with a sheer drop of about 900 feet, is about 1.5 miles northwestward from the head of the cove.

Nuka Island, on the western side of Nuka Bay, is about 7.5 miles long and 3.5 miles wide. The island is mountainous, the highest peaks rising to 2,115 feet, and is densely wooded on the lower slopes in the northern part and grass covered in the southern part. The eastern shore rises precipitously to the mountain tops and is bare shale and talus formation. The western shore, bordering on Nuka Passage, is broken up into numerous bays and coves.

On the western shore of the island, about 2 miles southward of **Hardover Point,** are the remaining buildings of what was once a fox farm.

Nuka Point, the southern end of Nuka Island, is fairly prominent. This point is

formed by a peninsula about 1 mile long and 0.6 mile wide, with a peak 769 feet high near its inshore end. The peninsula is connected with the main part of the island by low land, so that, from a distance, it resembles an island. The eastern and southern shores rise in sheer cliffs, making a landing impossible. Two rocks about 3 feet high are 0.3 mile off the point eastward of the 769-foot peak, and a reef covers the area inshore of them.

Nuka Rock is a lone rock, 3 feet high and 20 feet across, 0.4 mile south of the southeastern tip of Nuka Point. Irregular depths of less than 25 fathoms extend about 3 miles southward from Nuka Point. A rocky patch of 8 fathoms is 1.5 miles eastward from Nuka Rock; another patch of 8 fathoms is about 3 miles northeastward from Nuka Rock.

Pinnacle Rock, 3 miles northeastward of Nuka Rock, is the most prominent landmark along this coast. The rock is 68 feet high and is 0.3 mile offshore. Numerous small rocks and reefs, marked by kelp, lie inshore from this rock.

Along the coast between Pinnacle Rock and Nuka Point, and also for 0.5 mile northward of Pinnacle Rock, are numerous rocks, some of which are as much as 250 yards offshore. About 1.5 miles northward of Pinnacle Rock is a small bight, with a cluster of rocks and islets, which is very foul.

Extending about 1 mile southward of the bight and lying offshore from two prominent sand beaches, is an area with sandy bottom. The bottom is smooth, with gradually increasing depths to the 10-fathom curve, nearly 0.5 mile offshore.

A prominent reef about 5 miles northeastward of Nuka Point and 3 miles southward of the entrance to Nuka Passage makes a good mark. This reef is formed by two large rocks, 25 and 30 feet high, the outermost being the smaller and lying 400 yards off the eastern shore of Nuka Island. Many rocks lie along the coast inshore of this reef, but deep water approaches within 200 yards on the offshore side.

The small inlet about 1 mile southward from the eastern entrance to Nuka Passage is the only important indentation in the eastern shore of the island. It has a width of 0.8 mile at the entrance, decreasing to about 200 yards near its head. Off the northern point of the entrance is a prominent wooded islet about 70 feet high, the outer face of which is bare white granite. There are numerous high, bare rocks and wooded and grassy islets on both sides of the entrance. The inlet is exposed to southeastward, and the southern side is foul, but small craft can approach its head as follows:

Enter in mid-channel and when 200 yards past the wooded islet on the northern side, anchor in 6 to 9 fathoms, sandy bottom. If going to the head of the inlet, favor the northern side above this anchorage to avoid submerged rocks lying almost in midchannel. A large sand flat is at the head, with very shoal water 125 yards offshore from it. Very small craft can anchor abreast the last point on the southern shore, 200 yards from the low-water line, in 2 fathoms, sandy bottom, but there is very little swinging room. This inlet affords fair-weather anchorage only.

For 1.5 miles northwestward of the inlet there are rocks as much as 250 yards offshore. The last of these is 2 feet high, 300 yards offshore, and makes a good mark for entering Nuka Passage. Deep water is fairly close outside these rocks, the 100-fathom curve lying 0.4 mile offshore.

Nuka Passage, between Nuka Island and the mainland, is about 12 miles long from the eastern entrance to the southern entrance.

When used with McArthur Pass, this passage affords a shorter and protected route

for vessels proceeding along the coast. It is of special use to small low-powered craft. The passage is deep and is easily navigated in clear weather.

In the approach to the eastern entrance is a bank with a least depth of 8 fathoms 1 mile southward of the point on the north side. Between this bank and the northern shore of Nuka Island are depths of over 100 fathoms. A shoal, with a least depth of 4¾ fathoms, is in mid-passage, 1 mile southwest of the northern point of the entrance, and nearly 0.5 mile southeastward of a prominent wooded islet on the northern side of the pass. Between this shoal and the southern shore are depths of 90 fathoms. About 1.5 miles inside the eastern entrance, on the north side, is a small cove open to the eastward; good anchorage is available for small craft in 4½ to 10 fathoms, mud bottom, and fresh water may be obtained from the stream.

Division Island is in mid-passage about 2.2 miles from the eastern entrance. It is 125 feet high and is wooded. It is in reality three separate islands connected at low water and diminishing in size toward the west. The ship channel is southward of the islands.

A rock awash at high tide is 180 yards southward of the eastern tip of Division Island. A rock bare at minus tides is in mid-channel to the north of the island. A 6-fathom shoal extends southward from the western extremity of the Division Island group, reaching almost halfway across the channel.

A near mid-channel course, slightly favoring the south shore, is recommended in making this passage. The tidal currents have considerable strength.

From Hardover Point the pass trends southward toward Gore Point. About 0.6 mile northwestward of Hardover Point, on the northern side of the channel, is a large sand-and-gravel flat which extends northwestward for about 1.5 miles to the foot of Yalik Glacier, a prominent mark. Deep water approaches close to this flat except at its southwestern end where it is shoal for considerable distance offshore.

Home Cove is a small cove about 1.5 miles southward from Hardover Point.

Berger Island is a prominent wooded islet, 25 feet high, about 5 miles southward from Hardover Point. The island is the outermost of a group making off from the eastern shore, and appears from northward to lie in the center of the channel.

A rock 8 feet high lies 250 yards northeastward from the island. A reef baring at low water extends 85 yards off this rock. A rock awash at low water and not marked by kelp is 1.2 miles 213° from Berger Island.

About 0.6 mile southward of Berger Island is a grass-covered islet 45 feet high surmounted by a bushy spruce tree which shows up well from the north or south, but blends into the background when viewed from the west. This tree is flanked by two dead trees which show up nearly white. The spruce tree in range with the west tangent of Berger Island to the north marks the 3½-fathom spot in the entrance to Westdahl Cove.

Westdahl Cove is one mile southward of Berger Island. The 3½-fathom shoal is about midway between the north and south entrance points. A rocky patch of 13 to 18 fathoms extends nearly across the bay. The anchorage is inside of this rocky patch in 22 fathoms, mud bottom. A reef baring at low water and marked by thick kelp is 0.3 mile westward of the southern entrance point.

Yalik Glacier discharges into the west arm of Nuka Passage. There is a good anchorage off the southwestern end of the glacier moraine in 14 to 17 fathoms, soft bottom. Local knowledge is necessary to avoid anchoring too close to a 2-fathom rocky

shoal about 0.4 mile southward of the low-water line of the moraine and about 0.3 mile eastward of the western shore. An unusual rocky reef, bare at low water, extends 300 yards in a southeasterly direction from the extreme soutnwestern end of the moraine.

Petrof Point is on the western side of tne passage opposite the middle part of Nuka Island. It is a prominent, low, rounding point with a wide sand beach.

Petrof Glacier, which shows prominently from the southward, discharges into the west side of the passage around the base of a prominent ridge about 2 miles southward of Petrof Point.

Brown Mountain, 2,375 feet high, is between Petrof Glacier and Tonsina Bay. It is of a distinctive brown shade during the summer months, and has a prominent round shoulder jutting to the eastward.

Tonsina Bay is a small bay 7 miles northward from Gore Point. It is marked by a large island, known locally as **Long Island,** nearly in the center of the entrance. The island has an elevation of about 80 feet. The entrance north of Long Island is preferred, as it is deeper and wider. Firm sand flats are at the head of the bay where vessels of any size can be beached in an emergency. On the north side of the northern entrance is a bold wooded islet. About 380 yards southward of this islet is a reef awash at high water. Thick kelp extends between the reef and the islet.

A rock awash at half tide is 660 yards 275° from this reef; it is 250 yards south of the north shore, and there is kelp inshore of it. Numerous rocks and islets make off to northward from Long Island. The northernmost is a well-defined rocky islet sparsely covered with grass and about 25 feet high.

Entrance should be made at low water when the various rocks and reefs are visible. Anchorage can be had in 22 fathoms, mud bottom, northwestward of Long Island in the basin formed by Long Island, the islets, and the mainland. Good anchorage for small craft can be had near the head of the bay in 5 to 10 fathoms, sand bottom.

Front Point, rising abruptly to a height of 170 feet, is 5 miles northward of Gore Point, on an island which is separated from the mainland by a narrow band of water about 25 yards wide.

A reef bare at minus tides is 0.4 mile eastward from the point and there are several sunken rocks and kelp patches inshore from this danger. The coast from the southern entrance to Tonsina Bay to the bight north of Gore Point has numerous rocks awash and kelp patches extending about 0.3 mile offshore.

Anchorage can be had anywhere in the bight north of Gore Point by keeping clear of the kelp and avoiding the rock, bare 3 feet at low water, 300 yards northeast of the well-defined rock point at the westerly end of the bight.

Charts 8553, 8554.—Cook Inlet, on the west side of **Kenai Peninsula,** merges with Shelikof Strait through a wide unobstructed passage westward of the Barren Islands. Leading from the Gulf of Alaska to Cook Inlet are Chugach Passage, inside the Chugach Islands, and the passages northward and southward of the Barren Islands. A submerged pinnacle rock, covered 4½ fathoms, is about 17 miles eastward of the Barren Islands in the seaward approach to these passages.

Prominent features.—The shore on both sides of the inlet can be seen in clear weather, but it is sometimes difficult to determine a position on account of the lack of marked features on the eastern shore. Conspicuous and useful marks are Augustine, Iliamna, and Redoubt Volcanoes in the lower inlet, and Mounts Susitna and Spurr in

the upper inlet. Prominent in their respective localities are the numerous peaks southward of Kachemak Bay and northward from Kamishak Bay; Anchor Point; the 1,900-foot hill 10 miles from the east shore between Capes Starichkof and Ninilchik; Chisik Island; Kalgin Island; East, West, and North Forelands; Point Possession; and Fire Island.

Dangers.—The shoals in Cook Inlet are generally strewn with boulders, which lie on the otherwise flat bottom, give no indication to the lead unless it strikes them, and are not marked by kelp. Most of those located by the survey were found by sighting them at low water. It was noted in places that the boulders rise as much as 30 feet above the general level of the bottom. As a measure of caution, therefore, it is considered advisable for vessels to avoid areas having depths no more than 30 feet greater than the draft. At low water, deep-draft vessels should avoid areas with charted depths of less than 10 fathoms.

In general, the shoal banks fronting the marshy parts of the shores in the upper inlet are free from boulders, the deposit having been sufficient, apparently, to cover them, but there are indications that boulders do occur in the deeper water outside these banks.

With an average tidal current there are swirls throughout the inlet, but they do not necessarily indicate dangers as they show in depths of 15 fathoms if the bottom is uneven. Heavy swirls with slight overfalls should be avoided, and any disturbance which has a recognizable wake in the water should be considered as indicating a dangerous rock or shoal.

The waters of the inlet are much discolored by glacial silt. At low water the discoloration may extend to the mouth of the inlet, and at high tide the water may be comparatively clear to East and West Forelands or even farther north. Frequently with either a flood or ebb current the water above the Forelands appears as a liquid mud.

Fish traps.—A large number of salmon traps line the eastern shore of Cook Inlet. They are pile structures and are required to carry lights at the outer end.

Harbors and anchorages.—Port Graham, Seldovia Bay, Kasitsna and Coal Bays in Kachemak Bay, Iniskin Bay, Tuxedni Channel, and Knik Arm are the secure harbors in the inlet, and the anchorage at East Foreland (Nikishka) is sheltered from easterly winds. Temporary anchorage in thick weather can be selected at most places in the inlet with the aid of the chart. The great range of the tides must always be kept in mind when anchoring.

Supplies.—The principal settlements along Cook Inlet are Port Graham, Seldovia, Homer, Kenai, and Anchorage; supplies and water are available. Water also can be obtained from numerous streams along all the high shores but is sometimes accessible only at high tide; in the upper inlet the only known streams where vessels can approach the shore closely enough to boat water in any quantity are on the north side of East Foreland, on the north side of Point Possession, and in Knik Arm.

Ice.—The upper part of Cook Inlet is more or less obstructed during the winter season by ice which forms on the flats and in the shallower waters. A Weather Bureau analysis of conditions at Anchorage is given later in this chapter.

During a mild winter or after a period of several days of mild weather, vessels will probably have no difficulty in reaching the head of the inlet and lying at anchor long enough to discharge their cargoes to lighters alongside.

During a severe winter or after a considerable period of severe cold such a course is not feasible; full-powered vessels could probably reach the head of the inlet even at such times but, because of the heavy masses of ice floating in the strong currents, would find it impracticable to discharge to lighters, either when lying at anchor or drifting with the current.

Ice does not generally interfere with navigation southward of Anchor Point except on the western side of the inlet, where large fields of it are sometimes carried by wind and tide as far as Augustine Island, closing Iliamna Bay for brief periods.

Traffic.—At present there is little traffic in Cook Inlet except that connected with the salmon canneries. All freight for the interior is discharged at Whittier and Seward and goes in over the railroad. The Territory of Alaska subsidizes a small vessel which makes regular trips from Seward to Iliamna Bay.

Tides.—Daily predictions of high and low waters at Seldovia and Anchorage are given in the *Tide Tables*.

Currents.—Tidal currents in Cook Inlet are strong and must be considered at all times. The small local steamers plan their trips so as to have a favorable current and prefer to anchor rather than steam against the current of a large tide. A vessel with a speed of 8 knots, picking up the flood current of a large tide a little northward of Anchor Point, can carry it to Fire Island.

At the entrance to Cook Inlet the tidal currents have an estimated average velocity of 2 to 3 knots at strength, and in general the velocities increase up the inlet, with very large velocities in the vicinities of Harriet Point, East and West Forelands, and the entrances to Knik and Turnagain Arms. The maximum current velocity measured by the survey ship *McArthur* was 5 knots at anchorages near East and West Forelands, Tyonek, and Point Mackenzie. These anchorages were out of the full strength of the current, and it is estimated that the maximum velocity of the current during a large tide is as much as 8 knots between East and West Forelands and probably more between Harriet Point and the south end of Kalgin Island.

In general, the direction of the current is approximately parallel to the trend of the nearest shore and, when flats are uncovered, parallel to their edges. Off the various bays a set may be expected, toward the bay on a flood current and from the bay on an ebb current.

Predicted times and velocities of the current for a number of locations in Cook Inlet may be obtained from the *Current Tables*.

The following statements give information not contained in the current tables. Current table information should be relied upon for all localities listed in those tables. The available current information for Cook Inlet is derived largely from observations near the shores. In the middle of the channel it is likely that velocities are larger and times of current somewhat later than near the shore.

At Dangerous Cape.—A current of nearly 3 knots sets at times across the broken ground around the cape, causing heavy rips and overfalls.

Kachemak Bay.—From Dangerous Cape, a flood current sets up Kachemak Bay with a velocity of 1 to 2 knots in a northeasterly direction, and the ebb flows in a southwesterly to westerly direction. The currents at the mouth of the bay are uncertain, and may vary from place to place, making it difficult to make correct allowance for set in crossing from Anchor Point to Seldovia.

At Seldovia.—The tidal currents have an estimated velocity of 1 to 2 knots at strength.

At Knik Harbor.—The tidal currents have moderate velocity at the anchorage near the shore, and are strong in mid-channel.

Turnagain Arm.—The currents are very strong and the flood frequently comes in as a bore, with large tides, under certain weather conditions. This bore is said to be 4 to 6 feet high at times, and is very dangerous for small craft. Boats should be beached well above the level of the flats, to avoid the bore when it comes in. The bore can be heard about one-half hour before it arrives, sounding like breakers on the beach; it travels slowly.

Harriet Point.—The currents are very swift at Harriet Point, exceeding 5 knots on large tides, and with southerly breezes bad tide rips occur between Harriet Point and Kalgin Island, and extend some distance southward.

Kamishak Bay.—In the northern part of the bay, the currents follow the coast, flooding northeastward and ebbing southwestward at a rate of about 1 knot at strength. The current is more noticeable near the shore. With a strong westerly wind, tide rips occur about 2 to 4 miles north of Chinitna Point.

Directions, Cook Inlet.—From a position with Cape Elizabeth bearing 357°, distant 6.5 miles, make good a 335° course for 14.3 miles, passing 2 miles off the outer rocks near Cape Elizabeth and Point Adam; Flat Island Light should then bear 028°, distant 4.5 miles.

Then make good a 000° course for 30 miles to a position with Anchor Point Light abeam, distant 6 miles; thence, a 016° course for 44 miles to a position with the light at the northeast point of Kalgin Island abeam, distant 5 miles; thence, a 012° course passing midway between East and West Forelands for a distance of 19 miles. Next, bring the southeast end of West Foreland astern on a 057° course, and make good for 45.5 miles to a position 0.5 mile abeam of Race Point Light on Fire Island. On this course it is imperative to make proper allowance for the currents setting to or from Turnagain Arm. An allowance of as much as two points is sometimes necessary.

From abeam of Race Point Light proceed to Anchorage as recommended near the end of this chapter; this is the critical part of the entire passage.

The aviation radio ranges, signal characteristics HOM and ENA at Homer and Kenai, respectively, have been found valuable as aids to surface navigation.

Chart 8532.—Barren Islands, a group of mountainous islands in the middle of the entrance to Cook Inlet between Chugach Islands and Shuyak Island, occupy an area about 13 miles long and 5 miles wide. East and West Amatuli Islands are bold and precipitous and devoid of trees. They are thickly covered with grass in the depressions and on the less precipitous slopes. In general, the anchorages around Ushagat Island are preferable to the others in the group.

Tidal currents of considerable velocity are found in the passages north and south of the Barren Islands, the flood current setting approximately northwestward and the ebb southeastward. Heavy tide rips occur with strong winds in the vicinity of the islands, and are frequently dangerous for small vessels. The wind among the Barren Islands is generally stronger than it is a few miles away.

In the deep water areas of the passages north and south of the Barren Islands

and their approaches, the current usually is regular and appears to have less force than along the sides of the passages. At the edges of the banks bordering the islands and on the detached 20- and 30-fathom banks, in fact wherever there is much change in depth, the current increases greatly in force. Such currents are usually, but not always, marked by ripples, eddies, or boils.

Ebb currents set strongly to the eastward along the edge of the bank bordering the north side of the Barren Islands, to the southward between Ushagat and Amatuli Islands, and to the eastward north of Sugarloaf Island. The ebb currents are variable for a few miles southward from the Barren Islands. Farther southward, they set steadily southeastward.

On the flood a narrow band of strong current will be felt a few miles north of the Barren Islands. Some lee from the flood current is afforded closer inshore, but even there a steady set to the westward will generally be found.

The current in general probably does not exceed 4 knots. Reports indicate that the slack waters do not occur at the times of local high and low tides, and the navigator is cautioned against assuming such a relation to exist. See currents for Chugach passage later in this chapter and for vicinity of Latax Rocks in Chapter 5.

Caution.—Operators of small boats should take particular care to avoid being caught in tide rips off the Barren Islands. With a moderate westerly sea, wind force 4 to 5, coaming seas in series of three to four high waves have been seen north of Nord Island with sufficient height and force to seriously endanger, if not swamp, the ordinary fishing launch. In moderate weather small boats should not leave these islands until the current sets with the sea.

Dangers.—In the seaward approach to the Barren Islands is a submerged pinnacle rock, covered 4½ fathoms. It is 16.8 miles 088° from Puffin Peak, East Amatuli Island. The top of the rock is of very small area, and apparently is the high point of a larger shoal. It may or may not be marked by a current slick.

A rock awash at half tide is 1.2 miles northward from the northernmost point of West Amatuli Island.

A bare rock 8 feet high is about 0.8 mile west of the northwest point of Ushagat Island. Two rocks awash at half tide are 220 yards northwest and 0.5 mile eastward of the bare rock.

East Amatuli Island, at the eastern end of the group, is about 2 miles long in an east and west direction. It has high peaks along its length, except 0.8 mile from its southwest end where it drops to a valley having a level of less than 200 feet. A rocky islet, 118 feet high and 200 yards off the eastern end of the island, is marked by **East Amatuli Island Light (lat. 58°55′0 N., long. 151°57′0 W.),** 120 feet above the water and visible 12 miles. It is obscured from 076° to 147°. A rock awash is 250 yards east of the light.

Puffin Peak, on East Amatuli Island, 1,540 feet high, is the highest peak in the eastern group of the Barren Islands. It has a conical top.

Amatuli Cove is on the north side of East Amatuli Island and close to the west end. It is about 0.5 mile in extent and affords fair anchorage near its head for small craft, in 6 to 8 fathoms, sand and gravel bottom. With a heavy northeast wind, considerable sea makes into the cove and the williwaws are heavy. Winds draw through the cove with great strength, especially when from the southeast and south. The hold-

ing ground is not good. Kelp grows along the shores, and there is a small stream at the head of the cove.

West Amatuli Island is about 2.5 miles long and mountainous. A cluster of rocks about 30 feet high is 0.5 mile eastward from the northeast end of the island, with a reef between. A rock 6 feet high is 370 yards off the north point of the island. A rock awash at halftide, which does not always break, is 1 mile north of the 6-foot rock.

Sugarloaf Island, 1.1 miles southward from East Amatuli Island, is about 0.8 mile long and 1,202 feet high, with deep water between it and the other Barren Islands. A large grass-covered rock, 95 feet high, is 0.4 mile south of Sugarloaf Island, with foul ground between. A rock awash is 200 yards from the southwest corner of the island and a 10-fathom bank, on which tide rips are common, is about 0.4 mile westward.

Nord Island, 1.3 miles northward from the eastern end of Ushagat, with deep water between, is about 0.5 mile in diameter. Its southern half is a dome 672 feet high, while its northern half is lower and irregular.

Sud Island, 1.1 miles off the southeast side of Ushagat, is 1.1 miles long and about 960 feet high near its southwestern end. Near its northeastern end is a knob 203 feet high. Sunken rocks and rocks awash extend out 300 yards in many places around the island.

A small rocky grass-topped island, 348 feet high, is 1.3 miles southeastward from the southwest point of Ushagat Island. Foul ground surrounds the island and extends almost to a bare rock, 48 feet high, about 1 mile to the southward. A low rock lies between the island and the bare rock. Strong tide rips in this vicinity extend to the southwest end of Ushagat Island. A barrier against the ebb current is formed by the island, rocks, and shoal area, thereby materially decreasing the strength of this current along the southeast shore of Ushagat Island.

Ushagat Island, the westernmost and largest of the Barren Islands, is 6.8 miles long and 3.5 miles wide near its western end. Ushagat Island is grass-covered except on the tops of peaks and where the cliffs are steep. The trees are spruce, ranging from about 50 feet high near the lake to 3 feet high near the west end. The island is practically inaccessible except at the low neck near the northeast end and at the beaches fronting the valley in the northwest part. The summit of the island, 1,965 feet, is the highest in the Barren Islands. **Table Mountain,** at the northeast end, 1,292 feet high, is separated from the other high land of the island by a low narrow neck. There are several brackish lakes which are probably fresh in the spring.

Two rocks nearly awash at high water are 0.4 mile northward from the northwest end of Ushagat Island. The dangers 0.8 mile to the westward have already been described. Bare rocks extend 0.4 mile southwestward from the southwest end of the island. The west side of Ushagat Island is indented about 1 mile by an open bay, about 2.5 miles wide, with two bights. Good anchorage for all easterly winds can be had in the bight at the north end of the bay.

Anchorage with shelter from southerly weather can be had off the north side of Ushagat Island near the head of the deep bight 2.5 miles from the northwest promontory. Some protection is gained here from westerly weather. Anchor in 12 to 15 fathoms, rock bottom, about 0.5 mile off the two small sand beaches. A small boat can get more shelter by anchoring close in.

Good protection in northerly or westerly weather can be had in the bight on the south side of Ushagat Island, northward of Sud Island. Williwaws are strong, but a

small boat can avoid the worst of them by anchoring under the cliffs to the west of the head of the bight. A large vessel should anchor in 12 to 18 fathoms, rock bottom.

Chart 8531.—Gore Point is the eastern end of a prominent headland, 18 miles 247° from Pye Reef and 16 miles 070° from the southeast end of East Chugach Island. From eastward and westward, the headland has the appearance of an island, with **Gore Peak,** elevation 1,393 feet, near the middle and a broad, high shoulder at the ends, and separated from the high land northward by a narrow gap. The arch in **Arch Rock,** at the eastern end of Gore Point, shows over a small arc from southward, and a folding in the strata in the face of the cliff shows on the south side of the headland.

Within a radius of 1.2 miles of Gore Point, the bottom is very irregular, depths of 14 fathoms being found at that distance off. A depth of 5½ fathoms was found 0.4 mile south of the point in general depths of 10 to 15 fathoms.

The neck joining the headland at Gore Point to the mainland is low and wooded. On the west side of the neck is a cove affording indifferent anchorage with easterly winds. The south point of the cove is the west end of the headland, and is a shelving ridge of bare rock. Close to this point is a rocky islet, from which rocks, bare at low water, and kelp extend about 200 yards northwestward. A rock, covered at high water, is about 100 yards from the cliff at the southeast end of the cove. A large kelp field extends about 200 yards northwestward from the rock. The anchorage is in 18 to 25 fathoms, soft bottom, 250 to 300 yards from the beach of the low neck and about 0.3 mile from the cliff on the southern side. The water deepens rapidly northwestward, the swinging room is scant, and the anchorage is uneasy. It is recommended only as a temporary anchorage.

Port Dick, westward of Gore Point, extends north for 2.5 miles to the junction of its three main arms. Abrupt shoals lie within a radius of 1.5 miles about the point at the western side of the entrance to Port Dick. The areas near the point are foul.

Takoma Cove and **Sunday Bay** are branches of the arm or bay on the eastern side of Port Dick, 2.5 miles above the entrance. A dangerous reef covered 1¼ fathoms is 0.3 to 0.5 mile westward from the south side of the entrance to the bay. Takoma Cove is the anchorage generally used in Port Dick. Sunday Bay has irregular depths and is not recommended as an anchorage.

Local magnetic attraction.—Local magnetic disturbances causing differences of generally not more than 3° from charted compass variations may be encountered in the inshore waters.

Directions, Takoma Cove.—Stand up the middle of Port Dick on course **357°** until the middle of the entrance to Takoma Cove bears 090°. Then steer **090°** for the middle of the cove; a prominent wooded islet on the south side of West Arm will be directly astern. Anchor in the entrance to Takoma Cove with the shore to the southwestward open with the point at the western side of the entrance to Port Dick; select a depth of 17 to 18 fathoms, sticky mud bottom. In the lesser depths near the head of the cove, the bottom is rocky and has poor holding quality.

Taylor Bay, the northeastern arm of Port Dick, extends in a northerly direction for 3.5 miles and is 1.5 miles wide at the entrance. Except for rocks fringing the shores, no dangers were found in Taylor Bay. A rock 4 feet high is 1.5 miles north of the entrance and 130 yards off the first well-defined point on the east shore. At the beginning of the narrows are 2 rocks, awash at half tide and about 100 yards off the eastern shore.

At the upper end of the bay is a basin, with depths of 20 to 25 fathoms, surrounded by extensive mud flats.

West Arm extends for a distance of 7.5 miles, and is about 0.8 mile wide at the entrance. There are two coves on the north side of the arm, 1.5 and 4 miles, respectively, from the entrance. The first cove has two islands in the center. Anchorage can be had eastward of the islands in 16 to 19 fathoms, rocky and muddy bottom. The westernmost cove is practically bare at low water. At the head of the arm on the south side are two islets, the western one marking the low water line which extends directly across the arm at this point.

In the southwest approach to Port Dick is dangerous **Gore Rock,** covered 1¼ fathoms and lying 7.5 miles 244° from Gore Point and approximately 3.5 miles from shore.

The second small bay to the westward of Port Dick, distant 5 miles, has good anchorage for small craft in depths of 15 fathoms and less. Between Port Dick and this bay the shore should not be approached closer than 2 miles, due to rocks awash extending 1.5 miles off.

Rocky Bay, the large bay north of East Chugach Island, is broken by numerous rocks, islets, rocks awash, and shoal spots. The depths are irregular and of little use as guides for navigation. For small boats there is sheltered anchorage in **Picnic Harbor,** which is 220 to 300 yards wide.

Two rocks awash at ¾ tide are 1.2 miles southward from the large wooded island in the middle of Rocky Bay. There is also a 2½-fathom spot 1.3 miles southwestward from the east entrance point of the bay.

Windy Bay, just west of Rocky Bay, extends 3.5 miles westerly and is 440 yards wide near its head. Good holding bottom of mud in 8 to 10 fathoms is near its head, but it is not recommended as a desirable anchorage because of the strong westerly breeze that draws through the bay. Boats entering this bay should favor the south side, keeping about 440 yards offshore when north of the southerly entrance point.

Chugach Bay, the large bay south of Windy Bay, has a northerly bight with deep water close inshore, and a westerly arm, 2 miles long, with a good holding bottom of mud. This anchorage, which is affected by a strong westerly breeze that draws through it, can be used by small boats except in easterly weather. The bottom in the southern half of the entrance is broken, with a rocky spot having a depth of 1¾ fathoms.

Chugach Islands are three mountainous islands near the coast of Kenai Peninsula at the entrance to Cook Inlet. In order from eastward they are East Chugach, Perl, and Elizabeth Islands.

East Chugach Island, about 3.8 miles long and mountainous, has a low valley through the middle in a northeasterly and southwesterly direction. The southerly peak has an elevation of 1,450 feet, and the peak near the west end is higher. The southeast point of the island is a cliff with a peak at its crest and slightly lower land between it and the mountains. The point is marked by a **light (lat. 59°06′.4 N., long. 151°26′.5 W.),** 325 feet above the water and visible 12 miles, shown from a white house; the obscured sector is from 118° to 227°.

Considerable foul ground extends from the island into the passage to the northward. A rock awash at low water is 0.5 mile off the northeast point. A 4¼-fathom, kelp-marked shoal is 1.4 miles northeast of the low wooded spit at the northwest end of the

island. The passage is apparently clear between the 4¼-fathom shoal and the shoal area making off the points at the entrance to Chugach Bay.

The passage between East Chugach and Perl Islands is clear, and is used by vessels passing inside of Perl and Elizabeth Islands.

About 10.5 miles 178° from East Chugach Light is a rock covered 4½ fathoms. The rock is in the seaward approach to the passage between the Chugach and Barren Islands groups, and in the southeastern approach to the passage between East Chugach and Perl Islands. (See Chart 8554.)

Directions, inside East Chugach Island from Gore Point.—The depths along this route to Cook Inlet are very irregular and the region cannot be considered free from dangers until it has been dragged. Vessels prefer to use the passage between East Chugach and Perl Islands, which is considered safe and easy to navigate.

A kite was towed over the track here recommended. It was set to depths of 12 fathoms from Elizabeth Island to the spit of East Chugach Island and 15 to 20 fathoms in the deeper water eastward. In using the passage, therefore, vessels are advised to follow this track closely, as elsewhere there is not adequate assurance that the passage is free from dangers.

From a position 1.6 miles off Gore Point, steer **265°** with the sand spit on the northwest end of East Chugach Island ahead and in range with the south shore of Elizabeth Island. This course passes midway between Gore Rock and another rock, awash at half tide, which lies 2.4 miles 352° from Gore Rock. Hold this course for 12 miles, until the southeast end of East Chugach Island bears 220°; then steer **283°** for 4.5 miles, heading for the middle of the west arm of Chugach Bay, and passing at least 0.3 mile off the kelp marking the 4¼-fathom shoal north of East Chugach Island.

When the end of the spit bears 205° haul sharply to a **236°** course, heading midway between the two peaks of Perl Island, and pass in mid-channel between the end of the spit and the bare reef off the south point of Chugach Bay. Hold this course for 2.9 miles, until the south point of Chugach Bay bears 010°, then steer **264°** for 3.3 miles, heading for the rocks off the south shore of Elizabeth Island, to a position 0.5 mile off the high north point of Perl Island.

Then proceed as directed for Chugach Passage.

In following the above courses care should be taken to make proper allowance for the currents, which set in and out of Port Dick and diagonally across the approach to East Chugach Island. Because of these currents, the passage should not be attempted unless the weather is clear enough to permit the leading marks to be seen.

Perl Island, about 2.5 miles long and 1.8 miles wide, is mountainous with elevations up to 1,660 feet. Its northwest point has a sand spit on the west side and a high cliff on the north side. A light 80 feet above the water and visible 8 miles, is on the extreme northeastern point of Perl Island.

Perl Rock, 87 feet high, is a prominent, detached rock about 0.5 mile south of Perl Island. A rock, visible at low water, is 185 yards westward from Perl Rock.

Nagahut Rocks, about 50 feet high, are large prominent bare rocks, close together and connected at low water. They are 1.5 miles westward from the southwest end of Perl Island, with foul ground and no safe passage between them and the island.

Dora Reef is a small patch of sunken rocks, covered 4 fathoms, about 1 mile southwest of Nagahut Rocks. The reef is steep-to and breaks at low water with moderate seas.

There is deep water in the passage between Elizabeth Island and Nagahut Rocks; however, a shoal of 5½ to 7 fathoms lies 0.4 to 0.8 mile eastward from the southeastern end of Elizabeth Island, and a shoal of 4 fathoms is 1 mile westward from the west end of Perl Island.

Chugach Passage is between Perl and Elizabeth Islands and the rounded end of the mainland. A buoy marks the northeastern side of the channel in the turn of the passage.

The end of the mainland is fringed with reefs, and in rounding it from the eastward the outermost danger is a rock, baring at half tide, 0.5 mile offshore. The half-tide rock is 300 yards southward from a small, fairly high, lone rock which rises on the western end of a ledge that bares at low water. The lone rock shows at all stages of the tide.

Chugach Passage is commonly used by vessels entering Cook Inlet from eastward. Depths of 8 to 10 fathoms were found in the shoalest part of the channel between the southeast end of Elizabeth Island and the dangerous reef extending from the mainland. An abrupt rocky spot having a depth of 7 fathoms lies about 400 yards southward of the recommended sailing course inside Perl Island.

Elizabeth Island is about 3 miles in diameter and is composed of two mountain masses, with elevations up to 1,690 feet, separated by a low valley extending in a northwesterly direction. The northeast point is a sand spit awash at high water. It is marked by a **light (lat. 59°10′.6 N., long. 151°47′.6 W.)**, 45 feet above the water and visible 8 miles, shown from a white house on a skeleton tower; the obscured sector is from 324° to 120°. A depth of 1½ fathoms is found 0.3 mile east of the light, and a prominent, large, bare rock, 20 feet high, is 0.2 mile northwest. **Cape Elizabeth** is the western end of the island.

Currents, Chugach Passage.—Eastward of Elizabeth Island the flood sets northward and the ebb southward with average velocities at strength of 3 knots and 2 knots respectively. Predicted times and velocities of the current in Chugach Passage can be obtained from the *Current Tables*.

It is reported that the turn of the current in the main passage southward of Elizabeth Island occurs earlier, possibly as much as 1 hour, than in Chugach Passage. In the area southward of the Chugach Islands, tidal currents are much stronger near the islands than in the deep water farther south.

Heavy tide rips occur from the northwest end of Perl Island to the western end of the passage. The heaviest rips are in the vicinity of Perl Island with an ebb current and easterly wind. Heavy rips also occur off the southeast point of East Chugach Island.

Directions, Chugach Passage.—From a position 1 mile southward of East Chugach Light, steer **293°** for 8 miles, passing 0.7 mile off Perl Island Light, to a position 0.5 mile off the high north point of Perl Island. Then steer **275°** for 2.1 miles, heading for the high south peak of Elizabeth Island. When the northeast tangent of Elizabeth Island bears 330° steer **344°** for 2.9 miles, heading for the prominent white scar in the cliffs on the north shore of the approach to Port Chatham, and pass about mid-channel between the shore of Elizabeth Island and the mainland. This course passes 0.6 mile off Elizabeth Island Spit Light.

When the mouth of the stream from a waterfall, 1.3 miles southeastward of Chatham Island, bears 090°, distant 0.8 mile, steer **270°** for 1.5 miles, thence **284°** for about 2.9

miles, with the 1,586- and 1,885-foot peaks on the mainland almost on range astern, to a position about 1.8 miles southward of the yellow bluff at the east entrance point of Koyuktolik Bay.

Then steer **307°**, with the sharp southwest peak of Perl Island showing over the middle of the low valley in Elizabeth Island approximately astern, to a position 1.5 miles southwestward of Point Adam.

Chart 8588.—Port Chatham, indenting the end of Kenai Peninsula northward of Elizabeth Island, is a secure harbor for vessels of any size, and is easily entered in the daytime with clear weather. During heavy gales some williwaws are felt at the anchorage, but they are not dangerous.

Below Chatham Island the shores on both sides of the entrance are foul, but above the island the main part of the harbor is clear. The dangers are marked by kelp with the water below half tide. The mountains on either side of the harbor rise abruptly from the water and are wooded about halfway to the summits. There is a small cannery at **Portlock** on the south shore opposite the low grassy spit on the north side. It is reported that vessels of moderate draft can tie to the cannery wharf.

Claim Point, on the west side of the entrance, is a wooded hill 220 feet high, with a low wooded neck back of it. Bare rocks and kelp extend about 200 yards off the southeast side of the point.

Chrome Bay, on the north side of the entrance to Port Chatham, was formerly the location of a mine and wharf, but the wharf is now gone and the mine is no longer in operation.

Kelp Point is 0.5 mile northeastward from Claim Point. A bare rock lies 250 yards south of Kelp Point, and a dangerous detached reef with rocks bare at low water is about 300 yards eastward of the bare rock. This reef is covered by kelp, but usually the kelp does not show at high water.

Chatham Island, small, low, rocky, partly wooded, is in the middle of the port, about 1.2 miles inside the entrance. The channel is west of the island, and the only known danger is a rock with 1¼ fathoms over it, 500 yards north of the light. The rock is marked on its southeast side by a buoy in 40 feet of water. There is deep water on either side of the rock. A depth of 5¼ fathoms, with a possibility of less, was found 250 yards southwest of the light.

The passage east of Chatham Island is foul and should not be attempted by strangers. A rock, with 2¼ fathoms over it and marked by kelp, lies 0.4 mile from the eastern shore and 0.7 mile 165° from Chatham Island Light.

The **light (lat. 59°12′.6 N., long. 151°46′.5 W.),** 40 feet above the water and visible 7 miles, is shown from a white house on the west point of the island.

On the east side, 0.6 mile northeastward from Chatham Island, is a projecting rocky, wooded point, where the port changes direction. The opposite side, northeastward from this point, is a low grassy spit, wooded near its eastern end. The best anchorage is in the board part of the harbor 0.3 mile eastward of this spit, in 10 to 13 fathoms, soft bottom. At the eastern end of the harbor are some rocks showing but little above high water. On the south shore, 188° from these rocks, fresh water can be conveniently obtained by boats which can be placed under a waterfall at the higher stages of the tide. Just northward of the low grassy spit is an excellent place for beaching a vessel.

Tides.—High and low waters at Port Chatham occur about 25 minutes earlier than at Seldovia. The diurnal range of tide is about 14½ feet. The tidal currents have little velocity in the entrance and harbor, but in the approach on either side of Elizabeth Island there are strong tidal currents, and at times heavy tide rips. Information on currents in Chugach Passage is given in the *Current Tables*.

Directions, Port Chatham.—The channel and approach have been examined with a wire drag. The dragged areas are shown on Chart 8588.

From Chugach Passage.—Continue on course **344°**, heading for the prominent white scar in the cliff about 350 yards northeastward of Kelp Point, until Chatham Island Light bears 051°. Steer **029°** for 0.5 mile, heading for a small point about 1 mile northeastward of Kelp Point, to Chatham Island Light bearing 102°, distant 0.3 mile.

From here the course is **067°** for 0.3 mile, heading for the tangent of the prominent point on the south side at the turn of the port, and passing 300 yards northward of Chatham Island Light and about 100 yards southward of the buoy marking the 1¼-fathom rock. After passing the buoy to port, steer **044°** for 0.5 mile, heading for the islet close to the north shore about 0.5 mile westward of the end of the grassy spit. When the northeast end of the point at the turn of the port is abeam on the last course, distant 0.2 mile, steer **098°** for 0.9 mile to the vicinity of the anchorage.

From Cook Inlet.—On course **090°**, heading for the mouth of a stream from a waterfall 1.2 miles southeastward of Chatham Island, steer for a position 0.5 mile 344° from the large bare rock 20 feet high, 300 yards off the north shore of Elizabeth Island. From here, continue on course **029°** for 1.5 miles, heading for a small point about 1 mile northeastward of Kelp Point, to Chatham Island Light bearing 102°, distant 0.3 mile. Then proceed as from Chugach Passage.

Chart 8531.—**Koyuktolik Bay** is about 3 miles westward of Port Chatham. Its north shore consists of bare rocky cliffs, while the south shores are lower. The south entrance point is a low yellow bluff. Temporary anchorage for a moderate-sized vessel, in 8 to 10 fathoms, hard bottom, can be found 0.5 mile from the head of the bay. It is probable, however, that in any heavy weather a considerable swell reaches this anchorage. It is restricted by a sand and gravel shoal extending from the south shore and by rocks awash off the north shore.

Point Adam, just west of Koyuktolik Bay, is low at the end, and rises in a steep grassy slope to mountains. **Magnet Rock** is 3.2 miles 345° from Point Adam and about 0.5 mile off **Point Bede.** The rock is 25 feet high, black, and prominent.

Flat Island, 1.4 miles northward from Magnet Rock, is small, flat grass-covered, and about 50 feet high, and is composed of two closely connected islands joined by bare reefs. On the northwest part of the island is a **light (lat. 59°19′.9 N., long. 151°59′.6 W.),** 70 feet above the water and visible 8 miles.

Chart 8589.—**Port Graham,** on the east side of Cook Inlet, 4 miles northward of Flat Island, is a secure harbor inside Passage Island, and with care is easily entered in the daytime. Its entrance between Russian Point on the south side and Dangerous Cape on the north side, has extensive outlying reefs, covered at various stages of the tide. The dangers are generally steep-to and are marked by kelp in summer and fall.

English Bay is an open bight on the west side of **Russian Point. English Bay Reef,** bare at low water, is about 1 mile west of Russian Point. There is broken bottom

between the reef and the foul ground extending from Russian Point, and strangers should not cross this area. Dangers along the south shore of English Bay may extend farther out than shown on the chart. **English Bay (Alexandrovsk)** (*pop. 75 in 1950*), a small Indian village with a Greek church, is on the northeast side of English Bay.

The passage northward of Passage Island and its approach is marked by several aids and is the one in general use for entering Port Graham. The unmarked passage southward of Passage Island is approached through a narrow channel with depths of 6 to 8 fathoms over a rocky bar northward of Russian Point. The bar channel rounds a reef, which bares at low water and extends 600 yards northward from Russian Point.

Dangerous Cape is on the north side of the entrance to Port Graham. **Dangerous Cape Reef** extends 0.5 mile westward from the western side of the cape. **Bird Reef,** 250 yards long, is 0.6 mile southward from Dangerous Cape. The highest rock at the north end of the reef is covered at extreme high tide. The shore reef inside of Bird Reef is composed of rocks awash and some bare rocks. A detached ½-fathom rock lies in the channel between Bird Reef and the shore reef. Midway between Bird Reef and Passage Island, and 0.5 mile from the north shore, is a small shoal with 2½ fathoms, marked by kelp and a buoy. Vessels should pass southward of it, as another kelp-marked shoal makes out 650 yards from the shore.

Passage Island, 1 mile inside the entrance, is 140 feet high and wooded. It is generally fringed with reefs to a distance of 150 yards, and a shelving spit, covered at high water, extends 350 yards eastward from its eastern end. The end of this spit is marked by a daybeacon placed in 18 feet of water. A reef, with numerous rocks bare and covered at various stages of the tide, extends 0.9 mile southwestward from the western end of the island. The northern end of the island is marked by a **light (lat. 59°22′.4 N., long. 151°53′.0 W.),** 50 feet above the water and visible 5 miles, and shown from a white house. The obscured sector is from 313° to 070°.

A rock bare at low water and marked by a buoy is 250 yards west of the point on the north shore eastward of Passage Island. This is the worst danger in the north entrance. The channel has a width of 300 yards between the rock and the reef fringing Passage Island.

East of Passage Island the shores are generally fringed with kelp to a distance of 200 yards. The only serious danger is a narrow, sunken reef with kelp which extends halfway across the port from the northern shore 0.6 mile from Passage Island, and is marked at the south end by a buoy. There are small streams on the shores of the port and a large stream and valley at its head.

Port Graham (*pop. 92 in 1950; P. O.*) has a cannery, with wharf, on the south side 2 miles beyond Passage Island; the wharf has a 150-foot face with depths of 15 feet along the middle. Large vessels dock port-side-to on a 321° heading. Fresh water is available from October to April, of each year The cannery maintains a small store and emergency supplies of coal and gasoline can usually be obtained. There is a small marine railway capable of hauling a vessel of 30 tons, with draft of 9 feet forward and 12 feet aft. About 800 yards northwest of the wharf is a shoal extending about 300 yards offshore and marked at its outer end by a buoy.

Anchorage.—Temporary anchorage for a small vessel can be selected in the middle of **Coal Cove,** inside Dangerous Cape, in 5 to 10 fathoms, rocky bottom; the shore of the cove is fringed with kelp to a distance of 350 yards. The cove should be used with caution. A better anchorage with more room will be found in the bight on the north

shore, northward of Passage Island, in 7 to 10 fathoms; a shoal extends 400 yards from the east side of the bight, and kelp extends 250 yards from its north shore. These anchorages are exposed to a heavy swell in southerly or westerly weather.

When inside Passage Island, anchorage can be had in any part of the port, in depths of 10 to 17 fathoms. One of the best is northward or northeastward of the wharf, in 10 to 13 fathoms, sticky bottom. The cove southeastward of the wharf is shoal.

Tides, Port Graham.—High and low waters occur about 5 minutes earlier than at Seldovia. The diurnal range of tide is about 16½ feet.

Strong tidal currents, both ebb and flood, set across the mouth of the harbor, but there is little current at or inside of Passage Island. With opposing wind and current, heavy tide rips occur off and well northward and southward of the entrance to Port Graham.

Directions, Port Graham.—The safest time to enter the port is at low water, and the better entrance is north of Passage Island. The channel south of Passage Island should not be used by strangers.

From southward, pass 1 to 1.5 miles westward of Flat Island and steer for Point Pogibshi, course about **041°**. When the village of Alexandrovsk is abeam, head in with Passage Island a little on the starboard bow, of course about **092°**. When 400 yards north of the light, change course to **129°** and pass southward of the buoy marking the reef off the north shore. Continue this course to a position with the daybeacon off the eastern end of Passage Island in range with Russian Point, then steer **157°**, with the point on the north shore astern, and pass westward and southward of buoy. Then keep in mid-channel.

From northward, follow the shore on a **210°** course, and pass over 1 mile westward of Dangerous Cape. Then steer for the village of Alexandrovsk, course about **168°**, and when Bird Reef is about 0.5 mile on the port beam steer for the summit of Passage Island, course about **120°**. When a little past the buoy, haul northwestward to pass 400 yards off the light on Passage Island. Then proceed as from the south.

Point Pogibshi is a prominent flat-topped grassy point with rocky sides about 50 feet high, on the east side of Cook Inlet 1.5 miles northward of Dangerous Cape. At this point the coast changes direction northeastward for about 5 miles to Seldovia Bay.

Kelp extends 0.5 mile off the bight 2 miles westward of Point Naskowhak.

Seldovia Bay, 7 miles northeast of Port Graham, is a secure harbor in any weather. It extends 4 miles in a southerly direction and has a width of 0.5 to 0.7 mile. The inner half of the bay is very shoal.

From the entrance until nearly up with the wharf, shoals with 10 to 12 feet in places extend halfway across the harbor from the western shore. The channel is between the shoals and the rocks and kelp patches near the eastern shore, and varies in width from 150 to 400 yards. The shoals and rocks are marked by kelp at slack water in summer and fall, but the kelp tows under during the strength of the tidal currents.

Point Naskowhak, the western point at the entrance, is the northerly of two small high rocky wooded knobs which stand on a low grassy spit surrounding a lagoon. A reef extends nearly 0.3 mile northward from the point, and kelp-marked broken ground extends nearly 0.5 mile northeastward. Two kelp patches, in which the least depth found is 18 feet, are 600 to 700 yards northeastward from the point.

Gray Cliff, the eastern point at the entrance, is a bare rock cliff 60 to 70 feet high marked at the south end by a light, 64 feet above the water and visible 8 miles.

Seldovia Point, 1 mile northward of Gray Cliff, is a cliff 200 feet high, wooded on top. Kelp extends 0.6 mile from the shore in the bight northeastward of Seldovia Point.

Red Bluff is a prominent high reddish bluff 0.2 mile southward from Gray Cliff. It is a good mark.

A rock, bare 4 feet at low water, is 300 yards westward from Red Bluff with foul ground between. This rock is steep-to on its western side, and is the principal danger in the harbor. It is marked by a buoy. A high pointed rock with some dead brush on top is near the eastern shore about 300 yards northward from Watch Point.

Watch Point, on the eastern shore 0.4 mile southward of Red Bluff, is a small, grassy head, about 30 feet high, with a few trees, and with a short, low grassy neck behind it. A **light** on a small white house has been established on the point. A red sector east of the bearing 170° covers the rock westward of Red Bluff. A depth of 2 fathoms has been reported 225 yards 176° from the light.

A rock, with 2½ fathoms over it and marked by kelp, is 150 yards 210° from Watch Point. The channel westward of the rock is marked by a buoy.

Seldovia (*pop. 437 in 1950; P. O.*) is a village with several stores, a small hotel, and a Greek church, on the eastern side of the harbor 0.3 mile southeastward of Watch Point. There are four canneries, a hospital, and a radio station of the Alaska Communications System at the village. It is the headquarters for a United States deputy marshal.

A shoal, partly bare at low water, extends 200 yards westward from the village, and the cove southward of it is nearly dry at extreme low water The southwest side of the cove is formed by a grassy head, with a few trees about 75 feet high, which is joined in the main shore by a low, narrow neck. On the south side of this neck are the ruins of an abandoned cannery and wharf.

The city wharf, known as Anderson's Dock, is about 350 yards southward from Watch Point. It has a face of 110 feet and a least depth alongside of about 22 feet. In approaching or leaving this wharf, care should be taken to avoid the buoy-marked, 2½-fathom spot 150 yards south of Watch Point and the 1½-fathom sunken rock 50 yards south of the wharf. Water and fuel oil are available at the wharf. Large vessels make a port landing with the stern in deep water.

Seldovia is a port of call for the monthly mail steamer from Seward. Radio communication is maintained from Seldovia by the Alaska Communications System.

The best anchorage is in the middle of the harbor, about 0.4 mile northwestward from **Powder Island,** in 9 to 10 fathoms, sticky bottom. A small vessel can anchor in 5 fathoms in the channel off the village, with Red Bluff open westward from Watch Point, and the Greek Church bearing 068°.

Tides.—The diurnal range of tide is about 18 feet at Seldovia. Daily predictions are given in the *Tide Tables.* The tidal currents have an estimated velocity of 1 to 2 knots at strength.

Directions, Seldovia Bay.—Steer for the northeast end of Gray Cliff, which is about 400 yards northeastward of the light, on a **137°** course until Point Naskowhak is a little forward of the beam. Then steer **168°** for Watch Point Light in range with the white-washed pinnacle rock off the north side of the grassy head south of the village. When

about 350 yards from Watch Point, with the high pointed rock near the eastern shore forward of the beam, steer **193°** and pass 125 to 150 yards westward of the point.

When abeam the buoy marking the 2½-fathom spot, haul to the eastward and proceed to the wharf, or bring Gray Cliff Light just open off Watch Point Light and hold the range until the inner basin is reached.

Chart 8531.—Kachemak Bay is a large bay on the east side of Cook Inlet. The entrance is between Seldovia Point on the south and Anchor Point on the north. It affords excellent anchorages for vessels of all classes and sizes.

Nubble Point is a long sand spit, terminating in a rocky knoll, which may be mistaken for Point Naskowhak if not sure of the position. The eastern part of the point is wooded.

Kasitsna Bay, between Nubble Point and **Herring Islets,** has good anchorage in 12 to 15 fathoms, good holding ground. The water shoals abruptly to the shore and to the flat which fills the cove formed by Nubble Point; but the flat in the cove will be avoided by keeping the easterly end of the point bearing westward of 014°.

A rock bare at extreme low water and marked by a buoy is 0.5 mile northeast of the north end of Nubble Point. The buoy is on the northeast side of the rock and marks the entrance between it and Hesketh Island. A least depth of 14 fathoms was found between the rock and Nubble Point by giving the north end of the point a berth of over 200 yards.

Hesketh, Yukon, and **Cohen Islands** are high and wooded. An islet is on the reef which extends 0.5 mile northwestward from Hesketh Island; a rock 60 feet high is at the north end of a reef which extends 0.5 mile northward from Cohen Island; and there is a prominent yellow cliff on the west end of Cohen Island. The passages between the islands should be avoided. **Eldred Passage,** eastward of the islands, is deep near the middle, except at the north end where there is a bar on which the least depths found are 8 to 12 fathoms.

Tutka Bay has no desirable anchorage and is not completely surveyed. Broken ground, on which some pinnacle rocks have been found, extends across the entrance. There is an abandoned salmon cannery on the shore just eastward of the southernmost island in Tutka Bay. The cannery had a small wharf with a 40-foot face and a depth of 19 feet at the inner corner. During the summer season a limited amount of fresh water was available. It is a difficult place for large vessels.

Just northwestward of this island is a half-tide rock which closes that channel to all but small boats.

Sadie Cove, the inlet in the east side of Eldred Passage, is not completely surveyed but is apparently clear near mid-channel.

Lancashire Rocks are rocks awash lying 1.8 miles from Cohen Island. They are 0.5 mile offshore with foul ground inshore from them. **Gull Island** is a prominent group of bare rocks, visible about 10 miles. **China Poot Bay,** northeastward of Sadie Cove, is a large bay that is nearly dry at low water.

Homer Spit is a low gravel and shingle spit, covered with grass and some trees, on the north side of Kachemak Bay. It is 3.5 miles long and from 100 to 500 yards wide.

Coal Point, the outer end of Homer Spit, is marked by **Homer Spit Light (lat. 59°36′1 N., 151°24′6 W.),** 12 feet above the water and visible 8 miles; the light is

obscured from 111° to 242°. On the north side of the point is a wharf used by deep-draft vessels. The face of the wharf is 135 feet long and has a least depth of 21 feet alongside. Petroleum products and fresh water are available on the wharf. A road leads from the wharf along the spit to Homer and the airport.

Beluga Mudlake, a shallow lagoon just north of Homer Spit, is entered by small craft at high water. The inner part of the bight between the spit and the lagoon has been dammed by a road fill and is used in summer as a seaplane anchorage.

Excellent anchorage can be had 0.8 mile or more northward of Homer Spit Light, in 10 to 15 fathoms, soft bottom. Greater depths and abrupt shoaling are found near the wharf, where it is not safe to anchor in less than 18 fathoms. **Coal Bay,** the bight north of Homer, is shoal but there are no outlying dangers. There are coal outcrops in the vicinity of Coal Bay and a small amount of coal is mined for local use.

Homer (*pop. 307 in 1950; P. O.*), on Homer Spit about 2 miles from the inner end, is in a farming community and has several stores, a hotel, an airfield, and an Alaska Communications System radio station. A United States deputy marshal and a United States Commissioner are stationed in Homer. The town is connected by the **Sterling Highway,** an all-weather thorofare, with Anchorage and Seward. Frequent airplane service is available to Anchorage and neighboring communities, and there is daily mail service from Anchorage.

Halibut Cove, on the south shore about 6 miles east of Homer Spit, affords excellent anchorage in 23 fathoms with good holding bottom. A **light** is on the northeast point of **Ismailof Island,** on the south side of the cove, and a daybeacon marks the rock awash 0.3 mile southward of the light. In the cove is an abandoned cannery with a wharf.

Bear Cove, on the south side of Kachemak Bay near the head, offers good anchorage in 12 fathoms, although the williwaws are violent and the swinging room is restricted. The head of Kachemak Bay consists of extensive mud flats. The north side is bordered with mud flats and the 10-fathom curve is about 2 miles offshore. From this curve the water shoals abruptly toward shore.

From Homer Spit to **Anchor Point** the coast is a line of bluffs, with the greatest height of 750 feet at **Bluff Point.** In front of the bluff is a narrow rock and shingle beach. The depths inside the 10-fathom curve are irregular, and there is a possibility of detached boulders not found by the survey. Anchor Point is marked by a light, 41 feet above the water, on a white slatted tripod, with a black and white slatted pyramidal structure 10 yards southeast.

Chart 8554.—The main bluff line recedes about 0.4 mile from the shore at Anchor Point and approaches the coast again about 1 mile to the northward, then continues close to the shore up to Cape Starichkof. The bank attains an elevation of 270 feet 2.8 miles northward of Anchor Point, then gradually descends to the northward.

At **Cape Starichkof** the bluff recedes again, is less steep, and is covered with vegetation. Northward of the cape the bluff follows the shore, varies from 100 to 240 feet in elevation, and continues nearly to **Cape Nimilchik.**

From northward of Anchor Point to Cape Nimilchik the coast is free from dangers so far as known, and anchorage can be selected in sand bottom. The surveying vessel used an anchorage close inshore just northward of Cape Starichkof, in 6 to 7 fathoms. The holding ground is fair, and there is some shelter from southerly weather.

The 1,900-foot hill 10 miles back of Cape Starichkof is a sharp peak with a high

saddle between it and a slightly lower peak just southward. It is the only prominent and distinctive highland feature between Anchor Point and Forelands.

Ninilchik (*pop. 97 in 1950; P. O.*), an agricultural settlement at the mouth of a small stream, is connected by the Sterling Highway with Homer and Anchorage and has radio communication. The Greek church and part of the village are prominent from offshore. There are several small hand-pack canneries in the vicinity. Range **lights** mark the entrance to the stream, but they should be followed only with knowledge of conditions.

North of Cape Ninilchik the coast is very foul, being characterized by immense boulders not marked by kelp. The boulders apparently rest on comparatively flat bottom, so that soundings give no indication of them. It is probable that many more exist than were found by the survey.

On the western shore of Cook Inlet, from Cape Douglas to Chisik Island, the mountains generally rise abruptly from the water, and Iliamna and Redoubt Volcanoes tower well above the surrounding peaks, affording excellent marks from all parts of the lower inlet.

Sukoi Bay, on the north side of Cape Douglas, is shoal, and can be used only by small craft with local knowledge. Rocks bare at low water in the middle of the entrance, and a ledge bares at low water between the rocks and the south shore.

The two bluff points 5 and 8 miles northwestward of Cape Douglas are the ends of two sharp, rocky ridges extending from the high land of Mount Douglas. Anchorage can be had in the bight between the points in 13 to 15 fathoms, sandy bottom, with shelter from southerly and westerly winds, but the williwaws are bad during westerly gales. At the head of the bight is a short valley with a glacier. Just clear of the bluff point on the southeast side of the bight is a pinnacle rock about as high as the bluff. The bight between this point and the northern point of Sukoi Bay appears shoal.

Shaw Island is 10 miles northwestward from Cape Douglas and 1.8 miles from shore. It is 0.6 mile long, about 50 feet high, flat and grass-covered. A depth of 12 fathoms was found midway between it and the shore. Ledges extend northward from the island for 0.8 mile.

Kamishak Bay has not been surveyed southward of Rocky Cove and Augustine Island except for a few reconnaissance lines of soundings. The bottom appears to be chiefly shelving with sudden changes in depths at the breaks in the bottom stratification. Because of these sudden changes vessels should proceed with caution in the unsounded areas.

The shores of Kamishak Bay are mountainous, with bare-faced headlands and palisades of stratified rock. Grass and alder patches cover the lower hillsides. There is no timber except at the north end of the bay. Northward of Iniskin Bay the lower lands are about half wooded.

The south and west shores of Kamishak Bay are bordered by dangerous reefs. No information is available for a safe passage to the south shore. It is possible, however, to reach the west shore of Kamishak Bay through a break in the reefs. This should be attempted only by vessels having local knowledge of the reefs and condition of the sea. Fishing craft go to the west shore on a rising tide near the time of high water.

The approach is from the south side of Augustine Island, which is passed from 1.5

to 2.5 miles offshore, on a course of **257°.** Head for Chenik Head, a low flat cape south of the former village of **Chenik. Three Peaks,** a high mountain group 3 miles northwest of Chenik, show slightly on the starboard hand. Avoid the rock ledge which bares at low water and which extends north-northeast from Nordyke Island for at least 1.5 miles. North of this reef is a channel about one mile wide and with a least depth of 6 fathoms. As soon as the line of the reefs is passed change course to **215°.** The west part of McNeil Head should be dead ahead and the outer tangent of Step Mountain should be dead astern. Anchor 1,100 yards west of Nordyke Island in 6 fathoms, sticky mud bottom. The currents at this anchorage set south-southwest on the flood and north-northeast on the ebb.

Nordyke Island, flat and grass-topped, is 55 feet high. It is 0.5 mile long and 0.3 mile wide. Two smaller flat grass-topped islands are southwest of Nordyke Island. A black bare rock about 30 feet high is 0.6 mile offshore from this group of islands. Rock ledges which bare at low water make off from these islets for a distance of 1.5 miles to the north and for a distance of one mile to the south. A series of reefs which bare at low water are like huge stepping stones between Nordyke Island and McNeil Head.

The south shore of Kamishak Bay is reported to be foul. There appear to be large areas of reefs which bare at low water northeast of Akumwarvik Bay.

Akumwarvik Bay, Pinkidulia Cove, and **Horseshoe Cove** are filled with sand flats which bare at low water.

McNeil Cove is shoal and filled with sand flats. The south side of the cove is marked by a prominent headland called **McNeil Head.** Bands of conglomerate rock cross the faces of McNeil Head. **McNeil Islet,** mushroom shaped and about 45 feet high, is located off this headland. A lagoon in the southwest part of McNeil Cove is used as a refuge in stormy weather by small fishing craft, which lie in the mud during low water. **Kamishak,** located on this lagoon, consists of one abandoned cabin. An abandoned wagon road twelve miles long leads from Kamishak to the site of a copper claim.

South of **Amakdedulia Cove** are hills and cliffs having a green and yellow tinge. Three flat-topped islets about 35 feet high are off these cliffs. Fingers of reefs spread out from the islets for about one mile.

Chenik Head is a low flat cape about 50 feet high on the north side of Amakdedulia Cove. A rock ledge bare at low water makes off this point for a distance of about 0.8 mile. An isolated rock 10 feet high is located on this ledge about 0.2 mile offshore. North of Chenik Head are two small islets which serve as markers for vessels crossing the line of reefs.

Amakdedori Beach is a long stretch of sand beach heavily strewn with drift of all kinds. Clear water is reported to lie close in and parallel to the beach but much foul ground is reported farther offshore.

North of Amakdedori Beach is an extensive stretch of conspicuous palisades. Above these and near the western end is a dome-shaped peak about 2,000 feet high.

Contact Point is a round-topped headland about 400 feet high surrounded by precipitous bluffs. It is conspicuous from the vicinity of Augustine Island. A tall pinnacle rock close to the headland identifies it when viewed from the southeast. A submerged ledge is reported to extend 3 miles offshore from Contact Point.

The entrance to **Bruin Bay** is north of Contact Point. On the south shore of the

bay and just inside the entrance are several modern buildings and radio masts. Bruin Bay is reported to be shoal, almost baring at low water. Near the entrance, a rock ledge extends north from the south shore; farther in, a rock ledge extends south from the north entrance headland. The outer approach to Bruin Bay has a fairly even bottom with depths of from 5 to 8 fathoms. The bottom is hard green mud and sand.

The shoreline northeast of Bruin Bay is rugged. A waterfall 3.3 miles northeast of Contact Point is conspicuous. **Fortification Bluffs** are bold, angular-edged palisades with faces of stratified rock. **Step Mountain** is the headland on the south side of Rocky Cove. Two flat areas below the peak form steps on the side of the mountain. **Rocky Cove** is obstructed by reefs, bare at lowest tides, which extend 2 miles offshore. **Ursus Cove** is exposed to a heavy swell in easterly weather. The bottom is very broken.

Augustine Island, about 7 miles in diameter and 3,970 feet high, is a volcanic, conical peak from which steam frequently discharges. The upper slopes are barren, but the lower parts of the island are covered with grass, brush and alder. There are also a few groups of spruce trees. The shore is low, with bluffs in places, and is generally strewn with boulders. A boulder reef extends about 0.8 mile off the northwestern shore of the island. The north end of the island, terminating in **Burr Point,** consists of numerous small mounds of boulders with sloughs between. The west end of the island is detached from the main part by a lagoon, the entrances to which are partly blocked by boulders. A second lagoon, inland from the cove on the southwest side of the island, is also partly blocked at the entrance but has been used as a loading basin by a power scow, which entered at high water.

The southwest cove is much used by fishing craft as an anchorage. It has an even bottom of coarse sand, green mud, shell and gravel. The depth is from 4 to 5 fathoms. Anchor off the sand spit on the east side of the cove; the west side should be avoided because of reported boulders on the bottom. Huge boulders can be seen near the entrances to the two lagoons.

An unsurveyed bank having depths of 3 to 4 fathoms extends over 3 miles westward of Augustine Island. A second unsurveyed bank having similar depths extends for 1.5 miles off the southwest point of the island.

Augustine Rocks are 9 miles southward from the peak of Augustine Island. They are two flat rocks, with a smaller one between, all covered at high water. Their position is reported to be generally marked by kelp or breakers.

Chart 8665.—Iliamna Bay is on the north side of Kamishak Bay about 15 miles northward from Augustine Island. It is 1 mile wide at the entrance, wider inside, and has a length of about 5 miles to its northern end and to the head of its western arm, called **Cottonwood Bay.** The greater part of the bay is filled by a flat but there is good anchorage just inside the entrance. The shores are mountainous and there are no trees except the cottonwoods on the flats at the heads of the bay.

A. C. Point, on the north shore of the bay about 2 miles northwestward from North Head, is often used as a landing place.

From the small native village in the cove a mile from the north end of Iliamna Bay, a road leads for about 10 miles to **Old Iliamna** (*see Chart 8554*), a village along Iliamna River. From Old Iliamna, a draft of about 3 feet can be carried through Iliamna Lake and Kvichak River to Bristol Bay.

White Gull Island (lat. 59°37′.1 N., long. 153°34′.3 W.), grass-covered and about 70 feet high, is conspicuous near the midddle of Iliamna Bay just inside the entrance. The island is marked by a **light.** The bay shoals gradually from 7 fathoms in the entrance north of White Gull Island to 2 fathoms in the entrance to Cottonwood Bay. Anchorage in 4½ to 5 fathoms, soft bottom, can be had 0.8 mile inside the entrance to Iliamna Bay with the northern side of White Gull Island in range with the south point at the entrance, and the north point at the entrance bearing 106°. The anchorage is exposed to east and southeast winds and there are heavy williwaws with westerly winds, but it is regarded as secure during the summer.

In the approach to Iliamna Bay the depths are 6 to 8 fathoms several miles from shore, and these depths extend close to Turtle and Black Reefs. Enter the bay on a **305°** course, between North Head and White Gull Island, and anchor 0.8 mile inside on the range and bearing given above. When in the bay care must be taken to avoid a reef, partly bare at low water and with 2½ to 3 fathoms close-to, which extends 0.4 mile eastward from the south point at the entrance to Cottonwood Bay.

Turtle Reef extends over 0.4 mile eastward from **South Head** at the entrance of Iliamna Bay. The reef is largely bare at low water, and is about 15 feet high at its highest point.

Black Reef is 0.5 mile from shore and 1.1 miles eastward from **North Head.** The highest points of the reef are two rocks, 5 to 10 feet high. Lying 0.5 mile northeastward of Black Reef is another reef which covers at half tide; its southern end is 0.5 mile from shore.

It is reported that Iliamna Bay does not freeze but that drift ice in large quantities sets in at times from the upper inlet. Fresh water can be obtained from streams on the northeast side about 1 mile inside the entrance. Northerly gales prevail in winter and heavy williwaws are reported to come from the mountains on the northeast shore. The prevailing summer winds are down the bay and are frequently fresh, especially on bright days.

The tidal currents at the anchorage have an estimated velocity of 1 to 2 knots.

Chart 8554.—Iniskin Bay is a secure harbor in any weather, although subject to some williwaws from the sharp bare peaks, about 2,900 feet high, on the west shore. The eastern shore is generally low and alder covered. The western and upper parts of the bay are filled with boulder-strewn flats, bare at low water, and the eastern part is shoal and fringed by a reef. The channel is nearly 0.8 mile wide at the entrance and tapers to a narrow slough at the head.

To enter Iniskin Bay, avoid the reefs which rise abruptly from deep water and extend about 1 mile from the shore eastward of the bay. Keep White Gull Island bearing northward of 278° and pass more than 1 mile southward of the outer islands off the entrance. When two prominent headlands on the west side of Iniskin Bay are in line, steer this range course **014°,** until near the western shore. Follow this shore a distance of 0.3 mile until **Range Peak,** on the north side of **Right Arm** is in line with Iliamna Volcano, and then steer this range, course **026°.** Anchor on the range, from 1.5 to 2.5 miles above Scott Island, in 7 to 8 fathoms, muddy bottom, where the width of the channel between the 5-fathom curves is about 700 yards.

Water can be obtained from the streams in Iniskin Bay, the most convenient to the anchorage being on the west side about 2 miles above the entrance. The tidal

current at the anchorage attains a velocity of 1½ knots at times. Current predictions can be obtained from the *Current Tables.*

Iniskin River, at the head of Iniskin Bay, is navigable for boats of not more than 3 feet draft for a distance of about 2 miles above the entrance.

Three small islands with outlying reefs lie on the east side of the entrance of Iniskin Bay. The northerly and largest is **Scott Island,** about 40 feet high and partly wooded, and from it a reef with rocks about 15 feet high extends 0.5 mile northwestward. The middle island is about 35 feet high, and from it a reef extends 0.8 mile southwestward, terminating in **Iniskin Rock.**

Iniskin Island, outermost of the three mentioned above, is 50 feet high on the north side, and from it a reef partly bare at low water extends 0.5 mile southwestward; lying 1 to 1.3 miles southwestward from the islet is **Iniskin Shoal,** a sunken reef with little depth, which does not break in heavy weather. These reefs rise abruptly from depths of 7 to 8 fathoms.

From Iniskin Bay to Oil Bay, the coast is fringed by a reef which extends about 1 mile from shore and rises abruptly. Many of the rocks show at low water. **Pomeroy Island,** 2.2 miles southeastward of Scott Island, is small and rocky and has a few trees on its west end. **Big Rock,** about 15 feet high, is 1 mile eastward of Pomeroy Island. From Iniskin Bay to Oil Bay there is a comparatively smooth passage for launches inside the reefs.

From Oil Bay to **Chinitna Point** reefs extend about 1 mile from shore in places and rise abruptly from deep water. Rocks show at low water close to shore only. With northerly winds, small boats can get some shelter in Oil Bay, Dry Bay, and the small bight under Chinitna Point.

Oil Bay is a shallow open bay with a sand beach at its head which bares for 0.8 mile from shore. The bottom is rocky and foul for about 1 mile offshore on the west side of the entrance. Abandoned oil wells are located in the valley of **Bowser Creek** about 2 miles from the head of the bay. From Oil Bay a valley leads through to Chinitna Bay, and a good trail to Iniskin Bay extends along the north side of **Mount Pomeroy.**

Dry Bay is a rocky shoal bight between Oil Bay and Chinitna Point. It has a sand beach at its head.

Chinitna Bay is shoal, and an anchorage in 4 to 5 fathoms in the entrance is exposed to all easterly winds. The bottom is muddy and good holding ground, and anchorage can be selected anywhere in the bay where there is sufficient depth to remain afloat at low water. A small vessel of less than about 12 feet draft can anchor with fairly good shelter, in a depth of about 18 feet, in the narrow channel 300 yards northwestward of the low point on the south side, 3 miles above the island in the entrance. There are strong williwaws with westerly winds. The bay is reported to be full of ice during the winter. The tidal currents rarely exceed 1¾ knots in the bay. Current predictions can be obtained from the *Current Tables.*

Gull Island is a prominent, rocky, grass-covered island, about 140 feet high, on the south side of the entrance to Chinitna Bay. Reefs extend 0.6 mile northeastward and southeastward from the island. A deep channel 0.4 mile wide leads into the bay southwestward of the island, but the main entrance is northward of the island and its surrounding reefs.

From Chinitna Bay to the prominent waterfall 5 miles southward of Chisik Island, the coast is low and wooded, with lagoons and marshes in places, and some quicksand. Along Tuxedni Channel the coast comprises rocky bluffs and rises abruptly to high land.

An extensive shoal, apparently an old glacial moraine with rocky very irregular bottom and indications of boulders, extends 6 miles from the west shore between Chinitna Bay and Tuxedni Channel. The least depth is about 3¾ fathoms, but there is probably less. Deep-draft vessels should avoid areas with depths less than 10 fathoms. Tide rips mark the shoal at all times except at slack water, and are dangerous for small craft in heavy weather; the heaviest rips are near the extremity of the shoal, about 6 miles from shore.

Iliamna Volcano, 10,017 feet high, is an important mark. Steam generally issues from fissures just below the summit and from one of the lower peaks on the southeast slope.

Chisik Island has a narrow ridge, about 5 miles long and comparatively smooth on top, that slopes gradually upward from the southeast end of the island to its northwest end where it terminates in a conspicuous cliff, 2,678 feet high. A **light** is maintained on the south end of the island; a reef extends 0.3 mile southward.

Tuxedni Channel, on the southwest side of Chisik Island, is a secure anchorage. Heavy williwaws occur with gales from any direction, and raise a choppy sea dangerous to open boats. The channel is reported to be blocked with ice from December to March..

Snug Harbor is generally accepted as including all the waters of Tuxedni Channel from Chisik Island Light to the cannery. These waters are quite well protected from all winds except williwaws blowing from the north end of Tuxedni Channel. The holding ground is good throughout the entire area and safe anchorage can be found on either side of the channel except when floe ice is present to varying degrees between the months of November and May, depending on the severity and the stage of the tides when the ice leaves the lagoons and streams at break-up time.

The cannery maintains a wharf and tie-up piles from the first week in May until about the 20th of August. This 190-foot wharf has 16 feet of water at its face at mean low water, and when removed the stub can only be approached at 18-foot tides or greater. After the season two caretakers remain at the cannery. There is no regular store open when the cannery is not operating, but water and emergency radio communication are available through the caretakers.

Tuxedni Bay consists largely of shoals and reefs. A narrow channel extends from Tuxedni Channel nearly to the head of the bay. This channel shoals rapidly after leaving Chisik Island. The passage northward of Chisik Island should be avoided, even by small craft.

To enter Tuxedni Channel give the south end of Chisik Island a berth of over 0.5 mile, keep in mid-channel until about 2 miles inside the entrance, and then follow Chisik Island at a distance of 0.5 mile. The anchorage is about 3.5 miles above the light, in 15 to 17 fathoms, sticky bottom, and has a clear width of 0.8 mile. On the island side the shore is bold but a shoal makes out 0.6 to 1 mile from the main shore abreast the anchorage; the shoaling is abrupt on the sides of the channel and there are boulders in places on the shoals.

For information on currents in Tuxedni Channel see *Current Tables.*

Chart 8553.—From Tuxedni Bay to Harriet Point the western shore of Cook Inlet is a gravel bluff with trees on top and a few boulders in the water. **Redoubt Point,** 7 miles northeast of Tuxedni Bay, is an alder-covered bluff from 200 to 300 feet high, with a number of bare slides. There are boulders in places on the shoals which fringe this shore, and vessels should proceed with caution when inside the 10-fathom curve.

Redoubt Volcano, 10,198 feet high, is an important mark 15 miles inland from Harriet Point. There is a notch on its southeast slope just below the summit.

Double Peak, 15 miles northward of Redoubt Volcano, is 7,088 feet high, has two knobs on top, and is easily identified from the inlet.

Harriet Point is a clay bluff about 100 feet high, with boulders at the water. A boulder reef bare at low water extends 0.8 mile eastward from Harriet Point. The point should not be approached closer than 1.5 miles on the line of the reef.

Fair anchorage is available in moderate weather on the north side of Harriet Point, which so far as known is safe during the summer except for southerly, southeasterly, and northeasterly gales. Very small vessels can anchor in about 5 fathoms about 0.5 mile from shore, with the point bearing 177°. At the anchorage the ebb current has a velocity of 2 to 3 knots, while the flood current is weak and of short duration.

From Harriet Point to West Foreland the shore of Cook Inlet is generally low and backed by patches of woods which appear continuous, and is subject to overflow at extreme high tides. It is fronted by a flat which extends off a greatest distance of 2.5 miles in the bight northward of Harriet Point and at the north end of **Redoubt Bay.** The edge of the flat is generally steep-to, but no boulders were seen on those parts lying in front of marshy shore. **Drift River** is shallow, rapid, and obstructed by rocks and snags.

A prominent wooded butte, 488 feet high, is 4 miles inland and 14 miles westward of West Foreland.

Wooded **Kalgin Island,** fringed with boulders, is 11 miles long and has elevations of more than 200 feet at its north and south ends. **A light,** 140 feet above the water and visible 11 miles, is shown from a house on the northeastern extremity.

A shoal extends 16 miles southward from Kalgin Island. There are spots bare at low water for nearly 8 miles from the island, and thence southward the least depths found are 1½ to 2¼ fathoms. It apparently is a part of an old glacial moraine, as the bottom is very broken. Lesser depths than found by the survey probably exist, especially between the shoaler lumps. No boulders show at low water, however, except near the island.

A passage with general depths of 12 to 15 feet, which is used by cannery tenders, leads across the shoal from 1 to 2.5 miles southward of Kalgin Island. A range should be picked up in the opening northward of Chisik Island to insure making the course good, as the currents on either side of the island have a velocity of 3 to 4 knots at times, and are nearly slack in the lee of the island. There are boulders near Kalgin Island and they may also be in the passage.

A sand shoal or ridge about 8 miles long lies 2.5 to 3.5 miles westward of Kalgin Island. It shows about 7 feet above low water at the highest point near its middle. The shoaling is abrupt on the sides.

A boulder-strewn shoal with depths of 7 fathoms or less extends 8 miles northward from the northeast point of Kalgin Island. The outer boulders which show at low

water lie 2.5 miles from the island in depths of 22 feet. It is advisable to proceed with caution where the depths are no more than 30 feet greater than the draft.

Small vessels can select anchorage off the middle of the north end of Kalgin Island, with good shelter from southerly gales drawing up the inlet. The holding ground is good and the currents are as weak as will be found at any of the exposed anchorages. Caution must be observed, however, at low water when crossing the broken boulder-strewn area where depths of less than 7 fathoms make off from the north end of the island.

The highest parts of the shoal between Kalgin Island and West Foreland show between 3 and 4 feet at low water. Although the shoal is rocky in places, no boulders show at lowest tides. There are boulders in places on the bottom between the shoal and West Foreland.

West Foreland is a flat wooded headland, 262 feet high, with a bluff at the water. The shore at West Foreland and for a distance of 4 or 5 miles northward is fringed with boulders which extend below low water.

Kustatan River has its entrance 3.5 miles westward of West Foreland. It connects inland with **McArthur River,** which enters the inlet 12 miles northward of West Foreland, and this route is used by the native bidarkas when going to Tyonek.

For a distance of 8 miles northward from West Foreland the bluff is at the water, and numerous boulders are on the beach. The bluff then trends inland to a conspicuous wooded ridge, 5 miles long and 300 feet high, which is 2.5 miles inland at its northern end.

For a distance of 15 miles northward from the end of the bluff, the shore of **Trading Bay** is flat, grass-covered, and subject to overflow, and has several sloughs. This part of the bay is fronted by a flat which extends off a greatest distance of 2.1 miles at the mouth of McArthur River. This river is about 1 mile wide at its entrance at high water, but due to a bar across its mouth it cannot be entered at low water.

Nikolai Creek is a narrow slough 19 miles northward of West Foreland. A depth of 1 to 2 feet at low water is in the channel across the flat. A depth of about 15 feet can be taken into the river at high water. The water in the river is fresh nearly to its mouth except for a short time at high water.

About 3 miles east of Nikolai Creek is a prominent gulch with a small stream in it. The bluffs come to the shore at the gulch and continue around North Foreland. Anchorage a mile off the gulch is in depths of 4 to 5 fathoms, hard bottom.

Granite Point is a prominent gray bluff a mile eastward of the gulch. Between the point and North Foreland, 5.5 miles to the east-northeastward, is **Beshta Bay,** a shallow bight with anchorage depths of 7 to 10 fathoms, mud and gravel bottom. The anchorage is good during moderate weather or with offshore winds. Care should be taken to avoid the rocky shoal that bares at low water and extends a mile from shore 1.5 miles eastward of Granite Point. The flood current has a velocity of 4 to 5 knots and the ebb 2 to 3 knots.

North Foreland, on the northwest side of Cook Inlet 25 miles above West Foreland, is a bluff about 150 feet high at the shore end of a hilly wooded ridge; thence northward the bluff is lower. A light is shown at the foot of the bluff.

Tyonek (*pop. 132 in 1950; P. O.*) is a native village near the mouth of **Indian Creek,** 1.5 miles northeastward of North Foreland. The village has a Bureau of Indian Affairs school. Vessels call at Tyonek, and a landing strip just north of the village is suitable for light planes. Mail is received once a week from Anchorage.

Chuitna River, about 3 miles northward of North Foreland, is marked by a low break in the bluff. A depth of about 8 feet can be taken into the mouth of the river at high water, and the tides are felt about 1 mile up the river.

A prominent bluff 150 feet high is on the south side of **Threemile Creek.** Bluffs continue northward for 2.5 miles from this creek, and then the tree line is from 2 to 3 miles inland from ordinary high-water mark, the strip between being subject to overflow at extreme high tides. This feature continues to within 2 miles of Point Mackenzie.

Beginning at Threemile Creek, the shore is fronted by a broad mud flat. Its low-water edge is about 2 miles off the mouth of Beluga River, 5.5 miles off the mouth of Susitna River, 3.5 miles off the shore eastward nearly to Little Susitna River, and then meets the shore about 1 mile westward of Point Mackenzie.

Beluga River is 11.5 miles northward of North Foreland. The channel through the flats at the mouth of the river has a depth of about 2 feet or less at low water, and is said to shift in the winter and spring from the action of ice.

The effect of the tide is felt in Beluga River 6 to 8 miles above the mouth, and it is said that boats can navigate as far as **Beluga Lake,** about 20 miles from the mouth.

Theodore River is 3.5 miles northeastward of Beluga River. Three or 4 miles up, the two rivers are within a mile of each other and there is an easy portage between them.

Susitna River is on the north side of Cook Inlet 22 miles northeastward of North Foreland and 18 miles westward of Point Mackenzie. **Mount Susitna,** 4,400 feet high, a prominent landmark along the upper part of the inlet, is about 5 miles west of the river at a point 13 miles above the mouth.

The channels across the flats at the mouth of Susitna River have depths of 2 feet or less at low water and change during the winter and spring because of ice and freshet action. The channels above the mouth are said to change frequently in the spring and early summer. Vessels navigating the deep channels of Cook Inlet should keep well away from the flats because their outer limits have been known to change drastically.

Launches navigate Susitna River to **Yentna River,** about 20 miles above Cook Inlet, thence run occasionally up the Yentna to the forks about 65 miles from the Susitna. The **tides** are not felt more than 7 miles from the inlet, and above this the **current** is swift.

Alexander is a small settlement on the west side of Susitna River 10 miles above the mouth. **Susitna** is on the east side 18 miles above the mouth and just below the mouth of the Yentna; launches, occasionally towing scows, run to and from Anchorage. Mail is delivered to both settlements twice monthly by airplane from Anchorage.

Ice.—Weather Bureau records for Susitna River at Susitna show an average ice breakup about the first of May and an average freezeup about the first of November. At **Talkeetna,** 65 miles above the mouth of the Susitna, average breakup is about the first or second week of May and average freezeup is about the first of December. See *Appendix* for tabular detail.

Little Susitna River, 9 miles westward of Point Mackenzie, is said to be navigable for launches at high water for about 8 miles.

Chart 8553.—Cape Kasilof (lat. 60°22′ N., long. 151°22′ W.) is on the east side of Cook Inlet opposite Kalgin Island. The high bluffs characteristic of much of the eastern shore are absent between the cape and Kenai, to the northward.

Five miles southwestward from Cape Kasilof and 2.3 miles from shore are **The**

Sisters, three prominent rocks, the highest of which has an elevation of about 5 feet. The foul ground back of The Sisters extends about 10 miles southward from the cape and is strewn with boulders 15 to 50 feet high.

Temporary **anchorage** is possible in depths of 4 fathoms a mile from shore a little southward of Cape Kasilof. The area is exposed except in northeasterly weather.

Kasilof River empties into the east side of Cook Inlet 2.5 miles northeastward of Cape Kasilof. The narrow winding channel that leads through the inner shallows to the river mouth nearly dries in places but is said to be navigable at low water for vessels drawing less than 6 feet. The entrance channel is marked by a **range,** lighted from April 1 to November 15 each year. Entrance should not be attempted without knowledge of conditions.

Kasilof (*pop. 62 in 1950; P. O.*) is a small agricultural settlement on the north side of Kasilof River mouth; the cannery at Kasilof has a small wharf with a face that bares alongside at low water. **Cohoe** (*P. O.*), another small settlement on the south side of the river mouth, has a store. Both villages are connected by the Sterling Highway with Anchorage, Homer, and other points along the west side of Kenai Peninsula.

Kasilof River is narrow and has a strong current. Boats drawing up to 6 feet can find good shelter in the river and remain afloat at low water. A bar is said to obstruct low-water navigation at the first bend. Vessels drawing as much as 10 feet enter the river at high water and go as far as 6 miles upstream.

Ice.—Weather Bureau records for Kasilof River at Kasilof show an average ice breakup about the second week in April and an average freezeup about the first week in December. See *Appendix* for tabular detail.

Karluk Reef, 4 miles northward of Cape Kasilof and 3.5 miles from the eastern shore, is 2.5 miles long from south to north and is partly bare at low water. There are other shoals and submerged rocks between the reef and the shore.

Salmo Rock, 9.5 miles northward of Cape Kasilof and 2 miles from shore, is one of the outer boulders off Kenai River and shows well at low water. A submerged rock is said to be about 2 miles westward of Salmo Rock.

Kenai River empties into the east side of Cook Inlet 11 miles northward of Cape Kasilof. The shores north and south of Kenai River are strewn with boulders. The bar at the entrance to the river is nearly dry at low water but there are depths of 8 to 10 feet in some places in the river.

The entrance channel to Kenai River is marked by a polychrome directional **light** operated from April 1 to November 31 of each year; a rear-range daybeacon is **051°** from the light.

Tidal **currents** in the river mouth attain velocities of 3 knots or more. Prevailing **winds** are northeasterly, and **fog** occurs from December to February.

Kenai (*pop. 321 in 1950; P. O.*), an agricultural town on the north side of Kenai River mouth, has a hotel, several stores, and an airfield. A United States deputy marshal and a United States Commissioner are stationed in the town. Kenai is connected by highway with Anchorage and Seward, and scheduled air service is available to Anchorage. Radio communication is provided by the Alaska Communications System.

The two canneries at Kenai have wharves with faces that bare alongside at low water. Barges are brought to the wharves at high water and allowed to settle in the soft mud at low tide for unloading. Kenai River is used as a seaplane landing.

Ice.—Weather Bureau records for Kenai River at Kenai show an average ice breakup about the first week in April and an average freezeup about the second week in December. See *Appendix* for tabular detail.

Salmatof, an old village 15 miles northward of Cape Kasilof and 6.5 miles southward of East Foreland, is on the edge of the agricultural area. The village is connected by the Sterling Highway with Anchorage and other points on the peninsula.

East Foreland, 21 miles north of Cape Kasilof and 9 miles across Cook Inlet from West Foreland, is a nearly level wooded headland with a 276-foot bluff at the water's edge. A **light,** 294 feet above the water and visible 12 miles, is shown from a small structure on the highest point of the bluff. A shoal, covered only 16 feet, is 3 miles south-southwestward of East Foreland and 2 miles from the eastern shore.

Nikishka is 2.5 miles northeastward of East Foreland. There is good anchorage for a small vessel, sheltered from all easterly winds, 0.4 to 0.5 mile from shore abreast or a little below the fish house, bearing 151°, in about 6 fathoms, good holding ground. An anchorage farther westward is not desirable, as the holding ground is not as good and the ebb current increases greatly in velocity on approaching East Foreland. Fresh water in small quantities can be boated at high water from a seepage just north of the fish house. Water in larger quantities can be had from a stream 0.8 mile northeastward of the fish house, but the flow does not usually last through the summer.

Nikishka Bay is the bight between Nikishka and Boulder Point, 3 miles to the northeast. Boulder shoals, bare in places at low water, fill the bight.

Middle Ground Shoal, a long ridge of hard sand with rocky bottom in places, lies in the middle of the inlet 10 miles northward of East Foreland. It shows at low water for a distance of 3.5 miles in a northeasterly and southwesterly direction, and its greatest height above low water is about 6 feet.

Beginning at **Boulder Point,** a prominent boulder reef with but few breaks in it, extends 20 miles along the shore to Moose Point. For the greater part of this distance the boulders, some very large, show at low water to a distance of 2 miles from shore, and there are occasional ones which show above high water.

A rock awash at low water lies 3.5 miles from shore and 4 miles 346° from Gray Cliff; a depth of 10 fathoms is close to the west side of the rock. Owing to the size of the boulders along this shore, it is not safe to skirt it with less than about 5 fathoms beneath the keel.

A prominent yellowish bluff, 300 feet high, is 4 miles eastward of Boulder Point **Gray Cliff,** 164 feet high, lies 10 miles northeastward of Boulder Point, and is a good mark from the inlet. There is a break in the boulder reef off Gray Cliff where a small vessel can approach the shore as close as 0.8 mile and find anchorage in about 5 fathoms, mud bottom, sheltered from easterly and southeasterly weather.

Moose Point is low and wooded, with a grassy flat at its end, and is not prominent. Between it and Point Possession, a distance of 10 miles, there are few boulders so far as known but the bottom is generally rocky and irregular. **Moose Point Shoal,** 5 miles long and partly bare at low water, begins opposite Moose Point, and is 1.8 to 2.2 miles from shore.

Deep-draft vessels should pass to the northwest of the 2¼-fathom spot, about 8.5 miles 110° from North Foreland Light and marked by a buoy, as shoaling may have taken place between it and the southeastern shore. A shoal which bares 4 feet at low water is in the middle of the inlet about halfway between North Foreland Light and

Fire Island and about 8.5 miles north of Moose Point. It is 0.3 mile wide and 2.7 miles long, with its axis extending in a 075° and 255° direction.

About 6 miles northeastward of Moose Point is a prominent reddish bluff, on the north side of which is a small stream in a deep canyon, the latter showing from southwestward.

Point Possession, 36 miles northeastward of East Foreland, is on the south side of Cook Inlet and on the southwest side of the entrance to Turnagain Arm. The point is a low, rounding, heavily wooded headland with a bluff at the water's edge. **Possession,** a small native village occupied only during the summer, is on the western side of the point where the bluff is low and a valley leads inland. A mile southward of the village the bluff is 140 feet high, and eastward it rises to 284 feet at **Grand View,** 1.5 miles inside Turnagain Arm.

A reef extends about 1 mile off the northwest side of Point Possession for a distance of about 0.8 mile. There are depths of 3 fathoms on its western edge; the northern edge drops off abruptly to depths of 12 to 20 fathoms. The range of the eastern side of Fire Island and Point Woronzof leads close to the western edge of the reef. Care should be taken when rounding the point at low water not to open this range until well clear of the reef. A current line generally indicates the edge of the reef when the tidal current is strong in either direction.

Temporary anchorage for a small vessel can be had 0.8 mile from shore and 2 miles southwestward of Possession in 4 fathoms, sandy bottom. It is sheltered from easterly and southeasterly winds, but considerable sea makes around Point Possession at times from the violent northeasterly winds that blow at intervals out of Turnagain Arm.

Shoals with least depths of 2 to 2¼ fathoms lie between Point Possession and Fire Island.

On the north side of Point Possession temporary anchorage for a small vessel can be had in 4 fathoms, hard bottom, 0.3 mile off a gulch midway between Possession and Grand View. The anchorage is out of the strong tidal currents that set in and out of Turnagain Arm. Water can be secured by boats at high tide from the gulch, but in the late summer the flow is small and the water discolored by flowing over the clay bluff.

Turnagain Arm is only partially surveyed. Most of it is a large mud flat, bare at low water and intersected by winding sloughs. Navigation is safe only for small craft drawing 6 feet or less Local knowledge is necessary since the channels wind from side to side and are subject to change, and strong currents and tide rips increase the difficulties of navigation. It is reported that sediment from the rivers is causing further general shoaling in the arm. The flood comes in at spring tides as a bore, sometimes attaining a height of 6 feet. Its rate of advance is about 6 knots but the velocity of the current may exceed 6 knots in places.

Small craft generally use the anchorage on the west side of Fire Island until the conditions are favorable for proceeding up Turnagain Arm. The only anchorage in the arm is the narrow channel close to the shore northward of **Burnt Island,** but it is exceedingly uncomfortable and even dangerous for launches when strong easterly winds are blowing down the arm. Best for launches is to beach them on the gradually sloping, smooth sand in the bight on the west side of **Gull Rock** or in the bight 2 miles farther westward.

Hope (*pop. 63 in 1950; P. O.*) is on the south side of Turnagain Arm 23 miles above

Point Possession. **Girdwood** (*pop. 79 in 1950; P. O.*) is on the north side 14 miles farther up. Formerly mining towns of some importance, both have stores and can be reached by small boats at high water. Girdwood is on the Alaska Railroad and the Anchorage-Seward highway which follow the north shore of Turnagain Arm.

Turnagain Arm is noted for the violent winds which blow out of it whenever the wind is easterly, and is locally referred to as the "Cannon," which expresses the opinion held of it. With light to moderate easterly winds in other parts of the inlet, a moderate gale will frequently blow out of the arm and a heavy sea and tide rips will be raised from its mouth across to North Foreland on the western shore.

Chart 8557.—West Point, the southwest extremity of **Fire Island,** is 6 miles north-northeastward of Point Possession. **Fire Island Light (lat. 61°07′.5 N., long. 150°16′.7 W.),** 45 feet above the water and visible 8 miles, is shown from a skeleton structure on West Point. The island is about 4.5 miles long between West Point and **North Point,** the northeast extremity, and has a greatest width of 1.8 miles between the southeast shore and **Race Point,** on the northwest. A **light,** 190 feet above the water and visible 9 miles, is shown from a small house on the bluff at Race Point.

Fire Island is wooded and has elevations of more than 250 feet in its central part. Near the southwest end are high sand hills, with bare summits, and a small lake. Another lake is in the northeast central part of the island. The shores are mostly high bluffs except at West Point and North Point.

Shelter Bay, on the west side of Fire Island between West Point and Race Point, is filled with mud flats, bare at low water. **Anchorage** for small vessels has been recommended in depths of 4 to 5 fathoms off the northern part of the bay, 0.5 mile from shore and with the highest hill near the middle of the island bearing 128°. The **current** is strong throughout the flood, but the ebb is weak and after the first 2 hours is nearly slack. With fresh southwesterly, northwesterly, or northerly winds, the anchorage has rough seas and tide rips.

About 2 miles northward of Fire Island is a sand shoal several miles long. A survey of this shoal in 1947 showed that it had changed radically since the previous survey in 1941. Subsequent reports, from 1949 through 1953, indicate drastic changes north and west of the shoal's crest, which bared 4 feet at low water in 1947.

The 1947 survey found a rock covered 12 feet at low water about 3 miles northeast of North Point, Fire Island; a lighted buoy is moored just south of the rock. A 1953 report states that a vessel struck a submerged object 500 yards east of the rock; Coast Pilot believes that the vessel grounded in charted depths of 24 feet or less.

The **deep channel,** between Fire Island and the sand shoal, is marked by several buoys. Strong **currents** and swirls make navigation difficult. With strong northerly winds, the tide may fall as much as 6 feet below mean lower low water, and vessels of more than 10-foot draft should wait for sufficient tide to insure safe passage.

Point Campbell, on the northeast side of the entrace to Turnagain Arm, is 2.5 miles eastward of Fire Island. The area between is a mud flat that bares at low water.

Point Woronzof, 3.5 miles northeastward of Point Campbell, is on the south side of the entrance to **Knik Arm. Point Mackenzie,** 2 miles north-northeastward across the entrance to the arm, is marked by a **light,** 80 feet above the water.

Anchorage (*pop. 11,254 in 1950; P. O.*), on the southeast side of Knik Arm 4 miles above the entrance, is headquarters of the Alaska Railroad, which extends from Seward

and Whittier to Fairbanks. **Glenn Highway** connects with Richardson and Alcan Highways. The airfield is the busiest in Alaska, with service to the Alaska Peninsula, Bristol Bay and Kuskokwim River, Fairbanks, and points along the Kenai Peninsula. The city has good stores, hospitals, hotels, and apartments. A United States marshal is stationed at Anchorage.

The best **anchorage** for deep-draft vessels is 0.5 to 0.8 mile west of the city in depths of 10 to 12 fathoms, silt bottom. The usual anchorage for small vessels is nearer Anchorage in depths of 8 to 10 fathoms. Holding bottom is good and there is little chance of dragging if the chain scope is 5 to 7 times the depth, but the anchor probably will foul in a blow if it remains down through two tides. It is dangerous to remain at anchor in this area when the ice breaks in the spring.

From a position 0.5 mile 330° from Race Point Light, Fire Island, steer **070°** for the outer end of Ocean Dock at Anchorage. This course passes 400 yards south of the 12-foot rock northeast of Fire Island and carries a controlling depth of about 24 feet at low water.

The diurnal range of **tide** is about 29½ feet at Anchorage; daily predictions are given in the *Tide Tables*. An eddy **current** flows up Knik Arm during the ebb. Vessels anchored close in avoid the strongest currents, which attain velocities of 6 knots or more at strength in mid-channel.

Calm and clear **weather** may prevail at Anchorage while strong breezes and rain are sweeping up Turnagain Arm. The prevailing wind is from the north; a maximum velocity of 66 miles per hour has been reported.

Ice.—Although upper Cook Inlet rarely, if ever, freezes solid because of the enormous tidal range, it is usually closed to navigation from late November to the first of April; the inlet is ice-free from about May 1 to November 1. The ice floes move with the tides, and patches of open water are occasionally visible. Tide and wind action on 6-foot floes cause frequent and extensive damage to piers and other shore installations. High-powered vessels probably could negotiate the waters to Anchorage during most of the winter, but they would be unable to tie up to docking facilities because of shore and floating ice. Small boats rarely could go as far north as Anchorage during the winter season. See *Appendix* for tabular detail on ice.

Ocean Dock, the deep-draft marginal wharf at Anchorage, is under the jurisdiction of the Corps of Engineers, U. S. Army. In September 1953, the 350-foot face had depths of 8 to 12 feet alongside but flat-decked barges of about 30-foot beam were moored to the face so vessels could tie to the outer sides and unload at all stages of tide; keel-line depths off the barges were 26 to 30 feet.

A tug usually is available to aid in tieing up to Ocean Dock. The wharf has rail and highway connections. Truck cranes shift cargo to the wharf. Gasoline, fuel oil, and fresh water are piped to Ocean Dock, and pipelines for petroleum products lead to the several Government storage facilities.

The cement-company wharf 400 yards south of Ocean Dock fronts several silos and a bagging plant. The wharf has depths of —10 feet or less alongside. A half mile south of Ocean Dock, the wharf of a fish and farm-products company extends out several hundred feet; the face bares at low water. A cannery wharf, about 0.1 mile farther south, has a face that is bare at low water. Between the farm-products wharf and the cannery wharf is the aft section of the U. S. S. *Sackett Harbor* which generates auxiliary power for Anchorage.

Ship Creek, on the northeast side of the Anchorage waterfront, is the small-boat harbor of the city. The creek bares at low water and there is no range for entering. Boats rest on the bottom at low water, and local knowledge is recommended for entering.

From about 7 miles above the entrance to Knik Arm to the head are extensive mud flats that bare soon after high water. The flats are cut by numerous channels and sloughs. The main channel lies close to the west shore of Knik Arm, then winds eastward and northward; it is narrow and intricate, navigable only on the tide, and then only with knowledge of conditions.

Knik (*see Chart 8553*) is a village on the northwest side of Knik Arm about 15 miles above the entrance. Small craft go to Knik at high water and lie on the bottom at the ends of the landings between tides. The channel to Knik is close along the western shore.

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CHAPTER 5

Kodiak Island

Chart 8556

KODIAK and Afognak Islands, lying close together southwestward of Cook Inlet, and separated from the mainland by Shelikof Strait, are large and have numerous small islands along their shores. The group is about 155 by 54 miles in extent, with its greatest length in a southwesterly direction.

The land is rugged and mountainous with elevations of 2,000 to 3,000 feet along the shores and above 4,500 feet in the interior. The rocky shores are indented by numerous deep, narrow inlets, which have numerous rocks and reefs.

The eruption of Katmai Volcano, on the mainland about 90 miles west of Kodiak, in 1912 covered this group with a thick deposit of volcanic ash. The effects of the eruption have gradually disappeared and the ash deposits in quantity are no longer apparent except in a few places.

Strong winds carry volcanic dust from the Katmai region causing a very hazy condition. At times there is a marked division between a very clear atmosphere on the one side and the dust-filled air on the other; this condition may be observed off the eastern coast of Kodiak Island with a strong northwest wind. The snow remaining in the mountains during the summer is discolored by the dust.

A number of salmon canneries are in operation during the season. The cod, halibut, and herring fisheries are important in this region. The halibut fishing fleet operates on Albatross and Portlock Banks.

Kodiak, on Kodiak Island, is the principal business center in this region.

Afognak Island, mostly timbered, is a Government forest reserve.

Some cattle and sheep raising is carried on and a few mineral prospects have been located.

The periods of good weather are longer on these islands than on the adjacent mainland, and considerable success has been attained in growing vegetables and foodstuffs.

Afognak Island is separated from Kodiak Island by Marmot Bay, Kupreanof Strait, and the passages on either side of Whale Island. These waters provide a direct route between Kodiak Harbor and Shelikof Strait. Kodiak, on the northeast coast of Kodiak Island, lies back of the islands in the northwestern part of Chiniak Bay. Kodiak has two approaches; one from the northward, the other from the southeast through Chiniak Bay.

Weather.—On Afognak Island the prevailing winds are northeasterly except in spring and again in late summer when they shift to southwesterly and westerly directions.

At Kodiak the winds, generally northwesterly during the latter part of the fall, winter and spring, shift to northeast in early summer and then to southeast until the end of September. The average wind velocity at Kodiak is 20 knots, and the area is subject to violent williwaws. Data from the 5° ocean area, 55°–60° N., 150°–155° W., in which Kodiak and Afognak Islands are situated, indicates that about 6 percent of the fall, winter and spring ship observations at Greenwich noon recorded gales of more than force 7, and that about two-thirds of these gales were more than force 8.

Kodiak and Afognak Islands have annual total precipitation amounts of 67 inches and 53 inches respectively. At Kodiak the annual total snowfall is 46 inches. Measurable snowfall has been recorded at Kodiak in every month of the year except July and August.

The annual mean temperature at Kodiak is 41° F. The highest temperature noted was 85° in August and the lowest was −2° in January. Water temperatures are about 1° F. lower than air temperatures in mid-summer and 1° to 2° higher in late fall, winter and early spring. Womens Bay, on the northeast coast of Kodiak Island, is frequently blocked by ice in mid-winter.

Fogs are common over this area. At Kodiak fog is reported on an average of 41 days a year, with dense fogs on about 20 of these days. Fogs are most frequent at Kodiak in June and July.

Cloudiness over the area is considerable. At Kodiak there is but little variation during the year, the sky cover averaging about seven-tenths.

Chart 8533.—Shuyak Island appears as part of the northern end of Afognak Island, but is separated from it by Shuyak Strait. The southern portion is densely wooded, with the higher hills showing bare rocky outcrops. Proceeding northward the trees gradually disappear and the northern part is entirely grass covered.

The passage between the Barren Islands and Shuyak Island, see Chapter 4, is readily navigable during the day, and in clear weather; however, the passage northward of the Barren Islands is generally used if bound for Shelikof Strait from the eastward.

Latax Rocks, the northernmost feature of the Kodiak-Afognak-Shuyak Group, are three rocky islets lying in the line of the trend of the west coat of Shuyak Island. They are 32, 27, and 20 feet high, the outer one being the lowest and the most ragged. A rock awash at half tide lies about 0.5 mile northward of the outermost rock, and a reef bare 6 feet at low tide lies about 0.4 mile westward of the outermost rock. Several detached shoals lie in the vicinity of Latax Rocks. Ships using the passage between Barren Islands and Shuyak Island should pass northward of Latax Rocks.

Current.—In the vicinity of Latax Rocks it has been noted that the current flows in a westerly direction on a rising tide and easterly on a falling tide with velocities reaching about 3 to 4 knots. The current appears to be less in the deeper water in the passage northward of Latax Rocks, see Chapter 4. On one occasion slack water occurred 2 hours earlier than high water.

Tide rips in the vicinity of Latax Rocks are particularly heavy and should be avoided by small vessels. See caution as to tide rips in the locality of the Barren Islands, Chapter 4.

Party Cape is the northwest end of Shuyak Island. It is 182 feet high and grass-covered for a mile or more back.

Dark Island, between Party Cape and Latax Rocks, is about 0.8 mile in diameter,

108 feet high, and grass-covered. Several large black rocks are off the southwest end of Dark Island. **Starr Rocks,** bare 6 feet at low water, lie between Dark Island and the eastern part of Party Cape.

Currents observed during one-half day in June on the southwest side of Dark Island set westward on the flood with a velocity of 1.3 knots. The ebb velocity was 1 knot. Slack before flood occurred near the time of low water at Kodiak.

The passage between Latax Rocks and Dark Island has 5¼-fathom shoal near the middle and should be avoided on account of strong currents.

Dark Passage, between Star Rocks and Party Cape, may be navigated by keeping 0.4 mile off the cape and passing northward of a rock 3 feet high lying 0.9 mile westward of Party Cape. Due to strong currents and heavy tide rips, the passage should be avoided.

Shag Islet and the west coast of Shuyak Island are described later in this chapter.

The northern coast of Shuyak Island from Party Cape to Point Banks is very irregular and fringed with numerous rocks and islets. Heavy currents and tide rips are found along this coast. **Carry Inlet** and **Shangin Bay,** the main indentations, are narrow and tortuous. They may be used only by small craft with local knowledge. Carry Inlet has its entrance channel about 2 miles southeastward of Party Cape. The narrowest part of Shangin Bay, 1.2 miles from its entrance, contains a mid-channel rock bearing at minus tides.

Perevalnie Islands lie close to the north shore of Shuyak Island and 0.5 mile westward of Point Banks. They are grass-covered with a maximum elevation of 95 feet. **Perevalnie Passage,** between the islands and the mainland, may be used as a boat passage with a depth of about 5 feet.

Temporary anchorage during southerly weather appears feasible 0.4 mile westward of the point 0.6 mile southwestward of the western end of Perevalnie Islands.

Point Banks is an island about 0.4 mile long, 130 feet high, and entirely grass-covered. The narrow passage between it and the northeastern end of Shuyak Island contains several rocks and is choked with kelp. An aviation radiobeacon is about a mile westward of the point.

Sentinel Island, a rock 33 feet high 0.9 mile northwestward of Point Banks, is a good landmark from an easterly or westerly direction. Its sides are nearly vertical.

Fronting the east coast of Shuyak Island, at a distance of 1.5 to 3.5 miles offshore, are a series of reefs and rocks separated by broken bottom areas and extending 7 miles in an approximately true south direction—from a 2½-fathom reef, 1.4 miles southeastward of Point Banks, to the vicinity of a bare rock 52 feet high. A similar series crosses the former in the latitude of Sea Otter Island.

Vessels using the passage along the east coast of Shuyak Island, inside the series of reefs and rocks, should proceed with caution. The bottom in this passage is extremely broken. It is considered that only a wire-drag survey would prove the absence of all dangers. The known dangers may be avoided by rounding the southeastern end of Point Banks Island at a distance of 0.5 mile until the eastern end of the island bears true north. Then proceed 5.8 miles on course 175° until the prominent group of rocks, highest 15 feet, are a little less than 0.8 mile on the starboard beam. Then steer 155° into Perenosa Bay. Tidal currents are very strong.

The main approach from seaward to Andreon Bay, Shuyak Strait, and Perenosa

Bay, is southward of the rocks southeastward of Sea Otter Island and between the 52-foot bare rock and Seal Islands, but its use by large vessels cannot be recommended. Indications of shoals along the approach are numerous, but they have not been examined with the wire drag. There are evidently pinnacle formations in this region. To avoid the known areas of extreme broken bottom steer course 282° from seaward, pass 3.2 miles northward of Tolstoi Point, then 1.9 miles southward of the large rock, 52 feet high, lying southwestward of Sea Otter Island, and then pass 1.5 miles northward of the sharp black rocks lying northward of Posliedni Cape.

Sea Otter Island, lying 7.5 miles southeastward from Point Banks, is grass covered, 0.4 mile long, and 105 feet high. Bare rocks and breakers extend to the east and southeast for a distance of 2.3 miles.

Little Fort Island, off the east coast of Shuyak Island and 8 miles southward of Point Banks, is grass covered and marks the entrance to Andreon Bay. **Big Fort Island** forms the south side of the bay. **Big Fort Channel** separates the island from the mainland. This channel bares at half tide. Anchorage for small boats may be had in **Andreon Bay** near the entrance to Big Fort Channel in 12 fathoms of water, muddy bottom. The axis of the entrance channel is a little less than one-third the way from the northeastern end of Big Fort Island to Little Fort Island, it then follows the rounded northern end of Big Fort Island at a distance of about 350 to 400 yards.

Shuyak Strait has a navigable entrance at its western end and is described later in this chapter.

Perenosa Bay on the north side of **Afognak Island,** lies between the east entrance to Shuyak Strait and **Posliedni Point.** The northwestern part of the bay is foul. Anchorages may be found in several arms of Perenosa Bay, but the approach to the bay from seaward is characterized by a very broken bottom, which has been described above.

Delphin Bay is the western one of the southern arms of Perenosa Bay. The channel westward of **Delphin Island,** tree-covered, is foul. In the center of the passage eastward of the island are rocks and the best water is 270 yards off the eastern points of Delphin Island. Boats can anchor in 16 fathoms, hard bottom, in the center of the head of the arm, after passing the island. A heavy swell comes into Delphin Bay in northerly weather.

Discoverer Bay, the southeast arm of Perenosa Bay, has an excellent anchorage in depths of 15 fathoms, muddy bottom, east of **Discoverer Island,** tree covered and northernmost in the bay. A 3¾-fathom shoal lies about 0.5 mile northwest from the east entrance point, and a 1-fathom spot lies between the shoal and the point. Small boats can enter the channel on the west side of the island and go to the head of the arm.

Phoenix Bay, the arm of Perenosa Bay just west of Posliedni Point is a good anchorage for all weather except northwest. Anchorage can be had in 10 to 17 fathoms, muddy bottom, 1.2 miles from the entrance. **Shields Point** forms the eastern entrance of the bay.

Seal Bay in general extends from Posliedni Point to **Tolstoi Point.** From a point 1.1 miles northward from Posliedni Point a series of rocky islands and reefs extends in an east-southeast direction across Seal Bay. Navigation in this area should not be attempted without local information.

Tonki Bay, on the west side of Tonki Cape, has two arms separated by a headland. A 106-foot rocky islet lies 0.5 mile northward of the headland. Three rocks, covered

at high water, lie about 0.3 mile from the eastern shore and 2 miles southward of Tonki Cape. The anchorage is found about 0.3 mile from the head of the eastern arm in 10 fathoms, soft bottom, but it is not secure with northerly winds. Small boats may anchor in the small cove on the east side of the head of the eastern arm in 8 fathoms, muddy bottom, in any weather.

The western arm of Tonki Bay extends 6.5 miles south of the headland separating the two arms. Anchorage may be had in 18 fathoms, muddy bottom, about 0.3 mile from head of the arm.

On the eastern part of Afognak Island is a series of mountain ridges with low depressions between them running through the island from north to south. From a distance Marmot Island appears as the easternmost of these ridges. The lower parts of Afognak Island are wooded, except its eastern coast, and its southwestern end southward of Paramanof Bay.

Caution.—In making Tonki Cape or Marmot Strait from the northward, a very irregular set to the westward has been experienced. In foggy weather a vessel is liable to be too close to the breakers off Sea Otter Island unless precautions are taken. Likewise in running to this locality from Seward, abnormal set has been experienced. From the experience of a survey vessel making these runs and in lying-to offshore, there seems to be two factors for which allowance should be made. First, if the run is made during the time of a flood spring tide, extra allowance should be made for set to the westward. Second, if the course of the vessel passes over a bank or even a locality where the water is shoaled, extra allowance for a stronger current should be made.

Tonki Cape, the northeastern end of Afognak Island, is a narrow grass-covered point 87 feet high near its northern extremity. A low-lying gap connects it with the ridge separating Tonki Bay and Marmot Strait. A short reef extends northward from the cape 0.3 mile, terminating in a rock awash at high water. It is recommended that vessels clear the north end of the cape by at least 1.5 miles.

Tonki Cape Light (lat. 58°21′.2 N., long. 151°59′.1 W.) is shown from a white wooden house. The light is 75 feet above water and visible 11 miles.

Sealion Rocks lie 5.5 miles eastward from Tonki Cape and 4 miles northward from Marmot Island. They are two bare rocks close together, the larger one being about 35 feet high. A reef, bare 7 feet at low water, lies 0.6 mile northeastward from these bare rocks. Sealion Rocks have been used as a bombing target.

Marmot Island, about 6.5 miles long, parallels the eastern side of Afognak Island. Between the islands is the passage called Marmot Strait. Marmot Island is wooded to a height of about 500 feet. The north end is low and rises gradually to the high land. The eastern side and southern end of the island are bluffs over 1,000 feet high in places. The western shore is also steep but lower. Three high rocks are close to **Marmot Cape,** the south end of the island, and two more are close to its southeast side.

Shoal areas adjacent to the northwest shore of Marmot Island extend northward toward Sealion Rocks and border the north approach to Marmot Strait. A 4-fathom spot in this area lies 2 miles off the north end of Marmot Island.

The point on the northwest shore of Marmot Island, 1.5 miles from the north end, is marked by a rock, 12 feet high, 600 yards offshore.

Two sunken rocks, on which the sea generally breaks at low water, lie about 1 mile apart and 2.5 miles eastward of **Cape St. Hermogenes,** the eastern end of Marmot

Island. The northern rock lies in the bearing 288° to the northern end of the island. The southern rock lies in the bearing 225° to the southeastern end of the island. Two pinnacle rocks close to the southeast side of Marmot Island bear 232° when in range—the range passes southeastward of both breakers. A vessel should pass over 2 miles outside the breakers to avoid broken bottom.

Marmot Strait, between Afognak and Marmot Islands, is 2.5 miles wide at its narrowest part. The strait is apparently free from dangers except along the shores. A shoal of 1¼ fathoms lies 650 yards off the western shore of Marmot Strait, 6 miles from Tonki Cape. A mid-channel course through the strait is recommended. Tidal currents have an estimated velocity of 1 to 3 knots, the flood setting northward through the strait. Directions through the strait en route between Kodiak and Seward are given in Chapter 3.

King Cove, lying 6 miles west of Marmot Cape, is an open bight 1.5 miles long, indenting the coast 1.8 miles. It may be used as a temporary anchorage in 7 to 12 fathoms, sand bottom. It is exposed to easterly and southerly weather.

The west coast of Marmot Strait for about 5 miles southward from Tonki Cape is broken and rocky, with reefs extending offshore. Along this stretch is a low bluff with a grass- and muskeg-covered plain, extending 0.3 mile inland to the main ridge which rises abruptly. Southward to King Cove the bluffs increase in height with the shores steep-to. From King Cove to Pillar Cape the shoreline is a steep, bare bluff from 500 to 1,000 feet high.

Chart 8534.—Marmot Bay extends westward between Afognak and Kodiak Islands to Whale Island. In the center of the bay, near the entrance and northward of The Triplets in places the bottom rises abruptly from deep water to depths of 14 to 18 fathoms. These areas should be avoided because there may be less water than that indicated.

The route from Marmot Strait to Kodiak is eastward of the broken bottom in the center of Marmot Bay entrance. However, shoal spots, exist along this route eastward of Spruce Island and in the vicinity of Spruce Cape.

The route in Marmot Bay from the vicinity of Marmot Strait to the passes at Whale Island lies between the general broken ground in the center of the bay and the north shore. Pillar Cape may be rounded at a distance of 1.5 miles in depths of 20 fathoms or more. Similar depths exist 0.8 mile off Izhut Cape. In the western end of Marmot Bay danger will be avoided by keeping well eastward of a line between the eastern end of Cape Kostromitinof and Stripe Rock, and eastward of this line extended southward until Hog Island is open from the northwestern side of Whale Island.

The route along the south side of Marmot Bay through Narrow Strait and Whale Passage is generally used by vessels from Kodiak bound for Shelikof Strait. Passage at the time of maximum current in Whale Passage should be avoided. Current predictions for Whale Passage may be obtained from the *Current Tables.*

Pillar Cape, the outer end of the north shore of Marmot Bay, is a bluff over 500 feet high, similar to the southeast side of Marmot Island. A high pinnacle rock is at the foot of the bluff 0.5 mile eastward of the south end of the cape. About 1.5 miles westward of the cape is an open bight from which low land extends through to the western arm of Tonki Bay.

Izhut Bay, a northern arm of Marmot Bay, opens with a width of 5 miles between

Pillar Cape and Peril Cape and extends about 7.5 miles in a northwest direction. The only dangers are along the shores and in the arms of the bay. The bay proper is exposed to southerly weather, but some of the arms afford protected anchorages.

The most important of these anchorages is **Kitoi Bay,** an arm on the west side. Its head is a landlocked basin about 0.5 mile in diameter. The swinging radius from the center of the basin is about 300 yards. To enter Kitoi Bay pass the north entrance point of this arm slightly less than 0.5 mile off on a course **305°,** picking up the range defined by the prominent point on the north side about 1.8 miles in and the stream at the head of the small bight at the head of the arm. Continue on course or range until 0.3 mile from **Midarm Island,** a small prominent mid-bay islet, 50 feet high. This position is between another islet 600 yards to starboard and a 3-fathom spot 125 yards to port. The islet on the starboard beam lies 100 yards from the north shore. The 3-fathom spot is marked by only a few streamers of kelp which are difficult to see. Then change course to pass southward of the islet and steer mid-channel course to the center of the basin which is clear to within a few yards from shore. A low-water spit extends a few yards off the north entrance point of the basin. Anchor in 20 to 22 fathoms, good holding ground. Small vessels may anchor in a small bight southwest of the basin in 11 to 12 fathoms.

Two fingerlike arms in the northeast part of Izhut Bay extend northward about 5 miles. **Saposa Bay,** the easterly arm, has an island about 0.5 mile from its entrance. A sunken rock, covered ¾ fathom, lies about 125 yards south of the island. The passage is west of the island. The controlling depth is 2 fathoms. Small vessels may anchor above the island in 7 to 10 fathoms, sand bottom. The westerly arm is not recommended as an anchorage.

Peril Cape, the outer end of the western shore of Izhut Bay, is a prominent precipitous headland about 600 feet high with a high pinnacle rock close to its southern side.

Cape Izhut, lying 2.5 miles southwestward of Peril Cape, is a projecting, long, wooded, hilly point from 250 to 500 feet high. There is deep water around the cape as close as 0.3 mile.

Duck Bay is about 6 miles long from Cape Izhut to Cape Kostromitinof. At the eastern end of the bay temporary anchorage, with a swinging radius of about 300 yards, may be had in the middle of the cove 1.5 miles northwestward of Cape Izhut, in 6 to 7 fathoms. The anchorage is eastward of an islet, 16 feet high, which lies 0.3 mile from the northern shore and should not be approached closely. **Selezen Point** forms the western side of the cove.

A round, rocky island, 163 feet high and grass covered on top, lies 2.5 miles westward from Cape Izhut and 0.8 mile from shore. Kelp extends nearly 0.3 mile westward and northward of the island, and numerous bare rocks extend 0.5 mile eastward of the island and to the shore northeastward of it. On **Selezen Bay,** the cove northward of the island, is the small native settlement of **Little Afognak.** Temporary anchorage may be had in the middle of the cove in 10 to 12 fathoms. Enter the cove westward of the island between the island and a large rock awash at high water, which lies 0.3 mile southward from the western point of the cove.

Mary Anderson Cove, the next cove westward, with its entrance 1 mile northwestward of the 163-foot island, is 1 mile long and 0.7 mile wide. The bottom is rocky and

kelp extends some distance from shore in places. Small craft entering with care can anchor in 5 to 8 feet of water at the head.

Cape Kostromitinof, on the northern shore of Marmot Bay, is a projecting, long, level, wooded point, about 200 feet high, with bluffs in places at the water. Northward from the cape the land rises gradually in a distance of 5.5 miles to **Duck Mountain,** a prominent peak, 2,080 feet high.

Kazakof Bay extends about 6 miles in a northerly direction from the northwestern part of Marmot Bay. Anchorage for vessels of any size is found at the head of the bay, see Directions, Kazakof Bay.

The cove on the eastern side, 3.5 miles above the entrance to Kazakof Bay, affords shelter for a small vessel anchored in 12 to 14 fathoms. Small craft can anchor in the southeastern end of the cove in about 5 fathoms. A reef extends about 100 yards off the south side of the entrance. The small bight in the eastern shore is shoal.

Parrot Islet, round, rocky, and 70 feet high, is in the entrance to Kazakof Bay. Channels for entering lie on either side of the broken ground on which Parrot and other rocky islets and rocks awash are grouped. A sunken ledge with some kelp and a depth of 3½ fathoms lies about 0.8 to 1.5 miles southeastward of Parrot Islet; its northern end lies 0.5 mile off Cape Kostromitinof.

Stripe Rock, 2.8 miles southward of Parrot Islet, is marked by a prominent white streak which extends along the entire height of the rock. It is composed of two pinnacles close together, about 35 feet high; the white streak is on the higher of the two pinnacles. A large bare ledge, 30 feet high, lies between Stripe Rock and Parrot Islet.

Westward of Stripe Rock and the large bare ledge, mentioned in the preceding paragraph, the area extending to the shore is mostly foul and should be avoided by vessels.

Directions, Kazakof Bay.—From eastward, shape the course for a position about 0.5 mile southeastward of Cape Kostromitinof. Head for Parrot Islet on a **305°** course until the southwestern end of the cape is a little forward of the beam. Change to **330°** and pass 0.25 mile off the southwestern end of the cape and the same distance northeastward of Parrot Islet.

Then steer **359°,** with Parrot Islet astern, to the head of the bay. Above Parrot Islet the only danger, if the shores are given a berth of 0.3 mile, is a low, bare rock lying 0.4 mile from the eastern shore and 0.6 mile from the head of the bay. The anchorage is about midway between this rock and the point separating the two arms at the head of Kazakof Bay, in 14 to 15 fathoms, muddy bottom. Small vessels can anchor in 8 to 10 fathoms, either in the broadest part of the western arm 0.3 mile from its head or in the entrance of the eastern arm.

From southwestward, keep Hog Island open from the northwestern side of Whale Island until Stripe Rock is in range with the eastern side of Cape Kostromitinof. Then steer **041°** for 2.3 miles to a position 0.25 mile eastward of Stripe Rock. Then steer **006°** for 1.1 miles to a position 0.25 mile eastward of a bare ledge about 30 feet high. Then steer **333°** about 1 mile. Then steer **358°** for 0.8 mile, keeping Stripe Rock open westward of the bare ledge astern until Parrot Islet is 0.5 mile on the starboard beam. From this position a **005°** course will lead to the head of the bay.

Afognak Bay, western tributary to Marmot Bay, makes into Afognak Island about 3.5 miles. There is secure anchorage off an unused cannery at **Rivermouth**

Point, near the head; see Directions, Afognak Bay. **Litnik** is a small village on **Afognak River** at the head of the bay.

Afgonak Bay may be entered easily in the daytime. The approach from Marmot Bay is through **Eastern Passage,** between Hog Island and Big Rock, which lie off Afognak Bay. This approach is endangered by a rock awash at low water and steep-to, lying 0.6 mile southeastward of Big Rock. Foul ground marked by kelp extends about 350 yards from Hog Island into Eastern Passage, and shoal water borders the passage in the vicinity of Big Rock.

A straight channel leads from Eastern Passage to the central part of Afognak Bay; both channel sides, however, are bordered by dangers. On the northeast side of the channel are the Skipwith Reefs, with shoal water projecting channelward; on the southwest side are **Danger Reef,** which bares at half tide; a 3¼-fathom shoal 0.9 mile southeastward of the reef, and a 2¼-fathom depth on a rock 0.6 mile northwestward of Danger Reef.

Hog Island, the prominent mark for approaching Afognak Bay and also Afognak Strait, is 0.4 mile long and has two wooded knolls with a saddle between them.

Big Rock, 1 mile from Hog Island with Eastern Passage between them, is comparatively narrow, irregular, and 100 yards long in a north and south direction.

Skipwith Reefs, a chain of bare rocks and reefs, extend 1.5 miles northwestward from Big Rock to Lamb Island. The southeastern side of the rocks should be given a berth of over 0.4 mile.

Lamb Island, 0.5 mile long and wooded, is near the point which marks the outer end of the eastern shore of Afognak Bay. Between this point and the rock awash at low water, 0.6 mile off Big Rock, the entire area is obstructed and should be avoided.

Alexander Island, 0.8 mile eastward of Lamb Island, is grass-covered and has a knob about 80 feet high at its north end. Foul ground surrounds the island and extends 1.2 miles toward Stripe Rock.

Dot Island, small and wooded, is the westernmost of three small islands close to **Posliedni Point,** where Afognak Bay narrows to 0.5 mile. On the western shore opposite Dot Island is a cascade where fresh water can be obtained by boat.

Graveyard Point marks the outer end of the western shore of Afognak Bay. **Lipsett Point** is the next point inside the bay. **Aleut Village** is on the shore of the bight between these points.

Village Reefs are partly bare at low water, are covered with kelp, and extend over 1 mile eastward from the shore around Graveyard Point out toward Hog Island. The point of the reefs is midway between Graveyard Point and Hog Island. Southeastward from the point of the reefs is a detached shoal with a least found depth of 3½ fathoms. Between this shoal and the reef extending 650 yards westward from Hog Island is a channel 0.5 mile wide. The channel is sometimes used by vessels, with local knowledge, to enter Afognak Bay from Afognak Strait.

Head Point is 1.4 miles southward of Graveyard Point and between these points is the village of **Afognak** (*pop. 158 in 1950; P. O.*). The white church with green roof, 0.3 mile southward of Graveyard Point, is the best mark in the village. Afognak has two sawmills. Regular passenger steamers do not call at Afognak; the mail is brought from Kodiak.

Small vessels can anchor in 5 fathoms near the kelp on Village Reefs, with the

church in Afognak bearing 344° and Head Point in line with Deranof Rock. Little current will be felt here, but there is exposure to easterly winds.

For tides, see Afognak Strait.

Directions, Afognak Bay.—From northeastward, keep Hog Island open from the northwestern side of Whale Island, bearing anything westward of **250°**; this range will lead about 0.3 mile southeastward of the rock awash at low water, which lies 0.6 mile off Big Rock. When Big Rock appears in range with the eastern end of Lamb Island turn to pass midway between Big Rock and Hog Island. For directions to continue into Afognak Bay, see below.

From Narrow Strait follow the directions in table of courses, Kodiak to Shelikof Strait, Chapter 3, until westward of Three Brothers. Then steer **328°** for 6 miles with Low Island astern to a position 0.5 mile northeastward of Hog Island.

Pass midway between Hog Island and Big Rock, and steer **315°** for the old cannery building at Rivermouth Point, showing midway between Dot Island and Posliedni Point. Keep this range for about 2 miles until the western end of Lamb Island is abeam. Then steer **308°** for 1.8 miles and pass 400 to 500 yards southward of Dot Island.

Keep this course for about 0.3 mile past Dot Island until 0.25 mile off the cascade on the western shore. Then steer **353°** for 0.8 mile, favoring slightly the western shore. Anchor near mid-channel off the old cannery at Rivermouth Point in 8 to 10 fathoms. The anchorage is clear if **Winter Island,** in the west arm, is given a clearance of 300 yards and **Last Point,** on the north shore, 400 yards.

From southward steer **359°**, with Big Rock and the southwestern end of Alexander Island on range ahead, to pass eastward of Hog Island. When the northern tangent of Hog Island is abeam, turn from the range to pass midway between Big Rock and Hog Island. For directions to continue into Afognak Bay see preceding paragraphs.

Whale Island, at the western end of Marmot Bay, is about 4 miles in diameter. Its southern half is a grass-covered mountain, 1,980 feet high, with a narrow light streak, or landslide, down its eastern slope. The northern side of the island is low, and the lower parts of the island are generally wooded. **Treeless Islet,** rocky and grass covered, lies 0.4 mile off the eastern side of the northern end of the island. Whale Passage is southward of the island, and Afognak Strait, northward.

Afognak Strait, between Whale and Afognak Islands, is used mostly by small vessels.

The currents are only half as strong as in Whale Passage. The dangers are marked by kelp, which grows in depths up to about 6 fathoms and shows at slack water.

If precaution is taken, the navigation is not difficult on a clear day when the marks for the strait can be seen, and when the summit of Kupreanof Mountain is not hidden. The range formed by this mountain peak and Deranof Rock, off Deranof Island, effectively marks the channel through Afognak Strait, except in the central part of the strait and just inside the western entrance. In the central part of the strait the range passes close to the edge of foul ground making out from the north shore; here a vessel should guard against going anything northward of the range. Just outside the western entrance, a 2½-fathom depth on a rock lying 600 yards from the Whale Island shore is on or a very little northward of the range. The channel is just southward of the rock, and here it is necessary to deviate a little southward of the range to avoid the rock;

the channel is only 300 yards wide between the 2½-fathom rock and the reef making out from Chiachi Point; the general depth is 24 feet.

A reef awash at low water lies 0.4 mile north-northwestward from Chiachi Point or 400 yards northward of Kupreanof Mountain-Deranof Rock range.

Most of the northern half of Afognak Strait is foul. Southwestward of Head Point the foul ground extends 0.3 mile offshore and its southern edge is near the Kupreanof Mountain-Deranof Rock range.

Dolphin Point is the northeast end of Whale Island. A reef partly bare at low water extends 600 yards from Whale Island at a point 0.3 mile westward of Dolphin Point.

Fox Bay, the bight in Whale Island 1 mile westward of Dolphin Point, has in its entrance a reef which shows well at low water. A small vessel can anchor in the bay inside the reef in 4 to 5 fathoms, but the south shore must be given a berth of 300 yards.

Westward of Fox Bay the shore of Whale Island is clear to **Chiachi Point,** the northwest end of the island, from which a shelving reef makes out about 350 yards in a northwest direction.

Temporary anchorage may be had in the channel of Afognak Strait between Fox Bay and Afognak village, in 7 to 8 fathoms, but exposed to the full strength of the currents and to easterly and northeasterly winds. A small vessel can anchor in Fox Bay.

A good anchorage in Afognak Strait, but exposed to easterly weather, can be had in 5 to 7 fathoms about 400 yards off a gravel beach on the southeast end of Little Raspberry Island. The bottom is sand and gravel and the anchorage is suitable for large or small vessels. To come into this anchorage from the east hold a 270° course with the south end of Little Raspberry Island ahead. The end of this island can be recognized as the north side of the passage northward of Deranof Island. Remain on the bearing 270° on the south end of Little Raspberry Island in order to avoid foul ground off Shoal Point and to avoid a rock south of this course which bares 1 foot at low water. This rock is marked by kelp which tows under at most stages of the tide. If this course is used coming into this anchorage, or for small vessels in The Narrows, it is possible to select a good range for this course, with the south tip of Little Raspberry Island against the slope of a mountain on Raspberry Island near Last Timber Point.

With easterly winds small vessels can anchor about 0.3 mile westward of **Afognak Point,** the point on the north side of Afognak Strait, 0.8 mile westward of Head Point, in about 4 fathoms; but care is required. When rounding into the anchorage, pass northeastward of a reef, bare at low water, lying 0.4 mile southwestward of the point; give the point a berth of over 300 yards.

Deranof Island, 0.5 mile long, low and wooded, is the southernmost and largest of the islands at the western end of Afognak Strait.

Deranof Rock, about 15 feet high, lies nearly 200 yards southward of the island. Broken ground with a least depth of 2½ fathoms lies 0.4 mile eastward of the island and 074° from Deranof Rock.

Tides, Afognak Strait.—High and low water occur about one-half hour later than at Kodiak. The diurnal range of the tide is about 10 feet.

The **tidal currents** in Afognak Strait set westward on the flood and eastward on the ebb. The estimated velocity is 2 to 5 knots at strength, depending on the range

of the tide. Slack water may be expected to occur about 1 hour earlier than in Whale Passage. See *Current Tables*. During the flood there is a strong set into Raspberry Strait; this should be kept in mind when in the western end of Afognak Strait.

Directions, Afognak Strait.—From Narrow Strait, follow the directions in Chapter 3 to the position 0.5 mile north-northeastward of Shakmanof Point; then steer **310°** for 5.5 miles, and pass 0.5 mile northeastward of Dolphin Point.

From eastward in Marmot Bay, keep Hog Island open from the northwest side of Whale Island, bearing anything westward of **250°**; and pass 0.25 mile or more southward of Hog Island and 0.5 mile northward of Dolphin Point.

Passing 0.5 mile northwest of Dolphin Point, steer for Deranof Rock in range with the summit of Kupreanof Mountain; or if the mountain is hid, steer for Deranof Rock with the southern end of Hog Island astern, course **253°**. Off Head Point and for 0.8 mile to the westward, go nothing northward of the range. When approaching the western end of the strait, keep a little southward of the range to avoid the rock with 2½ fathoms over it; but give the shore of Whale Island a berth of over 300 yards; on the flood guard against a northerly set toward Raspberry Strait.

When the eastern one of the two highest peaks on the southern side of Whale Passage opens westward of Whale Island, bearing 184°, steer **238°** and pass 0.25 mile southeastward of Deranof Rock. Continue the course 0.8 mile past the rock, and then steer **286°** with the summit of Whale Island astern. This course made good will lead through Kupreanof Strait, passing 0.4 to 0.5 mile southward of Gori Point, 0.9 mile northward of Outlet Cape, and 0.5 mile southward of Malina Point.

Raspberry Strait is described later in this chapter.

Raspberry Island, extending from Shelikof Strait to Afognak Strait, is about 15 miles long in a northwest and southeast direction, and averages about 5 miles in width. On the northeast side it is separated from Afognak Island by Raspberry Strait, and Kupreanof Strait borders its southwest side. This island is rugged and mountainous with elevations up to 2,345 feet. Most of the shores are bold and precipitous except where numerous valleys meet the shore. The island is grass-covered except along the Shelikof Strait side, where it is for the most part barren sheer cliffs, and along the southeastern half of Raspberry Strait where the island is heavily covered with spruce.

The description of features along the various shores of this island is given in connection with the coast pilot information pertaining to Kupreanof, Raspberry, and Shelikof Straits.

Kupreanof Strait extends from Whale Island to Shelikof Strait between Raspberry and Kodiak Islands. The strait is the western link of the direct route between the port of Kodiak and Shelikof Strait.

Kupreanof Strait is 1.8 to 3 miles wide and mainly clear; but the outlying areas to be avoided are as follows: A rock having a depth of 2½ fathoms near the middle of the Strait, southeastward of **Bukti Point** and marked by a buoy; a series of shoal spots between the shoal area 0.6 mile northward of the western end of Dry Spruce Island and Chernof Point; and Thomas Rock off the southeastern shore of Raspberry Island and the shoal spots outside of the rock.

The recommended course (see Table of Courses, Kodiak to Shelikof Strait in Chapter 3) through the strait passes northward of the 2½-fathom rock, and when abreast

of the rock, Chernof Point, wooded, appears halfway between the north side of Dry Spruce Island and the opposite shore near Gori Point.

Tides (Kupreanof Strait).—At Onion Bay high and low water occur about the same time as at Seldovia. The diurnal range of the tide is 14½ feet. The tides meet in the strait a little westward of Dry Spruce Island. The **tidal currents** at Kupreanof Strait have an estimated velocity of 2 to 3 knots at strength during large tides.

Anchorage may be had in places near the shores of Kupreanof Peninsula, but the only secure harbor is Dry Spruce Bay.

The islands bordering both sides of Kupreanof Strait are grass-covered and mountainous, the north shore especially rising abruptly. The timber extends westward along the shores to **Last Timber Point** and Dry Spruce Island, where it terminates except for scattered clumps.

Whale Passage, southward of Whale Island, connects Kupreanof Strait with Kizhuyak Bay and is a part of the main route between Kodiak and Shelikof Straits. Afognak Strait is the alternate route for small vessels.

Whale Island has been described earlier in this chapter.

Kizhuyak Bay, a continuation of Marmot Bay, is described later in this chapter.

Passage through Whale Passage at time of maximum current should be avoided. A 2½-fathom depth on a mid-passage rock is 1 mile from the eastern end of the passage, and heavy swirls and eddies occur in the vicinity. Broken ground with a detached rock of 3 fathoms lies in the eastern end north of Ilkognak Rock where vessels enter the strait from the eastward. With a strong ebb current, heavy swirls and overfalls occur in the wake of this broken ground; and dangerous tide rips prevail at such times with northeasterly gales.

Navigation in the daytime is not difficult when the current is not too strong; however, careful attention to steering is required under any condition. The route is southward of the 2½-fathom mid-passage rock. Gori Point open a little southward of the south end of Koniuji Islet, heads southward of the 2½-fathom rock.

Temporary anchorage can be had in the bight on the north side of Whale Passage if stopped by too strong a flood current in the passage eastward. There is an eddy current in the bight, and care should be taken to get in far enough to ride to the eddy alone. A good berth is in about 8 fathoms, 300 yards from Whale Island, with Koniuji Islet bearing about 238°.

A better anchorage can be had 0.3 to 0.4 mile off the western side of Whale Island, in 8 to 10 fathoms. This is convenient to either Whale Passage or Afognak Strait and is well out of the current, but is is exposed to westerly winds.

Ilkognak Rock (lat. 57°54′.8 N., long. 152°46′.9 W.), awash at high water, lies in the middle of the eastern entrance. It is marked by a **light,** shown from a small white house on a square tower on a concrete pier, 15 feet above the water. The entrance channel is between this rock and Whale Island. In 1954, a ledge with a least depth of 2¼ fathoms was found to extend 0.4 mile eastward from the rock. A detached rock with 3 fathoms over it lies 500 yards 044° from Ilkognak Rock, and 550 yards 151° from a rock awash at high water near Whale Island. A sunken reef extends 250 yards southwestward of Ilkognak Rock.

Shag Rocks, bare at half tide, lie 0.4 mile southward of Ilkognak Rock, and about 0.4 mile northward of **Inner Point.**

Koniuji Islet, grass-covered and about 40 feet high, lies 0.3 mile from the south

side of Whale Passage and 2 miles westward of Ilkognak Rock. Kelp extends 0.2 mile and broken ground 0.8 mile westward from the islet. The channel is northward of Koniuji Islet, and it should be given a good berth as the current sets toward it at times.

Tidal currents in Whale Passage set westward on the flood and eastward on the ebb. During the large tides the currents are very strong with boils and swirls. The mean velocity of the strengths is about 4½ knots. The time of slack water and the time and velocity of the maximum current may be obtained from the *Current Tables.*

For directions, see Table of Courses, Kodiak to Shelikof Strait, Chapter 3. The navigator should study the chart carefully and lay down ranges to aid him. Some of the courses are at an angle with the axis of the current.

Chernof Point is a prominent, low, wooded point on the south shore of Kupreanof Strait, 2.5 miles westward of Whale Island.

A ledge of rock about 150 feet long and 50 feet wide, baring 5 feet at low water, lies 0.6 mile westward of Chernof Point and 0.2 mile offshore. It is marked by a heavy growth of kelp.

Ostrovka Point, 2 miles westward of Chernof Point, is low and wooded, and has a high, grassy islet close-to. Broken ground with a depth of 4½ fathoms lies 0.6 mile 047° from the islet.

Thomas Rock, awash at low water, lies 0.4 mile southwestward of the southernmost wooded island between Deranof Island and Raspberry Island. A patch with 6 fathoms over it lies 0.3 mile southwestward of Thomas Rock.

Last Timber Point Light is shown from a small white house on the end of the point about 7.4 miles northwestward of Ilkognak Rock Light. It is 35 feet above the water.

Kupreanof Mountain, 2,426 feet, is 10 miles westward of the eastern entrance of Whale Passage. The surface of this prominent mountain is broken gray rock.

Bare Island, the entrance island of Dry Spruce Bay, is abreast of Kupreanof Mountain. It is 0.9 mile long and partly wooded on its eastern half. A fox ranch is on its northeastern side. A small grassy island, 0.4 mile westward of Bare Island, is marked by a **light.**

Dry Spruce Island, northeastward of Bare Island, is 1.4 miles long, 225 feet high and wooded. Two grassy islets and a pinnacle rock lie off the north side of the western point of Dry Spruce Island; and a ledge, bare at half tide, lies 0.6 mile westward of the western point.

A small wooded island and shoals, dry at low water, lie between Dry Spruce Island and **Drying Point,** the end of the mainland on the north side of Dry Spruce Bay.

Dry Spruce Bay, indenting the north side of Kodiak Island and adjoining Kupreanof Strait, has two navigable entrances, one on either side of Bare Island. The bay extends about 3 miles eastward of Bare Island; the southern shore of Dry Spruce Island and the impassable area eastward from the island to the mainland forms the northern limit of the bay.

A cannery and wharf are located on the south shore of Dry Spruce Bay opposite Dry Spruce Island. The face of the wharf is 150 feet long and in 1941 had a depth of 24 feet alongside. Fresh water is available and the usual supplies and machine shop of a cannery are to be found here. Diesel oil, fuel oil and gasoline are available. The cannery operates a radio station during the canning season.

The best anchorage for large vessels is about 0.5 mile eastward of Bare Island and 0.4 mile off the cove in Dry Spruce Island, in 16 to 19 fathoms. A small vessel can

anchor in the middle of the entrance to this cove in about 6 fathoms, taking care to keep clear of the flat, which extends 250 yards from its northeast side. With strong southwesterly winds some williwaws are felt from Kupreanof Mountain. Water may be obtained from a stream in a cove on the south side of the bay south from the eastern end of Bare Island.

A mid-bay rock, bare at low water, lies 0.8 mile from the head of Dry Spruce Bay.

The entrance channel northward of Bare Island is contracted to a width of about 400 yards by a low-water rock which lies 200 yards from the shore, a little inside the west end of Dry Spruce Island. The rock located about 0.3 mile northwesterly of Dry Spruce Island is marked by a **light.** Shoal water extends from the eastern end of Bare Island.

The entrance southward of Bare Island is over 0.5 mile wide and clear. A rock awash lies about 150 yards westward of the small island. Foul ground extends over 400 yards from the south shore of Kupreanof Strait, 1.8 miles westward of Bare Island.

Approaching Dry Spruce Bay from eastward, give Dry Spruce Island a berth of 0.8 mile, and steer for the western end of Bare Island on any bearing southward of **226°** until past the reef northwestward of the western end of Dry Spruce Island. Then haul eastward and pass midway between Dry Spruce and Bare Islands, course about **139°.**

Approaching Dry Spruce Bay from westward, vessels may enter either between Bare and Dry Spruce Islands, or south of Bare Island and the small island westward of it.

Gori Point is on the north shore of Kupreanof Strait, opposite Bare and Dry Spruce Islands. The shore on either side of Gori Point is the base of an abrupt sloping ridge, summits of which are close to the shore.

Outlet Cape is the western end of **Kupreanof Peninsula,** included between Kupreanof Strait and Viekoda Bay. The cape has a steep slope to a peak, 1,620 feet high eastward of which is a low divide extending through. **Laida Rocks** are a cluster of bare rocks 350 yards off the northwest end of the cape.

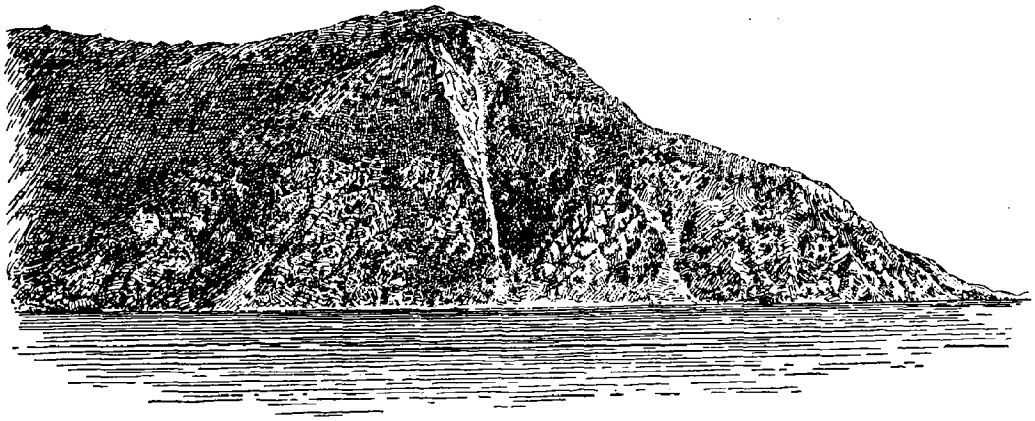
Viekoda Bay is described later in this chapter.

Onion Bay makes into Raspberry Island about 2 miles, and from its head a low divide extends through to Shelikof Strait. The entrance is narrow; and just inside it the bay is blocked by shoals partly bare at low water, between which are narrow channels suitable only for small craft. The tidal currents have an estimated velocity of 3 to 5 knots in the entrance. Temporary anchorage can be had 0.4 to 0.5 mile off the entrance, in 10 to 15 fathoms.

Malina Point (lat. 58°02′.3 N., long. 153° 21′.8 W.), marked by a **light** visible 11 miles, is at the southern end of the mountainous headland on the southwestern part of Raspberry Island. The point itself is projecting and prominent. It has a grass-covered knoll at its end, with a low neck behind it, and then a steep slope to 1,500 feet.

During northeast weather, small craft can find excellent protection behind Malina Point.

Raspberry Cape is at the western end of the mountainous headland on the southwestern part of Raspberry Island. The cape is steep and high and has areas of bare rock for one-third its height. There are some bare rocks in the water close to the foot of the cape.



Raspberry Cape from the northwest

Kizhuyak Bay is the continuation of Marmot Bay, and from Whale Island and Kizhuyak Point it extends southward about 14 miles into Kodiak Island. The outer bay is exposed to northeast weather, and only at or near the head is protection afforded from seas sweeping in from Marmot Bay. A landlocked anchorage for small vessels is available in Anton Larsen Bay but local knowledge is required to navigate its narrow entrance channel. Sharatin Bay, another arm, is exposed to seas from the northeast.

A mid-channel course in Kizhuyak Bay is clear of known dangers; however, a bank of 6 to 9 fathoms, irregular in outline and rocky in places, extends across the bay, 2 to 3 miles southward of Peregrebni Point. A somewhat similar bottom exists between opposite shores in the locality of the islet, 2½ miles from the head. A small rock and a rock awash lie 300 yards westward of the islet.

Peregrebni Point, on the west side of Kizhuyak Bay, is on a wooded peninsula which is backed by **Settler Cove.** The bottom of the cove, favoring the western shore, is sandy, and it rises gradually from a depth of about 2 fathoms just inside the entrance to the mud flats at the head of the cove.

At Peregrebni Point the bay narrows to a width of 1.5 miles. The western shore from 1.2 to 4.5 miles southward of Peregrebni Point is foul; a rock bare at low water lies 2.3 miles southward of the point and 0.4 mile from the western shore.

A flat extends 0.5 mile from the head of Kizhuyak Bay, where there is a large valley. Vessels may anchor off this flat in 19 fathoms, mud bottom; the depths are regular and there is ample room.

Kekur Point marks the northern end of the eastern shore of the narrow part of Kizhuyak Bay. A rocky patch of 6 fathoms and probably less depth, lies 0.9 mile 032° from Kekur Point.

Between Kekur Point and Kizhuyak Point, the west shore of the outer bay is indented by Sharatin Bay and Anton Larsen Bay. The waters along the intervening shore between the two bays, from **Threepillar Point** to **Crag Point,** contain several sunken rocks distant about 0.3 to 0.4 mile from that shore; and a patch of broken ground with a depth of 9 fathoms lies 1 mile offshore in Kizhuyak Bay. Off Anton Larsen Bay is a kelp patch with a depth of only 4 feet, 0.9 mile 006° from Crag Point.

Sharatin Bay, eastward of Kekur Point, has a small grass-covered near islet the

center of the bay. A sunken rock with a depth of 4 feet is 400 yards northward of the islet. A rock baring 9 feet at low water lies 300 yards off the projecting point of the bay-shore westward of the islet. A sunken rock, with a depth of 7 feet, lies nearly 0.5 mile north-northwestward of Threepillar Point. A tide flat extends 0.8 mile from the head of the bay.

Anton Larsen Bay, between the point 0.9 mile southward of Kizhuyak Point and Crag Point, has its entrance nearly blocked by islands; and only small craft can enter. A sunken rock, with a depth of only ½ fathom, lies about 0.5 mile northward of the outer entrance island northward of Crag Point. The rock is marked by kelp. A reef, bare at minus tides, lies 260 yards 045° from Crag Point. The passage into the bay eastward of Crag Point is very narrow. The two passages at the northern entrance are also very narrow.

The northernmost passage into Anton Larsen Bay was used by a survey tender, 77 feet long and 6½ feet draft. The entrance to this passage is between the northernmost island in the bay entrance and the northern point of the bay. About 0.3 mile inside this entrance and about 130 yards from the mainland is a large rocky patch, part of which bares at low water. The channel is southward of this rocky patch. At the narrowest part of this passage is a small, narrow islet which hugs and parallels the mainland. The survey indicates that the channel borders close along the outer side of the narrow islet and makes a slight turn around the west end of the islet. Opposite the west end of the islet, the southwest side of the channel is bordered by rocks. Extreme caution or local knowledge is necessary.

Anton Larsen Bay has a 3-mile stretch of water with an average width of 0.5 mile, extending in a southerly direction from the northern entrance passage. A rock, awash at high tide, is in the middle of this stretch, about 1 mile from the entrance passage. The channel lies between the rock and the shore westward of it. A vessel may anchor about 0.3 mile southward of the rock in about 15 fathoms.

Kizhuyak Point marks the outer end of the eastern side of Kizhuyak Bay. A 2¼-fathom depth in a kelp patch lies about 0.8 mile 210° from Kizhuyak Point.

The broad point 0.8 mile northeastward of Kizhuyak Point is partly wooded and terminates in white cliffs in places. A rock bare at half tide lies 400 yards northward from this point. Shoal water extends 300 yards northward of the rock.

Between the broad point mentioned in previous paragraph and Shakmanof Point is **Shakmanof Cove.** A sunken rock with a depth of 4 feet is near the center of this cove.

Shakmanof Point, on the southern side of Marmot Bay about 2 miles westward of the entrance to Narrow Strait, is prominent and heavily wooded. Some rocks show at low water close to the point, and it should be given a berth of over 300 yards.

Low Island Anchorage, the cove between Shakmanof Point and Low Island, affords anchorage in suitable depths but it is exposed to northerly weather. Northerly winds in this locality are infrequent.

Three Brothers, 1.2 miles eastward of Shakmanof Point, is a kelp-marked reef 600 yards long and steep-to on its western side. Near its southwestern end are two rocks bare at half tide, and at its northeastern end is a rock covered at one-third flood.

Parts of the reef bare about 8 feet at mean lower low water. A **light** on a steel skeleton tower on a granite pier marks the southwesternmost rock awash. The light

is 32 feet above the water. Kelp extends about 250 yards southward of the light toward Low Island.

Low Island lies in the middle of the bight on the southern shore of Marmot Bay between Shakmanof Point and the western entrance to Narrow Strait. It is grass-covered, and about 40 feet high at its southern end. Near its northern end is a clump of trees.

Vessels cross the 7-fathom bank or bar about 0.3 mile north-northeastward of Low Island, bound to or from Narrow Strait. A range consisting of Prokoda Islet Light just open on the nearly vertical bluffs of Uzinki Point leads between a red buoy marking a sunken rock on the north side of the crossing and a black buoy marking a 3¼-fathom shoal on the south side of the crossing. A wire drag examination along the range reveals a clear depth of 30 feet. It is required, however, that no deviation from the range be made. The sunken rock is 800 yards from Low Island and has less than 14 feet of water over it. The 3¼-fathom shoal is at the end of a reef extending northward from Low Island. These dangers are marked by kelp.

The passage south of Low Island is blocked by shoals that bare at low tide. Narrow Strait is described later in this chapter.

Spruce Island, on the south side of Marmot Bay, is about 6 miles long in an east and west direction. The island is rugged, with a maximum elevation, **Mount Herman,** of about 1,595 feet, 2 miles westward of East Cape. The lower elevations are in general heavily wooded, with a low wooded area 0.8 to 1 mile wide extending between the eastern shore of the island and the base of Mount Herman. Grass is quite pronounced on the higher slopes of Spruce Island. The higher summits are barren. The waters adjacent to the northern and eastern shores of the island have not been completely surveyed.

About 1 mile off the western shore of Spruce Island and approximately on a line between Three Brothers and Wooded Island, are two dangers: a kelp-marked shoal with a depth of 3 fathoms lying about 1 mile from Three Brothers and a rocky islet 24 feet high lying 0.9 mile from Wooded Island.

Reefs extend 600 yards off the western shore of Spruce Island, 0.8 mile northward of Uzinki Point, described later in this chapter.

Wooded Island, comparatively low—174 feet high, lies 300 yards off **Zapadni Point,** the promontory on the west side of Spruce Island. It is heavily wooded and is occupied by a fox farm. A fair anchorage protected from easterly winds can be had just to the southward of the island. A 3-fathom shoal lies 700 yards 098° from the southwest end of Wooded Island.

The Triplets, 2 miles westward of North Cape, are a chain of three high, grassy islets extending 1 mile in a north-and-south direction. The northernmost islet, **Taliudek Island,** is the highest of the group, with an elevation of 275 feet.

North Cape, the northern headland of Spruce Island, is a wooded knob 551 feet high. Rocky islets and rocks baring at various stages of the tide fringe the northern side of the cape within 400 yards of the shore. A shoal of 2¼ fathoms lies 0.4 mile off the eastern point of the cape.

Island Bay, just southward of North Cape and opening to the eastward, has not been surveyed. It affords fair anchorage for medium-size craft from westerly wind. If small craft use the head of the bay, care should be taken to pass northward of a low water rock about 0.3 mile from the head.

Knee Bay is the outer portion of the indentation in the north shore of Spruce

Island about 2 miles southward of North Cape. **Balika Cove,** narrow and about 1 mile long, is the continuation of Knee Bay. The bay and cove have not been surveyed. The first enclosure of Balika Cove affords excellent shelter for small craft, but can be entered only at high tide on account of a ledge at the entrance to the cove.

The north shore of Spruce Island between Knee Bay and East Cape is bordered by rocky islets and rocks awash at various stages of the tide. Some of these lie over 0.3 mile offshore.

East Cape, the northeastern end of Spruce Island, is a wooded flat extending about 0.8 mile inland to the base of Mount Herman. A group of bare rocks lie within 300 yards eastward of the cape. Banks with depths partly under 10 fathoms extend nearly 2 miles north-northeastward of the cape.

A rock awash at low water lies about 0.5 mile southward of the point of East Cape and 400 yards from the eastern shore of Spruce Island.

Two wooded islands, forming **Ostrof Point,** about 1 mile southward of East Cape, are surrounded and connected to the eastern shore of Spruce Island by a reef. The outer part of this reef terminates in a rock baring about ¼ flood tide, 300 yards eastward of the outer island. Rocks baring at low tide lie 0.3 mile northeastward of the outer island. A rock baring about ½ tide lies 250 yards southward of the outer island.

Icon Bay is the small indentation in the eastern shore of Spruce Island halfway between East Cape and South Point. This bay as well as the adjoining small bays to the southward have not been surveyed. It is reported that a medium-size craft may find temporary anchorage in westerly weather. A rock baring near low water lies 300 yards from the head and 150 yards from the north shore of Icon Bay.

The southern shore of Spruce Island is described in the paragraphs following the description of Narrow Strait.

Narrow Strait, between Spruce and Kodiak Islands, is used by vessels bound from Kodiak to Shelikof Strait. It has a clear width of 1 mile at its eastern end, while at its western end the channel is 150 to 300 yards wide with a least depth of about 7 fathoms. With easterly gales a heavy swell sets into the strait, but this generally loses much of its force toward the western end.

At the narrow part of Narrow Strait, commonly known as Uzinki Narrows, vessels use the passage southward of Prokoda Islet. The best water in the eastern part of the south passage is midway between the southeast point of Prokoda Islet and the mainland point to the southeastward, and then along a mid-channel turn until abreast of Prokoda Islet Light. From abreast of the light to abreast of Uzinki Point, the route is practically a straight course and passes between Otmeloi Point and a daybeacon marking a rock which bares about 6 feet at low water. The daybeacon is a white slatted square daymark on a mast. Careful attention to piloting is required in the Narrows as the currents will set a vessel into danger rapidly.

The western approach to Narrow Strait is southward of Three Brothers and across the 7-fathom bank 0.3 mile north-northeastward of Low Island.

The best anchorage in Narrow Strait is in the middle of the cove between Prokoda Islet and Uzinki, in 18 to 20 fathoms, somewhat exposed to an easterly swell. A small vessel and small craft can anchor at the head of the cove near Uzinki, slightly favoring the western side, in 5 to 10 fathoms.

South Point, the eastern end of the Spruce Island shore to Narrow Strait, is marked

by a high black rocky islet lying 600 yards off the point. This rocky islet is 65 feet in elevation; several lower ones lie just to the southward and westward thereof.

Two islands are on the north side of Narrow Strait. **Eider Island,** the eastern one, is very uneven and grassy on top. A small low rocky islet lies 400 yards eastward of the eastern island, and a rock awash at low water lies 200 yards southward of the eastern island. **Nelson Island,** the western one of the two islands, is higher and wooded. A group of rocks, baring 5 feet at mean lower low water, lie 350 yards southward of Nelson Island and similar rocks lie 0.3 to 0.4 mile westward of the island.

The passages leading to the cove back of Nelson Island are mainly foul or composed of broken bottom. They should be avoided by vessels of any size, except perhaps by small craft with local knowledge.

Sunny Cove, the bight on the north shore of Narrow Strait, 0.6 mile eastward of **Wooded Point,** affords anchorage for small craft in 3 to 4 fathoms, sand bottom. A sunken ledge having a depth of 1½ fathoms lies 0.3 mile south from the western point of the entrance to Sunny Cove. Two bare rocks lie off the middle of the entrance. A rock baring at low water lies 90 yards northwest from the eastern point of the entrance. In entering, the western shore of Sunny Cove should be favored.

A rocky patch, covered by 2¾ fathoms and marked by kelp, lies 0.3 mile from the north shore of Narrow Strait just eastward of **Black Point.**

Prokoda Islet, in the middle near the western end of the strait, is 114 feet high and partly wooded. An islet lies 100 yards off its northeast end, and kelp extends 100 yards off the islet and the southeastern side of the island.

The southwest point of Prokoda Islet is marked by a **light** 40 feet high. It is shown from a small white house and is obscured from 148° to 274°. The light is a guide for navigating the passage south of the islet.

The channel northward and westward of Prokoda Islet is 300 yards wide and clear, but the turns are sharp and are difficult to make when the current is running.

Uzinki (*pop. 177 in 1950; P. O. Ouzinkie*) is a small native village at the head of the cove in Spruce Island northward of Prokoda Islet. The principal industry is that of fishing. A salmon cannery and wharf are on the western side of the cove. A dilapidated wharf, which is unsafe for vessels, and an abandoned cannery are on the eastern side. About 60 yards off the wharf on the eastern side of the cove, and practically on line with the northwestern side of the wharf, is a rocky patch, covered 13 feet and marked at times by thin kelp. This danger is otherwise unmarked.

The cannery wharf on the west side has a face of 104 feet and a least depth alongside of about 20 feet.

A small general store is at Uzinki. In entering Uzinki from the eastward, care should be taken to avoid the reef which extends some distance off the southeast shore of Prokoda Islet.

Uzinki Point, southwest end of Spruce Island, is the point on the north side of the western entrance to Narrow Strait. At the point are cliffs above which a wooded slope rises steeply to a knoll about 110 feet in elevation. The knoll is connected with the land back of it by a low, narrow, grass-covered neck.

Kelp is close to Uzinki Point and the point should be given a berth of about 125 yards.

Entrance Point, on the south side at the western entrance of Narrow Strait, is grassy with some scattered trees, and a rock 12 feet high lies 100 yards off its eastern

side. A kelp-marked shoal with 7 to 12 feet over it extends 250 yards northward from Entrance Point.

Neva Cove, between Entrance Point and Otmeloi Point, provides good anchorage for medium-size craft from all winds except northwesterly, in 13 fathoms, soft bottom.

Uzinki Narrows is the name given to the narrows of Narrow Strait in the vicinity of Otmeloi Point and Prokoda Islet.

Otmeloi Point is on the south shore of Narrow Strait about 0.4 mile from the west entrance. A rock, showing about 6 feet at low water and marked by the daybeacon previously mentioned, lies about 275 yards northward of Otmeloi Point. It is 40 yards southward of a line from the southern end of Prokoda Islet to Uzinki Point.

The channel southward of the rock, marked by a daybeacon, has a depth of 7 fathoms and is 125 yards wide between the rock and a shelving spit with kelp which extends 125 yards from Otmeloi Point. Vessels pass southward of the daybeacon and at a distance of 80 yards to avoid the shelving spit at Otmeloi Point.

In the passage south of Prokoda Islet (Uzinki Narrows) shoal water of 5 fathoms or less extends 200 yards southeastward of the island, and shoal water of 4 fathoms or less extends 200 yards northward from the small mainland point 0.5 mile eastward from Otmeloi Point. Between these shoal-water areas are depths of over 10 fathoms for a width of 150 yards. Vessels pass midway between Prokoda Islet and the small mainland point and then along a mid-channel turn until abreast of Prokoda Islet Light. From abreast of the light to abreast of Uzinki Point the route is practically a straight course and passes 80 yards southward of the daybeacon.

Course Point, on the south shore of Narrow Strait, 2 miles eastward of Otmeloi Point, is prominent and is marked by a small rocky grass-covered islet 150 yards from shore.

A tall pinnacle rock, 70 feet high, lies near the south shore of Narrow Strait about 0.9 mile south-southeastward of Course Point. The cove southeastward of the pinnacle is foul except for a small area in the center. A 4¼-fathom shoal is 400 yards from the south shore near **Azimuth Point.**

Termination Point is the eastern limit of the southern shore of Narrow Strait. Foul ground extends nearly 0.5 mile northward of the point.

Monashka Bay, just eastward of Termination Point, is clear inside except within 0.3 mile of the shore. Anchorage depths may be found near the southeast part of the head of the bay, but there is full exposure to northeast weather.

Miller Point, on the eastern side of Monashka Bay entrance, is partly wooded and terminates in a rocky bluff. High, bare rocks extend more than 200 yards off the point, and rocks baring at various stages of the tide lie outside of them. The outermost rock bares 9 feet at low water and is 0.6 mile 040° from Miller Point. The range, consisting of the northeastern end of Long Island open northward of the outer Hanin Rock, clears the rocks off Miller Point.

Tidal currents in Narrow Strait are weak except in the western entrance where the mean velocity of the strengths is about 1½ knots. The times of the slacks and strengths may be obtained from the *Current Tables.*

Directions for Narrow Strait are given in table of courses, Kodiak to Shelikof Strait, Chapter 3.

Chiniak Bay is the indentation in the northeast end of Kodiak Island between Spruce Cape and Cape Chiniak. Kodiak is on the northwest shore of the bay, back of the islands close to that shore. The northern approach to Kodiak is off Spruce Cape; the southern approach is southward of the two large islands in the northern part of Chiniak Bay.

Caution.—The narrow passage westward of Near Island leading to the wharves at Kodiak, requires careful piloting and strangers are advised to study the Coast Pilot sailing directions and chart carefully before attempting it.

The northern part of Kodiak Island westward of Chiniak Bay is mountainous and there are several prominent peaks near the shore. Spruce Cape, Cape Chiniak, and the islands overspreading the northern part of the bay, are comparatively low.

Devils Prongs are three prominent peaks southwestward of Monashka Bay. Approaching from southeastward they appear of nearly equal height, the middle one flat on top. The northern prong is 2,075 feet high and sharp.

Pillar Mountain, a short ridge 1,274 feet high, rises steeply from the western shore just back of Kodiak.

Barometer Mountain, is a peak 2,488 feet high lying 2 miles from the western shore of Chiniak Bay and 5 miles southwestward from Kodiak. It is a useful guide in clear weather for the northern approach, from which direction a notch shows on the western side of its summit.

An **aviation light,** 178 feet above water and visible 19 miles, is shown from a wooden tower about 1.2 miles northeastward of the summit of Barometer Mountain At its limit of visibility, the light can be seen from 270°30′ to 300°30′, being obscured by Woody and Long Islands and the mainland to north of that sector, and to the southward of it by the mainland. From 300°30′ to 304°50′ it is partly obscured by Pinnacle Rocks and Chiniak Island. The light is considered useful to vessels approaching Kodiak.

Williams Reef, 3.3 miles 026° from the northeast end of Long Island, is composed of two rocks, 100 yards apart. The rocks bare at the lowest tides, deep water is close-to, and breakers generally occur, except near high water with a smooth sea. Mt. Herman bears 306° from the vicinity of the reef. The range of the cliffs at the southwest end of Long Island open from the high, grassy head at its northern end, bearing 221°, leads about 0.4 mile westward of the reef. Barometer Mountain in range with Kodiak or the northwest side of Near Island, bearing 257°, leads about 0.4 mile northwestward of Williams Reef. A lighted whistle buoy is 0.9 mile 052° from Williams Reef.

A small patch with 3¼ fathoms over it lies 1.8 miles 288° from Williams Reef. Hanin Rocks Light bears 265° from the vicinity of the patch. The ranges given in the sailing directions for the northern entrance clear this patch.

Kodiak Rock, covered with 7 feet of water, lies about halfway between Williams Reef and Long Island. Extensive reefs, partly marked by kelp and having some high bare heads, extend 0.6 to 0.9 mile northward from the northern shore of Long Island. Shoal spots lie between the end of these reefs and Kodiak Rock.

Shoal rocky spots lie within 1.8 miles eastward of Kodiak Rock; and 1.8 miles to the westward is a sunken rock with a depth of 2½ fathoms.

Caution.—Care must be exercised in approaching from seaward to avoid Williams Reef, Kodiak Rock, and the other dangers in this general locality. Vessels making the

northern entrance to Kodiak should keep northward of Williams Reef and northward and westward of the 3¼-fathom patch lying 1.4 miles westward from the reef.

Long Island, the easternmost island in the northern end of Chiniak Bay, is 3.5 miles long, about 240 feet high, hilly, with cliffs at the water, and wooded except toward its northern end.

The northeastern end of Long Island is formed by two grass-covered knolls; the eastern one is joined to the other by a narrow neck almost covered at high tide. The northwest corner of the island is a prominent vertical bluff more than 100 feet high, rising to a grass-covered knoll 178 feet high. Two prominent pinnacles 60 feet and 50 feet high, with lower bare rocks nearby, lie off the northern extremity of the island. Extensive reefs, partly marked by kelp, with some high bare heads extend 0.6 to 0.9 mile northward from northern side of the island.

The southeastern side of Long Island is fringed with rocks and kelp, and detached dangers lie 0.3 to 0.5 mile from the shore. **Refuge Island,** a small steep, grass-covered rocky islet, 80 feet high, connected with Long Island by a reef, lies off the southern extremity of Long Island. It is prominent from eastward.

A 4¼-fathom rock, which has been observed to break in heavy weather, lies 4.2 miles 095° from Refuge Island. This submerged rock is near the center of a bank, 1.5 miles long in a southwest-northeasterly direction and about 0.8 mile wide, characterized by very broken bottom.

Humpback Rock, 3 miles 143° from the south end of Long Island, is low and of small extent. Between the rock and the southern shore are numerous reefs. Vessels should pass not less than 1 mile northward of Humpback Rock to avoid broken ground extending in that direction from the rock. A lighted whistle buoy is 0.6 mile northeast of the rock.

A well-enclosed bay, making in from the west side of Long Island, is accessible to small vessels and affords good shelter and holding ground of mud. An island lies just inside the middle of the opening and is connected with the eastern bay shore by a bar. A black rock about 6 feet high lies between the island and the south point of the opening. To enter the southern part of the bay steer **179°** and pass between the black rock and the south point, slightly favoring the rock and then the west bay shore at the point. Anchor in the center of the basin. Access to the northern part of the bay requires local knowledge. A fox farm is on Long Island.

Chart 8545.—Spruce Cape, the northwest point of Chiniak Bay, is a low bluff, grass-covered on top and backed by woods. Bare rocks and foul ground extend 0.6 mile northward from the cape to **Hanin Rocks,** which are two masses about 30 feet high with an extensive surrounding ledge. The southwest rock is marked by a **light** shown from a white cylindrical house. The light is 43 feet above the water and is visible 10 miles. A reef, mostly bare at low water, extends 250 yards northward of Hanin Rocks.

Hutchinson Reef, 0.8 mile off Spruce Cape, is 0.3 mile in extent and is partly bare at low water. A large kelp patch lies between the reef and Hanin Rocks. A lighted whistle buoy is moored 0.4 mile northeastward of Hutchinson Reef to mark the western side of the northern approach to Kodiak.

On the eastern side of the channel to Kodiak, southeastward of Hutchinson Reef, is some broken ground with a depth of 4½ fathoms; it is marked by a buoy.

On the western side of the channel, 0.4 to 1 mile southward of Spruce Cape, are two bare reefs. The outer edges of the reefs are about 600 yards from shore. **Channel Rock,** on the southern reef, is a black rock, 7 feet high, amid extensive ledges. Kelp surrounds the reefs and extends south-southwestward of Channel Rock, gradually trending toward the shore and joining the shore kelp. Deep water extends close to the edge of the kelp at 150 yards off Channel Rock.

A rock with 1½ fathoms of water over it lies 0.9 mile southeastward from Spruce Cape. It is marked by a lighted whistle buoy. The channel is westward of the rock.

Woody Island (*pop. 111 in 1950*), westward of Long Island, is 2.5 miles long and 260 feet high to the tops of the trees. The island is heavily wooded except for a high grass-covered bench at the southern end of the island and a small area back of **Icehouse Point,** the site of an orphanage. The orphanage buildings, especially the tall white church tower, are conspicuous from the westward.

The eastern side of the passage between Woody Island and the mainland is marked **by a light.** The light is on a white box structure at the top of the bluff on the west side of the northern point of Woody Island. The light is 50 feet above the water, and is visible 5 miles; it is obscured from 228° to 040°. The outer limits of foul ground and kelp surrounding the northern part of Woody Island lie 0.4 mile westward and 0.5 mile north-northeastward from the light.

A kelp patch of a 4-fathom shoal marked by a buoy lies 0.35 mile 255° from Woody Island Light. Another kelp patch of a 4-fathom shoal marked by a bell buoy lies 0.6 mile 047° from the north end of Holiday Island. The recommended channel is between these shoals.

Foul ground extends 1.3 miles northward from the northeast side of the island. A shoal with a depth of 3¾ fathoms is 1.5 miles 092° from Woody Island Light. **Vasilief Rock** lies about halfway between the south point of Woody Island and Refuge Island. The rock has a depth of ½ fathom and is marked by kelp.

Inner Humpback Rock, a pinnacle 11 feet high, lies 0.5 mile 170° from the south point of Woody Island; the intervening area is foul. Foul ground extends 600 yards southwestward of Inner Humpback Rock.

A detached rocky patch, having a depth of 3 fathoms of water over it, lies 0.5 mile westward from the south end of Woody Island.

A rock awash at mean lower low water lies about 0.4 mile southwestward of Icehouse Point, the western end of Woody Island; and a shoal of 3½ fathoms lies 600 yards 348° from the point. A rock bare at low water lies between the 3½-fathom shoal and Bird Island. The recommended channel in the passage westward of Woody Island lies between Icehouse Point and the 3½-fathom shoal.

Westward of Woody Island is a group of islands; **Holiday Island,** the northernmost, is wooded on its northern half and is 165 feet high to the tops of the trees. The large clump of trees on the northern part of Holiday Island is prominent from the northern channel. **Bird Islet,** close eastward of Holiday Island, is 68 feet high and grass topped. Foul ground and kelp extend 550 yards northward of Bird Islet. A bare rock lies close to the southern end of Bird Islet. **Near Island,** the largest of the group, is 202 feet high and grass covered.

Shahafka Cove is on the north shore of the approach to Kodiak. It is identified by three large white buildings.

Kodiak (*pop. 1,710 in 1950; P. O.*), one of the principal and one of the oldest

towns of Alaska, is located near the northeast part of Kodiak Island. It is situated northeast of St. Paul Harbor on the north side of the narrows between Near Island and the Kodiak mainland.

The radio masts and the domes of the Russian church in town and the Standard Oil storage tanks close to the waterfront are conspicuous landmarks.

Vessels may approach the wharves located in the narrows of Kodiak Harbor from either the east or the west entrance to the narrows. This channel, east of the wharves, has a controlling depth of about 20 feet and a width of 50 yards in places. The channel west of the wharves has a controlling depth of about 25 feet.

The **Inner Anchorage,** locally known as **Winter Anchorage,** is about 0.5 mile southwest of Kodiak and 250 to 300 yards from the western shore in 7 to 8 fathoms. This is considered a good anchorage, but williwaws are sometimes heavy and may cause vessels to drag.

The area between Woody Island and Kodiak Island in the vicinity of Shahafka Cove is a **prohibited anchorage.** The limits are indicated on Chart 8545.

Much of St. Paul Harbor is included in the **Womens Bay U. S. Naval Reservation.** The limits are indicated on Chart 8545. Authority to enter or anchor in the reserved area must be obtained from naval officials.

Most of the **dangers** are marked during the summer months by kelp. Sometimes the kelp grows also in the channel.

Cyane Rock, in the middle of the northern end of the passage west of Near Island, is bare at lowest tides. The entrance channel lies north of Cyane Rock and south of the foul ground which extends nearly 200 yards from the bight in the western shore. Cyane Rock is marked on the northerly side by a lighted bell buoy.

The north end of Near Island inside the line between its northwest shore and Cyane Rock buoy is mainly foul. The northwest shore facing the channel is bold. The western side of the passage is foul nearly to the middle of the passage until west of the narrowest part.

Shoal ground extends southwestward from the Kodiak waterfront on the north side of the channel for a distance of 0.35 mile. The southwest end of the shoal is marked by a buoy.

A shoal, the outer end of which is marked by a lighted buoy, extends 200 yards north of **Round Island.**

Northern approach to Kodiak.—In coming from Marmot Island, the routes pass over or near shoal spots off Spruce Cape. There is a 6½-fathom spot 3.5 miles eastward of Spruce Island. Several shoal spots of 5½ to 6½ fathoms lie 2 miles northeastward of Spruce Cape. These areas have not been examined with the wire drag. In coming from Narrow Strait, the route passes northward of St. George Rock and Hutchinson Reef.

In coming from the eastward toward Spruce Cape, the recommended route is northward of Williams Reef and northward and westward of the 3¼-fathom shoal lying 1.6 miles westward of the reef.

The channel off Spruce Cape leading to Kodiak passes eastward of Hutchinson Reef, eastward of the reefs near the east side of the cape, westward of the 4- and 4½-fathom shoals lying 0.9 mile 105° from the cape and westward of the 1½-fathom rock marked by a lighted whistle buoy lying 0.8 mile 145° from the cape. Between the northwest side of Woody Island and the mainland, the channel passes westward of the shoal

area off Woody Island Light, eastward of the 4-fathom shoal distant 0.3 mile from the mainland and northward of the shoal areas extending from Bird and Holiday Islands. At the north entrance to the narrow passage westward of Near Island the channel passes northward of the lighted bell buoy marking Cyane Rock.

The northern approach to the harbor is not difficult in clear weather, but is dangerous at night or in thick weather. The soundings are irregular in the approach and the lead cannot be dependent on as a guide to the entrance or to avoid danger. Strangers should make a complete and careful study of the Coast Pilot and chart before entering the narrow passage westward of Near Island.

Southern approach to Kodiak.—In coming from the vicinity of Cape Chiniak, the route passes northward of Humpback Rock and southward of Long Island. If coming from the eastward to pass southward of Long Island, a vessel should keep well southward of the 4¼-fathom rock lying about 3 miles eastward of the island. The rock breaks in a heavy swell.

After passing southward of Long Island and continuing to Kodiak, one route is by way of the passage between Woody and Bird Islands, the other by way of the passage between reefs 0.6 mile northward of Cliff Point.

The route by way of the passage between Woody and Bird Islands passes southward of Inner Humpback and the dangers immediately south of it, westward of the 3-fathom spot lying 0.6 mile westward from the south end of Woody Island, and eastward of the 3½-fathom spot lying about 0.3 mile eastward from Bird Islet. It then joins the route from the north described under "Northern approach to Kodiak."

The route by way of the passage between reefs, marked by buoys, 0.6 mile northward of Cliff Point, passes southward and westward of the reefs extending about 0.4 mile southwestward from Puffin Island (St. Paul Harbor) and southward and westward of the reefs extending from Gull Island. This route through St. Paul Harbor has been examined by the wire drags and has been found clear to a depth of about 25 feet at low water.

Currents.—In Chiniak Bay, including the passage west of Near Island, the flood current sets northward and the ebb current southward with considerable velocity in places around the islands. In the northern entrance the tidal currents have an estimated velocity of 2 to 3 knots during the strength of the larger tides. They turn sharply around Spruce Cape and across the reefs north of it.

In the narrows off Kodiak the mean velocity of the tidal current is about ¾ knot. The flood sets northeastward. For predictions of slacks and strengths of current, see *Current Tables*. An eddy is generally felt alongside the main Kodiak wharf. This may carry a vessel off unless the lines are gotten out promptly.

It is possible at slack water for a vessel of less than 200 feet in length to turn around in the passage opposite the wharves, but this should not be attempted by a stranger. Except during a strong flood (northerly) current, vessels are advised to pass through to the inner basin (St. Paul Harbor) to make the turn there and then return to make a port landing at the wharves.

Directions.—Kodiak Harbor may be approached from either the northeast or the southwest. The northeast approach passes south of Spruce Cape and north of Woody Island, Holiday Island and Near Island. The southwest approach passes well east of Long Island and enters Chiniak Bay near Humpback Rock, thence through St. Paul Harbor by way of the buoyed channel.

If it is desired to approach Kodiak Harbor through the narrows northeast of the harbor after entering Chiniak Bay from the south, the course is altered 1.3 miles southeast of Puffin Island to pass between Woody Island and Bird Island. It then passes north of Bird Island and Holiday Island. Here the course joins the courses of the northeast approach.

The channel south of Spruce Cape has been wire-dragged from abeam Hutchinson Reef to the bell buoy southeast of Shahafka Cove, thence between Woody Island and Bird Island, continuing to and through the buoyed channel into St. Paul Harbor.

Southern Approach.—Enter Chiniak Bay giving Long Island and the 4¼-fathom reef lying 3.25 miles northeast of Humpback Rock a wide berth. See Chapter 3.

Northeastern Approach.—From seaward, keep northward of the line to Spruce Island summit bearing 294° until the cliffs near the southwest end of Long Island are well open west of the sheer cliff at its northwest corner. Then steer 241° for about 4 miles with Barometer Mountain ahead and Spruce Cape slightly to the right and passing 100 yards northwest of Kodiak outside lighted whistle buoy 1, to a position 250 yards southeast of Hutchinson Reef whistle buoy 2. Continue by table in Chapter 3.

Port activities.—A salmon cannery is in Kodiak. A number of stores, shops, and a bank supply the needs of the town and that of the surrounding region.

Hospitals.—A 30-bed hospital is in Kodiak.

Government offices.—A U. S. Commissioner, a deputy marshal, and an agent of the U. S. Fish and Wildlife Service are stationed at Kodiak.

Docking facilities.—The main wharf at Kodiak, now called Donnelly and Acheson Wharf, is 185 feet long; the least depth alongside was 27 feet in June 1951. On the dock is a warehouse with a capacity of 1,200 tons of general cargo. Fresh water suitable for drinking or boiler use is available. Longshoremen, jitneys, and trailers are available for handling cargo. Charges are made to commercial vessels for wharfage and for fresh water.

An oil station with a float landing supplies diesel oil, gasoline, kerosene, and lubricating oils. The float is 68 feet long and had a least depth of 22 feet alongside in June 1951. Diesel oil and gasoline are also piped to the Donnelly and Acheson Wharf.

The Fish and Wildlife Service maintains a wharf 60 feet long with dolphins 15 feet beyond both ends. The least depth alongside was 16 feet in June 1951.

The Kodiak City Dock, north of the inner anchorage and 0.5 mile southwest of Kodiak, is the longest in the area and had a least depth alongside of 25 feet in June 1951. Cargo-handling facilities are at the dock. Fresh water suitable for drinking or boiler use is available. The southwest end of the dock was demolished; new construction was under way in June 1951 for a cold storage firm and for an oil company adjacent to the dock. An agent of the Alaska Steamship Co. has a desk in the dock office.

A float landing 340 feet long extends northeast from the City Dock; the least depth alongside was 14 feet in June 1951.

Supplies.—There are several good general stores. Provisions and ship chandlery are among the supplies available.

A **chart agency** of the U. S. Coast and Geodetic Survey is in Kodiak.

Marine repairs.—General repairs can be made to vessels by local machine shops. A floating dry dock is available for hauling out boats up to 50 tons displacement.

Communications.—Vessels call weekly during the summer months and monthly during the winter months, carrying freight and passengers to Seward and to Seattle.

The U. S. Army Signal Corps maintains radio and cable service.

St. Paul Harbor is southward of Kodiak and westward of the many reefs and islets between Cliff Point and **Crooked Island,** the island just eastward of Near Island. The northern entrance is made by way of the passage westward of Near Island. With additional aids to navigation established, entrance is made practicable through the passage northward of Cliff Point. This buoyed passage and the route in St. Paul Harbor, from the passage to the vicinity of the cannery wharf westward of Kodiak, have been examined with the wire drag. A controlling depth of 25 feet is indicated.

Entrance Light, on a small white house on skeleton tower, is located about 0.9 mile northward of Cliff Point. The light is 38 feet above water and visible 10 miles. The shore of St. Paul Harbor, between the entrance to Womens Bay and **Gibson Cove,** is bordered by a series of dangerous reefs paralleling the shore at distances up to 700 yards.

For directions to St. Paul Harbor, see directions, Kodiak Harbor, Southern Approach.

Puffin Island, near the center of St. Paul Harbor, is small, grass-covered, and 80 feet high. Foul ground extends 600 yards southwestward from the island.

In the vicinity of Zaimka Island and Cliff Island and around Cliff Point are found numerous and extensive rocky reefs varying in height from awash at extreme low tide to heights of 6 feet above high water. Two prominent pinnacle rocks are among the reefs under Cliff Point.

Cliff Island is a small island, 62 feet high, with steep cliffs on all but the southeast side. It is located about 600 yards north of Cliff Point, with a pinnacle rock on the northeast side and a 30-foot one on the south side. **Zaimka (High) Island,** the largest island at the entrance to Womens Bay is covered with bushes and grass. It is about 155 feet high, and is bordered with cliffs. **Blodgett Island,** inside Womens Bay, is connected with the mainland at low tide by a sandy isthmus.

A shoal of 4½ fathoms, mud bottom, lies near mid-channel westward of **Gull Island.** Foul ground extends northward from Gull and **Uski Islands;** its extremity is marked by a lighted bell buoy. A shoal marked by a daybeacon is 300 yards southwest of Gull island. The daybeacon is a white square daymark on an I-beam.

Chart 8546.—Womens Bay has its entrance at the southern end of St. Paul Harbor, between Cliff Point and the shore near **Buskin River.** Comparatively shoal water extends across the entrance and the controlling depth is 4¼ fathoms through a dredged channel near Zaimka (High) Island. **Nyman Peninsula** forms an inner bay to the westward. A narrow sand spit, bare at low tide, extends about 650 yards in a true southeasterly direction from the end of the peninsula.

Womens Bay and the area surrounding it is a **U. S. Naval Reservation.** The limits of the reservation are given on Charts 8534, 8535, 8545 and 8546. No vessels, except those authorized by the Secretary of the Navy, shall be navigated in this area. There are three principal docks in the bay. The cargo pier had a controlling depth of 24 feet alongside the face in June 1951. The fuel pier had depths of about 28 feet along its north and south sides in June 1951, and the 1,400-foot marginal wharf had a least depth

of 27 feet alongside its face in June 1951. Docking space is assigned by the operations officer. A dry dock with a capacity of about 3,500 tons may be used in emergencies by commercial vessels.

Vessels authorized to enter Womens Bay may approach from either the northeast through the channel south of Spruce Cape and north of Woody Island or else from the east, passing into Chiniak Bay one mile northeast of Humpback Rock. An advisory pilot will meet vessels at Buoy 10, if requested. Tugs are available upon request.

Womens Bay and the channels leading to it, starting off Spruce Cape, have been wire-dragged.

Currents.—In the outer part of Womens Bay the currents follow the general direction of the channel, flowing southwest on the flood and northeast on the ebb with an estimated velocity of about three-fourth knot. Velocities of about 1 knot have been observed in the vicinity of Zaimka and Blodgett Islands. It has been reported that at the strength of ebb there is an eddy north of Blodgett Island in the vicinity of Buoy 23 which will set a vessel to the south and should be guarded against. Also, the ebb current flows northeast across the sandspit projecting southeastward from the end of Nyman Peninsula. Ships passing near the spit at such a time might experience a set onto the spit. There are marked eddies near **Frye Point** at the west end of Womens Bay. Although deep water is found close to this point, ships should guard against passing too close to it.

Directions from northeast.—Keep north of the line to Spruce Island summit bearing 294° until the cliffs near the southwest end of Long Island are well open westward of the sheer cliff at its northwest corner. (1) Then steer **241°** for about 4 miles, Barometer Mountain ahead and Spruce Cape slightly to the right, passing 100 yards northwest of lighted whistle buoy 1, to a position 250 yards southeast of Hutchinson Reef lighted whistle buoy 2. (2) Steer **223°** for 2.9 miles, passing westward of Kodiak Entrance lighted whistle buoy 1B and eastward of Kodiak North Entrance buoy 4, with the east tangent of Bird Island ahead, to Woody Island Light bearing 087°, distant 0.4 mile. (3) Steer **206°** for 3.75 miles, with Viesoki Island ahead, to a position 250 yards eastward of St. Paul Harbor lighted bell buoy 10. (4) Steer **276°** for 1.6 miles to a position about 200 yards northward of St. Paul Entrance lighted bell buoy 15. (5) Swing left and follow the well-marked channel southwestward into Womens Bay.

Directions from the east.—Enter Chiniak Bay, giving Long Island and the 4¼-fathom reef lying 3.25 miles northeast of Humpback Rock a wide berth. (1) From a position 1 mile north-northeast of Humpback Rock steer **283°** for 5.8 miles to a position 50 yards south of the flashing white buoy 10 located 1.2 miles southeast of Puffin Island. (2) Pass between the reefs on course **276°** for 1.6 miles as listed under **(4) of** Directions from northeast.

Chart 8535.—Cliff Point, 4 miles southward of Kodiak, is the end of a prominent headland 192 feet high. The headland is covered with grass and scattered brush.

Middle Bay has its entrance between Broad and Cliff Points. **Viesoki Island,** small and flat-topped, 101 feet high with sheer rock bluffs, lies near the mid-entrance. A rock bare at low tide lies 650 yards 036° from the island. The bay is exposed to northeasterly weather.

Broad Point is the end of a long peninsula in the southwestern part of Chiniak Bay,

separating **Middle Bay** from **Kalsin Bay.** Broken ground, on which are some dangers, extends about 1.5 miles northward from the point.

Kalsin Bay is the largest of a series of tributary bays extending inland and south-southwestward from Chiniak Bay. An abandoned Government cattle experimental farm is located at the head of Kalsin Bay. Several houses and barns remain in a habitable condition. The low valley extending between Kalsin and Ugak Bays is used as a portage.

Queer and **Kalsin Islands,** in the western part of the entrance to Kalsin Bay, are fox farms; three houses are on Kalsin Island. Protection from all weather cannot be had between this pair of islands and the peninsula forming Broad Point.

A large expanse of reefs overspreads the eastern part of Kalsin Bay, leaving a well defined channel along the eastern shore. The leading marks of this area are **Pinnacle Rock,** 30 feet high; **Middle Island; Svitlak Island;** and **Kekur Island,** 45 feet high. The channel along the eastern shore leads to the V-shaped cove southeast of Svitlak Island, where excellent anchorage for small vessels is afforded in any weather. Directions are given below.

An extensive submarine ridge, characterized by extremely broken bottom, extends north-northeastward for 9 miles in Chiniak Bay from the reefs and islands in the eastern part of Kalsin Bay. Some of the dangers on this ridge are the 4¼-fathom breaker eastward of Long Island and Humpback Rock, both described in the approaches to Kodiak earlier in this chapter, and **Kalsin Reef** which is awash at high water.

Bordering the western side of the submarine ridge is a distinctive submarine valley. Its seaward outlet leads around the northern end of the ridge. Inside, the valley leads into Kalsin Bay. In the center of Chiniak Bay it enlarges to form a deep basin southward of Long Island.

Directions, Kalsin Bay.—From a position 1 mile 000° from Humpback Rock steer 227° for 4.8 miles to the northeast end of Queer Island abeam, distant 0.8 mile. When inside the bay favor the west shore to avoid a rock baring 4 feet at mean lower low water 1 mile 260° from Svitlak Island. Also avoid the rock, baring 9 feet, mean lower low water, 0.5 mile south of **Isthmus Island.** The recommended anchorage is in 9 to 10 fathoms off the eastern shore about 0.5 mile 000° from the bluff point 1.5 mile from the eastern part of the head. This anchorage would probably be untenable during a a northeast storm.

To reach the V-shaped cove southeast of Svitlak Island from a position 1.2 miles 000° from Cape Chiniak Light, steer 267°, heading for Kekur Island with Middle Island summit on range, until the sharp point on the west end of Isthmus Bay bears 191°. Then turn left to course 240° and head for the large square rock south of Svitlak Island until abeam of the north end of Svitlak Island, then turn left to 220° and head for the point at the south entrance of the cove until the large square rock bears four points on the starboard bow. Then steer 180° and anchor in 6½ to 7 fathoms 400 yards off the south shore. To go farther into the cove requires local knowledge. The channel abreast Svitlak Island is narrow with shoal water on both sides and caution should be exercised to avoid depths less than 10 fathoms. The shoal water on the east side of the channel is extensive and surrounds the point forming the northern limit of the cove.

Isthmus Bay, just east of Kalsin Bay, affords anchorage for vessels in southerly weather. The range of Kekur Island and the summit of Middle Island, course 267°,

clears the dangers off the eastern end of Isthmus Bay. In an emergency a vessel may be beached on the sand at the head of the bay.

Chart 8556.—Kodiak Island, southeast coast.—A comprehensive survey was made of the waters along the southeastern coast of Kodiak Island to and including part of Albatross Bank. A vessel equipped with echo sounding apparatus would be aided in determining its position by soundings taken while cruising over this area.

The shoaler, outer parts of two extensive submarine plateaus form Albatross Bank. A trough of deep water lies between them and branches extend into both entrances of Sitkalidak Strait and toward Sitkinak Strait. A very regular trough, northeastward of Albatross Bank, leads directly from seaward to Chiniak Bay.

A depth of 8 fathoms, rocky bottom, is located in latitude 56°22′.5 N., longitude 152°56′.0 W. on Albatross Bank.

Canneries are located at Shearwater Bay, Lazy Bay, and Olga Bay.

Chart 8535.—Cape Chiniak, the southeastern point of Chiniak Bay, is low and wooded for 0.8 mile back and then rises to higher land. **Chiniak Island,** a flat grass-covered islet, and numerous high, bare rocks extend 1.1 miles northeastward from the cape.

Cape Chiniak Light (lat. 57°37′.7 N., 152°09′.1 W.) is located on the northwest side of Chiniak Island lying 0.5 mile off the cape. The light, shown from a white wooden house, is 120 feet above the water, and visible 12 miles. The light is obscured from 001° to 052° and from 257° to 260°.

A ship anchorage with protection from southerly weather may be had 1.3 miles 320° from Cape Chiniak Light in 18 to 20 fathoms. It is reached by rounding the rocks at the cape 1.3 miles off.

Cape Greville, 2 miles south of Cape Chiniak, is fronted by several rocky islets. Broken bottom extends 0.8 mile in a northeasterly direction from the cape. In approaching from the vicinity of Ugak Island, Cape Greville should not be mistaken for Cape Chiniak.

The land is thickly wooded for about 5 miles southward from Cape Chiniak, then to Narrow Cape it is bare except for scrubby brush in the gulches and valleys and some grass and scattered clumps of small spruce trees on the lower slopes.

A 10-fathom bank is located 8.3 miles 166° from Cape Greville.

Eight miles southward from Cape Chiniak the shore bends westward to meet a valley that terminates in a sand beach. Northward from here the shore is marked with sunken rocks and rocks awash to a distance of 0.5 mile offshore; shouthward to a distance of 1 mile offshore, with thick kelp in the vicinity of Narrow Cape. Outside these areas the bottom consists chiefly of sand and gravel with some rocky sections off the points. No anchorages are recommended along this coast.

Narrow Cape is 13 miles southward from Cape Chiniak. Its southeast face is an abrupt grass-topped cliff about 100 feet high and 1.1 miles long. The cape is flat, but gradually drops close to sea level about 0.3 mile back of the cliff, having the appearance of an island when seen from the vicinity of Cape Chiniak. From this low part, grassy slopes with a few scattered spruce trees roll gradually upward to the mountains north of Ugak Bay. Reefs and sunken rocks extend 0.3 mile off the points of the cape.

Ugak Island lies 2.5 miles off Narrow Cape. A ridge over 1,000 feet runs the full length of the island close to the offshore side. From well out to sea, Ugak Island is

generally readily discernible against the distant background of higher mountains. The shore is steep and rocky and fringed with rocks and reefs, except at the northwest end where a grassy slope spotted with a few scattered spruces descends gradually to a sand spit. Several shacks of a fox farm are built near the spit.

Ugak Island from the southeast, distant 2 miles

Across the passage between Ugak Island and Narrow Cape, a bar composed of rock and hard sand extends from the sand spit on the island to the southern tip of Narrow Cape. The least depth found near the middle of the passage on the bar is 6½ fathoms. Although not wire dragged, the passage is considered safe for moderate-sized vessels and is regularly used by fishing boats and whalers of from 8- to 10-foot draft. Tide rips are experienced, particularly on and near the bar, except at slack water. These rips increase with strong northeast winds, producing breakers and causing the false impression that the passage is foul. At such time the passage is dangerous for small craft.

Currents.—The current floods in a northeasterly direction through the passage between Ugak Island and Narrow Cape. There are strong cross currents north and south of Ugak Island and tide rips near the shores.

In going from the passage between Ugak Island and Narrow Cape to Ugak Bay, there are several dangers to be avoided. A rock awash at minus tides lies 0.7 mile southwest of the southern tip of Narrow Cape. A rocky shoal of 4 fathoms lies 1.1 miles southeastward of Pasagshak Point. A ½-fathom rock lies 1 mile southeastward of the 127-foot island inside Ugak Bay entrance.

Ugak Bay has its entrance between Pasagshak and Gull Points and extends 19 miles in a general westerly direction, its inner end branching into a basin at the north and a narrow arm at the south. In entering, vessels should pass southward of the ½-fathom rock lying a little northward of mid-entrance. Depths of 40 to 55 fathoms will be found 1 mile off the points along the south shore from the entrance to Saltery Cove, then the bottom abruptly shoals to about 16 fathoms and deepens again to about 45 fathoms near the junction of the basin and arm at the head of the bay. Magnetic boat compasses have been observed to swing 15° to 180° in the bay.

Pasagshak Point, 4 miles westward of Narrow Cape, is a prominent, narrow mountainous headland 894 feet high. The point presents the appearance of a pyramid when viewed from a southwest direction.

Pasagshak Bay is rectangular-shaped, 1 mile wide at its entrance, and has its eastern side formed by Pasagshak Point. It is shallow a short distance inside and exposed to any existing swell.

The 127-foot island off the north shore westward of Pasagshak Bay is rocky and grass-topped. It is surrounded by a reef and numerous rocky islets. There is foul

ground between the island and the north shore and 1.2 miles southeastward of the island.

Portage Bay is the rounded bight 4.5 miles westward of Pasagshak Bay. This bay is identified by a small flat-topped, sheer-bluff islet 42 feet in elevation. This islet is located in the middle of the entrance, and a pinnacle rock 34 feet in elevation lies 270 yards southwest from it. Both are surrounded by deep water. The bottom has a gentle slope toward the head of the bay.

Eagle Harbor is an open cove on the south side of Ugak Bay, 5.5 miles from the entrance. Its northwesterly point is marked by two pinnacle rocks. At the northwest shore of the cove are several shacks of the deserted village of **Eagle Harbor.** There is no secure anchorage here. The cove is exposed to easterly swells.

Between Portage Bay and Kalsin Bay, and between Eagle Harbor and Shearwater Bay are portages.

Saltery Cove, on the north shore of Ugak Bay and 8.5 miles above the entrance, is a half-moon shaped bight. It is marked on its eastern extremity by a reef point surmounted by a pinnacle rock 32 feet high. The cove has a gently sloping sand and mud bottom, but shoals abruptly to flats along the shore. A high-water rock lies just outside of the flats near the head of the cove. The recommended anchorage is along the 10-fathom curve near the eastern end of the bight. This is regarded as the best general anchorage in Ugak Bay.

Hidden Basin, the northern branch at the head of Ugak Bay, has a slightly curving bottle-neck entrance. The controlling depth through the approach is only 5 feet. The channel is along the western shore of the approach. Strong currents are encountered in the entrance. Depths charted in the approach to the basin are reported to be inaccurate; this and the swift and turbulent current during periods of maximum and minimum flood make the entrance hazardous.

The southern branch at the head of Ugak Bay is about 7 miles long and has an average width of 0.5 mile. A rock bare at about ½ tide lies near the middle of the constricted part of the arm. The channel lies southward of the rock which may be avoided by keeping 200 yards off the south shore in 10 fathoms.

Gull Point and the point 1.8 miles southward have bold rocky faces with islets of massive rock close by. The small cove on the south shore of Ugak Bay westward of Gull Point provides anchorage for small boats in southerly weather. A sand beach is at the head.

The cove about 3 miles southward of Gull Point is connected by a tidal channel to a marsh which is flooded at high tide. The bottom at the entrance to the lagoon and along the beach for about 1 mile northward is sandy and apparently free from rocks. A sunken rock having a depth of 2½ fathoms of water over it lies 0.8 mile northeastward from the rocky point at the south end of the cove.

Chart 8536.—Dangerous Cape, on the southeast coast of Kodiak Island between Ugak and Kiliuda Bays, is the southern end of a ridge. On the south side of the cape is a bluff reaching an elevation of over 500 feet. A large rock about 30 feet high lies about 400 yards southward of the cape.

Dangerous Cape Light (lat. 57°16′8 N., long. 153°42′6 W.), shown from a white wooden house on the west side of the cape, is 192 feet above the water and visible

12 miles, but it is obscured for vessels approaching the cape from the northeast until the light bears 305°.

Boulder Bay, just westward of Dangerous Cape, affords poor anchorage on hard sand bottom. There are numerous rocks lying several hundred yards offshore. These rocks are mostly submerged or awash at high water, and extreme care should be taken in navigating this bay.

Inner and Outer Right Capes form a double cape lying 3.5 to 5 miles southwestward of Dangerous Cape. **Outer Right Cape** is comparatively low with eroded bluffs about 100 feet high; however, land slides extend almost to the summit of the mountains along the coast 1 mile northeastward of the outer cape. On a clear day these are recognized a long distance offshore. **Inner Right Cape** rises to a height of 512 feet. Broken ground extends about 1 mile offshore between the outer and inner capes.

Kiliuda Bay has its entrance between Left Cape and Inner Right Cape. It extends about 4 miles in a northwesterly direction and then about 6 miles in a westerly direction.

Indenting the northeast side of Kiliuda Bay are Santa Flavia Bay and Shearwater Bay. The shore between these bays is fringed with islands and rocks.

Kiliuda Rock, 2 feet above high water and about 1 mile westward of Inner Right Cape, is on the range of the tangents of Inner and Outer Right Capes and about on the range of the small points along the western shore of Santa Flavia Bay. The rock is surrounded close-to by depths of 17 fathoms.

Santa Flavia Bay, between Inner Right Cape and **Ermine Point,** is apparently clear in the center with depths of 13 to 15 fathoms, sand bottom, but is exposed to swells and seas accompanying southeasterly weather. Kiliuda Rock should be avoided in entering.

Shearwater Bay, the northeast arm of Kiliuda Bay, is about 2.5 miles in extent. Rocks awash extend from either side of the entrance. In the entrance channel between the rocks there are depths greater than 20 fathoms for a width of 0.4 mile. The rocks extending 0.2 mile westward of Pillar Point bare at low stages of the tide, and shoal water extends about 200 yards channelward from the outermost rock. Near the outer end of the group of rocks on the northwest side of the entrance is a dry patch of rock 3 feet above high water. The outermost rock bares at low water and lies 300 yards from the dry patch in a direction toward the head of the bay.

Pillar Point marks the southeastern side of the entrance to Shearwater Bay. **A light,** shown from a small white house, is on the islet adjacent to Pillar Point. The light, 40 feet above the water, is obscured from Sitkalidak Strait and entrance to Kiliuda Bay when bearing less than 359°. **Bluff Point,** 0.5 mile farther inside the bay, is marked by the eroding bluff of a knoll which overlooks the lowland back of Pillar Point.

The small enclosure, back of the narrow strip of land at Bluff Point, provides secure shelter for small craft with local knowledge.

About 0.7 mile from its head, Shearwater Bay contracts to a width of about 0.4 mile between **Observation Point,** the site of a cannery, and the opposing point on the southeast side. Anchorage may be had about 0.3 mile beyond this contraction midway between the shores in about 6 fathoms, mud bottom, avoiding shoal water extending 200 yards northward of the opposing point and the shoal depths adjacent to the flats along the northwest side at the head of the bay.

In 1941 the cannery wharf was reported to have a face 100 feet long with a depth alongside of 24 feet. Fresh water is piped to the wharf. The adjacent oil wharf had

a 60-foot face with a depth of 17 feet alongside. Timber skidways for hauling out launches are laid on the beach on the north side of the cannery site. The timber skidway which could handle 38-ton craft drawing 6 feet forward and 10 feet aft was reported in poor condition. Gasoline, diesel and fuel oils are stored for cannery use. The company operates a machine shop where emergency repairs can be made.

Directions, Shearwater Bay, from the southwestward.—Round Cape Barnabas at a distance of 2 miles and make good the following courses: (1) **331°** for 9.5 miles to Pillar Point Light bearing 066°, distant 1.5 miles; this course passes 1.1 miles off Left Cape and heads for Shearwater Point. (2) **048°** for 1.4 miles to Pillar Point Light, abeam, distant 0.4 miles; this course heads for the Cannery Wharf at Observation Point (3) **056°** for 1.3 miles to abreast of the Cannery in Shearwater Bay.

From the northeastward.—Round Dangerous Cape at a distance of 3.5 miles and make good the following courses: (1) **276°** for 3.5 miles to Outer Right Cape (eastern end) bearing 000°, distant 2.5 miles. (2) **305°** for 3.4 miles to Inner Right Cape bearing 052°, distant 1.6 miles; this course heads for the tangent of the bold shore about 2 miles northwestward of Left Cape. (3) **331°** for 3.8 miles to Pillar Point Light bearing 066°, distant 1.5 miles; this course heads for Shearwater Point. Then follow courses (2) and (3) of the preceding paragraph.

The northern side of Kiliuda Bay is indented by an open bay about 1.2 miles wide between **Shearwater Point** and **Coxcomb Point.** Foul ground extends 0.3 of the way from Shearwater Point to Coxcomb Point. A rock 4 feet high lies 0.5 mile east of Coxcomb Point. The entrance channel is 200 yards eastward of this rock. A northerly course leads to the center of the open bay which has a depth of 3 fathoms. The bottom has a gentle rise to the extensive sand beach at the head. A vessel may be beached here in the event of an emergency.

A rock, 45 feet high and 0.5 mile southward from Coxcomb Point, marks the outer limit of shallow depths. A triangular-shaped bank lies outside the line drawn from the rock to Shearwater Point and northward of **Pivot Point.** The anchoring depths on the bank are 14 to 17 fathoms, sand bottom.

The point on the northern side of Kiliuda Bay about 3 miles to the westward of Coxcomb Point is a low grass-covered sand spit. The axis of a channel of deep water is 300 yards from the sand spit, and the 40-fathom depth curve is only 150 yards from the spit. Just southward of this channel the depths are very irregular and the area should be avoided.

Left Cape is a bold headland separating Kiliuda Bay from the eastern part of Sitkalidak Strait. The southeastern face of the cape is covered with a series of long rock slides extending almost to the mountain summit back of the cape. Numerous boulders lie close inshore and submerged rocks fringe the cape.

Sitkalidak Island, about 18 miles long, is adjacent to the southeast coast of Kodiak Island. The island is grass covered and in general devoid of trees. The easternmost mountain summit at Cape Barnabas is a good landmark from the eastward and southeastward. On the coastal ridge northeastward of Black Point are two tips, 1,646 feet and 1,527 feet in elevation, between which the ridge sags in a smooth curve. This feature may be readily recognized from seaward even against the distant background of higher mountains.

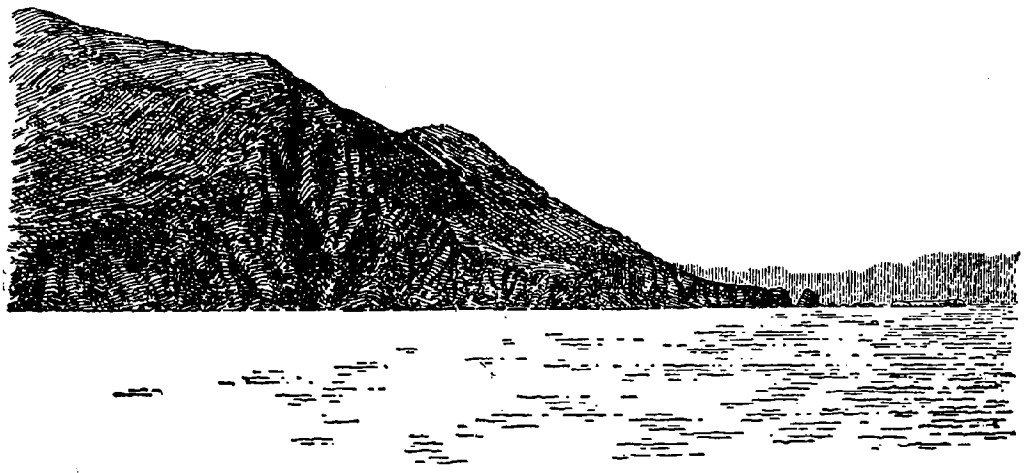
Sitkalidak Strait borders both the northern and western sides of Sitkalidak Island,

separating that island from Kodiak Island. Sitkalidak Passage is the name applied to the narrow part of the strait.

That part of Sitkalidak Strait northward of Sitkalidak Island extends from the eastern entrance between Dangerous Cape and Cape Barnabas to Sitkalidak Passage. The broken bottom northeastward of Barnabas Rock has been examined with the wire drag and no dangers were revealed. This part of the strait is navigable by all vessels to as far as Sheep Island, and offers several secure anchorages. The minimum depth through Sitkalidak Passage at mean lower low water is 12 feet. The passage and its eastern approach are marked by lights.

During the months of June and July thick white fogs occur around the south end of Kodiak Island which sometimes last for several days. These fogs generally drift about the sea, but frequently do not enter the strait and adjacent bays. The east entrance to Sitkalidak Strait is frequently clear when a thick fog lies less than 1 mile offshore.

Cape Barnabas, the eastern end of Sitkalidak Island, is marked by a conspicuous mountain 1,705 feet in elevation. There are rock slides on the slopes of this mountain and a series of eroded bluffs along the northeastern face. Submerged rocks and rocks above high water border around the cape and numerous kelp patches lie several hundred yards offshore. In thick weather this cape is usually easier to pick up than Dangerous Cape.



Cape Barnabas from the southeast, distant 2 miles

Vessels making Sitkalidak Strait from the southeastward should pass Cape Barnabas 2 miles off and steer **321°,** heading for the northeast tangent of Left Cape until Table Island Light bears 195°, then change course to **252°** and follow directions given below.

Barnabas Rock is a rock bare about 3 feet at low water and lies 0.8 mile 075° from Table Island. The sea breaks over this rock at high tide when there is a moderate swell, but often in calm weather at high tide there is no indication of the rock. It has no kelp. The passage between the rock and Table Island is apparently clear and has

been used by steam whalers operating from Port Hobron; but due to uncertain currents the passage is not recommended. The water between Table Island and Sitkalidak Island is foul with submerged pinnacles.

Table Island is a flat-topped island about 100 feet high lying 2 miles westnorthwest from Cape Barnabas. A **light,** shown from a small white house on the northern end of Table Island, is 106 feet above the water and visible 12 miles.

Tanginak Anchorage, the bight eastward of the entrance to McDonald Lagoon, is a good anchorage in southerly weather, but a rock awash at low water is about 0.5 mile off the eroded bluff forming the western end of the bight. Shoal water lies between the rock and the point.

McDonald Lagoon, about 4.5 miles westward of Table Island, almost divides Sitkalidak Island. It has a bottleneck entrance. The bar channel, 13 feet deep, is westward of the ½-fathom shoal lying 0.2 mile northwestward of the bottleneck and follows the northern side of the west entrance point until about 200 yards westward of the bottleneck; here it is necessary to avoid a small shoal making out from the northern side of the point. Strong currents run in the entrance and in northerly weather the bar breaks all the way across. Small vessels with local knowledge may enter the lagoon which deepens inside and has good holding ground.

Port Hobron is the second deep-indenting bay along the northern side of Sitkalidak Island westward of Table Island. The bay is a good harbor for all vessels except during a northeasterly gale, when a comparatively heavy sea enters the bay.

A former whaling station and wharf are on the eastern side of Port Hobron. The face of the wharf is 155 feet long and has a least depth of 29 feet. A rock awash at low water lies about 150 yards northward of the wharf and in line with its face.

At the head of Port Hobron is a small settlement known as **McCord.** A company operating a cattle ranch has built a small wharf on the south side of the sand spit on the east shore. The wharf has a face of 80 feet, with a least depth of 22 feet alongside. The water shoals suddenly south of the dock and maneuvering room is scant. There is no fresh water on the dock.

Cathedral Island, the largest island in Sitkalidak Strait, lies in the middle of the strait at the entrance to Port Hobron. The island is 192 feet high and is covered with grass. It is dome-shaped, with steep eroded cliffs on all sides except on the southerly side. The best water is found passing south of the island.

Nut Island, lying 0.9 mile westward from Cathedral Island, is of small extent and 29 feet high. It is marked by a **light** which is shown from a small white house. The light is 40 feet above the water.

Aberdeen Rock lies in the middle of Sitkalidak Strait about 0.7 mile westward of Nut Island and has a least depth of 1 fathom. It is unmarked and breakers occur over it only in the heaviest northeasterly weather at extreme low tide.

The recommended passage in the vicinity of the three mid-strait obstructions—Cathedral Island, Nut Island, and Aberdeen Rock—is to the southward of them. To avoid Aberdeen Rock when using this passage and when in the vicinity of the rock, do not go northward of the line between Nut Island and Bush Point Lights. The passage northward of the three mid-strait obstructions is clear and is used by local craft.

Three Sisters Rocks, near the north shore, are low; after passing southward of these when bound westward in the northern passage, care must be taken to stand well over toward the north shore in vicinity of Aberdeen Rock.

Amee Bay, about 2 miles westward of Port Hobron, is clear in mid-channel and offers fair anchorage, but violent williwaws blow out of this bay in southerly weather.

Shag Rock, 6 feet high, is about 150 yards northward of **Cub Island** which in turn is about 2.4 miles westward of Cathedral Island. Shag Rock forms an important turning point for vessels using the narrow parts of Sitkalidak Strait. It is reported that on the rising tide a southward set is noticeable between Shag Rock and Bush Point.

Bush Point is on the north shore of the narrow part of Sitkalidak Strait 2.8 miles westward of Cathedral Island. It is marked by a **light** which is shown from a small white house. The light is 15 feet above the water.

Midway Bay, known locally as **Sheep Bay,** is that part of Sitkalidak Strait located between the narrows at Bush Point and Sitkalidak Passage. **Sheep Island,** 48 feet high, covers the central part of Midway Bay. The bay affords the best anchorage in the general vicinity of the strait. The recommended anchorage for large vessels is between Sheep Island and Bush Point; small vessels usually anchor northeastward of Sheep Island in 5 fathoms, sticky bottom.

The through passage is southward of Sheep Island. A shoal bar strewn with boulders extends westward from the shoal area surrounding Sheep Island to the eastern end of the northern shore of Sitkalidak Passage. The channel for entering Sitkalidak Passage borders the south side of the shoal area and bar. The shoal on the south side of this channel is marked by a light on a single pile in 8 feet of water.

Sitkalidak Passage separates the northwestern end of Sitkalidak Island from Kodiak Island and is the link between the two sections of Sitkalidak Strait. The controlling depth is only 12 feet at low water through the passage. The passage is fairly straight and about 1 mile long. Inside the eastern entrance the channel slightly favors the northern shore; in the western half of the passage it slightly favors the southern shore.

Currents.—The currents seem to meet at Sitkalidak Passage under ordinary conditions of wind and weather, but in strong southerly weather the current occasionally flows northeastward continuously. No current velocities have been measured, but it is estimated that the maximum velocity never exceeds 3 knots. Slack water occurs at about the time of high and low water.

Directions for Sitkalidak Strait are found in chapter 3.

Outer coast of Sitkalidak Island.—For several miles westward from Cape Barnabas, the outer coast is particularly bold and rocky and seldom free of breaking seas. A series of mountain peaks stands close to the rounded outline of this projecting coastal section.

About 5 miles westward of Cape Barnabas, a channel navigable by launches in moderate weather leads to a lagoon. Practically all of the lagoon goes dry at low water.

Partition Cove, having a small islet in the center and separated from McDonald Lagoon by a low narrow neck of land, is foul.

Ocean Bay, the pronounced indentation of the outer coast of Sitkalidak Island, has a wide sand beach several miles along. The waters adjacent to a long section of the beach are apparently free of rocks. A sheltered anchorage during prevailing southwesterly weather may be found in 4 fathoms of water in the lee of the prominent rocky point marking the southern end of the sand beach.

On the coastal ridge between Ocean Bay and Black Point are two tips, 1,646 feet and 1,527 feet in elevation, between which the ridge sags in a smooth curve. This

feature may be recognized from seaward even against the distant background of higher mountains.

Black Point, the southwest end of Sitkalidak Island, is a low grass-covered cape sloping gently to the adjacent hills. It does not show darker than the surrounding country, but there are some low eroding bluffs around the cape and scattered boulders along the shore.

A coastal shelf, approximately defined by the 18-fathom depth curve around Black Point, extends 4 miles off shore and spreads fan-shape about the point. Very broken bottom exists on the shelf. In some places the survey indicated rather deep water where live kelp appeared. It is recommended that Black Point be given a berth of at least 4 miles by passing vessels.

That part of Sitkalidak Strait westward of Sitkalidak Island extends from its southern entrance between Black Point and Twoheaded Island to Sitkalidak Passage. At the entrance Ship Rock should be given a wide berth to avoid the broken bottom extending about 1 mile from the rock on range with Puffin Island and also the 11-fathom bank lying about 1.8 miles west of Ship Rock. **Tallapoosa Shoal**—least depth found, 9 fathoms—lies in the middle of the strait about 2.1 miles southeastward of Cape Kasiak. In the upper reach of this section of Sitkalidak Strait, a cluster of dangerous rocks lies 0.6 mile from the western shore southward of Barling Bay.

The most prominent point on the southwest end of Sitkalidak Island is at the western extremity of the coastal ridge back of the low land in the vicinity of Black Point. **Puffin Island** and **Ship Rock** lie respectively 0.5 and 1.1 miles off this point on the seaward extension of the line of the ridge. Broken bottom extends 1 mile farther in this direction. The passages on either side of Puffin Island are not considered safe.

Puffin Island is a grass-topped irregular mass of rock 75 feet high. Several bare rocks, some of the pinnacle type, lie near the island. Ship Rock is only 6 feet high.

Rolling Bay, the first bay on the eastern side of Sitkalidak Strait from the southern entrance, has a sand beach and tide lagoon at the head, and a valley leads to Ocean Bay. The bay is exposed to the prevailing southwesterly swell.

A prominent rock, 83 feet high, having vertical sides and terminating in a dome-shaped top, lies on the extensive reef projecting from the north point of Rolling Bay. A needle-top rock 40 feet high lies near the point.

Sitkalidak Lagoon is the upper part of **Natalia Bay,** the 5-mile inlet just northward of Rolling Bay. The restricted entrance to the lagoon around the end of the spit is navigable only by small craft.

Natalia Peninsula, the rectangular mountainous headland on the eastern side of Sitkalidak Strait opposite Cape Kasiak, has two knolls; one of these is at the northwest end of the headland, the other is at **Natalia Point,** the southwest end. A 3½-fathom shoal lies 0.5 mile off the headland.

Newman Bay is on the eastern side of Sitkalidak Strait opposite Three Saints Bay. A 5-fathom shoal lies 0.5 mile off the northern entrance point. Several dangers are near the southern shore. A shoal of 4 fathoms extends 400 yards northward of the point marked by a 50-foot elevation which appears as an island from a distance. Anchorage is available in 8 to 9 fathoms in the center of the upper bay.

Old Harbor (*pop. 121 in 1950; P. O.*) is a native village on the west side of Sitkalidak Strait 1 mile from the western end of Sitkalidak Passage. A Government school and

a trading post are in the village. The trader has a small wharf with a face of 25 feet; the face of the wharf is reported to dry at about 4 feet above low water. A fish trap extends 350 yards out in the channel from a point about 50 yards southward of the wharf. Generally a light is on the end of the trap.

Between Old Harbor and the round point on the opposite shore, Sitkalidak Strait narrows to 0.5 mile in width. The western half of this part of the strait is a sandy shoal having depths less than 3 fathoms. A small reef baring 4 feet at low water lies 100 yards off the eastern shore of the strait opposite Old Harbor.

Barling Bay is the first bay southward from Old Harbor. In northwesterly weather violent williwaws blow out of the bay. The bay near its head affords excellent holding ground for small craft and is secure except in northwest weather. The anchorage for large vessels in just inside the entrance.

A broad grass-covered sand point projects into Sitkalidak Strait forming the south entrance point of Barling Bay. One mile southward of the point and about 0.6 mile off the western shore of the strait are a cluster of dangerous rocks marked by kelp. The least depth of water over them is 1 foot at low water. The outermost rock is 0.9 mile 204° from the point. The area between the rocks and the western shore is shoal.

Three Saints Bay, on the west side of Sitkalidak Strait, affords anchorage at the head in 14 to 18 fathoms, mud bottom. At the entrance a shoal borders the southwest shore. A 4-fathom shoal lies 0.5 mile inside **John Island,** outer islet in the entrance, and 0.3 mile off the northeast shore. A course through the middle of the entrance leads between the two shoals.

The first Russian settlement on Kodiak Island was established on this bay in August 1784 and named for the vessel *Three Saints*.

The cannery in Three Saints Bay was destroyed by fire in 1931. The face of the cannery wharf remains. The depth at the northeast corner of the wharf is only 11 feet and about 5 yards farther inshore it is only 4 feet. At the downstream corner the depth is 24 feet. Southeastward of the wharf the low water shore areas extend beyond the line of the face of the wharf. A port landing is always made. With a heavy wind broadside on, it is found impossible for a vessel under her own power alone to leave the wharf.

An excellent anchorage for small vessels is in the enclosure formed by a long sand spit inside the entrance on the southwest side of Three Saints Bay. A vessel about 65 feet in length may anchor here. The native village of **Nunamiut** has been abandoned.

Two streams enter at the head of Three Saints Bay draining separate valleys. The south valley is said to have a trail leading across Kodiak Island to Uyak Bay.

The three rocky peaks on the ridge that terminates at the headland at the turn of Three Saints Bay are locally known as **The Three Saints.** The peaks are over 3,000 feet in elevation and when clear form a leading mark at sea for identifying the south entrance to Sitkalidak Strait.

Cape Kasiak is a prominent headland on the western side of Sitkalidak Strait southward of the entrance to Three Saints Bay.

Kaiugnak and **Kiavak Bays,** collectively known as **Wide Bay,** indent the western shore of Sitkalidak Strait between Cape Kasiak and **Cape Kiavak.** A small shoal of 3½ fathoms lies 1 mile southwestward of Cape Kasiak. A shoal of 2 fathoms lies near the middle of the upper part of Kaiugnak Bay. A rock bearing 5 feet at low water lies 0.5 mile northeastward of Cape Kiavak. There are two lagoons, one at the head

of each bay; neither permits entrance except at high water. A large waterfall is in the northwestern branch of Kaiugnak Bay.

Anchorage for all weather except easterly gales is provided in the southwestern part of Kaiugnak Bay. Large vessels should not proceed westward of a line bearing south from the small island off the projecting point at the head of the bay.

Knoll Bay, the first cove on the western shore of Sitkalidak Strait northward of Twoheaded Island, affords anchorage in about 12 fathoms during westerly weather. Small craft may anchor under the bluff in the southwest corner of the cove.

Chart 8537.—Twoheaded (Nasikan) Island, lying off the southern extremity of the western shore of Sitkalidak Strait, has two irregularly rounded peaks, the highest of which is 1,838 feet, and a ridge of an average elevation of 1,440 feet extending along the eastern part of the island. The coast of the island is bold and precipitous. Numerous large boulders and rocks are awash along the shores. Two bare rocks 24 and 28 feet high lie near the southwest shore. The 28-foot rock is block shaped and the 24-foot rock is shaped like a finger pointing up from a heavy base. A fox farm is on this island; the house is on the north shore.

In the passage north of Twoheaded Island, a large group of rocks baring 6 feet at low water lies 0.5 mile off **Knoll Point,** the point on the north side of the passage. Heavy kelp beds lie immediately east of the group of rocks. The channel in the passage has a width of 0.8 mile. Twoheaded Island should be favored in navigating the passage.

Jap Bay has its entrance 2 miles northwestward of Twoheaded Island. A sunken rock of 2 fathoms is in the middle of the entrance and broken bottom extends northeastward from it to a group of large rocks which overspread the eastern part of the entrance. The channel for entering is westward of the sunken rock. The rock is generally not marked by kelp.

Vessels may anchor near the head of the outer bay. After entering proceed midchannel until the inner tangent of the group of large rocks in the entrance is in range with the outermost of the two high rocks off Twoheaded Island. Then anchor in 15 to 16 fathoms, mud bottom.

The restricted entrance to the inner bay is about 190 yards wide. The channel curves around the end of the gravel spit but has a depth of 11 fathoms. An excellent anchorage is in the inner bay just north of the spit. The swinging radius is about 270 yards in a basin having depths of 9 to 10 fathoms, mud bottom. A vessel may be beached on the north side of the spit.

Cape Kaguyak is about 2 miles southwest of Twoheaded Island and between them is the passage leading to Jap Bay. The area in the vicinity of the cape is foul. The 163-foot rocky islet at the southeastern tip of the cape has the appearance of a huge sun dial. The outermost danger is a sunken rock with a depth of 2½ fathoms lying 0.6 mile northeastward of the cape. **Kaguyak Bay,** immediately westward of the cape, affords anchorage at the head of the bay in 6 to 9 fathoms for westerly and southerly winds. With northeast winds small craft may find a fairly comfortable anchorage under the bluff on the southeast side of the head of the bay.

The native village of **Kaguyak** is at the head of Kaguyak Bay. No supplies are obtainable.

The coast of **Aliulik Peninsula** from Cape Kaguyak to Cape Trinity, the southwestern extremity of Kodiak Island, is bordered more or less by foul ground. Extensive

foul areas also surround Geese Islands and Aiaktalik Island which lie along this coast. The outstanding danger is a 2½-fathom rock lying about 3 miles eastward of Geese Islands and 5 miles off the mainland. Geese Channel is not navigable except for small vessels, and ships proceeding along this coast pass through Sitkinak Strait. Old Kaguyak Bay and Russian Harbor provide anchorage for small vessels.

The southernmost peak, 2,200 feet in elevation, on Kodiak Island is about 5 miles westward of Cape Kaguyak. This detached mountain is regular in outline and forms a distinctive mark. From the mountain toward Cape Trinity is a long gradual slope.

Flat Island, about 0.9 mile off the entrance of Old Kaguyak Bay and 6 miles southwestward of Twoheaded Island, is flat topped with a general elevation of 119 feet. The island has sheer rocky bluffs. A pinnacle rock 38 feet high and another rock outside of it lie close to the southwest end of Flat Island. The rocky reef extending 0.9 mile to the northeastward shows in small groups of rocks.

A channel exists between Flat Island and the mainland; its width is narrowed by heavy kelp beds lying on either side.

Old Kaguyak Bay affords protection to small craft in northerly weather. A rock, 28 feet high, lies in the center of the entrance and a rock baring at ⅓ tide lies 100 yards southwest of the elevated rock. To enter pass between the elevated rock and Boot Point but favor the shore around Boot Point to avoid the ⅓-tide rock. Anchor in about 3 fathoms, sandy bottom, a little northward of the center of the bay.

Boot Point, forming the western side of the entrance of Old Kaguyak Bay, is marked by a humped hill 496 feet high.

About 0.5 mile southwestward of the western extremity of the headland forming Boot Point are two islets close together. The highest part, the northern end of the western islet, is 41 feet in elevation. The islet 0.2 mile farther offshore is 19 feet high. The islet 0.1 mile inside is 10 feet high.

Geese Islands, three in number, are flattened in appearance, the easterly and highest being 150 feet high. The passages between the islands are dry at extreme low tide and the area for a distance of 1 mile south of the islands is foul.

A reef and shoal area extends 3 miles eastward from the eastern Geese Island, terminating in a submerged rock having a depth of 2½ fathoms of water over it. The submerged rock breaks in a moderately heavy sea but not in ordinary weather. The reefs, 1 mile inside of the submerged rock, bare 4 to 7 feet. It should be noted that the bottom shoals vary abruptly in this locality.

Aiaktalik Island shows as two knolls, the eastern one being the sharper and higher, 308 feet. The island is approximately 3 miles in diameter and the native village of **Aiaktalik** with a Greek church is on the cove on the northwest side of the island. The natives of this village move to Alitak Bay to work in the canneries during the summer, but at the close of the cannery season they return for the winter. The area south of the island is foul for a distance of 1.5 miles.

A cylindrical rock, 50 feet in diameter and 58 feet high, stands on the shore reef at the western end of Aiaktalik Island. The top of the rock is covered with grass.

Sundstrom Island lies just off the southwest end of Aiaktalik Island. Several wart-like projections rise above the general level of the island which is about 70 feet; the highest has an elevation of 158 feet. The shores consist of rocky bluffs.

The passage between Sundstrom and Aiaktalik Islands should prove useful to small craft in that it avoids the tide rips around the southwest point of Sundstrom

Island. Both sides of the narrow passage are lined with heavy kelp but the mid-channel is clear of kelp and has a controlling depth of about 2½ fathoms.

The passage between Aiaktalik and Geese Islands is navigable for small vessels and has a controlling depth of about 6 fathoms. The chart is the best guide.

The passage between Kodiak Island and the chain composing Aiaktalik Island and Geese Islands, via Geese Channel and Russian Harbor, is used considerably by small local vessels.

Geese Channel, the passage back of Geese Islands, has a controlling depth of about 3¾ fathoms. Shoals and reefs lie scattered in the passage. Several buoys mark the channel; they are numbered from west to east. The recommended course is **064°** passing 0.5 mile off the northern shores of the east and west islands of the Geese Islands. At the western end of the passage the course passes about 200 yards off the northern edge of heavy kelp and south of a thinner kelp patch. The heavy kelp marks the shoal patch 0.5 to 0.9 mile westward of the west island of the Geese Islands. If available, a natural range on Aiaktalik Island as a mark for this channel would greatly simplify its navigation.

Russian Harbor, between Aiaktalik Island and Kodiak, is a temporary ship anchorage in moderate weather, in about 8 fathoms, hard sand bottom. There is but little shelter and strong tide rips are frequent.

In general it is difficult to make courses good in passing through Russian Harbor due to strong currents, swirls, and eddies. A **light** marks the north point of Aiaktalik Island. Shown from a small white house it is 57 feet above the water. The recommended course from the west entrance to abreast of the north point of Aiaktalik Island is **069°** giving the Kodiak shore a berth of about 0.4 mile. A middle ground in Russian Harbor has depths of 2½ fathoms.

In **Aiaktalik Cove,** the seas and wind sweep around the point in even moderate weather, making the cove an uncomfortable anchorage. The best anchorage for small vessels, affording excellent protection from the prevailing northeast weather, is on the Kodiak Island side of Russian Harbor. This anchorage is 0.8 mile northward of the point located 4.4 miles eastward of Cape Trinity, opposite a stretch of sand beach in a break of the shore reef. The anchorage is in 4 fathoms, soft sand bottom.

Cape Trinity is described later in this chapter.

Sitkinak Strait is the broad strait lying between Trinity Islands and Kodiak Island. It is navigable for large vessels.

The eastern approach is marked by Geese Islands on the north and **Cape Sitkinak,** the eastern end of Sitkinak Island, on the south. As viewed from seaward, this end of Sitkinak Island shows as precipitous dark rock and shale bluffs dominated by two peaks or heads, the northern one 605 feet high and the southern one 821 feet.

Two groups of two bare rocks lie 0.5 mile and 1 mile off Cape Sitkinak. The outer group, light gray in appearance, is 17 feet high, and the inner group is 13 feet high. Rocks awash lie outside of the outer group of bare rocks.

The vicinity of the Geese Islands is foul.

An extensive reef, the limits of which are marked by thick growing kelp, extends in a fan-shaped manner from 2 miles east to 1.3 miles south of the southeast point of Aiaktalik Island. It is made up of two rocky ledges and many individual rocks, most of which uncover at mean lower low water. It is believed that the rock on which the *Pavlof* struck is located near the edge of this reef.

A bank of considerable extent, on which a least depth of 4 fathoms was found, lies near the middle of Sitkinak Strait about 2 miles north of Whirlpool Point.

Whirlpool Point, northern point of Sitkinak Island, is low, flat, and sandy. A light 51 feet above the water is shown from a small white house on a skeleton tower on the point. It is visible 10 miles and is obscured from 293° to 089°.

Currents.—The currents in Sitkinak Strait set westward on the flood and eastward on the ebb. There are heavy tide rips in the strait particularly southwest and west of Aiaktalik Island. So far as observed, they are heaviest with a westerly wind and a flood current. The tide rips are often dangerous for small craft and troublesome for small vessels. At times when the current opposes seas from eastward in the vicinity of Whirlpool Point, the seas become very steep. Current predictions for Sitkinak Strait may be obtained from the *Current Tables.*

Directions, Sitkinak Strait.—A rocky ridge on Albatross Bank on which a depth of 8 fathoms was found, lies in the seaward approach to Sitkinak Strait from the southeastward. The ridge lies about 42 miles 105° from the summit of Sitkinak Island. It should be avoided.

Enter the strait on a **270°** course passing about 4.3 miles north of Sitkinak Cape and 1.2 miles off Whirlpool Point Light. Continue on this course for 4.0 miles until Dolina Point bears 190°. Then change to **000°** and continue to a position 2.2 miles west from Cape Trinity. Due regard must be had for the strong currents in this strait.

If bound to the westward, steer **270°** for 12 miles with Cape Trinity astern and then **256°** for 75 miles to a position 10 miles 134° from Foggy Cape. Further directions are given in Chapter 3.

If bound for Alitak Bay, follow directions given later in this chapter.

Chart 8556.—Albatross Bank lies about 45 miles off the southeast coast of Kodiak Island. The depths on this bank range from 8 fathoms to about 61 fathoms.

An area, having depths ranging from 12 to 20 fathoms and covering approximately 50 square miles, lies between the meridians 153°00′ W. and 153°20′ W., and between the parallels 56°20′ N. and 56°28′ N. The bottom characteristics noted on this area include gray mud, fine black sand and gravel, and rock. Kelp has been seen on this area at various times. On occasion, moderate tide rips have been noted.

A rocky shoal is a short distance to the eastward of the large shoal just described. The depths range from 8 to 20 fathoms with a very irregular rocky bottom. The shoalest part is a sharp rocky ridge with a depth of 8 fathoms. It is located in latitude 56°22.′5 N., and in longitude 152°56.′5 W. Currents having a velocity of about 3 knots were observed in this area. It should be avoided in heavy weather on account of possible breakers.

A 16-fathom bank is in latitude 56°40′ N., longitude 152°10′ W. There may be less water. This shoal is separated from the shoals previously described by an extensive trough of deep water. This trough extends in a northerly direction and branches extend into both entrances of Sitkalidak Strait and toward Sitkinak Strait.

Trinity Islands lying off the south end of Kodiak Island consist of two islands, Sitkinak and Tugidak. Unsurveyed areas include the southwest coast of Sitkinak Island and all of Tugidak Island except the northern end. Soundings in these unsurveyed areas are from reports.

Fresh water can be obtained from the ravines and pools on the islands. Landings

can readily be made when the wind is offshore. The sea makes up fairly rapidly. The beaches are heavy shingle, gravel, and in places fine sand. There are a few alder bushes and there is driftwood on the beach. The only inhabitants are occasional hunters and fishermen in summer and trappers in the winter. Some prospecting has been done on Tugidak Island.

The summit of **Sitkinak Island** (*also see Chart 8537*) is **Sitkinak Dome,** 1,640 feet in elevation. The mountain has a smooth rounded top and with its dominating height, the top presents a distinctive mark at sea to the limit of its visibility.

The east end of Sitkinak Island and Whirlpool Point have been described under Sitkinak Strait. The northwest side of the island, southwestward of **Dolina Point,** is composed of earth cliffs several hundred feet high, broken by narrow ravines.

Sitkinak Island is divided by **Sitkinak Lagoon** which is navigable through the north entrance by a small vessel, except during easterly swells or seas. The south entrance should be attempted only during a calm sea. Scattered rocks, baring at low tide, fringe the entrance on the south coast. A small launch may enter at high tide. The lagoon is a flat traversed by tidal channels. These channels are fairly deep near and inside the entrances, but only 3 feet deep at high water in the connecting channel between them. Sitkinak Island eastward of the lagoon is composed of many hills some of which are separated from one another by low valleys.

The south coast of Sitkinak Island is foul and should be avoided. Kelp beds extend 0.5 to 2 miles off the eastern and southern shores. A bank having its center 9½ miles south-southwestward from Cape Sitkinak has not been fully surveyed. The depths on this bank range from 11 fathoms to 20 fathoms. The bank covers an area varying from 0.5 to 1.5 miles in width, 6 miles in length, and extending in a north-northeast and south-southwest direction. The bank is an extension of an extensive area along the south coast of Sitkinak Island having depths less than 20 fathoms with irregular bottom in most places.

A temporary anchorage is off the south entrance to Sitkinak Lagoon. This part of the south coast of the island is recognized offshore by the flat land at the lagoon. A prominent rocky point with an arched opening 50 feet high marks the entrance to the lagoon. To reach this anchorage from outside the 20-fathom curve, steer for the point with the arched opening bearing **026°**, and anchor in not less than 11 fathoms about 1 mile from the point.

Tugidak Passage, between Sitkinak and Tugidak Islands, has very strong and freakish tidal currents and rips. Only the north approach has been surveyed. The south approach is apparently blocked by shoals. The tide rips in the middle of the passage are extremely dangerous to small boats and should be avoided by hugging the Tugidak Island shore.

Tugidak Island, in its northern part, is chiefly sand flats, but little above high water. A level boulder patch baring at low water lies 0.5 mile off the north coast of Tugidak Island, 5 miles westward of Tugidak Passage.

The higher parts of the island are low grassy sand hills which terminate in bluffs in places along the shores. The northern part is separated from the southern or higher part by a large lagoon having one entrance from the southeast.

The lagoon is reported to bare at low water, except near the southwestern side of the entrance where there is a pocket or basin of about 5 to 6 fathoms, sand bottom. The basin is suitable for anchoring a small boat, protection from the sea being afforded

by a long sandspit extending eastward from the entrance point on the southwest side. A narrow channel leads from Tugidak Passage to the basin. This channel follows the southeast side of Tugidak Island. It is almost bare at low water so passage in and out is possible only at half or greater tide.

In 1909, Mr. S. Applegate located the foul and broken area which extends about 10 miles southward from the south end of Tugidak Island, as shown on the chart, by compass bearings on Tugidak Island and the summit of Sitkinak Island. Until a survey is available it is considered unsafe for vessels to cross this area. The bottom is very uneven, the depths changing abruptly from 2 to 4 fathoms in places, and boulder reefs with little depth may be expected. There are strong currents and heavy rips and overfalls.

The waters off the northern end of Tugidak Island have been surveyed. The general absence of kelp in this comparatively shoal area may be taken as an indication of the existence of but little if any ledge rock. The bottom apparently is composed of loose material including boulders leveled down by the action of the sea to form the more or less flat area of this region of 5 to 7 fathoms. Slight shoaling occurs in patches where apparently there is a predominance of boulders resisting the general leveling action of the sea.

The north and west sides of Tugidak Island may be generally approached as close as 1.5 miles in good weather by a careful use of the lead. Care should be observed near the middle of the west side of Tugidak, as an unsurveyed bank with depths probably as little as 2 fathoms lies some distance off, possibly 2 or 3 miles.

Ptarmigan were found in enormous number on Tugidak Island during the late summer of 1931.

Chirikof Island (*also see Chart 8851*) lies about 60 miles south-southwestward of the Trinity Islands. The southern part of the island has bold, high peaks and bluffs, from which it gradually slopes to the north end, terminating in a low, green, undulating country. An islet is near the southeast end. The island is easily recognized at night unless fog-covered. It is visible for many miles in clear weather.

Anchorage may be found in the bight at the southwest corner, **Southwest Anchorage,** at the mouth of the stream and opposite the houses; or in 10 fathoms, on the west side off the bluff just south of the stream, possibly 2 miles from the northwest point. There is foul ground between Chirikof Island and the islets west of it. These islets are known as **Nagai Rocks;** the largest, **Round Rock,** appears like a haystack.

On numerous occasions breakers have been observed off the southern end of Chirikof Island. The position of the breakers is reported to be latitude 55°42′ N., longitude 155°36′ W. A least depth of 4 fathoms was reported on the reef. The area of possible shoal water does not appear to be over 50 to 100 yards in diameter.

A shoal is reported to extend from the east side near the middle of the island; breakers have been reported 3 miles 114° from the middle of the island. A breaker is reported in an estimated position 4 miles east-southeastward from the southeast point of the island. A shoal with kelp is reported to extend about 1 mile westward from the northwest point of the island.

In 1923 the U. S. S. *Cardinal* was wrecked on the east side of Chirikof Island and the survey ship *Discoverer* while engaged in rescue work struck a reef about 1.5 miles offshore.

The wide passage between Chirikof Island and Tugidak Island has not been ade-

quately surveyed. From widely scattered soundings taken in this locality, it appears that a submarine ridge with depths less than 19 fathoms extends from one island to the other. Foul and broken bottom extends about 10 miles southward from Tugidak Island. Fairly regular depths across the ridge are indicated in the more closely sounded area 10 miles northward of Chirikof Island. Tugidak Island is low and featureless and cannot be used as a navigational guide in the passage. Vessels bound for Chignik from the eastward use this passage.

Currents.—Between Sitkinak and Chirikof Islands the general set of the current is reported to be about 249°, 0.5 knot. The current between Chirikof Island and Lighthouse Rocks has a southerly set, less than 0.5 knot. From Lighthouse Rocks to Kupreanof Point the current sets generally 260° and varies from 0.3 to 0.7 knot.

On three runs between Chirikof Island and Castle Rock, Shumagin Islands, a southerly set was experienced each time, an average of as much as 1.5 knots having been noted.

Vessels crossing the Gulf of Alaska westbound are often subjected to a strong northerly set and should verify their position by sounding when approaching the meridian of Chirikof Island. It was this northerly set in conjunction with thick weather that was responsible for the loss of the *Cardinal* in 1923.

Chart 8537.—Alitak Bay, at the south end of Kodiak Island has its entrance between Cape Alitak and Cape Trinity, and extends 26 miles in a northerly direction to the head of Deadman Bay. Lazy Bay is a good anchorage, convenient to Cape Alitak and the site of a salmon cannery operated by the Pacific American Fisheries. The cannery of the Alaska Packers Association is located on Olga Bay at the head of the northwest arm of Alitak Bay.

The country is treeless and except for outcropping ledges of bare rock on the knolls and peaks, the land is covered by thick moss and grass. A herd of reindeer is maintained in the vicinity of Lazy Bay by the natives.

The only mail service is that furnished by the cannery steamers during the fishing season. During the winter the only communication is by an occasional halibut boat or trading vessel.

The prominent feature in the approach is Twin Peaks on the peninsula between Lazy Bay and Kempff Bay. It can be seen from off Cape Ikolik on a clear day. The peninsula between Kempff Bay and Olga Bay is mountainous and rises to heights of 2,000 feet.

Cape Trinity, the southern entrance point to Alitak Bay, is a table land terminating in an almost vertical bluff. Rocks and reefs extend a short distance off the cape.

Chart 8575.—Cape Alitak (lat. 56°50′.6 N., long. 154°18′.3 W.), the northern entrance point of Alitak Bay, is the south end of a sloping ridge with numerous knolls. It is partly grass covered, with much bare rock. Deep water extends close up to the cape on its southwest side, but a long shoal of fine gray sand makes off its southeastern side in the direction of Cape Trinity. The 10-fathom curve extends 3 miles off the cape and the 5-fathom curve lies about 1.3 miles off. At the outer end of the shoal the depth increases rapidly to 20 fathoms.

Cape Alitak is marked by a **light,** shown from a small white wooden house on the

southern end of the cape, 63 feet above the water and visible 12 miles. It is obscured from 190° to 263°.

Lazy Bay, lying 4 miles northward from Cape Alitak, is well marked by Twin Peaks and Egg Island on its north side, and some white rocky ledges close to its southern entrance point. The shore south of the entrance is clear if given a berth of 0.4 mile with the exception of the shoal making off the southeast side of Cape Alitak.

A cannery with a wharf is located on the north shore about 1 mile from Egg Island. In 1941, the length of the face was reported to be 140 feet and the depth alongside 28 feet. Fresh water is available at the wharf face and the cannery has limited machine shop facilities. Diesel and fuel oils are stored in some quantity for cannery use. The cannery maintains a store the year-round and a radio station which is operated during the fishing season. Also a slipway that is capable of hauling out vessels up to about 130 tons, with a maximum draft of 6 feet forward and 8 feet aft.

The northern part of the bay beyond the sand spit above the cannery consists of mud flats and many boulders.

Anchorage in 9 to 15 fathoms, mud bottom, may be had between the cannery and the eastern entrance point to Rodman Reach. With easterly gales the wind blows directly in Lazy Bay and there is little room in case of dragging or parting a cable. Northwesters blow with great force into Lazy Bay from over the ridge back of the head of the bay. Small craft can find excellent shelter and smooth water in the entrance to Rodman Reach during easterly weather.

Rodman Reach is a narrow arm which extends southwestward from Lazy Bay and inside of **Tanner Head** to Cape Alitak where it forms a shallow basin from which **Alitak Lagoon,** also shallow, extends 3 miles northwestward, being separated from the sea by a narrow shingle spit. About 100 yards off the eastern entrance point is a rock which bares 9 feet at mean lower low water. Excellent shelter for small craft will be found in the entrance to Rodman Reach.

Egg Island is the low flat rocky islet off the northern entrance to Lazy Bay. It is marked by a **light** shown from a small white boxlike structure. The light is 25 feet above the water and is visible 6 miles.

Twin Peaks, between Lazy and Kempff Bays, are a mark from as far westward as Cape Ikolik. **North Twin Peak,** the higher one, is 1,495 feet high and **South Twin Peak** is 1,310 feet in elevation. Both peaks are fairly definite, devoid of vegetation, and very rocky and stony. From the westward they are first raised as an island.

Kempff Bay, on the north side of Twin Peaks, has too deep water for convenient anchorage and on its north side has broken bottom that should be avoided. There are neither settlements nor improvements in Kempff Bay.

Favoring somewhat the south shore through the bay, anchorage can be selected near the head in about 18 fathoms. A spit with deep water close-to extends 350 yards from the north shore at a point 0.7 mile from the head.

A reef covered at high water, lying between **Drake Head** and **White Rock,** extends 0.5 mile from the shore just southward of Kempff Bay. White Rock, 10 feet high, should be given a berth of 0.3 mile when passing east of it in Alitak Bay and the same distance when passing north of it entering Kempff Bay.

Akhiok (*pop. 72 in 1950*), a native village on the beach of **Akhiok Bay** about 1.5 miles northeastward from Kempff Bay, has a school house and a Greek Catholic church. A foot trail leads from the cannery at Lazy Bay to Akhiok. Akhiok is best reached in

launches via the passage from Kempff Bay. This passage is shoal and has many rocks. A pilot can usually be obtained at the Lazy Bay cannery.

Round Hill, 193 feet high, is a symmetrical, round grassy knoll at the east end of **Akhiok Island** which forms the north side of the entrance to Kempff Bay.

Akhiok Reef, awash at extreme high water and always showing, is a group of black jagged rocks lying about 0.6 mile off the southeast point of Akhiok Island. In clear weather the reef makes a good landmark. A deep pocket of 30 fathoms is 350 yards southeast of Akhiok Reef.

Small vessels, with local knowledge, when bound from Lazy Bay to Moser Bay pass between Akhiok Reef and Akhiok Island. Strangers are advised to keep to the east of Akhiok Reef.

Middle Reef covers an area about 2 miles long in the central part of Alitak Bay. The northwest end of the reef-area is marked by a group of black rocks that bare about 7 feet at low water and will usually be seen bare or breaking. A kelp-marked rock baring 2 feet and a ledge baring 5½ feet at low water lie along the eastern side of the reef-area. The kelp-marked shoal at the southern extremity has a depth of 2¾ fathoms. There is little if any warning of shoaling of the general depths of the bay adjacent to the reef-area.

Nelson Reef, which has a least known depth of 2½ fathoms, lies 1.5 miles northward of Middle Reef and 2.7 miles east-southeastward from the entrance to Moser Bay. A thin growth of kelp is sometimes seen on this reef.

Moser Bay, the large northwest arm of Alitak Bay, has depths of 10 to 14 fathoms, soft mud bottom. It is a secure harbor and an excellent anchorage. The entrance is between **Bun Point,** low and sandy, and **Amik Islet,** rocky, on the south; it is obstructed by a rocky shoal which makes northward from Amik Islet for nearly 0.5 mile. The north end of the shoal is marked by a buoy moored in 27 feet of water.

The channel between Bun Point and the northern end of the rocky shoal is 175 yards wide and lies close to Bun Point. It has a least depth of about 7 fathoms and strong tidal currents flow in the direction of the axis of the channel.

About halfway between Bun Point and Fassett Point is a shoal which extends halfway across from the northeast shore toward a spit on the opposite shore. The shoal has a depth of 3 fathoms at its outer end which is marked by a buoy. In 1929 a large steamer grounded on this shoal and sustained serious damage.

A gravel shoal bare at low tide extends to 400 yards east-northeastward from the spit on the south shore opposite the shoal described above.

Fassett Point, a low grassy head with lower land back of it, is the turning point on the northeast side of Moser Bay, nearly 2 miles inside the entrance.

Trap Point is the low point across the channel from Fassett Point. The Alaska Packers Association maintains a warehouse, wharf, and ways for hauling out scows here. The wharf has a face of 100 feet and a least depth of 34 feet alongside.

The Far North Packing and Shipping Co. has a cannery about 0.4 mile northwest of Trap Point. The wharf is T-shaped, 480 feet in length with an outer face 70 feet long at which the depth was 18 feet in 1941. Fresh water is available and diesel oil is stored for cannery use. There is a small machine shop and a small slipway for scows.

Snug Cove, the cove southwestward from Fassett Point, shoals gradually to its head. A pass between the mountains extends from Snug Cove to the sea.

Chart 8537.—Chip Cove is on the west shore of Moser Bay 1.5 miles northward of Fassett Point. Shoals extend from the shores of the cove and a flat extends about 0.4 mile from its head. Vessels can anchor off the entrance, favoring slightly the western shore of Moser Bay, and small craft can select anchorage near the middle of the cove.

Shoals make off irregularly from the shores. A shallow area makes out 0.3 mile from the 1½-mile length of shore northward of Fassett Point.

Olga Narrows connects Moser Bay with Olga Bay. It is possible to carry about 21 feet through the passage only by carefully following the narrow and crooked channel. It should not be attempted except with local knowledge.

The **current** in the narrowest part of Olga Narrows attains an estimated velocity of 8 knots. During large tides there is no stage at which there is slack water the entire length of the narrows. During small tides there is said to be a period of slack water occurring between 1½ and 3 hours after high water at Trap Point and lasting from ½ to 1½ hours.

Olga Bay is an irregularly shaped body of water 17 miles long. The western end is separated from the ocean by a strip of land 1 mile wide at a point 6 miles north of Low Cape. The shores of Olga Bay are rocky except at the western end where low grassy bluffs are from 10 to 80 feet in height. On the north and south shores of the bay the land rises abruptly to heights of 800 to 2,000 feet.

The bay has the appearance of a lake and the rise and fall of the tide is only from 1 to 2 feet at the cannery which is on the north shore about 8.5 miles above the narrows. A store is open the year around and a limited amount of supplies can be obtained. During the season fresh water may be obtained at the wharf, where the depths vary from 7 to 11 feet.

Anchorage for fishing craft can be found at several places along the shores. The best anchorage is in **Anchor Cove** on the south side of Olga Bay, 5.5 miles above the north end of the narrows. The cannery company has dolphins here where small boats are tied up over the winter period.

Between Bun Point and Fox Island are several off-lying islets and rocks and much foul ground. The shore here should not be approached closer than 1 mile except with local knowledge.

Fox Island, lying about 0.5 mile off the west shore near the entrance to Deadman Bay, is bordered by bluffs and is 90 feet high. It is grass-covered and comparatively flat. It is a good mark in entering Deadman Bay.

Deadman Bay is deep except near the head where it divides into two arms. The northerly arm terminates in a mud flat, while the easterly arm, known as Alpine Cove, affords an excellent anchorage. The northwest shore of Deadman Bay is fringed with numerous rocks and reefs, while the southeast shore is bold and unusually clear. No settlements are along the bay only an occasional cabin used by trappers during the winter season.

Alpine Cove, the easterly arm at the head of Deadman Bay, is a beautiful cove surrounded by high rugged mountains. An excellent anchorage is near the entrance in 12 to 15 fathoms, mud bottom, and sheltered from all winds and seas.

Portage Bay opens into Alitak Bay from the northeast. **Bert Point,** a dark rocky point, separates the two arms of the bay. **Sulua Bay,** the main or western arm, extends

3.5 miles in a northerly direction from this point. A stream enters through the flats at the head.

The eastern arm of Portage Bay is short and terminates in a large shoal lagoon extending 2.5 miles in a northeasterly direction. A stream enters through the flats at the head of this lagoon.

The shores of Sulua Bay are precipitous except at its head. Several short gravel spits extend from the west shore and on the first two of these are cabins used by fishermen during the season. Mooring piles are driven on the north side of these spits.

In Sulua Bay are two rocks. The southerly one bares 2 feet at low water, and lies 1.7 miles from Bert Point and 330 yards off the east shore. The second rock is located about 0.4 mile north of the first and about 550 yards off the same shore.

A 3½-fathom shoal lies 875 yards southwestward from Bert Point.

Reefs and rocks extend as much as 0.5 mile off the 2½-mile length of shore eastward of **Cape Hepburn.**

A good anchorage is about 0.5 mile southeast of a 44-foot pinnacle rock at the head of Sulua Bay in 10 fathoms, mud bottom.

Directions, Alitak Bay.—Coming from the westward, steer **075°** for 88 miles from Foggy Cape bearing 327°, distant 10 miles. This will lead to a position in the middle of the entrance to Alitak Bay 3.6 miles 145° from Cape Alitak. The southernmost peak, 2,200 feet, on Kodiak Island should be about 3° on the port bow while passing Cape Alitak on the course given.

If following the southwest coast of Kodiak Island in approaching Alitak Bay, follow the directions given later in this chapter—Cape Karluk to Cape Alitak—to Cape Alitak bearing 010°, distant 1.5 miles. Then steer **121°** for 2.7 miles in order to clear the shoal making southeastward from Cape Alitak. This will lead to the mid-entrance position 3.6 miles 145° from Cape Alitak.

To enter Lazy Bay: (1) From Alitak Bay mid-entrance position given above, steer **015°** for about 5.5 miles until the south shore of Lazy Bay is abeam. Then change to **309°** until Egg Island is abeam on the starboard hand, distant 350 yards, then change to **284°** and enter the bay. (2) If coming from Sitkinak Strait, follow directions given earlier in this chapter, to a position 2 miles west true from Cape Trinity. Then steer **001°** for about 8 miles until the south shore of Lazy Bay bears 287°. Then change to **309°** until Egg Island is abeam on the starboard hand, distant 350 yards. Then change to **284°** and enter the bay.

To enter Moser Bay: (1) From Alitak Bay mid-entrance position given above, steer **034°** for 9.2 miles until Akhiok village bears 297°, distant 3 miles. Then change to **348°**, heading 150 yards off Bun Point. This course leads 300 yards off the fish trap on the starboard hand. When nearly up to Bun Point change to **005°**, passing 150 yards off the high-water line at the point. When the buoy bears 237°, haul westward to a **290°** course, passing about 275 yards northward of buoy.

Continue on this course for 1 mile until past the buoy marking the end of the long shoal which makes out from the northeast shore. Then haul to the northward and anchor as desired.

Strong tidal currents will be found at Bun Point setting along the axis of the channel. Large vessels should wait for slack water.

(2) If coming from Sitkinak Strait, follow directions given earlier, to a position 2 miles west true from Cape Trinity. Then steer **019°** for 11.5 miles until Akhiok village is abeam on the port hand, distant 2.6 miles. Then change to **348°**, heading 150 yards off Bun Point, and follow directions given above for entering Moser Bay.

To enter Deadman Bay: From a position with the northwestern Middle Reefs bearing 121°, distant 1.5 miles, make good a **041°** course for about 4 miles until the south end of Fox Island is on the port beam, distant nearly 1 mile. This course leads 0.5 mile northwestward of Nelson Reef, a shoal with a least known depth of 2½ fathoms. When the south end of Fox Island is abeam haul to the northward and steer mid-channel courses up Deadman Bay, if anything favoring the southeastern shore.

Chart 8556.—Shelikof Strait separates Kodiak and adjoining islands from the mainland of Alaska. From the eastward the strait is reached by way of the passages north and south of the Barren Islands, see Chapter 4, or by way of Kupreanof Strait.

The western shore has not been surveyed, but the prominent points and most of the offlying islands are correctly charted.

The hydrography of the main part of the strait has been done from Barren Islands to Cape Ikolik. Depths ranging from 80 fathoms in the north end to 140 fathoms in the southern entrance will be found in mid-channel. Along the eastern shore, the 100-fathom curve lies from 1 to 3 miles off the various headlands. Suitable depths for temporary anchorage will be found near the shores in most places.

In thick weather when not sure of the position, depths should not be shoaled less than 50 fathoms. For deep-draft vessels it is considered safer to favor the eastern shore.

Currents.—The limited current data available for Shelikof Strait indicate that the flood sets into the strait from both ends.

Current observations have been made for short periods at various anchorages used by surveying vessels near the shore. On the western side of the strait currents of ½ to ¾ knot have been recorded, setting alongshore in either direction, with the current in the southwesterly direction predominating. Apparently the current is less along the west coast of Afognak Island than on the opposite side of the strait.

At the northeast entrance to the strait in the vicinity of Dark Island and Latax Rocks, heavy tide rips, variable in position, are frequent; strong tidal currents are encountered along the coast of Shuyak Island.

Weather.—During the summer of 1908 gales and rainy conditions were frequent. June was the best month and July perhaps the worst. Northeast winds invariably bring rain and thick weather, and it is from this direction that most of the heavy weather comes. During the greater part of the season the wind when strong from this quarter rarely varied much in direction while its strength lasted, and it never backed. In the latter part of the season a northeast gale almost invariably backed through northwest to west or southwest, blowing with great force.

During the summer of 1929 good weather with a preponderance of westerly winds prevailed throughout June, July, and August. Southeast gales were of frequent occurrence in September, but no northwesterly gales were experienced until after October 1.

Southeast winds generally bring clouds, but may be accompanied by either rain or fair weather.

Southwest and west winds are invariably accompanied by fine clear weather, but

they often blow with great force. The southwest gale is perhaps the most to be dreaded in Shelikof Strait, as it raises a short, heavy sea that is trying to a small vessel.

Southerly winds generally bring a haze, which is sometimes so thick as to resemble fog.

Northwest winds bring fair weather and a clear atmosphere; however, in the wake of the Katmai region, the air may be hazy due to volcanic dust.

During the early spring northwest gales are often accompanied with freezing weather and vessels are in danger of becoming iced down. Small craft especially should hug the northwest shore under such conditions, so that they may seek shelter before the icing becomes serious.

Gales in this region last without intermission anywhere from a day to two or three days.

Northeast winds are generally accompanied by a low barometer and southwest winds by a high barometer, but the rule is not invariable. The barometer is of little value or no value in foretelling the weather, as it accompanies rather than precedes corresponding conditions. The slope of the barometric curve is apt to change suddenly, the weather changing with equal suddenness. A sure sign of rainy weather and wind from the northeast is the gathering of clouds on the northeast side of the mountains.

During strong westerly winds, the atmosphere often becomes filled with a fine volcanic ash reducing visibility to a distance of 1 mile or less.

Little fog was encountered during the season, but blinding snowstorms were frequent in early spring.

The western coasts of Shuyak and Afognak Islands trend 218° and the distance from the northernmost Latax Rocks, described earlier in this chapter, to Raspberry Cape is 48 miles. From Raspberry Cape the eastern coast of Shelikof Strait trends 230° for 45 miles to Cape Karluk.

Chart 8533.—Party Cape, Dark Island, and the north coast of Shuyak Island are described earlier in this chapter.

The western side of Shuyak Island is irregular and fringed by a chain of islets and rocks about 1 mile from shore. Between them and the island are many rocks and kelp patches. The outer ones lie nearly on a line through Gull Island from Black Cape, bearing 213°.

Shag Island, a group of grass-covered islets, is 36 feet high and lies 0.9 mile westward of Party Cape. A bare rock 3 feet high lies 0.6 mile northward of Shag Island.

Wonder Bay, lying southeastward of Shag Island, is rock strewn and should not be entered except by launches with local knowledge.

Gull Island lies 2.8 miles southwestward of Party Cape and has a distinctive dome-shaped top, grass-covered, 83 feet high. Several large reddish rocks lie to the north of it. It marks the entrance to **Western Inlet,** which is shallow and foul. Gull Island is connected to the large island at the entrance of Western Inlet by a sand spit which bares at minus tides. This area is extremely foul.

Big Bay is of considerable size, having a main arm branching into four smaller arms at its head. While the main arm has a controlling depth of 3½ fathoms, and would afford protection in northeasterly weather, it should not be attempted without local

knowledge, as its entrance is infested with numerous rocks, many of which bare only at minus tide. The smaller arms are not accessible except for very small craft.

Chart 8573—Shuyak Strait, between Shuyak and Afognak Islands, is not recommended as a through passage for ships by reason of its restricted eastern entrance and broken bottom in the seaward approach from the eastward. Its western approach in Shelikof Strait is characterized by less uneven bottom and the western entrance is mainly clear and 1.5 miles wide.

Islets and rocks, bare at low water, lie on both sides of the western approach to Shuyak Strait. The best water is found by favoring the north side of this approach Shuyak Strait is apparently clear of dangers in mid-channel except as noted below. Soundings indicate depths of from 60 to 80 fathoms near mid-channel as far east as Redfox Bay. Wooded hills, about 400 feet high, line the rocky shores on both sides, and there is practically no low flat land.

Rocky Islet, bearing 280° and distant about 4 miles from Lighthouse Point, lies on the south side of the western approach to Shuyak Strait. It is a bare rock 12 feet high and about 100 feet wide. Midway between Rocky Islet and Lighthouse Point, but southward of a line between them, is a reef bare at half tide. The reef is marked by kelp and surrounded by shoal water.

The outermost danger on the north side of the western approach to Shuyak Strait is a rocky shoal of 2 fathoms lying about 3 miles 052° from Rocky Islet. A rock baring at minus tide lies 400 yards northeastward of the rocky shoal and the area inside of them to **Green Island** and thence to the shore at Neketa Bay is foul.

Neketa Bay is a small bay east of Green Island, very shoal, with a reef extending nearly across its entrance.

A rocky bank of 12 to 17 fathoms lies about 1.5 miles northeastward of Rocky Islet. In approaching the western entrance of Shuyak Strait it would be advisable to pass northward of the bank.

Alligator Island, so called from the resemblance from certain directions, is a grass-covered island about 0.3 mile in diameter and 64 feet high, lying 1.3 miles southward from Rocky Islet. Alligator Island is marked by a **light,** shown from a small white house, 70 feet high and visible 12 miles.

Cape Newland, the southwestern extremity of Shuyak Island, is about 75 feet high and grass-covered for several hundred feet up to the tree line. Rocks awash at various stages of the tide lie detached 400 yards westward and about 600 yards southward from the cape. Broken bottom extends into the entrance to Shuyak Strait about ⅓ the way from the cape to Lighthouse Point.

Lighthouse Point (lat. 58°29′.0 N., long. 152°39′.0 W.), the point on the south side of the western entrance to Shuyak Strait, is marked by a **light** 60 feet high, shown from a small white house. The light is visible 7 miles and is obscured from 285° to 073½°. The point is grass-covered up to the tree line. The bight just east of the point is foul.

Two bare rocks, 12 and 5 feet high and 100 yards apart, lie in mid-entrance to **Shuyak (Shaw) Harbor.** The bare rocks are surrounded by rocks awash and are nearly connected at low tide. A sunken pinnacle rock having a depth of ¾ fathom lies in the harbor passage eastward of the mid-entrance rocks, leaving a narrow channel adjacent to the shore. The better channel into Shuyak Harbor is westward of the mid-

entrance rocks. The harbor has a swinging room of about 200 yards in diameter. The salteries in this harbor have been abandoned and the wharves are no longer in serviceable condition.

Port Lawrence is a bight on the north shore of Shuyak Strait, 1.5 miles from the western entrance. A small grass-covered 15-foot islet is in the eastern part of the bight. The wharf at the abandoned herring plant is in bad condition and cannot be used.

Port William, 0.5 mile east of Port Lawrence, is 0.3 mile wide and 0.5 mile long. A cannery is operated here. The wharf has a face 184 feet in length with a least depth alongside of 21 feet. The direction of the face is 082°. Fresh water is piped to the wharf. A radiotelephone station is operated by the Washington Fish and Oyster Co. At a small oil wharf diesel oil and gasoline can be obtained at all seasons of the year.

A rock, bare 2 feet at low water, 200 feet in diameter, and marked by kelp, lies 250 yards offshore between Port Lawrence and Port William. Nearby and closer inshore is a rock about 10 feet high.

Redfox Bay, the largest indentation on the south side of Shuyak Strait, has general depths of less than 20 fathoms, mud bottom, and is an excellent anchorage in any weather. The swinging room just inside the entrance island is about 700 yards in diameter.

The southern half of the entrance island in Redfox Bay is wooded. Opposite this island and 100 yards off the western shore of the bay are some rocks that bare 2 feet at low water. The channel between these rocks and the island is about 200 yards wide and apparently clear. Freight steamers use this channel and anchor just south of the islet to discharge cargo to boats or barges.

A pinnacle rock, unmarked by kelp, which bares 1½ feet at low water, lies off the entrance to a small cove on the eastern shore of Redfox Bay 0.8 mile southward from the entrance island.

The diurnal range of the tide in Redfox Bay is 13½ feet.

The bay over 1 mile eastward of Redfox Bay is foul in places. The bottom is irregular.

Daylight Harbor is 0.5 mile east of Port William. The herring plant here has been abandoned, and the wharf is in ruins. From this harbor to **Cape Current,** a distance of about 2 miles, there are no important indentations and very little traffic.

A dangerous patch of small rocky heads with a least depth of 2¾ fathoms exists about in the middle of the strait 2.3 miles from its eastern end. This danger is abreast of two small islets, the western one is about 100 yards in diameter, half grass-covered and half wooded. The kelp marking this spot usually is drawn under by the current.

Cape Current Narrows form the eastern end of Shuyak Strait, and are about 1 mile long. Rocky obstructions in the narrows near the eastern end greatly reduce the width of the channels on either side of them; the channel along the north shore is preferred.

The Shuyak Island shore of the narrows is abrupt, wooded, and about 700 feet high. The Afognak side is grass-covered for a distance of about 200 feet back from the shore and about 50 feet high with level top and abrupt shore.

The western part of the narrows apparently is clear with general depths over 10 fathoms. Broken ground with numerous rocks, either above water or baring at various stages of the tide, extends from the south shore near Cape Current to within 195 yards of the north shore. Along this part of the narrows, vessels should pass about 100 yards off the north shore where the least found depth is 8 fathoms. A channel exists through

the middle of the narrows, passing between the rocks on the broken ground, but it cannot be recommended to those without local knowledge.

The tidal currents at Cape Current Narrows are strong, and bad tide rips are frequent. Current predictions may be obtained from the *Current Tables*.

A large kelp patch is off the eastern entrance to the narrows just south of Big Fort Island.

Entering Shuyak Strait from Shelikof Strait, vessels pass about 1 or 1.5 miles northward of Rocky Island and head for the middle of the strait on a course about **113°**.

Chart 8573 is the guide and it should be carefully followed.

Bluefox Bay, indenting the shore of Afognak Island southwestward from Lighthouse Point, has an entrance about 2 miles wide.

Teck Island, Hogg Island, and **Bear Island** are the three principal islands overspreading the entrance and the area inside of Bluefox Bay. Bear Island is used as a fox farm. A herring reduction plant and wharf with fresh water are on the south side of Hogg Island. Radio communication may be had through Kodiak WXF. A wharf extends to deep water at the eastern end of Hogg Island.

Three channels lead into Bluefox Bay. The western channel has been used by small craft, but it is foul and is not recommended.

The eastern channel is the one in general use, but it also contains several dangers and should be navigated with caution. A rock with a least found depth of 3¾ fathoms lies in mid-channel about 200 yards off the middle of the east side of Hogg Island. A rock with a least depth of 1 fathom lies 375 yards east from the southeast point of Bear Island. A rock bare at low tide lies about 0.5 mile south-southeastward from the same point. At this rock the tangents of Hogg and Bear Islands are nearly in range. A rock with 2¼ fathoms over it lies 200 yards off the southeast point of the same island just south of Bear Island.

To enter Bluefox Bay, vessels are reported to hold the course into Shuyak Strait until the eastern channel opens; then to change course to about **177°** and proceed through the east entrance in mid-channel, heading for a wooded point on the east side of the bay near its head, but favoring the west side of the channel near the 3¾-fathom spot mentioned above. The navigation beyond Bear Island is difficult and Chart 8573 should be followed closely. No directions of value can be given.

Chart 8533.—The west coast of Afognak Island from Shuyak Strait to Black Cape is irregular, rocky, and wooded to an elevation of about 700 feet. Some grass appears on the points. The small island about halfway between Black Cape and Alligator Rock is about 0.3 mile in diameter, 50 feet high, and covered with grass. Inside a line from Black Cape to Alligator Island the water is very foul with numerous pinnacles showing at low tide.

Devil Inlet, 3 miles northeast from Black Cape, has wooded shores. About 0.3 mile inside the entrance are rapids which run heavily except at high water when there is a depth of about 3 feet. The entrance outside the rapids is a good anchorage in heavy weather for small craft; however, the approaches and the inlet itself are unsurveyed.

Black Cape is low and grassy at the end, and rises gradually in a narrow heavily wooded ridge to a prominent bald knob, 1,155 feet high. Bare and sunken rocks ex-

tend a short distance off the cape, and a reef, mostly showing above water, lies on its south side.

The unsurveyed bay between Black Cape and Ban Island has reefs, which do not extend westward of the island.

Ban Island is mountainous, its highest peak being found near its south shore. Kelp is close to its west end.

Paramanof Bay, between Ban Island and Cape Paramanof, is not surveyed. It is recommended to favor Ban Island when entering. A survey ship anchored on the south side, 3 miles eastward of Cape Paramanof and about 0.5 mile off a rocky shore, in 22 fathoms, soft bottom. A short sand beach is just eastward of the anchorage, and a rocky islet lies close to shore a short distance westward. The anchorage is exposed to westerly and northerly winds. Good anchorage is said to be farther in, but no definite information is available.

The lower levels of Afognak Island in general are wooded with the exception of the eastern coast and the southwestern end southward of Paramanof Bay.

Cape Paramanof is the northwest end of the peninsula included between Paramanof and Malina Bays. It is a low tongue of land projecting 0.5 mile northward from the mountains. A reef lies on the north side of the cape inside Paramanof Bay, and a part of it, about 0.5 mile from shore, is bare at low water.

The peninsula between Paramanof and Malina Bays is marked by two mountain ridges trending eastward, with a small stream in the valley between them. The land is grass-covered, with bare rocks in places, and there is no timber. The northern ridge rises in steep, grassy slopes to an elevation of 1,830 feet, with a saddle behind it and then extends eastward with about the same height. **Tanaak Cape** is the northern point at the entrance of Malina Bay.

Chart 8534.—Malina Bay, indenting the west coast of Afognak Island, lies between the mountainous peninsulas terminating in Tanaak and Steep Capes. It is about 10 miles long and is a secure harbor. Water can be obtained from numerous small streams. Some timber is found near the head of the bay and in some of the valleys. Steep Cape and the high cliff at the south point at the entrance, and the rounded grass-covered mountains on the northern side of the bay, mark the entrance.

The bay is 2.5 to 3 miles wide for nearly 4 miles and then contracts rapidly to a neck about 1.5 miles long with a least width of 0.4 mile. From the south side of the neck an arm, known as Malka Bay, extends 1.5 miles southeastward. Above the neck is a basin 2 miles long with a greatest width of 1.2 miles. From the eastern end of the basin an arm extends 2 miles eastward, with a width of about 0.2 mile; it is filled by a flat nearly to its mouth.

The outer part of the bay is clear, with the exception of a rock bare at low water lying 0.2 mile from shore in the bight on the south side nearly 4 miles inside the entrance. Rocks awash at high water extend 300 yards off the south side at the entrance to the neck, and lie 0.5 mile westward of the island in the entrance of Malka Bay. The depths are suitable for anchorage 0.3 to 0.4 mile from shore nearly anywhere in the outer bay. An anchorage, exposed only to westerly winds, can be had on the north side of its eastern end, about 0.3 mile westward of an islet, and the same distance from the shore northwestward, in 15 fathoms, sticky bottom.

In the neck off the entrance of Malka Bay is an island, 0.4 mile long and 116 feet high, with a clump of trees near its middle. There is no safe passage between it and the shore southeastward. An islet 30 feet high lies on the south side of the neck 0.4 mile eastward of the island, and foul ground extends 225 yards from the south shore just eastward of the islet. A rock 15 feet high, with a small one close westward, lies 400 yards northeastward of the islet. The best channel lies between the 30-foot islet and the 15-foot rock. A rock bare at low water lies 400 yards eastward of the 15-foot rock and over 300 yards from the northern shore.

To pass through the neck, pass 200 yards northward of the island, steer **121°**, and pass 100 yards southward of the 15-foot rock, lying in the middle of the neck.

The basin has depths of 30 to 47 fathoms in its western half and shoals gradually eastward, affording secure anchorage. A rock covered at high water lies 400 yards westward from the north point at the entrance to the narrow arm extending eastward, and a shoal extends 600 yards southwestward from a point on the north shore 0.4 mile northward of the rock. The best anchorage is about 0.4 mile off the bight at the northern end of the basin, with the entrance (neck) just closed, in 15 to 18 fathoms, sticky bottom.

Malka Bay is a secure anchorage with a clear width of 0.2 mile. The northwest point of the island in the entrance should be given a berth of over 100 yards; a rock bare at low water lies 100 yards from the shore southwestward of the same point.

To enter Malka Bay, steer **163°**, pass 150 yards southwestward of the northwest point of the island, and follow the southwest shore of the arm at a distance of about 250 yards. Anchor in the broad part about 0.6 mile from the head, in about 10 fathoms, sticky bottom. A flat extends nearly 0.4 mile from the head.

High and low water in Malina Bay occur about 10 minutes earlier than at Seldovia. The diurnal range of the tide is 14½ feet.

Raspberry Strait lies between Raspberry Island and Afognak Island. From Shelikof Strait, at its northwest end, to Afognak at the southeast end, the strait is about 16 miles in length and quite uniformly narrow, averaging about 1 mile in width.

The approach to the northwestern entrance is clear of dangers, no known shoals or detached rocks are more than 100 yards offshore. The Shelikof Strait sides of Raspberry Island and Afognak Island are rugged with barren cliffs and bluffs except where valleys make into the interior of the islands.

The southeastern end of Raspberry Strait ends in two passes which lead into Afognak Strait around Little Raspberry Island. Both passes are dry at from 2 to 3 feet above low water, and numerous reefs border the shores of Raspberry Island in this vicinity and of Little Raspberry Island. However, the northeastern pass is used at high water by local boats drawing less than 8 feet. Neither of these is recommended to vessels without local knowledge.

Steep Cape, also known as **Twin Heads,** is about 2.5 miles northward of the northwestern entrance to Raspberry Strait and is the most prominent headland between Malina Bay and the Strait. Its bare gray rocky rides rise abruptly from the water's edge to its twin summits, 1,530 and 1,516 feet in elevation. A light-colored rockslide is quite noticeable. About 100 yards offshore is a prominent pinnacle rock 78 feet in height which cannot be distinguished when seen against the cape.

Between Steep Cape and the entrance to the strait is a bight with a gravel beach at

the foot of a valley blocked by a high bluff of glacial moraine about 250 feet high. The shore between the cape and this bight consists of a steep gravel bluff, 213 feet high, grass-covered at the top, and giving the appearance of a tableland. The bluff is in the form of a point from which shoals extend for 0.5 mile offshore.

The rounding point of the headland on the southwest side of the entrance to Raspberry Strait when seen from the southwest is somewhat similar to Steep Cape. However, its cliffs and rock slides are covered with grassy patches and do not have the general gray appearance which makes Steep Cape more prominent. The summit of this headland is 1,963 feet high and the slopes are steep. A pinnacle rock is off the southwest shore. It is 25 feet in height and makes a good landmark when not seen against the foot of the headland. Between this headland and Raspberry Cape are bights from which low valleys lead into the interior of Raspberry Island. The shores of these bights are of gravel and the valleys are easily distinguished from offshore.

Anchorages.—Since Raspberry Strait itself is not wide, small vessels may anchor along the shores throughout the strait where depths appear suitable, depending upon the protection required. The following anchorages are recommended for deep-draft vessels:

On the northwest shore of Raspberry Island in Shelikof Strait are two bights, with gravel beaches located about 3 and 5 miles southwest of the entrance to Raspberry Strait. At the head of these bights deep valleys extend inland. Anchorages may be had in 10 to 15 fathoms, sand bottom, with good protection from easterly storms but exposed to the westerlies. The northeastern of these two bights is clear; the southwestern bight is foul, and in coming in from the north vessels should keep at least 800 yards off the port shore.

North of the entrance to Raspberry Strait and south of Steep Cape is a small bight with suitable protection from easterly storms and where anchorage may be had in 10 to 15 fathoms, sand and gravel bottom. The shore of this bight is a gravel beach just north of which are low grass-covered hills of glacial gravel.

One and one-half miles northwest of Dolphin Point, vessels may anchor off the northeastern shore of the strait, in 12 to 15 fathoms, sand bottom, with good protection from easterly storms about 400 to 500 yards offshore.

Fair anchorage for deep-draft vessels is 0.9 mile about 210° from Dolphin Point Light, in 12 to 15 fathoms, mud bottom.

The best anchorage in the strait for large vessels with protection from easterly storms is 600 yards off the northeastern shore, east from Port Vita Cannery with a small unpainted cabin, easily identified, bearing between 070° and 090°. The depth is from 12 to 18 fathoms, sticky bottom.

Another possible anchorage is located in deeper water, in mid-strait off Selief Bay in about 18 fathoms, sand bottom.

Anchorage for small vessles with good protection in any weather may be found in Selief Bay.

Dangers.—There are no offlying dangers or shoals at the northwest approach and entrance to Raspberry Strait. From the entrance of the strait to Selief Bay, the only dangers are inside 300 yards of the strait shore except for a shoal of 3½ fathoms lying almost in mid-strait, 0.75 mile 124° from Dolphin Point Light. This shoal is passed to the northward as broken bottom lies between the shoal and the gravel point on the south side of the strait.

From Selief Bay to the southeastern end of the strait are numerous shoals and dangers, and local knowledge is required even by small boats. Deep-draft vessels should not proceed beyond the entrance to Selief Bay. Between this bay and The Narrows, are 4 rocky shoals well offshore. One of these having a least depth of 11 feet lies in mid-channel about 0.4 mile northward of Tiger Cape. From this cape southeastward to The Narrows, sandy spits make well out into the strait from many of the points.

Directions.—The northwest entrance to Raspberry Strait may be approached from any direction by keeping 1 mile offshore. Come into the middle of the entrance off Raspberry Strait Light and steer a course **138°** for about 4 miles until Dolphin Point Light is abeam at a distance of about 700 yards. Thence steer **090°** for about 1.5 miles until abeam the end of a low gravel point which is about 0.75 mile northwest of Iron Creek Cannery. Pass this gravel point at a distance of about 0.4 mile and change course to **120°**. Hold this course for about 1 mile and when Iron Creek Cannery comes abeam, follow the middle of the strait on a course **160°**.

Approaching The Narrows at the southeast end of Raspberry Strait from Kupreanof Strait set a course **007°** with the east end of Little Raspberry Island ahead. Approaching from the east, that is from Afognak Strait, set a course **270°** with the south tangent of Little Raspberry Island ahead, and pass 500 yards south of the foul ground south of Shoal Point. Give the east tip of Little Raspberry Island a berth of 400 yards as reefs make out 200 yards off the high-water line. Come into the pass favoring the north side and pass about 100 yards off Nochlega Point and the next point which is adjacent. These two points form a double point with a short gravel beach between them. The Narrows bares several feet at low water and is not recommended to vessels without local knowledge. Under slow bell, and with information as to the range of tides, this pass can be negotiated at high water springs by vessels up to 8-foot draft.

Tides and currents.—At Dolphin Point high and low waters occur about the same times as at Seldovia, and the diurnal range is 13½ feet. The tide at Tiger Cape is 5 minutes later than at Dolphin Point and the ranges are about 0.5 foot more. At the south end of The Narrows the tides are about 15 minutes later than at Seldovia and the diurnal range is 12 feet.

Tidal currents in Raspberry Strait are weak, except at The Slough and Narrows. At The Narrows and The Slough, the range at the north end is greater than the range at the south end as a result of which it is estimated that from approximately mid-tide to high tide and from high tide to mid-tide, the current flows from Raspberry Strait into Afognak Strait. This current probably amounts to from 2 to 3 knots during spring tides. At approximately mid-tide the tidal level at the two ends of The Narrows is equalized and as the tide falls below mid-tide the current reverses and flows from southeast to northwest until the pass goes dry at 2.5 feet above low water.

Weather.—During the survey season of 1941 westerly winds prevailed from June to September 15th, mostly from the southwest. This prevailing wind is attended by good weather, mostly clear skies with little rain. These winds, however, often blow with such force as to build up heavy seas in Shelikof Strait, uncomfortable for all vessels except full-powered steamers. The storms with easterly winds come with a frequency of one or two per month from June to October. During the summer of 1941, July was the worst month as the prevailing wind seemed to be easterly attended by much rain although there were no severe easterly storms.

Raspberry Strait Light (lat. 58°09′.6 N., long. 153°13′.3 W.), on a small white house, is on a small grass-covered island off **Cape Nuniliak** on the northeast side of the entrance. The light is 50 feet above the water and visible 8 miles. This island blends with the shore and it is difficult to pick up except when approaching from the north. Inside the strait, about 1 mile southeastward from Raspberry Strait Light on the northeast side is a prominent light-gray rocky bluff, which extends from the water's edge to a height of 150 to 200 feet.

Both shores of Raspberry Strait, from the northwestern entrance to the vicinity of Iron Creek Cannery which is about 7 miles inside, consist of rocky ledges and numerous short gravel beaches between small rocky points. The shores rise steeply to the mountains except where valleys intervene. Close along the southwest shore about 1 mile inside the entrance are a number of offlying pinnacle rocks, 5 to 41 feet in height.

Dolphin Point Light is about 4 miles inside the strait, shown from a small white house on a small rocky islet off the end of Dolphin Point. The light is 17 feet above the water. It is maintained only during the summer months. **Dolphin Point,** when approached from Shelikof Strait, appears as a long grass- and tree-covered point with several low hills or nobs between it and the foot of the steep slope inland.

Muskomee Bay, receding 1.5 miles, is about 3 miles east of Dolphin Point on the east side of the strait. This bay is not suitable as an anchorage for large vessels, and it offers little protection for smaller vessels as easterly and westerly winds draw through the deep valleys at the head of the bay. Along its shores are outcropping ledges and a few gravel beaches. The bottom near the head is rocky. At the south side of the entrance 200 yards off the shore is a reef bare 7½ feet at low water. Off the north shore at the entrance to the bay are three rocky shoals with least depths of from 10 to 20 feet at low water. The head of the bay is foul except around the north side of an island lying in the head of the bay.

Around the next bend of the strait, about 2 miles southeast of Dolphin Point and on the opposite side, is the Iron Creek Cannery reduction plant and saltery. Two similar plants are between this cannery and Selief Bay on the same side of the strait.

From the Iron Creek Cannery, the shores of the southeastern part of the strait consist of boulder and gravel beaches, and several low grass-covered shale or gravel points. The terrain back of these shores is not as steep as in the northwestern part of the strait and is timbered from Dolphin Point. Logging operations are in progress in this locality. The points extend from 200 to 300 yards and have shoals or outcropping ledges extending into the strait another 100 yards or more. One of these is on the northwest side of the strait about opposite Selief Bay. Tiger Cape is about 2 miles southeastward from the bay.

In 1941, there were three plants in the strait for the reduction or salting of fish: **Iron Creek, Port Vita,** and **Port Wakefield.** All are located on the southwest shore between Muskomee and Selief Bays. During the fishing season commercial steamers call frequently. A mail boat from Kodiak maintains a weekly schedule to this area. Good water is obtainable and usually food supplies in limited quantities. Fuel and diesel oils are stored for cannery use. The Iron Creek Cannery operates a radio station during the summer months. No facilities are available for hauling out boats, nor for machinery repairs other than that afforded in the small machine shops of the canneries.

The Iron Creek reduction plant has a wharf 200 feet long with a berthing space of

100 feet; the least depth off the face is 18 feet. There are two dolphins, one off each corner of the wharf. Large vessels make either starboard or port dockings, the headings being either 153° or 333°. At Port Vita the wharf has a face 100 feet long with a least depth alongside of 15 feet. The reduction plant at Port Wakefield has a wharf with a 100-foot face and a least depth alongside of 19 feet. Large vessels make port dockings here, with their bows in 30-foot depths next to a dolphin.

Selief (Yukuk) Bay is on the southwest side of the strait about 6 miles southeastward of Dolphin Point. The outer part of the small peninsula on the eastern side of the entrance to Selief Bay is a grass-covered glacial hill 93 feet high, serrated at the top and the most prominent landmark southeast of Dolphin Point. This bay offers good protection and anchorage for small vessels in any weather, particularly from southeasterly or easterly storms. The entrance to the bay is shoal with a bottom formation similar to a bar and with a least depth of 8 feet. Inside the bay the best anchorage is with the end of the point at the east side of the entrance bearing about north and in 1½ to 3 fathoms of water. The bottom is mud and the west side is shoal.

Tiger Cape, about 2 miles southeast of Selief Bay on the same side of the strait, is a low grass-covered shale point with several abandoned houses near the foot. More abandoned buildings of a former sawmill are located about 0.25 mile farther southeastward.

The two islands opposite Tiger Cape and about 2 miles eastward of the entrance to Selief Bay are also prominent. The crests of these islands are wooded and the westernmost is 100 feet high, the other 156 feet.

No other landmarks are between Tiger Cape and the south end of Raspberry Strait.

On the opposite side of the strait north of Tiger Cape is a shallow bay, about 1 mile wide in a northwest and southeast direction, locally known as **Cottonwood Bay.** This bay shoals to 1 fathom about 300 yards inside the general trend of the northeastern shore of the strait. Throughout the bay the depth varies from 2 to 8 feet. A long gravel and rocky spit making into the bay from the northern point at the entrance dries at low water. Favor the opposite side in entering.

Another bay locally known as **Waskanareska Bay** is east of Tiger Cape and on the southeast side of a gravel spit which separates it from Cottonwood Bay. Depths vary from 3 to 6 feet. The inner part of the bay and the part along the northeast shore for a distance of 200 yards offshore bare at low water. The eastern half of the entrance is foul and bares at low water.

Through **The Narrows,** which is the pass on the northeastern side of **Little Raspberry Island,** and the approaches in Afognak Strait, the shores are mostly rock ledges with many offlying dangers, some of which are dangerous to small craft.

Rocks and shoals too numerous to mention are in the passes among Deranof Island, Little Raspberry Island, and Raspberry Island. The pass on the west side of Little Raspberry Island is **The Slough.** These passes are used only by small vessels with local knowledge, and at high tide only.

The western side of Raspberry Island is mountainous and grass covered, the principal points being three high cliffs, between which are two deep valleys trending eastward. The southern valley, about the middle of the island, is especially low and extends through to Onion Bay. The southern side of Raspberry Island and Kupreanof Strait have been described earlier in this chapter.

Viekoda Bay is on the eastern side of Shelikof Strait between Outlet Cape and Uganik Island. It extends about 15 miles into Kodiak Island in an east-southeasterly direction to a narrow head. Uganik Passage enters Viekoda Bay on the south side about 7 miles inside the entrance. Good anchorage for moderate size vessels in 12 to 17 fathoms may be had 0.5 to 1 mile northwest from the islands 1.5 miles from the head of Viekoda Bay.

Off the entrance, about 3 miles from Outlet Cape, is a bank on which the least depth found is 6¾ fathoms.

A narrow point, its end detached, extends 0.4 mile from Uganik Island 1 mile eastward from its northern end. Broken ground, with depths of 4 and 5 fathoms, extends 0.6 mile northward from the point. A fair anchorage in southerly weather is in the bight on the east side of the point, 0.3 to 0.4 mile from shore, in 10 to 15 fathoms.

A rock, with 4¾ fathoms on it and which should be avoided, lies 0.6 miles from Uganik Island and 2.5 miles westward of **Naugolka Point.**

This point has an islet near it, and a rock bare at low water lies 0.8 mile eastward of the islet and 0.4 mile from the south shore of Viekoda Bay. Depths of 3 to 5 fathoms extend 0.3 mile northward of the rock.

Uganik Passage borders the northeast and south sides of **Uganik Island** and connects Viekoda and Uganik Bays. The depths in the passage are too great for anchorage except in Terror Bay.

The part of Uganik Passage on the northeast side of Uganik Island is clear in mid-channel except 5 miles from Viekoda Bay and 1 mile from the southeastern end of Uganik Island. At this point a flat makes two-thirds the distance across the passage from the mouth of a stream in a large valley on the northeastern shore, and leaves a clear channel 350 yards wide close to a point of Uganik Island. An islet lies close to Uganik Island in the bight southeastward of this point.

Terror Bay extends several miles south from the turn of Uganik Passage at the southeast end of Uganik Island. The main part of the bay is clear with the exception of three rocks, each of which lies about 300 yards from the western shore, as indicated on the chart. Secure anchorage for vessels of any size is 3 miles above the entrance and about 2.5 miles from the head of the bay, in 7 to 15 fathoms.

The part of Uganik Passage south of Uganik Island is 9 miles long from the southeastern end of Uganik Island to East Point, where it joins Uganik Bay.

A rock bare at low water lies 0.3 mile from the south side of Uganik Island 0.6 mile from its southeastern end.

A high peninsula extends southward from Uganik Island 2 miles from its southeastern end and narrows the passage to 0.2 mile. From the point on the south shore southeastward of the peninsula a ledge bare at low water makes nearly halfway across the passage where narrowest, and the southeast end of the peninsula must be kept aboard distant 100 to 150 yards until past the narrowest place.

Westward of the peninsula is an island in the middle of the passage, in the vicinity and westward of which are several rocks, sunken and bare at various stages of the tide. Vessels from eastward may pass northward of the foul ground by following the southwest shore of the peninsula at a distance of about 200 yards, taking care to avoid the rock awash which lies 350 yards offshore, until the island is abaft the port beam, and then steer **300°** for the southernmost point on Uganik Island which shows ahead with the summit of the peninsula a little on the port quarter. When the bare rock 0.4 mile

westward of the island is abaft the port beam the dangers will be passed. These are: A rock bare at low water lies 300 yards northeastward of the island. A rock bare at low water lies 250 yards northward of the bare rock 0.4 mile westward of the island.

Foul ground and rocks bare at low water extend 0.3 mile from Uganik Island 0.4 to 0.9 mile westward of the peninsula.

The channel southward of the island is narrower than that northward. To go through this channel from eastward, bring the south end of the peninsula barely open from the point eastward, astern; and steer for the prominent point on the south shore 0.8 mile westward of the island, course 281°. Keep close on this line, passing midway between the island and an islet near the south shore 0.3 mile southwestward of the island. When the islet is passed, haul northward and give the point a berth of over 200 yards. The principal dangers are: A rock bare at low water lies 200 yards southwestward of the island. A rock with 8 feet over it lies 0.4 mile westward of the island and 0.3 mile northwestward of the islet. The islet should be given a berth of over 100 yards.

Westward of these dangers Uganik Passage is broad and free from outlying dangers. In the large bight of Uganik Island 5 miles eastward of East Point shoals extend 0.5 mile from the northwest shore for a distance of 1 mile from its head. From this bight a broad, low divide extends across the island.

Rocks bare at low water extend 0.5 mile from the south shore of the passage 1.8 miles eastward of East Point, and 0.5 mile farther eastward rocks make out 600 yards on the northwest side of a point on the south shore.

Cape Uganik, the northwest end of Uganik Island, is low and flat for about 0.3 mile back and then rises to elevations of 1,200 to 1,500 feet. For a distance of 1.5 miles southward from the cape foul ground extends for 0.3 mile and more offshore. Vessels should give the cape a berth of 1 mile.

Chart 8542.—Uganik Bay is on the eastern side of Shelikof Strait between Cape Uganik and Miners Point. In general the bay and its arms with exception of East Arm have depths too great for anchoring. Several small shoal spots rise abruptly from the general level of the bottom. One of these lies in mid-channel about 1 mile northwestward from Mink Point at the junction of East and South Arms, two others lie in the passage between Sally Island and the shore at Starr Point. The shores of Uganik Bay rise abruptly from cliffs in places and are generally covered with grass and alder bushes.

Two salmon canneries are located in Northeast Arm. During the fishing season communication by radio telegraph may be had with Uganik Fisheries, Inc., KLP, and by radio telephone with San Juan Fishing and Packing Co., KLY. A saltery is located in East Arm.

The best anchorage in Uganik Bay will be found in East Arm where there is plenty of swinging room and depths of 10 to 15 fathoms, sticky mud bottom.

Noisy Islands lie 0.5 to 0.6 mile from Uganik Island and 2.5 miles southward from Cape Uganik. The group consists of two islands. The northern island is rolling with round-topped, grass-covered hills, the highest of which is about 192 feet high. A light 90 feet above the water is on the western bluff of the northern Noisy Island. The light, shown from a skeleton wooden tower, is visible 10 miles and is obscured from 227° to 319°.

The southern Noisy Island is also grass-covered, but is low and flat. Two fine sand beaches are near the northern end of this island and a house is near by. When off Uganik Bay, these islands are sometimes hard to pick up as they merge into the brown hills of Uganik Island. Noisy Islands should be given a berth of 1 mile.

Noisy Passage, between Noisy Islands and Uganik Island, has been sounded and appears to be clear in mid-channel with a least known depth of 7½ fathoms. It is in constant use by small coasting vessels but is not recommended for deep-draft vessels. Vessels using this channel should be careful to avoid the rock awash, which lies about 0.4 mile northward of the northerly Noisy Island.

Miners Point, 8 miles southwestward from Cape Uganik, is distinctive in appearance as it terminates in three moundlike hills, the inner one being 390 feet high, and the outer one about 188 feet high.

Broken Point, at the eastern entrance to Uganik Bay, is low and flat for 0.4 mile back and then rises to the high land back of it. The outer end of the point is detached and appears as if it had been broken off. A reef which bares on a 2-foot minus tide lies about 250 yards off the point. The point should be given a berth of 0.8 mile.

A stream enters the bay in the bight 1.6 miles southward from Broken Point. Good anchorage sheltered from southerly to westerly winds is off the mouth of the stream in depths of 8 to 15 fathoms.

West Point is a comparatively low rocky cliff which rises rapidly to the high land behind it.

East Point, 5 miles eastward from Broken Point, is the northwest extremity of the peninsula separating Uganik Bay and Passage. A flat rock with bluff sides lies close to the point and from the point is a long gentle slope to the high land.

Rock Point, the southern entrance point of **Northeast Arm,** is marked by several bare rocks which extend 250 yards off the point.

Northeast Arm Light is shown from a small white house on a concrete foundation at the north side of the entrance to the arm. The light, 55 feet above the water, is obscured from 139° to 282½°.

Starr Point is the low rounding point on the northeast side of Northeast Arm where the channel is split by Sally Island. A rock, which is awash at extreme high tide and attached to the shore at low tide, lies a few yards off this point. Deep water is close up to this rock which is marked by a light. The light, shown from a small white house on tower, is 16 feet above the water.

Sally Island, nearly 2 miles in extent, occupies a central position in the basin at the head of Northeast Arm. It is covered by grass and alder bushes and is about 1,100 feet in height.

Sheep Island is a small island just off the southeast point of Sally Island and is connected to it by a gravel spit which is covered at high water.

The Uganik Fisheries' cannery lies east from the north end of Sally Island. In 1941 the least depth was 30 feet alongside the 110-foot face of the wharf. In approaching this wharf care should be taken to avoid the spit which bares 150 yards off a small stream 0.3 mile westward from the wharf. Deep water extends close up to the spit. The San Juan Cannery, located at **Port O'Brien** 1 mile southeast from the other cannery, has a well-built wharf with a least depth of 32 feet alongside in 1941. The wharf is 162 feet long and the face 105 feet. The oil wharf parallel to this main wharf is of equal length with a 30-foot face and had a depth of 20 feet alongside in 1941. Both canneries store

fuel oil, diesel oil and gasoline for their own use. They have some machine shop facilities and scow ways. Tides of 16½ feet are necessary to use these ways. There are no marine railways. Both canneries have an abundant supply of fresh water and operate radio stations during the fishing season.

Deep water surrounds Sally and Sheep Islands except for the narrow passage between Sheep Island and the mainland, where it is nearly bare at low water.

A shoal with a least known depth of 5¼ fathoms, sand and gravel bottom, lies about 300 yards north from the northern tip of Sally Island.

Anchorage may be had off either cannery in about 30 fathoms.

East Arm extends eastward from Uganik Bay 7 miles southward from East Point. It is 1 mile wide at the entrance and over 3 miles long but a flat extends 1.5 miles from its head or 0.3 mile below the unnamed island in the bight on the south side of the arm. Depths range from 15 fathoms at the entrance to 3 fathoms near the flats. A rock 450 yards northwestward from the island near the south shore bares 2 feet at low water. Between this rock and the shore is another rock which bares at low water. A row of four sunken rocks, covered about 2 feet at low water, is reported to lie near the west shore about 0.4 mile southeast of Mink Point and to extend southward about 0.2 mile to the beach. A saltery is on the south shore near the unnamed island. It has a small wharf that goes bare at low water. In approaching the saltery care should be taken to avoid the rocks mentioned above.

East Arm affords an excellent anchorage for vessels of any size in depths from 10 to 15 fathoms, sticky mud bottom. It is subject to heavy williwaws during southerly gales.

South Arm extends 5.5 miles southward from **Mink Point,** the southern entrance point to East Arm. The arm near its head is only 0.2 mile wide. A sunken rock with ½ fathom over it lies 225 yards off the eastern shore 0.6 mile southward of Mink Point. Between the point and the sunken rock is a rock which bares 2 feet at low water, lying 200 yards offshore. Anchorage may be had near the head in 16 fathoms, sticky mud bottom, where the arm is 0.7 mile wide.

Village Islands are numerous islands and rocks 2 to 3.5 miles southward from West Point. A hand cannery is back of the islands. An abandoned native village is in the cove just south of the islands. Anchorage for small craft may be had here in 6 to 12 fathoms, but the approach is over broken ground making it safe for launches only. There are apparently no continuous channels between the various rocks and islands.

Directions, Uganik Bay.—From northward, round Cape Uganik at a distance of 1 mile and steer **222°** for 3.5 miles to a position 1 mile westward of Noisy Islands. Round the islands at a distance of 1 mile and steer **158°** for a distance of 5 miles to a position midway between East and West Points.

From southward, give Cape Ugat and Miners Point a berth of 1.5 miles and Broken Point a berth of 0.8 mile. Then steer **143°** 4 miles to a point midway between East and West Points.

To enter Northeast Arm.—From a position midway between East and West Points steer **163°** for 2.2 miles until the north tangent of the largest and most northerly of the Village Islands is on the starboard beam. Then change to **133°** for 1.8 miles until a small grassy islet is on the port beam, distant about 0.5 mile. Then change to **101°** for 1.5 miles. Then change to **132°,** heading about 0.2 mile off Starr Point. Round

Starr Point at a distance of 0.2 mile or less and continue in mid-channel along the east side of Sally Island to anchorage or wharf.

To enter South Arm.—From a position midway between East and West Points, steer 163° for 2.2 miles until the north tangent of the largest and most northerly of the Village Islands is on the starboard beam. Then change to 190°, heading 0.3 mile off Mink Point which separates East and South Arms. From mid-channel off Mink Point, steer mid-channel courses taking care to avoid the rocks which lie as much as 225 yards offshore for 0.8 mile southward from Mink Point.

To enter East Arm.—Follow courses as above until off East Arm and then enter on a mid-channel course taking up anchorage as desired.

Cape Ugat is on the eastern shore of Shelikof Strait 12 miles southwestward from Cape Uganik. It is a high ridge sloping to a low rocky cliff at the point of the cape. A short distance off the cape is a small rocky grass-covered islet 104 feet high which can be seen for a distance of 15 miles up and down the coast on a clear day. A reef that covers at ⅔ tide lies about 175 yards west of this islet. Between the islet and the cape is a channel used by the local cannery tenders. **Little River** is a meandering stream which enters the strait a short distance southward of Cape Ugat.

Cape Kuliuk, about 5 miles southward from Cape Ugat, is a cliff at the end of a ridge about 2,000 feet high. On the summit back of the cape is a peculiar and prominent clump of rocks.

Uyak Bay is on the eastern side of Shelikof Strait, southward of the mountainous peninsula terminating in Capes Ugat and Kuliuk.

The approach between Cape Kuliuk and Rocky Point is about 11 miles wide, eastward of which the bay converges rapidly to Harvester Island. It extends 25 miles in a southeasterly direction from Harvester Island. The shores of the bay rise in steep slopes to elevations of 2,000 to 4,000 feet, and have many mountain streams. The only timber is some alders in the gulches and some cottonwoods at the heads of the bays. Uyak Bay is an important salmon fishery, and four canneries are located in the bay, two of which were not operated in 1937. The best anchorages in Uyak Bay will be found southward of Harvester Island, and in Zachar Bay.

Chief Point, on the north shore of Uyak Bay opposite Harvester Island, is formed by a grass-covered island about 90 feet high, and has several ridges and small hills. About 0.3 mile west from the northwest point of this island are several rocks bare at low tide. The highest of a group of rocks 0.8 mile southeastward from Chief Point is 110 feet high.

Chief Cove is the narrow strait behind the island forming Chief Point. A rock which bares 6 feet lies in the northern entrance. The southern entrance is very shoal. Depths of 8 to 12 feet are found in the northern part of the cove. It is used as an anchorage by cannery tenders and pile drivers during the fishing season.

Spiridon Bay opens into Uyak Bay northeastward of Harvester Island. It extends 12 miles inland in an easterly direction. Broken ground extends about 1.2 miles northwestward from the point on the southern side of the entrance. The only good anchorages for large vessels in Spiridon Bay are at the head where anchorages may be selected in 13 to 16 fathoms, sand and mud bottom. Care should be taken to avoid the 2¾-fathom shoal lying 0.3 mile off the eastern shore and 1.2 miles southeastward from

Telrod Cove. A temporary anchorage can be had in 16 to 18 fathoms about 0.5 mile northward from Clover Rock. The bottom is volcanic ash, which has the appearance of yellow sand and has fair holding qualities.

In entering Spiridon Bay from the northward, Chief Point should be given a berth of 1 mile. In approaching from the southward, the point separating Spiridon and Zachar Bays should not be approached closer than 1 mile to avoid the rock which lies nearly 0.5 mile off the point. From a position 1.5 miles south from Chief Point steer 097° for a distance of about 8 miles until Ditto Islets are abeam to starboard, distant about 0.3 mile. Then change to 138° and take up anchorage as desired.

Clover Rock is a rocky islet 0.2 mile off the south shore and 1.5 miles from the southern entrance point. It is 34 feet high and is connected to the mainland by a gravel shoal which bares on the minus tides. A large stream enters the bay just east of Clover Rock.

Thistle Rock is a small islet consisting of black jagged rocks about 10 feet high lying a short distance eastward of Clover Rock. It is always bare and affords a good mark in clear weather. A rock which bares at half tide lies about 300 yards northwestward from Thistle Rock.

Ditto Islets, a pair 30 feet high, lie in the middle of Spiridon Bay about 7 miles inside the entrance. The bottom between the pair and the south shore is broken and contains several rocks bare at low water and a rock 25 feet high. A group of islands in a foul area adjacent to the south shore lie southwestward of the Ditto Islets; of these **Anguk Island** is the largest.

Telrod Cove is a small cove on the north side of the bay about 10 miles from Chief Point. It affords good shelter in westerly weather for small craft. The cove shoals rapidly with mud flats at its head. Anchorage may be had in 7 to 15 fathoms, sand and shell bottom. A large stream enters the bay here.

Weasel Cove forms the western arm at the head of Spiridon Bay. It is 0.3 mile in width with depths of 6 fathoms sand and mud bottom. The cove forms excellent anchorage for small craft. To enter Weasel Cove keep from 250 to 300 yards off the western shore and enter the cove in mid-channel, taking up anchorage as desired.

Chart 8822.—Harvester Island, about 9 miles south of Cape Kuliuk and 0.3 mile off the southwestern entrance point to Uyak Bay, is over 1 mile long, 860 feet high, steep sided, and grass-covered. The 20-fathom curve is about 0.3 mile off the northern and eastern sides of the island.

Bear Island, about 1 mile westward of Harvester Island, is nearly 0.4 mile in diameter, 249 feet high, and grass-covered. It lies 0.3 mile from the shore, with which it is connected by a boulder spit, bare at half tide.

Uyak Anchorage is one of the best harbors on the eastern side of Shelikof Strait southward of Uganik Bay, and is easily entered. It lies between Harvester Island and the shore, the passage having a width of 0.3 to 0.4 mile. The depths range from about 7 fathoms between Harvester and Bear Islands to 20 fathoms 0.3 mile northwestward of the site of a former cannery. The best anchorage is about 0.5 mile northwest of the cannery site, in 12 to 14 fathoms. Good anchorage, except with heavy northeasterly or easterly winds, is in the bight 0.3 to 0.4 mile southeastward of the cannery site and 0.3 mile from shore, in 12 to 14 fathoms.

The better and safer entrance is around the south end of Harvester Island. **Cor-**

morant Rock, bare at half tide, lies over 0.6 mile southeastward of Harvester Island and 300 yards from shore. A spit, bare at low water and steep-to, extends 425 yards southward from the south end of Harvester Island. This spit extended 45 yards in the direction of its axis between the years 1908 and 1915.

The end of the spit is marked by a **light,** shown from a red triangular target on a pile dolphin, placed in 12 feet of water. The light is 12 feet above the water and visible 3 miles.

The northwest entrance is 0.4 mile wide between two reefs, partly bare at half tide and marked by kelp, one extending 400 yards westward from the northwest end of Harvester Island, and the other lying 250 to 550 yards eastward from Bear Island. With care this entrance is not difficult in the daytime, especially at low water when the principal dangers show above water.

Uyak is a native village. The cannery on the southwest side of Uyak Anchorage opposite the south end of Harvester Island has been abandoned. The depth is 20 feet at the wharf. There is considerable undertow, and good fore and aft spring lines are needed with westerly weather. Currents are sometimes troublesome in making this wharf.

Tides.—At Uyak Anchorage high and low water occur about 10 minutes earlier than at Seldovia. The diurnal range of the tide is about 14 feet.

Directions, Uyak Anchorage.—From northward, round Cape Ugat at a distance of about 1.5 miles and steer **220°** for 6 miles to a position 2.5 miles off Cape Kuliuk, bearing 102°. Then steer **172°** for 10 miles, giving the eastern shore a berth of about 2 miles, to a position 0.5 mile eastward of Harvester Island.

Then steer **237°**, passing about 0.3 mile southeastward of Harvester Island. Anchor 500 yards northeastward or northward of the slipways, in 10 to 14 fathoms.

To go to the inner harbor, follow the preceding directions, and then hauling northwestward, round the light at a distance of 100 yards, and steer **341°** for the northwest end of Harvester Island, pass 150 to 200 yards off the cannery wharf, and continue the course to mid-channel.

From southward.—Give Cape Uyak, Rocky Point, and Bear Island beths of 1 mile or over, and follow the eastern shore of Harvester Island at a distance of 0.5 mile or more. Then follow directions as given above.

In passing Rocky Point care should be taken to avoid **Wolcott Reef** which lies 0.3 mile off the point and bares only at extreme low water.

Chart 8542.—A rock with 2¾ fathoms of water at low water lies inside the entrance of Uyak Bay about 0.9 mile off the western shore. The position is about 1.9 mile 134° from Harvester Island Spit Light.

Zachar Bay lies about 7 miles southeast true from Harvester Island. It is 0.8 mile wide at the entrance and extends to the southeastward for a distance of 5.5 miles where the bay terminates in an extensive mud flat bare at low tide. This mud flat affords an excellent place for beaching a vessel in an emergency.

Carlsen Point, the southern entrance point, is low and shows as a bluff when off the entrance.

Carlsen Reef is a dangerous reef lying about 0.5 mile northwest from the northeast tip of Carlsen Point. It bares 10 feet at low water.

A dangerous rock with 2¾ fathoms over it, lies about 1.8 miles northwestward from Carlsen Point. It is marked by a buoy moored about 50 yards to the westward of it.

A reduction plant is on the north shore of Zachar Bay 3 miles above the entrance. The plant has a wharf with a 90-foot face and a least depth alongside of 19 feet. Large vessels dock port-side-to. The cannery and wharf 0.5 mile above have been abandoned. The shore plant and wharf of a floating cannery on the south shore of Zachar Bay have been abandoned.

A large stream enters the head of the bay. A number of large cottonwood trees are along the stream. Kodiak bears are numerous in the locality.

Excellent anchorage sheltered from all winds may be had in 12 to 15 fathoms, mud bottom, off the mud flats at the head of Zachar Bay. The anchorage is subjected to moderate williwaws. In anchoring, care should be taken to avoid the mud flats which extend 1.5 miles from the head of the bay.

In entering Zachar Bay, the shore on the port hand should not be approached closer than 1 mile and a course should be laid to pass 250 yards off the buoy marking the 17-foot rock. From this point steer 127° until Carlsen Point is abeam on the starboard hand, then change to 145° and continue, keeping in mid-channel.

Amook Island, formed by a mountainous ridge, divides an 8-mile stretch of Uyak Bay into two passages. The eastern passage is narrow and obstructed in places, and as a through route should be used only by small vessels with local knowledge. Reefs extend 0.3 mile northward from the north end of Amook Island.

The ship passage is westward of Amook Island. **Aleutian Rock,** marked by a buoy on its southwest side, lies 0.3 mile off the southwest shore of Amook Island, in the southern end of this passage. This dangerous rock bares 1 foot at low water, and does not have any kelp around it. Vessels should pass between Aleutian Rock and Alf Island. The steamship *Aleutian* was lost here in 1929.

A cannery is on the west shore of Uyak Bay opposite the south end of Amook Island.

In the bight on the western side of Amook Island, 2.5 miles from its north end, is an anchorage for a small vessel, in about 10 fathoms, with shelter from easterly and southerly winds. The bottom is uneven with a possibility of dangers. The entrance is between the south point of the bight and a bare rock lying 0.6 mile northward from the point and 0.5 mile from Amook Island. Between this rock and the island is a reef, partly bare at low water, which extends 0.5 mile southeastward from an islet.

The passage eastward of Amook Island for a distance of about 2.5 miles from its north end has suitable depths and sufficient width for anchoring vessels of moderate size. The passage then narrows to 300 yards, and from the point on the eastern side a kelp-marked reef extends westward and northwestward more than halfway across, leaving a narrow channel between the reef and the western shore. Near the northwest end of the reef is a bare rock. An anchorage for small vessels may be found on the west side at the south end of the narrows, around the point, in 5 to 8 fathoms. A small vessel can also anchor 300 yards off the narrow entrance of the shallow lagoon 0.4 mile northeastward of the point of the narrows, in 5 to 6 fathoms. A 2¼-fathom spot lies about 500 yards off the lagoon entrance.

Thence for a distance of 2 miles the passage is clear to the second narrows. Here a spit partly bare at low water extends halfway across from a low grassy point on the west side and leaves a channel 125 yards wide between the southeast end of the spit

and an island. The channel is westward of this island and the next island 0.4 mile southward, and the western shore should be favored until over 0.2 mile southward of the southern island. Southward of this point the passage is clear. Some prospecting has been done on the east side of the passage 2 miles from its south end.

During the fishing season a floating cannery is usually moored near the old mining camp on the east side of the strait.

Lying 0.8 to 2.5 miles southward of Amook Island is a chain of islands with foul ground between them and about 300 yards off the northwest end of **Alf Island.**

The safer and recommended passage is eastward of the chain composing Alf Island. Broken bottom extends about 300 yards into the passage from the central islets of the chain and directly opposite a reef extends 200 yards from the eastern side of the passage, but the reef is marked at its outer end by a bare rock visible at all times.

At the south end of the chain of islands is a small inlet in the west shore about 0.8 mile long and 300 yards wide, affording anchorage in about 12 fathoms.

From 3 to 6 miles southward of Alf Island, Uyak Bay shoals gradually from 20 to 7 fathoms and anchorage may be selected in any depth desired. The swinging room is about 1,400 yards in diameter.

The upper end of Uyak Bay is bordered by high snow-covered mountains and is a well-known hunting ground for the large Kodiak brown bear.

Chart 8822.—Larsen Bay (*pop. 53 in 1950; P. O.*) is on the western side of Uyak Bay, 6 miles southward from Harvester Island. Depths are 30 to 40 fathoms near its northern side and less on the opposite side. From its head, a trail leads over a low divide to the Karluk River. A large cannery is maintained by the Alaska Packers Association in the bight just southward of the inner south entrance point. Gasoline, fuel, and diesel oils are stored, and a machine shop is maintained for cannery use. A radio station is maintained during the fishing season, call letters KHA. The marine railway can haul vessels of 100 gross tons with maximum draft of 20 feet.

The entrance is through a narrow crooked channel and is marked by daybeacons built and maintained by the cannery company. A reef which bares at low water lies in mid-entrance and is marked by an obstruction buoy. The spit which extends southward from the northern entrance point is marked by a pile dolphin.

The channel between the mid-entrance reef, marked by a buoy, and the 20-foot elevated rock, 200 yards southeastward from it, is marked by a range. The front mark is a dolphin on the flats bearing a yellow wheellike device, and the rear mark is a yellow circular disk painted under the gable of a building. This channel carries a least depth of 24 feet on the range.

A good **anchorage** for larger type vessels will be found about 400 yards northwestward from the small island on the south side of the bay, and about 700 yards off the cannery wharf in depths of 20 fathoms, mud bottom. In westerly weather winds blow down the bay with great force, but the holding ground is good. In former years the cannery company moored its sailing vessels here during the summer months.

Directions.—Small vessels can enter Larsen Bay at any stage of the tide, but large vessels should choose a high-water slack with calm weather for entering or leaving.

Enter on the range, yellow dolphin on a yellow circle painted under the gable of a cannery building, and pass midway between the reef marked by the buoy and the 20-foot rock, 200 yards southward from it. Hold this range, 248°, until within about 300

yards of the yellow dolphin and then make good a 292° course passing 100 yards off the pile dolphin at the end of the spit on the starboard hand and 150 yards off the inner entrance point on the port hand. When the inner south entrance point is a little abaft the beam change to 263° for 0.3 mile, then haul southward and take up anchorage as desired.

A deeper channel exists on the north side of the reef marked by the buoy, but the use of this channel necessitates a more difficult turn, and for this reason the channel south of the red daybeacon is recommended. A range of the yellow dolphin on the twin cannery stacks marks the northern channel.

A strong tidal **current** sweeps through the entrance with an estimated maximum velocity of 4 to 5 knots.

The wharf is built out over the shoal water and is 1,035 feet long and has a depth of 8 feet at its outer end. A 5-ton crane is on the wharf. Fresh water is available through a pipeline.

Chart 8541.—Sevenmile Beach is the long boulder-strewn beach from Bear Island to Rocky Point. It is backed by low cliffs from which a broad grassy valley extends back several miles toward Karluk Lake.

Rocky Point is a double point on the south side of the approach to Uyak Bay. It consists of bold cliffs which rise rapidly to the ridges of which the point is a termination.

Wolcott Reef is a dangerous group of rocks that bare at extreme low tide. It lies 0.3 mile off the easterly spur of Rocky Point. A channel is between the reef and the point with a least known depth of 4 fathoms. This channel is used by local cannery tenders in fine weather. A horizontal-banded buoy is 0.2 mile west of the reef.

Cape Uyak, on the east side of Shelikof Strait about 4 miles southwestward from Rocky Point, is a precipitous, high headland at the end of a ridge. From the water the slope is rapid to an elevation of 647 feet. There is then a slight fall to a deep notch in the narrow neck back of the cape, from which there is a rise in steep, grassy slopes to higher land. **A light (lat. 57°38′.3 N., long. 154°21′.3 W.),** shown from a small white house, is 93 feet above the water, and marks the end of the cape. The light, visible 12 miles, is obscured from 260° to 039°.

Northeast Harbor is the bight on the south side of Cape Uyak. In northeast weather it affords excellent shelter for small craft that can anchor close under the shore in 3 to 5 fathoms, sandy bottom. Larger vessels anchor farther out in 9 fathoms with some protection but subject to an uncomfortable swell.

Between Cape Uyak and Karluk are two long cliffs about 1,300 feet high, the southern one having a marked slide extending from its highest point almost to the water. In the valley between the cliffs are two waterfalls. Beach seining is carried on here during the season, and a number of shacks used by fishermen are on the beach at the foot of the cliffs.

Chart 8822.—Karluk (*pop. 144 in 1950; P. O.*) lies 5.5 miles southward from Cape Uyak and 1½ miles eastward from Cape Karluk. It is a native village with a school and a church. Fishing is the principal industry. The old cannery buildings are still standing but they are no longer used, as the fish are now taken to Uyak Bay for canning. A strong set southward toward the shoals inshore has been experienced.

A radio station operated by the Alaska Packers Association, call letters KYK, is operated throughout the year.

The entrance to **Karluk River** is through a narrow channel at the south end of a spit and is only passable by launches at high water. Some wharves are just inside the mouth. About 1.5 miles up the river is a weir where the salmon are counted as they ascend the river. The weir is removed during the winter season.

Karluk Anchorage off Karluk is sheltered from offshore winds but is exposed to winds from the southwest around through west to northeast. Vessels should be prepared to move on short notice. Anchorage may be had off the town in 12 to 14 fathoms, sandy bottom. During the fishing season a number of scows and launches will usually be found moored in the roadstead.

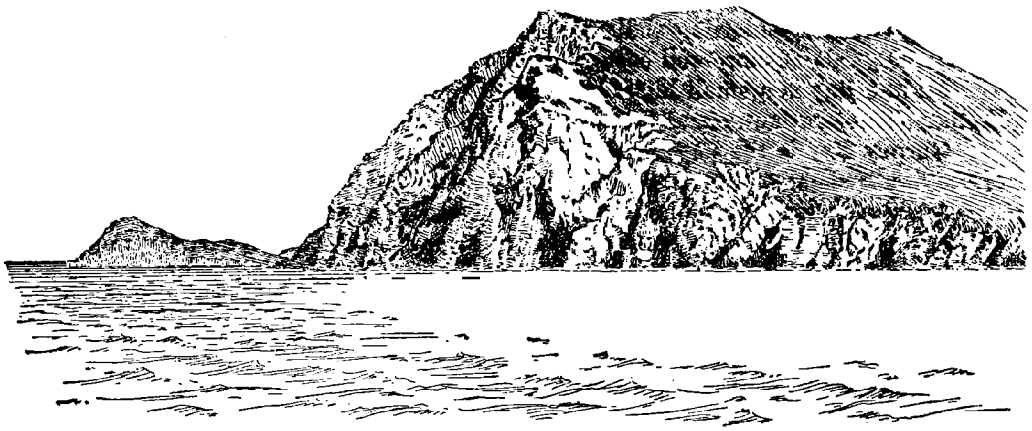
The abandoned cannery buildings and the Greek Catholic church, with its green roof and dome, are the principal objects to be seen in approaching Karluk.

Tanglefoot Bay is the bight adjacent to Cape Karluk on its eastern side. It is separated from Karluk by a high cliff, the base of which is not passable by pedestrians at high water. **Tanglefoot Beach** is very steep and has a bad undertow. Landing here is dangerous if there is any surf.

Chart 8541.—Cape Karluk is the most conspicuous landmark along the west coast of Kodiak Island. The cape is a prominent, projecting head, 1,398 feet high, with bare rock cliffs on its seaward face and grassy slopes on its eastern side to low land. It is readily identified by its cone-shaped appearance, a notch in the summit, and the low land behind it.

Sturgeon River has its mouth about 2 miles southward from Cape Karluk. The entrance is between 2 shingle spits covered with driftwood. It can be entered by small boats at half tide or better. For about a mile back of the beach the river flows through a mud flat, all of which is covered at high water.

Sturgeon Head is a high whitish eroded headland 5 miles southward from Cape Karluk. Several rocks and reefs lie as much as 200 yards offshore at the foot of Sturgeon Head.



Sturgeon Head from the southwest with Cape Karluk in the distance

Cape Grant lies about 10 miles southward of Cape Karluk and is a rugged headland at the end of a high ridge, the summit of which is marked by a small cluster of peculiar pinnacle rocks.

A rock nearly awash at low water lies 0.3 mile off the southwest tip of Cape Grant. Shoalwater extends some distance beyond this rock and vessels rounding the cape into Halibut Bay should give it a berth of 0.8 mile.

Halibut Bay is the large bight lying just southward from Cape Grant. The bight is bordered by eroded bluffs and a broad sand beach. A stream enters the sea at the southern part of Halibut Bay. Vessels anchor in 7 fathoms, hard sand bottom, 0.8 mile off the beach. Small craft may find more protection by anchoring closer in near the mouth of the lagoon.

Anchorage can also be had in the northern corner of the bay, but care should be taken to avoid the reef which makes out from the southwest tip of Cape Grant.

A cannery in Halibut Bay, at the entrance to the lagoon, is operated by Alaska Red Salmon Packers, Inc. The cannery wharf dries at low water. Radio communication may be had through Kodiak (WXF).

Middle Cape, the westernmost promontory on Kodiak Island, consists of two headlands having precipitous, rocky cliffs facing the sea, and smooth grassy slopes facing inland. The northern headland is the higher, being a little over 1,000 feet in elevation. Its summit consists of three rocky clumps, the middle one of which is the highest. These rocky clumps are prominent and easily distinguished from the northward.

A prominent high pinnacle rock lies at the foot of the northern slope of Middle Cape.

Tombstone Rocks consist of two detached rocks about 100 yards apart lying 0.8 mile off Middle Cape. The southerly rock is 99 feet high while the northerly rock is only a few feet high. From some directions these rocks appear as the headstone and footstone of a grave. Deep water is close to the rocks.

Mushroom Reef, which bares 13 feet at low water, lies about 0.3 mile offshore and 1 mile southeastward from Middle Cape. This rock when exposed by the tide is round and has the appearance of a huge mushroom. Deep water is close up to it.

A prominent pillarlike shaft of rock 170 feet high with overhanding sides, lies about 100 yards offshore and east true from Mushroom Reef.

Middle Bay is a small bight lying about midway between Middle Cape and Cape Ikolik. The 5-fathom curve lies about 0.3 mile off the beach.

Gurney Bay is the bay immediately northeastward from Cape Ikolik. The head of the bay is shoal with a sand beach strewn with boulders.

Anchorage may be had in 10 fathoms, sandy bottom, midway between the two entrance points. This is a comfortable and secure anchorage in easterly weather.

Chart 8540.—Cape Ikolik, 4 miles southward of Middle Cape, is a rugged headland 980 feet high, with its summit forming a ridge lying in a northeast and southwest direction.

Outer Seal Rock, lying 1.8 miles westward from Cape Ikolik, resembles a sail and is 89 feet high. The rock has deep water close-to except about 200 yards to the southwest where there are sunken rocks. Outer Seal Rock is a sealion rookery.

Inner Seal Rock, which lies 0.3 mile west from Cape Ikolik, is a steep-sided bare rock 125 feet high, surmounted by a rocky nub which gives it the appearance of a lighthouse. From some directions it appears as a huge bell.

Bumble Bay lies 2.5 miles east of Cape Ikolik. The western point of the bay is marked by three pinnacle rocks, while the eastern point is marked by a single pinnacle rock 127 feet high. Small craft will find shelter from easterly winds in the eastern part of the bay, while large vessels will find anchorage in the center of the bay in 12 fathoms, sand bottom.

Ayakulik Island is small and about 220 feet in height. A reef extends eastward from the east point of the island to a sand spit on the mainland of Kodiak Island. At a distance of 300 yards west and north of the island are bare rocks and rocks awash.

Small launches will find shelter in southeasterly or easterly weather in 5 fathoms, 300 yards northeast of the island. Larger vessels will find shelter from easterly weather in 7 fathoms, 0.5 mile north of the island.

Ayakulik River, known locally as **Red River,** discharges at a point 1.8 miles southeast of Ayakulik Island. With local knowledge, the river can be entered at high tide in smooth weather by small launches. The Fish and Wildlife Service maintains a station here during the salmon season.

From a point 3 miles north of Ayakulik Island to Low Cape, the shoreline runs in a nearly north and south true direction and is marked by earth bluffs varying from a few feet to 267 feet in height.

Ikpik Hill, a prominent high dark-colored earth bluff, lies a little over 3 miles north of Low Cape, and in approaching from Cape Ikolik, this bluff is apt to be mistaken by a stranger for Low Cape.

Low Cape, lying 11.5 miles 323° from Cape Alitak, is the western extremity of the low land in this vicinity. The extremity of the cape is marked by a peak-shaped, light-colored earth bluff about 90 feet high. A spit, bare at low water, extends nearly 0.3 mile off the cape. The water deepens gradually, the 10-fathom curve lying 2.3 miles off the cape.

From a position 2 miles westward of Low Cape a heavy kelp bed extends in an east-southeasterly direction. Soundings in this kelp showed depths of from 3 to 7 fathoms, but much shoaler water probably exists. Low Cape should be given a berth of about 3 miles.

Sukhoi Bay has its entrance about 6 miles south of Low Cape. The entrance is narrow and lies between two sand bars. It has a depth of about 6 feet, but should not be attempted except with local knowledge.

The coast from Low Cape to Cape Alitak apparently has no offlying dangers.

Cape Alitak has been described earlier in this chapter.

Directions, Cape Karluk to Cape Alitak.—From a point 2 miles off Cape Karluk, steer **222°** for 5.5 miles to a position with Sturgeon Head (a high white eroded cliff) abeam. Then change to **213°** for 11.5 miles until Tombstone Rock is on the port beam, distant 2 miles.

Then change to **196°** for 4 miles or until Outer Seal Rock (a sail-shaped pinnicle) is a little abaft the beam, distant 2 miles.

Then change to **154°** for 23.3 miles to pass 2.8 miles off Low Cape. On this course Low Cape should be passed in a depth of 14 fathoms.

When Low Cape bears 083°, distant 3 miles, haul to **132°** for 12.5 miles, passing about 1.3 miles off Cape Alitak, to a position with the cape bearing 010°, distant 1.5 miles.

If bound to Alitak Bay, follow directions given in the description of that place.

CHAPTER 6

Alaska Peninsula

Charts 8502, 8802

GENERAL REMARKS.—The south coast of the **Alaska Peninsula,** from Cape Douglas to Cape Pankof, has a length of about 425 miles. It is irregular and greatly broken by numerous indentations affording anchorages. Many of its points are rugged cliffs of great height which cannot be approached too closely on account of reefs at their bases, while others are low with more or less shoal water off them.

The mountains on the peninsula are high, irregular, and bold, and many of the peaks reach heights of 2,000 to 9,000 feet.

The run from Shelikof Strait to the Shumagin Islands is one of the most difficult in Alaska, because of prevalent thick weather and unknown currents. The current effect in the general locality of Foggy Cape is particularly confusing.

In 1943, reconnaissance lines of soundings disclosed no dangers to navigation along a strip 5 miles wide from Shelikof Strait to 8 miles southeast of Foggy Cape Light; thence to 5 miles southeast of the east end of Mitrofania Island; thence to Gorman Strait in the Shumagin Islands.

Pavlof Volcano, the most prominent of several on the peninsula, is on the west side of Pavlof Bay, and has three symmetrical peaks in a general north and south line. The middle and highest peak rises to about 8,300 feet and has been in active eruption several times in recent years. It smokes frequently.

Frosty Peak, a conspicuous snowcapped mountain near the southwest end of the peninsula, has several peaks, one of which rises to 5,820 feet. Its outline is irregular.

Many lakes and sizable streams are found inland and there are several portages across the peninsula and between the adjacent bays. Occasional settlements, canneries, and fishing stations are scattered along the coast and among the offlying islands. Numerous offlying islands and groups of islands have navigable passages between them and good harbors on their coasts.

Weather.—At Chignik, on the Alaska Peninsula just north of the Shumagin Islands, the winds are extremely variable. In early winter they are from the northwest and west, and in January and February they are from the southeast. The winds are most frequently from directions between southeast to southwest from March until September, when they shift through west and west-northwest to northwest by November. Gales are frequent in winter, with strong winds blowing from the Bering Sea through the mountain pass over Chignik Lake. The winds recorded at Unga and

Pavlof Islands in the Shumagins are most frequently from southwesterly directions in summer and from southerly directions in winter. Southwesterly gales occur at times during the fall, winter, and spring.

Along the lower coast of the peninsula the winds are most frequently from directions between west-northwest and north-northwest in the fall and early winter, and are generally from the southeast during the remainder of the year. The average velocity at Cold Bay is 16 knots, with stronger winds frequently occurring.

The strong northwest winds are usually accompanied by clear weather. The southeast and southwest gales of summer are usually accompanied by rain and thick weather. Strong winds draw in and out of the various bays and inlets and a ship coasting will often experience a variety of weather in a short distance.

The annual amount of rainfall along this coast is extremely variable, ranging from 48 inches at Coal Harbor to 151 inches at Chignik. The annual total snowfall is 57 inches at Coal Harbor and 60 inches at Chignik. Snow may fall at the water level until June and on the peaks until late in the summer. It extends far down the slopes at the close of September and may be expected at the water level early in October.

All harbors on the south side of the peninsula are free from ice and open to navigation throughout the year. Pack ice has been known to drift through Isanotski Strait and interfere with navigation in Ikatan Bay.

The mean annual temperature on the east side of the peninsula ranges from 37° F. at Chignik to 42° F. at Coal Harbor. At Coal Harbor an extreme high of 80° occurred in July and a low of −19° occurred in February. Ocean water temperatures are 1° to 2° above air temperatures in winter and slightly lower than the air in mid-summer.

Though fog may be encountered along this coast at any time during the summer months, it is more prevalent during the months of June, July, and August. The southeast winds bring in the fog from the great fog banks that lie in the North Pacific. Fog often hangs about the headlands and entrances to bays when the upper parts of the bays are clear. Fogs are reported at Chignik on about 7 days each year. At Cold Bay, fog is least frequent during the autumn and most frequent during the months of July and August.

There is usually a considerable amount of cloudiness over the area. Cold Bay averages 65 percent of the sky covered during the year. Thunderstorms have been reported at Cold Bay but they are apparently rare as no reports of thunder are noted at other stations in the area.

With the exception of an occasional fine summer, the weather of the Alaska Peninsula can be classified as bad, and the difficulties of navigation are many.

Currents.—A continual current of considerable strength follows the coast all the way from Shelikof Strait to the Aleutian Islands. This westward current is considered an eddy which accompanies the general eastward drift across the Pacific southward of latitude 50° N., and forms a part of the general circulation of the North Pacific Ocean.

The current along the Alaska Peninsula has been called a warm current originating in the Gulf of Alaska and it doubtless assists in causing the southern side of the peninsula to be warmer than the Bering Sea side. It is also well known that the islands off this coast have a milder climate than the mainland; almost the entire population of the area is found on them as a result.

The coastal current searches out all the passages, large and small, between and

around the many islands, and in some of them it becomes strong enough to be important. An approaching northeast storm gives warning by strengthening this current; in many places the current will indicate northeast weather a day before the barometer falls. Westerly winds weaken the current.

On three runs between Chirikof Island and Castle Rock, a survey ship experienced a southerly set indicating an average strength of current of 1½ knots.

The tidal currents in the vicinity of the south coast of the Alaska Peninsula are strong in many of the constricted passages. In the open waters offshore they are generally weak.

Kelp.—The navigator cannot rely on seeing kelp on rocks and shoals; many rocks and gravel banks bear no kelp, especially in early or late summer. Many others have only a light growth of thin ribbon kelp which cannot be seen until the vessel's stem enters it, and which is often drawn under by currents or seas.

Commerce.—Many vessels use the south Alaska Peninsula passage in voyages between southeast Alaska and Bering Sea. From March to September, vessels of the Pacific American Fisheries make regular trips from Bellingham, Washington, to the canneries. These vessels are common carriers. Practically all the canneries operate radio stations during the fishing season. Government radio stations are located at Kodiak and Dutch Harbor.

Local magnetic disturbance, generally not exceeding 1°, is frequently encountered in the waters about the Alaska Peninsula. It has been reported in the passage between Dolgoi and Goloi Islands, and off King Cove. Unusual magnetic disturbance has been observed on the shore near Arch Point, on the eastern shore of Belkofski Bay and on Vodapoini Point; all on Chart 8703.

Chart 8556.—Cape Douglas, the mainland promontory on the western side of the northern end of Shelikof Strait, is a grassy peninsula about 3 miles long and 190 feet high. At its western end it breaks off in a bluff to a low, narrow neck which connects it to the mainland. Rocks bare at low water extend about 0.5 mile eastward from the cape.

NOTE.—Cape Douglas and other prominent points and most offlying islands on the western side of Shelikof Strait are correctly charted with respect to the surveyed coast of Kodiak and Afognak Islands. Otherwise this stretch is inadequately surveyed.

The bight west of Cape Douglas affords anchorage, sheltered from northerly and westerly winds, in 6 fathoms, sand bottom. There is some shelter from northeasterly winds, but if heavy, some swell rolls around the point. A stream enters the northeast end of the bight at the foot of the bluff, and this part of the bight is dry at low water nearly out to the southwest end of Cape Douglas.

Mount Douglas, 7,064 feet, and **Fourpeaked Mountain,** 6,903 feet high, are snow-covered mountains west and southwest, respectively, of Cape Douglas.

Douglas Reef, 5.5 miles south of Cape Douglas, is about 2 miles in diameter. The reef is partly bare at low water, and near its middle is a rock 28 feet high. A sounding of 6¾ fathoms with 40 to 60 fathoms close-to was obtained 1 mile 081° from the rock. Two rocks, close together and awash at high water, are 2.8 miles southwestward from Douglas Reef and 1.5 miles from shore. A reef bare at low water extends about 0.8 mile southeastward from them. About 10 miles southward of Cape Douglas is a point marked by a hill 673 feet high. In the valley south of the point is

a small glacier. Lying 1.2 miles from the point and 168° from the hill is a rock awash at about half tide. There is no kelp on the rock, and the sea seldom breaks on it when it is covered.

Two kelp patches are about 1.5 miles southwestward of the preceding rock and the same distance from shore. The kelp shows well only at low water, and the sea seldom breaks on the rocks.

Kiukpalik Island is 17.5 miles south-southwestward of Cape Douglas and 2 miles from shore. It is 1.3 miles long, 155 feet high, nearly level, and grass-covered. A shoal scantily marked by kelp is about 0.5 mile northwest of the island, and the channel between them is not safe. Temporary anchorage, with shelter from easterly winds, can be had in the bight on the west side of the island, in 8 or 9 fathoms, muddy bottom. The mainland opposite the island should be avoided, as there is a possibility of shoals on that side.

Shakun Rock, a prominent dark pinnacle 50 feet high, is 5 miles 232° from Kiukpalik Island. From the rock, a semicircular reef partly bare at low water extends southward and westward to the south end of the chain of grass-covered **Shakun Islets.** Between the rock and the islets is foul ground, and apparently they are joined to the mainland by a reef.

Swikshak Bay is a lagoon which is practically closed at all stages of the tide. The entrance is about 200 feet wide.

Kaguyak is a village behind a large bare rock, which is joined to the beach at low water. Approaching from southeastward, a Coast Guard vessel anchored in about 7 fathoms, hard sand bottom, with Cape Chiniak bearing 205°, Shakun Rock 086°, and the settlement rock 346°. Between Cape Chiniak and Shakun Rock the bottom was found to be uneven, depths 10 to 20 afthoms, mud and hard sand alternating.

Cape Chiniak, the north point of Hallo Bay, is 7.5 miles northward of Cape Nukshak. It has a high hill near its end.

Hallo Bay has not been examined except near Cape Nukshak.

Ninagiak Island, in Hallo Bay, has a knob with an estimated height of 200 feet. A rock bare at low water is about 0.8 mile eastward of the island.

A reef, about 1.2 miles long east and west, is in Hallo Bay about midway between Ninagiak Island and Cape Nukshak. The reef is bare in places at low water, is covered at high water, and has no kelp.

Cape Nukshak, 36 miles southwestward from Cape Douglas, is flat and grass-covered to the foot of a prominent sharp peak. Just off the cape is narrow **Nukshak Island,** which is 0.5 mile long, 133 feet high, and has two knolls. Between the island and the cape is a narrow passage about 75 yards wide that has a depth of 5 fathoms in mid-channel. A prominent pinnacle is close to the west end of the island. Anchorage and shelter from westerly winds can be had 0.2 mile south of the island in depths of 10 fathoms, sandy bottom.

A large reef, covered at high water, lies 0.5 mile off the mainland and 1.8 miles southwest of the outer end of Nukshak Island. A rock, covered 3 feet at low water, is 0.6 mile east-southeastward of the reef and is not marked by kelp. From Cape Nukshak to Kukak Bay the cliffs along the shore are irregular and numerous high-water and submerged rocks extend a mile from shore.

Yugnat Rocks, about 3 miles southwest of Cape Nukshak, are several prominent

rocks about 20 feet high. The area around the rocks is foul and ships are warned to keep outside the 20-fathom curve.

Chart 8851.—Kukak Bay, between Cape Nukshak and Cape Ugyak, has depths as great as 67 fathoms and extends inland about 6 miles. The entrance is 0.6 mile wide and is easy of access. The shores are steep in most places and anchorage area is limited.

Kukak Point is about midway between Yugnat Rocks and **Tiny Island,** which is on the north side of the entrance to the bay proper. The low grassy point was the site of the Indian village of **Kukak;** in 1949 there was no visible trace of the village. A reef extends 0.5 mile southeastward from Kukak Point.

Devils Cove, between Kukak Point and Tiny Island, has a flat muddy bottom and depths of 4 to 7 fathoms. There is a waterfall at the western end of the cove. Entrance to the cove is obstructed by three reefs which are covered at high water. The best passage into the cove is between the westerly reef and Tiny Island. Strangers are cautioned not to enter unless the reefs are visible.

On the south side of Kukak Bay are two islands; **Aguligik Island** is just inside the entrance and **Aguchik Island** is near the head of the bay. A salmon and clam cannery is located in the small cove opposite the eastern side of Aguligik Island. The face of the cannery dock bares at extreme low water.

Cannery tenders anchor in a small bight south of Aguligik Island in depths of 28 fathoms, mud bottom. A large anchorage is available south of Aguchik Island in depths of 10 to 20 fathoms, mud bottom. Both anchorages afford good protection against wind and swell. The holding bottom is good. The maximum range of tide is about 17 feet. Currents are negligible.

A submerged rock, covered about 8 feet at low water, lies near the center of the inner part of Kukak Bay. The rock is 0.5 mile from the north shore, 0.8 mile from the south shore, and about midway between Aguligik and Aguchik Islands.

Chart 8556.—Devils Desk, Kukak Volcano, Mount Stellar, and **Mount Denison** are high snow-covered peaks on a ridge about 10 miles northwestward of Kukak Bay.

Cape Ugyak, 8 miles southwestward of Cape Nukshak, is the east end of the mountainous peninsula between Kukak and Kaflia Bays. **Kulichkof Island** is a small grass-topped rock 0.2 mile north of the cape.

The area north of Cape Ugyak is foul for a radius of about 1 mile. Bare rocks, sunken rocks, and reefs are numerous. A rock awash and not marked by kelp is 1.3 miles north-northwestward from Kulichkof Island and 0.8 mile off the mainland. A rock, covered 12 feet at low water, is 0.8 mile north-northeastward from Kulichkof Island; a small patch of thin kelp is visible only at extreme low tides. A small rock, covered 1 foot at low water, is 0.3 mile northeast of Kulichkof Island; a small patch of kelp is visible on the lower tide.

Kaflia Bay, between Capes Ugyak and Gull, has at its head two small basins with depths of 20 to 35 fathoms in the middle and joined by a very narrow channel. The first basin has a narrow entrance, reported to bare at low water. The channel is south of an islet in the entrance and apparently on either side of a rock which bares at low water.

Cape Gull is a bold headland, terminating in a cliff 503 feet high. Temporary

anchorage can be had in the cove on the south side in 9 fathoms, sandy bottom. The south point of the cove is a rocky islet about 15 feet high.

Cape Kuliak is the outermost headland on the mid-section of Shelikof Strait's western shore. The cape rises gradually from a crumbling bluff at the end to high mountains inland. Between Capes Kuliak and Atushagvik is **Missak Bay,** nearly 4 miles long, which has not been sounded. A bare rock is 300 yards off a prominent point on the north shore. Rocks bare at low water are 600 yards southeastward and 0.5 mile westward from the point.

Cape Atushagvik is 4.2 miles 225° from Cape Kuliak. It has a low bluff at the water, and rises in a gentle slope to a prominent knoll, 904 feet high, with a decided saddle between it and the higher land farther back. A kelp patch is nearly 0.4 mile southeastward of the cape.

Between Capes Atushagvik and Ilktugitak are Kinak and Amalik Bays. **Kinak Bay** is 8 miles or more long and nearly 3 miles wide at the entrance. It is clear of islands, except off Amalik Bay on the southwest. On the northeast side of the bay, 1.5 miles inside Cape Atushagvik, is a low peninsula 0.6 mile long, with a bluff 150 feet high near its end. **Russian Anchorage,** on the northwest side of the peninsula, has good holding ground, 300 to 500 yards from shore, in 10 to 18 fathoms, muddy bottom. Fresh water can be obtained by boat. The bay has been sounded to the anchorage, and the only directions necessary are to give Cape Atushagvik and the islands on the southwest a berth of about 1 mile.

Amalik Bay, on the north side of Cape Ilktugitak, is separated from Kinak Bay by a high peninsula. It is unsurveyed but is known to have secure anchorage at its head. Takli Island is in the entrance. About 0.6 mile northeastward of Takli Island is an inner chain of islands which extends 1.5 miles southwestward from the high peninsula. On the north and west sides of this chain is a basin about 0.4 mile wide with the anchorage at its north end. On the west side of the basin is the inlet to a landlocked inner basin known as **Geographic Harbor.**

The entrance to Amalik Bay from southwest of Takli Island is 0.6 mile wide and apparently clear. The channel follows the western shore through the basin and along the western side of the inner chain of islands. From Kinak Bay a channel along the shore of the high peninsula passes north of the outlying islands and between Takli Island and the inner islands.

Takli Island is nearly 2 miles long, its eastern part being low, broken, and rocky. At its western end, a hill 455 feet high has a sheer drop to the water. A chain of reefs and rocky islands extends 1.5 miles eastward from Takli Island. The passage between them and the islands 1 mile northward is dangerous and should be avoided.

NOTE.—Much of the coast from Amalik Bay to Chignik Bay is unsurveyed. Notes on the unsurveyed portions are from the most reliable sources available, but should be used with caution.

This section of the coast is still covered with the yellow volcanic ash from the Katmai eruption of 1912, and is almost devoid of vegetation. It has the appearance of a desert.

Cape Ilktugitak, just southward of Takli Island, is fairly low, but rises rapidly to the high land back of it. Between the cape and Takli Island is a small islet. The chart shows a group of rocks 2.5 miles southeastward from the cape, but a survey steamer saw no indication of the rocks when in the vicinity in 1929.

The steamer *Golden Forest* was lost on the south side of Cape Ilktugitak in 1929.

Dakavak Bay is a large open bay between Cape Ilktugitak and Katmai Bay.

Katmai Bay is an exposed and rocky roadstead which can only be used in northerly and northwesterly weather. The north part is foul, as represented on the chart. A shoal, showing kelp, on which a depth of 6 fathoms was obtained, is reported to lie about 3 miles off the coast and 9 miles eastward of Katmai.

Katmai River, previous to the eruption of Katmai Volcano in 1912, could be navigated by launches at high tide as far as the now abandoned village. From last reports, the river was choked with pumice, which washes down from the higher slopes faster than the stream can dispose of it. Steam and smoke from volcanic activity of the region generally hang over the vicinity, obscuring the higher ground in a murky haze.

The area in the vicinity of Katmai Volcano from Cape Douglas to Cape Kubugakli is the **Katmai National Monument.** The most spectacular feature of the monument is the mountain-encircled **Valley of Ten Thousand Smokes** in the northwestern portion of the reservation. Here the ground is broken open, giving vent to several million fumaroles or little volcanoes, from which rise jets of steam. Some of the jets throw their steam a thousand feet into the air, and hundreds of others go up to a distance of 500 feet, all merging above the valley into one colossal cloud.

The inner part of **Kashvich Bay** is foul and the outer part does not afford shelter.

Katmai Volcano, 7,500 feet high, is part of a high ridge and is not easily distinguishable from Shelikof Strait. In 1912 this volcano gave vent to a violent eruption, the initial stages lasting three days, during which several cubic miles of material were emitted. This eruption was of such violence as to rank in the first order of volcanic explosions. The volcano is now quiet and in its crater is a lake over a mile long and nearly a mile wide.

Mageik Volcano, 7,250 feet high, is about 10 miles southwestward from Katmai Volcano. It has a more definite summit and can be easily identified from the strait.

Cape Kubugakli is bold and rises rapidly to **Mount Kubugakli,** a prominent mountain with two summits. The 2,920-foot southerly peak is the higher.

The southern and open part of **Alinchak Bay** is foul to the head. Although there are probably many reefs and pinnacles around the entrance to the north arm, it is reported to afford good anchorage, but should not be attempted without local knowledge.

Cape Kekurnoi, between Alinchak and Puale Bays, is fairly low, but rises gradually to elevations of over 1,500 feet. Reefs and rocky islets extend 3.5 miles southward from the southwest tip of the cape. There are bad tide rips off these reefs, which is frequently the case along the west side of Shelikof Strait.

Puale Bay is open to the south and is only partly protected on the east by the reefs and islets extending south from the Cape Kekurnoi. The northern shore has low rocky bluffs and small rocky beaches. The western shore has two long sandy beaches separated by a rocky bluff 400 feet high. The southwestern shore is formed by the bold rocky bluffs of Cape Aklek.

The eastern and northeastern sections of the bay have numerous dangerous rocks and reefs. The western portion has fairly regular sand bottom. Reefs and kelp-covered rocks extend 0.2 to 0.4 mile off the eastern side of Cape Aklek.

Directions, Puale Bay.—From sea steer for the highest point on Cape Aklek when it bears **325°.** On this heading the bottom is irregular, with depths varying from 20

to 55 fathoms. Continue on this heading until the northwest tangent of the cape bears 347°. Then steer **015°** for 4.5 miles in depths of 40 to 60 fathoms to latitude 57°42′ N., longitude 155°31′ W. From this point the vessel can proceed to a variety of anchorages in the inner bay. By steering **338°** for 4.5 miles the vessel will find anchorage near the head of the bay in 10 fathoms on even sand bottom; on this heading the depth decreases quickly to 20 fathoms and then slowly to 10 fathoms. If seeking shelter from southerly winds and seas the vessel may run 2.5 miles on course **276°** in depths shoaling quickly to 15 fathoms to anchorage in 10 fathoms. Protection from easterly to northerly winds may be found by steering **075°** for 3.5 miles over irregular bottom to anchorage in 10 fathoms, taking care to avoid the 3-fathom rock in latitude 57°43′ N., longitude 155°27′ W.

There are no satisfactory ranges for entering the bay but they are unnecessary. Cape Aklek can be approached with safety on any heading between **305°** and **020°**. The channel between the 10-fathom curves at the entrance to the bay is over 2 miles in width.

Fishing craft sometimes enter the bay from the east, using a narrow channel between the mainland and the southern rocky islets. This channel has a least depth of 6 fathoms but is only about 350 yards in width, is bordered by kelp-covered rocks, and has a 4-fathom rock near its outer end.

Anchorages in Puale Bay are indifferent to poor. There is no protection from southeasterly weather. Southerly swells enter the bay a large part of the time and increase in size in the shoal water. Williwaws are frequent. Even in westerly weather the winds funnel through the low passes to the west of the bay with considerably greater velocity than that encountered in Shelikof Strait.

Cape Aklek, the most prominent headland in the vicinity, rises to a height of 1,800 feet within 0.6 mile of the shoreline in a series of bare slides, bluffs, and cliffs. Two large rocks about 75 feet high are off its southern and southeastern shores, but they are inconspicuous from seaward against the rocky background of the cape.

Dry Bay lies between Cape Aklek and Cape Unalishagvak. As the name implies, the entire inner bay bares at low water. The outer bay has a rocky irregular bottom. Here again williwaws are frequent and westerly winds are increased in violence in the low passes to westward.

Chart 8666.—Jute Bay is between **Cape Unalishagvak** and **Cape Kanatak.** The part inside **Jute Islands** is called **Island Bay.** Reefs marked by kelp and breakers extend to the southeast from Jute Islands and tend to break the swells during easterly winds. A reef also extends from the east side of Island Bay about halfway to Jute Islands. The channel between the reef and the islands has depths ranging from 11 to 5 fathoms. The channel west of Jute Islands has depths of from 3½ to 5 fathoms, but its south end is obstructed by rocks and reefs extending southwestward from the islands, and its use is not recommended except by boats with local knowledge. Indifferent anchorage, sheltered except from southeast winds, can be obtained northward of Jute Islands in Island Bay.

As in all of the bays in this vicinity, the williwaws are violent with westerly winds and are very disagreeable, if not dangerous, to small craft.

Portage Bay, between Cape Kanatak and Cape Igvak, is clear except for reefs and rocks about 1 mile from its head. The bay is open to southeasterly winds and

is subject to northwest winds, which draw down from the mountains with great force.

Kanatak (*P. O.*) is a town at the head of Portage Bay. Since the discontinuance of oil drilling in this area, Kanatak has been practically abandoned. It is a port of call for the local mail steamer.

A kelp-covered reef extends 0.5 mile southwestward from **Kelp Point.** Just off the reef and separated from it by a narrow channel is a rock with 1½ fathoms over it and marked by a buoy on its western side, leaving a clear channel 0.2 mile wide for entering the inner part of the bay. A lighted range marks this channel. The front light, shown from a white wooden house, is 20 feet above the water and visible 7 miles. The rear light, shown from a white slatted tripod, is 36 feet above the water and visible 9 miles.

The best anchorage is in 10 to 12 fathoms southeastward of the buoy. Coasting vessels often use the inner anchorage northwestward of the buoy. The anchorages are subjected to violent williwaws with westerly weather, and at such times the inner anchorage should not be used. The wind is apt to shift from northwest to southeast with but little warning. In such cases, launches run to Kanatak Lagoon for shelter.

Vessels with passengers or freight usually anchor as far in as their draft permits With northwesterly winds there is but little swell.

Kanatak Lagoon, on the west side of the bay about 5 miles from Kanatak, has a narrow entrance with less than 6 feet at low water, but has depths of 6 to 12 fathoms, mud bottom, inside. It affords excellent anchorage in easterly weather, but is a maelstorm with northwest winds. Under such conditions the williwaws blow with almost hurricane force, and the water level at the eastern end is higher than that at the western end.

Directions, Portage Bay.—In approaching from Shelikof Strait, careful track of the reckoning should be kept, as the various headlands are similar and the bay is difficult to recognize from a distance. Enter on a mid-channel course and, if bound to the inner anchorage, follow the lighted range on course **334°,** pass 100 yards southwest of the buoy marking the 1½-fathom rock, then head for the town and anchor as desired.

Cape Igvak, a conspicuous headland separating Portage and Wide Bays, is the southern extremity of a ridge of mountains rising to heights of 2,000 to 2,600 feet, and covered with clouds most of the time. **Cape Igvak Light (lat. 57°26′.0 N., long. 156°01′.8 W.),** 80 feet above the water and visible 12 miles, is shown from a small white house. The light is obscured from 071° to 232°.

Wide Bay is formed by a chain of islands parallel to the coast. It is the only protected harbor along this section of the coast and affords secure anchorage in any weather. There are no known dangers southward of **Coal Point** except the reefs off the various islands, and these do not extend far enough to be menaces. The part of the bay north of Coal Point is foul. The channel between Coal Point and the island to the southeastward is about 300 yards wide, with a least found depth of 3 fathoms, hard sand and rock bottom.

The lagoon at the northern end of Wide Bay has a very foul entrance which should not be used except at high water, and then only by small launches.

The recommended entrance channel is between Channel Rock and East Channel Island. The northern entrance is foul and should not be used. The channels southward of Channel Rock should not be attempted by strangers.

Channel Rock, about 40 feet high, is between East and **West Channel Islands** and is unmistakable. Several rocks and reefs extend seaward from Channel Rock,

the outer one being about 1.2 miles distant. These reefs are marked by kelp and usually show breakers.

East Channel Island, low and flat, is one of the larger islands of the chain, second from the north.

Magnetic disturbance.—Some local magnetic attraction has been observed in the vicinity of the entrance.

Anchorage.—Inside the bay excellent holding ground is available in any depth from 5 to 20 fathoms. The williwaws are disagreeable with westerly winds but are not dangerous to moderate-sized vessels. Small craft can anchor in the lee of the various islands.

Weather.—Weather conditions are bad. Winds, fog, and rain are the rule. May, June, and July are supposedly the best months, but even during these months conditions are only fair.

Chart 8502.—This section of the coast has not yet been closely surveyed. These Coast Pilot notes were compiled by a Coast and Geodetic Survey vessel on reconnaissance in 1944–45, and are primarily for the guidance of small craft using the inshore track along the peninsula between Wide Bay and Sutwik Island. Tidal current in this area is considerable, and navigators should not rely entirely upon compass courses. A magnetic survey in 1944 indicated that the charted variation is substantially correct.

Practically all of the shoal areas encountered were marked by kelp, but it is probable that much of this kelp is washed away during the winter months.

Cape Kayakliut is the first cape south of Wide Bay. It has a generally flat appearance, sloping smoothly back to the mountain. The shoreline is formed by low, steep cliffs and close to the point is a prominent grass-topped island. A foul area extends eastward from this island for 0.8 mile; the inshore portion is marked by reefs with two prominent rocks about 10 feet high near the center. The easternmost part of the area is marked by an extensive kelp bed with depths of 6 fathoms or less on the outer edge deepening to 13 to 15 fathoms 0.5 mile east. Ships should pass at least 1.5 miles off the cape.

Imuya Bay, 4 miles south of Cape Kayakliut, is wide and open to the east, and clear except for a group of islands in the northwest corner. Depths shoal gradually from 17 fathoms inshore from a line between the north and south points to 5 fathoms at a point 0.4 mile from the center of the sand and gravel beach which heads the bay. The area close-to and between the islands is shoal and foul, and the area between the largest island and the mainland to the north and west is mostly bare at lower low water. A large stream enters the bay at the west end of the sand and boulder beach at the head. The south shore of the bay has not been investigated and should be approached with caution.

The wreck of a large vessel lies against the shore west of the islands at the south point of the bay.

To enter Imuya Bay from the north, follow the trend of the shoreline from the north point around the islands, keeping the islands at least 0.4 mile on the starboard hand, and thence midway between the islands and the south shore to the head of the bay. Indifferent anchorage can be had for small craft in 5 fathoms, hard, fine sand bottom, 0.4 mile from the beach at the head of the bay.

In entering the bay from the south, care should be taken to avoid a shoal area of 5

fathoms or less 1.2 miles east of the outermost island at the south point of the bay. There is a passage between this shoal area and the island but it is not recommended even for small craft without further investigation or local knowledge.

Kilokak Rocks, two rocky islets, are about 2 miles offshore and just south of Imuya Bay. The northwest rock is the higher, with an elevation of about 30 feet. The area east of these rocks has not been investigated but the area west is known to be clear for 0.8 mile toward the shore. Depths of 15 fathoms or more can be carried to within 100 yards of the north, west and south sides of the higher rock.

A rock bare at half tide is 1.3 miles northwest of Kilokak Rocks. This rock marks the southeastern end of a foul area which extends inshore to a group of reefs and islets near the shoreline.

The chart shows a sunken rock about 2 miles southwest of Kilokak Rocks. In passing this area, no indication of this rock was noted.

Agripina Bay, 5 miles southwest of Kilokak Rocks, is a deep indentation with a generally low but bold rocky shoreline indented with numerous small bights and clefts. The northern and southern points forming the entrance are marked by groups of small steep rocky islands; a larger group of very prominent islands, near the south central part of the bay, roughly divides the outer and inner portions of the bay.

Anchorage for large vessels can be had in 15 to 20 fathoms in the western end of the outer bay about 0.3 mile north of the islands and 0.3 mile from the western shore. This area is protected from all but northeast to southeast weather. One of the best small-boat anchorages along this section of the coast is in the bight at the head of the inner bay, midway between the east and west shores, in 6 to 8 fathoms, sticky mud bottom. No swell makes into the bight even in heavy weather, and there are no williwaws even in strong winds. Northwest of the bold rocky hill which forms the west side of the bight is an extensive gravel flat, bare at low water except for the shallow delta channels of a large stream which enters the bay at this point.

The only danger in the inner bay is a group of rocks near the west side. The outermost of these rocks is 300 yards off the west shore and 400 yards south of the anchorage.

The coastline from Agripina Bay to Port Wrangell is very broken, with many indentations and small inshore islands. The area is rocky and foul within 400 yards of the beach but is clear outside the small islands except for the shoal area, marked by kelp, which extends 500 yards southeastward from the point 0.5 mile southwest of Agripina Bay.

Offshore from the sailing track are numerous rocks and islands.

Ashiiak Island is high and rocky with a rounded central dome. The west side has sheer cliffs to the waterline and the water is deep close inshore. The east side of the island appears foul, with small islets extending 0.3 mile offshore and with one sunken rock, which breaks in heavy weather, 0.8 mile offshore. A small rocky islet about 10 feet high is 400 yards west of the island. A rock bare at ¾ tide is 0.9 mile southwest of Ashiiak Island. Another rock, bare at low water, is about 150 yards to the east. In a moderate swell these rocks break at high water.

A small islet of striking appearance, 2.3 miles southwest of Ashiiak Island, is about 100 feet high, of a distinct brick red color, and with vertical or slightly overhanging cliffs on the west end which rise to a flat grassy top.

Chart 8851.—Port Wrangell, 7 miles south of Agripina Bay, is a deep, narrow indentation in the coastline. The outer bay, open to the southeast and east, has depths in mid-channel ranging from 60 fathoms at the entrance to 14 fathoms at the inner end. The shoreline is steep and rocky.

The inner bay, one of the best anchorages along this coast, is 0.9 mile long, and varies in width from 300 yards near the entrance to over 600 yards at the widest part near the head. The depth varies from 10 fathoms near the entrance to 6 fathoms at the head, with excellent holding ground in sticky, blue mud bottom. The shoreline rises steeply all around the bay and there are probably williwaws on strong northwest winds although none have been noted. The ground swell does not make into the inner bay, which is recommended as anchorage for ships up to 2,000 tons. The greatest swinging room can be had near the head of the bay in 7 to 8 fathoms.

About 500 yards inside the inner bay on the east shore is a small stream, dry during extremely dry weather, where small craft can come close alongshore and take water aboard with 200 feet of hose at about 30-foot head.

East of Port Wrangell is a group of three large islands. **David Island,** the most northerly and largest of the group, is high and bold with steep rocky sides marked by numerous caves and clefts. Two small, rocky islets are close inshore on the north side, and 1 mile northeast is **Lone Rock.** Northwest of David Island a reef, marked by thick kelp and bare at low water, extends 400 yards south from the mainland.

Poltava Island is 0.8 mile southeast of David Island. It has the same general appearance as David Island but is smaller and lower. The passage between David and Poltava Islands is not recommended as the soundings show very irregular bottom.

Navy Island, the most southerly and smallest of the group, is 0.4 mile southeast of Poltava Island. Several detached rocks or islets extend for 600 yards in a westerly direction from the main island. The passage between Poltava and Navy Islands is not recommended. Thick kelp and foul ground lie between Navy Island and a low rock 400 yards to the northeast. The chart shows a sunken rock about 0.5 mile southeast of Navy Island. This area is unsurveyed and should be given a wide berth.

Cape Providence, three miles south of Port Wrangell, is fairly low with steep rocky shoreline and many small indentations. At the tip of the cape is a group of three rocky islets extending offshore for 0.5 mile in a southeasterly direction.

Chiginagak Bay, between Cape Providence and Cape Kuyuyukak, is 6 miles long, 10 miles wide between the capes, and 2 miles wide at the inner end. The outer bay has scattered groups of rocks and small islands, and a group of three larger islands is along the western shore.

Offshore from the bay and five miles south from Cape Providence is a prominent group of islets known as the **Aiugnak Columns.** The highest rises about 85 feet. The areas immediately surrounding the Columns and the other islands and reefs in the outer part of the bay have not been surveyed, and vessels should give them a wide berth.

The inner part of Chiginagak Bay, roughly two miles square, is separated from the outer part by **Derickson Island,** 1.2 miles long and 0.3 mile wide, between a bold headland on the east and a low rocky point on the west. A smaller island is 1 mile due north of the larger.

At the head of the bay is a flat sand and gravel beach which bares 200 to 400 yards offshore at low water. A large stream enters the head of the bay on the west side over a broad sand delta bare at low water. Two smaller streams enter the north-

east corner west of a prominent rocky headland distinguished by several small caves at the high waterline. A ledge showing considerable area at low water is just east of the delta. Several pinnacles on this ledge bare at high water.

Anchorage for vessels of any size can be had in the inner bay. In moderate weather from any direction, or in heavy weather from the west, north, or east, the best anchorage is 0.2 to 0.5 mile southwest of the rocky point east of the beach at the head of the bay. Depths are 8 to 11 fathoms, sand or mud bottom, good holding ground. In southerly weather, better shelter can be found 500 yards north of Derickson Island in 13 fathoms. In moderate southerly weather very little swell makes into the anchorages.

Chart 8502.—Cape Kuyuyukak, between Chiginagak Bay and Nakalilok Bay, is bold and prominent with high grassy hills sloping steeply to sheer cliffs at the beach. Numerous rocks and islets are close inshore south of the cape, and a chain of reefs extends 2 miles eastward from the cape. South of the reef, a shoal area extends for 1.3 miles with numerous kelp patches.

Ugaiushak Island, 6 miles south of Cape Kuyuyukak, is really a double island with a narrow, low boulder ridge connecting the two parts. The western part of the island is high, with a broken skyline and very tall, steep cliffs on the west and north sides. The eastern half is much lower, flat on top, with sheer cliffs to the shoreline on the north and west, and a gradual slope to a low and rugged shoreline on the east. A group of buildings, with one cabin in good condition, is at the west end of the ridge.

A narrow chain of reefs about 0.5 mile long is 1.4 miles south of Ugaiushak Island. The southeast reef is marked by two pointed rocks about 60 feet high and the northwest reef by a single point about 25 feet high.

Midway between Ugaiushak Island and Nakalilok Bay is a small but very prominent island with a single high peak shaped like a conical beehive. A small rocky islet is 200 yards south of the larger island.

The southernmost of a second group of islands is 4 miles due west from Ugaiushak Island. On the north are 3 small rocky islets; in the center is an island 1.1 miles long and 0.2 mile wide, with grassy top and steep rocky shoreline; on the south is a large, high island, 0.6 mile long and 0.1 mile wide, with very high vertical cliffs to the water line. Depths obtained around these islands were 15 to 18 fathoms, very smooth sand bottom, but the formation of the islands suggests hidden dangers.

Five miles eastward of Cape Kunmik is **Hydra Island,** large and flat-topped, 0.5 mile long and 0.2 mile wide, and with a small, rocky islet 300 yards to the north. There are indications of shoal areas 2 to 3 miles to the southward of Hydra Island.

Nakalilok Bay is divided into an eastern and western part by a low double-headed cape. The eastern part is 4 miles long, 3 miles wide at the entrance, and 1.5 miles wide at the head which terminates in a low sandy beach. The bay is generally deep except for a small shoal area marked by kelp, 1.3 miles east of the double-headed cape, and for a shoal area which extends 0.4 mile eastward from the same cape. The western shore is boulder and ledge beach backed by steep cliffs. The eastern shore is boulder strewn near the entrance, with gravel toward the head, and is backed by very steep hills. A very prominent waterfall is 1.5 miles from the head of the bay on the eastern side. This section of the bay affords good shelter for small craft except in heavy southerly weather. The anchorage is in 7 to 9 fathoms, sand bottom, 600 yards offshore from the east end

of the sand beach at the head of the bay. Large craft can anchor in 10 to 15 fathoms about 0.5 mile offshore.

The western part of Nakalilok Bay has a long stretch of sand beach, shaped like a flat crescent, which lies between the double-headed cape and the north point of Yantarni Bay. Very smooth and flat, the beach is backed by low grassy dunes on the western half. The bottom off this beach is of fine sand and is unusually smooth and flat, with no indications of sunken reefs. Depths vary from 5 fathoms 0.4 mile offshore, to 18 fathoms 1.6 miles offshore.

Yantarni Bay, on the east side of Cape Kunmik, is about 2 miles wide at the entrance and 2 miles long. The east side of the bay is a low cape with a very flat top and vertical cliffs of an unusual red-yellow color dropping sheer to the high waterline. A narrow reef extends 600 yards south. The head of the bay has depths of less than five fathoms, and is not recommended for anchorage.

Cape Kunmik, high and bold, is one of the most prominent capes along this section of the coast. The highlands are rounding in contour, covered with grass and alder patches on the lower slopes and prominently marked by deep gullies. The shoreline is formed by vertical cliffs 20 to 400 feet in height and deeply indented with small bights and clefts. The beach is generally foul and boulder strewn, with sunken rocks, reefs and small rock islets extending 200 to 500 yards offshore. There are no known dangers farther offshore than the islets visible to the navigator.

The southernmost tip of the cape is a small semidetached rocky island with very steep sides terminating in a wedge-shaped rock about 70 feet high. About 600 yards northeast of this point and close inshore is a detached islet of very striking appearance. As viewed from the south and east, it resembles a cathedral, with a single central spire about 200 feet high on the south face, and a lower rounding dome on the north. In sunlight this formation stands out prominently against the black cliffs behind.

Six hundred yards off the southeast side of the cape is a small islet 70 feet high with vertical black rock sides and a smooth *turtleback* top of grass. A low reef is 200 yards southeast, and a sunken rock is 500 yards east of the islet. The area between the islet and the cape is foul and thick with kelp.

Amber Bay, large and open, is just westward of Cape Kunmik. A reconnaissance examination indicated that the outer part of the bay has moderate depths and regular bottom except for ledges and reefs alongshore, and that the inner half is shallow, with numerous reefs and kelp patches. Being exposed, the bay is not recommended for anchorage, but emergency anchorage for small craft can be obtained in 5 to 6 fathoms, sandy bottom, under the northeast shore just northwest of a long reef awash at high water. The reef is 3.4 miles northwest of the prominent beak-shaped cliff which marks the south tip of Cape Kunmik. The bight inshore from the reef is foul with rocks, bare at various stages of the tide.

Eagle and **Garden Islands,** separating the entrances to Amber and Aniakchak Bays, are grass-covered table-topped formations, with sheer cliffs almost continuous on all sides. Eagle Island is nearly round and Garden Island is crescent-shaped. A large breaker is just south of the line between Eagle and Garden Islands. From the north point of Garden Island is a sand and gravel spit extending toward **Cape Ayutka,** which divides Amber and Aniakchak Bays. South and west of the cape is an extensive foul area marked by kelp. The passage between Garden Island and Cape Ayutka should be avoided until it has been surveyed. At the south end of Garden Island are

two prominent pinnacles, the outermost needle-shaped. Good anchorage for small craft can be obtained close under the shore on the west side of Garden Island in 7 to 10 fathoms, sandy bottom.

Aniakchak Bay, wide and open, is entered between Garden Island on the north and Kumlik Island on the south. Reconnaissance examination indicated moderate and regular depths to the steep sand and gravel beach at its head. Along its northern shore, for about 1.5 miles west of Cape Ayutka, foul area, marked by kelp, extends 200 to 800 yards offshore. In the northwest corner of the bay is a small island 82 feet high, with vertical cliffs along its eastern side. Immediately northwest of this island, in the restricted area between the island and the mouth of a river, cannery tenders and barges moor to piling in favorable weather, but a southeast swell piles up in this anchorage.

Along the south side of the entrance to the bay and about 1.2 miles northwest of Kumlik Island is a prominent flat-topped pinnacle rock 85 feet high. Southeast of this rock 0.4 mile is a breaker marked by kelp, and about 400 yards off the north point of Kumlik Island is a small rock 3 feet high. Between the breaker and the small rock is a deep channel. Southwest of the pinnacle rock about 0.4 mile is another breaker, marked by kelp; and west of the pinnacle about 0.4 mile is a 3-fathom spot marked by kelp. A prominent headland, locally known as **Elephant Head Point,** is 1.3 miles northwest of the pinnacle. Rock ledges extend north and east about 400 yards from Elephant Head Point. Leading to Aniakchak Bay from the southward is a channel between Kumlik Island on the east and Cape Kumlik on the west, thence between the prominent pinnacle rock on the east and Elephant Head Point on the west. This channel is used by cannery tenders operating out of Chignik, but is not recommended for general use without local knowledge.

About 1.2 miles northwest of Elephant Head Point is another low, rock-cliff point with a rock awash at high water about 300 yards to northeastward. In the slight bight just westward of Elephant Head Point temporary anchorage can be obtained in 8 fathoms.

Vessels can select anchorage in 12 to 20 fathoms in the southwest, west or northwest portions of the bay at distances of 0.6 to 1.5 miles from the sand and gravel beach. The bay is protected from the southwest through west to north. Easterly and southeasterly swells pile up heavily in this bay.

Sutwik Island, about 7 miles off the Alaska Peninsula and about 90 miles southwestward from Kodiak Island, is 13 miles long and 4 miles wide. The southern side of the island, low and marshy in places, is very foul for a distance of 1 mile from the beach. The north side has steep shores and is foul along an 8-mile stretch of shore west from Foggy Cape. This stretch should be given a berth of not less than 2 miles in passing.

Northwest of Sutwik Island is a deep channel which leads between visible rocks, one near shore and the other about 2 miles off. Small-vessel anchorage, protected from south to southwest winds, can be had in the small bay on the north side of Sutwik Island about 9 miles from Foggy Cape.

An anchorage, 3.5 miles from the northwest tip of the island is in a cove just east of a very prominent rock about 75 feet high and 600 yards off the shoreline. This rock has a square blocklike appearance, and is the largest rock off the north coast. Anchor in 5 fathoms, smooth sand bottom, with a kelp patch around rocks bare at low water bearing 225°, distant 300 yards, and a similar patch bearing 135°, distant 300

yards. This anchorage furnishes good shelter in southeast to west weather, but is poor in easterly weather.

An excellent anchorage for small craft in easterly or northeasterly weather can be found in a small bight 1 mile off the northwest tip of the island. The north side of this bight is a narrow point with steep rocky sides and a flat grassy top. Two hundred yards southwest of this point is an islet of very striking appearance. Its flat base and cylindrical rock, about 70 feet high and 150 feet broad, recall the "cheesebox on a raft." Reefs and kelp extend from the rock to the shoreline.

To enter the anchorage from the west, keep the rock 200 yards on the port hand, proceed until 300 yards from the beach, and anchor in 5 fathoms, hard sand bottom. Current and rips encountered 0.3 to 0.5 mile offshore do not make into the anchorage. A vessel of 140 tons rode out a 30- to 40-knot easterly wind in this anchorage without dragging and with no swell although seas were running high 0.5 mile offshore.

Foggy Cape, the eastern end of Sutwik Island, is a prominent landmark for vessels passing along the coast. It rises to a height of 418 feet, and is first raised as a detached island due to a low neck of land which separates it from the rest of Sutwik Island. No sounding has been done around the cape, but tide rips have been observed, and mariners are advised to give it a wide berth. Foggy Cape and the south side of Sutwik Island are often covered with fog when the north side is clear. Blankets of fog have been observed when the entire outline of the island was indicated without any part of it being actually visible.

Foggy Cape Light (lat. 56°32.5 N., long. 156°59.0 W.), 195 feet above the water and visible 12 miles, is shown from a house on the east end of the island. The light is obscured from 081° to 148°.

Off Foggy Cape the strength of the southward current occurs about 4 hours after the predicted time of high water at Kodiak. The average velocity at strength is about 1½ knots. The current is approximately slack during the period between predicted low water and high water at Kodiak.

A vessel drawing 10 feet has reported striking a rock about 3 miles south of Foggy Cape. In 1943 some sounding was done in this area, but the reported rock was not found. It was not proved, however, and vessels are advised to haul out if soundings of less than 50 fathoms are obtained. The ship track through this passage is 10 miles off Foggy Cape or about midway between the cape and Aghiyuk Island, the northern Semidi Island.

Chart 8851.—The **Semidi Islands** are about 90 miles southwest of Kodiak Island, and about 20 miles southeast of Foggy Cape.

Aghiyuk, the northerly large island, is long and narrow and rises vertically from its shoreline in high rocky cliffs, which are practically unscalable, especially along the west side of the island. In the south center of the island is a grassy plateau, with a prominent rockpile, the highest point on the island, rising to 1,014 feet.

On the east side of the island is a fair-sized bight, with a sandy beach that is clear except near its north end, where kelp-marked rocks extend a little way offshore. East of the bight, about 1 mile offshore, is small sheer-sided **Aghik Islet,** which is 528 feet high. Scattered ledges and rocks extend about 500 yards off the southeast point of Aghik Islet.

Anchorage can be obtained 400 to 600 yards off the bight in 10 to 15 fathoms, sand

bottom. It can be safely approached from the northeast, passing Aghik Islet about 600 yards off; or from the southeast on a mid-channel course between Aghik Islet and Aghiyuk Island.

A small group of rocks is 500 yards west of the southwest point of Aghiyuk Island. The highest has an elevation of 20 feet.

Chowiet Island, the southerly large island, is triangular in shape, and has sheer cliffs alongshore, especially on its west side. It reaches a height of 824 feet near its west side, slightly north of its center. The island has alder- and grass-covered ridges with many bedrock outcrops and cairn-shaped rock piles. Some of the latter are very large, and are in various odd forms.

A double bay is on the northwest side of Chowiet Island. Anchorage can be obtained in the center of the east arm of this bay in 16 fathoms, sand bottom. This anchorage is most favorable for winds from the northeast and around through east to southeast, but a southwest swell creates considerable surge. Anchorage can be obtained in the center of the west arm in 22 fathoms, sand bottom. This anchorage provides about 250 yards swinging radius and is favorable for winds out of the east and around through south to southwest. It is less subject to surge with a southwest swell than is the east arm.

At the south end of Chowiet Island is a small bay formed by a chain of low rocks and two steep-sided islets extending southeastward. The largest islet is **Aliksemit,** elevation 342 feet. Anchorage with about 200 yards swinging radius can be obtained in the north center of the bay in 20 fathoms, sand bottom. This bay is protected from southwest through west to northwest.

An arm on the east central side of Chowiet Island is too small for suitable anchorage, except for small craft in fair weather. Swells pile up heavily in this arm.

Kateekuk Island, 0.8 mile long by 0.4 mile wide, is 0.6 mile northwest of Chowiet Island, and is 486 feet high. Between this island and Chowiet Island to the southward, and Aghiyuk Island to the northward, are strong tidal currents, which cause very bad tide rips.

Anowik and **Kiliktagik Islands** are about 1.2 miles northeast of the north end of Chowiet Island. They are about equal in elevation, Kiliktagik being 404 feet. Between these islands and Chowiet Island are strong currents which cause moderate tide rips; a heavy southeast swell piles up excessively.

Suklik Island is about 0.9 mile south of Kiliktagik Island and about 1.2 miles east of Chowiet Island. A low flat rock is about 150 yards off the north end of the island, and numerous sheer pinnacles extend about 0.5 mile south.

South Islet, 2 miles southwest of Chowiet Island, is a huge bare rock with vertical sides. Several high, sheer, rock pinnacles are just west of it. The breaker charted about 5.5 miles west-southwestward of Chowiet Island is reported to be much nearer the island.

A few reconnaissance sounding lines indicate deep water adjacent to the islands and clear channels between them Strong tidal currents and bad tide rips are found among the Semidi Islands, especially in the channels, between Aghiyuk and Kateekuk; and between the latter island and Chowiet.

Lighthouse Rocks, about 30 miles southwestward of Chowiet Island, are several detached barren rocks, occupying an area about 0.2 mile in diameter. The largest

rock is 500 feet long and 90 feet high. They can be approached as close as 0.5 mile with safety. A large sealion rookery is on the rocks.

A rock awash has been reported 25 miles 154° from Lighthouse Rocks. The locality has been partially sounded, but the rock was not found. A rock awash lies 11 miles 123° from Lighthouse Rocks.

Between Lighthouse Rocks and Chirikof Island a southerly set is generally experienced.

Chart 8710.—Cape Kumlik, the promontory on the Alaska Peninsula nearest to Sutwik Island, is foul with ledges and reefs along its south shore. Near the eastern end of the south shore and extending 0.5 to 1 mile southward is a group of rocks and islets. The southerly islet, narrow and about 400 yards long, has an elevation of 81 feet; it is a valuable landmark for the approach to the channel between Cape Kumlik and Kumlik Island. From the southwest point of Cape Kumlik, ledges and reefs, which break in a heavy swell, extend 2.8 miles southwestward and obstruct the north side of the entrance to Kujulik Bay.

Kumlik Island, 0.8 mile off the eastern end of Cape Kumlik, has an elevation of 1,053 feet. The shores are steep and rocky; reefs border its north, east and south sides. About 3 miles eastward of the island is a lone high-water rock. Midway between Kumlik and Sutwik Islands are two rocks about 1 mile apart in an east-west direction. The easterly rock has an elevation of 3 feet, and the westerly one is awash at half tide. From the southeast end of Kumlik Island on a bearing of 204°, and at distances of 2 and 3 miles respectively, are a rock awash at low water and a rock with an elevation of 55 feet. The latter is particularly valuable as a landmark for the passage eastward of Kumlik Island.

Kujulik Bay (Sitkum Bay) has its entrance about 14 miles westward of Sutwik Island. It is a large open bay which affords good shelter in northwest winds. Reefs and rocks fringe the shores of the bay and the entrance is flanked by reefs on each side. The western arm of the bay is shoal for a distance of 7 miles from the head. The best protection is in the northern part of the bay.

Unavikshak Island, off the entrance to Kujulik Bay, rises to a height of 465 feet near its northern side, and is used as a fox ranch. Numerous rocks and reefs fringe the shores. Two rocks about 25 feet high are 1.5 miles southward of the island. The western rock is conspicuously flat-topped. The passage between the rocks and the island is deep and free of obstructions. Off the northeast point of Unavikshak Island is a smaller island 153 feet high. Anchorage can be had on the northwest side of Unavikshak Island, in 15 fathoms, hard, rocky bottom.

Cape Kumliun, southward of Kujulik Bay, is a broad bold headland rising to a height of 1,671 feet in a peak near the southeastern part of the cape. This peak is the most conspicuous object in the vicinity, but is often covered by clouds. The cape is foul with reefs and rocks extending a mile offshore at its eastern point. Some of these dangers do not break even at low water and may not be marked by kelp.

Chignik Bay is about 50 miles westward of the Semidi Islands. Entrance can be made either to the northward or southward of Nakchamik Island. The southern part of the bay is irregular but deep. Important salmon fisheries are in Chignik Bay.

Nakchamik Island is an irregular island in mid-entrance to Chignik Bay. The conical peak 1,450 feet high in the south central part of the island is a distinctive land-

mark and is prominent from all directions except through an arc of about 90° around due south, where other mountains obscure it.

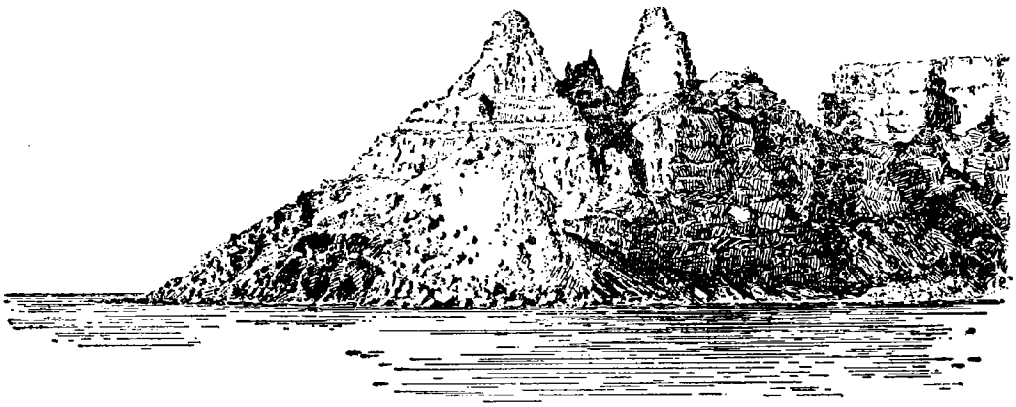
The bight on the east side can be used as an anchorage. Enter the middle of the bight and anchor in 12 fathoms, sand bottom. The north end of the island is steep-to, and no anchorage is afforded. The western point is fringed with reefs extending about 300 yards offshore. There are no offlying dangers.

Kak Island, 1.3 miles southward of Nakchamik Island, is 400 feet high, bold, and generally reddish or grayish in color, with grassy patches on the gentler slopes. The southern bluffs are of marked columnar structure. The island has deep water on all sides and can be approached close to.

Atkulik Island is about 1 mile long and 0.8 mile wide, and is 725 feet high with precipitous shores on its south side. It has no anchorages. There are two detached rocks, one about 25 feet high, at the northeast end, the other about 35 feet high at the southeast end. A small rock awash is a short distance off the west side.

Castle Cape (Tuliumnit Point) is on the south side of the entrance to Chignik Bay. The cape is narrow and precipitous; stratification is a conspicuous feature. The strata are of many shades of light-colored rocks varied by bands of black. The cape has been worn into many curious castellated pinnacles and buttresses, hence its name.

A pair of towering eminences near the end of Castle Cape reach an elevation of 1,220 feet and form a most distinctive feature. Between the towers are needle peaks of lesser elevation.



Castle Cape from northward

Castle Bay is deep, with mud or clay bottom, and presents no known outlying dangers. Small boats can anchor along the south shore of Castle Bay about 4 miles westward from Castle Cape, where the bottom and shore slope gradually to sand and gravel beach. The remaining shore rises almost vertically from the water. The only vegetation is grass and some scattering alders.

Anchorage Bay is west of the fourth ridge from Castle Bay, the ridges forming a succession of headlands on the south shore of Chignik Bay. This ridge terminates in vertical bluffs about 200 feet high, and rises to a rounded hill, 1,050 feet high, which is

covered with grass and alders. The ridge west of Anchorage Bay is irregular in form, with bluffs at the water. Off the western point are **Eagle Rock,** a large grass-covered rock 100 feet high, connected with the shore at low water, and a lower rock, 30 feet high, 100 yards farther out. A shingle spit projects from the eastern shore in a southwesterly direction.

Chignik Spit Light (lat. 56°18′.7 N., long. 158°23′.0 W.), 35 feet above the water and visible 8 miles, is shown from a pyramidal skeleton tower on a white house on the end of the spit; the light is obscured west of 238°.

The bay is easily recognized, and when nearly abreast of it the smokestacks of the cannery show over the shingle spit. In entering, give the spit a fair berth. In thick weather care should be taken to avoid entering Mud Bay by mistake. By following the south shore of Chignik Bay little difficulty should be experienced.

Anchorage is good throughout most of Anchorage Bay, but dragging can be expected during the heavy winds and williwaws prevalent here. If the anchor is on the bottom long some difficulty may be experienced in weighing. Care should be used in anchoring at high tide, for the flats make out for a distance and drop off sharply. An anchorage for small craft is on the east side of the bay near the sand spit, with soft mud bottom; however, this anchorage should now be avoided because of an old wreck which is likely to foul an anchor.

Chignik (*pop. 253 in 1950; P. O.*) is a village at the head of Anchorage Bay. The cannery at the village has been abandoned and the wharf is in bad condition. The monthly mail steamer from Seward makes regular calls.

The cannery of the Alaska Packers Association is 0.7 mile west of the village and has two wharves. The west one has a face of 62 feet with a depth of 18 feet alongside, while the east dock, about 90 feet distant, has a face of 50 feet and a depth of 21 feet alongside. Vessels of over 16-foot draft should approach the wharf bow-on and maneuver alongside. On both sides of the wharves is a line of dolphins. There are depths of 8 fathoms 50 feet off the dolphins.

The Alaska Packers Association maintains radio station KHC.

Mud Bay is shallow and of no commercial importance. The bay is filled with eel grass which interfers with the operation of launches. The only anchorage is in the entrance.

Chignik Lagoon is a large body of water at the southwestern part of Chignik Bay. The entrance to the lagoon is marked by the **Nigger Head,** a high, round-topped vertical bluff. From the Nigger Head, the channel closely follows the shore with a least depth of 15 feet on the bar 0.5 mile westward of the Nigger Head. From here the channel deepens and a depth of 21 feet can be carried into the lagoon and to the Alaska Packers idle cannery 2 miles above the sand spit forming the lagoon proper.

A cannery is located on the west shore of Chignik Lagoon 4 miles from the entrance.

The best anchorage is off the east shore cannery wharf, where the cannery company establishes mooring dolphins for the use of small boats. Beyond the wharf, which is dry at low water, the lagoon shoals, and only launches use the channels to the head. Chignik Lagoon has an important run of red salmon. Vessels of 14-foot draft enter the lagoon at all stages of the tide. A frequently used portage connects Chignik Lagoon to the head of Kuiukta Bay.

A reef with 4½ fathoms of water over it lies 3 miles 040° from the Nigger Head.

This is the only outlying danger in Chignik Bay found during the survey of 1924. The reef breaks in heavy weather.

Anguvik Island is bordered by a reef extending about 1 mile to the eastward and 0.3 mile to the west, which breaks at all stages of the tide. The island is flat-topped, 50 feet high, and covered with soil and high grass. The sides are precipitous. Northeast of this island the coast is foul for a distance of 0.8 mile offshore, and should be avoided.

Hook Bay is deep, excepting near the head where the slope of the beach is very gradual, with the 10-fathom curve 0.3 mile off the high-water mark. The area behind the spit is shoal. Fair anchorage may be obtained for small craft just westward of the outer end of the spit in 3 fathoms. Large vessels can find no protection from southeasterly weather. If anchoring near the head of the bay, avoid dragging onto the shoals, which rise abruptly.

Weasel Mountain, 2,410 feet high, is 1 mile south of Hook Bay and is the most prominent mountain in this vicinity.

A group of bare rocks is about 1 mile south of the southern coast of Cape Kumliun. The highest of the group is 39 feet in elevation. They are connected by reefs, but otherwise are apparently steep-to. The rocks are covered with grass and there is but little kelp bordering them. Between the rocks and the cape to the north is a clear passage but it is of no importance and is rarely used.

Katmai Reef, lying 3.3 miles 009° from the north point of Nakchamik Island, is narrow and about 400 yards long in a northeast and southwest direction. A small rock on the reef bares at extreme low tide. There are usually breakers, even with a smooth sea, but the breaks may occur at long intervals. A light growth of kelp is on the reef. There is deep water between this reef and the detached rocks about 3 miles to the northeast, in the direction of Unavikshak Island, but the passage is not recommended.

Directions, Chignik Bay.—With Foggy Cape on the starboard beam distant 4 miles, and on course 216°, continue for 5 miles to avoid the position of the reported rock southward of the cape, then change to 263° to a position 1 mile north of Nakchamik Island. Then steer 259° to a position with Chignik Head 0.5 mile on the port beam. Change to 247° and, when Eagle Rock bears 317°, change to 213°, passing Chignik Spit Light at a distance of about 600 yards. When the light is a little abaft the beam, haul to 169° and anchor off the Northwestern Fisheries wharf as desired.

To enter from the south, round Castle Cape at a distance of 1 mile, and after crossing Castle Bay, give the shore a berth of 1 mile and enter Anchorage Bay by passing 0.5 mile off Chignik Head. From here follow the directions preceding.

Chart 8802.—The section of the coast from Castle Cape to Mitrofania Bay is characterized by steep rock-cliff shoreline, high jagged ridges, sharp peaks, steep slopes of bare rock, alder brush or grass, and numerous rock slides. It has many waterfalls, striking cliffs of contrasting colors, and intermittent stretches of boulder and shale beach, the latter resulting from broken cliffs and large rock slides. Close alongshore are numerous pinnacle rocks, most frequently off capes and points.

The water is generally very deep in all of the bays and arms throughout this area. No known dangers are more than 500 yards offshore.

Chart 8710.—Chankliut Island, as it opens out from Castle Cape, appears as three separate islands tangent to each other. The parts are connected by low necks of land; the eastern and central ones appear generally flat while the western part is conical. The slopes are grassy. Six pinnacle rocks are off the west point of the island and a small rock 10 feet high lies 250 yards off this point.

In the eastern cove on the north side of the island, small craft can find anchorage by steering 180° toward the lowest part of the neck of land and anchoring in 7 to 10 fathoms, sandy bottom. Surge from current and swell is felt in this anchorage.

The channel between Chankliut Island and the mainland has been surveyed and found free from dangers. It is subject to moderate tidal current rips, especially in northeast weather.

Nikolai Cove and a small unnamed cove, on the mainland 1.5 and 6.0 miles respectively west of Castle Cape, afford temporary restricted anchorages for small craft with winds from southwest through west to north, but are subject to strong williwaws and are exposed to any swell. Necessity Cove, farther westward, is considered a better anchorage.

Necessity Cove indents the eastern shore of a conspicuous unnamed cape, 11 miles southwest of Castle Cape. This unnamed cape has rock-cliff shoreline and high rugged peaks. Approaching from the eastward a prominent light-colored rock cliff is visible along the eastern shore of the cape, just south of Necessity Cove. A rock awash is 600 yards off the eastern shore of the cape and about 1 mile south of the entrance to the cove. Small vessels anchor in the cove close to shore in 7 fathoms and although subject to strong williwaws it affords good anchorage with winds from southwest through west to north. It is reported to be a safer anchorage in northwest weather than Warner Bay or Ross Cove, but is exposed to swell.

The area from Warner Bay to Kupreanof Point has not been surveyed, but revision of the Coast Pilot westward to Alexander Point has been made from preliminary information obtained by a survey party working on control in that area in 1945.

Chart 8802.—Warner Bay lies on the west side of the unnamed cape, 11 miles southwest of Castle Cape. About 1 mile northwest of the south end of the cape the entrance to Warner Bay lies between a small grass-topped, pinnacle-tipped islet, just off the eastern shore, and a broken rocky point on the west, which separate the entrances to Warner Bay and Ross Cove. Warner Bay extends in a northerly direction about 4 miles, but is too deep for anchorage except behind the narrow shingle spit on its western shore, 2.5 miles above the entrance. The center of this small cove behind the spit is 25 fathoms deep, but anchorage close under the shore can be obtained in 20 to 22 fathoms. It is thoroughly protected from sea and swell but the space is too restricted and the water too deep for safe anchorage during violent williwaws which occur with a strong northwest wind. Warner Bay and the anchorage behind the shingle spit can be entered with safety by steering mid-channel courses.

Ross Cove is a small, deep, triangular-shaped bay on the west side and at the head of the short arm just west of the entrance to Warner Bay. Entrance to the cove, which lies between the north end of a narrow shingle spit and the north shore of the short arm, is only 150 yards wide and can not be identified until nearly at the head of the short arm. A bar at the entrance has a least known depth of 11 fathoms over it. The cove, which can only be used by small craft, is 23 fathoms deep at its center, but anchorage in 16 to 20

fathoms can be obtained close under the shore. From the head of the cove a long deep valley extends toward **Virgin Peak**, elevation 3,700 feet. The depth of water, restricted area, and violent williwaws make it a dangerous place during northwest weather, but during southeast or southwest winds it is very quiet. The short arm leading to the cove and entrance into the cove may be traversed with safety by steering mid-channel courses.

Devils Bay has a wide deep entrance about midway between Warner Bay and Seal Cape. The north side of the entrance is marked by a high, detached pinnacle rock, close to the point of a narrow peninsula which has precipitous rocky cliffs and high rugged peaks. About 1.5 miles inside the entrance, the bay divides into two main parts, one extending northwest 2 miles, with three small arms at its head, the other, in the form of a hook, extending southwest 1.5 miles, then southeast for about 2 miles.

The main portion and center arm of the northern part of the bay are too deep for anchoring. The northeast and west arms of the northern part of the bay were not investigated. In the hook-shaped southern part of the bay is a small bight at the head of the first arm, which trends southwest. Anchorage with restricted swinging room can be obtained 400 to 600 yards from the head of the small bight in 16 to 20 fathoms, mud bottom.

During periods of southwest and northwest weather, no williwaws were experienced in this anchorage, and during fresh northeast weather only moderate williwaws were encountered. No sea or swell entered the anchorage during this storm, although the seas and swell were heavy outside. The anchorage was not tried during southeast weather.

The southeast arm of the hook-shaped southern part of the bay was found too deep for anchorage. At the head of this arm are large sections of flat shale spits, formed by rock slides from sheer cliffs which rise from the shoreline to a high rock-faced ridge with many towering pinnacle tips. The pinnacle tips and the sheer wall of this ridge present a very striking formation upon entering this arm of the bay.

Seal Cape and Cape Ikti are twin headlands on the Alaska Peninsula, 2.5 miles apart, each having high rugged peaks, jagged ridges, and sheer rock cliff shorelines. Seal Cape, 15 miles southwest of Chankluit Island, is the most offlying tangent as seen from the channel between Chankluit Island and Castle Cape. From the same direction the summit, 2,074 feet, of a high narrow ridge, about 0.6 mile inside the tangent of the cape, appears as a very sharp peak. A breaker is 0.2 mile off the south end of Seal Cape.

Cape Ikti, west of Seal Cape, marks the eastern side of the entrance to Kuiukta Bay. There are numerous knife-edged pinnacles very close along shore near the end of Cape Ikti. A prominent high peak, 2,281 feet, lies about 2 miles from the point of the cape.

The open bay between Seal Cape and Cape Ikti is generally deep and is marked by extensive kelp in its northeast portion. While anchoring depths for small craft can be found close under the shore in the northwest portion of the bay, it is wide open to all swell and sea, and anchorage is not recommended.

Kuiukta Bay (Dorai Bay) extends 14 miles inland and has 11 arms or bays of various sizes and shapes, 6 on the east side and 5 on the west side. Its shores, especially for

the first 9 miles, are extremely precipitous, and have striking bare cliffs of great height, in contrasting shades of gray, red, brown, and black. The rocks appear to be well metamorphosed. A prominent band of black rock, resembling a lava flow, is on the eastern shore 4.8 miles northwestward from Cape Ikti, or just northward from the prominent point marking the north side of the entrance to the first arm on the east side of the bay. A very prominent triangular-shaped high vertical cliff, dark brown in color, with irregular streaks of light colored rock across its face, is directly ahead about 6.5 miles upon entering the bay from the southeastward.

Kuiukta Bay entrance, 5 miles wide, lies between Cape Ikti on the east and the sharp eastern point of an unnamed double headland on the west. This double headland marks the north side of the entrance to Mitrofania Bay. From mid-channel at the entrance Kuiukta Bay trends north-northwest for 4.5 miles, where it narrows to a width of 2 miles, then trends northwest for another 4.5 miles at an average width of 2 miles, then northeast at an average width of 1 mile, interspersed by a few small islets, for about 5 miles to the head of the bay, where arms spread out to the eastward and westward. The bay is a natural funnel for winds and has a reputation of being one of the windiest bays in Alaska. The water off the entrance and in the lower part of the bay is subject to tide rips, especially during northwest weather

The water is generally deep close to shore throughout Kuiukta Bay and with few known exceptions in the arms leading from it.

The entrance to the first arm on the east side of Kuiukta Bay, 4 miles northwest from Cape Ikti, is 1 mile wide between a rounding, undercut, dark rock cliff point on the southeast and a prominent gray cliff point with two large offlying gray pinnacles on the northwest. About 1 mile inside the entrance the channel, which is very deep, is constricted to a width of 500 to 600 yards between the north shore and the end of a steep-to boulder-gravel spit extending from the south shore. The average width of the bay inside the spit is 0.5 mile; and the general depths are 40 to 50 fathoms, with deep water close alongshore, which is fringed by a very narrow strip of boulder gravel or shale. The bay is landlocked and no sea or swell enters it. Anchorage for a small vessel with restricted swinging room may be obtained within 0.5 mile of the head of the bay in 16 to 20 fathoms, muddy bottom. This anchorage was found to be very quiet when fresh northwest winds prevailed outside in Kuiukta Bay. During the storm with fresh northeast winds, moderate williwaws were experienced here, but the survey vessel did not drag anchor. An all-season stream from a low waterfall is on the south shore inside the boulder-gravel spit.

The second arm on the east side of Kuiukta Bay, about 7 miles from Cape Ikti, is a small narrow finger extending 1.5 miles in an easterly direction between extremely high steep slopes. It is too narrow and the water too deep, 30 to 40 fathoms, for any suitable anchorage. A number of waterfalls enter this bay.

The third arm on the east side of Kuiukta Bay, about 11.5 miles from Cape Ikti, has not been investigated. It is very narrow and extends about 1.3 miles in a southeasterly direction. On the north side of the entrance to this arm is a small bight just southeast of a small grass-topped islet. A restricted anchorage in 15 fathoms, sticky bottom, may be obtained for small craft at the entrance to this bight, about abeam of the southwest end of the small islet.

The fourth arm on the east side of Kuiukta Bay, about 1.5 miles from the head of the bay, extends about 1.2 miles in a southeasterly direction. It has not been examined.

The north side of the entrance to this arm is marked by a grass-topped U-shaped islet, with steep rock cliff shoreline.

The fifth arm on the east side of Kuiukta Bay, about 0.5 mile from the head of the bay, extends about 0.5 mile in an easterly direction between sheer rock cliffs. It has not been examined.

The first arm on the west side of Kuiukta Bay indents the cape opposite the abandoned Indian village of **Mitrofania**; and is separated from the small lagoon on which the village was located by a narrow boulder-gravel spit. The arm is 1.8 miles long, extending in a westerly direction between sheer rock cliffs to its head at the steep-to boulder-gravel beach. Anchorage on the centerline of the arm about 0.6 mile from its head may be obtained in 18 fathoms, sandy bottom, but any swell piles up in this bay, as evidenced by large amounts of driftwood high up the boulder-gravel beach, and in northwest weather williwaws are very strong. Anchorage here is not recommended except in favorable weather.

The second arm on the west side of Kuiukta Bay, about 4.5 miles north of the point marking the west entrance to Kuiukta Bay, extends about 1.5 miles in a southwesterly direction, and is restricted at its deep entrance to a width of 400 yards by a hook-shaped boulder-gravel spit extending from the southeastern shore of the arm. Within the hook itself the water is very shallow; and southwest of the hook for a short distance along the southeastern shore the water is shallow. Otherwise the arm, including the narrow entrance, is very deep. There is no anchorage in the bay, except for very small craft on the shoal bank close to the southeast shore, just southwest but not within the boulder-gravel hook.

Foot Bay is the third arm on the west side and about 5 miles north of the west entrance to Kuiukta Bay. Foot Bay is almost 1 mile wide and extends about 2 miles in a westerly direction. It is deep throughout, except close up in the northeast corner where the bottom rises abruptly from 25 to 2 fathoms or less in the vicinity of the mouth of a fair-sized river entering the bay. The only available anchorage is in the southwest corner of the bay, about 300 yards from shore, in 20 fathoms, muddy bottom. This anchorage is off a small sand beach and a low valley which extends to the northeast arm of Mitrofania Bay. The anchorage is swept by strong squalls in bad weather.

Windy Bay is the fourth arm on the west side and is about 8 miles north of the west entrance to Kuiukta Bay. The south side of the entrance to Windy Bay is marked by a sharp dark-colored pinnacle lying close to a dark-colored, high rock cliff point. From the entrance, about 1.3 miles wide, the bay trends northwestward for 1.5 miles, narrowing to 0.6 mile in width, where there is a small shallow bight extending 0.5 mile southwestward; and where the bay changes direction at a right angle to the northeastward to enter the northern part of the bay, through a deep passage about 600 yards wide between low steep-to gravel spits on either shore. After entering the northern part of the bay it widens to about 0.8 mile and trends in a northerly direction for about 1 mile, thence west-northwestward, in a narrowing arm for about 2 miles. Anchorage, about 0.8 mile north of the gravel spit marking the west side of the entrance to the north arm, can be obtained about on the centerline of the bay in 15 to 20 fathoms, sticky bottom. Almost continuous fresh winds and frequent williwaws, accompanied by fog and mist, were experienced here during a 36-hour period of west and northwest winds.

The small bight on the south side of Windy Bay shoals rapidly a short distance

inside its entrance. A temporary anchorage with restricted swinging room can be obtained at the entrance in 15 fathoms, muddy bottom.

The fifth and last arm on the west side and at the head of Kuiukta Bay extends west by north 2.5 miles from a small but high grass-covered islet to a low valley at the bay's head, where an easy portage leads to Chignik Lagoon. Good anchorage, 0.5 to 1 mile west of the small but high grass-topped islet marking the south side of the entrance to the arm, can be obtained in 19 to 15 fathoms, muddy bottom. This anchorage is directly exposed in northwest weather to winds funneling through the low valley from Chignik Lagoon.

Directions.—Passage into Kuiukta Bay from its entrance to Windy Bay may be made with safety by clearing either shore 0.5 mile, and the arms leading off this part of the bay may be entered safely on mid-channel courses. The narrower northern part of the bay should be entered on about mid-channel courses between various islands and the opposite shore as follows:

From a point in approximate mid-channel about 1 mile 040° from the pinnacle point marking the southern entrance to Windy Bay, steer **040°** with the pinnacle point astern. On this course pass westward of the low grass-covered island lying just off the eastern shore about opposite the north side of the entrance to Windy Bay; thence about 3 miles farther pass eastward of the next island, which has a sugarloaf top. From abeam of the sugarloaf-topped island steer **020°** for about 1.8 miles passing westward of a U-shaped island.

About 0.8 mile above the sugarloaf-topped island the water shoals abruptly from 45 fathoms to 7½ fathoms, then deepens to 30 fathoms or more. Pending a detailed survey, caution should be used when navigating this area. Directly after passing the U-shaped island, round on the port hand and on mid-channel courses two closely spaced islands, the northerly one of which is the higher and is the last island at the head of Kuiukta Bay. Anchor in the west arm about 0.5 mile to 1 mile west by south of the last island in 19 to 15 fathoms, mud bottom.

Mitrofania Bay, large and open, is bordered on the south by Mitrofania Island, on the west by Long Beach and on the north by high, rugged, unnamed capes of the mainland. The bay is deep and free of dangers, except for the area southwest of the Brother Islands.

The north side of the entrance to Mitrofania Bay is marked by an unnamed double headland, which is connected to the mainland by a low narrow strip of gravel beach just east of the abandoned Indian village of Mitrofania. Close inshore off the south tangent of the eastern headland is a towering brown pinnacle rock. Between the double headlands is a small arm with a short section of steep-to gravel beach at its head, and many huge pinnacle rocks in its northwest portion. This arm is exposed and not recommended for anchorage. At the eastern entrance to this arm is a prominent gray rock pinnacle lying about 200 yards off the shore.

About 200 yards off the western point of the western headland is a rock which bares about 3 feet at low water. Between this point, and the south end of a high rugged cape 1.5 miles northwestward, is the entrance to a large unnamed bay with three small arms. The eastern arm affords an anchorage with restricted swinging room in its western portion in 18 to 20 fathoms, muddy bottom; but the inner portion, which is entered through a very narrow passage, is a shallow lagoon. The site of Mitrofania is

at the northwest corner of the lagoon. This site is not visible from the anchorage in the outer portion of the arm.

The northeast arm of the unnamed bay affords an anchorage with restricted swinging room in its southeastern portion, just inside of a low gravel point, in 15 to 20 fathoms, muddy bottom.

In the entrance to the northwest arm, about 0.8 to 1.2 miles from the head of the arm, good anchorage, with 300 to 600 yards swinging radius in 15 to 20 fathoms, can be obtained. This anchorage was used by the survey vessel during a period of stormy weather, when a heavy swell was breaking high on the gravel beach at the head of the small first arm leading off Kuiukta Bay, opposite Mitrofania village, but effects of the swell were barely noticeable in the anchorage.

Ivan Bay, an arm leading off the northwest corner of Mitrofania Bay, lies between rock-cliff shoreline and high rugged peaks on either side, and has a steep-to sand beach at its head, with a low, narrow river valley extending northward. There are two small lakes, one on the east side and the other on the west side of the valley, just inshore of the low gravel beach. The water in Ivan Bay is deep and there is no anchorage.

Long Beach, about 3 miles of steep-to black sand, forms the head or western shore of Mitrofania Bay. The sand beach is flanked on the northern end by a vertical cliff 600 to 800 feet high, made conspicuous by many strata of different colored rocks, and on its southern end by a precipitous double headland, covered with a dense growth of alder bushes, and terminating at the south end in a long narrow point. An isolated rock lies on Long Beach, about 300 yards back from the shoreline and near the base of the higher and northerly mountain of the double headland. This isolated rock, nearly rectangular in form with vertical sides, is about 100 feet broad by 60 feet in height, and its slightly rounded top is covered with grass, ferns and small bushes. Seen from a distance it has the appearance of a huge native sod house. Extending back from Long Beach to the foothills of **Veniaminof Crater** is a broad river valley, in which are many ponds of fresh or brackish water. A large river empties into Mitrofania Bay about through the center of Long Beach. From a distance the double headland at the south end of Long Beach appears as an island located well offshore from the mainland.

Mitrofania Island, about 5 miles wide between its north and south tangents, and about 6.5 miles between its east and west tangents, is somewhat crescent-shaped, has a backbone ridge of steep jagged peaks of nearly the same height, and a rock cliff shoreline. The highest peak, a little east of the center of the island, appears fan-shaped from the northeast and is 2,020 feet high.

Within the crescent on the south side of the island is a large open bay, which has a considerable area of anchoring depths in 15 to 20 fathoms along its northwest shore, where cliffs of white and reddish hues rise vertically to a ridge of numerous pinnacle tops. In the southwest part is a bight, formed by a sharp hook of the island to the eastward, with anchoring depths of 10 to 20 fathoms, sandy bottom. This bight is well protected from wind and sea from the southwest through northwest to north or northeast, but is affected by any heavy swell. Extending eastward about 0.4 mile from the northeastern part of the large open bay is a small arm with a very restricted anchorage in 15 to 18 fathoms, sandy bottom.

On the north side of Mitrofania Island is a very small bay, open to the westward, which has an anchorage for small craft in 15 to 20 fathoms, sandy bottom. A sandy beach is at its head. The bay is well protected from weather out of the north around

through east to south. Sea and swell from the southwest are reduced by the low sand and gravel spit extending off the point about three miles westward of the bay.

Spitz Island, 1,084 feet high, is 1.2 miles southward of the southwest tangent of Mitrofania Island. It has sheer rock-cliff sides and is conspicuous from the eastward and westward. A line of rocks extends southward for 0.7 mile from the island. The most southerly rock is long, narrow, irregular, and about 40 feet high.

Brother Islands, two in number and about 1 mile apart, are on a north-northwest line in the west central part of Mitrofania Bay and across the northern part of the opening between Mitrofania Island and the double headland at the south end of Long Beach.

The easterly Brother Island, 1.5 miles north of the north point of Mitrofania Island, is wedge-shaped with point to southward, 0.3 mile on its longer eastern side and 0.2 mile on its north side. The island presents a flat profile, is 395 feet high, and from its summit drops sheer to the water's edge along the eastern side, where the high rock cliffs are undercut with caves inhabited by thousands of birds. From the southern point of the island a large rock, bare 1 foot at low water, lies south-southwest 0.6 mile; and about on the same line 0.8 mile beyond the rock is the north end of kelp-marked shoal area, which is 0.3 mile long and has a least known depth of 4 fathoms. This shoal has not been thoroughly surveyed and there may be less water over it. Between this shoal and the nearest point of Mitrofania Island, 0.7 mile to eastward, is a deep water channel, passing the shore of Mitrofania Island 300 to 500 yards off on a course of 234° with the end of the low grass-covered gravel spit forming the northwest point of Mitrofania Island about dead ahead; and holding this course until about 0.5 mile from the gravel spit, thence changing course to the westward and rounding the steep-to spit, then about 300 to 500 yards off.

The westerly Brother Island, lying 1.5 miles east of the southern shore of Long Beach, is nearly round, 3.5 miles in diameter, with flat top and sheer cliff sides. From the center of the island a large rock, 22 feet in elevation, lies south-southwest, 0.4 mile; and a rock, bare 1 foot at low water, south 0.6 mile. Between the westerly Brother Island and the mainland the water is deep and clear of any known dangers. Both Brother Islands have about the same elevation.

Chart 8859.—The character of the shoreline between Mitrofania Bay and Ivanof Bay differs from that to the eastward in that it has several stretches of steep-to sand beach, interrupted by low rocky headlands or high rocky capes. Long Beach, described above, is the first of several beaches. The second stretch of sand beach, about 2.5 miles long, marks the head of a large open bay between the sharp pointed headland at the south end of Long Beach on the east and Coal Cape on the west. The low valley north of this beach joins that extending inland from Long Beach. Just inshore from about the center of this sand beach are two detached mountains on the valley plain. These two mountains appear as islands from a distance offshore. The southerly one, known locally as **Red Bluff Mountain,** 1,041 feet high, has reddish-hued jagged pinnacle tips and is very prominent.

Small craft can find temporary anchorage in depths of 3 to 10 fathoms, sand bottom, about 1.1 miles southwest of Red Bluff Mountain. Fresh water may be obtained from a stream that empties into the northwestern part of the open bay.

Coal Cape and Coal Point are the names of two separate and distinct features of

the Alaska Peninsula lying about 10 miles apart. The end of Coal Cape is about 4.5 miles northwest of the shore of Mitrofania Island, and the end of Coal Point is about 2.5 miles north of the shore of Paul Island.

Coal Cape is a prominent rock-cliff headland which reaches an elevation of 2,100 feet and whose skyline is extremely broken and serrated. About 2 miles from its southern tip the cape is about 2 miles wide and from its rock-cliff shoreline long low sand beaches extend to the eastward and westward. Fair-sized rivers break through the beaches on either side and close to the base of **Coal Cape Mountain Range.** The ridge continuing inland from the cape is a spur from Veniaminof Volcano. This spur is flanked both east and west by extensive river valleys extending inland from the long sand beaches.

Perryville, (*P. O.*), an Indian village, was established to provide for people who were driven away from the vicinity of Katmai Volcano by the eruption of 1912. It consists of a number of wooden houses, including a small Government store and school, standing on the flat beach about 2.5 miles westward of the foot of Coal Cape Range. There is no wharf and the water is too deep for anchoring off the steep-to beach in front of the village. Temporary anchorage for small craft can be found in depths of 6 to 10 fathoms 0.3 mile southeast of the westerly of two conspicuous rock ledges just eastward of the village; a small 6 fathom shoal 0.6 mile southeast of the same ledge is the controlling depth for the area, but there are depths of 12 to 15 fathoms between this shoal and the beach.

Three Star Point, a low alder- and grass-topped rocky headland about 1.5 miles southwest of Perryville, separates two long curving stretches of sand beach at a point about midway between Coal Cape and Coal Point Ranges. A prominent line of pinnacle rocks extend eastward about 400 yards from Three Star Point and a prominent pinnacle rock is about 200 yards south of the point. A series of low hills extending inland from Three Star Point divides the broad valley lying between the spurs leading to Coal Cape and Coal Point.

Chiachi Island lies with its most northerly point about 1 mile southeast of Three Star Point and with its southern tangent about on line with the southern tangents of Coal Cape 5 miles to the northeastward and Paul Island 7 miles to the southwestward. The island is about 3 miles in extent from its sharp north point to its rounding south side and about the same distance from its most easterly point to its sharp west point. It has several rugged peaks of about the same elevation. A somewhat prominent one in the southwest portion of the island is 1,447 feet high.

Chart 8851.—Chiachi Bay, in the east end of Chiachi Island, is about 0.6 mile in both width and depth. Anchorage is available for small vessels in depths of 13 to 19 fathoms, mud bottom, and is protected from winds out of the southwest through west to north, but any moderate swell, even from the southwest, surges into the bay.

Pinusuk Island, 0.9 mile long east to west, is 600 yards off the point on the north side of the entrance to Chiachi Bay; a high wedge-shaped ridge, rising to heights of about 800 feet, has its point to the eastward and makes the island easy to identify from that direction. A towering pinnacle rock, 79 feet high, is 400 yards off the eastern end of Pinusuk Island. A rock island, 0.6 mile long and about 800 feet high, lies with its western end 350 yards off the point on the south side of the entrance to Chiachi Bay.

Chart 8859.—Two more islands lie off the northeast shore of Chiachi Island. The northerly one, **Shapka Island,** is a sugarloaf 700 feet high, about 0.8 mile northeast of the north point of Chiachi Island; the other, **Petrel Island,** is a small flat rock mass, lying about 400 yards off the mid-point of the northeast shore of Chiachi Island.

Coal Point, 5 miles southwestward of Three Star Point, is broad and irregular, has rock cliffs along the shores and a high sharp ridge that extends inland; two needle-shaped rocks are on the cliff slope on the southwest point. A reef, marked by kelp at its outer end, extends 0.4 mile from the southeast point. A rock 1¾ fathoms deep is 0.25 mile south-southeastward of the southernmost tip of the point, and a rock 4 feet deep is 1.1 miles east by north of the same tip.

Humpback Bay lies west of Coal Point between Egg Island and the mainland. The bottom in this bay is relatively flat and about 22 fathoms deep in its central part. In the northeast part of the bay, about 0.5 mile northwest of a lone grass-topped pinnacle rock 22 feet high, and about 0.5 mile offshore from the sand beach marking this part of the bay, anchorage can be obtained in 7 to 10 fathoms, sand bottom, but swells pile up in the bay through the entrance between Egg Island and Coal Point. For about 1 mile along the northwest side of the bay the shore is rocky, with several detached rocks close alongshore. In the western part of the bay, about 1.5 miles northwest of Egg Island, is a short stretch of sand beach, from which a portage leads to Ivanof Bay.

Egg Island is about 1 mile long by 0.5 mile wide, has vertical cliffs on its eastern side and steep grass-covered slopes on its western side. It has several round-top summits of about equal height, reaching an elevation of 500 feet in the east central part of the island.

A low sandspit extends well offshore from about midway along the western shore of Egg Island, and a rock 5 feet high is about 125 yards off the northern end. From the reef at the south end of the island a narrow underwater ridge of sand and gravel extends to the north shore of Paul Island; on a course of **233°**, with the tangent of Alexander Point ahead, the least depth is 6 fathoms over the ridge, which drops off abruptly both to the northeastward and southwestward. A buoy marks the north side of the passage between Egg and Paul Islands, and about 0.8 mile southwestward of the underwater ridge a light marks the north shore of Paul Island. The **light** is near the outer edge of a rounding grass-covered sandspit, which forms a small section of the north shore of Paul Island.

Deep-water passage can be made between Egg Island and the mainland by entering Humpback Bay from the eastward midway between Egg Island and the southwest end of Coal Point, thence round the north end of Egg Island about 0.8 mile off, thence steering mid-channel between the mainland and the end of the sandspit on the west side of the island, and finally steering for mid-channel between Paul Island and the jutting point on the east side of Alexander Point.

Alexander Point, opposite the western point of Paul Island, is sheer and rocky and marks the end of the high cape bordering the east side of Ivanof Bay. The first definite peak on the cape, about 1 mile north of Alexander Point, is 1,569 feet high. On the east side of the cape about 1 mile north of Alexander Point is a jutting rocky point, heavily covered with grass and alder; and lying just off the end of this jutting point is a large pinnacle.

Paul Island is somewhat hook-shaped and for its entire length has high sharp ridges

and peaks, which reach an elevation of 1,560 feet in the northern portion of the island. For a short distance along the northwest side of the island is a low grass-covered sand-spit, and inside of the hook of the island, which forms the north shore of Kupreanof Harbor, the beach is low sand and gravel. In this region is a small salt-water pond at the foot of the steep grass- and alder-covered slopes.

In latitude 55°46′.9 along the east side of Paul Island is a semicircular cove, 0.3 mile across, that is danger-free except for the rocky point and reef that form the southeast side. Small boats can anchor in depths of 3 to 5 fathoms, sand bottom, 200 to 400 yards off the sand beach. Fresh water can be obtained from any of the several streams in the vicinity. Along practically all the rest of the Paul Island shores are sheer rock cliffs.

Jacob Island, shaped like a leg of mutton with its point to southward, is about 4 miles long. The highest point, about 1 mile from its north end, has an elevation of 1,647 feet. From the highest point a sharp ridge, which drops almost vertically to the eastern shore, extends southward to **Noon Point,** meeting the sea in a narrow overhanging precipice. Northward of the highest point thickly covered alder slopes broaden out to form the south side of Kupreanof Harbor.

Both Paul and Jacob Islands are stocked with foxes. Attendants' buildings are on each island, located on the north and south shores of Kupreanof Harbor.

Kupreanof Harbor, enclosed by Paul and Jacob Islands, is circular in shape, 1.1 miles across, and free from dangers. It is sheltered from all directions and is the most accessible safe harbor in a wide region. Williwaws have been experienced here with northeast and easterly gales, but the muddy bottom provides good holding ground.

The western entrance to Kupreanof Harbor is 0.7 mile wide and danger-free. To enter, steer **090°** through the middle and change course to **058°** when the point on the north side is abeam; when the southern entrance is about to open, anchor in the north central part of the harbor in depths of 10 to 11 fathoms, mud bottom, with the tangents of the points at the southern entrance in range and bearing 151°.

The curving southern entrance is 0.4 mile wide and has a channel depth of 6 fathoms northeast of the middle. Vessels should approach from the southwest on a course of **020°,** passing 0.75 mile northwest of the southern tip of Paul Island and 0.25 mile southeast of the easternmost point of Jacob Island; when abeam of the latter, steer **000°** for 0.25 mile, thence **317°** for 1.2 miles to anchorage. The 317° course will carry a vessel in the best water northeast of mid-passage and about 0.15 mile off the shore of Paul Island.

The current movement within the harbor is irregular in direction and velocity. Current velocities of one knot have been observed.

Ivanof Bay lies between Alexander Point and Kupreanof Peninsula. It is from 1 to 3 miles wide and about 7 miles long in a north and south direction. Bluffs and high ridges parallel both shores from the entrance to the northern part of the bay where low valleys lead off from both the east and west shores. When east of Alexander Point and proceeding up the bay, **John (Road) Island,** a round-topped, steep-sided island 420 feet high, is seen in the channel 4 miles ahead. Two miles above Alexander Point a grassy headland and a grass-topped, taper-pointed islet 110 feet high are located on the east shore. The west shoreline is here markedly precipitous and rugged, the bluffs rising from one to two thousand feet above the shore. West and north of John Island is an area of sand spits, tide flats and low land. Several steep-sided, grass-

topped islets are connected to the sand spits at low water. Westward of northern Ivanof Bay is a large lagoon and beyond are marshy flats across which **Granville Portage** leads to Stepovak Bay. The north shore of Ivanof Bay is hilly. To the northeast of the bay a low valley and flats extend into the interior.

A cannery wharf, with a least depth of 22 feet alongside, and marine ways are midway along the north shore of Ivanof Bay. The buildings of a fox farm are along the cove in the northwest shore of John Island; a dilapidated wharf in the cove is usable only by small boats on the higher half of the tide.

Vessels can anchor in depths of 15 fathoms, sticky mud bottom, 0.3 mile south-southeast of the cannery wharf. To be avoided are the mud flats that rise abruptly from depths of 10 fathoms on the eastern side, and the ledge that makes out from the northernmost point on the same side.

A ledge with places that bare 1 to 3 feet at lower low water is 0.4 mile southeast of the northeast point of John Island; a rock that bares 2 feet at lower low water is 0.9 mile east by north of the same island point and 0.3 mile from the eastern shore of the bay. A pinnacle rock 1 fathom deep is about 150 yards southwestward of the cannery wharf.

When southeasterly weather prevails along the coast, the wind often blows in the northern part of Ivanof Bay from the northeast, coming down through the valley on that side of the bay. The northern part of Ivanof Bay is well protected from southerly swells.

A pilot for Ivanof Bay occasionally may be secured from Kupreanof Harbor or from Squaw Harbor, Unga Island.

Depths of 12 to 15 fathoms can be carried through the channel west of John Island. From a position 1.4 miles west of Alexander Point, steer **337°** until the south end of John Island is 450 yards on the starboard beam; thence **353°** for 0.9 mile to a position where the north end of the island is 600 yards on the starboard beam; and thence **014°** for the cannery wharf, taking care to avoid the submerged rock 150 yards off the southwestern corner.

The channel east of John Island has a ruling depth of 18 fathoms but rocks off both shores make navigation dangerous for strangers; passage should be made at low tide when the rocks are bare and can be seen. From a position 1.4 miles west of Alexander Point, steer **336°** until the small grass-topped islet 2 miles north of Alexander Point is 0.6 mile on the starboard beam; thence **000°** until the north end of John Island is 0.5 mile on the port beam; thence 334° until the highest islet on the west side of the upper bay is 1.0 mile on the port beam; and thence **014°** for the cannery wharf.

Directions, Castle Cape to Kupreanof Point (Alongshore Route).—From a point 1.5 miles southeast of Castle Cape steer **220°** for 5.4 miles. When abeam of the west end of Chankliut Island, distant 1 mile, steer **216°** for 12.8 miles to clear Seal Cape at a distance of 1 mile. A breaker lies 0.2 mile off the south end of Seal Cape. In thick weather it is recommended that the course be shaped to pass Seal Cape 1.5 miles off.

When the east tangent of Seal Cape and the point at the south entrance to Devils Bay are on range, bearing 000°, steer **249°** for 9.1 miles with the north tangent of Mitrofania Island ahead. This course passes Cape Ikti about 1 mile off.

When the prominent rocky points marking the entrance to the first arm on the west side of Kuiukta Bay close, bearing 013°, steer **282°** for 6.9 miles with north slope

of mountain on flats west of Long Beach ahead. This course passes north of the west Brother Island at a distance of 1 mile.

When 0.5 mile beyond the range of the west tangents of the west Brother Island and Mitrofania Island, bearing 194°, steer **201°** for 3 miles. This course passes about 0.6 mile off the west Brother Island and about 0.6 mile off the long pointed headland at the south end of Long Beach.

When Red Bluff Mountain, described earlier, opens on the Long Beach headland, bearing 305°, steer **246°** to a position 0.8 mile south of Coal Cape; thence **270°** to a position 0.3 mile south of Shapka Island; thence **292°** to a position 0.3 mile north of the northern tip of Chiachi Island; and thence **240°** for 6.2 miles to a position 0.8 mile north of the most northerly tip of Paul Island. Then steer **233°**, with Point Alexander ahead and the prominent, low headland of Three Star Point astern, for 2.8 miles, using the marked passage, described earlier, between Egg Island and Paul Island.

When the west tangent of Paul Island comes on range, bearing 165°, with the highest point of Jacob Island, steer **201°** for 16 miles with the center of Egg Island astern. This course passes about midway between Paul Island and the jutting point on the east side of Alexander Point; about 0.8 mile off the west coast of Jacob Island; midway between Noon Point and Leader Island; 1.8 miles east of Fox Cape; and 2 miles east of Kupreanof Point.

The eastern shore of **Kupreanof Peninsula** from Ivanof Bay to Kupreanof Point is bold and precipitous, broken only by a broad sand beach 1.5 miles long located 9 miles north of Kupreanof Point, and by a small sandy cove 4.5 miles north of Kupreanof Point.

Leader Island, lying between Kupreanof Peninsula and Jacob Island is a *turtleback*-shaped, rocky, islet 125 feet high. It may be passed in depths of 23 to 37 fathoms on the west side and 32 to more than 50 fathoms on the east side. An 18-fathom bank is 1 mile north by east of the island.

Hag Peak, a black dome-shaped mountain, the seaward faces of which consist of rows of tilted basalt columns, is at the south side of the entrance to the long sandy beach cove and 3 miles west-southwest of Leader Island. The peak is a distinctive landmark.

Fox Cape, 4 miles south-southwest of Leader Island, appears as a pyramidal-shaped headland with several offlying islets. The largest of these islets has a sloping flat top and sides with a number of deeply carved caves.

South of Fox Cape the shoreline is bold and reef fringed. A group of three pinnacles, 25 feet high, is 1.5 miles south of the cape.

Kupreanof Point (John Point) is the southeastern end of Kupreanof Peninsula. It appears as a row of rugged monoliths, graduated downward from the high point of the cape, which is 900 feet high. Several reefs fringe the base of the cliffs at the southeast end of the point. A reef, which breaks in a moderate to heavy swell, is 700 yards northeast by north of the outer end of Kupreanof Point.

The south shore of Kupreanof Peninsula between Kupreanof Point and Bluff Point is bold and rugged, broken only by a sand beach-bordered cove about midway between the points.

Stepovak Bay, lying northeast of the Shumagin Islands, is large and open. Numerous small bays and coves indent the east and west shores of Stepovak Bay. They lie between steep ridges on both sides. At the heads of each of these smaller bays are stretches of sand beach behind which are lagoons and grassy flatlands.

Kupreanof Peninsula on the east side of the bay is mountainous. The higher peaks are rocky, barren, and scarred from erosion. The lower slopes are grass covered with patches of alder. The draws and lines of drainage on the lower slopes have dense growths of alder.

The north shore of Stepovak Bay is a long stretch of wide sandy beach, behind which are grass-covered sand dunes. Beyond the dunes a belt of flat tundra extends into Ivanof Bay.

The western shore of Stepovak Bay is mountainous, on a more rugged and massive scale than is the terrain of Kupreanof Peninsula. Snow and ice fields fill the upper plateaus. A small volcanic vent in the high country above Ramsey Bay often sends out a cloud of vapor. The steep terrain surrounding the fluted shafts of Mount Stepo is rich in beauty and grandeur.

Stepovak Bay is much traveled by fishing craft during the salmon season, and gill nets are laid out from many of the rocky points. Brown bear, wolverines, and foxes track the shores, and there are trappers' cabins in several of the tributary bays.

In the central part of Stepovak Bay, the bottom is regular, with depths ranging from 40 fathoms in the northern part to 90 fathoms in the southern part. Near the eastern shores the depths vary from 20 to 40 fathoms. North of Pad Island the bottom is rough, and there are several submerged pinnacles. On the west side of the bay, reefs and submerged shelves make off from many of the headlands. Some of these reefs bare for a few hundred yards offshore, then continue as submerged shelves with depths of 10 to 20 fathoms extending several miles off these points.

The bottom in most of the bays is a sticky dark-green mud, in depths of 15 to 20 fathoms.

Kupreanof Peninsula partly protects this bay from the southeasterly swell common along this coast during the summer. The bays and coves on the western side of Stepovak Bay are more exposed to the southeasterly swell. These bays are also subject to violent winds and downdrafts during northwesterly weather. For this reason the bays on the east shore offer more protected anchorages than do those on the west shore.

Bluff Point, the southernmost feature on the east shore of Stepovak Bay, is a sharp narrow promontory about 700 feet high. It bristles with a descending series of projecting nobs and points.

Boulder Bay, north of Bluff Point, the southernmost bay on the east side of Stepovak Bay, offers good anchorage but is somewhat exposed to southern swells. The bottom is very even, sloping gradually from 20 fathoms at the entrance to 15 fathoms near the anchorage. The bottom is a black gritty mud. The anchoring depth and swinging room make Boulder Bay suitable for medium-draft vessels.

Cub Point, on the northern side of Boulder Bay, is a broad-topped, rounding headland about 900 feet high. It has almost perpendicular faces. These faces are strongly marked with inclined bands of light and dark stratified rock. A patch of white rock halfway up the outer face of Cub Point makes an identifying landmark.

Fox Bay, on the north side of Cub Point, is the largest tributary on the east side of Stepovak Bay. Vessels of all sizes can find protected anchorage in Fox Bay except during very strong westerly winds. An islet 90 feet high in the southeastern part of the bay is a good leading mark for vessels entering. The entering course is **090°** for the islet; when 1 mile from the islet, and with a low gravel point that begins near the inner end of a grass-topped bluff abeam to starboard, change course to **065°** and proceed

to anchorage in depths of 15 to 18 fathoms, or less if desired, in the large cove at the head of the bay.

The cove on the southeast side of Fox Bay is the most protected anchorage for small craft in Stepovak Bay. Enter Fox Bay as in the preceding paragraph and when 1 mile from the islet change course from **090°** and steer **108°** for 0.9 mile to a position where the islet is 0.3 mile on the port beam; thence **135°** for 0.6 mile to anchorage in depths of 8 or 9 fathoms, sticky mud bottom. Fresh water can be obtained from a waterfall on the southeast side of the cove.

The northern part of Fox Bay should be avoided by strangers. A reef 750 yards long and 300 yards wide is awash at lower low water 1 mile south-southeast of the headland on the north side of the entrance.

Dome Point, the north entrance headland of Fox Bay, is precipitous with a somewhat level grass top. A large yellow scar on the eroded face identifies this headland.

Island Bay, located north of Fox Bay, is large and open. Its shores are indented by several coves. As in Fox Bay, an islet 32 feet high is in the inner part of the bay and makes a good leading mark for vessels entering the bay. In entering Island Bay vessels should keep at least 0.5 mile offshore. An extensive submerged ledge makes off from the cove 0.8 mile west-southwest of the islet. This must be avoided when approaching the anchorage.

Anchorage west-southwest of the 32-foot islet is in depths of 17 to 20 fathoms, mud bottom. Fishing craft sometimes anchor east of the islet in depths of 3 to 6 fathoms, blue mud bottom. A submerged ledge makes off from the east end of the islet, and a shoal 4 feet deep is near the bay's north shore northwest of the islet.

Stonehouse Cove, 1 mile inside of the north entrance point of Island Bay, is a small cove. A long reef extending halfway across the entrance breaks the sea in this cove which has a very smooth, white sand bottom that bares at extreme low tides. The cove is used by fishermen to careen their craft.

Pad Island is located off the north approach to Island Bay. It is a low, flat, grass-covered island about ¼ 0.5 mile long and 0.2 mile wide. A narrow channel separates the island from the main shore. Kelp patches and foul ground extend northward from Pad Island. A pinnacle 5 feet deep is 0.9 mile south by west of the island; another pinnacle 1½ fathoms deep is 0.4 mile north-northeastward of the island. A large shoal with a least depth of 5 fathoms is 1.3 miles northward of Pad Island.

The shore from Pad Island northward consists of rugged cliffs. Two striking rock formations are located 1.5 miles north of Pad Island. One is a chimney-like column 120 feet high projecting from the cliff slopes. The other is a spike-like rock 400 feet in elevation projecting above the cliff line. This spike is noticeable from a distance.

The small cove in the northeastern corner of Stepovak Bay is rimmed with rocks and reefs except at its head where there is a sandspit and a lagoon. Depths are 4 to 8 fathoms, mud bottom, at the entrance and decrease gradually toward the head.

Along the north shore of Stepovak Bay is **Stepanof Flats,** a 5-mile stretch of broad sand beach. Behind the beach are grass-covered sand dunes and beyond are extensive flats of tundra. Two streams flow out of these flats, often bringing silt which discolors the sea for large areas around their mouths.

Gull Rocks, just offshore from Stepanof Flats and about midway along the northern shore of Stepovak Bay, are two barren rocks joined by reefs; the southerly rock is

about 25 feet high and the other is about 4 feet high. From southward they appear light-colored against the dark background of the hills. The water is shallow between the rocks and the shore.

Louies Corner is at the west end of Stepanof Flats. Hills and a rocky headland lie west of Louies Corner. Behind Louies Corner is a detached cone-shaped hill 700 feet high which shows distinctly from the south end of the bay. An anchorage with depths of 17 to 20 fathoms, mud bottom, is 1.3 miles west of Gull Island; it is exposed to southerly weather.

Ramsey Bay, at the north end of the west shore of Stepovak Bay, is fairly open and exposed, and in the central part of the bay the depths are too great for anchoring. A broad sand beach stretches for several miles around the north and northwest shores of Ramsey Bay. At the east end of this beach is **Bales Landing.** Small vessels can anchor in depths of 5 to 10 fathoms, green mud bottom, 0.3 mile south of the landing; the anchorage is exposed to southerly weather.

West of Bales Landing two streams form deltas off the sand beach. On these deltas sand bars and sand flats bare at low water for more than 0.5 mile offshore from the high-water line.

From Ramsey Bay southward to Dent Point, the shore is steep and rocky. At the Ramsey Bay end of this stretch is a rocky headland; reef and rocks, bare 1 to 4 feet at lower low water, extend 0.2 mile southeastward from the headland.

Dent Point, between Ramsey Bay and Grub Gulch, is broad and rounding, backed by steep cliffs, and fringed with reefs. Two conspicuous rocks, 40 feet and 16 feet high, are joined at low water with the southernmost tip of the point. A rock 2 feet deep is 0.3 mile offshore 1.1 miles northeast of the same tip. Vessels should keep at least 0.5 mile off this shore.

Grub Gulch is marked by two grass-covered islets and several low bare rocks and reefs. The bottom near the entrance is very broken, but a channel with an average depth of 20 fathoms can be carried to the head of the bay by favoring the west shore well away from the vicinity of the islets. The anchorage at the head of Grub Gulch is deep, having 20 to 23 fathoms of water. The swinging room is limited. The bottom is mud. At the northeast end of the beach at the head of the bay the mouth of a stream is surrounded by sand flats which bare at low tide. In anchoring, a vessel should favor the southwest end of the beach.

The outer part of Grub Gulch is not suitable for anchorage because the average depth is about 45 fathoms, and there is little or no swinging room in the shoaler depths near shore.

Red Hill, a sharp, steep, red-hued mountain about 2,300 feet high, is on the point between Grub Gulch and Clark Bay. A reef extends 0.3 mile south-southeastward from the outer end of the point to a conspicuous pinnacle rock 20 feet high.

Clark Bay is a large open bight backed by two valleys. A grass-covered islet is located near the east shore of Clark Bay. It is reported that small fishing craft anchor northwest of this islet in 6 or 7 fathoms, finding some lee from southeasterly storms.

Near the west end of the east bight of Clark Bay are two pinnacle rocks. Between these pinnacles and the west shore the bottom is foul. The west bight of Clark Bay is called **Little Norway.** Anchorage off the sand beach is found in 15 fathoms, mud bottom. During northeasterly storms the winds draw down across this bight with terrific force.

The west shore of Clark Bay consists of a rocky bluff line. A conspicuous waterfall is about 1 mile north of the entrance to Clark Bay. An odd-shaped slender pinnacle rock is about 0.2 mile south of the waterfall.

Waterfall Point is a broad, rounding headland and ridge separating Clark Bay and Orzinski Bay. A waterfall, visible for many miles, marks the south tip of this point. This waterfall, viewed in profile, appears to spout its stream clear of the bluff line. Reefs and rock ledges make off Waterfall Point for 0.5 mile; the point should be given ample berth.

Orzinski Bay has steep slopes along most of its shores, but there are grass flats and a lagoon at the head. It is shoaler than the adjacent bays but seems to have better protection at times from northwesterly storms. A shoal that extends 0.5 mile off the northern shore has depths of 7 feet or less. The bay must be navigated with caution; the best water is found by favoring the north side of the entrance, then heading for the middle of the bight in the south shore and strongly favoring the south shore to the head. The bottom rises rather abruptly but anchorage is possible in depths of 10 to 20 fathoms, mud bottom, about 0.2 mile from the head; the anchorage has good holding ground but is exposed to southeasterly weather.

An alternative anchorage which offers some protection from southeasterly weather is found off the mid-bight in the south shore, 0.8 mile west-northwest of Elephant Point. Anchor in 13 fathoms, mud bottom. Two abandoned buildings are at the head of Orzinski Bay. One is near the mouth of the stream and the other is farther upstream at the base of a hillside.

Elephant Point, on the south side of the entrance to Orzinski Bay, is a sharp-ridged promontory, 655 feet high, bound by sheer cliffs having striking bands of stratified rock. The cliffs at the outer extremity of Elephant Point are deeply undercut. A ledge that bares at low water extends for 0.5 mile east-northeast to southeast from the point. Shoal indications extend 1.5 miles east-southeast of the point, and vessels should keep at least that distance off.

American Bay is open and exposed in its outer part, but narrows into a long fiord which is fairly well protected from the outside swell. This inner bay is surrounded by tremendously high peaks of a striking and rugged appearance. In the outer bay a pinnacle 4¾ fathoms deep is 0.6 mile southwest of Elephant Point, and another pinnacle with the same depth is 0.3 mile southwest of the rocky point 2 miles along the north shore from Elephant Point. A sandspit projects from the northeast shore and a gravel spit from the southwest shore 2.5 and 3.5 miles from the entrance.

The valley at the head of American Bay shows considerable evidence of glacial deposit. There are shoals and low-water sand flats off the mouth of the stream that flows from the valley. Ruling depths in the inner bay are 20 to 30 fathoms, and the bottom rises steeply except off the flats at the head. Anchorage is possible for small craft in depths of 8 to 10 fathoms, mud bottom, near the head of the bay; other anchorage is not recommended because of the depths and the limited swinging room.

Blunt Point, on the south side of the entrance to American Bay, is a broad cape with grass-covered slopes above a shoreline of eroded bluffs. Reefs make off Blunt Point and vessels should stay well clear of it.

Wind Bound Bay is a small cove 1 mile west of Blunt Point. Inside the cove is a small valley surrounded by high mountains. It is reported that small fishing craft anchor off the mouth of the creek in 3 fathoms of water.

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Chart 8700.—Chichagof (Chicago) Bay, 3 miles westward of Blunt Point, is used as an anchorage by small fishing craft. A reef fringes the bold headland separating the bay from West Cove on the southwest. The reef extends about 0.7 mile southeastward from the headland and is marked at its outer extremity by a kelp patch. A second reef extends southwestward of the northeast side of the entrance. A survey vessel drawing 9 feet entered the bay on a 300° course favoring the eastern shore, and heading slightly to westward of the low, 1,050-foot rounded peak which is the culmination of the ridge forming the west side of Chichagof Valley. From a point about 1 mile off the entrance the bottom shoaled gradually from 21 fathoms to 5 fathoms 0.4 mile from the beach. Soundings indicated a suitable anchorage at that depth with hard sand bottom and sheltered except from the southeastward. There is a shoal sand delta in the inner southwestern part of the bay.

West Cove is small and appears to be fringed on both sides with submerged rock ledges. A long ledge extending southwestward from the point on the west side of the cove has pinnacles that bare at various stages of the tide. A depth of 8 fathoms was found off the entrance to the cove.

Dorenoi Bay is open and exposed to the east and southeast, and subject to strong winds through low ground to the northwest. Both sides of the bay are mountainous and rock ledges border the shores. At the head of the bay is a long stretch of sand beach. The bottom near the entrance is extremely broken and depths vary from 20 to over 70 fathoms. Approaching in mid-channel, a good anchorage is at the head of the bay, where depths shoal gradually from 30 fathoms. The holding ground is good.

Renshaw Point marks the south entrance of Dorenoi Bay. Renshaw Point lies at the base of a rugged mountain. The deeply eroded orange-buff cliffs are conspicuous for many miles. Black rocks and reefs make off the point.

San Diego Bay is the open bight north of a string of islets and rocks between Guillemot Island and the mainland. A low yellow cliff marks the north side of the bay. San Diego Bay is much used during the salmon fishing season as an anchorage and as a fish transfer point. The approach north of Guillemot Island is deep and clear. Smaller vessels may carry 4 fathoms through the passage between the east end of the island and a conspicuous pinnacle rock that is midway of the distance to the mainland shore.

Guillemot (San Diego) Island is about 1.6 miles long, 0.3 mile wide, and 624 feet high. It has bold precipitous cliffs on the north side and low bluffs on the south side. Above the low bluffs the grass-covered ground slopes evenly upward to the top of the cliffs on the north side. A neck of land extends off the southeast end of the island to a rocky, round, and steep-sided headland. On the east shore, between this round headland and the cliffs to the north, is a bight with a sandy beach.

Off the southwest end of the island is a flat and sandspit. A fisherman's cabin is on this flat land. Smaller craft often anchor on the south side of the island in the bight east of the sandspit, in 1 to 5 fathoms. Northwesterly and northeasterly weather causes strong winds to sweep down the grassy slopes, so this anchorage should be used with caution.

The water is fairly deep off the north and south sides of the island, but a submerged ledge having a least depth of 6 fathoms lies 0.8 mile east of its east end.

South of Guillemot Island the coast is bold and precipitous, except for two stretches of low sand beach bordering valleys which break through from the interior. Rocks and reefs fringe the bases of the cliffs.

Lumber Bay, or **Rough Beach** as it is called locally, is on the eastern face of Swedania Point, 2 miles northeastward of its south end, and consists of a shallow bight at the entrance of a valley; the beach is a dike of cobbles thrown up by the sea, and is capped by a great windrow of driftwood.

Swedania Point is the seaward end of a ridge 1,400 feet high; at the extremity are rugged cliffs, and on the southwestern side is a gravel spit at the foot of the cliffs. The profile and end slope are striking and unusual, resembling in magnified outline the end of an artificial earthwork or bunker, back of which the mountain rises steeply. Strong williwaws blow on the lee side. One mile east of Swedania Point a group of rocks, bare at low water, extends southward.

Balboa Bay, known locally as **Portage Bay,** offers good shelter on the eastern side about 5 miles from Swedania Point in a small bight with a low gravel point south of it at the mouth of a large ravine containing a stream. The mid-channel into the north arm is deep. When the coal mine at Herendeen Bay, on the other side of the Alaska Peninsula, was in operation, supplies were landed here and carried across the trail by pack train, a distance of about 15 miles. The highest point on the trail, less than 600 feet, is near the south side of the peninsula. This portage is still used frequently.

On the west shore of Balboa Bay a reef extends 600 yards off the entrance point and then fringes the shore to the northward at a distance of 200 to 600 yards offshore. Outside the reef the water deepens rapidly to the middle of the bay.

The west shore of Balboa Bay for 3.5 miles inside the entrance has been surveyed. A reef extends 600 yards off the entrance point and then fringes the shore to the northward at a distance of 200 to 450 yards offshore. Outside the reef the water deepens rapidly to the middle of the bay.

Albatross Anchorage is a secure harbor near the head of the north arm of Balboa Bay. The best anchorage in mid-channel abreast of **Ballast Island,** close to east shore, has a clear width of 0.4 mile, with depths of 5 to 8 fathoms. A reef extends well off from **Reef Point,** on the east side 0.6 mile southward of Ballast Island. Small craft may anchor in the bight on the west side opposite Ballast Island and secure better protection from the sea by keeping well over on the southern side to avoid a ledge which uncovers at half tide and extends 300 yards southeastward from **Bassett Island.** The depths are 8 to 12 feet.

Lefthand Bay, known locally as **Left Arm,** on the west side of Balboa Bay, is well protected and a good anchorage, mud bottom, for any size vessel. Shoals extend about 500 yards off the north and south shores at the entrance, and about 200–300 yards inside the bay. Mid-channel depths are 30 fathoms at the entrance, shoaling gradually towards the sand beach at the head of the bay. Low marshy ground, known as **Kagayan Flats,** leads from the head of the bay to Beaver Bay.

Cape Aliaksin has no distinctive form; it is of a rounded outline and a low rounded profile; there is low land for some distance from the shore all around. The summit is broad and flat, and about 2,000 feet high. There is shoal water near shore all around, and a rock awash at high water about 0.3 mile off the southwest side. A reef extends 600 yards off the cape in a southeasterly direction.

Cape Aliaksin is distinguished with difficulty from westward, but it comes out clearly from eastward.

Beaver Bay is described later.

Chart 8859.—Shumagin Islands, comprising 15 sizable islands and many islets and rocks, extend for a distance of 60 miles from the coast of the Alaska Peninsula from which the group is separated by Unga Strait.

The inside passage along the Alaska Peninsula in the vicinity of the Shumagin Islands is through Gorman, Korovin, and Unga Straits, and northward of Jude Island. See directions in Chapter 3.

In general, the Shumagin Islands are bold and mountainous, and the shores are broken in many places by inlets that afford good anchorages. The shores are rock-bound close-to. Fishing stations and camps are scattered throughout the group, and good fishing banks are off the islands. Fox and cattle raising are carried on to some extent.

The surveys accomplished in the region of the Shumagin Islands include: Unga Island, except the west coast; the coasts of Nagai Island from Cape Wedge to Eagle Harbor on the west side and from Cape Wedge to Larsen Bay on the east side; the islands between Unga and Nagai Islands; the four islands in East Nagai Strait; and the west coast of Big Koniuji Island from abreast of Peninsula Island to abreast of Bendel Island. The available information for the other islands is similar in character to other unsurveyed areas.

A depth of 6¾ fathoms was reported, in 1952, in latitude 54°29′ N., longitude 159°26′ W., 17 miles south-southeastward of Chernabura Island. Widely spaced depths charted in the vicinity are 67 fathoms or more.

Weather.—The prevailing winds in summer are southwesterly, force 4. This wind brings in a sea fog which lasts as long as the wind prevails, and usually covers Unga and Popof Islands, the southwesterly section of Nagai Island, the southwesterly shores of Big and Little Koniuji Islands and Simeonof Island. In Popof Strait and Humboldt Harbor, the lay of the land thins the fog to mist through which the shores are visible and often these waters are in a clear pocket when the fog around is heavy. The southwesterly wind also produces a moderate swell and choppy sea on the southwestern side of the islands. While this condition prevails on the southwesterly side of the group, it is generally clear on the opposite side, with light breezes, smooth sea, and no swell. A landfall for the Shumagins, in summer, should therefore be made to northeastward, and the most unmistakable point is Castle Rock. A northerly breeze dries and clears the islands to crystal clearness.

Chart 8700.—Unga Strait separates the Shumagin Islands from the Alaska Peninsula. The strait is 2.7 miles wide in its narrowest part, between the sand spit on the north side of Unga Island and Cape Aliaksin on the peninsula. The sand spit is marked by a light. Depths of 16 to 30 fathoms are found in this part of the strait. A vessel should keep 0.8 mile off either shore.

Currents.—In general, currents set in the direction of all courses from Sand Point to Pavlof Bay. See remarks on currents, Alaska Peninsula, at the beginning of this chapter.

In Unga Strait a current will generally be found setting westward, its velocity varying with the stage of the tide. In the northern part of Popof Strait a tidal current with a mean velocity of about ½ knot at strength sets northward on the flood and southward on the ebb. The predicted times and velocities of the tidal currents in Unga and Popof Straits may be obtained from the *Current Tables*.

Chart 8851.—Simeonof Island, the most easterly of the Shumagin Islands, is about 4 miles long and 3.5 miles wide. It is composed of two clusters of hills, the southeastern and higher ones being about 1,400 feet high. These hills are separated by a low plateau which is nearly cut in two by a very irregularly shaped inlet known as Simeonof Harbor.

The coast of the island is fringed with reefs and shoals. Those on the south and southwest sides are variously reported to extend from 3 to 7 miles offshore; those on the east side, 3 miles; and those off the other shores, 0.5 mile. A rock on which the sea breaks at low water has been reported halfway between Simeonof and Chernabura Islands.

Simeonof Harbor makes in from the western side of the island. A reef extends about 0.5 mile westward from the north point of the entrance to the harbor. Off the south point of the entrance is a low, flat, rocky island fringed with reefs. In October 1948, thick kelp beds were observed parallel to the reefs on either side of the harbor entrance. The harbor is protected from all winds, the entrance is tortuous, with reefs on either side; the shores are rocky and the water very shoal. The inner anchorage is in 2½ fathoms, with not over 2 fathoms at the lowest tide; the bottom is smooth gravel. Anchorage, exposed to westerly winds, may be had in the outer part of the harbor, in about 4 fathoms, about 0.5 mile inside the entrance.

Twelve Fathom Strait, about 2.2 miles wide, separates Simeonof and Little Koniuji Islands. In 1948 an average depth of 12 to 15 fathoms was found in the strait, with a 6½-fathom shoal near the middle of the strait and about 0.5 mile in from the northeast end. With the exception of this shoal and a few kelp patches on the Simeonof side, no other dangers are known.

Little Koniuji Island is very irregular in shape, consisting of three parts, 1,200 to 1,600 feet high, connected by raised sand beaches. The southern end terminates in a high rocky pointed cape, with a reef marked by a breaker extending about 0.3 mile southwestward from it. The eastern coast is indented by two coves, and there is a large harbor on the western side.

Sandy Cove is on the eastern side of Little Koniuji Island. It is about 1 mile wide at the entrance and 1.5 miles long. On its western shore are prominent granite cliffs. The cove affords good anchorage in its southerly bight in about 10 fathoms, sheltered from all but southeasterly weather. Excellent anchorage was reported, in October 1948, 1.1 miles 155° from **Entrance Point** in sand bottom; this anchorage affords good protection against weather from the southwest.

Atkins Island is about 1.5 miles long and about 0.6 mile wide, and is connected to the northeast headland of Little Koniuji Island by a shoal. The island rises to a height of 800 feet at its southeastern end. Anchorage is reported southward of the island.

Northwest Harbor, a bight in the northern side of Little Koniuji Island, southward of Herendeen Island, may be entered from either side. It affords fair anchorage and protection from all but northeast winds, in 5 to 10 fathoms. The harbor is about 0.5 mile wide. An abandoned fishing station is here.

Herendeen Island is triangular shaped, about 0.9 mile long and 0.5 mile wide. An islet is off the western end.

Northeast Harbor, the large bay in the western side of Little Koniuji Island, has two bights and is approximately 4.5 miles long. The southeast bight of the harbor is

somewhat open to westerly winds and the holding ground is rocky and poor. The extreme southeast end of the harbor is more protected and is a favorite refuge for fishermen, though the bottom, being alternately patches of rock and sand, is not good holding ground. At the head of a small well-protected boat harbor are several houses belonging to a fox farm.

Chart 8859.—Chernabura Island, is the most southerly of the Shumagins, is high and mountainous, and there are few breaks in its profile, the highest part being at the east end. A rocky islet, apparently connected with the main island by a bar, lies off its northern end. On the east side are three small bays; the middle one is reported to afford anchorage in westerly winds.

Bird Island lies about 4 miles westward of Chernabura and is more irregular than that island, but several of its peaks are nearly as high. Passing well southward, Bird Island appears as four principal peaks connected by low valleys. Almost its entire southeast side is a series of cliffs. A rock above water lies a short distance off its southern end.

An anchorage is reported in the bight on the east side of Bird Island, just inside of **Point Welcome,** in 5 to 12 fathoms. The wreck of a schooner is at the head of the bight. Temporary anchorage, exposed to all but winds from the southeast quadrant, may be had in the bight in the northwestern side of the island in about 12 fathoms, sand bottom, southwestward of the reef making about 1 mile in a northwesterly direction off the northwest point of the island. Rocks are 0.5 mile offshore in a westerly direction from the southerly point of this bight and a shoal about 1 mile in a northwesterly direction off the southwest point of the island. Sunken rocks are found about 0.5 mile off the northern shore of the large bight on the eastern side of the island.

Otter Strait, between Bird and Chernabura Islands, is said to have depths between 20 and 35 fathoms, sandy bottom.

Big Koniuji Island, the northern and largest of the eastern group of the Shumagin Islands, is about 13 miles in length and about 6 miles in width at its widest or southern end. The island is rugged and very mountainous, with a well-defined central ridge and spurs projecting toward the points. The coast is broken by many inlets and the points are rockbound close inshore. The highest peaks are frequently mist covered. **Cape Thompson,** its northern point, is comparatively low, and its southwestern end terminates in a long narrow point with a high connecting ridge which resembles an island from some points of view.

Flying Eagle Harbor, on the east side of the island, about 5.5 miles southward of Cape Thompson, offers well protected anchorage for small vessels, especially in southerly gales, in 7 to 10 fathoms.

Chart 8851.—Hall Island, about 0.9 mile long and 0.4 mile wide, lies about 1 mile off the eastern shore. There are two rocks above water close to the southeast face of the east end of the island, and a reef extends about 0.3 mile southwestward from the southwest point.

Murre Rocks are a group of three islets about 0.6 mile northwestward from Hall Island. A rocky ledge extends about 0.3 mile southwestward from the southern islet.

Yukon Harbor is southwestward of Hall Island. A rocky ledge covered with kelp lies close around the eastern entrance point, and rocks are close to the western

point. Anchorage, protected from westerly weather, may be had in the center of the harbor, in about 7 fathoms, but the bottom is poor holding ground.

Eastward of the southwestern point of Big Koniuji Island is a bay, but the depth is reported to be too great for anchorage. East of the bay is another one, larger and wider, in which vessels have anchored in 16 fathoms, hard bottom, with protection from northerly and westerly winds. The holding ground is poor. A 3-fathom shoal extends from the south end of the island.

Koniuji Strait, between Big and Little Koniuji Islands, is about 1.5 miles wide. Soundings of 16 to 28 fathoms are reported.

Chart 8859.—Four prominent bights are on the west side of Big Koniuji Island. They are open and easy of access and their shores are clear, except close-to. Anchorage in 24 to 26 fathoms may be had near the head of the bight 146° from Peninsula Island which is 3.5 miles northward from Spectacle Island. In approaching the anchorage it is necessary to keep northward of mid-channel to avoid a shoal extending 300 yards off the south shore about 0.5 mile from the head of the bight.

The other bights do not offer anchorage on account of the great depth of water. Anchorage for very small craft may be found in any of these bights, close inshore, and in the numerous indentations and small coves. The winds draw through the divides into the bights and the williwaws are very strong.

Castle Rock, lying about 1.5 miles northward of Cape Thompson, the north point of Big Konuiji Island, is rugged and serrated, and its highest peak has an elevation of 825 feet. It makes an excellent landmark. A 3-fathom shoal extends about 0.8 mile off its southern end.

The bottom between Big Koniuji and Castle Rock is said to be even, averaging 28 fathoms.

East Nagai Strait separates Nagai and Big Koniuji of the Shumagin group, and has an average width of 6 miles. Peninsula, Spectacle, Bendel, and Turner Islands lie in a general north-northeasterly and south-southwesterly direction in this passage, and the waters between this chain of islands and Nagai on one side and Big Koniuji on the other are deep and clear and mid-channel courses may be safely steered.

Peninsula Island, 3.5 miles northward from Spectacle Island and the most northerly island in East Nagai Strait, has a length of 1.5 miles and a width of 0.8 mile. It has a central peak 1,190 feet high. The shore is rugged, steep, and rock-bound. A long boulder spit extends off the southeast end. The northeast end should not be approached closer than 0.3 mile and the southeast end not closer than 0.5 mile. Exposed anchorage may be found on the tail of the shoal extending off the southeast point, in 7 to 12 fathoms, a short 0.5 mile from the narrow point.

Spectacle Island is 2.5 miles long and 1.5 miles wide at its southern part. It is rock-bound and has steep cliffs on the north, east, and south sides. The northern part is distinguished by two peaks about 900 feet high and the southern part reaches an elevation of 1,240 feet. In general, the island may be approached within 0.2 mile.

Anchorages, under favorable conditions, for small craft are in the large bight on the east side of Spectacle Island in 6 to 9 fathoms, in the bight on the west side in 4 to 5 fathoms, and in the small cove in the south side in 3 fathoms. The bights on the eastern and western sides are open and easy of access. The entrance to the small cove on

the southern side is about 70 yards across with foul ground on either side for a distance of about 0.1 mile inside the entrance.

The passage between Peninsula and Spectacle Islands is about 3.5 miles wide and is deep and free from dangers.

Bendel Island lies in a southwesterly direction from Spectacle Island and is separated from it by a passage 0.6 mile wide. It is about 2 miles in diameter and 1,250 feet high. The eastern end terminates in a narrow neck. There are high bluffs on the southern side and sloping valleys on the others. The coastline is rocky, with kelp, and the depths around the island are irregular. A flat extends off the southwest side for a distance of about 1 mile with depths of 5 to 10 fathoms and with several shoaler spots. Depths of 7 to 8 fathoms are also found off the northwest and southeast sides. Exposed anchorages for small boats may be found in the bights and on the flats.

The passage between Spectacle and Bendel Islands is 0.6 mile wide and a mid-channel course leads through 21 to 11 fathoms.

Turner Island is separated from Bendel Island by a passage from 0.8 to 1.5 miles wide. The island is 2.8 miles long and about 0.9 mile wide, with a greatest elevation of 1,180 feet. Its shore is rockbound and the southeast coast is very foul for a distance of about 0.5 mile offshore. There is a low flat on the northwest end with a 400-foot knoll on the point. The bluffs on the north, southeast, and south sides vary in height from 400 to 800 feet.

The passage between Bendel and Turner Islands is deep at both entrances and shoals gradually to 4 fathoms, in its narrowest part, about mid-channel off the southwest point of Bendel Island. Dense kelp grows on this shoal and small craft find difficulty in passing through. This passage is not recommended for large vessels.

The **Twins** consist of three small islands, the highest of which has an elevation of about 410 feet. Their sides are precipitous and bare. As no breakers were seen about them in heavy weather, it is presumed there are no outlying dangers.

Near Island, in the southern approach to East Nagai Strait near Nagai Island, is about 1.4 miles long and 1,289 feet high, with precipitous, rocky sides. The island is easily recognized by a regular serration, which cuts its crest into five little peaks. There are rocks close to the shore.

Charts 8859, 8700.—Nagai Island, in the center of the Shumagin Group, is approximately 29 miles long and 9 miles wide. Its coast is irregular and indented by numerous inlets, several of which extend nearly through the island and have low, narrow isthmuses at the head. The island is mountainous and its shores rockbound; near the center it reaches an elevation of 1,837 feet in a group of confused ridges.

Cape Wedge, the northern end of the island, is a pointed headland with a rounded, sloping hill 749 feet high. The north end of the cape terminates in a double point, with elevations of 262 and 316 feet and a rocky bluff 150 feet high between. Its shores are rocky and forbidding, but may be approached within 0.3 mile with depths of 14 to 25 fathoms; closer in a vessel would be in danger. In general, however, a vessel should keep 1 mile offshore.

Cape Wedge Light (lat. 55°17′.5 N., long. 159°52′.8 W.), 60 feet above the water and visible 12 miles, is shown from a white house on the north end of the cape. The light is obscured from 290° to 072°.

Mountain Point, the southerly end of Nagai Island, is narrow and about 500

feet in height. There are rocks surrounding the point at a distance of about 0.5 mile and a sunken rock about 1 mile offshore in a south-southwesterly direction.

Chart 8700.—Pirate Shake is a local name for the low neck, about 65 yards wide, of Nagai Island, 4 miles southward of Cape Wedge. The cove on the east side of the neck is a good anchorage but is exposed to winds from about east-northeast to east-southeast. The outer points at the entrance are surrounded by reefs, and a reef in the middle of the entrance bares about 8 feet at high water. The better entrance is northward of the reef, heading for an islet, 40 feet high, on the north side of the cove, on a 286° course. Pass 300 to 500 yards southward of the islet, and anchor in the middle of the cove west-southwestward of the islet, in about 8 to 9 fathoms, bottom soft in places. Anchorage can also be selected in the entrance of the cove just northeastward of the islet, in 7 to 8 fathoms, bottom generally rocky, taking care, however, to avoid the reef which extends about 0.4 mile from the northeasterly shore of the cove. The flat islet 40 feet high on the north side of the cove and a wreck just inside the outer point on the south side of the cove are good marks for the entrance.

Northeast Bight, on the east side of Nagai Island, about 6 miles southward of Cape Wedge is 1.3 miles wide. It is open, deep, and free from dangers except close to shore. The main body of the bight is too deep for anchorage, but a vessel may anchor in the two coves at the head in about 20 fathoms.

Chart 8851.—Mist Harbor is a landlocked basin about 1 mile long and 0.4 mile wide, lying on the east side of Nagai Island, about 9 miles southward of Cape Wedge, and 314° from the north end of Bendel Island. The depths in the middle of the basin are 27 to 35 fathoms, but small craft can find secure anchorage in the cove on the south side of the west end of the harbor, in 6 to 7 fathoms. The south side of the harbor is formed by a long spit; the entrance is around the west end of the spit and is about 250 yards wide, and necessitates a sharp turn in entering. A mid-channel course should be followed through the entrance, and also when entering the cove at the west end of the harbor to the anchorage. A flat fills the easterly end of the harbor; otherwise there are no dangers away from the shores.

A fishing camp is usually located on the cove at the west end of Mist Harbor and small temporary wharves may be found. Water may be had from small streams on the northeasterly side of the harbor. Strong williwaws draw down from the high mountains at times. A low neck of land, about 150 yards wide, separates the west end of the harbor from the head of Northeast Bight.

Chart 8859.—East Bight on the east coast of Nagai Island, about 3 miles southward of the entrance to Mist Harbor, is about 3.2 miles long and 2 miles wide. It is deep, open southeastward, and the shores are clear except close-to. Anchorage for moderate-sized vessels may be found on the shelf on the northeast side in 15 to 20 fathoms, about 1 mile inside the north entrance point and about 0.4 mile offshore.

The two west arms do not afford good anchorage on account of the depth, about 29 fathoms. A 7-fathom spot, surrounded by deep water, is in the northerly of the two arms, lying 650 yards off the west shore and about 0.9 mile from the head of the arm.

The entrance to the south arm is restricted to about 450 yards by a shoal extending about 650 yards in an easterly, and 900 yards in a northerly, direction off its south

entrance point. In entering, favor the north shore at a distance of 0.1 to 0.2 mile. Small boats may find protected anchorage behind the hook at the south entrance point, in 9 to 15 fathoms. After passing well through the entrance to the arm, head 180° to pass about 100 yards westward of the west end of the hook spit. When abreast of the end of the hook, round into the cove and select anchorage about its center.

Larsen Bay, on the eastern side of Nagai Island opposite Turner Island, affords good anchorage in 4 to 10 fathoms, sandy bottom. The bight is open and easy of access but is exposed to easterly winds. The western shore is low and is distinguished by white sand dunes. A bold headland about 100 feet high projects from the south side. There are several open bights on the east coast of the island between Larsen Bay and Mountain Point.

John Island, off the west side of Nagai Island about 8 miles northward of Mountain Point, is 300 or 400 feet high. South of John Island, Nagai Island consists of two clusters of rocky hills, about 1,000 feet high, united by low isthmuses.

The southerly isthmus is called **Saddlers Mistake,** due to a vessel attempting at night to pass through between the adjacent high parts of the island.

Falmouth Harbor, on the west side of Nagai Island, about 6 miles northward of John Island, affords a secure, though limited anchorage for a small vessel in the basin behind the spit at its head, in 7 to 8 fathoms, sandy bottom. The entrance to the basin is not over 300 yards wide, has a depth of 6 fathoms, and contains no known dangers. The basin is 0.5 mile wide and its north side is a broad sand flat, which drops suddenly to 4 fathoms.

A reef extends 0.3 mile southwestward from the south head of Falmouth Harbor; and a rock, bare at low water and marked by a breaker and kelp, lies 0.8 mile from that head in the same direction.

The south shore of Falmouth Harbor is low near the water's edge but slopes rather steeply. The northern headland rises some 500 feet in a perpendicular cliff. The shore is rocky and bold. A rock, 5 feet above water, is 0.3 mile from shore and 1.2 miles northwestward from this headland. Halfway up the bay on the south side is a low point, with a rock close-to, known as **Cape Horn.**

Chart 8700.—Wooly Head, on the west side of Nagai Island between Falmouth and Eagle Harbors, is a promontory about 1,200 feet high; there are rocks 0.2 mile from shore all around its face, some of them awash and others forming towers and pinnacles 50 feet high. A vessel may pass 0.4 mile off in 20 fathoms. Violent williwaws are frequent here.

From Wooly Head to Cape Wedge the coast and adjacent waters have been surveyed and are as shown on Chart 8700.

Eagle Harbor, about 1.2 to 1.5 miles wide, has depths of 15 to 20 fathoms, with no outlying dangers except near the spits which lie 1.5 miles from the head of the harbor. In passing between the spits, favor the one on the southwest shore. There is good anchorage anywhere in the head of the harbor above the spits in 14 to 18 fathoms, soft bottom. Small craft can anchor in the lagoon behind the north spit in depths of 5 to 7 fathoms.

A fishing station with a large warehouse and boat wharf is on the southern side of Eagle Harbor 1.3 miles inside the entrance, and a small abandoned fish station and boat wharf are on the north shore 1.8 miles inside the entrance.

Sanborn Harbor is on the west side of Nagai Island about 10 miles from Cape Wedge. The pinnacle rock 103 feet high off **East Head,** the northern entrance point, and the two waterfalls on the west face of the south entrance point, are conspicuous landmarks. The harbor is 5 miles long and has good anchorage at its head. To secure good shelter, a vessel should pass between **Macks Head** and **Granite Point,** and then anchor as desired, avoiding only the upper half of the northeast arm, which is shoal. There are no outlying dangers anywhere in Sanborn Harbor.

A fishing station is in a small exposed bay on the north side of Sanborn Harbor, 2.3 miles southeastward of East Head; it has a warehouse and a boat-wharf, dry at low water.

Caton Cove lies on the north side of Sanborn Harbor, 3.5 miles southeastward of East Head; there is shelter in **The Kitchen** for light craft back of the sand spit. The channel, close to the spit, until through the narrowest part of the entrance, has a least width of 100 feet and a least depth of 10 feet.

Porpoise Harbor, about 3 miles northward of Sanborn Harbor, affords no useful anchorage because of its great depth.

The bight about 2.5 miles northward of Porpoise Harbor has temporary anchorage in 8 to 15 fathoms, giving the shore a berth of over 300 yards. **Porpoise Rocks** are a small cluster 10 feet high, with deep water close-to, lying 0.8 mile from the north shore in the approach to the bay.

The narrow bight west of Pirate Shake, described previously affords anchorage for small craft about 0.3 mile inside the entrance and about on the middle line of the cove, in 4 to 6 fathoms, rocky bottom. The bight is exposed to westerly winds and its eastern half is foul and shoal to the head.

West Nagai Strait, between Nagai and Andronica Islands of the Shumagin group, is 3.3 miles wide at its narrowest point between Porpoise Rocks and The Haystacks, with depths from 25 to 40 fathoms and no outlying dangers. A vessel should pass eastward and southward of The Haystacks and on these sides may approach as close as 0.3 mile in 25 fathoms.

The currents in West Nagai Strait set with the wind and reach a velocity of 1½ to 2 knots in strong winds. Under ordinary conditions the prevailing set of the current is said to be southwestward in this vicinity.

The Haystacks are a formidable appearing group of four islets 265 to 293 feet high, and a broken chain of rocks runs through them. Broken ground on which the least depth found is 9 fathoms lies 1.3 miles southwestward from the southwesterly bare rocks. A rock called **The Whaleback,** 1 mile west of The Haystacks, is 22 feet high, and 300 yards south-southwestward of it is a sunken rock. Temporary anchorage in 20 fathoms or less can be had in the bight eastward of The Haystacks. A landing can be made on the boulder beach.

The soundings indicate clear passage between Andronica and The Haystacks, between The Whaleback and The Haystacks, and between the north Haystack and the rest of the group, but none of these passages are recommended.

Andronica Island, one of the Shumagin Group, lies westward from the north end of Nagai Island. The island is 2 by 3 miles in extent and 1,175 feet high. It is bordered by rocks all around to a distance of 0.2 mile from the shore, and vessels should give the shore of the island a berth of 0.5 mile. A flat islet 22 feet high extends 0.4 mile off the southeast point toward The Haystacks.

The northeastern point of Andronica Island is marked by a **light (lat. 55°20′.9 N., 160°03′.6 W.)**, 115 feet above the water, is shown from a white house. The light is obscured from 275° to 291½° and from 317° to 078°. Eastward of the point is a prominent conical-shaped rock, 280 feet high. This rock is very useful, under conditions of low visibility, in aiding the mariner to identify the north point of the island; a sight of this feature assures him that he is not getting into the wrong passage. The light is obscured by the rock.

A rock awash at low water 0.4 mile westward of the north point and 0.4 mile offshore, is the farthest outlying danger in the approach to Gorman Strait.

A bare rock 5 feet high is 0.2 mile off the western point of Andronica Island.

Temporary anchorage may be found 0.5 mile from shore in the bight on the northeast side of Andronica, off the sand beach near the northern point, in 20 fathoms. Small vessels can anchor closer to shore in this bight and also in the bight on the southwest side of the island, and landing can usually be made in one of these bights.

Gorman Strait between Andronica and Korovin Islands, is clear if the shores be given a berth of 0.5 mile. Deepest draft vessels should also use caution passing the 7-fathom shoal 0.9 mile southeast of Cape Devine.

The currents in Gorman Strait set with the wind and reach a velocity of 1½ to 2 knots in strong winds. Under ordinary conditions the prevailing set of the current is said to be southwestward in this vicinity.

Korovin Island in the north central part of the Shumagin group, has two summits, separated by low land and marsh extending from Korovin Bay to Grosvold Bay.

Sounding has been completed on the south side of Korovin Island from Cape Devine to a point 2 miles southeastward of Henderson Island; otherwise only a few reconnaissance lines have been run around the island.

Cape Devine, marking the northwest side of Gorman Strait, is a gray headland 885 feet high joined to the remainder of Korovin Island by a low neck. The shore is fringed with rocks, and a rock awash at low water lies 400 yards off the south side of the cape. A bank on which the least depth if 9 fathoms extends 0.8 mile southward from the cape and a 7-fathom shoal is 0.9 mile southeast of it.

Korovin Bay, the western bight on the south side of Korovin Island, affords fair shelter in northerly weather, but the holding ground is poor. Anchorage may also be had for smaller vessels in the eastern bight. Both bights are free of danger except for numerous reefs near shore.

Scotland Point (lat. 55°27′ N., long. 160°08′ W.) the northeast end of Korovin Island, is distinguished by the large pyramid-shaped rock 100 yards off the point. **Scotland Rock,** reported to be in the passage between Korovin and Karpa Islands, has been searched for by sounding and wire drag, and no evidence of it was found. The passage is considered safe for all vessels. A wire-dragged 9-fathom shoal is 1.8 miles northwest of Scotland Point.

Grosvold Bay, 2 miles westward of Scotland Point, may be used as an anchorage for small craft. The entrance is foul on both sides but safe in the middle, and inside on both east and west shores is foul ground The peak of the bold rocky headland on the west side of the entrance is a prominent landmark.

The bay between Scotland Point and Grosvold Bay is not recommended for anchorage.

Henderson Island is 0.2 mile long, 58 feet high, and lies 0.2 mile off the west end of

Korovin Island. When approaching from westward it is hard to distinguish Henderson Island from Korovin Island until close-to. Between the two islands is shallow water. Rocks, which should be given a wide berth, extend 0.1 mile off the west end of Henderson Island, and two shoals having a least depth of 6 fathoms are 0.75 mile northwest and 1.1 miles west-northwest of it.

Korovin Strait, between Korovin and Popof Islands, has a least width of about 2 miles and is free of dangers. The bottom is rough, with depths ranging from 24 to 125 fathoms.

Karpa Island, 4 miles northeastward from Korovin Island, is 0.7 mile by 1.3 miles in extent and 1,373 feet high. It is grass-covered, with a smooth profile, and has a remarkable cliff 900 feet high at the northeast point. The island may be ascended only from the southwest point; 70 yards off this point is a tower rock 50 feet high, and a reef above water extends 140 yards off the southeast point. A narrow kelp field is along the south and southeast sides of the island, and otherwise there are no outlying dangers.

Popof Island, close eastward of Unga Island in the Shumagin Group, is irregular and rough in shape, with hills ranging to approximately 1,000 and 1,500 feet high. The highest point, 1,550 feet, is a short distance northeast of the center of the island. The shores are generally rocky and steep and have many ledges, covered with kelp, extending 200 to 300 yards offshore.

The north and east shores of Popof Island have no outlying dangers, but the shore should be given a berth of about 0.5 mile. Between Andronica and Popof Islands the water is deep and clear. Temporary anchorage may be found 0.3 mile off the north shore of Popof Island anywhere west of Pirate Cove in 10 to 20 fathoms.

Pirate Cove, 4.5 miles east-northeastward of East Head, was formerly an important cod-fishing station but has been abandoned for many years. The buildings are in ruins except the watchman's house, maintained by the Alaska Pacific Salmon Co., which stores trap piling. The watchman is the only inhabitant. The cove is properly only a boat harbor.

Pirate Cove Light, 85 feet above the water and visible for 7 miles, is shown from a white wooden house on the bluff at the north side of the entrance.

High Island, 0.4 mile off the northeast part of Popof Island, is 0.2 mile in extent and 310 feet high, with its greatest height near its north end. It is grass-covered, but has reddish cliffs showing westward and grassy slopes on the other side. There are 30 fathoms and more 200 yards from it all around, and the passage between it and Popof Island is clear. The island can be passed fairly close-to and is a useful mark for making Gorman Strait in thick weather.

Little Harbor (**Fox Hole**) is on the east side of the north end of Popof Island, and is about 1.2 miles long in a south-southwesterly direction. It affords well-sheltered anchorage for small vessels in all weather except easterly and northeasterly. Depths range from 15 fathoms at the entrance to 6 fathoms near the edge of the flat which extends 0.3 mile from the head. The harbor has a clear width of about 400 yards; foul ground extends over 100 yards in places from the shores, and a reef extends about 250 yards northward from the point on the south side of the entrance of the narrow part of the harbor. The north point of the entrance is a sheer cliff about 150 feet high. The only directions necessary are to keep in mid-harbor.

Popof Head, 980 feet high, is connected to the southeast part of Popof Island by

an isthmus. It is a high precipitous headland with a steep talus. The depths increase from 20 fathoms 200 yards south of it to the 100-fathom curve 2 miles off. Vessels should give this headland a berth of 0.5 mile, although in fog it might be approached more closely.

Two large bights, with sand beaches, the westerly one known as **Red Cove,** are on the south side of Popof Island. Both of the bights furnish anchorage in northerly weather, in 8 to 10 fathoms, sandy bottom. Landing with keel boats is difficult on account of considerable surf and shoal water near the shore. The point separating the bights is a narrow, rocky projection fringed with foul ground to a distance of about 300 yards; rocks awash at low water lie 600 yards from shore and 0.4 and 0.7 mile westward of the point.

Sand Point and Sand Point Village, two cannery sites on the western side of Popof Island, are described below in connection with Popof Strait.

Popof Strait, between Popof and Unga Islands of the Shumagin Group, contracts at its northern end. A channel leads through the northern end; it is narrowed by rocky ledges, but these are marked by lighted aids. About 1,000 yards north of Sand Point Light is a depth of 5¾ fathoms.

In the northern entrance of Popof Strait is a 3¼-fathom shoal about 700 yards northwestward from Range Island. The S.S. *Victoria* reported striking bottom in the northern entrance during a low tide.

A sunken pinnacle rock in the broad part of Popof Strait eastward of Egg Island has a depth of 1¼ fathoms. Kelp seldom grows sufficiently long to be seen at the surface of this danger. The dangerous rock lies on a line drawn from the north end of Egg Island to Popof Head (direction 111°) and about midway between the island and the head. It is a little more than a mile off the point about midway along the south shore of Popof Island.

On a rocky shoal 1,000 yards 110° from the first pinnacle rock on the beach south of the entrance to Baralof Bay is a depth of about 5 fathoms or less. The bottom of the southeastern part of Popof Strait is broken and irregular but no hidden dangers other than those described were found by the survey.

Egg Island is in the middle of Popof Strait 2.5 miles southward of Sand Point. It is 165 feet high, 600 yards across, and grassy on top. **Little Egg Island,** close westward of it, is grassy-topped, 25 feet high, and 130 yards across. There are a few detached rocks about these islands. A vessel should not approach closer than 400 yards, where 15 fathoms or more will be found.

Sand Point is a flat sandspit 0.4 mile long. Its south shore is fringed close-to by rocky ledges and its north shore has sandy bottom. A shoal shelves off about 150 yards westward from the point and then drops off abruptly to deep water.

On the north side of the spit at Sand Point 1.5 miles southward of Sand Point village are prominent buildings and a wharf, maintained by the Alaska Pacific Salmon Co. and Pacific American Fisheries Co., for boat and trap piling storage. The former cannery of the Alaska Pacific Salmon Co. has burned down. Fresh water is generally not available. Two marine railways capable of hauling out a 10-ton boat and a 100-ton barge are available.

Sand Point Light (lat. 55°19′.3 N., long. 160°31′.6 W.), 20 feet above the water and visible 8 miles, is shown from a white house on the end of the point. The light is obscured from 232° to 332°.

Humboldt Harbor furnishes excellent shelter and good holding ground. Occasional strong southwesterly winds necessitate the use of a second anchor to prevent dragging in this harbor. Passing 0.3 mile off Sand Point Light steer for Sand Point Wharf on a **056°** course; anchor in about 10 fathoms about 0.3 mile from the shore northward and eastward, with the end of Sand Point bearing 220° and Range Island 30 yards open from the land.

Sand Point village (*pop. 107 in 1950; P. O.*) on the north side of Humboldt Harbor, has two wharves. The westernmost and larger is owned by the Aleutian Cold Storage Co. and has a frontage of 180 feet with a depth of 24 feet alongside. Fresh water is available without charge. The machine shop at the cold storage plant is available for minor repairs to small craft. Stocks of gasoline, kerosene, lubricating oil, and diesel oil are maintained in sufficient quantity to supply fishing craft operating in the area and local needs. A general store handles both fresh and dry stores, ship chandlery, and hardware. A radio station, call signal KWC 39, is maintained by the company. Sand Point is a **customs** port of entry. This port is only open during the halibut fishing season.

The easternmost and smaller of the two wharves has a frontage of 60 feet and a depth of 14 feet alongside.

The monthly mail steamer from Seattle via Seward calls on its eastward and westward trips. Mail and passenger service by air usually is available weekly from May to September, but because this service is periodically contracted for it may not always be regularly scheduled.

A large white frame structure on the hill back of the cold storage wharf is prominent from the southern part of the strait.

Popof Reef lies in Popof Strait, westward and southwestward of Sand Point village wharf. Its northern part has a least depth of 8 feet, and lies 300 to 700 yards westward of the point just northwestward of Sand Point Village Wharf. The 2¼-fathom spot 0.3 mile south-southwestward from the shoalest part of the reef is marked by a lighted buoy.

Unga Reef, the eastern side of which is marked by a buoy, extends 0.7 mile south-southeastward from the western shore of Popof Strait, in the narrowest part opposite Sand Point village wharf. A small patch lying about 0.3 mile off the point on the Unga Island shore is bare about 2 feet at low water, and has ribbon kelp around it. The south end of the shoal, with depths of 3 to 4 fathoms, lies about 0.5 mile northwestward from the end of Sand Point. The southern part is known as **Caton Shoal.**

A small rocky shoal of 2¾ fathoms lies in the middle of Popof Strait 0.5 mile 212° from Range Island Light. A sunken rock lies about 200 yards westward from the shoal. A lighted buoy is 200 yards southwestward of the sunken rock.

Range Island is 30 feet high and 300 yards across; it is round and grassy over the summit. One hundred yards from the northwest end is an 8-fathom spot. Vessels cannot pass between Range Island and Popof Island. **Range Island Light** marks the northwestern point of the island.

East Head, on the east side of the north entrance to Popof Strait, has foul ground and kelp for a distance of 0.3 mile off its west side and extending southward to Range Island. About 0.3 mile southward of East Head, two radio towers, each 150 feet high, are prominent from the eastward.

West Head, the point of Unga Island at the north entrance of Popof Strait, is a

black cliff 40 feet high, and 0.5 mile south of it are cliffs 300 feet high. Westward from West Head the cliffs are higher, broken, however, by numerous valleys. There is 10 fathoms 300 yards off West Head.

Directions, Popof Strait.—From eastward pass 1 mile southward of Popof Head and steer 288° for about 5 miles for Hardscratch Point, which leads 1.1 miles southward of the 1¼-fathom rock. When Egg Island bears 323° steer 334° for 4.2 miles, passing 700 yards eastward of Egg Island and round Sand Point Light, 0.3 mile off.

Entering from southwestward.—From a position 0.5 mile off Kelly Rock steer 337° for 8 miles, passing 700 yards eastward of Egg Island and round Sand Point Light 0.3 mile off, as before.

After rounding Sand Point Light at a distance of 0.3 mile, steer 056° for Sand Point village wharf for about 0.6 mile, until Egg Island begins to close on the bottom of the hillside at Sand Point.

Then steer 000°, passing midway between Popof Reef lighted buoy and Unga Reef buoy, and heading a little to the left of Popof Strait lighted buoy. This course should head just inside the point opposite Range Island. When up to Popof Strait lighted buoy, change to course 027°, passing 350 yards westward of Range Island Light. When the light comes in range with the point where Sand Point Village Wharf is located, change to course 000°. The course through the northern entrance of Popof Strait should be navigated cautiously by deep-draft vessels, taking care to avoid the 3¼-fathom spot to the westward of the course.

Bound westward.—After passing West Head, at the north end of Popof Strait, 0.4 mile distant, on a 000° course, run 1.1 miles, and change course to 289° with High Island astern and the tangent to Cape Aliaksin ahead; run 4.7 miles to a position 0.9 mile northward of Gull Island. Then follow directions in Chapter 3.

Bound eastward.—After passing through the strait as above directed, pass about 0.6 mile off East Head and steer 086° to pass 0.9 mile northward of High Island. Then follow directions in Chapter 3.

Unga Island, the largest and most important of the Shumagin Group, has several large indentations, among which are Zachary Bay on the north side and Delarof Harbor and Baralof Bay (Squaw Harbor) on the east. It is quite mountainous, especially the eastern half. The western half is comparatively low, that part west of Zachary Bay having somewhat rolling topography. The highest mountains are just south of Zachary Bay, where a maximum elevation of 2,270 feet is found. In general, the shoreline is rocky and precipitous. The south and west coasts are particularly foul. Near the west end of the north shore is a sand beach 3 miles long and sand dunes immediately back of it. The west shore of the island has not been surveyed.

A sailing vessel should avoid approaching the south coast of Unga Island, except in fine weather. There is no shelter or protection, and often a southeast storm comes on suddenly, making it a bad lee shore. It is a poor landfall when approaching from seaward in unfavorable weather, and the currents cannot be foretold. However, all dangers on this side are within 0.5 mile of the shore.

Baralof Bay (Squaw Harbor), on the eastern coast of the island, about 6.5 miles northward of Unga Cape and about the same distance westward from Popof Head, is a good anchorage except in heavy easterly weather. In approaching from southeastward, keep 0.8 mile or more offshore, and in entering the harbor, favor, if anything, the north side.

Anchor in the middle of Baralof Bay in 16 to 18 fathoms, sticky bottom. Small vessels anchor nearer the head of the harbor, in not less than about 6 fathoms. The bottom appears to be good holding ground, but a number of vessels have dragged here and mariners are warned not to have too much faith in its holding qualities. On the north side about 0.5 mile within the entrance is a salmon cannery. In entering the bay, the cannery does not open up until nearly abreast of it.

The wharf at the cannery has a frontage of 190 feet; fresh water is piped to the wharf and is available during the summer season. A depth of about 26 feet is alongside the wharf. The cannery has a small machine shop and stores fuel and diesel oils and gasoline for its own use. A marine railway is capable of handling vessels of 100 tons drawing 5 feet. An oil wharf had a least depth of about 3 feet along its face in 1941.

Vessels of the Pacific American Fisheries sailing from Bellingham, Washington, make regular calls. Small amounts of coal, fuel oil, and gasoline can usually be obtained from the general store in emergencies. The codfishing station has a wharf across Baralof Bay from the cannery. A trail leads overland to Unga.

Pacific American Fisheries operates a radio station during canning season, call letters KJT.

In the middle of Baralof Bay and 1,000 yards from its head is a small rocky shoal having a depth of 3 fathoms. On the northwestern end of this rocky shoal is a buoy. The rocky shoal is surrounded by sandy bottom. A sandy shoal extends 0.3 mile off the south side of the entrance.

Northward of Baralof Bay the shore is more or less foul. A few settlers live along this coast. There is a fishing station in the bight west of **Hardscratch Point** which is about 1.3 miles northward of Baralof Bay. The northern entrance point to Baralof Bay is marked by a **light.**

Kelly Rock marks the southwest side of the southern entrance to Popof Strait. It is a flat-topped grassy islet 65 feet high, 160 yards across and 200 yards offshore. A depth of 14 fathoms is 175 yards offshore from it. Vessels should give it a berth of 0.5 mile or more. An unused fishing station is in the bight a mile west of Kelly Rock. A fish trap extends from the beach toward Kelly Rock, but between the ends of the trap and the rock is a passage. Kelp grows between the rock and the shore. A light is maintained on the end of the trap. A rock with a depth of 1 fathom at low water lies about 0.3 mile offshore 1 mile south of the south point of Baralof Bay.

Delarof Harbor, 3 miles northward of Unga Cape, is not sheltered except in northwesterly weather, and the holding ground is bad. The depths in the outer harbor range from 15 fathoms at the entrance to 5 fathoms about 300 yards outside the entrance to the inner harbor. It is not safe to anchor in less than about 6 fathoms.

On the approach from either direction, several rocks and islets will be found close inshore. **Halfway Rock,** 70 feet high and 90 yards in diameter, lies 0.9 mile east-northeast of Cross Island. **Cross Island,** 265 feet high, lies midway of the north shore. The point on the south side of the entrance to Delarof Harbor is a narrow projecting rocky mass 155 feet high. The name, **Elephant Rock,** is applied to the point. The base has been hollowed out by the action of the sea and from Unga the point resembles an elephant. A rock 40 feet high lies 300 yards off Elephant Rock, to which it is connected by a reef.

A dangerous shoal known as the **Blind Breaker,** bare at extreme low water, lies in

the entrance 850 yards 180° from the southeast end of Cross Island. The rock is closely surrounded by depths of 12 to 14 fathoms and is marked by a buoy placed just north of it.

A shoal with 3¼ fathoms at low water is in the center of the anchorage off the town, about 650 yards 122° from the south entrance point of the inner harbor.

Delarof Harbor, owing to its exposed position, close quarters, and rugged shores, cannot be recommended as an anchorage.

Enter Delarof Harbor on a 287° course, heading for the point on the south side of the entrance of the inner harbor, which leads 0.3 mile northward of the Blind Breaker. A mile from the entrance is a narrow constricted passage beyond which the bay is shoal. In the center of this inner harbor is a large reef which is exposed at extreme low water. **Flagstaff Hill,** 81 feet high, is the rounded point, surmonted by a flagpole, at the north side of the narrow passage to the inner harbor.

Unga (*pop. 107 in 1950; P. O.*) lies back of this hill and consists of a fishing station, several stores, a school, church, and about 30 houses. There is no wharf except for launches. The anchorage off Unga is not recommended except perhaps at a time when most favorable conditions exist.

Unga has a United States deputy marshal. It is a port of call of the monthly mail steamer from Seward. Cargo is lightered ashore from the outer harbor. At the head of the shallow inner basin are the abandoned workings of the Apollo Mine. A ledge, bare at low water, extends 400 yards southward from the Unga Wharf which is suitable only for small craft at high tide. Unga is the center of a considerable codfishing industry.

Unga Cape, the southeast point of Unga Island, is a bare gray rugged cliff 855 feet high. A wall-like slab of rock 500 feet high, connected to the cape by a narrow bar, is just south of the cliff and perpendicular to it. At the foot of the cliff are ledges. A vessel may pass 0.5 mile off in 25 fathoms.

Sealion Rocks, 3 miles south-southeastward of Unga Cape, are 0.2 mile in extent, 130 feet high, flat-topped and grassy. A breaker extends 0.4 mile northeastward of them. A vessels may pass 0.5 mile off in 26 to 32 fathoms but should give them a greater berth. Between Sealion Rocks and Unga Cape is a clear width of 2.5 miles, with depths from 20 to 30 fathoms and no outlying dangers.

Acheredin Bay, a large open bight in the south shore of Unga Island, is 3 miles across and 2 miles in depth. Its shore is a sand and pebble beach, behind which is a lake 7 feet above high water. A vessel may approach to 0.6 mile off the sand beach in 8 fathoms.

Acheredin Point, the southwest end of Unga Island, is a black mountain 1,402 feet high, with an exceedingly rough surface and serrated profile. At the end of the point is a separate hill 500 feet high. A vessel should keep 1 mile off.

Acheredin Point to Dolgoi Island.—A description of this direct route to the westward is given later in this chapter.

The west side of Unga Island is unsurveyed.

Bay Point (**Nigger Head**) is a rocky headland of rounded profile, 315 feet high, which forms a good landmark all around, and shows over the land in Unga Strait. There is said to be anchorage in 7 fathoms northward of Bay Point affording good shelter from northeasterly winds.

The northern point of the island, known as **Unga Spit,** is a sandspit surrounded

by shoal water extending 0.3 mile offshore. This spit is marked by a light (lat. 55°24′.6 N., long. 160°43′.5 W.), 40 feet above the water and visible 8 miles.

Under favorable weather conditions, fair anchorage may be found in 5 to 7 fathoms, sand bottom, 0.8 mile 280° from Unga Spit. Small vessels can anchor closer to shore off the western side of the spit in as little as 4 fathoms in places. About 2 miles southwestward of this spit to the beginning of the rocky shoreline the 5-fathom curve is about 1 mile offshore.

Gull Island is a flat-topped, grassy islet about 37 feet high and 80 yards across. It is 0.9 mile off the west side of the entrance to Zachary Bay. The island has deep water all around it as close as 200 yards. There is a passage with a clear width of 0.5 mile inside of the island, but care should be taken to avoid the reef extending from the west entrance point of Zachary Bay.

Zachary Bay, on the north side of Unga Island, is open and easily entered. The outer part of the bay has depths of 10 to 20 fathoms, sticky bottom, affording anchorage, but is exposed to northerly and northeasterly winds. The principal dangers are as follows:

Two small reefs, known as **Weedy Shoals,** which show well at low water, lie 0.2 mile from the eastern shore halfway from the entrance to North Head. A kelp-marked ledge, bare at low water, extends nearly 0.6 mile northeastward from the western shore at the entrance; the end of the ledge lies 1.1 miles 162° from Gull Island.

The best anchorage for vessels in Zachary Bay is about 0.3 to 0.4 mile from the eastern shore and 0.5 to 1 mile southward of Round Island, in 8 to 12 fathoms, sticky bottom. To enter, pass North Head, on a 178° course for the west end of **Round Island** in range with the middle of a saw-toothed mountain, which leads 0.2 mile westward of **North Head** through a narrow channel. The middle of the saw-toothed mountain is a little to the eastward of the highest tooth. To use the highest tooth as the back range might bring a vessel dangerously close to the shoal making off North Head. Pass about 200 yards westward of Round Island and follow the eastern shore southward at a distance of 0.3 to 0.4 mile.

The principal dangers consist of a rock with 3¼ fathoms over it, 300 yards westward of North Head, and an extensive shoal which makes out from the western shore between **White Bluff** and the head of the bay. The 5-fathom curve, on the eastern edge of the shoal, passes 700 yards westward of North Head and 350 yards westward of Round Island; southward of Round Island the edge of the shoal is steep-to. The bay is shoal from 1.4 miles southward of Round Island to the head of the bay.

Coal Harbor is the best anchorage for small vessels in Zachary Bay. The berth with best swinging room is 0.2 mile north-northeastward of **Quartz Point,** with North Head just open from the western entrance point of the bay, and **Range Islet** bearing 260°, in 7 fathoms, sticky bottom. The best entrance is in mid-channel northeastward of Round Island; then follow the northeast shore at a distance of 300 yards. The principal danger is a spit, bare only at extreme low water, which extends 600 yards 120° from Round Island; the range of North Head and the western entrance point of the bay leads over the easterly edge of the spit, and vessels should keep eastward of this range when Range Islet bears 230°. The head of the harbor southeastward of Quartz Point is shoal.

On the west side of Zachary Bay is an abandoned coal mine.

Chart 8704.—Completed surveys cover the recommended steamer track south of the peninsula westward of the Shumagin Islands. Some of the water and land areas, adjacent to the track, have not been surveyed.

Beaver Bay lies west of Cape Aliaksin, described previously, and is 3.5 miles wide at the entrance. The bay is unsurveyed and little information is available. The shoreline has few indentations, consisting of a line of low cliffs, with occasional waterfalls. The point on the west side of Beaver Bay is called **McGinty Point.**

On the western side of Beaver Bay the land is low and rises gradually for 12 miles west-southwestward.

A single line of soundings at a distance of 2 miles from the shore showed depths of less than 10 fathoms, irregular bottom, for a distance of 5 miles southwestward of the southwest point at the entrance to Beaver Bay. The least depth found was about 4 fathoms at a point 2 miles from shore and 7.4 miles 300° from Bay Point, Unga Island. Recent surveys indicate navigable waters outside this 4 fathom spot, soundings deepening gradually to the 20-fathom curve, which lies 5 miles offshore.

Jude Island lies about 8.5 miles westward from Unga Island shore and about 7 miles off the coast of the Alaska Peninsula. The route from Unga Strait to the Pavlof Islands follows the coast of the peninsula and passes northward of Jude Island.

Jude Island is about 150 feet high, and about 0.5 mile across, round in profile, grassy on top, and rocky at the shore. Deep water extends close to the northwest side of the island. Dangerous rocks may be found on a line from Jude Island to Bay Point and from Jude Island to Wosnesenski Island. Breakers were seen in these localities, and a vessel should keep 2 miles or more to the northward.

Seal Cape, at the entrance to Coal Bay, is low and difficult to recognize. It terminates in a flat-topped mound 100 feet high connected to the mainland by a low neck of land. Lying 3 miles eastward of it is a southerly projecting point which appears to be cut off to form an island. The extremity of this point is marked by **Seal Cape Light (lat. 55°21′0 N., long. 161°14′8 W.),** 75 feet above the water and visible 8 miles, and shown from a white house; it is obscured from 172° to 235°. One mile east-northeastward of the light is a rocky ledge 0.8 mile offshore and showing 8 feet above water. Broken grounds, with depths less than 2 fathoms, extend southward of the rocky ledge. A pile is located about 500 yards south of this same ledge. It may be picked up when skirting the shore in thick weather. Abreast this ledge, about 0.5 mile inshore from the beach, is a hog-backed mountain 1,100 feet high.

Moses Rocks, two breakers about 0.3 mile apart, are 0.6 mile southward and southwestward from Seal Cape and 270° from Seal Cape Light. The lead gives no warning of these breakers. A depth of 10 fathoms, irregular bottom, and not developed by further sounding, was found 1 mile south-southeastward of Seal Cape.

Coal Bay is a good shelter for small vessels in northeasterly weather. The bay extends east-northeastward toward a broad valley inland of a hog-backed mountain, and is entered on a **065°** course. A depth of 4 fathoms was found near the middle of the bay north-northwestward of Seal Cape; no soundings have been taken farther northward or eastward.

Pavlof Bay, indenting the southeast coast of the Alaska Peninsula, has its entrance about 25 miles westward from Unga Island of the Shumagin Group. It is an open bay leading to a landlocked arm, Canoe Bay, which has a very narrow entrance pass.

Flat Island, Lump Island, and a bank of 11 fathoms lie in the entrance to Pavlof

Bay. The bank is 2.5 miles southward of Flat Island; although volcanic ash bottom is indicated, the bank itself is probably of rock structure and may have less water over it. Another bank, having a depth of 12 fathoms and possibly less, is in the center of the bay westward of Settlement Point. In the entrance to Pavlof Bay is a dangerous shoal, about 0.7 mile 088° from Lump Island. There is a depth of 7 feet over the shoal. It is marked by kelp, which may be drawn under water by strong tidal currents.

Except for several fish traps operated during the salmon season, there are neither commercial enterprises nor settlements in Pavlof Bay. Several cabins along its shores are occupied by fur trappers during the winter.

Cape Tolstoi, at the eastern entrance of Pavlof Bay, is high and bold with eroded bluffs from 200 to 600 feet in height. The cape is marked by two peaks of about 1,800 feet elevation and separated by a deep narrow valley. Abutting the western face of the cape are two prominent pinnacle rocks. Deep water extends close up to Cape Tolstoi. Along the outside coast about 1 mile eastward of the cape is a small flat rocky island about 20 feet in height. At low water the island is connected to the mainland by a reef awash.

Northward of Cape Tolstoi to Canoe Bay the country is mountainous and the shore is bold and strewn with many rocks and reefs.

Settlement Point, 7.5 miles northward of Cape Tolstoi, is a low narrow tableland. Just back of it is a prominent hill, green in summer, 208 feet in height. Shelter for small craft may be had on either side of the point in all except southwest winds. A dangerous reef, bare at about half tide, is 0.2 mile southward of the point. About 0.6 mile northward of Settlement Point is a long fish trap.

Black Point, forming the western entrance to Pavlof Bay, is low and indefinite. It is composed of black cinders and ashes, and has deep water close-to.

Black Rock, about 15 feet in height, is 1.3 miles offshore about 3 miles southwestward from Black Point. It is surrounded by deep water, and can be passed close-to on either side

Flat Island is the large flat-topped island in mid-entrance to Pavlof Bay. It is 62 feet high and has precipitous shores. A detached reef, bare at low tide and of considerable size, extends 0.5 mile south of the island. Detached reefs are also to the northward and westward of it, but the east side of the island is clear with deep water close-to.

Irregular bottom extends 3 miles southward from Flat Island. No dangers were found in the survey, but vessels are cautioned to avoid the area of broken bottom.

Lump Island is a small rocky islet 45 feet in height 2 miles eastward from Black Point. A detached rock 20 feet high is just south of the main islet and connected to it by a reef which bares at low water.

Gull Island, a bird rookery 4.5 miles westward from Settlement Point, is a small rocky island with a rocky reef extending 0.2 mile westward from it.

Ivan Island (John Island) is the largest island in the bay. It is flat-topped and about 200 feet in height with vertical cliffs rising abruptly from the water. On the eastern side of the island is a shallow basin, with two entrances, which forms a good launch harbor. About 6 feet can be carried through here at ordinary high water. Between Ivan Island and the mainland the water is shoal with scattered growths of kelp.

For about 7 miles northeastward from Ivan Island there is considerable foul ground,

with several dangerous rocks and reefs. Owing to the irregularity of the bottom, it is not assured that all the dangers were found in the survey and the area should be avoided by deep-draft vessels.

Round Island is a small round-topped island 90 feet in height, located in the upper part of the bay. To the northeast are two unnamed rocky islets about 25 feet high. The broken area to the northeast of Round Island should be avoided.

A dangerous rocky shoal 2 miles northwestward from Round Island has a least depth of 4 feet. The northern shore of the bay consists of reddish eroded bluffs 50 to 70 feet high, giving way to low flat shores near the entrance to Canoe Bay. This shore is strewn with boulders and rocks inside the 6-foot curve.

In northerly weather, anchorage may be selected at any place in the northern part of Pavlof Bay. The bottom consists of mud and ashes, and has good holding qualities. In southeasterly weather good protection may be had just northwest of Cape Tolstoi, in 15 fathoms, sticky mud bottom. In westerly weather anchorage may be found near the western shore about 2 miles south of Ivan Island.

Weather.—In the early spring and fall, northwest winds sweep out of Pavlof Bay with great force. The prevailing winds in summer are southeast to southwest, and they draw up the bay with considerable force and at times cause a heavy sea in the upper part of the bay. Fog is more prevalent in the entrance than in the upper part of the bay.

Canoe Bay is a deep body that joins Pavlof Bay at its northeastern part. The entrance has a width of only 175 yards with a depth of 13 fathoms between the entrance points, which are of rock formation and about 50 feet in height. A rock with 9 feet of water over it is 0.7 mile eastward of the south point of the entrance. The maximum current here is estimated at from 5 to 7 knots, and slack water occurs at about the time of high and low water in Canoe Bay.

Local vessels of sufficient power enter Canoe Bay at any stage of the current, but vessels of more than 100 feet in length should not attempt the entrance except at slack water. The survey showed 23 feet to be the limiting depth for entering the bay. This depth occurs just within the entrance, from whence the depths gradually increase to 10 fathoms, then deepen abruptly to 30 to 40 fathoms.

At the head of the bay is a shallow lagoon which extends 3.5 miles eastward. Canoe Bay is bordered on the north by a mountainous ridge which culminates in a remarkable volcano with an extinct crater, circular in shape. On the south side of the bay is a prominent sharp peak which shows well from Pavlof Bay. Northwesterly winds do not blow strongly in Canoe Bay, but it is reported that the northeasterly winds of winter sweep down the bay with great violence.

Anchorage in Canoe Bay may be selected just inside the entrance in 4 to 10 fathoms, hard bottom. For large vessels the best anchorage is in the eastern part of the bay in 23 fathoms, sticky bottom.

Chart 8703.—Long Beach is the long, low, sandy beach between Black Point and Arch Point. Back of the beach the ground rises gradually, culminating in the three peaks of Pavlof Volcano. The center peak, which is active, has been in eruption several times in recent years.

A flat-bottom area makes out from the shore about 6 miles northeastward from Arch Point, affording good anchorage in depths of 14 to 15 fathoms on the outer part

of the flat area. The anchorage is useful for vessels waiting for the weather to clear before attempting the passage among the islands.

Arch Point, at the northern entrance to Volcano Bay, is moderately low with cliffs about 100 feet high, and is joined by a low neck to the high land farther back. The cliffs are undercut in several places forming caves and arches. The rock is black near the water, changing to light brown above with grassy land back of it. Deep water extends close to the south side of the point.

Arch Point Light (lat. 55°12′.4 N., long. 161°54′.3 W.), 105 feet above the water and visible 8 miles, is shown from a red house on the southeast part of the point; it is obscured from 105° to 213°.

A rock with 1¾ fathoms over it is a little southward of a line from Arch Point to the north end of Dolgoi Island, and on the range of Bluff Point, Dolgoi Island, and the southeasterly tangent of Moss Cape. The rock is marked by a buoy. Broken ground, on which the least depth found is about 5¾ fathoms and which should be avoided, extends 0.5 mile eastward from the 1¾-fathom spot.

Local magnetic attraction exists near Arch Point; it is 10° greater (easterly) than the normal magnetic variation.

Volcano Bay is free from rocks and shoals, except near the shores which should be given a berth of 0.4 mile. The shoaling is abrupt from about 30 fathoms to the flats at the north side of the bay. Good anchorage and shelter from all except southeast winds may be had near its head in 10 fathoms, sticky bottom. Shelter for small craft from southeasterly wind may be had in 2 fathoms behind the sand spit which makes out from the southerly side of the northwest part of the bay. Fresh water may be had here. Rocks and ledges extend 500 to 700 yards offshore between this spit and Bear Bay.

Bear Bay is a small inlet which affords fair anchorage in the middle of its entrance. The inner part of the bay can be entered only by pulling boats.

Pavlof Islands, near the Alaska Peninsula and westward of the Shumagin Islands, are Wosnesenski, Ukolnoi, Poperechnoi, Dolgoi, Goloi, and the two Iliasik Islands.

The inside passage along the Alaska Peninsula in the vicinity of the Pavlof Islands is northward of Jude and Ukolnoi Islands and through the following passages: (1) between Arch Point and Dolgoi Island, (2) between Moss Cape and Goloi Island, (3) between the Inner and Outer Iliasik Islands, and (4) between Bold Cape and Deer Island. See directions, Chapter 3. The inside route has been surveyed from Cape Tolstoi to Cape Pankof and with aid of the charts may be used with confidence. Between Unga Island and Dolgoi Island, the rocks and islands have been approximately located by reconnaissance.

Wosnesenski Island, the easternmost of the Pavlof Islands, has a rocky flat-topped peak 1,200 feet high, near the southeast point, and the remainder of it is lower. In the northwest portion is a lagoon and on the north shore a small settlement A vessel may anchor in the bight on the north shore 0.5 mile westward of a bare ledge. Otherwise the shore seems foul all around, and depths of 10 to 15 fathoms are found northeastward for 2 or 3 miles and probably dangerous rocks exist. On the southwestern side of the island is a pear-shaped pinnacle rock several hundred feet in height.

Ukolnoi Island, high and mountainous, is steep and bold at the northwest point. East of the island are several rocks and ledges showing above water as far as the longitude of Wosnesenski Island, and there appears to be foul ground right across. Should it

be necessary to pass through, a channel might be found by skirting Wosnesenski Island. Along the south shore of Ukolnoi Island there are several breakers 0.3 to 1.8 miles offshore. On the northwestern point of the island is a **light** (**lat. 55°14′.8 N., long. 161°39′.5 W.**), 35 feet above the water and visible 8 miles. It is obscrued from 238° to 052°.

The channel north of Ukolnoi Island has been surveyed and found safe. There is a rocky islet about 0.6 mile westward from the most northerly point of the island. This rock should be given a berth of 0.8 mile to avoid the broken ground in its vicinity.

Direct route, Acheredin Point (Unga Island) to the Iliasiks.—A single line of soundings has been run from Unga Island direct to Dolgoi Cape, and the visible dangers were located. This route is used considerably by small fishing and whaling craft and has been used by cannery steamers drawing about 20 feet. The following directions may be useful: From a point off Acheredin Point a course should be laid to pass 1 mile south of Poperechnoi Island and Dolgoi Cape; then head up to pass between the Iliasiks.

Several low rocks and islets are southward of Poperechnoi and Dolgoi Islands. Two miles southward from Dolgoi Cape is a particularly dangerous breaker and a second breaker is reported 0.6 mile eastward of this. Breakers were observed between the two small islets 3 miles southeastward of Poperechnoi Island. This track should not be attempted except in clear weather. If caught in a fog off Poperechnoi Island, a vessel will have to anchor and wait for clear weather.

Poperechnoi Island has rugged cliffs 1,300 feet high along its northeast shore. There is a rock awash at half tide 1.3 miles from the northwest point on a line toward Wosnesenski Island, and another breaker 1.3 miles east-northeastward of this rock. Still farther east is a pinnacle rock well above water in the middle of the strait. No sounding has been done.

Dolgoi Island, 9.7 miles across and grass-covered, is divided into two mountain masses by Dolgoi Harbor and the lowland at its head The greatest height at the east and west ends of the island are 1,450 and 1,510 feet, respectively. The shore is generally abrupt and high. The north point of the island is an overhanging cliff. Bluff Point is described below. The south part of the island is particularly bold, the cliffs being several hundred feet high. At the middle of the southeast side is a headland with a cliff 920 feet high.

Dolgoi Cape, the south point of Dolgoi Island, is marked by several large, detached rocks a few yards off the shoreline. A reef of small extent 2 miles southward from the cape breaks in southerly weather. The depth over it is ½ fathom. A rock with 1 fathom over it is 1 mile east of the reef.

Chart 8851.—Dolgoi Harbor has been considered the safest and most commodious harbor in this part of Alaska, giving perfect shelter and freedom from violent williwaws; however, the commanding officer of the U.S.S. *Gannet* reports that the bottom is apparently of volcanic ash and of poor holding quality causing his vessel to drag freely. He further states that radical changes of weather occur frequently and with remarkable suddenness. Two islets are on the west side of the entrance and two larger islands are inside the harbor.

To enter Dolgoi Harbor, steer **020°** for the highest point (500 feet) of the ridge at the head of the harbor showing westward of the two islands in the harbor, and pass 200

yards or more eastward of the outer one of the two islets on the west side of the entrance. Pass westward of the first island within the harbor, favoring if anything the side nearest this small island.

The deeper passage then leads between the two islands in Dolgoi Harbor, taking care to give the north end of the south island a berth of over 150 yards, and the southeast end of the north island a berth of over 300 yards; the best course through is about **109°**. Or, vessels can take the passage west of the upper island, which has a depth of about 4 fathoms, by keeping the island at a distance of about 200 yards. In 1924, the U.S.S. *Cuyama*, drawing 24 feet, entered Dolgoi Harbor, using the channel west of the north island in departing. The soundings showed nothing less than 4½ fathoms on a course **208°**. This channel obviates the turn between the two islands, which is somewhat difficult for long ships, especially during southeast winds.

Anchorage in Dolgoi Harbor can be selected anywhere above the islands in depths of 7 to 10 fathoms, mud bottom, with no outlying dangers. It is reported that the best anchorage is at a point 1.5 miles northward of the northerly of the two large islands inside the harbor.

Dolgoi Harbor is easily approached with the aid of the chart, passing on either side of Goloi Island. The principal outlying dangers in the approach are two rocks with 1 foot over them, which lie about on the range of the east point of Goloi Island and the end of the spit at the west end of Dolgoi. One rock lies 0.7 mile 135° from the east end of Goloi Island; the other rock lies 0.9 mile 222° from the cluster of rocks at the southeast side of the entrance of Dolgoi Harbor.

Chart 8703.—Bluff Point is a rocky headland forming the northwest end of Dolgoi Island. It rises abruptly to a height of about 50 feet, with a gentle grassy slope to the eastward.

Arch Point and the dangers in the passage between the cape and Dolgoi Island are described earlier in this chapter.

The sandspit making out from **Moss Cape** is marked by a daybeacon and a buoy marks the outer limit of the shoal extending southeastward from the cape. When on southerly courses approaching the passage between Moss Cape and Goloi Island, use care not to mistake a pinnacle rock, lying midway of the east shore of Inner Iliasik Island and skylined in the low center of the island, for the light on Goloi Island. Also, use care in passage to avoid foul ground making out from either side.

Goloi Island, within the western limit of the Pavlof Group, is 970 feet high and the sides are generally abrupt except at the two sand spits, one at the west end, the other at the middle of the northeast side of the island. The end of the spit making out from the west side is marked by a **light.**

Caution should be used in making the passage between the Iliasik Islands because of reefs which make out from each island, constricting the navigable channel to a width of 0.6 mile. Growing kelp has been seen midway between the islands in the middle of the summer.

Iliasik Islands are each about 2.7 miles long and 0.7 mile wide. They are both high and have cliffs at the water. Viewed from Bold Cape they appear as three islands, as **Inner Iliasik Island** is nearly divided by a low neck of land into parts about 800 feet high. The high north end of **Outer Iliasik Island** is also separated by low ground from the rest of the island. Ledges and kelp extend about 200 yards from the

east side and about 0.3 mile from the west side and southeast end of Inner Iliasik. Outer Iliasik is surrounded by ledges and kelp to a distance of 0.3 mile in places; bare rocks and foul ground extend 0.5 mile west-southwestward from the west end of the island.

Iliasik Islands Light (**lat. 55°02′.3 N., 161°56′.3 W.**), 95 feet above the water and visible 8 miles, is shown from a white house on the south end of Inner Iliasik; the light is obscured from 120½° to 254°. A buoy is moored 0.3 mile off the northwestern extremity of Outer Iliasik Island in range with the light. On the extreme northwestern slope of the inner island is a house occupied by a fox farmer.

From the north point of Inner Iliasik Island a reef extends to the mainland. Just east of the mainland end of the reef and close to the shore is a large boulder which is easily recognized. There is little depth on the reef near the island, and about 8 feet on the greater part of it. Near the mainland a depth of 11 to 12 feet can be taken across the reef by passing 100 to 300 yards off the large boulder on a course parallel to the shore. The passage is used by local fishing vessels of about 6 feet or less draft and is not recommended for any but light-draft vessels; the tendency is to cross too far from the large boulder.

Sarana Island, about 270 feet high, is a rocky island off the southern point of Outer Iliasik Island. The island is fringed with reefs and should be avoided. The passage between it and the Outer Iliasik appears foul. A reef bare at low water was seen about 1 mile eastward of Sarana Island, and an extensive reef with occasional bare rocky islets appears to extend to the southward from the south point of Outer Iliasik Island.

A rock with ¼ fathom over it lies about midway between the south end of Outer Iliasik Island and Deer Island. Vessels should keep well to the northward of this rock, as the area to the southward is foul.

Belkofski Point is the first point on the Alaska Peninsula westward of the Iliasiks. It is marked by a cliff 40 feet high and by a **light** (**lat. 55°04′.4 N., long. 162°03′.1 W.**), 40 feet above the water and visible 8 miles; the light is obscured from 089° to 224°. A reef extends 600 yards to the southwestward from this point, and the shore for 0.5 mile on either side is fringed by a reef extending from 100 to 200 yards offshore. In view of the broken and uneven bottom here, the cape should be rounded at a distance of not less than 0.8 mile.

Belkofski (*pop. 119 in 1950*), a native settlement on the eastern side of Belkofski Point, consists of a church and about 25 houses. The church is painted white and is prominent. Vessels anchor off the village in 10 fathoms and land goods on the sand and boulder beach unless southerly weather makes the surf too heavy.

The mail steamer from Seward makes regular stops. In the summer the village is nearly deserted, and most of the natives work in nearby salmon canneries.

Belkofski Bay is deep and free from hidden dangers, except for reefs and ledges near the shore. Local magnetic attraction on the eastern side of the bay is 5½° greater (easterly) than the normal magnetic variation.

Kitchen Anchorage, on the east side of Belkofski Bay, is easy to reach and affords good shelter in all except northwesterly winds. In strong southerly weather, the williwaws become frequent and violent. The bottom is soft volcanic mud and its holding quality is good. A large fresh-water stream flows into the head of the harbor and a fish trap is located at about the middle of the southern shore. From the northern entrance

point of Kitchen Anchorage, for a mile to the entrance to the outer portion of Captain Harbor, the shore is a steep-to cliff, and may be approached within 200 yards.

Captain Harbor is the indentation at the extreme northeastern end of Belkofski Bay. It extends for nearly 2 miles in a northerly direction with an average width of 0.4 mile, and is divided into an outer and inner anchorage by a shingle spit extending from the western shore. The outer portion is narrowed to a width of 300 to 450 yards between the 3-fathom curves, and the anchorage is in 10 fathoms in the center with the eastern end of the shingle spit bearing 033°, distant 600 yards. The holding ground is poor, being soft volcanic ash over a hard sub-stratum. The northern shore of the outer anchorage is a low cliff, with shoal water extending 300 yards offshore in places.

The outer portion of the harbor has general depths of 8 to 12 fathoms and 10 fathoms can be carried into it. At the entrance, a slight bar extends off the north side with a shoalest sounding of 7½ fathoms near the middle of the entrance. Depths of 4 to 8 fathoms prevail over most of the inner part and the 3-fathom curve carries practically to the head of the bay, affording good shelter for small boats.

The western entrance is formed by two low sand-and-gravel islets, with flats extending 250 yards to the eastward and similar flats extending 400 to 600 yards off the 2-mile stretch of beach to the westward.

The entrance to the inner basin is about 350 yards wide, with 9 fathoms in midchannel. The inner anchorage, entirely landlocked, is a secure anchorage for small craft in 7 fathoms, mud bottom, with the end of the shingle spit bearing 185°, distant about 600 yards. This is the best small-boat harbor along this section.

Directions, Captain Harbor.—Round the prominent point at the southern entrance to Kitchen Anchorage at a distance of 0.4 mile, and steer **030°** to a point 250 yards off the southeastern entrance to Captain Harbor. Then steer **054°** and anchor. To enter the inner harbor, continue on the **054°** course until midway between the end of the shingle spit and the opposite shore; round the spit and steer **003°** for a small stream. Anchor as indicated in previous paragraphs.

Indian Head is a very noticeable promontory about 200 feet high, projecting 0.5 mile into Belkofski Bay on its western shore. It is distinguished by several pinnacles near the outer end; a reef extends 250 yards off the point.

The bight north of Indian Head is of even bottom, with the 3-fathom curve about 600 yards offshore. Vessels of any size will find excellent shelter from all except southerly winds in this bight. Anchorage can be had in 10 to 20 fathoms, sticky bottom. In the severe northerly winds, anchorage can usually be found in some section free from the wind. The survey ship found this anchorage by far the best in this section except for southerly weather, and the Fox Island Anchorage, described later in this chapter, the best for southerly winds.

Slavna Point is the high rocky point on the western side of the entrance to Belkofski Bay, about 1.8 miles southward of Indian Head. It is steep-to, with depths of 8 fathoms 200 yards off the point.

Bold Cape, on the Alaska Peninsula opposite Deer Island, is a rugged headland faced with vertical cliffs, above which the mountain rises in steep rock-strewn slopes. Several prominent boulders stand a few yards offshore.

King Cove, westward of Bold Cape, reaches inland between high ridges which rise from the shore on either side of the cove. The outer bay is deep and free from dangers except those close to shore. Vessels may anchor in 16 fathoms 0.5 mile off the wharf

and about midway between two shores. The anchorage is subject to violent williwaws which are apt to sweep across the bay from all points of the compass, but the holding ground is excellent.

Morgan Point, the western entrance point to King Cove, is marked by a **light (lat. 55°02′.5 N., long. 162°20′.0 W.),** 120 feet above the water and visible 8 miles; the light is obscured from 039° to 206°. The shoal areas extending eastward from Morgan Point and from the western shore inside the cove are rocky and marked by kelp. Near the head and on both sides of the cove a line of single piles, in some cases dolphins, mark the offshore limits of the shoal areas. The bar across the mouth of the cove, about 0.5 mile inside Morgan Point, has depths of 11 and 12 fathoms, with sand bottom overlaying a harder stratum. In the outer part of King Cove, the holding ground is very good. In the deeper waters of 17 to 20 fathoms, in the upper part of the cove, the bottom is mud mixed with volcanic ash.

King Cove (*pop. 162 in 1950; P. O.*) has a wharf and salmon cannery. The southern and main side of the wharf consists of two faces with a small basin between them. Vessels of considerable size (4,800 gross tons) can lie across the two faces of the wharf. In going alongside either of the southern faces of the wharf, vessels should make a starboard landing on the ebb and a port landing on the flood. The ebb sets out of the lagoon at the head in a southeasterly direction with considerable strength, such that a port side landing with an ebb current is almost impossible, whereas a starboard landing should be made easily. A permanent mooring buoy with a 10-ton anchor has been placed off the wharf in a southwesterly direction to assist vessels in hauling themselves out from the wharf when unmooring. The use of this mooring is necessary only when there is a strong southerly wind. The buoy was reported sunk in 1940; it was then necessary to use a bower anchor for going alongside and hauling off with southerly wind.

Fresh water is not always available for vessels as the supply is limited. The Pacific American Fisheries, Inc., maintains radio station KMS.

The cannery company maintains a slipway for hauling out their own boats; this is available during the cannery season for emergency repairs. Vessels up to about 100 feet in length can be hauled out. A good machine shop is operated in connection with the cannery, and carpenters are usually available. A small amount of coal and gasoline is kept on hand and might be available in emergencies.

During the summer season, from April to September, vessels of the Pacific American Fisheries, sailing from Bellingham, Washington, make regular calls, and the monthly mail steamer from Seward makes regular calls.

To enter King Cove, steer for the wharf on a mid-channel course. On the ebb, a strong current parallel with the shore sets eastward along the face of the dock. This current is caused by the discharge of water from the lagoon.

King Cove Lagoon is back of the long spit on which the cannery is located. This spit is slightly overlapped by a rounding spit extending from the western side. Between the spits, just westward of the shipyard, is the narrow entrance to the lagoon. The lagoon extends in a north-northeasterly direction for nearly 2 miles with depths of from 5 to 8 fathoms over most of the area. A basin is formed by the rounding spit at the southern end of the lagoon with depths of 5 to 7 fathoms, where the floating equipment of the cannery is usually moored. An extensive shoal separates this basin from the deep water in the northern section.

The channel from King Cove into the basin had a controlling depth of 4 feet at

low water in 1940. Inside the basin the depths vary from 1 to 7 fathoms, with mud bottom in the deeper areas, and sand and gravel in the others. The maximum ebb current is about 4 knots, with flood current somewhat less strong. Current eddies and swirls through the basin cause small boats to swing at anchor. The holding ground is poor, probably due to the motion given anchored vessels by the current. Swinging room is limited. Apparently little or no channel exists from the basin into the lagoon. In 1940, the controlling depth from the basin to the lagoon was roughly 1½ feet. Vessels drawing as much as 5 feet have been taken into King Cove Lagoon at high water slack by employees of the King Cove Cannery.

Small craft can be beached on the sand spit forming the northern shore of the entrance to the lagoon. The beach slopes evenly and is smooth.

Owing to the extensive flats which block the entrance to the upper basin of the lagoon, the plane of low water in that part of the lagoon is about 2 feet higher than the corresponding plane in the cove, and there is a considerable lag in the times of high and low water.

Deer Island, near the coast of the Alaska Peninsula westward of the Pavlof Islands, is separated from the Peninsula by Deer Passage. The passage is a part of the inside route along the Alaska Peninsula. The island consists of a series of high conical peaks, many of which are so nearly of the same elevation as to be recognized only with difficulty from different positions.

Stag Point, at the north end of Deer Island, is a short sand spit, except for which the shore is rocky and steep. Back of the point is a high sugarloaf peak. The point may be recognized by a steep, high, triangular-shaped bluff at the end of a shoulder of the peak which is conspicuous in the otherwise sloping sides. **West Cape** is a ridge of bare rock ending in sheer faces at the western extremity and at the two sides. **Fawn Point** is the southern cape.

Approaching Deer Island from westward, Fox Island shows up low and irregular and is not very distinct until some time after passing Umga Island, distant 14 miles, unless the weather is exceptionally clear. West Cape off Deer Island shows as a flat-topped sugarloaf, appearing as a detached island, but later is recognized as a part of Deer Island, while at the same time Stag Point shows as a high sugarloaf beyond West Cape. Southward of West Cape are two barren craterlike peaks, which form an excellent landmark.

Fox Island is marked by a **light** on its northwestern point. The light is on a red box, 40 feet above the water. Just back of the light is a prominent knob, which is separated from the rest of the island by a low neck of land. The southeastern part of the island is high and nearly flat-topped.

Fox Island Anchorage on the east side of Fox Island offers good anchorage in 10 to 16 fathoms, soft bottom, well sheltered from the wind and sea from northeastward to southwestward. A rock with 3 fathoms over it is in the channel about midway between Fox Island and West Cape.

The passage between Fox Island and Deer Island is clear except for that 3-fathom spot. In leaving the anchorage through this passage, round the southern end of Fox Island at a distance of 400 yards and lay a course westward until the lighted whistle buoy about 2.5 miles southward of Thin Point bears about 228°, and Fox Island Light about 068°.

About 2 miles from Fox Island and a little westward of a line to Sozavarika Island,

is a rock with 3 fathoms over it and marked by a buoy. The southwest side of Deer Island is very foul.

Eastward of Deer Island the flood current sets northward and the ebb southward. North of Fox Island the flood current sets northeastward and the ebb southwestward. The tidal currents here are weak.

Deer Passage, between Deer Island and the mainland, is marked by a buoy near the 3-fathom shoal about 1 mile west of West Cape. The bottom northwestward of the buoy is smooth and regular and consists of sand, shells, and gravel. By passing close to the fairway buoy, least depths of 9 and 10 fathoms can be carried through. In thick thick weather vessels coming from the westward, if unable to pick up the buoys, should anchor and wait for the weather to clear, for there are dangers on each side of the pass.

A lighted whistle buoy is in the fairway, about 2.5 miles southward of Thin Point. A depth of 6 fathoms is about 1.6 miles 282° from West Cape. A buoy is eastward of a 4¾-fathom spot, about 2 miles eastward of Thin Point.

Cold Bay, indenting the coast of Alaska abreast of Deer Island, is a spacious body of water, navigable by ships of any draft. Neither settlements nor commercial enterprises are located in the bay. A few cabins are occupied by fur trappers during the winter.

Cold Bay aeronautical radio range is at lat. 55°15′0 N., long. 162°45′5 W. The identification signal is CBD (_ . _ . _ . . _ . . .). The frequency is 248 kc.

A pier in 55°12′3 N., 162°42′0 W. with an 837-foot face, 65 feet wide at the northwest end and 149 feet wide at the southeast end, extends about 1,850 feet from shore in a 326° direction. It is 36 feet wide for 1,690 feet from shore. Water, fuel oil, and hospital facilities are available.

Weather.—Weather conditions here are bad, as the bay forms a natural draw through which strong breezes sweep in or out. Often when there is little wind elsewhere, a strong wind blows out of Cold Bay. Winter brings extremely strong winds. From October to January the prevailing winds are from the northwest, and during the remainder of the year they are from the west to southwest.

Vodapoini Point at the eastern entrance to Cold Bay is low and flat-topped, with high mountains immediately behind it. The magnetic variation due to local attraction at this point is about 14° greater (easterly) than the normal magnetic variation. The variation at Thin Point, across the bay, is normal. From Vodapoini Point to Lenard Harbor the country is high and mountainous, with bold and rocky shores.

Bear Rock is a black jagged rock, about 25 feet in height, 300 yards offshore at a point 2 miles northwestward from Vodapoini Point. It shows up prominently from the eastern entrance to the bay.

Kaslokan Point is the end of a low spit composed of sand and gravel and covered with grass. A **light,** 14 feet above water, on a small white house, is located on the point.

Kelp Point is low and rocky and marks the entrance to Lenard Harbor.

A reef marked by a heavy kelp patch lies 0.8 mile westward from Kelp Point. From this patch a ridge with 2 to 5 fathoms over it extends across the bay to the western shore. This area is foul and should be avoided. A natural channel carrying depths of 11 to 15 fathoms extends between this kelp patch and Kelp Point; it is recommended for all vessels ascending the bay. On the western edge of the natural channel, about 0.5 mile after passing **Kaslokan Point Light,** is a depth of 3 fathoms marked by a buoy. The channel is buoyed. During the big tides there is a strong current (prob-

ably 4 knots) in this channel, and with an adverse wind, tide rips make it dangerous for small boats. The chart is a sufficient guide.

The northern shore of Cold Bay is bordered by many boulders close in and should be navigated carefully, even by launches. The western shore of the bay consists of low bluffs and sand beaches with many boulders strewn here and there. Back of the beach is rolling tundra.

Lenard Harbor is a small but well-protected harbor formed by an arm of Cold Bay. The anchorage is in 16 to 22 fathoms and is protected from all seas. It has good holding bottom, but during stormy weather it is subject to the usual williwaws common in this section, and during southeasterly weather the wind may funnel through with terrific force. An extensive reef, which is awash at ordinary high water, lies 0.3 mile off the southern shore of Lenard Harbor. This reef constricts the anchorage near its head to an effective width of about 0.4 mile. The water shoals abruptly to the mud flats at its head and to the reef. A fine stream of water flows into Lenard Harbor from its northern shore.

From Lenard Harbor north the mountainous country gradually gives way to the low rolling tundra that borders the northern and western sides of the bay.

Kinzarof Lagoon, at the head of Cold Bay, is large and irregular in shape. While it consists mostly of mud flats, it may be entered at high tide by small launches; with local knowledge such boats may be taken to the cabin on the north shore of the lagoon. Just inside the western entrance is a cabin and a small area of deep water.

In northerly weather, comfortable anchorage may be selected at any place in the upper bay with mud bottom and good holding ground. In southeasterly weather good protection with excellent holding ground may be had behind **Delta Point.** A **light (lat. 55°11′.6 N., long. 162°38′.6 W.),** 48 feet above the water, is shown from a small white structure. The only anchorage protected from all directions is Lenard Harbor.

Chart 8701.—Thin Point, forming the western entrance to Cold Bay, is a low, grassy, gently rolling point. The extremity is a yellow eroded bluff with reefs, bare at low water, extending from its southwest and southeast points. Shoal water extends 1.3 miles southward from the point.

Telegraph Hill, 375 feet in height, is about 2.5 miles northwestward from Thin Point. It is a grassy, symmetrical, dome-shaped hill which stands out conspicuously as the only high ground near the point. It is a valuable landmark, for it is often visible when the higher hills are in the clouds.

Frosty Peak is the sharp rocky summit of a snow- and ice-covered mountainous mass between Cold Bay and Morzhovoi Bay. It is 5,820 feet in height and prominent from seaward, although its snowcapped summit is seldom visible through the low-hanging clouds.

South Walrus Peak, a ragged summit of 2,927 feet, usually shows prominently to vessels passing by when the peak is clear. All other peaks are so blended in the general mountain mass as to be of little use to the navigator.

Thinpoint Cove lies westward of Thin Point. The eastern part of the cove is foul and should be avoided. Numerous kelp-marked reefs extend into the bay for a distance of 2.3 miles westward from Thin Point. The western half of the cove is clear except for reefs fringing the shore. At the head of the cove a series of shallow lagoons extend for several miles in a northerly direction and are connected with Thinpoint Cove by a small

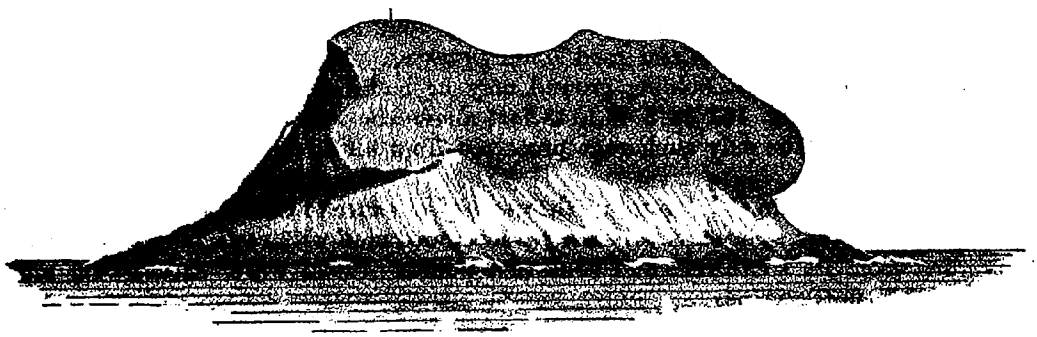
stream. The lagoons can be entered by small launches at high tide. The cove affords excellent shelter for small craft in northerly weather, but care should be exercised in entering to avoid the reefs to the south and west of Thin Point.

The coast from Thinpoint Cove to Morzhovoi Bay is rather rocky, with an occasional sand beach and grassy bluffs rising from the water. The shore is fairly steep-to, and the shore reef, extending 200 to 500 yards offshore, is heavily marked by kelp.

Sandy Cove is a small bay 3 miles eastward of Egg Island. The head of the cove, which is at the foot of a deep valley making through the mountains, is clear. The eastern entrance point is steep-to. A reef extends nearly 0.5 mile in a southerly direction from the western entrance point. Good shelter in northerly weather is afforded small craft.

Sozavarika Island (Grassy Island), low and grassy, lies 3 miles southwestward from Deer Island. The island is composed of shells deposited on rock; it may be approached close-to on its northwestern side. Between this island and Deer Island are many rocks and reefs.

Umga Island, about midway between Deer Island and Cape Pankof, is a small, grass-covered, rocky island about 250 feet in height. It is surrounded by deep water. The route from Deer Passage to Cape Pankof passes northward of Sozavarika and Umga Islands. **Umga Island Light (lat. 54°48′.2 N., long. 162°43′.5 W.)**, 258 feet above the water and visible 8 miles, is shown from the summit of the island.



Umga Island with Light bearing above 170°, distant 1.5 miles

Rush Rock, with 5 feet over it, lies 1.5 miles northeastward from Umga Island. It is nearly on range with the south side of Umga Island and Cape Pankof. This reef is of small extent and breaks only with a heavy swell.

Amagat Island, high and bold, shows as two parts; the southeast part is 1,065 feet high and has a dome-shaped peak, while the other part is 660 feet high, broader and flat-topped. The island is the nesting place for thousands of birds. A fair anchorage may be had in 16 fathoms just northeast of the island. Between the island and Cape Tachilni is a deep-water passage.

Two miles south-southwestward from Amagat Island is a shoal spot of small extent with a least known depth of 5¼ fathoms. Deep-draft vessels should avoid this spot.

Kenmore Head, forming the western entrance to Morzhovoi Bay, shows prominently from the usual coasting track. There is a small summit just west of the point which drops off with a vertical cliff to the water.

Morzhovoi Bay is the last bay indenting the coast of the Alaska Peninsula; it is about 15 miles eastward of Isanotski Strait. The broad, deep entrance has no known dangers except a rock with 12 feet over it, 400 yards eastward of Kenmore Head. The land bordering the entrance is very mountainous, giving way to rolling tundra at the head of the bay.

Cape Tachilni, forming the eastern side of the entrance to the bay, is an indefinite rounding point with grassy bluffs.

Egg Island, 325 feet high, is a rocky precipitous island with a fairly definite summit. Shoal water covered with kelp extends from the island to the mainland. The south side of the island affords temporary anchorage for small vessels while waiting for the northwest winds to moderate before crossing the bay.

Morzhovoi Bay forms a natural draw for the wind which sweeps in and out of the bay with great violence. The cannery, which was once near Littlejohn Lagoon, was moved to Isanotski Strait because of the severe winds and lack of protection in Morzhovoi Bay.

Littlejohn Lagoon, north of **Reynolds Head,** is marked by a grassy islet off its entrance. The lagoon offers excellent protection in all weather, but can be entered only by small craft. About 5 feet at low water can be carried through the crooked channel leading through the entrance, but once inside, there are depths of 4 fathoms, sticky mud bottom. In 1924 there were several dolphins near the entrance strong enough to moor vessels up to about 100 tons. Littlejohn Lagoon is occasionally used as a refuge for piledrivers and tenders used in driving fish traps in various parts of the bay.

The cannery formerly located just northwest of the lagoon is abandoned, and the buildings are in ruins.

Big Lagoon is the large irregular lagoon at the head of the bay. It has no entrance channel and is full of mud flats.

Middle Lagoon leads to a large lake which is a spawning place for a large run of salmon. At the eastern entrance point is a cabin. The lagoon has no channel, and with a southerly wind, breakers extend across the entrance. During the autumn months great flocks of wild geese frequent the lagoon. From Middle Lagoon it is about 7 miles by the easiest route to the Bering Sea shore.

Boiler Point, on the southwestern side of Morzhovoi Bay, marks the end of the mountain ridge extending from the entrance. In the cove just northwest of the point is a good anchorage, protected from all except northeast winds, with mud bottom.

In northerly weather good anchorage with mud bottom may be had at any place along the northern shores. In southwesterly weather the cove near Boiler Point offers good protection, while in easterly weather fair anchorage may be had off Littlejohn Lagoon. Indifferent anchorage may be had in the cove just northwest of Kenmore Head.

From Kenmore Head to Kabuch Point the shores are bold and mountainous, with deep water extending close-to. Ikatan Bay and Isanotski Strait separate Unimak Island from the Alaska Peninsula. Isanotski Strait, known locally as False Pass, is in general use for fishing boats and other craft of less than 10 feet draft when bound for Bering Sea points. Vessels up to 419 feet in length have entered the strait and docked at the False Pass cannery which is on the Unimak side, 3.5 miles within the entrance. The region is approached by steamers from the inside route along the Alaska Peninsula through Deer Passage, from seaward through the passage between Sanak Island and

Hague Rock, and from the westward through the passage between Cape Pankof and Sanak Island.

Ikatan Bay, on the north side of the Ikatan Peninsula, is deep and free from dangers except for the area north of Sankin Island. An abandoned cannery at the southwest corner of the bay has a wharf which is worm-eaten and unsafe. The larger buildings have been demolished.

Ikatan Point (Cape Horn) is bold and rocky. There is indifferent anchorage just west of the point, but vessels are apt to drag off into deep water.

Sankin Island, lying 1 mile from the north shore of the bay, is high and rocky. In the passage between the island and the mainland is a reef awash at low water. For several years, during the early part of the fishing season, two or three floating salmon canneries have operated from the anchorage just west of Sankin Island. After the middle of July, they usually move to the Bristol Bay region.

The southwest side of Ikatan Bay is separated from Otter Cove by a sandy isthmus 20 to 30 feet high; a shifting river enters the bay at the middle of this lowland and the flat off its mouth drops off abruptly to deep water. Along this shore are several fish traps.

Isanotski Strait (False Pass) between the end of the Alaskan Peninsula and Unimak Island, has its southerly entrance at the northwest end of Ikatan Bay.

Kabuch Point, at the eastern entrance of the strait, is high and rocky and is marked by a **light (lat. 54°49′.0 N., long. 163°21′.6 W.),** 15 feet above the water and visible 8 miles; it is obscured from 174° to 323°. The western side of the entrance, a low sand beach, may be passed close-to. A reef bare at low water makes off a short distance from Kabuch Point.

Whirl Point, on the Unimak side about 1 mile within the southern entrance to Isanotski Strait, is bold. A reef bare at low water makes off a short distance from the point, then drops abruptly to deep water. At high water the end of this reef is made evident by the swirls of the current.

A salmon cannery is located on the Unimak Island side at **False Pass** (*pop. 42 in 1950; P. O.*), 3.5 miles northward of the southern entrance to Isanotski Strait. A good wharf here has a 200-foot face and a 30-foot depth alongside. A good general store is maintained the year around. The monthly mail steamer from Seward calls on both the outward and homeward trips. P. E. Harris & Co. maintain a radio station (call letters KJL) from about April to September each year. Limited supplies of gasoline, distillate, and fuel oil are usually obtainable. A plentiful supply of excellent water is piped to the dock. There is also a small oil dock with 13 feet along its face. The ebb current (flowing southward) sets toward the low flat point just south of the cannery, and with such a current care must be taken to avoid being set onto this point on leaving the wharf. Due to the strong currents and changeable eddies this wharf must always be approached with caution. Often it will be slack water at the face of the wharf with a strong current running a hundred feet out in the stream.

Directions, Ikatan Bay to False Pass.—In entering Isanotski Strait from Ikatan Bay the Unimak side should be favored to avoid the reef off Kabuch Point. Follow the Unimak shore until almost up to Whirl Point; this shore drops off abruptly and can be passed close-to. Off Whirl Point, the tidal current may attain a strength of 7 knots when a tidal current of 4 knots is predicted off the wharf of False Pass Cannery. The reef making off Whirl Point when covered is generally made evident by swirls of

current. During the ebb current this reef deflects a violent current directly against the axis of the pass, tending to turn a northbound vessel toward the eastern shore of the strait. Careful steering is required to offset the effect of this current.

After rounding the reef at Whirl Point stand directly for the cannery, taking care to avoid being set too near either shore. A recent grounding on the eastern side of the channel about 0.8 mile southeastward of the cannery wharf indicates a ledge extending southwestward from the point 0.4 mile south of **Nichols Point.** A range consisting of the end of the wharf and some mark on shore back of the wharf would be helpful along the reach from the turn at Whirl Point direct to the wharf. If unable to go alongside, a temporary anchorage may be had in the cove just northward of the dock.

A vessel must be able to make 11 knots to be able to stem the maximum current. Large vessels should enter only at slack water.

Times of slack waters.—The predicted times of slack water and the strength of the current will be found in the *Current Tables.*

Directions, cannery to Bering Sea.—North of the cannery the depths gradually shoal to Chunak Point, where the limiting depths are 7 to 9 feet. From abreast the cannery the Unimak shore should be followed at a distance of about 0.5 mile until abeam of **Rocky Point.** Just before reaching this point a cabin will be seen in a little cove on the Unimak shore. From Rocky Point head for the daybeacon, which is located on a prominent sand dune. Continue this course until the end of **Chunak Point** comes in range with the westerly end of the spit of **Cape Krenitzin.** Keep this range until near **Chunak Point,** then round the point at a distance of about 200 yards from the grass line. The channel diverges slowly from the shore until it is 0.5 mile offshore when abeam of the daybeacon. The channel then passes between two shoals that are usually breaking and deepens gradually to the open sea.

Caution.—The channel is subject to change.

Vessels passing northward through Isanotski Strait should call at the cannery to obtain further information concerning the Bering Sea entrance.

Tides.—The tides at False Pass are somewhat irregular and become diurnal at the time of the moon's maximum declination. The diurnal range of the tide is about 4 feet.

Ice.—As a usual thing, the strait is open to navigation throughout the winter season, but during the winter 1923–24 the pass was entirely blocked with ice and the mail steamer could not get beyond Sankin Island. At this time drift ice extended from Cape Pankof to Sanak Island, a very unusual condition.

Traders Cove on the eastern side of Isanotski Strait, is a good anchorage. A small native village known as **Morzhovoi** has a church. The village is deserted during the summer when the inhabitants are employed in the canneries.

It has been reported that during northeasterly gales, the wind in the locality of Traders Cove is deflected to such an extent as to blow in an opposite direction.

Bechevin Bay, which is an enlargement of the northern end of Isanotski Strait, is shoal and full of sand and mud flats. A blind channel leads from **Traders Head** toward the **Isanotski Islands.**

St. Catherine Cove is the western bight in the northern end of the strait. In former years there was a channel leading into the cove affording anchorage for small schooners, but of recent years it has shoaled and the cove is nearly bare at low water.

About 2.7 miles northwestward from Rocky Point and 0.5 mile offshore is a reef bare at extreme low water. Several local boats have struck this reef.

Ikatan Peninsula, the southeastern extremity of Unimak Island and southward of the end of the Alaska Peninsula, is about 10 miles long and is composed of several mountain masses separated by low depressions. The wind blows through the low depressions of the land with great force. The south shore of the peninsula has rocks and breakers.

Cape Pankof, the eastern end of Ikatan Peninsula, is a sheer rocky headland consisting of a single 1,243-foot peak dropping immediately to a bluff which forms the southeast side of the cape.

The slope of the top of the bluff descends gradually from the peak to the northward, whereas to the southward the descent is broken in the form of vast steps. From the southward, the peak has a sharp outline and an abrupt rise from the sea.

Cape Pankof Light (lat. 54°39′.6 N., long. 163°03′.7 W.), 82 feet above the water and visible 8 miles, is shown from a white house. The light is obscured from 101° to 217°.

Cape Pankof Light, on second little hump from left, bearing about southwest

Another prominent headland, 1,070 feet in elevation, rises precipitously from the bluffs on the south shore of Ikatan Peninsula, 1.5 miles westward of the southern extremity of Cape Pankof. The mountain masses of the two headlands are separated by a low depression 0.8 mile westward of the cape. The bluffs are rust and gray in color. The slopes are grass-covered (in the summer) with frequent bare spots. On the higher bluffs is evidence of recent small rock slides.

A shoal with a least depth of 7 fathoms has been reported 2.7 miles 022° from the light. A depth of 7½ fathoms is about 10 miles southwestward of Cape Pankof in latitude 54°31.5′ N., longitude 163°14′ W. This shoal, about 350 yards across, is surrounded by depths of 25 to 30 fathoms.

A sunken rock which breaks with a light swell during low stages of the tide is about 1 mile westward from Cape Pankof Light and about 300 yards offshore. Another offshore danger is off the eastern point of the entrance to West Anchor Cove, described below.

Pankof Breaker is a sharp pinnacle rock with ¾ fathom over it, lying a little over 2 miles 053° from the southeast point of the entrance to East Anchor Cove. During the summer season the rock seldom breaks. There are 12 to 14 fathoms close to the rock. A buoy, moored in 30 fathoms of water, has been established 400 yards east of Pankof Breaker.

East Anchor Cove, on the north side of Cape Pankof, is a good anchorage except for winds from the north to southeast, through east. The cove is large and easily entered; the only danger in the approach is Pankof Breaker. Just inside the southeast entrance point is a fish trap. Anchorage may be selected as desired in 7 to 10 fathoms.

Westdahl Rock, with 3 fathoms over it, lies 7.9 miles 104° from Cape Pankof Light. It is a rocky patch of small extent. Westdahl Rock Lighted Whistle Buoy has been established in 30 fathoms of water 1 mile southwest of the rock.

Bird Island, about 0.5 mile in extent, is the most prominent landmark between Capes Pankof and Aksit. From the south, the island appears as a single elevated rocky mass, rounded but somewhat ragged in outline; the highest point, 775 feet, is a knob readily identified. Steep sides, fringing rocks, and breakers make a landing very difficult. The only practical landing place is on the north tip which has a steep beach of rather coarse gravel.

A bar consisting of a sunken reef connects Bird Island with the western point of the entrance to Dora Harbor. The greatest depth is 5¼ fathoms, and passage is not recommended. This bar depth is on the line passing through the 1,760-foot peak 1.6 miles northward of Cape Aksit and the summit on the western point of the entrance to West Anchor Cove. The line crosses the bar a little more than halfway from the point (on the north) to Bird Island. A sunken rock on the bar is a little less than halfway from the point to the island. The rock does not break in ordinary weather.

West Anchor Cove, the largest indentation on the south side of Ikatan Peninsula, affords indifferent anchorage. Anchorage in East Anchor Cove is preferable. The anchorage for all but small craft is confined to the open part of West Anchor Cove, which is exposed to southerly and southwesterly weather, always accompanied by heavy ocean swells. The bottom in West Anchor Cove is fine, dark, gray sand, which is good holding ground. The entrance is wide and clear, but rocky reefs extend from the points on either side. A narrow shelf of rocks extends along the shore at the eastern point of the entrance, the outer edge of which shows at half tide and probably breaks all the time. A rock with a depth of 2½ fathoms is off this ledge, distant 0.5 mile and southwesterly from the point. This is the outermost danger in the approach from the eastward.

A prominent flat rock, 4 feet high, is 0.5 mile off the round point on the eastern side of West Anchor Cove and about the same distance inside the entrance. This feature marks the western limit of the dangers on the eastern side of the cove and has been found useful for making the anchorage in thick weather. A detached shoal of 2¾ fathoms lies in the middle of the inner part of the cove about 1.2 miles from the head. The shoal marks the upper limit of anchorage for all but small craft. Rocky ledges extend from the north and south shores but not over 300 yards. A rock column, 46 feet high, on the south side and near the head, stands out prominently.

The bight between West Anchor Cove and Dora Harbor is small and exposed. Rocky reefs extend about 400 yards from the shore off the entrance points. A prom-

inent rock 32 feet high lies 330 yards off the west side of the headland at the east end of the bight. A prominent rounded rocky hill, 789 feet high, dominates the headland.

Dora Harbor, on the south side of Ikatan Peninsula, provides the only good anchorage with protection from all winds and sea on the south side of Unimak Island, but the harbor is limited to small vessels. The entire shore is fringed with ledges, partly bare at low water, to a distance of about 300 yards. The reef extending 0.3 mile westward from the eastern point of the entrance and that projecting from the western point toward Bird Island afford protection from ordinary southerly and westerly swell at the outer anchorage, but a heavy swell from southward is uncomfortable. The outer anchorage, however, is seldom used.

Low tableland terminates in bluffs at the shores on both the eastern side of Dora Harbor and the middle point of the western side.

The inner harbor of Dora Harbor is a slight expansion at the head with depths of 9 to 15 feet in the middle. A heavy swell from the southward will cause this anchorage also to be uncomfortable.

In entering Dora Harbor care should be taken to avoid a rock awash at low water lying 0.3 mile 220° from the eastern point at the entrance. The rock is detached and distant 200 yards from the edge of the shore reef. In calm weather, when the rock is covered, a light swell may not cause a breaker. Favor the western side in the entrance to avoid the reef extending about 0.3 mile westward from the point on the east side of the entrance, and then steer mid-harbor courses to the inner harbor, where anchorage with somewhat restricted swinging room is afforded vessels of 7 feet or less draft. Care must be taken to hold the mid-harbor course in entering the inner harbor in order to avoid reefs that make out 325 yards from the points on each side.

Otter Cove (Big Badger Bay) is an open bight between Ikatan Peninsula and Cape Aksit. The shores on both sides are characterized by high bare rocky cliffs. The sand beach forming the head is bordered by a series of grass-covered dunes. Other dunes in the form of ridges are farther inland.

Otter Cove is exposed to southerly winds and ocean swells, and always has a heavy surf. Northerly winds blow with great violence over the low isthmus separating it from Ikatan Bay. The only safe boat landing is in the northeastern corner of the cove. Two rocks, close together and baring 1 foot, lie over 0.5 mile from the shore of Ikatan Peninsula and 3.5 miles northwestward from Bird Island.

The story has been handed down among the natives that a channel once existed between Otter Cove and Ikatan Bay and that the Russian vessels once sailed through.

Cape Aksit, the western point of Otter Cove, is bold and rugged.

Cape Lazaref and the south coast of Unimak Island are described in Chapter 7.

Chart 8705.—Sanak Islands, the last group of islands along the Alaska Peninsula, are east-southeastward of Ikatan Peninsula with a 13-mile expanse of water between the group and Cape Pankof. The inside route along the Alaska Peninsula emerges here, passing between Cape Pankof and Westdahl Rock, described previously. Following the north side of the Sanak Islands, a route from the sea to the vicinity of Cape Pankof passes southward of Hague Rock and between Westdahl Rock and Crowley Rock.

The group consists of two large islands, Sanak and Caton Islands, and a great number of small islands and rocks southward of the main islands; all are bare of trees. They cover an area about 20 miles long and 10 miles wide.

The anchorages at Sanak Islands are suitable for small or moderate-sized vessels only, and with the exception of Caton Harbor there are no harbors affording shelter from all winds.

The mountain mass at the northwest end, the summit of which is **Sanak Peak,** elevation 1,740 feet, is an important landfall. A lower peak, elevation 787 feet, 1.5 miles westward of Sanak Peak, is often visible when the latter is hidden by clouds. On the eastern side of the mountain mass, a ridge rises to more than 200 feet. The remainder of the land in the Sanak Group is low in comparison, being a little more than 100 feet on the northern side and decreasing to less than 40 feet high among the southern islands and rocks of the group.

Crowley Rock, 1.5 miles off the north side of Sanak Island and 348° from Sanak Peak, is composed of several small pinnacles very close together. The least depth found on the rock is ½ fathom with depths of 25 fathoms or more surrounding it, except to the northwestward. Inside Crowley Rock is a good passage. The rock is not always marked by kelp and does not break unless the water is much disturbed; however, a prominent slick is evident on occasion.

The western end of Sanak Island is fringed with rocks. The westernmost breakers of the rocks, which form a continuous barrier from shore, are 2 miles 281° from **Point Petrof,** or 1 mile 267° from the northwesternmost bare rocks of the barrier.

Clifford Island is southeast of **Long Island,** the largest island southwest of Sanak Island. Clifford Island is grass-covered with prominent steep, rocky cliffs on the Sanak Island side. The offshore side (southwest) is fringed with rocky ledges, rocks, reefs, and kelp extending as far as 0.5 mile off. The bight to the eastward of Clifford Island affords anchorage for small craft in 2½ fathoms, rocky bottom. Local knowledge is necessary as the waters between Long, Clifford, and **Sisters Islands** are very shoal.

Chart 8860.—A reef with five rocks above water is between 4 and 5 miles southwestward of Clifford Island. Submerged **Hennig Rock** is the northernmost rock of the reef, and is nearly on the range of Sanak Peak and the western end of **Troitz Island** (the middle and largest **Trinity Island**) and distant 3.5 miles from Troitz Island. A 4½- and a 6¼-fathom depth are about 0.9 and 1.6 miles, respectively, northward of Hennig Rock. **Oneida Rock,** awash, is 4 miles 162° from Hennig Rock and is the southernmost rock of the reef. It is 5 miles from Clifford Island and 224° from Sanak Peak.

A narrow bank, about 6 miles long in an east and west direction, is 7 miles southwestward of Clifford Island. Depths of 1½ to 7 fathoms were found on it, and it is marked by kelp at slack water. The least depth was found at its northwest end, which lies 12 miles 238° from Sanak Peak.

Aleks Rock lies 16.7 miles 241° from Sanak Peak. It is the farthest outlying known rock southwestward of Sanak Island. The least depth over Aleks Rock is 1½ fathoms. The rock is a pinnacle, extremely limited in extent. The depth increases abruptly to 25 fathoms on the eastern side. To the westward and northward of the rock, a submerged shelf 5 to 15 fathoms deep extends for several miles. About 3.5 miles north of Aleks Rock is a pinnacle with 7½ fathoms of water over it.

Chart 8841.—Sanak (Acherk) Harbor, at the northwest end of Sanak Island, is 0.8 mile long and about 0.3 mile wide, and affords restricted anchorage for small vessels with protection from southerly and westerly winds, but is exposed to winds from northwest

to east, and a swell makes in with strong westerly winds. **Sanak** (*P. O.*), a small settlement at the southeast corner of the harbor, has a boat landing where water can be obtained. The diurnal range of the tide is about 6½ feet.

On the point on the east side of the middle part of the harbor is **Sanak Light (lat. 54°29′.2 N., long. 162°48′.9 W.)**, 40 feet above the water and visible 8 miles, and shown from a small white house. A daybeacon 132 feet above the water is established on a hill on the western shore of the harbor. The sunken rock 210 yards 278° from Sanak Light has a depth of 7 feet and is marked by heavy kelp. Temporary anchorage may be had about 0.3 mile northeast of Point Petrof, in 10 fathoms.

A monthly mail steamer calls at Sanak. The village has a store and is a cod-fishing center. Cattle are raised on the island.

The northward and eastward approach to Sanak Harbor has several dangers, shown on Chart 8705.

Approaching Sanak Harbor from the northwestward, steer for the western hill of Sanak Mountain on any course between **140°** and **176°**, taking care to avoid Westdahl Rock. When off the entrance, steer **193°** for the middle of the entrance, and anchor a short distance to the northward of the light, taking care to avoid the 7-foot spot which lies in line between the light and daybeacon. There are sunken rocks off the points at the entrance, but they are marked by kelp and can readily be avoided.

Chart 8705.—Murphys Crack (Murphys Cove) is a small indentation about 1.2 miles east of Sanak Harbor. It is protected by a reef and affords shelter for the boats of the local fishermen.

Pavlof Harbor (*pop. 68 in 1950*) is a small bay about 1 mile east of the eastern base of Sanak Mountain. It is reported to be a good harbor for small craft, but requires local knowledge because of the protecting reefs at the entrance; vessels drawing more than 7 or 8 feet cannot use it. There is a fishing station in the harbor.

Unimak Cove, 1.2 miles east of Pavlof Harbor, is an unimportant open bight.

Johnson Bay, 1.5 miles west of Northeast Point, has an inner harbor for boats and small craft, where there is a fishing station. Vessels may anchor just inside the entrance to the bay, favoring the east side, in about 9 fathoms, with protection from southerly and westerly winds. Close to the west point at the entrance are some rocks.

Chart 8841.—Northeast Harbor, at the northeast end of Sanak Island, affords temporary anchorage about 0.2 mile south-southeastward from Northeast Point in about 13 fathoms. Small vessels may anchor between Northeast Point and Eagle Rock, slightly favoring the point, with Cherni Island just open of Northeast Point, in 6 to 9 fathoms, sandy bottom. The bay is exposed to easterly winds.

Northeast Point, forming the north side of Northeast Harbor, is about 100 feet high. **Eagle Rock,** 58 feet high, lies near the middle of the bay; it is surrounded close-to by a ledge which covers, and a sunken reef which connects it with the head of the bay. Water can be obtained by boat.

Chart 8705.—There are steep and prominent rocky bluffs on the northeast shore of Sanak Island just to the northwestward of **Finneys Bay.**

Lida Anchorage is a temporary anchorage in southerly winds, at the west end of

Caton Island and south of **Lida Island,** and may be entered from either side of the island.

Approaching Lida Anchorage from eastward stand in near the visible rocks off the east end of Lida Island, taking care to avoid the partially covered reef, nearly 0.5 mile eastward of Lida Island, which extends in a northerly direction from Caton Island. Anchor about 0.3 mile from Caton Island, and 0.3 to 0.5 mile southward of Lida Island, in 6 to 7 fathoms, sandy bottom. Care should be taken not to approach the south side of the anchorage.

Approaching Lida Anchorage from westward steer for the southwestern side of Caton Island on a **144°** course, passing about 0.4 mile southward of Lida Island, and leaving a rock awash, 0.5 mile northward from **Wanda Island,** about 0.4 mile on the starboard hand, and anchor as directed above. The western end of Lida Island should not be approached closer than 0.5 mile.

Caton Island is rolling but comparatively low, the grass-covered land rising in places to elevations of 120 to 170 feet. Steep and prominent bluffs are on the northwest point of the island. The eastern side is low and fringed with rocky ledges to an average distance of 0.5 mile offshore. The southern side is also fringed with rocky ledges to as far as 1 mile offshore. Heavy breakers extend a considerable distance offshore, and the entire south side of the Sanak Islands, excepting perhaps Peterson Bay, is dangerous to approach by a stranger.

The beaches on Caton Island for the most part are composed of rocky ledges or boulders and gravel.

Whale Bay, on the northeast side of Caton Island, is extremely shoal.

Caton Harbor is a large area with general depths of 2 to 3 fathoms, sandy bottom, on the southwest side of Caton Island; it is protected on the south by **Elma Island** and on the northwest by the islands and reefs, above water in many places, between Caton Island and Sanak Island. It is protected from all swells, and schooners of considerable size have wintered here. These waters provide the best all-weather anchorage for small vessels in the Sanak Islands. Fresh water in small quantities may be obtained.

Princess Rock, off the west end of the islet in the center of Caton Harbor, is the most prominent feature in the vicinity.

The best entrance channel to Caton Harbor is from the northward. It is narrow and is close to the west end of Caton Island. To enter the harbor from the south through **Devils Pass,** westward of Elma Island, or through the pass eastward of Elma Island, requires local knowledge to avoid reefs and breakers. These passes should not be attempted by a stranger. Surveys indicate a controlling depth of 1¼ fathoms in the approach to Devils Pass with deeper water through the narrow part of the pass. The tide rips in Devils Pass are at times dangerous to small craft.

To enter Caton Harbor from northward, proceed as directed for entering Lida Anchorage from westward, and when well past the rock awash, mentioned under Lida Anchorage, bring the south side of the rock awash in range with Northeast Point astern, and stand in, keeping the range astern, course **125°,** until close to Caton Island. Then keep the bare rocks and kelp projecting from Caton Island close aboard on the port hand, but do not approach the kelp on the starboard hand; the least depth found in the narrowest part of the passage was 4½ fathoms, shoaling inside to 3½ and 3 fathoms. When past the rocks on the port hand, steer **193°** for about 0.5 mile, and anchor in about 3 fathoms with Princess Rock (high, grassy on top, extensive surrounding reefs covered

at high water) in line with Sanak Mountain, bearing 294°. This anchorage is about 0.5 mile from Caton Island, and the same distance from the nearest reef on the western side. Anchorage, with probably better shelter from northeast gales, can be made off the sand beach on Caton Island, just inside the narrow entrance.

Chart 8841.—Peterson Bay, on the south side of Sanak Island, is well protected from all but southeast winds, especially for small vessels of 12 feet or less draft which can anchor well inside the bay. It is reported that during northeast winter gales a heavy swell makes into the bay. The entrance is nearly 0.5 mile wide. In the widest part of the bay near the head are depths of 2 to 2¼ fathoms. A 1¼-fathom spot is in mid-channel about 0.5 mile inside the south entrance point. Another shoal of 1¾ fathoms marked by heavy kelp lies about 350 yards off the south shore and about 0.2 mile inside the south entrance point. The diurnal range of tide is about 6 feet.

To enter Peterson Bay.—In approaching from eastward, give the east and southeast sides of Caton Island a berth of about 2 miles to clear the reefs and the breakers which extend more than 1 mile offshore, and steer **262°**, passing 1 mile southward of **Umla Island** and **Telemitz Island.** When the latter island is abeam bring the tangent of the north side of Peterson Bay in line with the slight saddle between Sanak Peak and the eastern shoulder of Sanak Mountain, and run in on this range, course **318°.** When the south point of the bay is about 0.7 mile distant, haul northward a little so as to bring the north side of the bay in line with the extreme southwest tangent of Sanak Mountain, and run in on this range, course **311°,** until the south point at the entrance bears 177°. Then steer **294°** for the middle of the bay but avoid the 1¼-fathom spot southward of the course, and select anchorage according to draft.

Chart 8705.—Hague Rock, 9 miles north-northeastward from Sanak Island, is a rocky, grass-covered islet, 47 feet high, with deep water close-to, except on its northern side. A reef extends about 1 mile in a northwesterly direction. The channel between Hague Rock and Sanak Island is clear and deep. Caton Island should not be approached closer than 1.5 miles. The channel between Hague Rock and Sanak Island is used by large steamers proceeding directly to sea from Ikatan Bay.

Hague Rock Light (lat. 54°33′.2 N., long. 162°24′.1 W.), shown from a small white house, is 60 feet above the water and visible 8 miles.

Cherni Island, 14 miles north-northeastward from Sanak Island, is grass-covered and shows as low rolling land in the northern portion, gradually rising to two sharp tips near the southern end. These hills are 162 feet in height and noticeable from offshore. The southwest side of the island is a bare rock cliff, rising to a height of about 90 feet. There is a very good small-boat anchorage at the north end of the island where even violent northerly winds cause but slight swells at high tide only. The anchorage may be approached from the north only with local knowledge. It is reported that there are cattle on the island.

Sandman Reefs, a large area of foul ground with numerous islands, islets, and rocks, extends in a southerly direction from Deer and Outer Iliasik Islands almost to the Sanak Islands, and in an easterly direction beyond **Pinnacle Rock,** 83 feet high. This area has not been fully surveyed and should be avoided. From Deer Island these reefs appear as an unbroken series from the vicinity of the Iliasiks around to Hague Rock.

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CHAPTER 7

Aleutian Islands

Charts 8802, 9102

THE ALEUTIAN ISLANDS are a prolongation of the formation of the Alaska Peninsula, sweeping in an arc 900 miles or more to the westward and forming the southern limit of the Bering Sea. The islands fall into various groups, of which the Fox Islands, Islands of the Four Mountains, Andreanof Islands, Rat Islands, and Near Islands are the most important.

The topographic features are uniformly rugged; the islands are mountainous, and the shores bold, with numerous offlying islets, rocks, and reefs. In the absence of complete surveys, the only safe assumption is that these features are duplicated beneath the surface of the water. At all times in approaching the land, therefore, vessels should be navigated with great caution.

In addition to the lack of surveys, navigation in this region is made difficult by the prevailing thick weather and further by the lack of knowledge of the currents which attain considerable velocity at times.

Currents.—Southward of latitude 50° N. is an eastward drift across the Pacific. An eddy, accompanying this flow, sets westward along the south shore of the Alaska Peninsula and the Aleutian Islands and then drifts through the passes into the Bering Sea. These currents form a part of the general circulation of the North Pacific Ocean.

Through the Aleutian Islands passes, the velocities of the currents caused by tidal and wind effects are large enough to mask the continual northward drift through the passes.

In the past, numerous reports have been received to the effect that the flood currents flowing into the Bering Sea are very much stronger than the ebb currents. These reports have been largely discounted by observations in a number of the passages which in general reveal equally strong ebb currents flowing through the passes from the Bering Sea. It is believed that on account of the large diurnal inequality in the current of this region, mariners have been deceived by the long periods of flood current that occur near the times of the moon's maximum declination.

Currents are highly complex, making generalizations impossible. They set counter to general trends in many places along shores, even within major passes. Whirls and eddies in wide distribution further complicate the problem.

All passages in the Aleutian Islands have strong currents. In the narrow Akun Strait, the current is reported to reach a velocity of 12 knots. Because of the scarcity of reliable observations, definite current predictions can be made for only a few of the

passes. Current predictions for some of the more important passes may be obtained from the *Current Tables*. The effect of the tidal currents has often been felt offshore at a considerable distance from the passes, resulting in unexpected sets. Mariners should guard against such contingency. In the region of the Aleutian Islands the navigator must heed the currents carefully; a vessel is in more danger there from that cause than from any other, except the lack of surveys. In bad weather, the currents cause much heavier seas, and this effect has been noticed as much as 20 miles off the passes.

In general, tide rips occur to the southward of the passes on the ebb and to the northward on the flood, furnishing a rough means of determining the set of the current, although local tide rips may be caused by detached banks.

Tide rips even well off the entrances may appear as broken, choppy seas, with a few steep, short swells near the edge. In rough weather, the effect is to make the seas higher and steeper. The tide rips are much more noticeable during periods of tropic tides. Whirls are more likely to occur in the passes near the times of slack water.

A characteristic of the currents in the vicinity of the Fox Islands Passes is the sudden change from slack to strength of flood. A change from slack to almost 2 knots in 10 minutes has been noted, and in many cases the maximum flood occurs within 1½ hours after slack. It is therefore probable that the worst tide rips occur at the first of the flood, and under exceptional combinations of weather and tropic tides an effect resembling a bore may be caused in the narrower passes.

In Unimak Pass the current is probably strongest between Scotch Cap Light and Ugamak Island, where at strength of flood or ebb the velocity averages about 3 knots, but the maximum may exceed this figure considerably during tropic tides when 6 knots during the flood and 6½ knots during the ebb are to be expected.

The current has a large diurnal constituent which at times of tropic tides may cause the current to set continuously in a flood direction for as much as 18 hours.

The set of the flood in Unimak Pass averages about 300°. A vessel proceeding from Unimak Pass toward Avatanak Strait will experience a set when off Ugamak Strait and off Derbin Strait. When crossing the deep, usually marked by tide rips, northward of Derbin Strait, a strong set in the direction of the axis of the deep is often experienced. Only weak currents are noted along the north shore of Tigalda Island, but farther to the northward strong ebb currents, setting toward Avatanak Strait, have been encountered.

Tide rips occur off the eastern end of Ugamak Island and in places where there is a sudden change of depth.

Instances have been reported of vessels, hove-to north of Unimak Pass and waiting for clear weather, being carried through the pass by the current and finding themselves on the opposite side when the fog lifted.

In Akutan Pass the currents have an average velocity at strength of about 5½ knots; however, velocities of 9 knots may occur.

The tide rips in Akutan Pass are strong during the periods of largest tides. With a heavy northwest wind, the rips are menacing in the vicinity of the 15-fathom spot just south of Cape Morgan. They are confused and make a vessel very uncomfortable; they are dangerous for small craft. However, the strongest rips are not generally found in the middle of the pass. With a current setting northward the rips will be strongest in the northern entrance, and with a current setting southward the strongest rips will be

be found at the southern entrance to the pass. When the current setting north is opposed by a strong northerly wind the tide rips in the northern entrance to the pass are dangerous, and it is advisable not to use this pass in a gale. Under ordinary conditions, when there are no strong winds, this pass can be used by full-powered steamers at any stage of the current, but sailing vessels should not use it except at or near slack water. It is said that the most dangerous rips occur at the north entrance to the pass.

In Unalga Pass, northeastward of Fisherman Point near the center of the pass, the average tidal current at strength is about 6 knots. At times of tropic tides, current velocities may reach 9 knots. The maximum velocity occurs in a short stretch between Fisherman Point and Unalga Island, and the strongest current can be avoided by favoring the Unalga Island shore. The current along the south side of Unalga Island will rarely exceed 2 knots.

The tide rips in Unalga Pass accompanying a flood current are most pronounced northeastward of Erskine Point. With an ebb current the most pronounced tide rips occur off Brundage Head. During the periods of tropic tides, however, tide rips may occur throughout the length of the pass. Small boats can avoid the tide rips by keeping close to the Unalga Island shore.

Treacherous seas caused by wind or ocean swell opposing the current may be encountered in the narrow part of Unalga Pass. When tide rips are heaviest in Akutan and Unalga Passes, the water is broken into heavy choppy seas which board a vessel and make it difficult to control the steering. Tide rips are dangerous for small vessels even if there is no wind or sea.

Additional information on currents will be found elsewhere in the text under their respective localities.

Information on **tides** in the Aleutian chain is contained in the *Tide Tables*.

Weather.—The weather of the Aleutians is characterized by persistently overcast skies, high winds and violent storms. No other area in the world is recognized as having worse weather in general than that which the Aleutian Islands experience. The weather is extremely local, conditions of fog, low ceiling, and clear weather often being encountered in a distance of 20 miles. Clear weather over large areas is seldom encountered. It is an important characteristic of the weather in the Aleutians that the northern shores of the islands have far better weather generally and much less fog than the southern shores.

The winter temperatures over the Aleutians are moderated by the warm waters of the Japan Current system, and the islands are, therefore, usually free from ice which would interfere with navigation.

Fox Islands and the Islands of Four Mountains.—Winds in this part of the Aleutians are greatly influenced by local topography. On Unimak Island the prevailing winds are southeasterly in mid-winter and generally from westerly and northwesterly directions during the other months of the year. Violent williwaws with velocities up to 65 knots have occurred at Dutch Harbor. This station, at the northern end of Unalaska Island, is protected by high mountains to the west and by lower ranges on the south and east sides. The table for Dutch Harbor in the *Appendix* shows the seasonal variations of wind of this station.

Chernofski, on the north side of Unalaska Island near the west end, has southeasterly winds from November through February and again in June, and northwesterly winds the other 7 months of the year. Williwaws are common at Chernofski, and al-

though gales frequently blow from north, northeast and east in winter, March is the month of highest average velocities. At the northeast end of Umnak Island, the prevailing winds are generally from southwesterly and northerly directions, with a maximum of 74 knots. The Greenwich noon ship observations in this part of the Aleutians indicate that high winds are frequent and that the most gales occur in fall and winter. About 11 percent of all such observations in these two seasons record gales higher than Beaufort force 7, and more than half of these gales are stronger than force 8. The percentage of gales in spring is about half as large, and in mid-summer gales of force 8 occur occasionally, but no gales stronger than force 8 have been reported.

Precipitation averages about 50 inches per year over this part of the Aleutians, with 46 inches on Umnak Island and 57 inches at Dutch Harbor. October is the rainiest month on Unalaska Island. Snowfall varies from an annual total of 28 inches at Scotch Cap to 77 inches on Umnak.

The annual mean temperature averages 40° F. at Dutch Harbor and Scotch Cap. The highest temperature recorded in the area was 80° F. on several occasions at Dutch Harbor, and the lowest was 5° F. in January at the same station. August is ordinarily the warmest month and January the coldest. Air temperatures are slightly higher than water temperatures in summer, and somewhat lower in winter.

There is a large amount of fog over this part of the Aleutians, with a decided maximum of occurrence in mid-summer. Scotch Cap averages fog 11 percent of the whole year, the maximum reaching 32 percent in mid-summer. Fog occurs less than 1 percent of the time at this station during December and January. Dutch Harbor reports fog on an average of 6 percent of the year, with a maximum of 19 percent in June. At Chernofski Harbor fog occurs about 50 percent of the time in mid-summer and about 15 percent of the rest of the year. Conditions on Umnak Island illustrate the extreme variability of fog occurrence. On the northeastern tip of this island fog occurs about 16 percent of the time. Along this tip a range of mountains with elevations up to 2,000 feet extends east and west, with Berry Field to the north and Fort Glenn to the south. In summer with south or southwest winds fog often covers Fort Glenn while Berry Field remains open, but with northerly winds during the same season Fort Glenn is clear of fog while Berry Field is closed in. Dense fog is reported on Seguam Island at about 9 percent of all observations in June.

The area has overcast skies a considerable part of the time, with clouds frequently low enough to obscure the higher mountain peaks. At Dutch Harbor the skies average nearly 80 percent cloud cover, while over Chernofski Harbor the skies are about 90 percent cloud-covered in summer and 70 percent in winter.

Andreanof Islands.—Winds over this part of the Aleutians are most frequently from the north or northwest during late fall, winter, and early spring; and from southeast, south, or southwest during the rest of the year. Topography has considerable effect on the local wind directions, however. At Atka, for example, the prevailing winds are northwesterly throughout the year. At Adak the winds are southwesterly in summer and early fall with an average velocity of 13 knots. They are generally from a northerly direction during the rest of the year, except that southwesterly winds are most frequent in February and westerly winds in April. A maximum velocity of 104 knots has been recorded at Adak. The ship observations made at Greenwich noon over these ocean areas show that about 20 percent of the fall, winter, and spring winds

have velocities greater than force 6. About half of these gales are force 7 and about one-fifth of them are force 9 or higher.

Precipitation amounts are variable, with windward stations in general getting considerably more rainfall than stations in leeward locations. Adak has an average annual precipitation of 17 inches and Atka has 53 inches. November is the month of heaviest rainfall. The annual total snowfall averages 50 inches.

The mean annual temperature of this part of the Aleutians is about 40° F., with an extreme maximum of 69° F. at Adak in July and a corresponding extreme low temperature of 12° F. at the same station in February. Water temperatures average 1° to 2° F. higher than air temperatures in fall and winter, and the water is slightly cooler than the air in summer.

There is considerable fog over this part of the Aleutians, especially in the summer. Fog is most likely to occur with winds from southerly or southeasterly directions and least likely with winds from the north. An average of 21 percent of all Greenwich noon ship observations in this area reported fog during mid-summer.

In the Delarof Group, it was noted that during the month of August 1952 fog and low ceilings appeared to be more prevalent on the west side of Amatignak Island, the most southerly island of the Aleutians, than in other parts of the area.

Completely overcast skies are to be expected about 25 percent of the time in summer, with somewhat less cloudiness in winter and spring. Entirely clear days are rare, the skies usually clearing for only a few hours.

Rat Islands and Near Islands.—The winds over the outer Aleutians are strong and quite variable. Northeasterly winds tend to prevail during the three winter months, except that westerly winds are recorded more frequently at Kiska during January and February. Prevailing wind directions are not well defined. The average wind velocity at Attu is 10.4 knots and a maximum velocity of 91 knots has been observed in February. It is known that extremely violent and dangerous williwaws are liable to blow from any one of several directions at Attu. The Greenwich noon ship observations indicate that about 20 percent of all observations during the fall, winter, and spring months record winds with velocities of Beaufort force 7 or higher, and about one-fourth of these gales have velocities greater than force 8.

The rainfall records, like other meteorological data for the area, are meager. The highest annual amount of precipitation is 76 inches at Attu. Fall is the rainiest season. There is considerable snowfall in the area, Shemya Island having 120 days with snow on the ground between late October and early April.

The mean temperature for the year is 39° F. in this section, with temperatures ranging upward to a maximum of 70° F. in August at Attu, and downward to a minimum of 10° F. in February at the same station. In winter the water temperatures average about 3° F. higher than the air temperatures; the water is only about 1° warmer than the air in spring and fall, and is about 1° cooler than the air in summer.

Fog occurs over the outer Aleutians from 40 to 50 percent of the days in mid-summer, but occurs infrequently in mid-winter. Attu has dense fog on about 10 percent of the observations made in July and August, but has but little fog, all of it light in mid-winter. Most of the heavy summer fogs of this area appear to originate to the east and south of Kamchatka Peninsula, and to move into the island area during periods of westerly winds. In the outer Aleutians fog was reported on about 25 percent

of the Greenwich noon ship observations in summer, but fog occurred much less frequently at this hour in spring and fall, and occurred but rarely in mid-winter.

No thunderstorms have been reported in this part of the Aleutians. There is a large amount of cloudiness, with the area completely overcast, usually with low clouds, from 80 to 90 percent of the time in mid-summer. Skies rarely clear entirely for a whole day, but strong winds, usually from the northwest, sometimes clear the skies for as much as 8 to 10 hours.

The **Aleutian Trench** is an extensive submarine landmark which marks the Pacific approaches to the southwestern part of Alaska and the Aleutian Islands. It is one of several prominent elongate depressions around the rim of the North Pacific basin. Like the Kuril, Japan, Mariana, and Mindanao Trenches, it occurs as a foredeep (in front) of a festoon of islands.

Beginning off Cape St. Elias in the Gulf of Alaska, the trench parallels the Alaska Peninsula and the Aleutian Islands for a distance of more than 2,200 miles. The axis lies about 60 to 90 miles off the islands. It is concentric with the trend of the Aleutians, but makes a slight jog landward at a point 70 miles south of the Shumagin Islands. This point also marks a change in the gradient of the trench floor.

The depths increase from 2,400 fathoms off Cape St. Elias to 3,200 fathoms off the Shumagin Islands. In the next 80 miles the depths increase to 3,700 fathoms. The descent to 4,000 fathoms off Amukta Pass is very gradual. Depths remain at about 4,000 fathoms in the western part of the trench, but the charts show two soundings of nearly 4,200 fathoms obtained on early tracklines.

Kelp beds.—Kelp is unusually abundant in the Aleutians; in winter, the kelp beds disappear entirely.

Shore topography.—In general, the topography of the islands is rugged and precipitous; the coasts are bluff and exposed; the shores are bold, with many offlying islets, rocks and reefs; the beaches are rocky and narrow; and the water is usually deep close to shore.

Beaches.—In general nearly all beaches in the Aleutian Islands present natural obstacles to landing. The shores are generally precipitous; the breakers are heavy; and in many cases the approaches are filled with jagged rocks and kelp fields. In most cases, even where sand beaches are found, steep vertical cliffs rise back of the beach. Sand beaches are rare, usually being found only at the heads of bays; and in no case does a beach extend more than 50 yards inland from the high-water line.

When heavy swells and seas are encountered along a beach, a landing in a small boat should not be attempted as there are strong and dangerous undertows accompanied by variable currents.

Anchorages.—Most of the larger islands in the Aleutians provide more or less sheltered anchorage. These are covered in detail under the name of the place. Of the better known harbors in the Aleutians the following may be mentioned: Akutan Harbor on Akutan Island, Dutch Harbor on Unalaska Island, Nazan Bay on Atka Island, Kuluk Bay on Adak Island, Constantine Harbor on Amchitka Island, Kiska Harbor on Kiska Island, and Massacre Bay on Attu Island.

Local magnetic attraction.—Local magnetic attraction has been found in many areas in the vicinity of the Aleutian Islands. On land, differences from normal magnetic declination of as much as 8° have been observed, with 3° and 4° rather common. Unusual magnetic disturbances have been observed on the northwest coast of Tigalda

Island east of Kelp Bay; on the south shore of Akun Bay; on Cape Aiak, Unalaska Island; and in Nazan Bay, Atka Island.

Chart 8860.—Unimak Island, the first of the Aleutian Island chain, is separated from the end of the Alaska Peninsula by narrow Isanotski Strait (also called False Pass). This pass is practically closed by shoals at its entrance from the Bering Sea. Unimak Island is about 50 miles long and 23 miles wide; it is extremely mountainous, bare of trees and generally grass-covered.

Isanotski Strait and the eastern end of Unimak Island are described in Chapter 6.

Unimak Island is one of the group known as the **Fox Islands,** the others being Unalaska and Umnak and their associated islands. The Krenitzin Islands, a part of the Fox Islands group, are between Unimak and Unalaska Islands. All these islands are bare of trees and are generally grass-covered. They are frequented by enormous numbers of birds, and immense flocks are frequently encountered in the vicinity.

The higher peaks on Unimak Island are excellent landmarks if they can be seen, but in summer they are usually obscured by fogs or low-lying clouds. The lower hills and islands and objects near the sea level are generally the only landmarks available.

Shishaldin Volcano, 9,372 feet in elevation, near the center of Unimak Island, is cone-shaped and very regular in outline, with faint wreaths of smoke and vapor drifting at times from its summit. It is for the most part snowclad, except where the rocky cliffs and projections afford no lodgment. Shishaldin has been in eruption several times in recent years.

Isanotski Peaks are close eastward of Shishaldin. They are very rugged and have a broken or castellated double summit, the highest point rising to 8,135 feet. The summit is bare and looks as though it were composed of great vertical rock masses. This mountain is known locally as **Ragged Jack.**

Roundtop Mountain is a rounded summit 6,140 feet high, surrounded by snow fields.

Pogromni Volcano, about 8 miles from the western end of Unimak Island, is 6,520 feet high and is a snow clad, conical peak with vertical ridges cropping through the snow. Pogromni is a guiding landmark in clear weather for making Unimak Pass both from southward and from the Bering Sea.

The south coast of Unimak Island has cliffs in places, with lower land and sand beaches, between, and is backed by the high mountain masses of the central part of the island. The coast is fairly regular, with no indentations of any extent, and there are no harbors nor sheltered anchorages westward of Ikatan Peninsula. The coast is exposed to the ocean swell and there is generally a heavy surf, which makes landing dangerous. The 10-fathom curve is less than 0.8 mile from the beach in most places, and there are no known outlying dangers.

Chart 8701.—Cape Lazaref, about 800 feet high, on the south coast of Unimak Island, is the southwesternmost of three high cliffs, with sand beaches between them. The northeastern cliff of the series is at **Cape Aksit.** From the sharp point of the cape, **Lazaref Reef** extends 1.1 miles southward. On this reef are **North** and **South Pinnacle Rocks,** about 100 feet high. Anchorage, with fairly good protection from westerly winds, can be had northeastward of this reef, about 0.5 mile southward of a group of

rocks lying 0.4 mile off the eastern side of the cape, in 10 fathoms, sandy bottom. **Rock Island,** small and 112 feet high, is 1.5 miles westward from the cape and 0.5 mile from the beach.

Chart 8860.—From Cape Lazaref the coast trends westward, curving gradually westward and southward, for about 30 miles to form **Unimak Bight,** broad and open, and having a sandy beach. This sand beach is broken by a lava bed 8.5 miles westward of Cape Lazaref, and by three conical hills, the southernmost formed into several columns and reaching the water to make a small projection, **Cape Rukavitsie,** 15 miles westward of Cape Lazaref.

At the southern end of the sand beach is a broad valley; the south point is a sharp steep-sided projection, about 350 feet high, which forms **Promontory Cove,** small, and open to northward. The cove is reported to afford anchorage with protection from southerly winds but not from the swell. The bottom is sandy and shoaling toward the beach is gradual.

Cape Lutke, 2.5 miles southward of Promontory Cove, is a cliff 610 feet high, joined by a lower ridge to the higher land farther back, and is the southwestern headland of Unimak Bight. At this point the coast changes direction to southwestward and then westward for 13 miles to Seal Cape.

Seal Cape, on the north side of Unimak Pass in entering from the Pacific, is not particularly noticeable, but the locality is well marked by Arch Point, Promontory Hill, and Scotch Cap. The coast is bold and can be approached close enough (0.3 to 0.5 mile) in moderately thick weather to be seen and followed.

Arch Point, 3 miles northeastward of Seal Cape, is a rocky projection 172 feet high with an arch through the point near its extremity. The arch is visible only from onshore or close to shore. A small sand beach on the west side of Arch Point is well protected from any weather, except from the south, by the point itself and by a projecting ledge. The heavy surf, which generally prevails along most of this coast, is reported to be absent on this beach. Small boats could probably land here when they have trouble on any other part of the coast in this vicinity.

Promontory Hill, 5 miles northeast from Seal Cape, is a short ridge, about 1,100 feet high, having a northwest and southeast direction, and detached from the interior high land. Its outlines are smoothly rounded and it has a slight saddle, the whole having a bare, brown appearance. It is isolated and prominent, and together with Scotch Cap is a good landmark for the eastern entrance to Unimak Pass. Approaching Unimak Pass from the east and southeast, Promontory Hill can often be seen when other landmarks are fog-covered.

From Seal Cape around to Cape Sarichef, a distance of 19 miles, the coast of Unimak Island has a number of projecting points, is low in appearance, and slopes gradually upward to the high land of the island. Between Seal Cape and Sennett Point, the 10-fathom curve is from 0.3 to 0.7 mile offshore. The 20-fathom curve is also close inshore in places and is irregular. A study of the chart will show that great care is required in navigating on soundings alone around the western end of Unimak Island which is a region of strong currents. There are no dangers if the coast is given a berth of 0.5 mile.

Along this part of the coast there are several prominent hills. **Red Hill,** a very distinctive formation, is near Cape Sarichef. This isolated hill, 798 feet high, is closer to the shore than the other peaks in the vicinity and is easily recognized by its reddish

hue. It is prominent from the north, northeast and west, and is often clear when higher peaks are obscured by fog or clouds.

Scotch Cap is a precipitous cliff of rock which extends along the beach nearly a mile. It is 420 feet high at its highest point. Back of the cliff the land slopes downward for nearly a mile, then rises uniformly to the higher land of the island. Scotch Cap can be seen many miles in clear weather and is unmistakable.

Scotch Cap Pinnacle, a rock 172 feet high, is 50 yards seaward from the cliff.

Pinnacle Rock, Scotch Cap, from the southeast

Scotch Cap Light (lat. 54°23′.8 N., long. 164°44′.5 W.), an airway-beacon type, 116 feet above the water and visible 17 miles, is shown from atop a flat-roofed rectangular-shaped building about 1.7 miles eastward of Scotch Cap. It is obscured from 106° to 274°. The radiobeacon and air-diaphone fog signal at the light station are synchronized for distance finding. Records over a period of years show an average of about 1,000 hours of fog a year at the light.

Sennett Point, midway between Scotch Cap and Cape Sarichef, is a low, flat, grass-covered bluff with a bold rocky coastline. Many detached rocks are near the surf-worn ledges which extend offshore from the base of the bluff.

About 1 mile north of Sennett Point a reef makes out 0.2 mile from shore; the rocks at the outer end of the reef are 3 feet high. The bight between the reef and Sennett Point offers the best shelter and has the best holding ground in this locality. Anchorage inside the 10-fathom curve of the bight is usually free from current, no matter how strong it may be running in Unimak Pass. In 1938 a survey ship rode out several southeast gales at this anchorage.

A good landing is just north of Sennett Point. It is a small protected beach between the rocky ledges of the point and a group of inshore rocks, the highest of which has an elevation of 13 feet. In southerly weather, this is the best small-boat landing on the west coast of Unimak Island. Mail and supplies for both Scotch Cap and Cape Sarichef Lights are landed on this beach when landings cannot be made at either light. A small cabin on the shore is kept in repair by the United States Coast Guard, and is equipped with stove fuel and a few necessary supplies. In northerly weather landings are made in the bight south of Sennett Point.

About 2 miles south of Cape Sarichef Light is a small, rocky beach, which is well protected by rocks and ledges and could be used as an emergency landing in rough weather. The beach is at the south edge of the black lava flow from a prominent, extinct volcano, 1,240 feet high and 3 miles inland.

Cape Sarichef is a steep, grassy bluff about 175 feet high; back of it is a tableland, then a gradual slope upward to Pogromni Volcano. The black lava flow already mentioned extends northward along the coast to within 0.5 mile of the light. At **Sealion**

Point, 1.5 miles south of the light, wave action has detached a part of the lava; the result is a flat rock, 35 feet high, which is prominent from seaward.

A shoal area extends westward from Cape Sarichef for about 3 miles. Depths on the shoal are 7½ to 15 fathoms; the bottom is mainly gravel, with some rocky patches. The shoal appears to be a submerged extension of the lava flow on the coast. Ships should avoid crossing it because of the heavy tide rips, overfalls and eddies; the current reaches a estimated velocity of 2 knots. During favorable conditions of weather and sea, passage may be made inside the rocky patches by following the shore at a distance of 0.5 mile.

Cape Sarichef Light (lat. 54°36.0 N., long. 164°55.7 W.), 177 feet above the water and visible 20 miles, is shown from atop a white rectangular building with flat roof, part way up the side of the bluff. It is obscured from 223½° to 018½°. The light station has an air-diaphragm fog signal and a radiobeacon. Several large buildings are on the reservation. In very smooth weather, supplies and mail are landed in the small cove directly below the light. Small boats come alongside the ledge, and a boom on shore is used to unload them.

The north coast of Unimak Island is described in Chapter 8.

Unimak Pass is the first ship passage southwest of the Alaska Peninsula for a voyage into the Bering Sea. It is about 10 miles wide between the southwest end of Unimak Island and Ugamak Island, which is one of the smaller islands of the Krenitzin Group.

Unimak Pass is the widest of the Fox Islands Passes and the one most generally used by deep-draft vessels. Unalga and Akutan Passes, 50 miles farther to the westward, are convenient under certain conditions if bound for Dutch Harbor, but Unimak Pass is the only one of the three that is lighted. Vessels equipped with a radio direction-finder will be aided in making the approach to the pass by the radiobeacons at the two lights.

Besides being a gateway to the Bering Sea, Unimak Pass is also used by some vessels to effect a shorter and better weather route across the North Pacific Ocean. The route westward via the Bering Sea avoids the prevailing head winds and heavy seas that are encountered south of the Aleutians.

Unimak Pass is free from outlying dangers, but the currents and prevailing thick weather make it necessary to exercise unusual care in approaching the pass, especially from southward. The Krenitzin Islands furnish considerable protection from southerly and southwesterly weather, but during easterly or northerly weather the seas in Unimak Pass are accentuated by the current. A northeaster will also augment the prevailing southwesterly current along the Alaska Peninsula. Current predictions for Unimak Pass may be obtained from the *Current Tables.*

Southeastward of Unimak Pass is **Davidson Bank,** on which the depths vary between 35 and 50 fathoms; the seaward edge of the bank drops off sharply into deep water. At times there is a marked change in the color of the water from blue to green when coming from deep water onto the bank. The current runs westerly with an average velocity of about 0.2 knot; with an easterly wind it reaches a velocity of more than 1 knot along the 100-fathom curve. Tide rips are of frequent occurrence.

Sailing directions for Unimak Pass are included in Chapter 3; currents in the pass should be kept in mind when using the recommended courses. A vessel should be sure

of its position before attempting to enter Unimak Pass, and in thick weather should not attempt the other passes.

Approaching Unimak Pass from the east, the chart is the best guide. Care must be taken to avoid Sanak Reefs and Aleks Rock (Chapter 6). A good rule is to stay on or south of latitude 54° N. and make longitude 163° W., while still outside the 100-fathom curve; then stand west-northwest across Davidson Bank for Scotch Cap Light.

Caution.—A sounding of 6 fathoms, by lead, has been reported in latitude 54°14′.2 N., longitude 160°54′.0 W. This position is 14 miles north of the recommended composite course. See Charts 8802 and 8859.

If the weather is very clear the mountains of Unimak Island can be seen and recognized, but under ordinary conditions the first land sighted will be Promontory Hill, Ugamak Island, or Tigalda Island. From a distance Tigalda Island will appear as a number of small islands, but closer to, it is one island with six distinct peaks or short ridges. Some navigators prefer to stand westward on latitude 54° N. beyond longitude 164° W. so as to sight Tigalda or Ugamak Islands; these islands often show when Unimak Island is fogged in.

The comparatively low land in the depression on the middle part of Avatanak Island is often clear when no other land is showing, especially in northerly weather. The grotesque irregularities of the topography make it easy to identify the locality. If approaching from the southward, this stretch probably offers the best chance for identification of surroundings, especially since it is easy of approach and comparatively free from current.

Chart 8720.—Ugamak Island is the easternmost of the **Krenitzin Islands,** which extend from Unimak Pass to Akutan Pass. The island has a sharp peak, elevation 1,042 feet, at the eastern end; when viewed from the southeastward, several pinnacles protrude from the side of this peak, giving it an extremely rugged appearance. Near the middle of the island is a knob 905 feet high. The island is mainly tundra-covered. The shore is backed by bluffs 50 to 1,000 feet high. Off the southeast point of the island is a conical pinnacle, 310 feet high, which is separated from the island by a narrow gorge 10 to 15 yards wide. About 0.3 mile off the southeast end are two rocks awash, generally marked by breakers. Twin grassy islets, the northern of which is 127 feet high, are 0.6 mile southward of the east point of **Ugamak Bay,** a cove on the south side of Ugamak Island. The islets are separated by a deep gorge and appear as one; the collective name of **Round Island** is applied to them.

Strong currents sweep around the east end of Ugamak Island and heavy tide rips occur. It is advisable to give this end of the island a berth of about 2 miles.

Aiktak Island, 556 feet high, is southward of the western part of Ugamak Island; the two islands are separated by a pass 0.5 mile wide and 6 to 10 fathoms deep. Small vessels use this pass for temporary anchorage, but moderately strong currents make the anchorage rather unfavorable. On the south side of Aiktak Island are sheer bluffs, the tops of which approach the highest parts of the island. The islet off the northeast end is grass-covered and less than 100 feet in elevation.

Temporary anchorage in northerly weather may be found in Ugamak Bay in depths of 16 fathoms about 0.5 mile from shore. In southerly weather, some shelter may be found on the north side of Ugamak Island in a small bight 1.5 miles from the east end; depths are 16 to 20 fathoms, 0.3 mile from shore.

Ugamak Strait has a width of 3 miles between Ugamak and Aiktak Islands on the north and Kaligagan Island on the south. A detached shoal of 10 fathoms lies in the middle of the northwestern entrance to the strait. Heavy rips and swirls occur in this area at certain stages of the tide. Passage of Ugamak Strait has been made on a 288° course, heading approximately for Billings Head on Akun Island; this course passes about 1.3 miles northward of the northernmost rock off Tigalda Island. Allowance must be made for the current which sets across this course. The average velocity of the current at strength of flood and ebb is about 3¾ knots; velocities greater than 6 knots have been observed. Current predictions for Ugamak Strait may be obtained from the *Current Tables*.

Tigalda Island, on the south side of Ugamak Strait, is 11 miles long in an east-west direction and 3 miles wide. It has six mountain ridges, 1,000 to 1,600 feet high, which trend northwest and are separated by low valleys. The western end of the island is comparatively low. Grass and tundra cover the island.

Kaligagan Island, lying in Ugamak Strait 0.8 mile off the northeast end of Tigalda Island, is 0.8 mile long and 478 feet high. A large number of bare rocks or islets extend 2.5 miles westward and northwestward of Kaligagan Island. The northernmost is the highest (63 feet) and lies about 1.8 miles north of the Tigalda Island shore. Passages between groups of these rocks are deep and safe for small craft.

Proceeding to Tigalda Bay from among the islets, care should be taken to avoid a group of rocks awash extending 270 yards off the north side of the entrance point of the bay. These rocks are marked by thick kelp. Currents in the passage between Kaligagan and Tigalda Islands are approximately as strong as in the main passage of Ugamak Strait and currents are present among the groups of islets.

Tigalda Bay, on the north side of Tigalda Island, 3 miles from its eastern end, is sheltered from all except northwest winds. The bay is about 0.6 mile wide and 1.5 miles long in an east-west direction, and has depths of 8 to 10 fathoms, rocky bottom. On account of the poor holding bottom, the anchorage is not secure in strong winds. An anchorage off the entrance to the bay in 12 to 15 fathoms, gravel bottom, is to be preferred, and furnishes just as good shelter in southerly and easterly weather. The mean range of tide is about 2 feet.

The small bay just east of Tigalda Bay is not recommended as an anchorage for small craft because the swell making in from the north or west is not broken up by the group of islets.

Welcome Bay, just west of Tigalda Bay, is an open bay 0.8 mile wide. At the head, a narrow passage leads to a lagoon largely bare at extreme low water. The passage at its narrowest part is 90 yards wide and 2½ fathoms deep. The bay anchorage is in 15 fathoms, sand and gravel bottom, 0.4 mile from shore. An anchorage for small craft is in 4 to 6 fathoms, sand bottom, at the entrance to the passage.

Kelp Bay, on the north side of Tigalda Island and 2 miles from the western end, provides temporary anchorage in southerly weather. The width of the entrance is reduced by a reef extending 0.3 mile from the west entrance point. The point to the eastward of the bay is marked by several offlying rocks, the outermost being 9 feet high. On account of a shoal area extending 0.8 mile northward of the point, large vessels should pass at a distance of not less than 1 mile. Anchorage is found in the center of Kelp Bay in 7 to 10 fathoms just inside the entrance.

A small bay 2 miles east of Kelp Bay provides anchorage for small craft in southerly

weather. Care should be taken to avoid sunken rocks 170 yards off the east entrance point and others 150 yards offshore on the west side. Anchorage in 7 fathoms is found 0.3 mile from the head of the bay.

At the western end of the south shore of Tigalda Island is a high pinnacle rock, 165 feet in elevation and about 100 yards offshore, which shows prominently in a southeast and northwest direction. The point about 3 miles eastward of the west end is marked by **Derbin Island,** about 0.4 mile long and 206 feet high, lying close to the shore. Eastward of this point the south shore of Tigalda Island consists of high cliffs intersected by low valleys. About 2.5 miles eastward of Derbin Island are two round bare rocks, 85 and 27 feet high, about 0.4 mile from the shore. The section of the coast abreast of the rocks is a steep rocky bluff rising to a 1,682-foot peak. About 2.5 miles eastward of the two rounded rocks is a 191-foot pinnacle near the shore. An arch through the pinnacle rock gives it the appearance of a huge chair.

Derbin Bay, the bight east of Derbin Island, provides temporary anchorage in northerly weather. The recommended anchorage is in 16 to 18 fathoms, 0.5 mile from shore and 0.8 mile from Derbin Island. The eastern shore of the bight is foul, with a sunken rock 300 yards southwestward of a 134-foot rocky islet. Small craft should favor the western shore of the bight in running to anchorage in 7 to 10 fathoms, 0.4 mile from the head of the bight.

A small indentation, 0.3 mile long and 0.1 mile wide, is one mile southwest of the eastern extremity of Tigalda Island. On account of the rocky bottom and the rocks awash along the shores, this is not recommended as an anchorage except in case of emergency. The depths range from 5 to 7 fathoms. A low pass extends in a northwesterly direction across the island to Tigalda Bay.

Derbin Strait, separating Tigalda and Avatanak Islands, is a little over a mile wide. No known dangers are more than 0.3 mile from shore. A safe course through the strait is 326° in mid-channel, with Billings Head of Akun Island ahead. On the eastern side of the southern entrance is Derbin Island; on the western side is a bare rock, 30 feet high and 400 yards off Avatanak Island.

A reef awash at half tide extends 330 yards westward from the 165-foot pinnacle rock about midway on the eastern side of Derbin Strait. On the west side of the north entrance is a bare rock 2 feet high, 400 yards off the northeastern point of Avatanak Island.

Tidal currents in Derbin Strait have an average at strength of about 5½ knots, and velocities of almost 8 knots have been observed. The flood sets northwestward and the ebb southeastward. In mid-channel, with wind and current opposing, the strait becomes exceedingly rough. A swell from southwestward to southeastward makes into the strait and is accentuated by the current. There are numerous eddies and cross currents near the shore. The ebb current causes tide rips a considerable distance offshore, especially on spring tides. Small boats should avoid Derbin Strait except under favorable conditions. Current predictions for Derbin Strait are contained in the *Current Tables.*

Avatanak Island, is 9 miles long and 3 miles wide at its eastern end, but the western half of the island averages less than 0.8 mile in width. The middle of the island is a depression less than 100 feet in elevation, the sides of which slope gently upward to maximum elevations of 1,635 and 1,276 feet on the east and west ends, respectively.

The lowland of the depression is often clear when no other land is showing especially in northerly weather. There are many grotesque irregularities in the topography.

Avatanak Point, the south end of the island, is sharp and bold and has a ragged chain of rocks and rocks awash extending over 0.3 mile in a southerly direction. The southernmost of these is a symmetrical oval rock 6 feet high.

Two pinnacle rocks lie west of the western extremity of the island; the highest and outermost is 200 yards offshore and 60 feet high.

Near the center of the island on the southern side is **Chimney Cove,** which affords temporary protection to small craft from northerly weather. It is exposed to the ocean swell. The cove is marked by a vertical chimney-shaped slab of rock, over 200 feet in elevation, which projects from the ground surface on the west point of the cove. The rock also shows in Avatanak Strait over the low-lying middle ground. Larger vessels may find temporary anchorage in depths of 15 to 20 fathoms southward of this rock, well clear of any currents.

Rootok Strait, separating Avatanak Island from Rootok Island, is a little more than 1 mile wide, but the clear channel is reduced to about 0.5 mile by a reef extending from the east side and by rocks extending from the west side. The reef, composed of separate rocks and heavily fringed with kelp, is bare at various stages of the tide, and extends 525 yards in a southwesterly direction from the highest of the two pinnacle rocks off the western extremity of Avatanak Island. The rocks on the west side extend 250 yards from the Rootok Island shore. Depths less than 10 fathoms extend almost 0.5 mile northward and northeastward from the northeast point of Rootok Island.

A detached shoal of 3½ fathoms was found near the middle of the southern entrance, about 1 mile northeastward of the east end of Rootok Island.

A flat-topped rock about 20 feet high lies just off the east end of Rootok Island and other rocks extend 400 yards from the rock into the strait.

In the bight indenting the eastern shore of Rootok Island a rock awash only at low tides is about 500 yards from the shore. Several pinnacle rocks fringe the southern shore of this bight.

To make the passage through Rootok Strait, steer **298°** for the north end of Rootok Island, leaving the east end of the island 0.6 mile to port; when the west end of Avatanak Island is abeam, change course to **331°** and pass in mid-channel between the bare rocks off Avatanak Island and those close to the north end of Rootok Island.

The currents in Rootok Strait have an estimated maximum velocity of 4 knots. Tide rips and whirls occur off the northern entrance, but, as this area is sheltered from winds from most directions, they are mild compared to the rips that occur in other passes.

Rootok Island, the westernmost island on the southern side of Avatanak Strait, is 3 miles by 2.2 miles in extent. The island's most prominent features are the twin peaks, 1,545 and 1,532 feet high and 600 yards apart in an east-west direction. The southern side of the island is a continuous cliff broken only by a small valley slightly eastward of the twin peaks. A flat-topped rock about 20 feet high lies off the east point of Rootok Island. The island is fringed with rocks and kelp and affords no secure anchorage. It is used as a fox farm, the buildings being in the southern valley of the bight on the eastern side.

Akun Island, 23 miles southwestward of Unimak Island, is the northernmost island of the Krenitzin Group. It is about 12 miles long, but is very irregular in shape, being

nearly divided by Akun Bay and Lost Harbor and a low depression joining them. The island is high and rugged, particularly its northern part, which reaches an elevation of 2,685 feet at **Mount Gilbert,** an extinct crater on the north side of Lost Harbor.

Avatanak Strait is a broad passage separating Avatanak and Rootok Islands from Akun Island. The strait has a general northeast-southwest direction and is 3 miles wide at its narrowest part. There are no hidden dangers over 0.3 mile from shore and its navigation is not difficult in clear weather. It is reported that strong northwesterly winds draw heavily through Akun Strait into the west end of Avatanak Strait.

Currents with a velocity of 6½ knots have been observed in Avatanak Strait; but average strengths of flood and ebb are about 4 knots and 2½ knots, respectively. The ebb sets to the westward, and the strength of the current is felt well to the westward of Rootok Island; but to the eastward of the strait along the north side of Tigalda Island the currents are weak. Current predictions for Avatanak Strait may be obtained from the *Current Tables.*

Tide rips and swirls occur in the narrowest part, off the entrance to Akun Strait, and among the islands off the south shore of Akun Island. A pronounced set is often experienced when crossing the narrow depression abreast of Derbin Strait, and light tide rips occur there.

Basalt Rock, in Avatanak Strait and 1 mile north of Avatanak Island, is a symmetrically rounded rock 50 feet high; it is steep-to and the channel inside of it is clear, with depths of 10 to 20 fathoms.

Jackass Point, the southern extremity of Akun Island, terminates in a chain of irregularly shaped rocky islets, the highest of which is 80 feet high. Tall and conspicuous **Pinnacle Rock,** 145 feet high, is 0.5 mile west of Jackass Point and 0.3 mile offshore.

Easy Cove, at the south end of Akun Island, is 0.4 mile wide and about the same in depth. Small vessels may find temporary shelter from northerly winds in depths of 8 to 10 fathoms.

Poa Island, lying about 2.5 miles northeastward of Jackass Point, is steepsided, about 0.6 mile long in an east-west direction, and 305 feet high.

Tangik Island, lying about 1 mile northeastward of Poa Island, is about 0.4 mile long and 220 feet high at its eastern end. It is surrounded by rocks, and a reef extends about 350 yards southwestward from its southwest end. The channel between Tangik and Poa Islands is clear except for reefs close to the south side of Tangik Island, which should be given a berth of at least 0.3 mile.

Trident Bay, westward of Tangik and Poa Islands, is about 0.8 mile wide and 1 mile in depth. The width of the entrance is reduced to less than 0.5 mile by an islet, 82 feet high, on the north side and a chain of rocks, terminating in a flat-topped rock 32 feet high, on the south side. Three small coves indent the shore at the head of the bay. A rock awash at low water is about 225 yards off the point between the middle and southerly coves. The heads of the coves are shoal.

Anchorage can be found in the middle of Trident Bay in 20 fathoms, with good protection from all directions but the southeast; however, the islands off the entrance provide some protection from this direction. With a southwesterly swell, small boats find better protection at the entrance to the western cove in 2 to 6 fathoms. The survey ship found this bay the best sheltered in the vicinity, and had sufficient swinging room.

To enter Trident Bay from southward steer **350°**, heading for the west tangent of the islet at the north entrance point. Pass midway between Poa Island and the land to the westward. When the outermost flat-topped rock is abeam to port swing sharply to **300°**, heading for the sand beach in the middle cove with the south tangent of Poa Island directly astern. In making this turn, favor the flat-topped rock which is steep-to, as the currents eddying around the entrance to the bay have a tendency to keep the ship's head from coming around. A bank of 8 fathoms extends across the entrance channel.

Cross Bay is an indentation about 1 mile wide on the southeast side of Akun Island and to the northward of Tangik Island. Rocks extend about 300 yards off its middle point. The channel north of Tangik Island is clear, but the channel west of the island has depths of 4 fathoms or less and should be avoided.

Round Head, the southeastern point of the peninsula extending east from Akun Island, is a rounded steep-sided headland 485 feet high; a pinnacle 52 feet high is 200 yards off the point. From Round Head the shore of Akun Island trends westward for 3 miles and is less rugged. It then turns to the southward for 1.5 miles to **Cross Point** forming an indentation known as **Seredka Bay.** Anchorage with good shelter from northerly and westerly winds can be found in depths of 10 to 20 fathoms about 0.4 mile from the shore. The northeast side of Cross Point is fringed with rocks and kelp.

Tanginak Island, of small extent but 295 feet high, is 2.2 miles off the east end of Akun Island. Although it appears to be one rounded island, it is in reality two islets separated by a narrow passage. The passage between Tanginak and Akun Islands is deep, but strong currents sweep through it, accompanied by tide rips and swirls.

About 4.8 miles northward of Tanginak Island and in the approach to Akun Bay is **Fathometer Reef,** a 3¼-fathom rocky shoal, which is about 0.3 mile in diameter and is surrounded by depths of over 30 fathoms. Heavy tide rips and swirls occur in the vicinity except at slack water. Vessels should keep well clear of the reef, as no kelp has been reported on it and breakers may not be distinguishable from the tide rips.

Akun Bay is the broad indentation in the northeast side of Akun Island; it affords anchorage at its head except with winds from the southeast to northwest, but heavy williwaws are experienced with offshore winds. There are no known dangers in the bay except close to shore. At its head, where the bay is 2.5 miles wide, there are two large bights; the north bight is known as **Helianthus Cove.** Anchorage may be made in either of the bights, about 0.5 mile from shore, in 10 to 15 fathoms. Small vessels can find fairly good shelter from all directions in the southern part of Helianthus Cove. Both bights have fresh-water lakes at the head; the lakes are about 10 feet above high water. A very low depression extends across the island from Helianthus Cove to Lost Harbor.

A long peninsula extends eastward from the middle of Akun Island; off the northern point at the outer end of the peninsula is a tall twin pinnacle, 230 feet high, which marks the southeastern limit of Akun Bay. A gully indents the cliff at the most easterly point of the peninsula.

The northern ends of Akun Island are **Billings Head** and **Akun Head,** 4 miles to the westward. These massive heads, separated by Little Bay, both have precipitous faces. Akun Head has a flat top 1,632 feet high. The bluffs on it northern and western sides are marked by rust-colored stratification. Billings Head rises to 1,690 feet.

On the north side of Billings Head, a **light (lat. 54°17′.9 N., long. 165°30′.6 W.)**

is shown from a small red house; the light is 100 feet above the water and is visible 8 miles. The light is obscured from 235° to 089°.

Little Bay indents the northern end of Akun Island. A spit makes out from the western shore. The area south of the spit is closed by a rocky bar and only boats drawing a few feet can enter. Anchorage outside of the spit may be had in 8 to 10 fathoms, sandy bottom.

Chart 9005.—From Jackass Point, described earlier in this chapter, the shore trends west-northwestward to a low point with an arch, marking the entrance to Akun Strait.

Akun Strait, between Akun and Akutan Islands, is roughly 1 mile wide at its narrowest part, but the navigable channel is reduced to 400 yards by reefs extending from the eastern shore and by Race Rocks on the west. **Race Rocks,** a flat rocky islet 25 feet high and some smaller bare rocks, are near the northern end of the strait and 0.3 mile from its western shore. **A light (lat. 54°08′.0 N., long. 165°39′.6 W.),** 46 feet above the water, marks the islet. It is shown from a skeleton tower and is visible 8 miles.

Shoal water and havy kelp surround Race Rocks for a distance of about 250 yards; **Swirl Rock,** awash at half tide, lies 250 yards northward of the light and is made readily discernible by the heavy overfall and swirls. The main channel is to the east and north of Race Rocks and Swirl Rock and has a least depth of 4½ fathoms. The channel to the westward of Race Rocks has a least depth of 2½ fathoms and is subject to currents which are just as strong as in the main channel.

With northwesterly winds in the summer, a bank of fog frequently streaks through Akun Strait, but under such circumstances, vessels navigating Avatanak Pass will usually sight the south shore of Akutan Island.

Currents in Akun Strait attain an estimated velocity of 12 knots in the narrowest part, setting northward with the flood. The slack period is very short. Tide rips, swirls, and overfalls occur and with a northerly wind or swell are extremely heavy. By skirting the kelp off Race Rocks and passing within 100 yards to the northward of Swirl Rock, local vessels are able to keep out of the strength of the current.

Green Bight, indenting the southeastern shore of Akutan Island at the entrance to Akun Strait, offers temporary anchorage in depths of 6 to 8 fathoms 0.4 of a mile from shore. It is convenient while waiting for slack water to pass through the strait.

The western or Akutan Island shore of Akun Strait is low, except in the middle where a rounded peak 650 feet high forms a steep cliff on the northern point of Green Bight. Shoal water marked by heavy kelp extends about 500 yards eastward from this point.

From the low point with an arch, 1.6 miles westward from Jackass Point, the eastern shore of Akun Strait extends northwestward for about 2 miles to a point with a flat grassy islet, 80 feet high, close by. Shoal water marked by heavy kelp fringes this shore. A rounded rock, 10 feet high, is 650 yards northwestward from the arch. A group of rocks, bare only at low water, lie about 500 yards northwestward of the rounded rock and about the same distance off the eastern shore of the strait.

The western end of the flat grassy islet, previously mentioned, can be approached to within 250 yards on the west, but shoal water marked by heavy kelp extends about 700 yards southward. A flat islet, 200 feet high, is 0.4 mile northward of the grassy islet; the passage between the two islets is obstructed and foul.

Akutan Bay opens into the Bering Sea between Akun Head and North Head. This approach from the Bering Sea is used to reach Akutan Harbor and other arms of the bay. Akun Strait, previously described, connects Akutan Bay with Avatanak Strait and the Pacific, but it is comparatively shoal and contracted, and is not recommended.

Akutan Harbor opens into Akutan Bay on the north side of the peninsula which juts into Akun Strait from Akutan Island; the preferred approach to the harbor is from northward through Akutan Bay. The harbor is 4 miles long and from 0.5 to 1.8 miles wide; there are no known dangers over 300 yards from shore. From the head of the harbor, a trail leads inland to the hot springs.

Akutan Point, on the north side of the entrance to Akutan Harbor, is a grassy hummock 175 feet high, which is connected with the island proper by a low, grassy neck. **A light (lat. 54°08′.8 N., long. 165°43′.7 W.),** 165 feet above the water and visible 8 miles, is shown from a white wooden house on the outer end of the point. The light is obscured from 060° to 143½°.

The native village of **Akutan** (*pop. 86 in 1950; P. O.*) is on the north side of the harbor and 1.8 miles west of the light. On the opposite side of the harbor and a mile farther west is a whaling station, from which steam whalers once operated; the whaling station has not operated as such since 1938. The wharf at the whaling station has ample depths along the northwest face for coasting vessels; the east face can accommodate only small boats.

A recommended anchorage is about 300 yards off the village of Akutan in 22 fathoms. Vessels can also anchor in the broad bight in the south shore in 15 fathoms, with the light on Akutan Point bearing 017°. The bottom at both anchorages is very sticky. The harbor is well sheltered from all except easterly winds, but heavy williwaws are encountered during gales.

Approaching Akutan Harbor from Akun Head, round the northwest shore of Akun Island at a distance of at least 1 mile—a reef extends 600 yards westward from Akun Head—and steer 180° to leave the light on Akutan Point 0.5 mile to starboard. Round the point at this distance and steer 257° into the harbor, giving the shores a berth of over 300 yards.

Approaching from westward, leave North Head 1 mile or more to starboard and steer 107° until Ridge Point is abeam, distant 2 miles; then steer 150° to a point 0.5 mile off the light, and enter the harbor as already directed.

Surf Bay, on the Akun Island side of Akutan Bay and just northward of Akun Strait, is an open bight exposed to the westward and northward. A group of rocky islets, the highest, 64 feet, lies in the middle of the bay about 1 mile from shore. A group of rocks, awash at low water, is 0.3 mile northward of the islets, and irregular bottom, with least depth of 2¼ fathoms, is found 0.3 mile northwest of the rocks. The channel southward of the islets is clear and anchorage can be found in 10 fathoms, 0.4 mile from shore, with good shelter in southerly and easterly weather. On the east side of Surf Bay is a sand beach about 1 mile long.

Lost Harbor is 3 miles north of Surf Bay. The harbor affords fairly good shelter although in northwest weather considerable swell rolls in from Akutan Bay. The north side of the harbor has gently sloping sand bottom, but depths of 6 fathoms or more will be found 0.4 mile from shore. A prominent stack and buildings mark the remains of a former sulphur mine on the north shore.

Sandy Cove is a small bight about 3 miles northwestward of Akutan Point. Small craft can anchor in the center of the bay in about 5 fathoms, sandy bottom. The cove is exposed to the northeast.

Hot Springs Bay is a wide indentation in Akutan Island opening into Akutan Bay. The point on the northwest side of the entrance is a high, rock cliff; **Ridge Point,** on the east side of the entrance, is a narrow ridge about 350 feet high, which has bare rock cliffs on its west side, but slopes rapidly on its east side into a grassy valley and sandy cove. At the head of the bay are three bights; a stream drains into the middle bight from the hot springs 0.5 mile inland.

A sunken rock, least water 2¼ fathoms, is 0.5 mile from the southeastern shore and 1.5 miles 243° from Ridge Point. There are no other known dangers in the bay. Anchorage in southerly and westerly weather can be found in the western part of the bay 0.5 mile from shore, in 14 to 16 fathoms, sandy bottom.

Chart 8720.—Akutan Island, largest of the Krenitzin Group, lies about 9 miles northeastward from Unalaska Island and is separated from the latter by Akutan and Unalga Passes.

The shore of Akutan Island bordering on Akutan Bay and Akun Strait is described in connection with those bodies of water.

Akutan Peak, elevation 4,244 feet, rises about 600 feet on the south rim of a crater, about 1.2 miles in diameter, to form a sharp summit. It is the highest peak between Unimak and Unalaska Islands. In 1946 the crater was in active eruption.

North Head, the northern end of Akutan Island, is a high bold cliff, with a large, deep grassy valley in the otherwise high shore on its east side. About 2 miles southwestward of the cape, a narrow, grassy valley separates the high ridge behind North Head from another high ridge; the western side of the valley is a bluff. **A light (lat. 54°13′.3 N., long. 165°58′.7 W.),** is shown from a small white house on concrete foundation on the point 1.5 miles west of North Head; the light is 60 feet above the water and is visible 8 miles. It is obscured from 257° to 054°.

Open Bight is an indentation just east of North Head. No depths greater than 10 fathoms are found in the bight. It is exposed to the northerly swell from the Bering Sea and is not recommended as an anchorage.

A rock awash lies about 250 yards off the rounded point just eastward of Open Bight; a sunken rock is inshore from the rock awash.

Lava Point, 6 miles southwestward of North Head, is a fairly flat lava bed varying in elevation from 150 feet along the shore to 300 feet at the base of the hill back of it. The cliffs all around the point are nearly vertical except in places where they are broken off. Numberous tunnels are under the cliffs. The northwest face of the hill back of the point is concave and very steep.

At the end of Lava Point is a flat rock having the same height as the point and slightly detached from it. In foggy weather low points will sometimes be seen below the fog, and the lava flow terminating in Lava Point often enables the navigator to identify this point. Due to the similarity of the headlands along these islands, this area is one where the navigator has unusual difficulty in identifying landmarks.

Lava Bight, just southward of Lava Point, provides temporary anchorage in southerly and easterly weather. On the south shore of the bight are several waterfalls, in-

cluding a large one to the eastward of a group of small ones. The anchorage is in 12 to 15 fathoms, sandy bottom, 0.5 mile from shore, with the large waterfall bearing **160°**.

A large circular reef lies off the west coast of Akutan Island between Lava Bight and Reef Point; the outer edge of the reef is about 0.9 mile from the shore. The reef is marked by heavy kelp and is studded with numerous rocks which bare 3 feet at low water. The western part of North Head open at Lava Point is a good range to clear this reef in passing to the northward of it. Between the reef and the shore is a passage which has a least depth of 2¾ fathoms and is clear of kelp; small boats use the passage to avoid the disturbed water outside.

Reef Bight, on the south side of the reef just described, is not recommended for anchorage on account of poor holding ground.

Reef Point, the western extremity of Akutan Island, is steep and rocky and reaches a height of 500 feet. A low rock 150 yards off the point has the appearance of a stranded freighter when seen from the northward or southward.

Currents.—Flood currents with an estimated velocity of 2 knots set along the west shore of Akutan Island as far north as Reef Point. Near Lava Point an ebb velocity of 1 knot has been observed. Off North Head, currents are weak. A north wind blowing against a flood current produces tide rips as far north as Lava Point.

The south shore of Akutan Island between Green Bight and Sarana Bay is a steep rocky bluff with numerous boulders extending about 200 yards off the shore. A rectangular-shaped rock 75 feet high lies 225 yards offshore, about 1 mile southwestward from the south end of Green Bight. Numerous waterfalls are visible along this shore in rainy weather.

Talus Point, on the east side of the entrance to Sarana Bay, is the end of a rocky ridge, about 1,700 feet high, which has several massive pinnacles split from the top. It is more easily distinguished from offshore than Battery Point.

Sarana Bay, lying between Talus Point and Battery Point, is 4 miles wide at its entrance, but narrows rapidly to an inner cove about 1 mile wide and 0.7 mile in depth. **Vulcan Point,** on the east side of the entrance to the inner cove, is marked by a flat-topped rock 45 feet high; a reef extends 450 yards southeastward from the rock. Anchorage in 5 to 10 fathoms can be found in the inner cove, but the shore should not be approached closer than about 450 yards. The bay is wide open to the southward and in a southerly swell is very uncomfortable.

Battery Point, the southernmost headland of Akutan Island, is marked by a peak with a distinctively shaped conical top resembling a liberty cap; it is faced by steep, high cliffs. Large vessels should give Battery Point a berth of 1.5 miles to avoid a 7-fathom shoal 1.3 miles offshore in a southeast direction; swirls and tide rips mark the shoal. A 3¾-fathom shoal, marked by kelp, is 0.4 mile off the southeast side of Battery Point, and a rock awash is 370 yards off the southwest side.

Broad Bight and **Cascade Bight** are the east and west bights, respectively, between Battery Point and Cape Morgan. This region can be used only for temporary anchorage in northerly weather. The heads of the two bights have beaches of sand and gravel and each is backed by a low, grassy valley. The bights are separated by a ridge terminating in a bold rocky headland with steep cliffs 800 feet high. Anchorage in Broad Bight can be found in 16 to 20 fathoms, sandy bottom, 0.8 mile from the beach and 1.1 miles 105° from the point of the headland; anchorage in Cascade Bight is in

14 to 16 fathoms, sandy bottom, 0.8 mile from the beach and 0.6 mile west of the same point.

About 1.3 miles southwestward of Cascade Bight is a group of rocky islets; one of them, 298 feet high, is 0.8 mile east of Cape Morgan. Close to these islets on the offshore side the depth is 14 fathoms.

Cape Morgan, the southwest end of Akutan Island, is a prominent headland with steep, high cliffs intersected by dikes of hard rock of characteristic color. **Triplet Rocks,** three pinnacles 8 to 15 feet high, are 600 yards off the cape. In navigating Akutan Pass, Triplet Rocks should be given a berth of over 0.5 mile.

Flat Bight is northward of a bold headland which forms the northwestern part of the Cape Morgan peninsula. At the headland, foul ground with thick kelp extends 0.5 mile offshore, and a sunken rock lies near a rock awash 0.3 mile northward of the headland. The bight is bordered by a gravel beach 1 mile long, which in turn is backed by a low, grassy valley. Temporary anchorage in easterly weather can be found 0.6 mile from shore in 12 fathoms, sandy bottom.

A large, low rock with an elevation of 2 feet lies 1 mile southward of Reef Point and 400 yards from shore. A depth of 12 fathoms can be carried to the face of this rock. There is no kelp around it. Several other rocks lie inshore of this one but they are inside the kelp line. A rock awash lies 0.8 mile farther to the southward and 250 yards from shore.

The shore between Reef Point and Flat Bight is an eroded bluff 300 to 600 feet high; when close by, a reddish outcrop is discernible.

Chart 9007.—Akutan Pass and Unalga Pass, on either side of Unalga Island, are ship passages, secondary to Unimak Pass, for entering the Bering Sea from the Pacific through the eastern part of the Aleutian Chain. Akutan Pass is 2.5 miles wide in its narrowest part, between the Baby Islands on the southwest and Triplet Rocks off Cape Morgan. The depths in the pass are very irregular, but no hidden dangers have been found. Depths less than 10 fathoms extend about 0.4 mile southward from Triplet Rocks, and the tide rips there are intensified, appearing as breakers. Small craft should avoid them. A narrow, crescent-shaped shoal with a least depth of 8 fathoms is 3.5 miles 297° from Cape Morgan. The shoal can be detected by the swirls and tide rips marking it.

Akutan Pass is wider than Unalga Pass and the currents and tide rips are not as strong. However, the strength of the current is felt over a much greater distance, so that with an adverse current it has been found that better time can be made by using Unalga Pass. On the larger tides, the flood creates such heavy tide rips northward of Unalga Island, even in calm weather, that it is advisable to be prepared to take seas aboard. Tide rips 15 feet in height have been observed. In approaching both Akutan Pass and Baby Pass, fewer rips will be encountered if courses are directed for the area southeastward of the Baby Islands and then swung over to either pass. This area is comparatively quiet on the ebb when both of the passes have heavy tide rips.

Akutan Pass, in the day time and with clear weather and a fair current, furnishes a convenient route for vessels bound to or from Unalaska Bay. From eastward it is recommended that courses be steered to make land in the vicinity of Tigalda Island and Avatanak Island; then follow the south side of these islands until the course is shaped from Rootok Island to Cape Morgan. A mid-channel course through the pass is recommended.

303668°—55——24

Remarks on currents in Akutan Pass will be found in the first part of this chapter. Current predictions may be obtained from the *Current Tables*.

Baby Islands, a group of six fairly low islands lying in Akutan Pass and northward of the east end of Unalga Island, have numerous rocks among them. The islands are all tundra-covered. On the westerly island is a large rookery and the ground is very pitted over almost the entire top. The southeastern island is used as a fox ranch. When seen apart from Unalga Island, the Baby Islands are fairly prominent although they tend to blend together to appear as one island.

Strong currents sweep among the Baby Islands. The southern end of the passage between the two southeastern islands is blocked by a reef bare at low water, forming a small protected bay, but strong currents make it a rather uncomfortable anchorage for small boats.

Directions, Akutan Pass.—From a position 3 miles southward of Rootok Island, course **280°** made good for 17 miles will lead 2 miles southward of Battery Point and to a mid-channel position in the pass between Cape Morgan and the Baby Islands. Continue the course 4 miles past Cape Morgan to a position 2 miles off the north side of Unalga Island. When northward of the Baby Islands, it is necessary to guard against a strong set on the ebb into Baby Pass. Then steer **269°** with Battery Point astern; this course made good for 7 miles will lead to a position 1.5 miles northward of Cape Kalekta. The set of the current is across the course and should be guarded against.

Baby Pass, about 0.8 mile wide, separates Unalga Island from the Baby Islands. Ledges along the shore restrict the navigable width, but depths up to 20 fathoms will be found in mid-channel. Less water is found at the north end of the pass.

On the Unalga shore of Baby Pass is a shallow cove in which small boats may get fair protection from southerly and westerly weather; however, a rock awash at low water lies a little southward of the middle of the cove. Off the northern point of the cove is a group of bare rocks extending into Baby Pass. The outer rock, 12 feet high, is 300 yards from the point. Foul ground extends 400 yards into Baby Pass from the 0.8 mile stretch of shore westward of the cove.

Very heavy tide rips occur to the northwestward of the Baby Islands on the flood, and extend a considerable distance to the southeastward on the ebb; see remarks on tide rips in Akutan Pass. The average velocity of the current at strengths of flood and ebb is about 4 knots and 5 knots, respectively. Flood and ebb velocities of 5½ and 7 knots occur at times of tropic tides. Current predictions for Baby Pass are contained in the *Current Tables*.

Unalga Island is separated from Unalaska Island by Unalga Pass. The island is low compared to the neighboring islands, the highest point being a rounded hill, 707 feet high, southwestward of the central point. The eastern end of Unalga Island is a flat-topped hill, 145 feet high.

Malga Bay, on the northwest side of Unalga Island, is about 0.6 mile in diameter and affords shelter in southerly weather. The eastern shore of the bay is a chain of jagged rocks and islets, the highest being 106 feet in elevation. Temporary anchorage in southerly weather can be found in the center of the bay in 11 fathoms.

On the north coast of Unalga Island, precipitous bluffs rise 100 to 200 feet, blending abruptly at the top into rolling, slightly rising, tundra-covered tableland. There is generally no beach, though a flat rock-shelf, from 10 to 30 feet wide, extends from

the bluffs to the water's edge. In places a few scattered boulders may be found on the shelf.

The Unalga shore bordering on Baby Pass has already been described.

On the south shore of Unalga Island, a prominent cylindrical rock, 120 feet high, is 0.5 mile southward of the east end of the island and 375 yards offshore. A point terminating in a rounded knoll, 150 feet high, is 1.8 miles southwestward of the eastern extremity.

A large barn, about 1 mile southwestward of the east end of Unalga Island, is located on the side of a hill at an elevation of over 100 feet, and is conspicuous from the southward. Several small houses are in the gully below the barn, but can be seen only when close-to.

Numerous boulders and rocks border the south shore of Unalga Island. A dangerous sunken rock, covered 2¼ fathoms, is 700 yards off, midway of this shore.

Off the southwestern extremity of Unalga Island, a group of rocks extends about 200 yards into Unalga Pass, and a rock about 4 feet high near the outer end of the group is conspicuous while entering the pass. The 4-foot rock should be given a berth of 300 yards.

Unalga Pass, the narrowest of the three principally used passes in the eastern Aleutians, is about 1.3 miles wide in its narrowest part and, with the exception of rocks which make out a short distance from Unalaska and Unalga Islands, is free from dangers. The depths in Unalga Pass vary from 12 fathoms, in the middle of the narrowest part of the pass, to over 50 fathoms.

Under normal conditions the pass is not difficult to navigate, especially as the current sets fair with the pass. In thick weather the shore of Unalga Island can be approached close enough to pick up an echo and followed through the pass. The soundings, especially in the southern approaches, furnish numerous characteristic depths to assist a vessel, equipped with echo sounding apparatus, to determine its position. For these reasons, coupled with the fact that this pass has been thoroughly surveyed, it is believed that is has distinct advantages over Akutan Pass for vessels going north, expecially in thick weather. However, under exceptional circumstances, currents and tide rips of unusual magnitude may be encountered (see the first part of this chapter); and treacherous seas, particularly in the narrow part of Unalga Pass, caused by wind opposing the current, often sweep a vessel without warning. These have caused severe damage and men have been washed overboard with resultant loss of life. There are temporary anchorages, easy of access, at either end of Unalga Pass where better conditions may be awaited.

Southward of Unalga Pass, a belt of deep water leading into Beaver Inlet makes the approach to the pass on echo soundings comparatively easy; the 50-fathom curve can be followed along the eastern limit of the deep, and the 100-fathom curve along the northern limit. In the outer reaches of Beaver Inlet it has been found invariably possible to catch a glimpse of the shore during the summer fogs. For this reason and because of ease of access, it can be recommended as good practice in thick weather to make the slight detour into the inlet to check the vessel's position before entering Unalga Pass. The currents in the entrance to Beaver Inlet generally do not exceed 2 knots.

For remarks on currents in Unalga Pass, see the first part of this chapter.

Deep Bay, indenting Unalaska Island on the north side of the entrance to Beaver Inlet, is protected on the northeast by rocks awash and small islets which make offshore about 0.3 mile; the ledge continues, totally submerged, 0.3 mile farther and terminates in a kelp-marked ¾-fathom rocky shoal which breaks in southeasterly weather. A kelp-marked 1¼-fathom rocky shoal is 0.3 mile off the bluff point on the southwest side of the entrance. Temporary anchorage in northwest weather can be found at the entrance to the small cove in the northwestern corner of the bay, in depths of 10 to 20 fathoms.

Beaver Inlet is described later in this chapter.

From the ledge marking the eastern part of Deep Bay, the shore extends northeastward for 2 miles to Brundage Head. This stretch of shore has numerous rocks and islets extending as much as 0.3 mile offshore, and strong currents are noticeable.

Brundage Head, on the west side of the southern entrance to Unalga Pass, has a knoll 192 feet high at its outer end. A pinnacle rock, 22 feet high and 300 yards eastward of the point, has deep water outside of it.

Fisherman Point, about 1 mile northwestward from Brundage Head, is 140 feet high. A reef, with several bare rocks about 15 feet high and marked by heavy kelp, extends over 400 yards northward from the point. The shore between Fisherman Point and Brundage Head is fringed with rocks, but none extend more than about 300 yards into the pass.

English Bay, on the west side of Fisherman Point, is a secure anchorage for small vessels. The western shore of the bay trends due south for about 2 miles to a low point, where it turns sharply westward for 0.9 mile to the head of an arm about 0.3 mile wide. The most secure anchorage is in this narrow arm, southwestward of the low point at the turn. The width of this anchorage between 5-fathom curves is about 300 yards. Good anchorage with more swinging room can be found eastward of the low point in 8 to 10 fathoms, but a shoal area extending 400 yards off the shore northward of the point must be cleared.

In entering English Bay account must be taken of the strong currents in Unalga Pass; follow a mid-channel course, giving the western shore a berth of at least 0.3 mile, and when heading into the arm at the head of the bay favor the south shore slightly. Good holding ground in depths of 12 to 20 fathoms will be found nearer the entrance.

From English Bay northward, the Unalaska shore of Unalga Pass is much higher, and **Erskine Point,** about 3 miles northwestward of Fisherman Point, is the northern extremity of a ridge 1,432 feet high. Along the shore from English Bay to Erskine Point are numerous rocks, but none are more than 250 yards off.

Lofty Mountain, 2,284 feet high and 2.5 miles southwestward from Erskine Point, is a symmetrically shaped, conical peak, the highest point in the vicinity. It is easily identified and, as it is often clear when surroundings are obscured, makes a valuable landmark.

The Signals, Egg Island, and Old Man Rocks are the prominent landmarks for making Unalga Pass from the southeastward.

Directions, Unalga Pass.—Passing about 3 miles southward of Rootok Island, course **262°** made good for 20 miles will lead to a position 1.3 miles off the southern point of Unalga Island; at this position Erskine Point will be seen clear of the western tangent of Unalga Island, and the Baby Islands will be closed behind the south tangent of Unalga Island. Then steer **292°** for about 3.5 miles, heading for the middle of the

highland south of Erskine Point. From a position 0.6 mile off the southwest end of Unalga Island and with the 4-foot rock bearing 055°, make good a 329° course for 2.7 miles to a position with Erskine Point 1 mile on the port beam. Then steer 297° for 4 miles and pass 1 mile northward of Cape Kalekta.

These directions lead slightly to the northward of the middle of the narrowest part of the pass. If the current is ebbing, one can get well out of the strength of the current and the tide rips by keeping closer to the Unalga Island shore. The 4-foot rock off the southwest point of Unalga Island can be safely passed at a distance of 300 yards. When southbound with a fair current, the course from Erskine Point can be followed until well clear of the pass, if desired, or if bound for Beaver Inlet.

Chart 8802.—Unalaska Island, one of the larger of the Fox Islands which form the eastern group of the Aleutian Island chain, is about 67 miles in length along the axis of the chain. The island is mountainous, and during the greater part of the year the higher elevations are covered with snow. The irregular coastline is broken by three long deep bays, Beaver Inlet, Unalaska Bay, and Makushin Bay, as well as by numerous smaller bays and coves. In general, the bays have deep water close to shore, sometimes too deep for convenient anchorage. Makushin Volcano, the highest point on the island, is near the northwestern side and about 25 miles from the eastern end of the island. In clear weather the volcano is a prominent landmark for vessels bound to Dutch Harbor, in Unalaska Bay.

Caution.—Unalaska Island is a **Naval Defensive Sea Area and Airspace Reservation,** and is closed to the public. No vessels or aircraft, except those authorized by the Secretary of the Navy, shall be navigated in or above the area within the 3-mile limit.

Chart 9007.—Kalekta Bay is a broad open bay in the north end of Unalaska Island just east of Unalaska Bay. It has no known dangers over 400 yards from the shore, and there are a number of places where a vessel may anchor; but as this bay is open northward, and English Bay and Dutch Harbor are better harbors, it is not recommended. A pinnacle rock is off Erskine Point, the eastern point at the entrance, somewhat similar to Priest Rock off Cape Kalekta, but the rock off Erskine Point is distinguished by a smaller one between it and the point. On the west side of Kalekta Bay, 1.8 miles in from Cape Kalekta, is a narrow pinnacle rock 45 feet high, 100 yards offshore.

On the west side of Kalekta Bay, 3 miles in from Cape Kalekta, a gap cuts through to Constantine Bay in a west-southwesterly direction. This gap is filled by a lagoon not connected with either bay. A reef extends 400 yards offshore just south of this gap. Anchorage may be found in the south end of the bay 0.5 mile from shore in 12 to 20 fathoms, sandy bottom. Small craft may find anchorage in the center of the small bight 0.5 mile in diameter on the east side of the bay, 1 mile in from Erskine Point, in 5 fathoms, rocky bottom. The holding ground is poor and this bight is not recommended for anchorage except in emergency.

Unalaska Bay opens into the Bering Sea between Cape Kalekta and Cape Cheerful when on the north side of Unalaska Island. The bay has very little commerce except for diesel oil and supplies for the local village of Unalaska. The shores of the bay are in general mountainous, with precipitous sea faces. Amaknak Island is near

the southern end of the bay. Westward of the island the water is deep, but there is no good harbor in this part of the bay; eastward of the island are the important harbors and anchorages of Iliuliuk Bay, Dutch Harbor, and Iliuliuk Harbor. The channel to Iliuliuk Bay and Dutch Harbor is free from dangers, except along the shores. Iliuliuk Harbor is obstructed at its entrance by ledges, but with the aid of the buoys, it is not difficult to enter with a vessel under 250 feet in length.

Unalaska Bay is open to navigation at all seasons. It is reported that on two occasions the drift ice of Bering Sea entered Unalaska Bay, but such an occurrence is so rare that it need not be considered. Ice often forms in the sheltered coves and harbors in cold, calm weather, but it never attains any thickness or interferes with navigation.

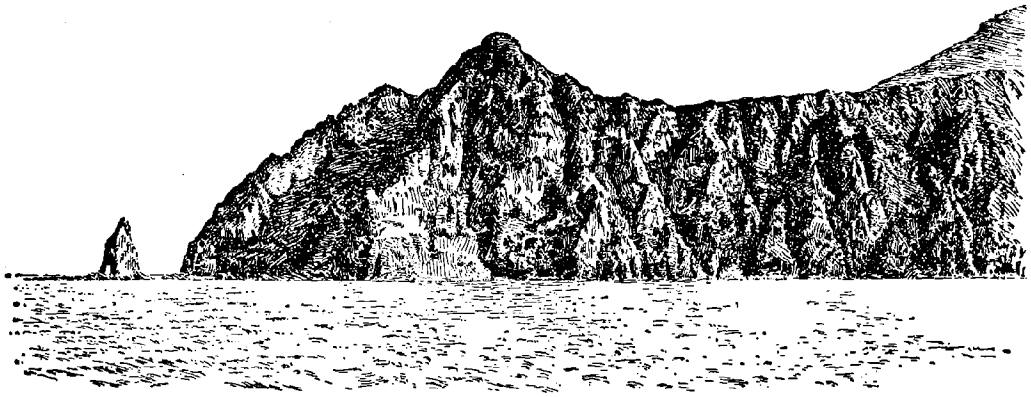
Landmarks.—Makushin Volcano, 6,680 feet high, is prominent, being the highest point on Unalaska Island. The volcano can generally be seen in clear weather. Table Top Mountain, 2,710 feet high, back of Cape Cheerful, and the crater of an extinct volcano with three points, the highest being 2,293 feet, west of Eider Point, are distinctive. Either peak may be used as a leading mark in approaching Cape Cheerful until close enough to distinguish the surrounding features; however, the crater west of Eider Point can be used only when it is not obstructed from view by the higher elevations northwestward of it. On getting close to the island, when the fog hangs over the land but leaves a clear space just along the water's edge, Wislow Island forms a good mark. It is in a small bay about 2 miles westward of Cape Cheerful, and is a small rounded island, regular in shape, and stands far enough from the land to be seen as not a part of the main island. Westward, under similar conditions, Koriga Point can be seen at times. The land slopes gently to the point from Makushin Volcano, and ends in a small peaklike formation. From eastward the cascade southeastward of Cape Cheerful is also useful as a mark, particularly for low visibility. Strangers, when in the vicinity and uncertain of the identity of the bay and its landmarks, should endeavor to pick out Ulakta Head. Looking into the bay, its flat top breaking off abruptly to sloping sides presents an appearance unlike any other in the vicinity, and shows up well against the background of mountains. When sighted, steer for it, leave it on the starboard hand, and follow around, keeping out of kelp.

Chelan Bank, the extensive 45-fathom bank extending about 7 miles northeastward from the vicinity of Cape Cheerful, may be found useful in fixing the position of a vessel by soundings. The bottom on the bank is composed of black sand and gravel; on the shelving areas the bottom is of gray sand and gravel up to about the 80-fathom depth. Chelan Bank, at its northeast end, almost makes a junction with a similar bank extending northward and westward from Cape Kalekta, the two banks practically enclosing Unalaska Bay. A light tide rip occurs along the outer edge of Chelan Bank.

Directions, Unalaska Bay.—When bound for the bay from any part of Bering Sea, it is recommended to shape the course for Cape Cheerful. In thick weather it is better to fall westward of Cape Cheerful and then round it than to fall to the eastward, with the possibility of being carried by currents into the dangerous regions of the passes.

Cape Kalekta is the headland at the eastern side of the entrance to Unalaska Bay. The headland has two summits 785 and 904 feet high, and a ridge, which sags to an elevation of about 700 feet, connects the headland with the mountains to the southward. The rounded extremity of the cape is the base of the slope from the lesser summit. When viewed sidewise, this slope which forms the end of the headland is rounded in

outline, rising precipitously at the water's edge and then bending gradually to meet the lesser summit.



Cape Kalekta and Priest Rock from the southwestward

The 904-foot summit is very close to the western side of the cape. It is predominant, being the highest point on the headland. Viewing the cape from either side, this summit has somewhat the shape of a crown. When off the extremity of the cape it appears as a sharp peak and the outline of a spur along the western descent becomes visible. This spur is composed of the massive protuberances, the most prominent of which takes the shape of a vertical shaft of rock rising above the level of the top of Priest Rock.

Cape Kalekta is rugged and precipitous at its extremity and particularly so on its western side. The headland rises almost vertically at the waterline with a few detached rocks including Priest Rock, but no beaches. The area about the extremity is foul and marked by kelp, and a dangerous ledge, usually marked by breakers and bare 1 foot at low water, lies nearly 0.4 mile northward from the cape. The ledge is roughly in line with the pinnacle of Priest Rock and the western parts of the low islets northward of Priest Rock. Broken bottom extends about 200 yards farther out. The northern end of the cape should be given a berth of at least 1.2 miles to avoid being carried toward the dangers by strong currents. There are pronounced tide rips.

Priest Rock, close-to, off the northwest side of Cape Kalekta, is a pinnacle 204 feet high. It is one of the most important landmarks in making Unalaska. It is marked by a **light** (**lat. 54°00′.6 N., long. 166°22′.5 W.**), 45 feet above the water and visible 10 miles, on a skeleton tower at the base of the rock on its northern side. The light is obscured from 271° to 047°. A 24-foot square on the base of the rock has been whitewashed to aid in its identification. Priest Rock should not be confused with the pinnacle rock off Erskine Point. Two low rocky islets of appreciable area are northward of Priest Rock.

The cascade southward of Cape Cheerful is visible off Cape Kalekta.

The point on the eastern shore of Unalaska Bay, about 1.4 miles southward of Priest Rock, presents a smooth, rounded profile and is grass-covered. The shore on either side of the point has little or no irregularity. The land about the point rises

somewhat abruptly at the shore to an elevation of about 150 feet, then rounds to assume a more or less flat area. This area has a gentle slope toward the steeper slopes leading up to a series of jagged peaks 0.5 mile inland from the point. The peaks have no particular distinctiveness. The 10-fathom depth curve is almost 0.5 mile off the point and broken bottom with a 1½-fathom spot lies inside the curve.

Princess Head, on the east side of Unalaska Bay, about 1.9 miles from Priest Rock, is a wall-like rock formation extending out for a distance of 200 yards from the shore cliff of that locality. The outer 200-foot length forms the highest part or head of the feature. The head has a fairly level top about 200 feet high. The side facing the southwest presents the surface of a rough square, distinguished from the remainder of the rock formation by its lighter shade. Small knobs on the top of the head mark the upper corners of the square. The head is an important and distinctive landmark, especially when in close to the east shore of Unalaska Bay, in thick weather or when fog closes out the peaks. Two low detached rocks are off the end of Princess Head.

The rounded shore in the vicinity of Princess Head is the base of a mountain rising to a peak 1,729 feet high. The southern slope of this mountain descends gradually to the lagoon in a low gap which bisects the Cape Kalekta peninsula. The point on the rounded shore is a spur from the base of the mountain. The spur parallels Princess Head and is 0.3 mile southwestward of it. A smaller projection from the shore is close northward of the point. A group of bare rocks lies off the point; about 100 yards off the outer one of this group is a rock that bares 2 feet at low water.

Constantine Bay, on the east side of Unalaska Bay, has shoal and irregular depths, less than 10 fathoms, and its use as an anchorage, except by small craft under favorable conditions, is not recommended. The shore at the head of the bay is sandy. The southwest shore is fringed with rocky ledges. On the east side of the bay is a gap in the land extending east-northeasterly to Kalekta Bay. This gap is filled with a lagoon which is not connected with either bay.

The headland west of Constantine Bay is rugged and precipitous and the area near and around its extremity is foul with rocks and kelp. The bluffs along the 1.5 mile stretch of shore southward of the extremity, facing Unalaska Bay, are especially high. They are very rugged and have gray, rocky knobs and deep vertical scars, giving the appearance of vertical stratification. **Split Top Mountain** marks the south end of this formation; the bluffs reach a maximum elevation of over 1,600 feet near the peak of this mountain.

Summer Bay, a wide opening in the eastern shore of Unalaska Bay, opposite Ulakta Head, is composed of several coves, the heads of which are low and sandy. **Morris Cove,** on the east side just northward of a prominent headland, has depths less than 4 fathoms, and the bottom is somewhat irregular. In the small cove between the southern cove and the headland, the depths decrease uniformly from 4 fathoms in mid-channel to the sand shore at the head. The depths in the southern cove are shallow and irregular.

Chart 9008.—Second Priest Rock, a pinnacle 75 feet high, lies close to the north side of the headland between Summer and Iliuliuk Bays. The pinnacle stands on the reef bordering the shore of the headland. A dangerous rocky shoal extends 0.2 mile northward from the headland.

Ulakta Head, the north end of **Amaknak Island,** is about 900 feet high. It has a

flat top, and in clear weather it is one of the best landmarks for fixing the position of Unalaska Bay. Looking into the bay, its flat top, breaking off abruptly to sloping sides, presents an appearance unlike any other in the vicinity, and shows up well against the background of mountains. From its northwest point a reef extends 0.1 mile, marked by **Needle Rock,** similar in appearance to Priest Rock, but not so large.

Ulakta Head Light (**lat. 53°55′.5 N., long. 166°30′.4 W.**), 61 feet above the water and visible 10 miles, is shown from a red skeleton tower built on the reef bordering the northeast side of Ulakta Head. The light is obscured from 271° to 047°. A pinnacle rock, 30 feet high, adjacent to the shore, is about 50 yards westward of the light. Another rock, 20 feet high, is 75 yards northwestward of the light.

Mount Ballyhoo, 1,634 feet high, dominates Amaknak Island.

Iliuliuk Bay has its northern entrance between Ulakta Head and Second Priest Rock. The entrance buoy, a lighted bell, is in 10 fathoms of water, 0.9 mile from Spithead Light on bearing 050°. Northward of Spithead is an underwater ridge extending across the bay, on which the least depths found are 7 to 8 fathoms near the middle of the bay; kelp has been seen on this ridge in about mid-channel. South of this ridge the depths increase to 16 to 19 fathoms. There is anchorage almost anywhere in the bay. The usual anchorage is at the head in 14 to 16 fathoms, muddy bottom, where, even with northerly winds, the force of the sea does not seem to reach.

At the head of Iliuliuk Bay, behind the town of Unalaska, is a ravine or break in the mountains, which extends through to the water southward. This is sometimes useful as a guide in entering the bay. The Greek church and the other buildings at Unalaska, on the lowland at the head of the bay, are prominent.

Shore observations indicate that the **magnetic variation** ranges from about 15° E. to 17° E. in Iliuliuk Bay and Dutch Harbor. The mariner is cautioned not to place too much dependence on compass deviations determined in this region.

Spithead is the end of the long, low, sand spit which forms the eastern side of Dutch Harbor; it is marked by a light at its extremity. **Spithead Light,** shown from a white slatted tripod with a small white house on the south side, is 38 feet above the water and visible 8 miles; it is obscured westward of the bearing 215½° to the light. Shoal water, less than 6 fathoms, marked prominently by kelp, extends 0.4 mile into Iliuliuk Bay from the middle part of the sandspit.

The west shore of Iliuliuk Bay south of the sand spit is fringed with rocks and should not be approached closer than 0.3 mile.

Rocky Point has a kelp-marked reef which extends toward Spithead about 400 yards with a depth of ¼ fathom 250 yards from the point. The northeastern extremity of the reef is marked by a buoy in 7 fathoms. Along the east side of Rocky Point the reef is extensive; the 10-fathom curve, which marks the outer limit of broken bottom in this part of Iliuliuk Bay, roughly parallels the side of the point at a distance of nearly 400 yards.

Dutch Harbor, on the west side of Iliuliuk Bay, has its entrance between Spithead and Rocky Point. The water is deep close to the shores and in all parts of the harbor, except off Rocky Point. The entrance is about 0.5 mile wide and 16 to 18 fathoms deep.

Anchorage may be had throughout the harbor in 14 to 22 fathoms. Violent williwaws are experienced during gales, especially from the southwest, and the best shelter will be found under the high part of the island well northward of the entrance.

The southwest gales practically have a clear sweep across the entrance because of the lowland westward. Vessels forced to lie at Dutch Harbor Dock during the early spring and fall will find it necessary to use chains and wire cables in addition to mooring lines during the severe gales at that season of the year. The williwaws are most violent.

Dutch Harbor Dock, 0.3 mile westward of Rocky Point, is T-shaped and has a loading face 500 feet long with a depth alongside of 34 feet. Large vessels berthing at this wharf should drop an anchor well offshore and warp in to enable them to get away at once in case of a sudden onshore wind.

Ballyhoo Dock, opposite Spithead, is T-shaped and has a loading face 900 feet long and a depth alongside of 30 feet. Midway on the west side of the spit is a T-shaped wharf with a face 70 feet long and mooring dolphins 510 feet apart; depths alongside are 27 feet. At the northern end of the harbor is an L-shaped dock with a face 220 feet long and depths alongside of 30 feet; the dock 400 yards southwest has a 533-foot face and depths alongside of 32 feet. All docks in Dutch Harbor are controlled by the U. S. Navy. South of Rocky Point is a T-shaped dock fronting on Iliuliuk Bay; the 77-foot face has mooring dolphins 510 feet apart and depths alongside of 24 feet. In 1950 the dock was in poor repair.

Caution.—Dutch Harbor is the site of an inactivated Naval Operating Base which is under the control of a Security Force. Government vessels and those that cannot berth at the regular commercial fuel dock south of Rocky Point may berth at Dutch Harbor Dock for fuel and water. The base is out-of-bounds to all vessel personnel.

Commercial supplies of gasoline, diesel oil, and stove oils are available in ample quantities at the regular fuel dock and at Dutch Harbor Dock. The water requires special treatment for use in boilers.

Tides.—Daily tide predictions for Dutch Harbor are given in the *Tide Tables*. The diurnal range of tide is 3½ feet. The tidal current in Dutch Harbor is inappreciable, and in Iliuliuk Harbor the velocity does not exceed 1 knot.

Unalaska (*pop. 173 in 1950; P. O.*) is on a low strip of land between the shore at the head of Iliuliuk Bay and a stream which empties into Iliuliuk Harbor. The wharf is at the western end of the strip of low land. The north side of the wharf faces the passage connecting the bay and harbor and the west side faces the harbor. The channel approach to the passage is endangered by Iliuliuk Reef which lies off the town in Iliuliuk Bay.

Unalaska is the largest settlement in the Aleutian Islands. The original Russian settlement was known as Iliuliuk. The principal sources of income are trapping and seasonal employment in the Pribilof Islands. A United States Commissioner and United States deputy marshal are stationed in the village. Unalaska has a public grade and high school. The Northern Commercial Co. operates a general store at which provisions are available in limited quantities. Fuel must be obtained at Dutch Harbor. There are no medical facilities.

The Alaska Communications System maintains a radio station at Unalaska; the call letters are WXFO and the operating frequencies are 476 and 500 kcs. Passengers, freight, and mail for Unalaska and Dutch Harbor are handled by airplane from Anchorage.

Iliuliuk Reef is a ledge, portions of which are always exposed, extending 250 yards in an east and west direction. From the eastern dry rocks a ledge, with 12 to 15 feet over it and marked by kelp, extends 150 yards southward.

East Channel is the channel most generally used between Dutch Harbor and Iliuliuk Harbor. The deeper portion of the channel has a navigable depth of 4½ fathoms for a width of about 150 feet, but vessels requiring more than 21 feet should take a pilot when passing through. Vessels drawing as much as 26 feet have passed through East Channel but vessels approaching this draft are advised to use South Channel.

The channel northward of Iliuliuk Reef has a least depth of 17 feet, but it should not be attempted without local knowledge. On the north side of the channel at its eastern end, 200 yards northward of the east end of Iliuliuk Reef, is a depth of 1¼ fathoms off the end of a pointed reef extending from the shore. The channel is buoyed.

The Northern Commercial Co. wharf at Unalaska provides 265 feet of berthing space with a depth of 30 feet alongside, and 270 feet with a depth of 22 feet alongside. A spit makes out from the north shore of the passage northward of the wharf.

The Coast Guard reports that an eddy has been noted making against the eastern end of the wharf at Unalaska on the ebb but it is not dangerous. The currents setting in and out of the harbor follow generally the trend of the channels and do not exceed 1 knot in the main entrance channel.

Iliuliuk Harbor, the harbor for Unalaska, may be entered through East Channel from Iliuliuk Bay or through the dredged South Channel from Captains Bay. The latter channel carries the greater depth of water and is the most easily navigated during northerly weather. The distance through East Channel is shorter for vessels from Dutch Harbor or the Bering Sea but South Channel is nearer for vessels from Captains Bay. Iliuliuk Harbor is small but landlocked with good holding ground, and an average depth of 10 fathoms. There is sufficient room for backing and filling in turning a moderate-sized ship. Violent williwaws are experienced with southerly gales. Vessels under 200 feet in length have ridden out gales here, but the short scope of chain allowable usually causes the anchor to drag slowly through the mud. On account of the limited swinging room, an anchorage in Dutch Harbor or Unalaska Bay is recommended during severe weather.

South Channel has a project depth of 30 feet and a width of 400 feet. Two sets of range daybeacons have been established to mark the center of South Channel on a line bearing 356°30′–176°30′.

Expedition Island is in the southern part of Iliuliuk Harbor. On the island is a small grove of evergreens. The trees are from Sitka and were transplanted in 1805 by a Russian Orthodox priest. A similar grove is located near the old Indian village of Amaknak. The trees are 25 feet in height and their number apparently has not increased.

Bailey Ledge, near mid-channel at the southern end of the passage leading from Captains Bay to Iliuliuk Harbor, is of small extent, and steep-to. Only a small amount of kelp marks this ledge, which bares 2 feet at low water. A metal tripod daybeacon with white square daymark has been established on the ledge.

South Amaknak Rocks lie in a foul area extending from the southern extremity of Amaknak Island. The smaller 15-foot rock near the southerly edge of the foul ground is about 250 yards southeasterly of the larger 30-foot rock. A deep-water channel is indicated midway between this group of rocks and Bailey Ledge and also about 250 yards eastward of the eastern South Amaknak Rock, thence deep water may be carried to the southern entrance of Iliuliuk Harbor by preferably favoring the eastern shore.

Range daybeacons bearing 081°30′ mark the mid-channel between Baileys Ledge and South Amaknak Rocks.

Chart 9006.—Captains Bay is the arm at the head of Unalaska Bay. Its entrance from Unalaska Bay direct is westward of Amaknak Island. The bay is also entered, as previously indicated, by passing eastward of Amaknak Island through Iliuliuk Harbor, and through the dredged channel leading southward from the harbor.

The entrance to Captains Bay westward of Amaknak Island is marked by **Arch Rock,** 4 feet high, adjacent to the point 0.8 mile from the southern extremity of the island. Directly opposite Arch Rock is a bold point marking the western side of the entrance. A reef extends 220 yards channelward from the bold point, and from the reef a bar of 5 to 8 fathoms extends to a point nearly three-quarters of the distance across the entrance toward Arch Rock. Large vessels in entering should pass about 100 to 200 yards off Arch Rock as the deep-water channel will be found at those distances.

Anchorage may be had in depths of 17 to 20 fathoms, even bottom of mud and sand, about 0.4 miles eastward of the northernmost island of the group at the head of Captains Bay. In approaching this anchorage favor the eastern shore to avoid **Swallow Reef** and the shoal to the southward, which lies northeastward and eastward of the northernmost island. A reef extends 150 yards from the eastern shore about abreast of Swallow Reef. Small craft may obtain secure shelter in 9 fathoms, sand and mud bottom, at **Port Levashef,** east of the most southerly of the larger islands.

Hog Island, 302 feet high, lies off the western side of Amaknak Island in Unalaska Bay. Foul ground extends nearly 0.5 mile northward of Hog Island. The reef extending 0.3 mile from the north point, a part of the foul ground, has numerous rock ledges jutting up from the rocky bottom. A buoy is off the northwestern extremity of the reef. Clear passage exists between Hog Island and Amaknak Island. Favor Amaknak Island to avoid a 3¼-fathom shoal, which is 600 yards northeast of the south end of Hog Island. A large, thick kelp patch lies southward of Hog Island and should be avoided.

Nateekin Bay, on the southwest side of Unalaska Bay, affords good anchorage, except for northeasterly winds, for small craft in 3 to 4 fathoms, 490 yards east of the head of the middle bight of the northwest shore. A shoal area of 1 fathom lies southeastward of this anchorage.

Chart 9007.—Broad Bay, a bight in the western shore of Unalaska Bay 2.5 miles southward of Eider Point, affords fair anchorage in 25 fathoms, sandy bottom, 0.5 mile offshore. The anchorage is exposed to northeasterly weather.

Wide Bay, 1.2 miles westward of Eider Point also affords fair anchorage in 25 fathoms, mud and sand bottom, 0.4 mile from the west head of the bight.

Makushin Valley, which borders on Broad Bay, is a flat, covered with tall grass and about 15 feet above high water. A sizable stream courses through the valley. The shore along Broad Bay is composed of a very coarse sand. A similar valley and shore are found at Wide Bay. The cascade just north of Broad Bay can be seen only in the restricted area to the southeast.

Eider Point is at the southern end of a rocky bluff-formation of great height which characterizes the coast for several miles along the western side of the entrance to Unalaska Bay. In places along this shore there are massive accumulations of loose rock and earth lying at the base of the bluffs, formed by slides. The bluffs are of hori-

zontal strata and like those about Cape Cheerful have a distinct reddish hue. Eider Point is a comparatively low projection pointing southward, and from it a narrow reef extends in the same direction for a distance of 0.8 mile into Unalaska Bay. The reef bares 2 to 4 feet at low water and usually breaks at high tide but not generally along its outer limit. Although deep water can be carried from seaward to the vicinity of the end of the reef, Eider Point should be given a berth of at least 1 mile when passing southward of it.

The cascade, 133 feet high, on the west coast of Unalaska Bay between Cape Cheerful and Eider Point and distant 1.5 miles from the latter, is the most distinguishable feature between the point and the cape. It makes an excellent landmark during a low-ceiling fog when only the lower part of the cascade can be seen. The bluff at the cascade has a remarkably smooth stratified face up to an elevation of about 100 feet, where it forms a distinct horizontal line directly above which the upper strata have very irregular surfaces and appear to overhang in places. The cascade emerges from a slight depression at the top to form a comparatively narrow white waterfall to a sea level bench at the foot of the bluff. On either side of the cascade are rock- and earth-slide accumulations.

Chart 9024.—Cape Cheerful, on the north coast of Unalaska Island just westward of Unalaska Bay, consists of a main and secondary headland about 1 mile apart, the two headlands being separated by a low grassy valley emerging on the coast. The valley is flat at the base and resembles an amphitheater; it is called **The Dry Dock.**

The main headland is the westerly of the two and is adjacent to Reese Bay; it projects farther to seaward and is marked by a peak 1,808 feet high. The peak is close to the extremity of the headland and dominates the end of the cape from most directions of approach. It may, however, merge with the higher elevations back of the secondary headland or be shut out by them when the peak and higher elevations are on range.

Table Top Mountain, with an elevation of 2,710 feet, is the highest summit back of Cape Cheerful, but there are several peaks to the eastward of it approaching this elevation. The western slope of this mountain descends to the deep valley extending inland from Reese Bay. The mountain has a wide flat top.

The bluffs about Cape Cheerful present a rugged and almost vertical appearance, and rise to elevations of 1,000 feet. They are of horizontal strata and have a distinct reddish hue. Large slides of loose rock at the waterline can be seen all along the cape. The area outside the base of the bluffs, which is at or near the high waterline, is very rocky and is strewn with boulders. Foul ground extends several hundred yards off the extremity of the secondary headland and its northeastern side. Depths of over 20 fathoms are found 0.5 mile off Cape Cheerful.

The currents apparently meet in the vicinity of Cape Cheerful, the flood setting northwestward from Unalga Pass and northeastward from Point Kadin, creating eddies which set toward the shore. In rough weather the seas are apparently accentuated in the vicinity of the cape and it is therefore advisable to give it a wide berth under such conditions.

Reese Bay, a cove between Cape Cheerful and Cape Wislow, is about 1 mile wide at the head, which consists of a low, narrow strip of sand with some marsh grass. It is about 1 mile in depth, but appears deeper on account of the pronounced valley or

mountain gap extending inland from the coarse sand beach at the head of the cove. It is a long flat covered with tall grass, partly filled by **McLees Lake,** and flanked by the side slopes of ridges which terminate at each cape. **Wislow Island,** lying in the middle of Reese Bay, although rocky, appears regularly rounded in shape. It is 121 feet high, and the top is grass-covered. Although small, Wislow Island stands out prominently against the low background and in this respect is a good landmark during low visibility. Anchorage in 14 fathoms may be found 0.5 mile northeastward from Wislow Island, with some shelter from southeasterly weather. There are depths of 2 to 3 fathoms southward of Wislow Island, but there is no shelter in northerly weather, and the shape of the bay apparently concentrates the effect of any northerly swell, so that it breaks well off the shore at the head of the bay.

The channel westward of Wislow Island is blocked by a detached, rocky shoal, marked by kelp, with a depth of 1¼ fathoms, lying 350 yards westward from the south end of Wislow Island.

Cape Wislow, 2.5 miles westward of Cape Cheerful, is dominated by **Mount Marshall Reese,** 2,545 feet high. This peak is at the northern end of the long ridge which parallels the low valley extending inland from Wislow Bay. The land slopes gradually and evenly from Mount Marshall Reese to the end of Cape Wislow where it terminates in a bluff about 600 feet high.

Southwestward of Cape Wislow, about 1 and 3 miles, respectively, are two remarkable rocky cliffs about 2,000 feet high. They appear as equilateral triangles from the northwestward. A smaller triangular bluff, 820 feet high, lies between them. Several large waterfalls from 200 to 500 feet high emerge from the gullies between these bluffs; the most prominent of the waterfalls is about 1.7 miles westward of Cape Wislow. Emerging from a V-shaped gully, the water makes a vertical drop of about 140 feet to the high waterline. Being a spray of white foamy water, it is visible against the dark rocky cliff for some distance, and makes a good landmark when viewed from the northeast.

Irishmans Hat, a square tower rock, 85 feet high, lies about 0.2 mile offshore from the foot of the westerly cliff previously described. This rock seldom can be identified from any direction except northeastward where it shows clear of the land. Irishmans Hat is surrounded by a kelp-covered reef.

Driftwood Bay, just westward of Irishmans Hat and about 6 miles westward from Cape Cheerful, is an open bight, with a sand and gravel beach at its head. The lowland inshore from the bay is a large, swampy valley covered with marsh grass. The lowland to the southward, separating the mountainous mass of Makushin Volcano from the highland in the vicinity of Mount Marshall Reese, often can be recognized from offshore when the mountains are in clouds.

Anchorage with some shelter from southwesterly and southeasterly weather can be found in depths of 11 fathoms 0.5 mile from the westerly shore, with Point Tebenkof bearing about 275°. The depths shoal rapidly towards the head of the bay, and depths of 3 fathoms and less are found 600 yards offshore near the southeastern part of the bay.

Point Tebenkof, the western point of Driftwood Bay, is probably the most readily identifiable of any of the points along this stretch of coast, especially from the southwestward. The point terminates in a grassy bluff 800 to 1,000 feet high which overlooks all the lower points to the southwestward.

From Point Tebenkof the land rises gradually and evenly to a flat-topped peak or ridge 3,505 feet high, 2.8 miles inland. From the southwestward this ridge is seen on the skyline as a straight line slightly inclined to the horizon and terminating at the inshore end in a smoothly rounded peak which is a spur from the higher land about Makushin Volcano.

Red Cinder Dome, 1,874 feet high, is 1.1 miles south of Point Tebenkof, and to the eastward of the ridge. This crater peak shows over the ridge to the westward as a flat-topped hump appearing as a part of this ridge. It is a useful landmark because it is often clear when all other peaks are obscured. It can be identified readily from northeastward, as there it shows clear over the lower land at the head of Driftwood Bay, while all other points and landmarks merge with the higher land in the background.

Point Tebenkof should be given a berth of at least 0.5 mile. A rock awash at high water is 200 yards offshore about 0.4 mile westward of the point, and a 2¼-fathom shoal, marked by heavy kelp, is 375 yards offshore, outside of the rock awash.

A large slide 1.3 miles westward of Point Tebenkof may be identified under certain conditions of light. The bare place has the shape of an enormous keyhole, about 600 feet high.

Bishop Point, is a level tablelike projection, 254 feet high, about 3 miles southwestard from Point Tebenkof. It terminates in a pinnacle 102 feet high. A deep gorge extends 3.5 miles southward from the point. Cascades are visible in summer high up on the walls of this gorge.

Temporary anchorage in southerly weather may be found 0.4 mile from shore in depths of about 16 fathoms 1 mile east-northeastward from Bishop Point or 0.5 mile west-southwestward from it.

Triple Falls, two large waterfalls, one of which is divided into two cascades about 100 feet high, are 1.6 miles southwestward from Bishop Point, and are visible to the northward and northeastward but not to the westward.

Koriga Point, 5 miles southwestward of Point Tebenkof, is about 140 feet high and is difficult to distinguish except from the southwestward. There are a number of rocky islets close to shore eastward and westward of the point. Deep water, 40 fathoms, is found within 0.3 mile of the point.

A round hill, 320 feet high, lying about 0.8 mile southwestward of Koriga Point, can be identified from the southwestward when it is clear of Point Tebenkof but is difficult to distinguish when seen against the higher land.

The shore southwestward of Koriga Point is composed of rocky bluffs 100 to 300 feet high. A small cove, with a sandy beach, 1.8 miles southwestward of the cape, has depths of less than 5 fathoms, and the eastern part of the cove is obstructed by rocks and kelp.

Point Kadin, 3 miles southwestward of Koriga Point, is an inconspicuous, rounding section of the northwest coast of Unalaska Island. A group of rocks 18 feet high lie 250 yards off the cape. About 0.4 mile southwestward is another group of rocks 7 feet high, 350 yards offshore from a waterfall about 60 feet high, visible only from the northward. Extending northwestward and westward more than 0.5 mile from these rocks is a rocky bank with depths from 5¼ to 8 fathoms, while depths of 11 fathoms are found about 1 mile westward. Tide rips occur in this vicinity, and in heavy weather

the seas are perceptibly heavier. It is recommended that Point Kadin be given a wide berth, especially in bad weather.

Round Top, about 1 mile inland at Cape Kovrizhka, is a massive, round-topped peak 2,452 feet high, separated from the peaks surrounding Makushin Volcano, and higher than any of the nearby peaks. It is a useful landmark.

Makushin Volcano, 6,680 feet high, is a flat-topped snow-covered mass with several jagged peaks of about the same elevation surrounding it. It can easily be identified when not covered by clouds. The westernmost of these jagged peaks is particularly sharp and distinct and has an elevation of 5,242 feet. A large glacier covers the entire top of the peak and extends down into the large valleys at its base. Faint clouds of vapor or steam from the northeastern end of the snow field were seen in 1936 and 1937.

Cape Kovrizhka, 5 miles southwestward of Point Kadin, is very prominent and easily distinguished by the dome-shaped rocky hill, 233 feet high, which forms its westernmost extremity. Numerous rocks are found around this cape, and it should be given a berth of 1 mile. Under certain combinations of wind and current comparatively heavy tide rips occur in the vicinity of the cape.

On the north side of Cape Kovrizhka is a small open bay which affords a temporary anchorage during moderate southeast weather. Differences from normal magnetic variation of as much as 3° have been observed at the cape.

Chart 9023.—Volcano Bay, immediately south and east of Cape Kovrizhka, is a small bay open to the west and south, forming a fair anchorage for easterly weather. However, strong winds are to be expected, and with winds shifting to the south and west the bay becomes quite rough and dangerous for small craft.

Makushin Bay, indenting the western side of Unalaska Island, is 2.5 miles wide at the entrance and extends in an easterly direction for 5 miles to the entrance of Anderson, Cannery, and Portage Bays.

Makushin Point, on the north side of the entrance to Makushin Bay, rises to 762 feet and is grass-covered. It is made prominent by a number of small knolls scattered over its top. Just north of the point there is a low valley which extends from Makushin Bay to Volcano Bay.

The village of **Makushin** is on the eastern side of Makushin Point. The mail steamer from Seward makes regular calls at Makushin, but there is no post office. Fresh water is obtainable from a stream at the village.

The north side of the entrance to Makushin Bay is marked by **Rock Islet,** 104 feet high, lying 0.5 mile southwestward of Makushin Point, with several rocks between it and the point. There are no known dangers if the south shore is given a clearance of at least 0.3 mile. An abrupt shoal, with least depth of 16 fathoms was found 1.2 miles 246° from Rock Islet.

A prevailing current sets in a northerly direction off Makushin Bay. The combined effect of the currents, including tidal currents, and winds causes a very noticeable choppy sea with attending tide rips across the entrance of the bay.

To enter Makushin Bay from northward, steer to pass about 0.5 mile westward of Rock Islet on a course of 135°, and when it is abeam, steer **095°** to head for **Cathedral Rocks,** a group of prominent pinnacles off **Cathedral Point.** Continue on this course until **Priest Rock,** 80 feet high and just south of the village, is abeam; then steer **026°** to head for the left or west edge of the prominent glacial valley, continuing on this course

until the village is just abaft the beam; then head in for the village, and anchor in 15 fathoms, mud bottom, with the church bearing 285° and Priest Rock bearing 230°, about 0.3 mile off the beach. This anchorage is good for westerly and northerly weather, but with southerly weather considerable swell makes in, and in easterly weather, it becomes quite rough.

In making Anderson, Cannery, or Portage Bays, steer mid-channel courses through Makushin Bay, passing midway between the reef 1 mile westward of Tarasof Point and the 8-fathom shoal lying 1.5 miles to the north of this reef.

Anderson Bay is the southern arm of Makushin Bay. It affords several good anchorages of moderate size and at least one anchorage for one or more larger ships. A gravel spit, forming **Tarasof Point,** on the western side of the entrance, is a distinctive feature. The bay extends about 6 miles in a southeasterly direction and terminates in two arms, **Naginak Cove** on the west and **Udamak Cove** on the east, with wedge-shaped **Iksiak Point** between them. Four well-rounded, grass-covered islands lie in the eastern half of the bay. These islands are well apart from one another; **Peter Island,** the northernmost, is near **Anderson Point,** the eastern entrance point of the bay, and the southernmost is well inside the entrance to Udamak Cove.

To enter Anderson Bay, steer 160° (mid-channel) from a position 0.8 mile northeastward of Tarasof Point. Pass westward of the islands until the southern tangent of the second island from the north is 0.4 mile on the port beam. Then steer 188° (mid-channel) and proceed to anchorage in Naginak Cove in 20 fathoms, mud bottom, northward of the narrow pass formed by two opposing points. The pass is about 1.2 miles from Iksiak Point, and is obstructed by a dangerous shoal of 1½ fathoms in mid-channel.

To proceed to anchorage in main bay, pass south of the second island from the north and midway between it and **Gull Island** (the third), and anchor in 20 fathoms, mud bottom, in bight of main shore opposite the second island.

To proceed to anchorage in Udamak Cove, pass midway between Gull Island and Iksiak Point; then pass to eastward of the fourth island and anchor in 22 fathoms, mud bottom, on a ridge of that depth extending from the middle of the fourth island to the main eastern shore.

Cannery Bay, 1 mile to the eastward of Anderson Bay, extends about 3 miles in a southeast and easterly direction. Near the head and on the south side of the bay is the wharf and cannery of the Pacific American Fisheries, which at present is inoperative. The wharf is in fair condition, with a frontage of about 80 feet, and fresh water can be obtained there. However, the pipe line is deteriorating. A watchman is maintained at the cannery.

To enter Cannery Bay, steer mid-channel courses, favoring **Cannery Point** on the eastern side of the entrance. The only anchorage is at the eastern end of the bay, about 0.4 mile northeast of the cannery in 15 to 17 fathoms, soft bottom.

Portage Bay extends about 4 miles in an easterly direction from Cannery Point. Two shoals, with least depths of 5¾ and 6½ fathoms, are found almost in mid-entrance.

To enter Portage Bay, pass on either side of these shoals and steer mid-channel courses until within 0.8 mile of the head of the bay; then steer to the north of the 1½-fathom shoal and rocks found near the head of the bay. Indifferent anchorage for small vessels may be had in 19 fathoms, sticky bottom, midway between these rocks and the north shore.

A trail to Unalaska begins at the prominent valley about 1 mile from the head and on the north side of Portage Bay. The trip to Unalaska takes about 8 hours.

Cape Starichkof, forming the southern entrance point to Makushin Bay, is marked by an offlying rock 27 feet high. Numerous rocks, sunken and awash, are found along the shore in this vicinity, but are not known to extend more than 0.3 mile from the beach. The mountains rise abruptly from the beach in this vicinity to a height of 1,600 feet.

Two miles southward of Cape Starichkof is a deep narrow valley, trending eastward. Convenient anchorage in southeast weather can be found 0.5 mile from shore off this valley in depths of about 20 fathoms, with the center of the valley bearing about 110° and a conspicuous small 4-foot rock, 150 yards off the shore at the southern edge of the valley, bearing about 150°. Launches can find more shelter by anchoring closer to shore. A small bank with least depth of 6¼ fathoms is 450 yards westward of the rock previously mentioned.

Skan Bay, on the west side of Unalaska Island, has its northeastern entrance point at the ledge 2 miles southward of Cape Starichkof. It is 2 miles wide at the entrance and extends about 4 miles in a southeasterly direction.

A bank, on which a least depth of 3¾ fathoms was found, lies in the bay entrance, 1.4 miles 205° from the point on the northeast side and 0.8 mile northward of the southwestern entrance point.

The two arms at the head of Skan Bay are separated by **Skan Point,** a high headland. The eastern arm is too deep to furnish any convenient anchorage. The entrance to the southern arm is about 0.4 mile wide and choked with rather heavy kelp, but has a least depth of about 5 fathoms in mid-channel. This arm extends over a mile to the southward, has depths over 30 fathoms, and provides good shelter from all directions; but the depth is too great in that the length of anchor cable required would not allow sufficient swinging room.

The survey ship used an anchorage just inside the southwestern entrance point of Skan Bay, a little less than 0.5 mile from shore in a depth of 15 fathoms, where some shelter from westerly weather was found.

Chart 9022.—Spray Cape, about 3 miles westward of the southwestern entrance point of Skan Bay, is conspicuous from the northward. A small islet, about 80 feet high, lies close to shore off its northwestern side, and rocks covered at high water extend southwestward from this point.

The shore between Skan Bay and Spray Cape is fringed with pinnacle rocks and islets, and a bank, with a depth of 6¾ fathoms at its outer edge, extends more than 0.5 mile offshore.

From Spray Cape the shore trends southward for 3.5 miles to the entrance of Pumicestone Bay. It is high and steep, fringed by rocks, but deep water is found at a distance of 0.4 mile. An anchorage with good shelter in southeast weather can be found 0.4 mile from shore at the entrance to Pumicestone Bay in a depth of 20 fathoms off a small bight.

Pumicestone Bay, on the northwest side of the long westerly extension of Unalaska Island, is 1.5 miles wide at the entrance, but narrows rapidly to less than 0.5 mile. The bay extends about 7 miles in an easterly direction with an abrupt S-turn to the northward and eastward about 4 miles from the entrance. The turn is partially blocked by a

small flat-topped island about 30 yards in extent and 36 feet in elevation, leaving a clear channel 300 yards wide.

The north shore of Pumicestone Bay is formed by low, grass-covered hills. The shore is extremely rocky and rugged, the bluffs having a general elevation of 50 feet. The south shore is almost vertical and is characterized by many slides. The bay is divided by the turn into an outer and an inner bay. The inner bay is almost surrounded by high, precipitous mountains, except at the head where the mountains recede from the shore, leaving a narrow, flat grassland some 200 to 400 yards in width.

Two large streams flow into the bay, one on the northeast and the other at the southward side of the head of the bay. At the turn of Pumicestone Bay is a strip of shingle beach on the eastern side, backed by a narrow strip of grassland, which extends to the high bluffs in back of it. A conspicuous waterfall about 800 feet in height is at the southern end of the beach.

The outer bay is very deep. The water shoals gradually from over 40 fathoms at the entrance to a little less than 30 fathoms at the turn. There is little shoal water suitable for anchorage, and no protection from westerly weather.

At the head, the inner bay widens forming a basin 0.5 mile in diameter where good anchorage may be found, in depths of 20 fathoms or less. The southeastern part of this basin shoals abruptly from 10 fathoms to less than 1 fathom.

Kashega Point, on the south side of the entrance to Pumicestone Bay, is 1,447 feet high, and deep water is found close to its northern shore.

About 1.5 miles southward of Kashega Point is a bold rocky island about 80 feet high, 600 yards from shore. **McIver Bight,** about 1 mile in diameter, indents the shore eastward of this island. Good anchorage can be found in the center of the bay in depths of about 10 fathoms with the island bearing west. The bay is exposed to the westward and northwestward, but small boats can find some shelter from westerly weather by anchoring closer to shore. The southeastern part of the bay has depths of 2 to 4 fathoms.

Kashega Bay is on the northwestern side of the long westerly extension of Unalaska Island and distant about 25 miles from Umnak Pass. At the southwestern side of the entrance is **Buck Island,** low and grassy. About 1.5 miles northwestward of Buck Island is a narrow rocky ledge extending northwestward about 0.4 mile on which are the two conspicuous **Kashega Pinnacles.** The outer one is about 95 feet high; the inner one is about 35 feet high. These pinnacles are the most conspicuous landmarks in approaching the bay. About 0.3 mile northwestward of the higher pinnacle is a small rock 5 feet high.

The bay has a navigable entrance 0.5 mile wide and is about 1.5 miles long in a southeasterly direction. **A light (lat. 53°29′4 N., 167°10′9 W.),** 260 feet above the water and visible 8 miles, is shown from a small white house on the point at the north side of the entrance. **Kashega** is a small village at the southeastern end, consisting of a school, church, sheep-ranch buildings, and a few houses. The village shows seaward through a small angle and then is not visible until arriving well inside the bay. Neither a post office nor supplies are available. The anchorage in the bay is exposed to the northwestward and the holding bottom is reported none too good. In proceeding to the anchorage, favor the northern shore to avoid a kelp-marked 2¼-fathom shoal 250 yards from the southern shore and 0.5 mile northwestward of the village church; anchor in 6 fathoms with the church bearing about 165°.

The valley at the head of Kashega Bay leads to Kuliliak Bay on the Pacific Ocean side of Unalaska Island. It is approximately 4 miles long and 1 mile wide, extending in an east and west direction. The floor of this valley is covered with fresh water lagoons which are fed by small streams. The sides of the valley are bounded by high hills entirely covered with grass. The hills to the northward are rolling, while to the south they are steep with a jagged skyline. The streams which empty from the lagoons into Kashega Bay are shallow at their mouths. Local residents of Kashega village report that during heavy northwesterly weather the tide backs up into the lagoons. The shores of the lagoons are mostly rocky with very few stretches of sand beach.

Just westward of Kashega Bay is **Buck Bight.** It is clear, except near the head. The bight is open to the northward.

Sedanka Point, 175 feet high, is the western extremity of the ridge bordering the south side of Kashega Bay. A conspicuous rocky pinnacle, 43 feet high, is 1.5 miles northwestward of the point of the cape with a smaller pinnacle 200 yards to the southeastward. A long ledge extends toward the pinnacles from the point and a conspicuous flat-topped islet, 105 feet high, is 0.3 mile off the point.

Kismaliuk Bay is an irregular-shaped bay, extending roughly southeastward for 2 miles, which branches into two arms. The arms are separated by a low broad point from which a chain of bare rocky islets extends about 0.5 mile in a northwesterly direction. The outer islet has an elevation of 20 feet.

The northern arm is of little importance and affords little protection from northwesterly weather. The depth of water shoals gradually from 17 fathoms at the entrance.

The southern arm, protected by the chain of islets, affords excellent protection. The entrance channel is clear and about 500 yards wide, with a mid-channel depth of 11 fathoms. The water shoals gradually to the head of the arm.

Alimuda Bay is the long bay immediately west of Kismaliuk Bay and separated from it by **Manning Point,** a bold, blunt, precipitous point of land from which an exposed rock ledge makes out some 400 yards in a northwesterly direction. The bay extends about 3.5 miles southeastward, with a width at the entrance of over 1.5 miles.

The water shoals gradually from 20 fathoms at the entrance to the gravel beach at the head. About 1 mile inside the entrance a low, flat reef, with several exposed rocks, makes out some 300 yards from a point on the eastern shore. About 1 mile farther inside, shoal water, extending some 600 yards off the same shore, has a least depth of 1½ fathoms. A bar, with 4¾ fathoms on it, extends southwestward across the bay about 0.7 mile from the head. Between this bar and the head of the bay, a depth of 8 fathoms is found, where small vessels can anchor. As this bar is exposed to all northerly and westerly weather, large swells rolling over it, often breaking there, reform to pile up in breakers at the head of the bay. This bay affords no real protection for any but small boats and then only in the extreme southeastern bend behind a small reef making out from the southeastern shore.

Wedge Point, a bold narrow ridge having remarkable serrations separates Alimuda and Aspid Bays. **Aspid Bay** extends about 2.2 miles in a southerly direction and affords but little protection from northerly and northwesterly weather. The depth at the entrance is about 15 fathoms; from there the water shoals gradually to the head of the bay. The bottom is good for anchoring in 9 to 10 fathoms.

Cape Aspid, on the north side of Unalaska Island about 15 miles from its western

extremity at Umnak Pass, has a conical hilltop, 901 feet high, near its outer end. The shape of the hill, terminating in bluffs at the shore, is unlike any other land in the vicinity, as all the adjoining hills are flat-topped with comparatively gentle slopes. The cape is a useful landmark from all directions except from the northward where the hill merges with the higher land to the southward. A ledge extends about 400 yards offshore, terminating in an islet about 24 feet high.

The wide bight southwestward of Cape Aspid affords shelter in easterly and southerly weather in depths of 12 to 15 fathoms, 0.4 mile from shore. A 4¾-fathom spot, marked by kelp, lies 0.6 mile eastward of Ram Point and about 0.4 mile from shore.

At some distance off the coast, between Capes Aspid and Spray, the currents vary in intensity from little or nothing off Spray Cape to about 1 knot off Cape Aspid. The current generally sets eastward, the flood being stronger than the ebb. Farther inshore, at Cape Aspid, the currents are stronger and small tide rips appear at the turn of the current. These rips extend as far eastward as Sedanka Point.

Chart 9009.—Ram Point, 2.7 miles southwest of Cape Aspid, is a prominent wedge-shaped rock 240 feet high. Ledges bare at low water and extend 0.2 mile offshore from the point. To the westward of the point there is a stretch of low land over which the masts of vessels anchored in Chernofski Harbor are visible from offshore.

Chernofski Point, the eastern entrance point of Chernofski Harbor, is the extremity of a narrow peninsula composed of several hills, the highest being 315 feet high. The seaward face of the peninsula is rugged and broken and there are rocks extending seaward on the line of the ridge. A **light** on the end of the point, shown from a small white house, is 101 feet above the water and is visible 8 miles. It is obscured from 268° to 314½°. A deep, wide cleft across the middle of this peninsula may be identified when bearing southward of southeast.

Several small detached banks with depths of 10 to 12 fathoms surrounded by deeper water lie to the northward of Chernofski Point.

Chernofski Harbor is a small, land-locked harbor which in its inner part affords complete shelter from swell and from winds except williwaws. Depths of water are suitable for anchorage; bottom is mud. With heavy south and southeast winds the harbor experiences a strong sweep from the valleys at the head. The entrance between Chernofski Point and **West Point,** through a narrow canal formed by low promontories, is about 4 miles southwestward of Cape Aspid.

Cutter Point, a low point on the south shore about 2.3 miles from the entrance, is marked by a low-powered light, 15 feet above the water.

The entrance to the harbor is difficult as there are no conspicuous landmarks. From the entrance, the northeast tangent of Umnak Island (Cape Idak) bears 309°. Wedge-shaped Ram Point, about 1 mile eastward of Chernofski Point, may help to identify the locality. From a position 3 miles westward of Point Kadin, course **205°** for 34 miles will lead to a position about 1 mile northwestward of the entrance, heading for the tangent to Peacock Point, the first point southwestward of West Point. On this course a small bank with a depth of 10 fathoms, 1.5 miles northward of Chernofski Point, may be crossed. When the entrance to the bay has opened out and the entrance light bears about 110°, enter on course **123°**, keeping mid-channel, as there are projecting ledges on both sides. A shoal with a least depth of 5½ fathoms is almost in the middle of the entrance, about 900 yards 232° from the light.

Round **Observatory Point,** the low shingle point at the southeastern extremity of the eastern promontory, giving it a good clearance and anchor in 10 to 12 fathoms, mud bottom, in the middle of **Mutton Cove,** halfway from Observatory Point to the former village.

Fresh water can be obtained from a stream in the southern part of the bay. The head of the bay, at the southeastern end, is shallow and can be used only by small boats.

The north coast of Unalaska Island west of Chernofski Harbor is described in connection with Umnak Pass.

Chart 9018.—Sedanka Island, close to the eastern end of Unalaska Island on the Pacific side and separated from the latter island by narrow, deep Udagak Strait, appears as a part of Unalaska Island. The island is mountainous and covered with tundra. There are numerous peaks, separated by deep valleys, running northwestward, but none of the peaks are conspicuous from the eastward. The highest peak, 2,130 feet high, is in the southwestern part of the island. The outer coast is broken by bays and coves separated by bold, rocky headlands.

Cape Sedanka, the eastern point of the island, terminates in a knoll 375 feet high. Rocks and islets fringe the shore, but deep water is found at a distance of 400 yards. The coast on the southeast side of the cape is unusually steep and reaches an elevation of 1,269 feet.

Egg Island is 0.6 mile in diameter, 541 feet high, and lies about 1.5 miles northeastward from Cape Sedanka. It is a grassy island with a bluff rocky shore, and has numerous rocks and islets within 200 yards of the shore, but beyond this distance deep water is found all around the island.

Old Man Rocks, a group of four, only two of which are prominent, are 0.9 mile westward of Egg Island. The two conspicuous rocks are 100 feet and 39 feet high. The group is surrounded by deep water at a distance of 200 yards.

Sedanka Pass separates Egg Island and Old Man Rocks from Sedanka Island. It is about 1.5 miles wide and has depths of 30 to 40 fathoms. The Sedanka Island shore should be given a berth of 0.5 mile. Strong currents with rips are experienced occasionally around Cape Sedanka and just south of Old Man Rocks.

The Signals are three rocks off the eastern coast of Sedanka Island. **Outer Signal,** 30 feet high, is 3.2 miles south of Egg Island and has a small rock, 10 feet high, 0.3 mile southeastward of it. Deep water is found close to these rocks. **Inner Signal** is 3 miles south of Cape Sedanka and 0.8 mile off the nearest Sedanka Island shore; it is 126 feet high and is surrounded by a shoal and reef area 0.4 mile in diameter. A bar, 7 to 8 fathoms in depth, reaches from this area to the nearest point of Sedanka Island. The passage between the Inner and Outer Signals is clear.

About 15 miles southeastward of Egg Island, after gradual shoaling from the 100-fathom curve to about 45 fathoms, the water deepens to depths over 60 fathoms, forming an underwater basin about 6 miles wide which leads northwestward into Beaver Inlet, furnishing an excellent pathway for vessels equipped with echo sounding apparatus. A crescent-shaped bank of rocky formation within the basin of deep water and 2 miles eastward of Egg Island has general depths of 12 to 14 fathoms and a least depth of 9 fathoms on the western part of the bank. The 50-fathom curve surrounding the bank approximates a circle about 1.5 miles in diameter. When navigating on soundings in

thick weather this bank and the characteristic deep water afford an opportunity to check a vessel's position. The navigator in finding his way on soundings to the bank must guard against the mischance of nearing Egg Island; the shoaling of the depths in doing so may mislead him in assuming that he is approaching the bank. A definite knowledge from soundings taken regularly along the course from seaward is necessary to avoid this error.

From Cape Sedanka the shore on the Pacific side trends southwestward for 3 miles, then turns southeastward for 1 mile to a precipitous point, inclosing a small bight where temporary anchorage in westerly weather can be found. A depth of 7 fathoms is located 0.5 mile from shore in the southwestern part of the bight. The bottom of fine gray sand slopes gradually from the sand beach at the head of the bight to the 20-fathom curve distant 1 mile offshore. To enter the bight, pass midway between Outer Signal and Egg Island.

On the southeast side of Sedanka Island, east of Udagak Strait, are three bays separated by bold headlands; the largest bay is 4 miles northeast of the entrance to Udagak Strait and extends 2 miles inland in a northwesterly direction. Good anchorage may be found 0.5 mile from the head of the bay in 7 fathoms. This bay is protected from all except southeasterly weather. The two other bays, which are nearer Udagak Strait, afford protection from the north and west.

The south end of Sedanka Island is a double point. On the eastern prong is a conspicuous, sharp pinnacle rising about 100 feet from a flat ledge.

Udagak Strait, between Sedanka and Unalaska Islands, provides a direct passage from the Pacific Ocean to Beaver Inlet. Foul ground extends 300 yards from the western shore of the strait at the entrance, but a mid-channel course clears this ground. The narrows at the halfway point in Udagak Strait have a width of 0.25 mile, and the channel is slightly over 0.1 mile wide in a depth over 10 fathoms.

The average tidal current at strength of flood has a velocity of about 2 knots and at strength of ebb about 1 knot. At the southern entrance of the strait and through the narrows the flood sets from the Pacific. For current predictions see the *Current Tables*.

The strait has good water throughout. However, in the narrows, which run east and west, the channel turns around a reef on the south side of the east end, and then in a reverse turn passes around a rocky shoal on the north side at the west end. The reef lies off the northeast side of a broad, gravel spit which forms the south side of the narrows. The reef is marked by kelp and rocks awash at three points. One or more of the rocks are generally visible. The rocky shoal has a least depth of 4 fathoms and extends 200 yards from the south side of a pointed, gravel spit which forms the west end of the north side of the narrows. The currents in the narrows necessitate caution as to their sheering effect on a vessel swinging to avoid the dangers. Anchorage in the south entrance of the strait is uncomfortable because of the current.

Udagak Bay, an indentation in the west shore of Udagak Strait, affords anchorage in 12 to 19 fathoms, sand and mud bottom, about 0.3 to 0.4 mile from the head of the bay. Small boats may anchor in 6 to 10 fathoms, mud bottom, farther toward the head. The bay affords good protection in any weather.

Light tide rips were frequently observed in the area off the mouth of Udagak Bay, sometimes extending well into the bay. These rips usually occurred when the wind

was contrary to the current. Numerous swirls were also encountered in the same area at all times when the currents were more than 1 knot.

Beaver Inlet has its entrance between Brundage Head and Cape Sedanka and extends 17 miles southwestward into the east end of Unalaska Island. It has an average width of about 3 miles in its outer reaches, narrowing to about 1.6 miles near its head. The deep water in the bay extends eastward between Unalga and Egg Islands, making access to the inlet comparatively easy for a vessel equipped with echo sounding apparatus.

Currents in Beaver Inlet are negligible, and in the entrance between Egg and Unalga Islands will not ordinarily exceed 2 knots.

From Cape Sedanka, the southeastern entrance point of Beaver Inlet, the shore trends northwestward for 1.6 miles to a point marked by a small natural arch and having a chain of rocky islets extending northward about 200 yards. Just westward of this point is an open bight, 1 mile wide and 0.4 mile in depth, which furnishes convenient temporary anchorage in southerly weather, well out of any swell. Anchor in the middle of the bight about 0.3 mile from shore, with Old Man Rocks showing between the rocky islets off the point to the eastward, in about 16 fathoms. Smaller boats can move farther into lesser depths near the western end of the bight.

Sisek Cove, about 4 miles southwestward from Old Man Rocks, is too deep for anchorage.

Udamat Bay makes into Sedanka Island from Beaver Inlet 5.5 miles southwestward from Old Man Rocks and just west of **Biorka** village, a small native settlement having a conspicuous church. The bay is 1 mile wide to a point 0.8 mile from its head where it narrows to 0.3 mile. A low valley extends southeastward from the head of the bay to the outer coast. About 1.4 miles south of the eastern entrance point, a reef makes out 200 yards from the eastern shore. With this exception the shores are clear, and a depth of 20 fathoms will be found within 250 yards or less of the shore. If necessary to anchor in the bay, the best places are at the head of the bay or just north of the reef, mentioned above, in a small bight indenting the eastern shore, but there will be scant swinging room. A small rocky patch with depths of 15 to 25 fathoms, is 0.4 mile northwestward from the same reef, and may offer anchorage with more swinging room.

Strait Bay, about 8 miles southwestward from Old Man Rocks, is 1.1 miles long, tapering from 1 mile wide at its entrance to 0.4 mile wide near the head. The bay is clear except for a 5½-fathom spot in the center. Anchorage may be had at the head of the bay in 20 fathoms about 250 yards from shore. A valley extends southward and eastward from its head and during a blow the wind is funneled into the bay through this valley.

Amugul Bay makes southward from Beaver Inlet about 3 miles southwestward of the entrance to Udagak Strait. **Round Island,** 136 feet high, marks the eastern side of Amugul Bay entrance. The bay affords fair anchorage for medium-sized craft in 22 fathoms, mud bottom, 0.2 mile from the head of the westerly bight. The southerly arm affords excellent anchorage for small craft in 10 fathoms, mud bottom, 0.1 mile from the head.

At the head of Beaver Inlet are four small bays; named in order, following the south shore around to the north shore, they are: **Tanaskan, Final, Kisselen,** and **Erskine Bays.** Temporary anchorage only can be found near the heads of these bays for medium-sized craft. The small bight on the southern side of Kisselen Bay affords

excellent anchorage for small craft in 5 fathoms, mud bottom, 0.1 mile from the head. In approaching this anchorage, care should be taken to avoid a reef, which bares 1 foot at low water and lies 160 yards southward of the southern island of a group of four. In Final Bay are heavy williwaws and a strong draw.

Dushkot Island lies along the north shore of Beaver Inlet near the head.

Uniktali Bay makes into the north shore of Beaver Inlet about 15 miles above its entrance. This bay is nearly 3 miles long in a westerly direction and 0.3 mile wide at its narrowest part near its head. An anchorage, practically landlocked, but limited to medium-sized vessels, may be found in 20 fathoms, muddy bottom, 0.5 mile from the head of Uniktali Bay. In entering, keep to mid-bay as far as the narrows, then favor the south shore to avoid a 6-fathom shoal which lies 260 yards off the north shore.

Small Bay, eastward of Uniktali Bay, affords good anchorage in 10 fathoms, 0.3 mile from the head.

Ugadaga Bay is an indentation in the north shore of Beaver Inlet 8 miles above the entrance. From the head of Ugadaga Bay a trail leads to Unalaska. Fair anchorage may be found 0.4 mile from the head of the bay in 20 fathoms, even bottom.

Agamgik Bay, indenting the north shore of Beaver Inlet, 5.5 miles southwestward of its entrance, offers anchorage in good holding ground with fair shelter, except in severe southeasterly weather. The bay is 1.2 miles wide at the entrance. Opposite a small, rocky peninsula jutting out from the western side about 1.4 miles from the western entrance point, the width is reduced to 0.4 mile. The anchorage is in this narrow portion in 16 to 20 fathoms. The bay is comparatively free from williwaws.

Eagle Rock, a large, flat-topped pinnacle, 75 feet high, is 125 yards off the rounded point on the east side of the entrance to Agamgik Bay. Off the western point of the entrance, sunken rocks and rocks awash extend from 0.1 to 0.3 mile into the entrance. A rock, bare 6 feet at high water, is outside of this rocky area and 600 yards eastward of the point.

The north shore of Beaver Inlet extends eastward from the eastern entrance point of Agamgik Bay for almost 3 miles to the western entrance point of Deep Bay, where it turns sharply to the northward and northwestward for 1.2 miles, forming the western shore of Deep Bay, which has been described earlier with Unalga Pass. About halfway between the two bays is a conspicuous waterfall, 350 feet high, with a pinnacle rock 46 feet high just to the westward of its base.

The gap between the mountains on either side of the southern part of Udagak Strait stands out in a measure, from a southeasterly direction, against a background of mountains on the west side of the northern end of the strait. The 1.5-mile stretch of shore forming the south entrance of the strait on the Unalaska Island side is at the base of a very steep side of a ridge, the summit of which is 1,920 feet high.

Mountain ridges just westward of Udagak Strait are normal to the trend of the outer coast, generally ending in deeply eroded cliffs. The mountains appear in confusion and can be identified only by a close study of the chart.

With the exception of Outer Signal, Inner Signal, the reef off Reef Point, and the rocks and ledges close to shore, the south coasts of Sedanka Island and Unalaska Island, as far west as Eagle Point, are free from outlying dangers.

Between Udagak Strait and Kayak Cape the valleys between the headlands have been partially filled with debris, forming a series of bights with shingle beaches at

their heads. Behind these beaches are grassy flats and, in all but one case, lagoons. The headlands between the bights protrude from the generally high mountain mass. The valleys, with the exception of one which leads through a mountain pass to the head of one of the bays of Beaver Inlet, are in the form of amphitheatres. Numerous rocks and ledges lie within 50 to 100 yards from the shores and occasionally as far as 200 to 350 yards. The waters along the shoreline are generally foul above and below the high water line, with boulders fallen from the heights.

Hive Bay, about 5 miles southwestward of Udagak Strait, is the largest of these bights, its two arms affording good protection from northerly weather. The west arm of the bay affords good anchorage in depths of 8 to 10 fathoms with generally good holding ground. A rock which bares 3 feet at low water is on the westerly side of the entrance to the eastern arm of Hive Bay. The headland between the two arms is recessive and undistinguished. The headland west of Hive Bay is deeply eroded. It has sharp ridges and 3 closely spaced summits of nearly equal elevation, with successively lower spurs toward the point. The cliffs are marked by narrow dark strata rising toward the point. The west side of this headland has a very conspicuous boulder slide.

The bight just west of Hive Bay has a short stretch of shingle beach, behind which is a valley leading inland over gentle slopes to a mountain pass with an estimated elevation of 400 feet. Beyond the pass is Tanaskan Bay, an arm of Beaver Inlet. The headland forming the west side of this bight has a reddish cliff, particularly noticeable from the southwest.

Staraya Bay, north of Kayak Cape, is divided into two parts by a bold promontory on which the remnants of volcanic craters are easily seen. Near the outer end of the headland forming the eastern side of the northern arm of the bay is a natural rock bridge arching from the cliff and footing in the shallow water near the shore. This span is about 50 feet, and the height under the arch is about the same. Ledges extend about 200 yards offshore from the outer end of this headland. The western arm of Staraya Bay is a bight which has a shingle beach of unusual length and height, 20 to 25 feet, and a large lagoon behind the beach. In the center of the mouth of this bight is a shoal area with a 1-fathom rock.

Kayak Cape is the first prominent point west of Udagak Strait. It is lower than points to the westward, bold at the extremity and its narrow ridge is marked by several prominent humps, 1,000 to 1,400 feet in elevation. Both sides of the cape display a conspicuous black stratum about 400 feet high at the point of the cape. These strata may be seen when the overcast is not too low.

Chart 9019.—From Kayak Cape westward the shoreline trends to the southwest and is deeply indented by several large bays, affording various degrees of protection. Only two of these, Usof Bay and Blueberry Bay, are considered to give adequate protection from all kinds of weather. Three Island Bay and Raven Bay are landlocked at the head, giving excellent protection for small craft only.

Protection Bay, just west of Kayak Cape, extends about 2 miles inland. There is a slight hook to the westward at the head of the bay, giving some protection for small craft from the south. Rocks extend 500 yards southeastward off the point of the hook. This bay has the least shelter of any in the vicinity, but its depth is more convenient for anchoring.

Cape Yanaliuk, about 4 miles southwest of Kayak Cape, is easily identified by the

mushroom-shaped rock just off the point. Altogether there are two small rock islets just off this point. The cape is narrow and precipitous except for a short distance on the southwest side, which is a grass-covered slope, topped and flanked at each end by rock cliffs. The cape has a markedly jagged appearance. A small bight on the east side of the cape extends 1 mile inland but affords no protection in bad weather.

Three Island Bay, west of Cape Yanaliuk, extends inland for about 5 miles in a north-northwesterly direction; it affords fair protection for small craft in any weather in 8 to 15 fathoms at the head of the bay, behind three small islands which give the bay its name. Deep water carries through to the head of the bay between the islands. Care must be exercised not to anchor too close to the rocks north of the eastern island, nor to the shoal water at the north end of the bay. Swinging room is restricted for vessels exceeding 100 feet in length, and the area affords only fair anchorage and protection for small craft. It is subject to violent williwaws, and in southerly weather a rather heavy swell from outside makes it uncomfortable. Local magnetic attractions cause differences as much as 2½° in some parts of the bay.

A cove on the east side of the bay, about 3 miles from the entrance, is too deep for good anchorage. **Foam Cove,** a wide cove on the west side, provides fair temporary anchorage near the mouth of a stream which shows conspicuously from the bay entrance.

Blueberry Bay, the next bay west of Three Island Bay, extends inland in a northwesterly direction for about 3 miles. A fairly sharp turn to the northward for about 1 mile makes the head of the bay landlocked and affords good shelter. The upper half of Blueberry Bay has a rugged shoreline characterized by narrow gravel and boulder beaches, or rocky shoreline with smooth rock slopes. Anchorage may be had in 15 to 20 fathoms in the middle of Blueberry Bay about 0.5 mile below the head in good holding bottom. The swinging room is entirely adequate for small craft and should suffice for ships of moderate size. Being entirely landlocked, there is almost entire freedom from swell. Winds are generally more moderate than in nearby localities and, as far as is known, never blow across the bay. Fresh water is available.

Whalebone Cape is characterized by a bare, rocky, 2,000-foot peak, which appears as a series of broken rust-colored cliffs from offshore. At the base of the mountain is a gray rock-slide about 300 feet in height. The foot of the slide extends to the high water line. The shore around the point of the cape is very rugged and broken, and dangerous for boat landings due to numerous rock islets, rocks awash, and sunken rocks close inshore.

Usof Bay, just west of Whalebone Cape, extends inland about 8 miles in a north-northwesterly direction and affords good anchorage at the head in 20 fathoms, sand bottom. The width of the bay narrows to 0.5 mile about 5 miles from the entrance and a slight turn to the northward for about a mile makes the head of the bay landlocked. The general depth of the bay is over 60 fathoms. A small hanging glacier shows at the head of the bay over the west side of the narrows as seen from the entrance.

Good anchorage for small craft is found in **Johnson Cove,** a small almost landlocked cove at the mouth of a canyon on the west side about 5 miles in from the entrance, in 7 to 10 fathoms, mud bottom. The south arm of Johnson Cove should be avoided as it is shallow and filled with rocks. To the north of the canyon is a conspicuous cascade.

On the east side of Usof Bay a group of sharp pinnacles marks the first point inside the bay—about 0.8 mile from Whalebone Cape. A prospector's cabin is at the head

of the second bight from the entrance on the east side. A rock at the entrance to this bight affords some protection inside of it.

The shoreline of Usof Bay is rocky and precipitous except at the heads of several coves or bights which occur at irregular intervals. Thick, long grass covers the flats and ascends the mountains, in some cases covering the slopes as high as the 2,000-foot level. There are numerous rock islets offshore at short distances and irregular intervals. Kelp is general along the rocky shoreline. A strong westerly set of the current was noticed on the rising tide off the west side of the entrance to Usof Bay on August 14, 1939. This condition was noted by the survey party because it was generally taken for granted that the set is to the eastward on a rising tide. There is not sufficient proof that this condition exists on every rising tide.

Cape Prominence, the west entrance point of Usof Bay, is marked by a tall cylindrical pinnacle connected at its base with the main point; it shows conspicuously from south-southwest. A flat ledge makes off 200 to 300 yards, and may be mistaken for the ledges off Reef Point.

Another cylindrical rock is about 700 yards northward on the east side of the cape. It is not so noticeable, but is an aid in identifying Cape Prominence. Breakers extend for about 500 yards off the cape.

Open Bay is the bight between Cape Prominence and Reef Point. It has anchorage for large or small vessels in 20 to 5 fathoms with good holding ground and sufficient swinging room. It affords limited protection from the southwest and east, but none from the south and southeast.

Reef Point is easily identified by a conspicuous cathedral rock, 240 feet high, just off the southern extremity. A ledge, just a few feet above high water, extends 0.5 mile off the point. No dangers were noted outside of this ledge. All of this ledge is not above high water; the depth is 5 fathoms between the outer end and inner parts. The outer end is a reef which is continually awash, due to the ocean swell, at all stages of the tide, but may actually be 2 feet above low water.

Raven Bay, on the west side of Reef Point, is entered on either side of **Ogangen Island** and extends 3.5 miles inland. The island, 1,180 feet high and 2 miles long by 0.5 mile wide, has its longer axis paralleling the west shore of the bay; the passage between is 0.2 to 0.4 mile wide and has depths of 9 to 15 fathoms.

East of Ogangen Island, the bay narrows from a width of 2 miles at the entrance to 0.3 mile at the north end of the island; depths are 25 to 40 fathoms. Northeast of the island, **Crow Arm,** narrow and stocking-shaped, extends 1 mile to the north; the arm is too deep for the restricted swinging room and is subject to considerable swell during southerly weather.

The west arm of Raven Bay narrows to 250 yards 0.6 mile north of Ogangen Island and continues north for another mile; excellent anchorage for small boats may be had in 3 fathoms just south of the prominent islet at the head of the arm. The sand flats at the extreme head are suitable for beaching small craft.

The small cove west of the middle part of the narrows affords anchorage for small boats in 3 to 5 fathoms, but the swinging room is restricted by the reef on the west side. At the head of the cove are abandoned saltery buildings.

A rock bare at low water is 400 yards south of the cove and slightly to the east of the middle of the channel; the best water is west of the rock. Just south of the entrance

to the narrows, a 4¾-fathom rocky shoal in mid-approach can be avoided by favoring the shore on either side.

Eagle Bay, 3 miles west of Raven Bay, is about 1.3 miles wide at its entrance and extends 2.5 miles in a northerly direction; it is characterized by a particularly rugged and precipitous shoreline. High rocky cliffs rise directly from the high waterline in most parts of the bay and even where cliffs do not exist, the rise is very steep and broken. The very rugged country surrounding Eagle Bay causes violent williwaws in northwesterly, northerly, and easterly weather. **Snipe Point,** which divides the bay into two arms, is very rugged at its southern tip and quite rough and weathered on the top.

The eastern side of the entrance to the bay is marked by **Spire Rock,** a very sharp pinnacle, 100 feet in height and about 100 yards offshore. On the western side of the entrance **Label Reef,** awash at high water, extends about 400 yards offshore from the eastern side of Eagle Point. This reef is plainly visible at any stage of the tide because of breakers.

Each arm of Eagle Bay is about 1 mile long and both extend in a northeasterly direction. The northernmost arm is only 0.4 mile wide at its widest point and has numerous islands near its head. The islands are flat, grass-covered on top, with steep rocky sides rising directly from the water, and are used as nesting places by many birds in the summer months. The arm is navigable as far as these islands.

The eastern arm of Eagle Bay is about 0.5 mile wide for half of its length, and affords good shelter in all but extreme southerly weather about 0.3 mile inside its entrance.

Good anchorage may be had in Eagle Bay, but the southerly swell is often uncomfortable. Anchorage with protection from all weather is available below the island in the northern arm, but swinging room is limited. Depths of 11 fathoms extend into both arms of the bay; however, broken bottom with a 3¼-fathom spot extends from Snipe Point almost halfway across the entrance to the northern arm.

A portage at the head of Eagle Bay leads to Pumicestone Bay on the north side of the island.

Eagle Point is the prominent headland between Eagle and Kuliliak Bays. The point is very rugged at its southern end, and is distinguished by two prominent mountain peaks. The southern peak, located at the extreme southern end of the point, is 1,340 feet high; when viewed from the south, it appears conical in shape with a very sharp top, but from the east or west it appears flat on top, with a sharp, rock peak at the south end of the flat portion. The northerly peak, about 1 mile northeast from the southerly one, is 1,520 feet high, and appears pyramidal in shape from all directions, with a bare rock top. The blunt, southern face of the cape is much weathered, with high rock cliffs, numerous slides, and many pinnacle rocks along the shore.

A shoal, with 14 fathoms 0.4 mile from shore, makes out to southward from the most southerly tip of Eagle Point. Passing vessels are advised to stay at least 0.5 mile off the cape in order to keep outside the 20-fathom curve.

Appreciable tidal current was noted for a distance of 1 mile off Eagle Point. The flood sets westward and the ebb eastward. With an appreciable swell running against this current, high, sharp, broken seas, with curling tops resembling tide rips, were noted off the point.

Chart 9020.—Kuliliak Bay indents the southeast coast of Unalaska Island immediately to the westward of Eagle Point. The bay is divided by a narrow ridge of land into two parts, forming an outer bay and a well-protected inner bay. The end of this narrow ridge of land, **Repetition Point,** is the eastern point of the entrance to the inner bay.

A chain of low, black rocks extends 325 yards offshore in a southwest direction from the southwest corner of Eagle Point and marks the east side of the entrance to outer Kuliliak Bay. A shoal, with 18 fathoms, 0.8 mile from shore, extends southwestward from the outer rock of this group. Vessels entering Kuliliak Bay from eastward should give the point a berth of 1 mile in order to avoid the shoal.

Outer Kuliliak Bay is open to the south. The shores are characterized by rock cliffs, except at the head of the deep bight which forms the northeastern part of the outer bay. At the head of this bight is a sand beach and a valley passes north of Eagle Point into Eagle Bay. Anchorage in 13 to 14 fathoms may be had at the opening of the bight, where some protection is afforded in southeasterly weather and good protection in northerly and northwesterly weather.

A reef, with the outer part of it awash at half-tide, makes out from the center of the north shore of outer Kuliliak Bay, and a shoal with 8 fathoms extends 330 yards southward from this reef. Otherwise the bottom of the outer bay is very even, decreasing in depth very gradually from 30 fathoms at the entrance to 12 fathoms at an average distance of about 200 yards off the northern shore.

Inner Kuliliak Bay affords good shelter east of Nest Rock in all weather. The entrance is about 500 yards wide between the cliffs 200 feet high on the western side and on the steep tip of Repetition Point on the eastern side.

Dome Rock, the outer rock of a conspicuous group which extends 120 yards southwestward from Repetition Point, is a good landmark on the eastern side of the entrance to the inner bay; the rock is about 30 feet wide and 5 feet high.

Along the west shore of the entrance to inner Kuliliak Bay, flat reefs, rocks awash, sunken rocks, and heavy kelp form a fringe some 200 yards wide. In this area is a large black rock, part of which rises to a sharp point 10 feet above high water, 75 yards out from the base of the shore cliff. About 160 yards northeast from this large, black rock and 180 yards offshore is **Perch Rock,** a small, black rock about 1 foot above high water and surrounded by kelp.

Trava Point is a small, flat, grassy point on the south side of inner Kuliliak Bay and 0.5 mile northeast of the entrance. **Nest Rock** is a small, grass-covered rock island, 15 feet high and 0.9 mile northeast of the entrance. **Williwaw Point** is a low, sandy point 0.3 mile beyond Nest Rock. A cascade is 0.5 mile inland from the head of the bay.

The western shore of the inner bay is a curving, pebble beach fronting a low, grassy bluff. A low, wide valley, through which fog often drifts and winds always draw in northerly and westerly weather, extends across Unalaska Island to Kashega Bay. The western and northwestern shores of the inner bay, eastward of Nest Rock, are lined with low reefs, rocks awash, sunken rocks, and heavy kelp for a distance of 100 to 300 yards offshore. A rock, awash at half tide and surrounded by kelp, lies 300 yards off the north shore directly north of the entrance. A fringe of very heavy kelp, 50 yards wide, lines the south shore from the entrance to Trava Point.

Proceeding to sheltered anchorage inside the inner bay, the controlling depth is

4½ fathoms after passing the entrance. A channel with this depth lies close to the southeast shore of the bay and just outside a heavy fringe of kelp along the northwest shore of Repetition Point. On the north side of this channel the water shoals very gradually to the opposite side of the bay. Northeast of Trava Point the water deepens and the bottom is flat; the depth at the anchorage east of Nest Rock is 7 fathoms.

In northerly and westerly weather violent williwaws occur in the head of inner Kuliliak Bay, above Williwaw Point. In southerly weather short seas, almost breaking across the entrance, make it difficult to enter.

Westward of Kuliliak Bay the country is less rugged; the peaks are lower and are separated by wide valleys. In the spring and early summer the snow disappears from all the peaks to the westward, while in the area east of Kuliliak Bay many peaks remain snow-covered throughout the summer.

From Kuliliak Bay the shore trends southwestward for 11 miles to Lance Point. Rocky ledges extend some distance off the intervening points.

Lance Point, 12 miles southwestward of Eagle Point, is about 465 feet high and has the appearance of a low tongue projecting from the higher land northward of it. **Huddle Rocks,** four small islands, the largest 170 feet high, are about 1 mile southwestward of the point.

About 5 miles westward of Lance Point is a small bight that affords shelter for small craft in all but southeasterly weather. Many rough rocky ledges extend from the shore between Lance Point and this small bight, at the head of which is a broad sand beach divided into two parts by a small rocky point. Three streams flow through the low, grassy valley behind the beach. An islet, 70 feet high, is southeast of the low point which forms the southern side of the bight; rocks awash are 300 yards northeast of the islet. A chain of small rocky islets extends across the entrance to the bight, and a broad, flat reef that bares 1 foot at low water lies northwest of these islets.

Cape Aiak, on the south coast of Unalaska Island, 8 miles southwestward of Lance Point or about 15 miles from Konets Head, is 1,820 feet high, and from the northeastward at a distance appears like a flat-topped island with a massive horn or pinnacle on the southern slope. Breakers extend 300 yards southward from the south end of the point.

Between Cape Aiak and Konets Head the flood current sets westward toward Umnak Pass and increases in velocity as the pass is approached. It is strongest near the shore. The ebb is weaker than the flood.

Surveyor Bay, on the west side of Cape Aiak, is 4 miles wide and 2 miles in depth. About 2 miles northwestward of Cape Aiak, the **Gargoyle Islands,** a group of fantastically eroded pinnacles about 250 feet high, make out 0.4 mile from a point on the north shore and divide the bay into two bights. A reef, awash at high water, connects the islands to the shore.

A shoal, which has a least depth of 3 fathoms and breaks in heavy weather, is 0.3 mile southward from the southwestern extremity of the islands; another 3-fathom shoal is 0.6 mile westward of the same point and 0.5 mile southward of a reef-fringed islet close to shore.

Small-boat anchorage with some shelter from southeastward can be found in 5 fathoms 250 yards from the shore in the cove northwest of the Gargoyle Islands. In using the anchorage, care must be taken to avoid a sunken rock 400 yards from shore

which breaks in moderate weather. The anchorage is not recommended but is the best available shelter between Kuliliak Bay and Umnak Pass.

The westerly bight of Surveyor Bay has low sand dunes along its northern shore; the western shore is fringed with ledges, one of which extends 700 yards off. A 4¾-fathom rocky patch, 1.5 miles 023° from Serpent Point, is approximately in the center of the bight.

Serpent Point, on the west side of the entrance to Surveyor Bay, is a low narrow point projecting southeastward. Anchorage with good shelter except from the south and southeastward can be found 0.8 mile north of the point and 0.5 mile from the west shore of the bay in depths of 15 fathoms. An 8-fathom shoal is 0.5 mile southward of the point.

Chart 9021.—About 1.8 miles westward of Serpent Point, a chain of grassy islets projects southward from **Cape Izigan** and terminates in **South Rock,** 23 feet high; this is the southernmost land feature of Unalaska Island. South Rock is 6 miles southwestward of Cape Aiak and 9 miles southeastward of Konets Head, the west end of Unalaska Island. Depths of 20 fathoms are found 300 yards off the south side of the rock.

Tiderip Point, 6 miles northwestward from South Rock, is marked by a round hill 397 feet high. A chain of rocks, one 25 feet high, extends 0.5 mile southward from the point.

Konets Head, the western extremity of Unalaska Island, is marked by a conspicuous knoll 127 feet high.

Lone Peak, about 3.5 miles northeastward of Konets Head, is the top of a long narrow ridge, 1,847 feet high, running roughly parallel to the coast. From northeastward and southwestward the peak appears like a sharp cone and forms a useful landmark.

The shore between Tiderip Point and Konets Head is fringed by reefs and ledges extending almost 0.5 mile offshore. Ledges extend about 300 yards westward from Konets Head but deep water is found 400 yards westward of the ledges. A bank, with a least depth of 8 fathoms surrounded by much deeper water, is 1.8 miles westward from Konets Head. Heavy tide rips occur on this bank on the ebb.

About 1.5 miles south of Konets Head is **Emerald Island,** a flat-topped, grassy island 0.3 mile in diameter and 204 feet high; the grass becomes green much earlier than on the main island and on account of the rich soil remains greener throughout the summer. The island is fringed by reefs, and a rock, bare 3 feet at low water, lies 700 yards southeastward of it. Another group of rocks, the highest, 8 feet, is 0.5 mile to the northward of the island. On the west side of the island rocks extend 350 yards off.

By using the channel between Emerald Island and Konets Head the tide rips to the southward of Emerald Island can be avoided. The narrowest part of the channel is at the northwest end, where it is less than 0.4 mile in width. The shores bordering the pass are broken with many projecting ledges, but these can be distinguished easily. The rock 700 yards southward of Emerald Island is the only detached danger. A mid-channel course is clear.

Irregular bottom with numerous depths of 6½ to 12 fathoms extends 3.5 miles southward of Emerald Island. Tide rips which have the appearance of breakers occur on these spots on the ebb; with a strong ebb and an opposing breeze they attain considerable size. It is advisable to avoid this area.

Polivnoi Rock, 17 feet high and 100 yards in diameter, is 5 miles southwestward from Konets Head; a breaker is 300 yards southwestward of the rock. Sea lions are often seen in the vicinity. In heavy weather, seas wash over the rock. An 8-fathom rocky shoal, marked by heavy tide rips, is 1.2 miles 065° from the rock.

A convenient anchorage in southerly weather can be found about 1 mile eastward of Konets Head in depths of about 20 fathoms. In approaching this anchorage on the ebb, allowance should be made for the current. The flood is not felt immediately northward of Konets Head.

A small bank, with a least depth of 5¼ fathoms, is about 0.5 mile from shore, 2 miles northeastward from Konets Head. Northeastward of the bank, the shore is steep-to and is exposed to the strong current of Umnak Pass.

Boulder Bay, 5 miles northeastward from Konets Head, is a small bay with a kelp patch in the middle of its entrance. Two small shacks are in a cove on the eastern shore.

No Name Cove, 3 miles northeast of Boulder Bay and on the west side of **Ranchers Point,** is a small bay about 0.5 mile wide and 0.5 mile in depth. A small indentation on its western side furnishes good shelter for small craft except in severe northerly weather.

Station Bay, on the east side of Ranchers Point, is divided into two arms. The eastern arm is about 0.3 mile wide and 1.5 miles long in a southeasterly direction. The buildings of a sheep ranch are on the west shore near the head of this arm. Anchorage for small vessels can be found off these buildings in a depth of 7 fathoms. Near the entrance to this arm is a conspicuous column-rock about 94 feet high. **Peacock Point,** separating Station Bay from the unnamed bight to the eastward, has broken ledges and rocks extending 700 yards northwestward. The western arm of the bay is about 0.5 mile wide and almost 1 mile long in a southerly direction.

Chernofski Harbor, 2 miles east of Station Bay, is described earlier in this chapter.

Umnak Pass, separating Unalaska Island from Umnak Island, is about 3 miles wide and about 10.5 miles long in a northeast and southwest direction from the vicinity of Polivnoi Rock to that of Pustoi Island. For description of the shore, see various headings previously described in connection with Unalaska Island and those following in connection with Umnak Island.

Currents, Umnak Pass.—Current predictions for Umnak Pass are contained in the *Current Tables.* The current is similar to that in Unimak Pass, at times of tropic tides the current may set in a flood direction for as much as 18 hours. The flood sets northeastward and the ebb southwestward with average velocities at strengths of about 3½ and 2½ knots, respectively. Velocities of 4½ knots have been observed.

Between Konets Head and Emerald Island, the average strengths of flood and ebb are about 3½ knots and 2 knots; currents of 4½ knots have been observed. The flood current causes a set almost at right angles to the course when navigating Umnak Pass.

Near Polivnoi Rock the strengths of flood and ebb average about 2½ knots.

The effect of the current in Umnak Pass is felt in a diminishing degree as far as Cape Idak and Cape Aspid on the north side, and on the south side it is felt about 10 miles to the southward of Polivnoi Rock.

On the ebb, very pronounced tide rips occur on the south sides of the shoaler banks in Umnak Pass and in the southern approach. These tide rips are different from the tide rips encountered in Akutan Pass and Unalga Pass. In smooth weather they look

like a line of breakers and may attain a considerable height. In moderate or stormy weather they merge with the seas, increasing their roughness to a considerable extent.

On the flood, light confused tide rips occur in the vicinity of Ship Rock and on the banks to the northeastward of it, while the pass, with its countercurrents, resembles a broad, shallow river, the effect being caused by several lanes of currents and countercurrents. Off the points along the Umnak Island shore, tide rips are dangerous for skiffs and small launches, especially between Otter Point and Kettle Cape.

From the southward, navigation is more difficult, as Polivnoi Rock is low and Kettle Cape is not easily distinguishable against the higher background. With a heavy, southerly swell and a strong ebb it might even be found dangerous to attempt the pass on account of heavy tide rips. The passage north of Emerald Island might be found preferable under such circumstances.

In the approach to the pass the soundings are confusing as there are numerous banks with depths of 6 to 10 fathoms at distances of 4 to 6 miles from Emerald Island and Polivnoi Rock.

The following **directions** are for a course laid eastward of Polivnoi Rock and to avoid the worst of the tide rips: From a position 1 mile east of Ship Rock make good course **217°** for 5 miles to a position abeam of the rocks north of Emerald Island. After passing Konets Head look out for a strong set from the passage north of Emerald Island. Tide rips will be seen on the 8-fathom bank, 2 miles westward of Konets Head, if the current is ebbing. Thence proceed on course **205°**, with Ship Rock astern, for 3.5 miles, to position abeam of Polivnoi Rock, 1.5 miles distant. If bound southwest, the 6-fathom spot 2.5 miles 195° from Polivnoi Rock can be avoided by continuing course **205°** beyond it.

Chart 8861.—Umnak Island, third largest of the Aleutian Islands, is about 65 miles by 15 miles in extreme length and breadth. On the island are reindeer, foxes, and a few head of horses and cattle. Mount Vsevidof, a volcano 6,920 feet high, is the summit of the island. It is situated southwestward of the center of the island, near the western shore, with no other mountains southwestward from it.

Chart 9021.—Tulik Volcano (Mt. Okmok), an enormous crater 7 miles across, is situated in the northern part of the island. Dense smoke was being emitted from various parts of the crater intermittently during 1936.

Mount Tulik is a conical peak 4,111 feet high on the southeastern rim of the crater; another very sharp peak, 3,519 feet high, is on the opposite side of the rim.

Kettle Cape, on the southeast side of Umnak Island and at the south entrance to Umnak Pass, is a jagged rocky ridge about 490 feet high which from certain directions resembles a kettle. It is the first prominent point west of Umnak Pass. The point is more comspicuous than its height or the configuration of the shore would indicate, as low land surrounds it.

Kettle Cape is fringed by rocks; the outer ones to the southeastward are about 0.2 mile offshore and are visible only at about low water. A large area of shoal water, 1.5 miles southeast of Kettle Cape, has a least found depth of 1¾ fathoms. This area breaks heavily in moderate southerly weather. It is marked by kelp but the kelp is difficult to see except in flat calm weather. Depths of 10 to 14 fathoms are found between this shoal and Kettle Cape. The survey ship used this passage frequently as

an approach to an anchorage east of Kettle Cape where some shelter can be found from westerly and northerly weather.

The shore northeastward from Kettle Cape is composed of sections of sand beach backed by low, earth bluffs and gulleys from whence it rises gradually to the rim of the enormous crater of Tulik Volcano which occupies the whole northern part of Umnak Island. Outside the high-water line are several shoals and reefs.

Two miles northeastward from Kettle Cape and extending several miles northeastward, the shore is fringed by rocks extending 500 yards offshore, and comparatively shoal water—less than 10 fathoms—extends 1.3 miles offshore. Heavy tide rips, dangerous for small boats, occur in this area.

Black Rock, a flat rocky ledge 10 feet high, is 7.6 miles northeastward of Kettle Cape and 0.5 mile from shore. Depths of 12 to 20 fathoms are found 0.5 mile southward and eastward of this rock.

About 2.7 miles northeastward from Black Rock is a point with a rocky ledge extending about 350 yards northeastward; a landing can be made behind the ledge.

Otter Point is 12 miles northeastward of Kettle Cape. The intervening shoreline is featureless and Otter Point, when abreast of it, is only recognizable from the change in direction of the shoreline which here turns to the northward. From the northeastward, a knoll 275 feet high, rising above a comparatively flat area just westward of Otter Point, stands out conspicuously.

Ship Rock, lying 1 mile southeastward of Otter Point, is one of the most conspicuous landmarks in the vicinity. It is an island about 500 yards long and 200 yards wide with a sharp inaccessible peak 424 feet high at its southern end. At its northern end is a lower peak ending in an abrupt bluff, giving the island its distinctive shape, but from northeast and southwest only the single higher peak is visible. The channel between Ship Rock and Umnak Island has depths of over 20 fathoms, but on account of strong currents and tide rips it should be avoided.

A bank with a depth of 9 fathoms, on which swirls and tide rips occur, extends almost 0.5 mile eastward of the island, but deep water is found beyond this distance.

Pustoi Island is flat and grassy, 68 feet high and about 500 yards in diameter. It is 0.9 mile northeastward of Otter Point. The channel between Pustoi Island and Otter Point has a depth of 8 fathoms. Deep water is found close off the eastern end of the island.

From Otter Point, the shore trends northward for 2 miles, then north-northwestward for 1 mile, then northeastward for 2 miles forming broad **Otter Bight.** Good anchorage can be found with shelter from south, west, and north, in depths from 8 to 20 fathoms. The adjoining beach is suitable for landing except in heavy northerly weather.

A vessel could remain in Otter Bight in moderate southeast weather but not in severe storms. In approaching the anchorage, the depths shoal rapidly from 20 to 10 fathoms about when Pustoi Island comes on range with Ship Rock. Depths of 10 fathoms are found 1 mile from shore, but depths of not less than about 6 fathoms will be found at a distance of 600 yards from shore.

A reef extends 400 yards from shore at a point 3 miles northward of Otter Point. One mile north of the reef high land begins and extends northward to Cape Idak.

The shore northeastward of Otter Bight to Cape Idak is composed of steep bluffs,

with several rocky islets close to shore. It has no hidden dangers except very close to the land and the shore can be skirted at a distance of 0.5 mile.

Cape Idak, the northeastern point of Umnak Island, is the northern end of a long, flat ridge about 1,570 feet high, sloping gradually to the northward. From the eastward this point appears as the northern end of the island as the land to the westward is low, but Cape Tanak extends about 2.7 miles farther north.

Chart 8861.—Between Cape Idak and Cape Tanak is a flat bight, which, because of low land back of it, appears to be more deeply indented that it actually is. The shore of the bight is very regular and lined with sand, while inland the terrain is low and grassy except in the region about 1.5 miles westward of Cape Idak, where a mountain slope terminates in bluffs near the beach. Depths of 20 to 30 fathoms are about 1 to 2 miles off the shore of the bight with the bottom shoaling gradually toward the beach.

Cape Tanak, about 7 miles west-northwestward from Cape Idak, is a low, rounding point with a number of hummocks about 50 feet high. Very deep water—more than 100 fathoms—is found within 1 mile of Cape Tanak, though two narrow ledges with depths less than 100 fathoms extend into much greater depths and cause tide rips which may be mistaken for signs of shoal. Good shelter from southerly weather can be found eastward of Cape Tanak.

The flood currents, which set northeastward along either side of Umnak Island, unite in the vicinity of Cape Idak, causing tide rips. The ebb divides in the vicinity of Cape Tanak.

Ashishik Point is a narrow point about 3 miles westward of Cape Tanak. It is low and from offshore blends with the higher land in back of it. The point extends almost as far north as Cape Tanak and it should be given a berth of more than 0.5 mile. Landing can be made on this point except in northerly weather and there is a good supply of water nearby.

The bight between Cape Tanak and Ashishik Point furnishes good anchorage in southerly weather. Since the prevailing winds in summer are southwesterly there are frequently long intervals when this bight is comparatively smooth.

From Ashishik Point the coast of Umnak Island trends southwestward. **Boiling Pinnacles,** with least depth of 3½ fathoms, are about 3 miles due west of Ashishik Point, with the outer end of the point in range with the outer end of Cape Tanak. The shoal is about 1.5 miles from the shore of Reindeer Point. Deep water is found outside of this shoal. It is marked by kelp, and tide rips occur to the northward of it. With the exception of this shoal, no indications of dangers have been found along the west coast of Umnak Island as far southward as Cape Kigushimkada and vessels in general may approach 1 mile off the shore.

Reindeer Point is 3 miles westward of Ashishik Point.

Cape Chagak, about 6 miles west-southwestward of Ashishik Point, is not conspicuous. On the north side of the cape there is a bold bluff rising about 200 feet. Southwestward of Cape Chagak the beach is about 3 miles in length and generally sandy.

Aguliuk Point is 5 miles southwestward of Cape Chagak and 4.5 miles northeastward of Cape Aslik. Northeastward of the point, for a distance of about 2 miles, the coast is broken and irregular with bluffs, sand beaches, lava outcrops, and offlying rocks, the farthest of the latter being within 125 yards of the high water line.

Rocks lie off the lava outcrops forming the foot of Aguliuk Point, and a long, narrow edge of rocks, 100 feet high, extends breakwaterlike for 225 yards into the sea on the southern side of the point. A sand beach, beginning at this edge, extends southeastward for about 3 miles to Cape Aslik. Back of this beach, for about 3 miles, the terrain is a regular and fairly consistent slope.

Bogoslof Island (lat. 53°56′ N., long 168°02′ W.) lies in the Bering Sea about 22 miles due north of Cape Tanak. It is of recent volcanic formation, and eruptions have completely changed the topographic features several times. According to existing records, eruptions have occurred in 1796, 1883, 1906, 1910, and 1923–27, but it is probable that there have been other eruptions of which there are no records. It now consists of one main island and a rocky islet known as Fire Island. Bogoslof Island forms a useful landfall on a course west from Cape Cheerful.

The 500-fathom curve around Bogoslof Island approximates a circle about 5 miles in diameter.

The main island, once known as **Castle Island** because of a castle-shaped rock on it, is about 1 mile long and 0.5 mile wide, and extends in a northwesterly and southeasterly direction. The southern end terminates in a low, black sand spit which is now the "haul-out" place of a large number of sea lions. This point was found to shift its position during the season of 1935. On the northwest part of the island is the volcano crater of recent time from which steam emits occasionally, and adjoining the crater is a pond which is 4 feet below high water; the crater is 141 feet high. The rocky portion of the island is the home of thousands of birds.

Castle Rock on the southwest part of the main island no longer resembles a castle. Its outline is ragged and consists of two main pinnacles, 333 feet high.

Fire Island, 225 feet high, is 440 yards northwestward of the main island and practically connected with it by a rocky ledge which is awash at low water. It is a steep, rocky island, 220 yards long and 100 yards wide, and has three distinct summits, the middle one being square and resembling a castle. This summit is lower than the adjoining ones. A small islet, 190 feet high, adjoins Fire Island.

Anchorage can be had on the northeast side of the island, offshore in 20 fathoms, sandy bottom. Anchorage can also be found on the northwest side of the island, 800 yards offshore, in 10 fathoms. These are fair-weather anchorages only.

A current is often reported setting eastward in this vicinity; it is variously reported to set toward Cape Cheerful and toward Umnak Pass, with a velocity of 0.1 to 0.4 knot. It is inferred that with a barometric depression near Unimak Pass it sets toward Cape Cheerful, but with a depression in the Pacific Ocean southward of Unalaska Island it sets toward Umnak Pass. Vessels coming from westward often made Point Kadin ahead instead of to starboard. Maximum northwesterly currents of 1.3 knots were found on the northeast side of the island. There were also indications of a stronger easterly current on the northern side of the island. A current, setting continuously northward for 21 hours at an average velocity of about 1 knot, was observed at a location 0.5 mile west of Bogoslof Island.

Chart 9025.—The shore of **Cape Aslik** is the face of an old lava flow. It is very precipitous and irregular, with numerous sunken rocks extending well offshore. Heavy kelp fringes the southern side of the cape. The cape is prominent, with vertical cliffs

60 to 150 feet high. Back of the cape, about 2 miles inland, is a conspicuous, conical hill, 865 feet high. This hill is of a dark red color, with a distinct hole in the slope on its southwest side. Farther inland, about 6 miles eastward of Cape Aslik, a distinctive peak rises to an altitude of 3,310 feet. It is very ragged with deep slopes and a shoulder 600 feet lower than the summit, extending about 0.5 mile to the northwest. Between Cape Aslik and Cape Kigunak the shore is a beach of fine black sand. Back of this beach is a large, flat valley bordered by mountain ridges on the north and south, and having a lone and prominent mountain in the middle. The valley, which extends to the Pacific Ocean side of Umnak Island, is swamp land covered with a heavy growth of grass. A large stream flows through this valley.

Cape Kigunak, about 5 miles south of Cape Aslik, is easily distinguishable and is a very prominent point on approaches from the north. It has a sharp, conical peak, 1,164 feet high, near its outer end. Its shore consists of a steep beach of boulders and broken rocks, with steep, grass slopes rising directly behind. Two rocks about 15 feet high, 300 yards off the western part of the cape, and a third rock, same height, on the low-water line show up very conspicuously. Many boulders and rocks and a band of heavy kelp extend about 400 yards offshore around the cape. The bight north of Cape Kigunak affords some protection in southerly and easterly weather, but is not recommended in heavy weather.

Inanudak Bay, between Capes Kigunak and Ilmalianuk, has depths of 10 to 40 fathoms and affords shelter except from the west and northwest. The shore of the bay is rocky and precipitous except at the heads of the several coves or bights which form part of the bay. Sand and pebble beaches are found at the heads of these coves, and low bluffs, from 5 to 20 feet high, rise abruptly from the beaches. Beyond these bluffs are flat lands or valleys.

From the westernmost point of Cape Kigunak, the shoreline curves sharply southeastward and eastward and the shore of the bay for about 2 miles is along the foot of a ridge almost straight up from the water line. At the end of the ridge, and at the head of **Izhiga Cove,** is a sand beach which extends to Cinder Point. The water is quite shallow along the beach and several lines of breakers make small-boat landing difficult. Back of the beach, beyond the low bluff bordering it, is a flat valley.

Cinder Point was formed by a lava flow and is about 150 feet high near the shore, except in the middle where there is a slight draw. A cinder cone 564 feet in height is near the center of the point.

Stepanof Cove, southeastward of Cinder Point, has a sandy beach about 1 mile in length at its head. Very shoal water and several lines of breakers make small-boat landing difficult except on the north side of the cove where the water is usually quiet; here fresh springs and seepages exist along the beach. A 70-foot pinnacle rock at the southern end of the beach is conspicuous from all parts of this cove. A low, narrow valley with steep sides extends southeastward from the head of Stepanof Cove to the Pacific Ocean side of Umnak Island. The buildings on the south side of the valley are stocked and maintained for land-air rescue work. A road extends from Stepanof Cove to Fort Glenn, about 20 miles to the eastward.

Steeple Point, forming the southern side of Stepanof Cove, has a very prominent, tall pinnacle projecting out of the side of its steep bank and numerous large rocks and boulders off its shore. The pinnacle resembles an inverted carrot and is 200 feet above the beach.

Hot Springs Cove has a mile of sand beach at its head with a small stream in the southern part. Salmon spawn in the stream about 2 miles back of the beach beneath several small waterfalls. The steam from several small, hot springs at the head of this stream can be seen from the eastern side of Inanudak Bay.

Between Hot Springs Cove and Cemetery Cove to the westward are 1.5 miles of rocky shore. Near and a little west of the center of this shore is shoal water marked by kelp, extending 0.4 mile offshore to the 10-fathom curve. Above the beach near the center is a high, overhanging cliff, about 1,000 feet in elevation. The beach in **Cemetery Cove** is rocky and bends northward toward Broken Point. Water may be obtained from a small cliff stream on the northern part of this beach.

Broken Point is not conspicuous. It has a rocky beach but the water is deep off the point and the 20-fathom curve is about 0.3 mile off its shore.

Geyser Bight, west of Broken Point, is about 1.5 miles in depth from a line tangent to Broken Point and Cape Ilmalianuk. Its beach is rounded and about 4 miles in length, with the eastern half sandy while the western half is rocky and bordered with kelp. There are 3 small rock islets 0.3 mile offshore in the center of the bight and another the same distance off the beach in the eastern part. Some protection may be found in Geyser Bight in southerly weather but it is not recommended in heavy weather.

Cape Ilmalianuk, the southern entrance point of Inanudak Bay, is about 500 feet high and conspicuous. It has a rounded shore, with a number of rocks and kelp extending seaward for about 300 yards. A rock, 0.4 mile northwestward of the point is conspicuous at low tide. A shoal area extending 1.5 miles off the cape is 10 fathoms deep 0.5 mile offshore and 20 fathoms about 1 mile farther off. Ships should keep 1.5 miles off the cape.

Anchorage may be found in any part of Inanudak Bay about 0.4 mile from shore. By shifting, shelter may be obtained from all directions except the northwest. No anchorage will give protection from severe northwesterly weather. Good anchorage is available for large ships in 20 fathoms about 1.5 miles from the beaches at the heads of Stepanof Cove and Hot Springs Cove.

Stepanof Cove affords the best shelter from southeast around to north-northwest. Anchorage may be found in 8 fathoms with Cape Kigunak just open of Cinder Point. When the wind gets around to south or southwest, this cove becomes uncomfortable and anchorage in Cemetery Cove is better.

Hot Springs Cove affords shelter in southerly and easterly weather but Stepanof Cove is otherwise considered more desirable.

Cemetery Cove affords shelter except from winds from the northwest quadrant. Anchorage may be found in Izhiga Cove 0.3 mile from shore in 8 to 10 fathoms, but better shelter from northerly weather can be found in Stepanof Cove.

Chart 8861.—Between Cape Ilmalianuk and Cape Kigushimkada, a distance of nearly 13 miles, are no dangers to navigation, no anchorages, no refuges, no tide rips, and ships are advised to keep 1 mile offshore in order to hold a depth of 25 fathoms or more. Kelp extends from 200 to 300 yards off the rocky areas.

The currents off the coast between Cape Ilmalianuk and Cape Kigushimkada are estimated to be from 2 to 3 knots, the strongest being opposite Kshaliuk Point. The current sets northeast on the flood and southwest on the ebb.

The weather conditions along this coast are apt to be different after passing Derby

Point. When foggy, wet, windy weather prevails southwestward of the point, good or comparatively clear weather may be encountered to the northeast and vice versa.

Between Cape Ilmalianuk and Derby Point, a distance of about 10 miles, the coast extends in a general southwesterly direction. A practically straight sand beach about 3 miles in length begins on the southwestern side of Cape Ilmalianuk.

Kshaliuk Point is a rounded, prominent point at the southwestern end of the beach. This point has grassy bluffs about 400 feet high, except on its northern side which is practically straight up and down with prominent horizontal layers of stratified rock. Southwestward of the point, the land back of the shore is low, the beach consisting of short stretches of sand, rock and lava formation. The most conspicuous lava flow is at **Twinlava Point,** about 4 miles southwestward of Kshaliuk Point.

Southward of Kshaliuk Point, between it and Mount Vsevidof, are 3 sharp prominent peaks about 2,000 feet high and approximately 0.5 mile apart. Less than 1 mile from the peak nearest the shore is another prominent peak of about the same elevation. It has a broad, rounded base, rising almost from the shore and has two points on the top; a low dipping saddle connects the points.

Derby Point, about 1.5 miles southwest of Twinlava Point and 3 miles northward of Cape Kigushimkada, has cliffs and rock outcroppings along its shore. The steep sides of the point are grass-covered above the cliffs, but the top is bare and strewn with cinders and small lava boulders. The rounded hill on the point resembles the crown of a derby hat when viewed from seaward, the rocky shoreline forming the brim of the hat. This point is a conspicuous feature of this coast, and also serves as a line of demarcation for different weather conditions.

The coast between Derby Point and Cape Kigushimkada has a southerly direction and consists of a bold, rocky cliff at the base of Mount Vsevidof.

Mount Vsevidof is an extinct volcano 6,920 feet high and the highest peak on Umnak Island. It is about halfway between Inanudak Bay and Nikolski Bay, and approximately 40 miles southwestward of Cape Idak.

The upper reaches of this mountain are covered with snow the year around. In 1938 however, its slopes, which appear smooth from offshore, were observed practically bare of snow after the month of August. The western side slopes gradually to the shore between Twinlava Point and the northern end of the large open bight south of Cape Kigushimkada.

The peak appears conical from the northwest with a slightly flattened top, but the large crater so plainly visible from the Pacific side of Umnak Island, does not show at all. The two small glaciers on the northern side of the extinct volcano are not prominent from offshore, but the valley extending inland on this same side has many bare, cinder patches and lava outcrops visible from offshore. This valley goes back toward the large, jagged, saw-toothed mountain range, 6,510 feet high, to the northeast of Mount Vsevidof.

Cape Kigushimkada is the northern point to a large open bight. This cape, at the base of Mount Vsevidof, is the outer end of a lava-flow which forms a very rugged, rounded headland having precipitous, rocky bluffs, 80 to 90 feet high, with numerous jagged indentations. Many rocks and pinnacles are adjacent to the rough and rocky shore of this cape. The shelf on top of the cape is covered with many lava outcrops, cinder beds and fissures, and rises gradually inland to form part of the western slope of Mount Vsevidof.

On the southeast side of Cape Kigushimkada is a bold headland, prominent from seaward. A broad sand beach, about 1.5 miles south of this headland extends for about 2.5 miles south-southwestward. Behind the beach is a broad, grassy valley with three prominent streams, the two northernmost carrying the drainage from the southern slopes of Mount Vsevidof.

At the southern end of the sand beach is a rocky headland with outlying ledges that are partially awash at high water. A rocky islet is about 0.6 mile west of the headland. About 0.5 mile south of this islet is a sunken rock which breaks in heavy weather, and another islet is about 1 mile north of Okee Bay. From the headland the shore runs in a southwesterly direction and is very irregular, with numerous indentations.

Chart 9025.—Okee Bay is a small, shallow cove on the eastern side of a small peninsula on the northern side of Okee Point. This bay affords some shelter for small craft and has a sand beach where landings can be made in most any kind of weather. Another small, shallow inlet is on the western side of the small peninsula.

Okee Point is a headland on the north side of the entrance to Nikolski Bay. It has steep, rocky bluffs back of the high-water line and rocky ledges extend offshore.

Southwestward of Cape Kigushimkada are no high peaks and the land is rolling, with numerous, rounded hills. The bottom along the shoreline of both Umnak Island and Ananiuliak Island is very uneven and has some dangers to navigation. This area has been surveyed, but from the very nature of the bottom some pinnacle rocks may have been missed.

Ananiuliak Island, on the northern side of Nikolski Bay and off Okee Point, is a kite-shaped island about 1.4 miles in length and 301 feet high near the center. Rocky ledges, above high water but pounded by the surf, extend 50 to 60 yards from the grass line on the shore of the western side of the island. Passage between this island and Umnak Island through **Seaweed Pass** is not advisable in the absence of aids to navigation as there are no natural ranges that can be recommended. In the summer, if there are no storms, kelp grows almost completely across the passage. A **light (lat. 52°59′.8 N., long. 168°55′.1 W.),** 82 feet above the water and visible 8 miles, is shown from a small white house on the southwest end of the island. The light is obscured from 211° to 254°.

Nikolski Bay, between Ananiuliak Island and Cape Starr, is about 12 miles southward of Mount Vsevidof. It is about 4.5 miles wide and 3 miles in depth, and is open from the west to the north-northwest. The shore of the bay consists mostly of gravel and rock beaches. It is fringed to varying distances offshore by reefs, large boulders and kelp. Many of these reefs actually are above high water but are covered by the heavy swell except on very calm days. The area bordering the reefs along the shore is foul, with numerous sunken rocks. It should not be approached too closely.

The bay is surrounded by rolling hills, which are covered with a thick mat of grass, and frequent, marshy areas. **High Hill,** also known as **Niggerhead,** 712 feet in height, is the highest hill near the bay's shore. It is near and north of the center of the bay and is a prominent landmark in approaching anchorage. It is cone-shaped but flat-topped, and the sides, except inland, are steep, rocky and rugged.

Except on very calm days there are few places where safe landings can be made. It is reported by the natives that in the winter when heavy northwesters are blowing,

it may be impossible to land even at Nikolski in Mueller Cove. Landing is possible in most any weather in River Cove in the mouth of Sheep Creek.

The currents are rather strong, especially around Ananiuliak Island, but are not dangerous, as they generally run parallel to the shoreline.

Anchorage with protection from westerly and northerly weather is found in the northern end of Nikolski Bay behind Ananiuliak Island in 10 to 25 fathoms of water with good holding ground. A good anchorage in easterly weather is off **Kelp Point** in 10 to 20 fathoms of water.

Eider Rock, about 1 mile northwest of High Hill, is a small island reef 600 yards offshore in the northeast portion of Nikolski Bay.

The head of Nikolski Bay southward of Kelp Point is a rectangular-shaped bight with a large, rocky ledge along the shore at its head. The two coves in this bight are **River Cove** at the northeast corner and Mueller Cove in the south. The large rocky ledge separating the two coves is almost entirely covered at high water.

With the exception of the stream which drains **Umnak Lake** into Mueller Cove, **Sheep Creek** is the largest stream in the vicinity and empties into River Cove. The creek extends northeastward into a broad, marshy valley dotted with numerous ponds. Fish traps are built by the natives across the mouths of these streams.

Mueller Cove, the inner anchorage of Nikolski Bay, is the cove in which the village of Nikolski is located. Only very small fishing boats attempt to enter this cove due to the constricted entrance caused by the reef in mid-channel. With any kind of weather from the west or north, seas break across the entrance.

Rudisell Reef, at the entrance to Mueller Cove, is practically covered at high water and in heavy weather the seas break over its narrow, outer ledge of rocks which are about 4 feet above high water. This ledge, however, serves as an excellent natural breakwater and protects the beach at the head of Mueller Cove except when heavy northwesters are blowing up the bay.

A rock, covered ¾ fathom, is 0.1 mile west of Rudisell Reef and in the entrance to the channel into Mueller Cove. The location of this rock nearly always can be determined by the breaker over it. At high water, in westerly weather, it may break very heavily and cause a dangerous surge across the channel roward Rudisell Reef.

Nikolski (*pop. 64, in 1950; P. O.*), a native village with a few white inhabitants, is one of the most frequented anchorages for small trading schooners west of Unalaska. Fishing, trapping and the harvesting of seals in the Pribilof Islands are the means of livelihood. A good shingle beach is in front of the village. The store and the church are painted white and are the most prominent buildings in the village. The church has two crosses, one of which is on the belfry tower. This tower is the most conspicuous point in the village. The store carries a few supplies, but is stocked only during the trapping season. The ranch buildings of the Aleutian Livestock Co. are about 0.3 mile southwest of the village. The buildings of the company consist of living quarters, barns, and storehouses. The largest of these buildings is the shearing barn which is a landmark looming prominently on the skyline from the anchorage off Kelp Point. The wool-storage building, painted red, also makes a conspicuous landmark.

Cape Starr, about 3 miles to the westward of Nikolski, is a bold headland with steep rocky bluffs, 150 to 350 feet high, backed by rolling, grass-covered hills. The shoreline is bordered by rough, irregular, rocky ledges and reefs, numerous rocks and

extensive kelp beds. Several small islets, reefs and rocks awash are from 0.5 to 3 miles off Cape Starr.

South of Cape Starr is a wide and flat beach of fine white sand. Back of the beach are low, grass-covered, sandy bluffs formed by the wind piling up the sand of the beach. Inland a broad valley extending across the island, bends northeastward to the chain of lagoons south of Nikolski. The remainder of the Bering Sea coast of Umnak Island is mostly rocky and rugged. Southwestward and westward from the white sand beach are numerous jagged, rocky projections and rock pinnacles. The area outside the high-water line is filled with rocks, small ledges and patches of kelp. The most prominent and highest place of the southwest end of Umnak Island is **Elbow Hill,** 442 feet high, about 4 miles southwestward of Cape Starr. It is grass-covered and is prominent from seaward in all directions. **Idaliuk Point** is 2.4 miles due west of Elbow Hill.

Pancake Rock, about 2.5 miles westward of Cape Starr, is a 22-foot islet which sometimes has, from a distance, the appearance of a flat pancake lying on the surface of the water. This islet is the eastern end of a low, flat, rocky reef about 500 yards in length.

Several reefs and rocky islets lie southeastward of Pancake Rock. The farthest from the shore of Umnak Island is a rocky islet, surrounded by ledges and rocks awash, about 1 mile southeast of Pancake Rock and 1.5 miles offshore from Cape Starr.

Adugak Island, about 7 miles west of Cape Starr and 4 miles off Idaliuk Point, is 160 feet high. In moderate weather, anchorage for small vessels is possible in the bights north and south of the island, in 10 to 15 fathoms. Because of the rocky bottom and limited swinging room, they are not recommended.

Chart 8861.—Cape Sagak, the southwestern end of Umnak Island, is long and generally low with rolling hills entirely grass-covered, and with short stretches of sand beaches.

The passage between Cape Sagak and the northeastern point of Samalga Island is dangerous. Foul ground and extremely heavy tide rips extend entirely across between the two points of land and for a considerable distance northward and southward. There is hardly any assurance of clear water in the pass, and during the late summer months there are impenetrable patches of kelp. The current goes through at a very high velocity, probably 7 knots at maximum strength.

Vessels drawing more than 4 feet should avoid this passage. Boats of less draft may pick their way through only during periods of slack water and in fair weather. Such craft should clear Cape Sagak by 0.25 mile on a course **160°.**

Samalga Island, the long and narrow island about 2 miles southwest of Cape Sagak, is 4 miles long and 0.5 mile wide at its widest part. The highwater line is strewn with rocks and small boulders, and occasional stretches of sand beach are found around the island. Back of the shore the terrain rises abruptly in the form of grassy slopes. The interior is flat, from 30 to 60 feet above sea level, and entirely covered with grass. Foxes and sea lions are the only wild life on Samalga Island. It is not inhabited, except for one month during the winter when the trappers come to get fox pelts.

The entire island is fringed with a rocky ledge, bare at low water and extending from 100 yards to 0.5 mile offshore. On the southwest end of the island this ledge becomes an extensive reef stretching west-southwestward along the prolonged axis of

the island for nearly 2 miles. In heavy weather there are breakers for a considerable distance over this area.

Landings can be made at various places, but should not be attempted in heavy weather as the island is then almost entirely surrounded with breakers. The best place to land is in a small bight just north of a cabin on the northern side of the north end of the island. Vessels may anchor in 10 to 15 fathoms on the bank which extends 160° from the middle of Samalga Island, or in not less than 15 fathoms, north of the southwestern end of the island. There is no protection in either of these anchorages.

The currents are treacherous in the vicinity of Samalga Island.

The southeast coast of Umnak Island should be navigated with great caution. Southwestward of Vsevidof Island, fog appears to be much more prevalent than to the northward. With westerly and southwesterly weather the fog drifts across the low, southwestern part of Umnak Island while the high mountains northwestward of Mount Vsevidof form a barrier which may cause clear weather to be found in their lee when all the area southwestward of Vsevidof Island is in fog.

Westward of Samalga Island currents of approximately 4 knots have been observed setting northward when the tide at Dutch Harbor is rising and southward when it is falling.

Currents are weak over the bank inside the 100-fathom curve south of Umnak Island.

Northeastward from Cape Sagak, the Pacific side of Umnak Island is fringed with rocky ledges and kelp beds. The shallow bight 11 miles from the cape has a sandy beach above the ledges and is backed by low, grassy bluffs about 100 yards inland. A chain of three lagoons lies in the low valley which extends northward from the bight to the village of Nikolski. On the northeast side of the bight is a bold headland with steep, rock bluffs rising to an elevation of 561 feet.

Driftwood Bay, about 40 miles southwestward of Konets Head, Unalaska Island, is on the southeast coast of Umnak Island opposite Nikolski. The bay is between Cape Udak and Black Cape. It is about 3.5 miles across the entrance and is divided into two arms by a headland about 435 feet high. Fresh water may be obtained in either arm.

The western arm is clear of dangers and shoals gradually. From its head a trail leads across the island to the village of Nikolski. Good anchorage may be found in 15 fathoms of water. In southwesterly weather some shelter may be obtained in the lee of Cape Udak. In southerly or southeasterly weather, there is no good anchorage, but in an emergency small boats might find some shelter in the eastern arm.

The eastern arm, **Traders Cove,** is more or less foul and should not be entered without local knowledge. Small boats could be hauled out on the sandy beach in the northeast corner of this arm. In this corner is a shack in which fuel and food supplies are kept for sheepherders.

To enter Traders Cove from a position 0.5 mile south true of Black Cape, steer **330°** for a small rocky ledge 415 yards 305° from the low eastern entrance point. Pass about 225 yards westward of this point and round it about the same distance. Anchor about 300 yards northward of the point in 7 to 8 fathoms.

Cape Udak, on the western side of Driftwood Bay, appears as a flat plateau about

600 feet high and about 1.2 miles across its seaward face. All sides of the cape are precipitous, rocky cliffs.

Black Cape, about 392 feet high, is on the eastern side of Driftwood Bay. The cape slopes gently down to the water's edge and has a group of rocky islets, about 135 feet in height, 175 yards offshore.

Lookout Point is 4 miles northeastward of Black Cape. From Lookout Point to the point opposite Kigul Island, a distance of about 6 miles, the shore of Umnak Island trends east-northeastward. Numerous rocky islets extend off this shore to a distance of 1.5 miles. In addition to these visible objects, numerous kelp patches mark depths of 2 to 5 fathoms. The outermost of these is south of Kigul Island and has a depth of 4½ fathoms.

Amos Bay is 8 miles northeastward of Black Cape and about 3 miles northward of Vsevidof Island. It is about 0.7 mile wide and 1 mile long in a north-south direction. The western side of the bay is bordered by reefs extending about 400 yards offshore, and the head is shoal. Anchorage with shelter from northeast to west can be found 0.3 mile west of the eastern entrance point, in depths of 7 fathoms.

To approach this anchorage, from a position 0.8 mile west of Vsevidof Island steer **000°** for 3.5 miles, passing 0.4 mile westward of a rocky islet lying 1 mile south of the eastern entrance point. Favor the eastern shore of the bay to avoid the reefs bordering the western shore. A trail leads from the head of the bay to Nikolski on the west coast. On the east side of the bay is a cabin in which food and fuel are kept for sheepherders.

Vsevidof Island, 280 feet high and about 1 mile across, is the largest of the group of islands on the southeastern side of Umnak Island and is southeastward of Mount Vsevidof. A small bay indents the southern shore of Vsevidof Island. Sunken rocks at the entrance prevent anything larger than a small launch from entering and then only when no surf is running. Rocks extend southeastward 0.4 mile from the southeast point of the island, terminating in a rocky islet about 30 feet high. Deep water—more than 20 fathoms—is found 0.3 mile eastward of these rocks.

Ogchul Island, 1.7 miles eastward of Vsevidof Island, is about 0.3 mile across, 180 feet high, and is surrounded by deep water. The island is flat-topped. The channel between the two islands has depths of 35 fathoms or more.

Kigul Island, 3.5 miles northward of Vsevidof Island and about 2 miles eastward of Amos Bay, is the largest of the inshore islands. It is about 0.5 mile in diameter and 219 feet high. The island lies 0.5 mile off the coast of Umnak Island, and the channel in the passage between the island and the coast is restricted by shoals to a width of about 150 yards. Northward of Kigul Island, anchorage with shelter from southerly and westerly winds can be found in depths of about 12 fathoms. Anchorage with shelter from easterly winds can be found westward of the island in depths of 7 fathoms. The approach to this anchorage is difficult without local knowledge.

Lone Rock, 1.5 miles northeastward from Kigul Island and 42 feet high, is the northernmost of the group of rocks and islets in this vicinity.

Russian Bay is an open bay near the middle of the Pacific Ocean side of Umnak Island. It is about one mile wide and 2 miles in depth. A rocky ledge 16 feet high lies about one mile east of the southern entrance point. This ledge should be given a wide clearance to the southwest to avoid a rock awash at low water which is about 425 yards southwestward of the ledge. The point on the northeast side of the entrance

should also be given a wide berth to avoid the foul area extending southwestward of the point for about 0.3 mile. At the head of Russian Bay is a sandy beach where a stream of considerable size flows into the bay. This bay offers protection from northerly weather with an anchorage in 10 fathoms, sandy bottom. In southeasterly weather the bay is not recommended except in an emergency.

The Pillars are a pair of pinnacle rocks, the larger 130 feet high, about 3 miles off the shore of Umnak Island and 15 miles northeastward from Vsevidof Island. These rocks stand out very prominently from all directions and may be seen many miles on clear days. From the north and south they have the appearance of a single pinnacle. From the east both rocks are visible. A rock awash at high water lies about 175 yards eastward of The Pillars. Deep water, 14 fathoms or over, can be carried to within 0.3 mile all around these rocks.

Thumb Point, about 3 miles west of The Pillars, is a long, narrow point, on the tip of which are three large pinnacles. Two of these, about 150 feet high, are on the beach. The third, 121 feet high, lies about 150 yards offshore. From distances less than 5 miles these three pinnacles are very distinct; though several others of like size are in the vicinity, these cannot be mistaken, there being no other group of three.

The broad bight between Thumb Point and Kettle Cape is fringed by offlying ledges. Two valleys lead across Umnak Island toward Inanudak Bay from the head of this bight.

Chart 9030.— The **Islands of Four Mountains** are a group of five, treeless, volcanic islands lying westward of Umnak Island. Their names are Uliaga, Kagamil, Chuginadak, Carlisle, and Herbert. The group is about 16 miles from Samalga Island and about 18 by 25 miles in extent.

These five islands are all high and snowcapped, with some snow remaining throughout the year. Clouds obscure the peaks most of the time. Frequently in the summer, while low fogbanks lie over the adjacent waters, the peaks stand clear above and are visible away from the fog banks. Fog is often in patches that may be avoided by passing around one of the islands, or by moving out of the sweep of wind through a pass. The winds play about the islands with all the vagaries common to williwaws and may sometimes be avoided by making a move of a mile or so.

Navigation among the islands is beset by frequent fogs, strong and treacherous currents, and tide rips which may be dangerous for small craft. Because of the frequent fogs and strong currents it is emphasized that navigation is safe only by frequent sounding and constant reference to the chart. All waters are clear for large ships at distances beyond about 1 mile from the shores, and for small craft beyond 0.25 mile except where obstructions are charted. It is not safe to attempt passage inside any of the offlying rocks.

In **Samalga Pass,** between Samalga Island and the Four Mountains Group, the waters are deep and 15 miles in width; however, a good berth must be given the shoals extending southwestward from Samalga Island.

A bank, with a minimum depth of 13 fathoms, is about 5.5 miles southward of Concord Point, Chuginadak Island. Apparently it is the high spot of a large shoal area rather than a pinnacle.

Among the group, the passes are probably all clear, though they have not been swept with wire drags.

It is strongly recommended that a vessel proceeding along the north side of the Aleutian Islands should avoid anchorage in the Four Mountains Group in bad weather. With a heavy sea running in the Bering Sea, dangerous tide rips will be encountered among the islands, and any lee afforded by indentations on the islands' shores is offset by the sudden shifting of the wind which may necessitate shifting anchorage during thick fog through narrow passes subject to strong tide rips.

Uliaga Pass, between Uliaga and Kagamil Islands, has a depth of 9 fathoms across almost its entire width, and a mid-channel course clears all known dangers. In the middle of the pass is a light growth of kelp; it is towed under and is difficult to see except during the periods of slack water.

Kagamil Pass, between Kagamil and Chuginadak Islands, is wide and clear; no obstructions northwestward of Corwin Rock. The least depth in the pass is 7 fathoms 1.2 miles north of Chuginadak Island.

In **Carlisle Pass,** between Chuginadak and Carlisle Islands, a mid-channel course will carry 28 to 32 fathoms in the shoalest part. The depths increase very quickly to 80 and 90 fathoms at both ends of the narrowest part of the pass. On either side of mid-channel the water shoals rapidly toward land, but no danger exists until about 550 yards from the shoreline. The currents in this channel are strong and the rips and swirls are of moderate intensity. Small boats should avoid the center of the pass to clear the worst of these.

Chuginadak Pass, between Chuginadak and Herbert Islands, is about 3 miles wide, with depths of more than 100 fathoms.

Between Herbert Island and Yunaska Island, to the westward of the Four Mountains Group, the passage is 14 miles wide and very deep.

Current observations among the Islands of Four Mountains have not been sufficiently detailed to serve as a basis for precise predictions. The best index to the times of flood and ebb appears to be the information for a location 1 mile east of Yunaska Island which is given in the *Current Tables*. Flood sets generally northward and ebb southward. The duration of slack is usually very short.

Among the islands the water swirls and counters in a highly confused manner, so that rips and eddies may be encountered almost at random. Rips in some cases indicate bottom configurations, but often not. Particularly in bights along the shores, currents counter to those outside may be anticipated.

Strong tidal currents set through all the passes. Velocities exceeding 4 knots have been noted and it is probable that they reach 5 and 6 knots at times. Heavy tide rips may be anticipated except at slack water. In Uliaga Pass and in Carlisle Pass, the flood sets northeasterly. Between Herbert Island and Chuginadak Island flood is to the northwest. In Kagamil Pass the currents are confused and the flood appears to enter the passage from the east, passing to the northwest to mingle with the flood current from Carlisle Pass, and thence turns northward along the west side of Kagamil Island. South of Chuginadak Island considerable differences in the direction and strength of the current over short distances may be noticed. Heavy rips, except in calm weather and at slack water, are located about 1.5 miles southeastward of Concord Point, the southeastern point of Chuginadak Island. Current boils have been noted as far as 7 miles offshore. Inshore, the set appears to be to the eastward most of the time. Offshore, about the 500- to 1,000-fathom curves, it seems to be principally to the westward.

Anchorages in the group of Four Mountains Islands are few and inadequate. The principal one is in Applegate Cove, a bight on the north shore of Chuginadak Island. Protection from northerly weather may be found in South Cove on the opposite side of this island from Applegate Cove. About 3.5 miles to the eastward of South Cove is another anchorage, of small extent but offering excellent protection from the north. An anchorage giving protection from southwesterly to northwesterly weather is available in the bight at the northeast corner of Chuginadak Island, about 0.9 mile south of Corwin Rock.

A fair anchorage for medium-sized craft is in a cove on the north side of Kagamil Island. Another anchorage is located in a bight on the southern side of the extreme east end of Kagamil Island.

No other anchorages about these islands can be recommended and none around Carlisle and Herbert Islands. Small craft may find bights here and there where the depths and swinging room are suitable for anchoring, but the prevalence of strong currents, heavy seas, and bad wind conditions make them unsafe. The bottom in and around this group of islands, where it is not rocky, is essentially cinders and volcanic ash mixed with sand and gravel.

Anchorages are described in more detail under names of localities.

Uliaga Island, the northernmost and smallest of the Four Mountains Group, consists of one, central mountain-cone with a few prominent spurs. On the slopes are several spire-like rocks. The crest of the peak, 2,910 feet high, has two points, one sharp and the other flat, larger, and slightly lower. The northwest side of the mountain is very steep and is greatly eroded. A serrated ridge protrudes from the south side of the mountain, and the southern one of three peaks on this ridge is a good landmark.

The cove on the north end of the island is filled with kelp and affords poor protection for small boats. The eastern side of this cove is a cape, formed by a rough, lava outcrop, with a sharp, narrow ridge leading down to it. The western side of the cove is a wall of rock 340 feet in height. The largest stream is on the western side of the island. A sharp, needle like pinnacle with two points, the higher 65 feet, lies less than 0.5 mile from the northwestern shore and about 1.1 miles north of the westernmost point of the island. This point is comparatively long and consists of a narrow ribbon of lava extending into the sea from one of the mountain ridges. On the south slope of this ridge and about 0.8 mile eastward of the westernmost point of the island is a sharp spur, 956 feet high.

A rock, baring 3 feet at low water, is about 0.2 mile from the eastern shore of the island and well outside the thick kelp-line. The best landing site on the island is on the eastern side about 0.5 mile from the southeastern corner. This landing is on a boulder beach behind a barrier of kelp and near a trapper's cabin, which is occupied during some winters. A prominent scar is in the low, grass bluff bordering the shore in this vicinity. The small cove southward of the landing is marked by a 40-foot pinnacle rock at the south end of a boulder beach.

Kagamil Island, between Uliaga and Chuginadak Islands, has a large mountain in the center of its southern half. The mountain is 2,920 feet high, and has a circular crater on its northwest side. Its upper slopes are steep and rocky, while those nearing the base make a somewhat abrupt change to large, gently sloping or flat areas of grass or tundra which generally terminate in bluffs. Near the southeast end of the

island a number of fumaroles emit vapor near the tops of the cliffs, and at the southern end is a strong steam jet in the cliff a few feet above the sea.

The hills in the northern part of the island culminate in a 1,640-foot peak, which is close to the northern shore. The two largest valleys are on the east side of the island; the northernmost is quite flat, with some grass-covered bluffs, and is drained by two small streams. What is probably the best camp site on the island is located in the valley at the head of **North Cove,** the largest of the coves on the northern shore. This valley, circular in shape, and the smallest on the island, has one permanent stream. North Cove has the only sand beach on the island.

Candlestick Point, on the western side of North Cove, has striking topographic features in a long, thin wall of rock with a 75-foot arch to form the point proper, and a group of 10 tall pinnacles close by. The wall of rock is 315 feet high and juts out northward into the sea. The pinnacles, the tallest being 156 feet high, are grouped slightly offshore about the outer end of the wall. The northwestern point of the island is a detached spur, 591 feet high, with a conspicuous smooth, red cliff, located about 0.3 mile westward of Candlestick Point.

From the red cliff the coastline trends southward. High cliffs with a series of gray pinnacles border the shore. Southward of these cliffs, the only valley on the west side of the island begins at the head of a small cove. This valley is narrow, about 2 miles in length, and is drained by the largest stream on the island. A small lake is reported to exist in this valley. To the southward, the cliffs along the shore rise almost vertically from the sea to heights of 300 to 500 feet, with no talus or ledge at the waterline. The cliffs at the southeast end of the island are broken in many places by caves. The shore around the southern end of the island is of very rough lava and boulders, the lava being most prominent at the southwest corner of the island.

A fair anchorage for medium-sized craft is on the northern shore of Kagamil Island in North Cove. It is subject, however, to violent williwaws. The depth is 10 fathoms, and the bottom rocky. Fresh water may be found in the cove. Entrance is from due north of the center of the cove and well clear of the vicinity of the pinnacles on the west side. Another anchorage may be found in 16 fathoms in a bight just south of the easternmost end of the island. The bottom is reported to be coarse, black sand and fine gravel. This bight is marked by a high ridge, extending east from the mountains, and a gablelike headland. There are a stream and a cabin in the bight. Williwaws may be encountered here, and the currents are troublesome; nevertheless good shelter from westerly weather may be had.

Chuginadak Island, the largest of the Four Mountains Group, consists of two mountain masses divided by a low, wind-swept valley across a narrow neck of land. The low area of the valley contains rolling grassland interspersed with areas of lava flow, cinder patches, and conical, cinder hills.

The eastern part of the island is an area of rugged terrain formed by a group of eroded volcanic peaks, the highest being 3,840 feet in elevation. Numerous valleys and ridges descend to the rocky bluffs bordering the shore. The peaks, almost constantly hidden by clouds, are covered with snow nearly the year around. The lower levels have a vegetation of thick grass, while the higher altitudes are of barren rocks and lava ash. Many prominent waterfalls may be seen around this part of the island. On the eastern coast, about mid-latitude, are several areas where steam escapes from the top of the shoreline cliffs. On the south side, **Concord Point,** the southeast end of

Chuginadak Island, is a high headland of rolling, grassy hills. Immediately to the northwestward of this headland, **Black Peak,** the remnant of a large crater, the west rim of which is a distinctive black crag, is a conspicuous landmark from the southeast and southwest. It is 1,525 feet high, and is usually visible when the higher peaks inland are hidden by clouds.

The coastline of the eastern part of the island is indented by many coves and bights. Extensive kelp beds are found in the shoal areas and numerous large boulders and offlying rocks along the shore. **Corwin Rock,** 56 feet high, stands prominently at the extremity of a submerged reef making out from the northeastern shore of the island. The outer limits of Corwin Rock are within about 0.7 mile from the nearest point of Chuginadak Island. Although this rock appears as a single island, it consists of two small islets, separated by a small, narrow strait. On the southwest side of Corwin Rock the kelp extends well out toward the shore of the island. Currents, swirls, and tide rips indicate foul waters, and no passage exists between the rock and the island.

The western part of Chuginadak Island consists of a tall, symmetrical cone, known as **Mount Cleveland,** 5,680 feet in elevation. The sides of this volcano are streaked by series of lava flows, with intervening, grassy patches on the slopes, most of these patches being on the south side. Because of the heat of its active crater, Mount Cleveland loses its snow more rapidly than the other high peaks. A wisp of smoke or vapor issues most of the time from the small crater in the top of Mount Cleveland and, upon a few occasions in 1940, a dim glow has been seen at night. An unusual condition consisting of a clear patch of sky in the lee of the volcano has been observed when all other places were heavily overcast. No waterfalls are on this part of the island and there may be fresh water only after a rainfall, as the entire cone is apparently so porous that no stream of water from the melting snow reaches the shore. The coastline is more regular than around the eastern part of the island, and the kelp beds bordering the shores are less extensive. A few rocks awash are found close inshore along most of the beaches and cliffs.

There are no good places to land on the island in unfavorable weather. However, in moderate weather landing may be made in some of the smaller coves indenting the point on the northeast side of Applegate Cove. It is generally possible to land on the south side of the island in South Cove. The landing is on the eastern side of the cove, at the end of the sand beach or on the adjacent, rocky shore. The best place for a small boat to obtain water is in a small cove about 1 mile eastward of this landing, near a waterfall with a peculiar white deposit at the top. This deposit can be seen 20 miles offshore on clear days. A small boat can pass inside the 140-foot pinnacle near this waterfall.

No houses are on the island but a large shallow cave is in the face of the cliff at the head of South Cove. With the exception of Corwin Rock no dangers are located very far offshore, the farthest being about 500 yards away. Rocks awash, and others bare at low water extend about 350 yards from the shore of the southeastern side of Concord Point. A 1¾-fathom spot is 0.3 mile off the south end of the point. The kelp around the island is not always visible due to the strong currents.

The anchorages in **Applegate Cove,** the largest bight on the north shore of Chuginadak Island, and in **South Cove** on the opposite side of the narrow neck of land have a most unfavorable weather condition. The fog hangs frequently over them when the two main parts of the island are comparatively clear.

Applegate Cove affords protection from all weather except from the northwest to northeast. However, winds of great intensity are almost constantly encountered. The valley across the narrow neck in the center of the island acts as a draw, causing the winds to be of much greater intensity than would be expected normally. Wind forces double those prevailing outside may be encountered in stormy weather. Bottom is of dark-colored sand and mud, but rocky patches may be found. The bottom holds fairly well in moderate weather but dragging may be expected during severe blows. Anchorage may be found in the center of the cove in 14 to 20 fathoms. Small craft should anchor well into the cove in 7 to 9 fathoms, from 600 to 800 yards offshore opposite the central part of the sand beach. Both the wind and fog may be avoided to some slight extent by anchoring near the western part of the cove, opposite a prominent, dark, rocky outcrop in the bluff.

An anchorage, giving good protection from the northwest to southwest, is available in a bight about 0.9 mile south of Corwin Rock; the depth is about 14 fathoms and the bottom rocky.

Protection from northerly weather may be found in South Cove, the large cove on the south side of the valley between the two mountain masses. Conditions regarding fog and wind correspond exactly with those of Applegate Cove. South Cove is smaller and has a shoal in the western part. The bottom is rocky and anchors may be fouled. The best anchorage is in 9 fathoms northeastward from the shoal and it can be approached from the southeast to southwest bearing in mind the shoal in the western part. The nearest source of fresh water is on the exposed coast, about 1.5 miles eastward, where small boats may obtain it in favorable weather.

A small anchorage in a bight about 3.5 miles eastward of South Cove and 3 miles northwestward of Concord Point gives excellent protection from northerly winds. Because of the shielding effect of high cliffs, it may be free from fog when South Cove is not. Several waterfalls mark this bight. Anchorage is in 15 fathoms, with rocky bottom and very limited swinging room.

Carlisle Island, about 1.2 miles northwest of Chuginadak Island, is a mountain consisting of a single, extinct volcanic cone with an elevation of 5,280 feet. The island is somewhat circular in shape, with a diameter of about 4 miles. The upper part of the mountain is snow-covered. Below the snow line, the slopes are dark lava, while lower than the 1,500-foot elevation they are covered with grass or tundra. The lower slopes flatten out and generally terminate in rocky cliffs or steep bluffs. On the west and north sides are numerous seepages on the face of the bluffs. The westernmost point of the island is an almost flat, oblong plateau 1,000 by 1,400 yards, with an average elevation of about 160 feet. The only stream on the island that may be flowing continuously is on the southeast side about 1 mile southward of a shack.

The most prominent features along the shore are: on the northeast side of the island, a small peninsula 0.4 mile long, formed by a lava-flow jutting out northeastward into the sea; on the southeast side, a knoll forming a rocky point; on the south, a peculiar, dragon-shaped, rock dike protrudes in the shape of a curving ridge and headland at the extremity forming **Dragon Point;** off the northwestern point, a rock has the appearance of a partly submerged ship when viewed from the east. Also a low, offshore rock is in this vicinity.

Herbert Island, the southwesternmost of the Four Mountains Islands, is separated

from Chuginadak Island by Chuginadak Pass, about 3 miles wide. The mountain on the island may be likened to a truncated cone, the truncated section being the rim of a crater about 1 mile in diameter. The rim is lower on the northern side, and from well offshore to the northward the inside of the crater is partly visible. The highest part of the island, having an elevation of 4,235 feet, is the southern rim of the crater. The northern side of Herbert Island appears fairly flat when approached from the east or west. The northern side of the mountain is deeply eroded, and is the most abrupt. The south and west sides of the island are marked by yellow scars on the cliffs. No trees or bushes are on the island. The island is tundra- and grass-covered, with snow from fall to early summer. The lower slopes are regular and in places gentle.

Along the west part of the northern side of the island is a low bluff, less than 50 feet high, which gives way on the east side to high, sheer bluffs of from 200 to 400 feet. Under these high bluffs, the shoreline is mainly a boulder beach, 10 to 20 yards wide, with kelp offshore. On the flat part of the northern end, however, the beach is fairly wide and reefs, with many rocks awash, extend well offshore, and beds of heavy kelp for some distance outside the reef and foul area line.

Eastward of the northernmost point of the island is a shallow bight which may be used for anchorage in calm weather, though it has a boulder bottom and in southerly weather is subject to heavy seas coming from the southward around the northeast corner of the island. Strong currents tend to form tide rips with any sea that might be running. A cabin, at the northwest end of the bight, is occupied at frequent intervals by fox trappers.

On the west side of the island, near the southwest corner, is a cup-shaped valley, apparently the eroded remains of a crater. The shore at the foot of this valley is a boulder beach with moderate slopes behind it. Northwestward of the valley, and about 0.5 mile offshore, is a 60-foot rock which stands out very prominently from both north and south. A small rock lies about halfway between it and the shore.

The south shore of the island consists of narrow beaches at the foot of cliffs of varying heights. All offshore rocks are within 200 yards of this shore except off the southeast corner of the island, where a prominent pinnacle rock 135 feet high is about 0.3 mile off the beach. The passage inside this rock is not clear, due to a rock awash, and another 2 feet above high water. Back of the pinnacle rock is a distinctive reddish headland.

Chart 8861.—Yunaska, Amukta, and Chaguluk Islands are a group of islands located west-southwestward of the Islands of Four Mountains. Yunaska, the nearest, is about 14 miles from Herbert Island while Chagulak and Amukta Islands, lying about 3 miles apart, are about 10 and 14 miles, respectively, to the westward of Yunaska. The pass between Herbert and Yunaska Islands and the pass to the westward of the latter are deep and clear of dangers. Navigation about these islands should be performed cautiously, with careful reference to the chart and with frequent soundings if the visibility is not good.

Current observations taken 1 mile east of Yunaska Island indicate average velocities at strength of about 2 knots. The largest velocity observed was nearly 4 knots. The flood sets northward and the ebb southward. Current predictions for this location may be obtained from the *Current Tables*. The velocity of the current changes very rapidly around the times of slack water, and the current frequently runs near its

maximum flood or ebb velocity for 4 or more hours. Strong currents and dangerous tide rips are reported in the vicinity of Amukta and Chagulak Islands. In a small gale and during spring tides, the tide rips are built up by an opposing swell. A strong ebb against a small swell is reported to cause 10-foot rips in a dead calm. Currents opposing the swell and a little wind may bring about such seas and rips that small vessels are forced to proceed slowly.

Yunaska Island is a treeless volcanic island, divided into two parts by a generally flat valley, with gentle slopes from the bluff back of the shoreline to the base of the mountains. The island is mostly grass-covered below the 1,000-foot elevation, especially in the lower flats where the grass is extremely thick and matted. Weather conditions are similar to those of the Islands of Four Mountains. Yunaska is a wildlife refuge; it has been stocked with blue foxes which are now quite plentiful and tame. Two cabins are located on the island. In general, the landing facilities are poor and there are not many sources of drinking water.

A large crater, about 2 miles in its greatest diameter, is in the eastern portion of the island. The highest point of the crater's rim, 1,968 feet in elevation, is found on the northwest side. This point appears to be a lone peak from some directions. The crater is surrounded by various conical and ridgelike hills, interspersed with small craters and lava flows. Within the large crater is a small peak, 1,804 feet in elevation, which has its own small crater. Eruptions in this part of the island have been known to occur within the past few years. A prominent lava flow extends from the southwest rim for about 1 mile to the south; it does not reach the shore. The cliffs along the south shore of this part of the island are honeycombed with caves and marked with many bridges and arches.

Near the northeastern shore of the island is a prominent saddle-shaped peak, 1,051 to 1,066 feet in elevation. A bold promontory, 747 feet high, adjacent to the shore, is at the end of a ridge leading northwestward from the saddle-shaped peak. To the west of this ridge and north of the crater is a broad, smooth valley. The surface is composed of porous ash covered with a moderate growth of grass. The entire area is well drained by a few narrow ditches 4 to 6 feet deep. Through the middle of the valley is a long lava flow, about 20 feet high and very rough. The lava flow extends north-northeastward to the shore where it spreads along the water's edge and where, under favorable conditions, landing might be made. A good supply of drinking water can be obtained from an underground stream about 150 yards east of and behind the westernmost corner of the lava flow. The stream flows below and around the boulders of the old beach.

Along the east and north coast of this part of the island the shore is bordered, in general, by steep, rocky cliffs which can be scaled in several places without too much difficulty. The most important break in the cliffs is at the foot of the lava flow. **East Cove** is a broad indentation on the extreme eastern end of the island. Landing sites are found in East Cove and at the head of a bight north of East Cove where some water can be obtained.

The central valley of the island is composed of flats occasionally broken by hills and knolls, and is covered with tundra. No dependable permanent source of drinking water has been found in this valley.

On the western portion of the island is the highest peak, 3,119 feet in elevation. It is an apparently lifeless volcano, somewhat eroded, with remnants of craters on its

side and about its base. From the west, the island appears as having grass-covered hills, with high bluffs on the north and south rising abruptly toward the summit of the peak, which consists of two large tits. These stand out, particularly from the westward, when they are not covered by clouds, which is seldom.

A low bluff extends along most of the western coastline. North and south of it much higher bluffs begin and rise 300 to 600 feet in places. A 300-foot bluff, beginning about 1 mile from the northwest corner of the island, extends southward for about 0.5 mile. A black sand beach, about 40 yards wide and 600 yards long, is at the foot of the southern half of this bluff.

With the exception of this short stretch of sand beach, the western shore is rugged and has many reefs and rocks awash offshore. Many lava points extend outward from the general bluff-line. The kelp is thick and extends from 50 to 200 yards outside the rocks. On the northern and southern ends of this shore, where the bluff-line is higher, the beach-line becomes a narrow, boulder shelf at the foot of the bluff, the boulders extending out into the water for some distance. A large reef extends offshore for a little more than 300 yards from the southwestern point of the island. On the eastern side of the bold southernmost point of the island, for a short distance the cliffs drop immediately into the water without even a shelf at their foot. Several large offshore rocks exist in this locality. A large pinnacle, about 200 feet high, is about 150 yards offshore and about 1.2 miles northeastward from this point of the island.

The shoreline around the island is rugged and has many offlying rocks and pinnacles. Heavy kelp extends several hundred yards offshore, except off the sand beach in the middle of the southern shore of the island and a few other places where there is deep water off vertical, lava cliffs. Heavy tide rips and strong currents are encountered off the points, especially those at the northeast and southwest ends of the island. All around the island the bottom breaks off fairly sharp, becoming more even as the 30-fathom curve is approached. Passing ships are advised to keep outside this curve.

Dangerous shoals extend off the eastern shore of the island in the vicinity of an offlying rock and on the southern side of the island in South Anchorage.

Ships should not approach within 1.5 miles of the island's shore except with extreme caution. Small craft may consider themselves safe at distances beyond 0.3 mile from shore, except where charted obstructions exist. A pinnacle rock 91 feet high lies off the southeast shore.

Around Yunaska Island are three or four fair anchorages. **South Anchorage,** the largest bight on the south side of the island, affords protection from northerly as well as westerly weather, and to some extent also from the northeast. The depths are from 13 to 15 fathoms with even bottom of rocks and cinders. The offlying reef and low rocks in the western part of the bight must be avoided, as well as the shoal in the eastern part. A safe entrance may be made by heading for the middle of the long, conspicuous black cinder bluff along the head of the bight on a course 000°. A tall shaft of rock, leaning slightly, is on the steep slope at the western end off the bight.

A fair anchorage for one ship may be found in East Cove, indenting the eastern shore. The cove is small, with a dangerous offlying ledge and rocks on the south side, and with troublesome currents. It affords fairly good protection from westerly weather; however, it is subject to violent williwaws during westerly storms, making it then inadvisable to anchor there. Heavy swells reach this anchorage during southwesterly storms. The depth is about 10 fathoms and the bottom is of cinders and mud which

holds well. Launches may find good protection inside the kelp behind the rock reef in the south side of the cove.

Protection may be found by small craft up to 40 feet in length in a small but pronounced cove near the middle of the west shore of Yunaska Island, in latitude 52°36′. The depth is about 3 fathoms, with a bottom of boulders. A narrow channel, about 100 yards wide, leads through the heavy kelp to the head of the cove.

The best protection from southerly weather is found in a small cove on the north shore of the island in longitude 170°41′.5 W. The depth is about 16 fathoms, with rocks and mud bottom. A 6-fathom depth is at the east end of the cove. About 0.5 mile to the westward is a smaller cove, where launches may find good protection from southerly weather in 3 fathoms, sandy bottom. A cabin is at the top of the high black bluff at the head of this cove.

Another fair anchorage is in **Crater Anchorage,** a bight on the west side of the island where some protection from easterly and southerly weather may be found. The depth is from 18 to 20 fathoms, with cinder bottom. The bight is marked by a curved black bluff on its eastern side, the remnant of a crater. Submerged rocks, covered 7 feet, are encountered a very short distance inside 15 fathoms in longitude 170°46′ W. These rocks constitute a serious danger in this anchorage.

Chagulak Island is a steep, volcanic mountain having a sharp peak 3,750 feet high at its summit. Its rugged slopes, mainly a series of sharp, steep-descending rocky ridges marked by numerous pinnacles, terminate generally in rocky cliffs at or near the shore. It is uninhabited and has no good landing places. The island is steep-to on all sides and soundings give little indication of danger. It should be given a clearance of at least 1 mile. The cove on the west side formed by the southwest point offers some protection and a possible landing for small craft during southeast weather; its approach, however, is endangered by violent tide rips

Great caution should be exercised during thick weather while navigating in the vicinity of Chagulak Island. Very strong currents make it impracticable to use soundings as a guide in thick weather. The 200-fathom curve lies dangerously close in places, barring the use of depth curves for rounding the island. There are no recommended ship anchorages near Chagulak. The island is small, steep-to, and affords no protection. The two principal exceptions to the general steepness of the slopes of the ridges are at the southwestern and southeastern points of the island.

The southwestern point is a peninsula formed by a comparatively long and flat, grass-covered ridge some 300 feet high, and the upward continuation of the ridge toward the mountain summit which has a comparatively regular and moderate slope. By reason of its low elevation, the peninsula is generally not fog- or cloud-covered during the prevailing low visibility. A slight, rounded rise near the shoulder of the ridge at the northwest extremity of the peninsula, and another on the south side of the peninsula, are distinctive as they alone project above the smooth appearing tabletop of the ridge. On the south face of the peninsula below the second rounded rise is a small white scar in the shore bluff.

The southeastern point is the extremity of a moderately descending grass-covered ridge projecting seaward to form a peninsula. The rounded northeast end of the island above the rocky cliffs along the shore is grass-covered and also has a fairly moderate slope.

On the north part of Chagulak Island, about halfway in distance and elevation

along the ridge between the summit and northernmost point, is a pronounced saddle. On the northern end of this saddle is a summit, with a pinnacle, 1,905 feet in elevation. A second smaller and lower pinnacle is just to the northward. From these pinnacles the ridge slopes in a general convex form to the northern point of the island. On the next prominent descending ridge to eastward, is a rounded thumblike protrusion, 1,120 feet in elevation, which is visible along the line of the northeast tangent of the island. A similar thumb, 1,495 feet in elevation, is on the western descending ridge, which forms the southern boundary of a deep valley on the west side of the island. It is seen along the line of the southwest tangent of the island and particularly well when snow is in the locality, as the steep sides of the feature itself are generally bare.

Chagulak Island is a nesting place for whalebirds and small gulls which fly in great numbers around the island within a radius of a few miles, and in foggy weather may indicate the proximity of the island.

The shore is either of large boulders, vertical cliffs, or outcropping rock. There are several offlying features. Off the northwest side are two prominent rock ledges; the inshore ledge has an elevation of 55 feet. Off the east side is a small rocky islet, steep and roughly rounded in outline at the top and 150 feet high. About 0.6 mile to the northward of the rocky islet and farther offshore is a very dangerous detached ledge, since it shows only a few feet above the surface and seas sweep over it in moderate weather. Several rocky islets are off the south shore and there is a low, rocky ledge off the southwestern point.

On the south shore is a prominent, smooth, narrow slide of snow and sediment which may be distinguished well out at sea.

On the west side is a 225-foot pinnacle rock. A beach landing may be made on the south side of the pinnacle. About 400 yards north of the pinnacle is a 20-foot dike that extends about 20 yards outside the high-water line. Many rocks awash and sunken rocks are off the point 250 yards north of the dike.

The northern shore is very rugged, with precipitous rocky bluffs. In general, the kelp near the shores is thickest along the western shore.

A submerged pinnacle having a depth of only 2 fathoms of water over it lies just within the 100-fathom curve, 0.5 mile northwestward from the southwestern point. In this vicinity are strong, erratic currents and heavy tide rips.

The small, rocky islet close to the southern side of the peninsula at the southwestern point affords some protection for making a landing on the island. The cove on the north side of the peninsula affords anchorage for small craft in southerly and easterly weather.

Chagulak Pass is clear except for the 2-fathom shoal mentioned in the description of Chagulak Island. It is about 3 miles wide but passage should be attempted only with local knowledge or during very clear weather. The flood current sets northwesterly and the ebb southeasterly. The velocity of the current is probably in excess of 3 knots. Tide rips were noted through the entire pass.

Amukta Island has a volcanic mountain cone with a crater at the summit. The highest point of the rim of the crater is 3,463 feet in elevation at its western end. On its southern end is an appreciable depression of the rim. The mountain is closest to the northern shore of the island, where its slopes descend directly to the shore. The base of the mountain cone proper is at about the 1,000-foot level, and to the east and west the lower slopes reform into spurs, hills, and ridges.

Near the northeastern shore a prominent, cinder hill, 1,486 feet in elevation rises at the side of the cone.

A group of fingerlike pinnacles mark approximately the flattened, 1,000-foot level which appears as a ridge bordering the eastern shore. This apparent ridge descends to the southward and is linked with the prominent ridge forming the peninsula at the southeast end of the island, a low saddle lying between them. Rising on the slopes of the mountain halfway between its summit and the southeast peninsula is a group of reddish knolls. A spur projecting from the mountain toward the northwestern shore is marked by two summits, the inner and higher one being a conical peak 1,036 feet in elevation.

A ridge of varying elevation borders practically the entire west coast and terminates in the peninsula forming the southwest end of the island. On this ridge are some distinctive summits and a decided break occurs about halfway along the western shore. The eastern slopes of the southern part of this ridge border the large cove indenting the south side of the island and the adjacent low lava fields.

A very distinctive feature on the island is a massive, rectangular outcrop of rock, crowning one of the summits of the peninsula-ridge at the southeast end. This block-shaped landmark is the highest part of the ridge and is 615 feet in elevation. Another massive outcrop of rock, peaked in shape, appears on the summit to the northward. These remarkable features are dark, in contrast to the grassy surface of the remaining part of the ridge, and may sometimes be recognized well to seaward against the 3-mile distant mountain background of the island.

Amukta Island is generally covered with lava and cinders, and is black in general appearance. However, some grassy areas are on the ridges along the west side of the island, in the area to the south of the cone, and on the ridge forming the southeast peninsula.

During low visibility the southwest peninsula of the island may be recognized by a 130-foot rock detached from the headland at its southern extremity; it appears as a pointed shaft of rock when viewed from the northwest and the southeast sectors. Against a shore background, the rock is not discernible at a distance.

High Rock, off the deep cove indenting the south side of Amukta Island, is a prominent landmark. It appears as a columnar monument rising 68 feet from a rocky ledge base. The top of the column is a smooth, truncated surface facing seaward and with favorable light, has a light-gray appearance, making it partly discernible from offshore against the island background.

The easternmost point of Amukta Island is formed by a projecting ledge, and directly off the ledge is a rocky islet, the inshore side of which rises vertically to a height of 65 feet. In this locality the shore rises abruptly in steps and thence to a jagged, ascending ridge. A prominent rock pinnacle on the ridge about 200 feet above the water level is about 300 yards from the point.

The northeast shore of Amukta Island bordering Chagulak Pass is in general composed of laval bluffs or large boulder beaches. Along this shore are many detached rocks. A good landing place is in the small bight about 1 mile southeast from the northernmost point of the island. A temporary small-boat anchorage and landing may be found in the small and deeply indented bight around the east side of the northernmost point.

The western shore of the island is composed of high bluffs meeting the slopes of the nearby ridges.

A trapper's cabin is on the shore of the bight on the south side of the island; some water is available in this locality.

Almost the entire coast of Amukta Island is fringed with detached rocks and ledges of various description. Off the southern coast of the island an area of broken bottom extends from the southwest peninsula for a distance of over 1.5 miles in a southeasterly direction; High Rock lies in and near the middle of this area. The section between High Rock and the peninsula is extremely foul and passage across it should not be attempted. The outlying section has a depth of 3½ fathoms about 0.5 mile southeast of High Rock.

An area of broken bottom also extends in a westerly direction from the southwest peninsula for a distance of about 0.8 mile, in which a 2½-fathom depth was found 0.3 mile westward from the south end of the peninsula.

Along the western shore abrupt changes in depth occur within the 20-fathom depth curve, which approximately parallels the shore at a distance of about 0.5 mile.

From the middle section of the northwest shore an area of irregular bottom extends for a distance of 0.8 mile to the 20-fathom depth curve, thence there is an abrupt deepening of several fathoms to seaward.

From the northernmost point, an area of broken bottom with shallow depths less than 5 fathoms extends for a distance of about 0.6 mile in a northwesterly direction. Off each of the several points along the northeast shore are small detached shoals of 1½ to 3 fathoms. Along the eastern shore broken bottom lies within the 20-fathom curve which is 0.8 mile from the shore near the middle of this section. From the southeast peninsula of the island, a shallow area with depths less than 8 fathoms extends in a southerly direction for a distance of about 0.4 mile.

As in the case of Chagulak Island no satisfactory anchorages are found in the vicinity of Amukta Island. During storms, the gales draw around its entire rounded coastline to the lee side, causing violent gusts of wind successively from opposite directions along the shore. Also, no section of the coast is free of strong currents, tide rips, and seas that sweep around the island. The bottom, generally of gravel, affords only fair holding ground.

The best anchorage for southwesterly weather is in 18 to 20 fathoms, gravel bottom, about 1 mile eastward of the northernmost point of Amukta Island, off the cove in that locality. Attention is called to the detached 1- to 2-fathom shoals off the several points close to this anchorage. The strength of the current here is less than elsewhere along the northeast coast.

In southeasterly weather anchor in 18 to 20 fathoms, gravel bottom, about 0.8 mile westward of the northernmost point, or in 18 to 20 fathoms off the middle of the cove about 2 miles southwestward from the northernmost point. In coming to anchor at the latter location, a strong northeasterly current may set the vessel toward the foul areas extending from the point of the northern end of the cove, and a range on the slope of the shore ridge should be selected and held in order to avoid this.

In northwesterly weather anchor in **Traders Cove,** in 24 fathoms about 0.8 mile eastward from the southeastern point of the island. Care must be taken to avoid the dangerous shoals just within the 20-fathom depth curve.

Overnight anchorage is not recommended in the large cove on the south side of Amukta Island. Strong winds from the southeast may make up suddenly and the approach and anchorage are bordered by dangers.

A remarkable bottom configuration has been noted in the area to the eastward of High Rock. With a general depth of some 35 fathoms a mile off the south side of the island, the depth may increase rapidly to 70 fathoms as the shore is approached. There is a considerable basin of about 50 fathoms, about 0.8 mile in length from east to west, this depth being found about 200 yards northeast from High Rock. The 3½-fathom shoal in this vicinity is on the southwestern rim of this basin.

As in all other parts of the Aleutian Islands, currents around Chagulak and Amukta Islands are strong and somewhat erratic in their nature. The general flood direction is to the north, and the ebb to the south. Tide rips make up swiftly and furiously at times. While the channel between the two islands is clear, tide rips give the impression of heavy seas in shoal water. On the flood, the current seems to divide on the south side of Amukta Island near the 3½-fathom shoal previously mentioned where the seas are very confused. The currents rejoin near the northern point of the island and the reverse action seems to take place on the ebb.

Similarly, the strongest currents along Chagulak Island are found near the southwestern point of the island, the current dividing somewhere near the center of the southern shore and rejoining on the north side of the island. The strong currents are particularly noticeable at times along the east side of this island where the general northerly trend of the current is unobstructed.

The currents vary considerably in velocity, and they probably often exceed 3½ knots.

Tide rips are conspicuous off all points, their violence being somewhat in the following order: Strongest, along the west part of Chagulak Island and in the pass between the two islands; around the southwest point of Amukta Island and near the 2½-fathom shoal; around the north point of Amukta Island; around the southeast point of Amukta Island, and around the southeast point of Chagulak Island.

Chart 8862.—Amukta Pass is a broad clear passage. It is often called the **172-degree Pass** or **Seventy-two Pass.** It is about 35 miles wide between Amukta and Seguam Islands; depths range between 50 and 300 fathoms. The landfalls on both sides are good, but should be given a clearance of not less than 1 mile. Both Amukta and Seguam Islands may be seen across the full width of the pass in fair weather.

Seguam Island is rocky and cinder-covered, has numerous lava flows, and is steep-to on all sides. It has, however, several good landing places and an abundant water supply. Irregular mountain masses are on both the east and west ends of the island and a saddle is in the east central section. The formation is volcanic and the peaks are rocky, extinct craters.

The mountains on the west end are the higher, and **Pyre Peak** reaches an elevation of 3,458 feet. The highest peak on the east end is a jagged pinnacle on a small crater within a larger crater and is 2,768 feet high. The mountains on the west end of the island are more ragged. The north coast is low rock and grass bluffs. The other coasts are steep and high, with the peaks close to the coast. The two good anchorages are Finch Cove on the north, and Lava Cove on the south. Numerous pinnacles are close to shore, the most prominent are those off the northwest point, the highest 98 feet high, being comparatively massive.

The precipitous eastern end of the island, except for a small peninsula, is at the base of a volcanic mountain having a crater within a crater, 0.5 mile in diameter, at its

summit. The summit has a confusing appearance; a pronounced rise along the northern rim of the main crater is 1,930 feet in elevation and appears as a sharp peak when viewed endwise. Also a pronounced rise is along the northern rim of the inner crater which is 1,934 feet in elevation. The southern rim of the inner crater merges with that of the main crater and is 1,820 feet in elevation.

Relatively shoal-water areas extend off all the principal points of Seguam Island, and are usually marked by breakers in bad weather. Kelp grows profusely in most of these areas.

Currents around Seguam Island are strong and very erratic. As around Amukta and Chagulak Islands, the general flood direction is northerly, with the ebb southerly. On the flood, the current seems to divide somewhere near Turf Point, and to rejoin near Finch Point on the north. The reverse appears to take place on the ebb.

Tide rips are severe off many points; they make up suddenly and furiously, and are dangerous to small craft. Passage through the rips by small boats should not be attempted unless the operator is familiar with the danger. The worst rips are found along the western end, with lesser ones off Moundhill Point and Finch Point. These are all conspicuous and while they seem to indicate shallow water by their whiteness, they make in deep water and so are no menace to navigation for the larger ship.

Strong currents and tide rips occur around the eastern end of the island.

On the southern end of the eastern coast is **Moundhill Point,** a small, rounded peninsula which forms a very important landmark during the prevailing low visibility. The peninsula is a mound-shaped hill, 465 feet high, and has four, small, rounded protuberances at its summit. The easternmost of these is separated from the remainder of the group by an appreciable distance and by an apparent depression in the top. Rounded protuberances also characterize the slopes of the hill. The hill is separated from the mountainous mainland by a draw about 100 feet high at the neck of the peninsula. At the water's edge, the hill slopes descend to form almost vertical cliffs of rock. A fair landing is on the north side of the neck. Fair anchorage for small craft is in the cove on the south side, which is marked by three tall pinnacles near its southwestern end.

Several lumps of about 3 fathoms lie in the shallow area 0.2 to 0.5 mile eastward of Moundhill Point, the easternmost point of Seguam Island. There are strong currents and it is advisable to round the cape at a distance of at least 1.5 miles.

At the northern end of the east coast the land projects to seaward forming prominent **Wharf Point,** which resembles a wharf or pier from a distance. The point has a more or less flat top, 50 feet high, and the bluffs on its three sides are approximately rectangular, forming two distinctive corners at the extremity.

Finch Cove is an indentation 2 miles in extent along the northeast side of Seguam Island; its northern extremity is Finch Point. A long, rocky point formed by a spur divides the cove into two parts. At the head of the cove, northward of the dividing point of land, is an 0.8-mile stretch of sand beach providing good landing. The approach to the middle section of this beach is apparently free of rocks and the depths decrease gradually, making this a favorable site for beaching a vessel in an extreme emergency. Several small huts are just inland from the northern part of the beach. The northern half of this part of the cove is foul with rocks of various description, among which is a 58-foot elevated, block-shaped rock. Along the shore of the cove eastward and westward of the dividing point of land are stretches of high, prominent cliffs. The western

stretch is about 0.3 mile long and 300 feet in elevation and the eastern, rounding stretch of cliff is about 0.5 mile long and 500 feet in elevation. To the eastward of the latter is a deep valley extending inland. A cone-shaped peak 1,447 feet in elevation is 1.5 miles inland from the cove.

Near the center of Finch Cove, an area of extremely broken bottom with shoal depths of about 4 fathoms extends out from the dividing point for more than 0.3 mile. In the southern part of Finch Cove, along the shore eastward of the dividing point, are heavy kelp beds.

Finch Cove offers good protection in southwesterly weather. The survey ship *Explorer* remained at anchor in Finch Cove during a storm in July 1952, with southerly winds up to force 12. The ship anchorage is in 14 to 17 fathoms off the center of the northern bight. Enter on course 274°, heading for the 58-foot elevated, block-shaped rock. Anchor on this bearing (a cross current may be experienced) and on cross bearing 191° to the left tangent of the dividing point of land. Tidal currents setting northwestward and southeastward have been observed. The strength of the northwestward current occurs about 1 hour after lower low water at Sweeper Cove, with an average velocity of about 2 knots. The strength of the southeastward current occurs about 5 hours before higher high water at Sweeper Cove, with an average velocity of about ½ knot. A 4-fathom spot is 0.3 mile southward from this anchorage.

Finch Point is the dividing point between the northern and northeastern sides of Seguam Island. It is formed by a broad, gently sloping ridge, the shore extremities of which break off into cliffs and ledges. Detached rocks of various descriptions lie about the point and these are particularly numerous at its northern extremity. Directly at the northern extremity, an 80-foot elevated, massive rock is a prominent landmark when viewed along the line of the northeast tangent. In this direction it appears vertical at the sides and its irregular top is roughly in the form of a gable. The outermost rock to the northward is lime-covered but it is small and only a few feet high.

At the northernmost part of Seguam Island just westward of Finch Point a large area of broken bottom extends more than 1 mile offshore. Several lumpy spots of about 8 fathoms are well offshore in this area.

The north shore of Seguam Island is irregular; the beaches are principally of lava or boulders and in general cliffs or grass-covered bluffs are directly back of the beaches. The cliffs are comparatively low. The slopes from the clifftops are covered with a heavy growth of grass and rise gently toward the high interior regions. Numerous gullies break up the terrain and are approximately normal to the general trend of the coast. Several waterfalls are along this coast. **Seguam Island Light (lat. 52°23′.2 N., long. 172° 26′.2 W.)**, 65 feet high and visible 8 miles, is shown from a small white house on the point just westward of Finch Point. The light is obscured from 264° to 075°.

A dangerous 2½-fathom pinnacle rock with surrounding depths of 23 fathoms close-by lies about 1 mile off the northern shore of Seguam Island in latitude 52°26′ N., longitude 172°29′ W. The danger is not marked by kelp.

Saddleridge Point is the northwesternmost point of Seguam Island. The small rise directly inshore from the saddle is a definite summit from all offshore directions, but not particularly prominent. A rocky islet 98 feet high, about 0.2 mile northeast from the point, and several smaller intervening rocks obscure the extremity of the point when viewed from the northeastward. A narrow cliff 231 feet high, facing seaward

and topped by a small grass-covered mound, rises at the inshore end of a long, narrow, projecting ledge 1.7 miles eastward from Saddleridge Point.

A mound 80 feet high, resembling a haystack, is 3.7 miles eastward from Saddleridge Point. The mount has the appearance of an island but is in reality connected to the shore. A 1-mile stretch of sand and cinder beach extends to the southwestward from this vicinity, and there is a waterfall about 0.2 mile northeastward from the mound.

From the northern rock off Saddleridge Point, foul ground extends northward for a distance of 0.2 mile.

Very favorable anchorage for southerly weather may be had along the north central section of the coast of Seguam Island 1.5 to 3 miles eastward of Saddleridge Point. The ship anchorage is 0.5 to 0.6 mile offshore in depths of 16 to 18 fathoms, sand and gravel bottom. In coming from the eastward care must be taken to avoid the 2½-fathom pinnacle 1 mile offshore; passage between the pinnacle and the shore is not recommended.

An anchorage in 20 fathoms about 0.8 mile southwestward of Saddleridge Point was used by the survey vessel. The depth decreases rather abruptly toward the shore.

Camel Islet is about 0.5 mile off the middle of the northwestern shore of Seguam Island. It is a massive rock, 53 feet high, and its top from the northward or southward resembles a camel's hump.

The northwestern coast, from Saddleridge Point to the western end of the island, a stretch of 5.5 miles, is in general a boulder beach directly in front of irregular cliffs ranging in height from 200 to 600 feet. In some places the cliffs rise abruptly from the water's edge. The slopes from the tops of the cliffs to the mountainous interior are decidedly steeper than those eastward of Saddleridge Point; also, the draws and valleys are steeper and occur at less frequent intervals. About 1.2 miles northward from the westernmost point of the island, the slope is very steep and the cliffs are especially high. Numerous waterfalls go dry in the late summer. Numerous detached rocks are found off this coastal stretch.

Between the westernmost point of Seguam Island and a high, dome-shaped, detached rock about 1 mile to the northward is a deep valley, with gentle ascending lower slopes, extending inland 1 or 2 miles.

Along the western end of Seguam Island very irregular bottom lies within the 20-fathom curve which follows the coast at a distance of about 0.5 mile. A reef is about 0.3 mile off this end, which is marked by a low rock, 4 feet high, discernible for some distance with a quiet sea. A depth of 3¾ fathoms was found 0.2 mile northwestward of the reef. Strong currents and tide rips occur in this locality.

From the western end of the island the coast trends southeastward for about 1.5 miles to **Rue Ledge.** This offshore rocky ledge, 36 feet high, is conspicuous when viewed along the southwest tangent of the island. The inshore side of the elevated part of the ledge has vertical corners; from here the top slopes to the offshore end. Halfway between this ledge and Turf Point, 2.6 miles to the eastward, is an offlying rocky islet which is marked near its offshore end by a cylindrical pinnacle rounded at the top; it, however, is not readily discernible unless the observer happens to be close-by. A waterfall over the shore cliff is about 0.2 mile northeastward from this pinnacle.

The southernmost point of Seguam Island, **Turf Point,** is a comparatively low, broad, and extensive grass-covered projection terminating in a rounding bluff. The

top of the point is flat and then rises gently to the steeper inland slopes, which on either side of the point terminate in bold rocky bluffs, making the point conspicuously low by contrast. A foul area fringes the rounding point. Westward of Turf Point, the south shore of Seguam Island is high and precipitous. The cliffs are close to the rocky beach and in places overhang it. The bordering mountains are high; grass extends from the cliffs to about the 1,100-foot elevation.

From Turf Point an area of broken bottom extends southward for 0.7 mile to the 20-fathom curve, thence abruptly deepening to over 40 fathoms.

On the south shore about 5 miles northeastward from Turf Point is **Lava Point,** a broad, jagged, and comparatively low point forming the terminus of an extensive lava flow. A narrow bight, but deep in extent, indents the middle of the extremity of the point. **Lava Cove,** immediately westward of Lava Point, extends for 2.5 miles to a rounded gravel point fringed with submerged and detached rocks. The gravel point is formed by a short broad spur 196 feet high, projecting from a regular, grass-covered mountain slope which descends to shore cliffs on either side of the point. At the head of Lava Cove is a decided indentation in which are several streams and an 0.8-mile stretch of sand beach. An ocean swell generally makes landing difficult. The remaining shore of the cove is composed mainly of jagged projections of rock or lava cliffs of moderate elevation. Curtains of waterfall at two places about 0.2 mile inland from the eastern end of the sand beach are visible from the cove. A row of pinnacle projections marks the near-shore ridge, 335 feet in elevation, between Lava Point and the curtains of waterfall.

From the point at the west end of Lava Cove an area of broken bottom extends southeastward for 0.7 mile, with a depth of only 1¾ fathoms 0.4 mile off the southeastern side of the point.

On the south side of Seguam Island, Lava Cove and the next large cove to the westward offer good protection in northerly weather. The ship anchorage in Lava Cove is in 14 to 17 fathoms, cinder and gravel bottom, off the indentation at the head of the cove. It has little or no current. Enter on a **north** course heading for the eastern half of the sand beach at the head. In coming from the westward, the broad gravel point at the western end of the cove should be given a wide berth.

The southeast coast of Seguam Island from a point about 1 mile eastward of Lava Point for a distance of about 4 miles to Moundhill Point is dominated by a chain of three mountain peaks over 2,000 feet in elevation and a very distinctive mountain, 1,410 feet in elevation, close to the shore in longitude 172°23′ W. The shore slopes of these mountains generally terminate in steep, rocky cliffs, and the coast has a bold appearance. A steep bluff rising to an elevation of 690 feet marks the promontory near the three high pinnacles in the southeastern part of the cove at the eastern end of this mountainous stretch. The upper reach of this bluff overlooks the draw back of Moundhill Point.

Off the middle part of this bold coastal stretch is a group of five, rocky islets; the outer islet has an elevation of 55 feet near its inshore end where it drops almost vertically to form its northwestern side. The area between this group of islets and the shore is foul.

The distinctive 1,410-foot peak, close to the shore about 1.5 miles westward of the group of islets, has a steep and rugged seaward face and a definite peak. With northerly winds this mountain may be free of clouds while those in the background

are covered. A small cave about 5 feet deep with an almost rectangular entrance is at the foot of this mountain near the shore. The cave is prominent when the light illuminates the surrounding yellow portion of the rocky cliff.

About 0.2 mile southwestward from the cave, a chain of rocks extends offshore for a distance of about 230 yards. The inshore rock is 110 feet high while the offshore rocks are low in comparison.

An area of broken bottom with shallow depths is within 0.3 mile of the section of the southeast shore of the island 0.6 mile to 1.4 miles from Moundhill Point.

Seguam Pass lies between Seguam and Amlia Islands. It has been regarded with suspicion, and a sailing vessel has been lost on Agligadak Reef, on the southwest side. The pass is about 12 miles wide, and it is reported to have strong currents, rips and overfalls, but no offshore dangers.

The Coast Guard Cutter *Haida* passed through Seguam Pass about 3 miles southward of Seguam Island. The sea was found very confused and the fathometer indicated very irregular bottom. Tide rips extend 5 to 7 miles westward from Seguam Island. The sea is extremely rough in these rips, even in 75 fathoms of water. The pass is not recommended.

Vessels have reported high breaking seas in Seguam Pass. The bottom is irregular, the currents strong, and tide rips may be encountered at any place, but particularly near the shore. The flood currents sets to the north-northwestward and the ebb to the south-southeastward; probable veolcity exceeds 4 knots. In 1914 a 24-foot sea, almost breaking, was met eastward of Seguam Island, with northerly weather. In 1927, the *Algonquin* was boarded by several high, breaking seas about 25 miles northeast of Seguam Island. These seas were encountered along a stretch of about 2 miles, where the tide rips were about 20 feet high. Tremendous tide rips also have been reported 50 miles northward of Amukta Pass.

Chart 9102.—Andreanof Islands extend in a long chain from Seguam Pass to Amchitka Pass.

Chart 8862.—Amlia Island is 40 miles long and has a greatest width of about 8 miles. On the island are a few small lakes. A chain of sharp peaks extends the length of the island, but none is especially distinctive. The eastern end of the island is visible for a considerable distance and is a good landmark in fair weather; it has a straight profile at a moderate elevation and drops to the sea in a precipice. The point should be given a berth of several miles because of the rocks and reefs to the eastward and southward. The unsounded areas around the island should be approached with caution.

Agligadak Reefs extend about 4 miles from the eastern extremity of the island.

Agligadak, Tanadak, and **Sagigik Islands** are small islets off the east end of Amlia Island. Their only importance is as dangers to navigation.

Chart 9121.—Sviechnikof Harbor is on the south shore of Amlia Island about 15 miles from the eastern point. The entrance is about 0.2 mile wide and is difficult to make out, and should be attempted only in clear weather. Sagigik Island, about 9 miles eastward, and the pyramid peak to the right of the entrance, may be recognized. The harbor extends about 2 miles in a north-northwest direction and has an average

width of about 0.3 mile. It can be entered without difficulty, is well sheltered, and has good holding ground. Excellent anchorage is available in the north end of the harbor in depths of 10 fathoms, soft bottom. The west side of the entrance should be favored until past the long island and the rocks and reefs on the east side.

Chart 8862.—Chalugas Bay, just west of **Cape Idalug** on the north coast of Amlia Island, is a small harbor reported suitable for small boats only; however, the anchorage for small vessels in 20 to 22 feet of water is just off the entrance.

The bight on the east side of Cape Idalug offers a lee in southerly weather for vessels of all sizes. The recommended anchorage for deep-draft vessels is in depths of 9 fathoms, soft bottom, at the entrance to the inner basin.

Atka Island, the largest of the Andreanof Islands, is separated from Amlia Island by narrow Amlia Pass. Atka Island is about 10 by 50 miles in extent. A low pass crosses the island from Nazan to Korovin Bays. **Korovin Volcano,** 4,852 feet high, is 3 miles inland from **North Cape,** the northern extremity of the island; the slopes of the mountain break off in a rocky escarpment at the cape. **North Cape Light (lat. 52°25′.1 N., long 174°08′.9 W.),** 115 feet above the water and visible 8 miles, is shown from a small white house at the end of the cape. It is obscured from 293° to 075°. The portion of the island southwest of Nazan and Korovin Bays is lower and runs off to the narrow southwest extremity. A high conical peak near is **Cape Shaw,** the eastern extremity of the island.

Atka Island and the adjacent islets are reported to be overrun with rats. Many species of birds frequent the island.

The north coast of Atka Island trends in a general west-southwesterly direction. Numerous small bays indent the coast from Korovin Bay on the east to Cape Kigun at the west end of the island. The formation is volcanic and similar to the other islands of the Aleutian Chain. Points are, for the most part, bold headlands rising sheer to 300- to 800-foot knobs or heads, and then rising more gradually to the peaks farther inshore. Generally, there is more than one ridge making up from each point. The land area is treeless and is covered with tundra to an elevation of about 1,000 feet, above which there is practically no vegetation. Bluffs generally carry well back into the bays and bights in the shoreline; but as a rule the heads of these bays are low, with sand, gravel, or small boulder beaches, back of which valleys carry into the interior of the island.

Several ranges of peaks, varying in elevation to 3,200 feet, extend along the island interior. On account of the fog, mist, and low ceiling, they are rarely visible and are of little use to the navigator. During a 4 months' period in the summer of 1943, the summits of the peaks were visible for one period of three days. During the balance of the season, the ceiling averaged 300 to 500 feet. Because of the prevalent weather conditions, extreme caution should be exercised in approaching the land even though there are few offlying dangers. There is considerably less fog and mist during the colder months of the year when these higher elevations show more frequently. Currents are weak, except at the passes east and west of the island.

At the extreme west end of the island, 0.6 mile east of Cape Kigun, is a peak of about 1,100 feet elevation, which is frequently clear. Its general appearance is cone-shaped, and the slopes from several directions are symmetrical.

Salt Island, Koniuji Island, and Kasatochi Island are offlying islands which are easily identified.

The south coast of Atka Island has not been surveyed. Several anchorages have been reported on this coast, the best apparently being just northeastward of **Sadatanak Island,** but without exception the entrances and approaches are rocky and appear dangerous.

Sergief Bay, on the south side of Atka Island and about 13 miles eastward of Cape Kigun, is considered a suitable anchorage except during strong southerly winds; but even if a ship were caught at anchor by such winds, the bay could be cleared with little trouble. Holding ground is probably poor. The gently sloping beach at the head of the bay is apparently of black sand or volcanic ash. It appears that a boat could land on the beach except in surf. When this bay was visited the wind was westerly, 20–25 knots; outside and well inside it was northwesterly. This was evidently caused by the high and precipitous mountains flanking the bay on the west and the low saddle which separates Sergief Bay from Portage Lagoon. In entering the bay from a position in 51°59′ N., 175°00′ W., hold a course of **000°** until the end of the western entrance point is abeam, then shape course to pass 300 yards off the rock awash in 52°01′.6 N., and after passing this rock steer **315°** for the head of the bay. Between Sergief Bay and Tillamook Cove, 0.5 mile off, no sounding of less than 20 fathoms was obtained.

Tillamook Cove is in 174°53′.5 W. and directly south of Wall Bay on the northern coast. This cove is considered of little value as an anchorage because of the poor holding ground and its openness to the sea. A more comfortable anchorage is found in 13 fathoms just outside the cove. A 40-foot pinnacle rock marks the seaward extremity of the western side. A shoal extends some distance seaward of the point of land marking the eastern side of the entrance. The western side of the cove is practically vertical to a height of about 100 feet, then slopes steeply to over 1,000 feet. At the head of the bay is a black sand and volcanic ash beach. With only a slight swell setting into the bay, the surf was approximately 3 feet high and broke 100 yards from the shore. The eastern shore is characterized by rocky ledges. On this side of the cove the land rises to a height of about 200 to 300 feet from the water to a relatively level shelf before rising to the mountains farther inland.

Beaver (Otter) Bay is situated on the south coast of Atka Island, just east of **Cape Tadluk.** No soundings are available for this bay. From a reconnaissance sketch, Beaver Bay appears to afford partly sheltered anchorage for small craft.

Chart 9010.—Amlia Pass, between Amlia and Atka Islands, is a strait about 2 miles long; it is 1 mile wide at the north end and 1.8 miles wide at the south end. It is probably unnavigable during heavy weather.

A sunken reef extends off the Atka shore to within 400 yards of **Swift Point,** Amlia Island. A high portion, **Mid Reef,** shows at all times, but is awash in extremely heavy weather. Other small areas may occasionally appear at extreme low water.

Along both shores are steep, rock bluffs rising to low hills. Kelp grows along the shores. A ledge extends 100 yards outside the bluff line at **Eddy Point,** westernmost point on Amlia Island. Deep water lies closely off this ledge and off the shore at Swift Point. At **Pinnacle Point,** is a prominent pinnacle on the shore with an 80-foot offlying pinnacle immediately southeast. A current of 10 knots has been observed, and generally, when the current is strong, large tide rips exist. Vessels should use the pass

at slack water, holding the Amlia shore; however, it may be used during moderate current by highly maneuverable vessels.

The current floods north and ebbs south. In general, tide rips exist in and outside of the north end of the pass during the flood, and in and outside of the south end during the ebb. When the current is running, small tide rips exist over the sunken reef. During strong currents, heavy swirls exist in the pass and its approaches, the greatest intensity being near Eddy Point.

North of Eddy Point the current floods northeastward and ebbs southwestward, causing a set off course to a vessel just north of the pass. Duration of slack is about 10 minutes; however, there is often a period of 1 to 3 hours when the current is not strong, and there are practically no tide rips. This is probably the period of lesser ebb or weak flood which occurs when the moon's declination is large. See explanation given in connection with current predictions for Unimak Pass in the *Current Tables*.

Heavy tide rips extending several miles northeastward of Amlia Pass have been observed with a moderately heavy swell from the northeast. A submerged pinnacle of 4½ fathoms is 1.5 miles 053° from Eddy Point and about 0.6 mile from the north shore of Amlia Island. There are probably other dangerous pinnacles in this area.

Directions.—When making Amlia Pass from the north, head for a point 300 yards off the ledge at Eddy Point on course **180°**. From this point steer **157°** to pass Swift Point at a distance of 200 yards. This is the narrowest and critical part of the passage, and must be made accurately, as a 15-foot reef lies about 500 yards off Swift Point. Thence steer **167°** to a point 0.5 mile off Pinnacle Point (bearing 080°). From there steer **170°** for 2 miles or more to deep water, taking care to keep within the sounded area to avoid reported dangers off the Amlia shore. This last course has Eddy Point, the west end of Amlia Island, dead astern on the southward passage and dead ahead on the northward approach to the pass.

Nazan Bay lies on the eastern coast of Atka Island, facing Amlia Island; the west point of Amlia is a conspicuous landmark for making the bay.

Atka (*pop. 85 in 1950; P. O.*), a small native village on Atka Island, is at the head of the bight which is just west of the Bolshoi Islands. The village is not visible from Nazan Bay until after the largest Bolshoi Island is passed.

A well-sheltered tide flat behind the Bolshoi Islands and 0.4 mile southeast of the village is suitable for beaching boats.

About 2 miles south of Atka village is a large and conspicuous waterfall. Fresh water can be procured from a stream near the village.

Trading vessels bound through Amlia Pass use the channel behind the Bolshoi Islands. Southward of **Cape Utes,** this route remains unsurveyed.

Nazan Bay is one of the most important anchorages in the Aleutian Islands. The inner anchorage in front of the village of Atka is sheltered and has depths of 6 to 12 fathoms, but is so limited in area that it is only practicable for small vessels.

The greater part of Nazan Bay (outer harbor) is only partially protected, being exposed to east and northeast. It is reported that there are strong northeast winds. The bay is subject to heavy swells and is at times unsafe for small boats. Ample anchorage area in 35 to 17 fathoms of water is west of Palisades Point. An L-head pier is 0.75 mile northwest of Palisades Point; the face is 395 feet long and the depth alongside was 35 feet in June 1953. Vessels can also anchor close to the northern shore

of the bay eastward of Palisades Point. Strong northwest winds draw through the low land between Nazan and Korovin Bays.

The bay has the disadvantage of poor access to the Pacific Ocean, since Amlia Pass can be used only by small, light-draft vessels and then only near slack water because of the strong and complex currents. Thus it is necessary for a vessel to steam about 60 miles in order to reach the Pacific by the way of Seguam Pass or about 80 miles around Cape Kigun, at the western end of Atka Island.

To enter Nazan Bay, pass 0.6 mile south of Cape Kudugnak and steer **270°.** When Uyak Island is on the port beam and distant 0.5 mile, head for anchorage as desired in the outer harbor; or, to enter the inner harbor, steer **250°** for 0.8 mile with the high pinnacle on the eastern Cone Islet ahead. Then steer **225°**, passing midway between the highest part of the southern Cone Islet and the high-water rocks at the northwestern point of the largest Bolshoi Island, and anchor as desired.

The tide in Nazan Bay is chiefly diurnal. The range from mean lower low water to mean higher high water is about 3½ feet.

Local magnetic attraction is known to exist in Nazan Bay. The maximum observed disturbance differs as much as 5° from the normal values shown on the chart.

In foggy weather the harbor in Nazan Bay will often be found clear when there is fog in the entrance.

Cape Kudugnak is the northern point of the entrance to Nazan Bay. A 200-foot, rounded, grassy knoll rises abruptly from the shore of the cape. When viewed from a distant northeasterly direction, the knoll appears as a rounded islet adjacent to a low point. From the cape the ground rises uniformly to the 2,687-foot mountain 2.5 miles to the northwestward. From off the cape, **Uyak Island,** about 100 feet high, on the south side of the harbor entrance, may be seen. This island has a rounded, grass top and rocky bluffs. A sunken rock, covered 5 fathoms, lies 0.6 mile eastward of Uyak Island.

Palisades Point, 1.2 miles due north of Uyak Island, is marked by prominent, rocky bluffs. From the top of the point, 322 feet high, a plateau extends inland to the mountains. A rock, 60 feet high, lies close to the shore just west of the southern extremity of the point.

Cone Islands are three small islands just north of the inner harbor. The northeast island of the group is 83 feet high and has three remarkable pinnacles on it.

Bolshoi Islands are a group of grass-covered islands along the south shore of Nazan Bay. The largest island has an elevation of 223 feet and forms the southeastern shore of the inner harbor. A narrow passage between Bolshoi Islands and the shore can be used by vessels up to 100 feet in length. It has widths of about 40 to 200 yards between the 3-fathom depth curves.

Chart 9136.—Korovin Bay is located on the north side of Atka Island. This bay is 8 miles long and has an average width of 3.5 miles. Depths shoal gradually from 80 fathoms at the entrance to the 5- and 10-fathom curves near the head of the bay, which is a low gravel beach. The shores of the bay are bold, sheer cliffs bordered by numerous pinnacles, except at the head of the bay and the vicinity of a lagoon on the north shore, both of which shores are low. Two bays, Martin Harbor and Sarana Cove, indent the south shore. Both entrance points, **Cape Korovin** on the north and Egg Point on the south, are bold headlands rising abruptly to mountain ranges.

At **Egg Point** the shore rises abruptly to an elevation of 1,033 feet. The point terminates in a prominent pinnacle rock 135 feet high.

Korovin Bay is well free of dangers 0.5 mile off the shoreline, except for two rocks 1.4 miles north of the entrance to Martin Harbor. The higher of these two rocks is bare 4 feet at high water, and is an aid in piloting a ship into the head of the bay. About 0.2 mile off the south shore of the bay, near its head, is a high, pyramidal-shaped, pinnacle rock of about 100 feet elevation, which is particularly prominent.

Korovin Bay is reported to be a good anchorage except possibly in extremely heavy westerly weather. All bays on the south shore of Korovin Bay provide shelter for very small vessels, but swinging room is very restricted. Although on the chart it would appear that Korovin Bay is sheltered from either southeast or southwest winds, this is not the case as strong winds howl through the draws and ravines which cut the hogback on Atka Island, and may force a vessel at anchor in Korovin Bay onto the north shore. Oftentimes, when it seems as though the winds coming out of the draws in a southeast direction are the prevailing winds, it will be found that outside the harbor the general winds are southwest.

Ship anchorages are available near the head of the bay, and off the lagoon (abandoned site of the village of **Korovinski**) 3 miles along the north shore from the head of the bay. The first anchorage is the better of the two and is suitable for easterly weather; the second is satisfactory in northerly weather. The bottom is gray sand of fair holding quality in both anchorages.

Martin Harbor and **Sarana Cove** are two smaller bays opening out of the south shore of Korovin Bay. The entrance to Sarana Cove is foul and should not be attempted by small craft without local knowledge. Martin Harbor is a small bay, about 1 mile in length, located 2 miles southwest of the head of Korovin Bay. Good protection for small craft is available in all weather in the head of the bay in 11 fathoms with mud and sand bottom.

Egg Bay is separated from Korovin Bay by the rugged cape which terminates in Egg Point. The shores of Egg Bay are mountainous, with humpy, grass-covered slopes. At the head of the bay is **Egg Island,** steep-sided, round-topped, and grass-covered.

Starichkof Reef lies 1.5 miles westward of Egg Point. The easternmost and largest islet is a vertical-sided block of rock 61 feet high. The second most conspicuous rock is a spurlike pinnacle about 0.5 mile northwest of the block-like rock. There are several other rocky islets, as well as a number of reefs or shoals in this area.

A dangerous 2-fathom shoal lies 0.3 mile north of the islets and 1.6 miles west of Egg Point.

Two shoals southwest of Starichkof Reef make it inadvisable to enter Egg Bay from the west side of the reef. One shoal, having a least depth of 2 fathoms, is 0.5 mile southwest from the westerly group of islets. The other shoal, having a least depth of 3 fathoms, is located 0.8 mile southwest from the same islets.

A 4½-fathom shoal is located 0.3 mile offshore on the east side of the bay, 0.8 of a mile south of the entrance at Egg Point.

Several other shoals having least depths of 8 to 12 fathoms lie near or in the bay. They should be avoided.

Numerous rocks and reefs border the shores of Egg Bay. The east shore for the

first 2 miles south of Egg Point is especially dangerous and should not be approached closer than 0.3 mile.

A pinnacle rock with a least depth of 2 feet is 250 yards off the northeast shore of Egg Island.

Approach Egg Bay on a course of 180° to pass 0.5 mile east of the easternmost islet in Starichkof Reef. When this islet is slightly abaft the beam, change course to 134°, heading for the left tangent of Egg Island. When 0.5 mile from Egg Island, haul to the left and round the island, keeping approximately in mid-channel.

Anchorage for medium-draft vessels is found northeast of Egg Island in 20 to 25 fathoms. The bottom is soft, fine, green sand, with rather poor holding properties. The lower end of Egg Bay offers fair protection in both northerly and southerly weather. The least swell is found south of Egg Island.

From Egg Bay to Banner Bay the shoreline is irregular and has several small bights. The bights, as well as the approaches to them, are foul. This area should be avoided.

Banner Point, on the northeast side of the entrance to Banner Bay, is lined by bluffs. Above the bluffs the land slopes upward to a 1,590-foot peak about 1 mile from the outer end of the point. A grass-covered islet, 165 feet high, is 0.3 mile northeast of Banner Point.

A rock awash at low water is 0.5 mile north of Banner Point; 0.1 mile north of the rock is a 2-fathom shoal; 0.2 mile northwest of the rock is a 5-fathom shoal. Kelp grows on both shoals.

Banner Bay is about 3 miles long and 0.8 mile wide. The trend of the bay is east and west. The shores are bold but free of dangers except for two groups of rocks, elevations 2 and 25 feet, in the northeast half of the entrance, and for an 8-fathom spot 0.3 mile off the south shore, 1 mile inside the entrance. Anchorage is available 0.6 mile from the head of the bay in 33 fathoms, which is the general depth in this part of the bay. Strong winds pull through this bay which, as a rule, are diverted to blow in or out of the bay.

Approaching Banner Bay, a large group of rocks, from which a foul area extends 0.8 mile southward, lies about 1 mile north of the entrance and 0.6 mile off the shore of Atka Island. The highest of these rocks, grayish in color and with an elevation of 57 feet, serves as an aid in reaching the bay.

To enter, from a position with the northeast point of Salt Island bearing 290°, distant 0.5 mile, steer 156°, heading for the highest bluff (also the highest nob on a ridge of low hills) at the south point of the entrance to Banner Bay. Hold this course until the group of rocks in the entrance to the bay bears 090°, then haul to port into the bay on mid-channel courses.

Salt Island is about 2.5 miles west of Banner Point. The island is a valuable aid to the navigator in approaching Atka Island. This island is 1.3 miles long in a northeast and southwest direction and about 0.5 mile wide. The highest point of the island, an elevation of 546 feet, is in the northeast half. All shores are rocky and bold, the northwest shore and northeast and southwest points being particularly so, with sheer cliffs over most of the shoreline, which is fringed by high pinnacle rocks. These pinnacles are particularly evident when the island is viewed from the southwest or northeast. The island is covered with grass and tundra. A small cabin is near the east end of the south shore.

A group of bare rocks lies 0.5 to 1 mile southeast of Salt Island. The highest of these is a light-colored, gray pinnacle of 38 feet elevation. A reef covered with heavy kelp obstructs the passage between Salt Island and these rocks and then continues southeastward. A small-boat passage is about 0.3 mile off the shore of Atka Island. It has a least depth of 6 fathoms, and scattered kelp over most of the passage. Foul ground extends 300 yards offshore, and heavy kelp may be encountered 0.5 mile off the Atka shore.

A 2-fathom shoal is 1.3 miles south of Salt Island and 1.4 miles west by north from the nearby prominent point of Atka Island.

Several reefs extend offshore from the north side of Salt Island, up to a distance of 0.3 mile.

Ship anchorage in 22 to 24 fathoms, sand bottom, is available south of Salt Island, affording protection from northerly and easterly weather. Anchor with the trend of the east shore of Salt Island in range and bearing 020°, and the 38-foot pinnacle in the group of rocks off Salt Island bearing 090°. Smaller vessels may anchor close inshore. Considerable shelter is afforded by the reef and kelp patch extending out from Salt Island.

In westerly weather suitable anchorage is available in 20 fathoms, sand bottom, about 0.5 mile off the east shore of Salt Island, with the 38-foot pinnacle bearing 200°.

Anchorage for large vessels is available in the bight of Atka Island to the south and southwest of Salt Island, in 20 to 25 fathoms, for protecton from easterly to southwesterly weather. The bottom is hard, however. The approaches to the shores and anchorage are free of dangers, except for scattered offlying rocks which are well within the 20-fathom curve. The survey ship anchored in 20 fathoms, 0.8 mile 215° from the western end of the point which lies at the southwest side of the entrance to Banner Bay.

Deep Bay, about 3 miles southward of Salt Island, is about 2 miles long and averages 0.3 mile wide, making into the Atka Island shore in a southeasterly direction. General depths range from 20 to 26 fathoms. From the northwest a long flat ridge can be seen at the south side of the entrance to the bay. The shores are bold but clear of dangers, except for several rocks at the middle of the entrance, and adjacent foul ground and rocks 100 to 200 yards off the entrance points. The most prominent rock in the middle of the entrance is 6 feet high. Anchorage in this bay is not suitable for large craft, because of insufficient swinging room. Medium-sized craft may anchor in 20 fathoms about 0.5 mile inside the entrance, or in suitable depths at the head of the bay. Bottom in the bay is hard. About 0.5 mile inside the entrance to the bay, a small inner bay makes into the south shore. This small bay is about 0.3 mile long, and depths range from 2 to 5 fathoms. It is suitable for small craft. To enter Deep Bay, pass 200 to 300 yards west to southwest of the 6-foot rock in the middle of the entrance.

Island Point, 4 miles southwest of Salt Island, is an irregular-topped, grassy headland 502 feet high. Because of the low valley between the headland and the main shore, this point may appear as an island to ships approaching from the west. Rocks and reefs fringe Island Point from 200 to 500 yards offshore. A conspicuous rock 22 feet high lies 0.2 mile northeast of the point.

The bight in the shoreline between Island Point and Kovurof Point is about 1.5 miles in depth. Three inner bays open into this bight.

Bluefox Bay is the open bight extending for several miles west of Island Point.

Two arms extend to the east and the south. A conspicuous, rugged hill 1,485 feet high is situated west of these arms. The shoreline of Bluefox Bay, especially in the arms, is irregular and broken, with many inshore reefs and pinnacles.

The eastern arm is open and easy to approach. It offers some protection from easterly weather. Anchorage is in 16 to 20 fathoms, the bottom being irregular and rocky, and offering poor holding ground.

A rock awash is located at the entrance to the southern arm, 0.2 mile west of the east shore. This southern arm has a hard bottom, and is an indifferent anchorage for shallow-draft craft. A 4-fathom shoal lies in the middle of the entrance to the bay, south of the rock awash. The west shore should be favored in entering the arm.

A small unnamed bay about 2.5 miles west of Bluefox Bay is behind a chain of rocky islets making out from the shore in a northeast directon. The larger and closer inshore islets are flat-topped and grass-covered; the outer islets are bare, black rock and of lesser height, the outermost being 20 feet high. A number of kelp patches on 3- to 5-fathom shoals are from 0.1 to 0.5 mile offshore northwest of these rocks. The offshore point of these rocks should be given a berth of at least 0.8 mile.

The shoreline between the chain of rock islets and Wall Bay has two indentations or inlets. At the head of these, as well as at the heads of the two arms first mentioned, are small beaches where pulling boats can land.

The bottom in the area between Bluefox Bay and Wall Bay is irregular and spotted with rocky patches.

Wall Bay is on the east side of Kovurof Point. It is a small bay which may be used as an anchorage by medium-draft vessels. This bay is about 1.5 miles long in the north and south direction and about 0.3 mile wide. High hills and bluffs border the west side of the bay, and moderate hills lie on the east side. A valley leads off to the south from the head of the bay. In southerly weather strong winds sweep out from this valley into the bay, making the bay an indifferent anchorage. The point on the east side of the bay appears as a long, broken, sloping ridge terminating in detached rock reefs at the waterline.

A 9-fathom shoal is on the east side of the entrance to the bay, about 0.6 mile east of the Kovurof Point shoreline and about 0.3 mile north of the rocks on the east side of the bay entrance.

A small dome-shaped, rocky islet 14 feet high is 0.1 mile off the west shore of the bay about 1 mile south of Kovurof Point. A 3-fathom shoal is 270 yards 115° from the rocky islet; a 2½-fathom shoal is 550 yards 175° from the islet.

A reef, which bares 1 foot at low water, is located in the lower part of the bay 0.1 mile off the east shoreline and 0.5 mile southeast from the islet. A submerged reef, marked by kelp, extends 200 yards northwest from the bare reef. Because of these various shoals it is not advisable for vessels to proceed south of the islet.

Approach Wall Bay on a heading of 180°, passing the Kovurof Point shoreline at a distance of 0.3 mile. When the rocks on the east side of the entrance are one point forward of the port beam, anchor in 17 fathoms. The bottom is gray sand.

Small boats can land on the sand beaches at the head of the bay.

Chart 9137.—Kovurof Point is the most prominent point westward of Salt Island along the north shore of Atka Island. It is a double point, both parts of which slope gradually up to a common peak of 1,320 feet elevation. This peak is quite prominent

on the few days out of the summer when it can be seen. The east point is the more prominent of the two and makes out farther to the northward. It is distinguished by four, flat-topped pinnacles directly off the point. Two of these pinnacles blend in together from certain directions and only three can be seen. The pinnacles identify this point.

Between Kovurof and Bechevin Points is a bight 1 mile in depth. Two small inner bays open into this bight, Kovurof Bay and Podsopochni Bay. They are separated by a peak of about 1,000 feet in height, which stands alone. The summit is a sloping ridge as seen from offshore; a sharp peak as seen from the east and west.

Kovurof Bay is suitable as a small-boat refuge. There are numerous islands and rocky islets at its entrance. The passage west of these islands into the head of the bay is free of all dangers, except close alongshore. Anchorage for small craft is available in 4 to 10 fathoms, sand bottom.

Podsopochni Bay, between Bechevin Point and **Podsopochni Point,** has a general depth greater than 10 fathoms and may be used as an emergency anchorage for small and medium-sized craft in any but northerly weather. The bay is free of dangers to within 0.3 mile of the shore. Enter the bay midway between the small, grass-covered island, 40 feet high, off Podsopochni Point, and the kelp-marked 1½-fathom shoal 0.7 mile northeast of Bechevin Point.

Bechevin Point, 5 miles southwest of Kovurof Point, is also a double point, with a small bight in the shoreline between. The bluffs at the ends of these points rise to about 250 feet and are brown in color, streaked with gulleys and studded with pinnacles. The eastern part of the point rises abruptly to a sharp peak of 710 feet elevation; the western part rises to a head of 615 feet elevation, and then drops to a saddle before rising to the 1,000-foot ridge behind.

North of the western part of Bechevin Point at a distance of 0.7 mile is a rocky 14-foot islet which is the most conspicuous and dangerous menace to navigation in this locality. Matted kelp and submerged reefs make out from the point and surround this rocky islet for some distance. Passage between the islet and the point should not be attempted, except by small craft; a low, flat reef which bares 2 feet at low water is 400 yards off the point. This islet is one of the few offlying dangers along the general trend of the north coast of Atka Island. Starichkof Reef could be considered another such danger.

The deep bight between Bechevin Point and White Point contains two small inside bays. The bay to the eastward, **Portage Lagoon,** is marked by numerous bare, black, rocky islets at its entrance, and by a high, steep-sloped peak directly west of the entrance. This lagoon which extends from Bechevin Bay across Atka Island almost to the Pacific side of the island, when seen from the northwest, appears as a low pass through Atka Island. Small boats can enter Portage Lagoon as heavy seas do not enter this lagoon because of the string of reefs and islets across the entrance which act as a breakwater. Passages between these reefs are narrow and dangerous, especially in heavy weather, and should not be attempted by strangers. One passage lies between the southwesternmost reef and the west shoreline. Several kelp-covered reefs are in this passage. A second passage lies east of the grass-topped islets and about midway in the line of reefs. This passage is about 50 yards wide and has submerged rocks on both sides.

Bechevin Bay, when approached from the north, is identified by the aforementioned low pass or valley cutting through the mountainous coast of Atka Island to the

Pacific. The rocky islet 0.7 mile off Bechevin Point helps to identify the bay. The southwest side of the entrance to the bay is marked by a rugged hill with deeply eroded scars and slides. The base of the hill is fringed with whitish-gray rock along the shore. Farther in, a low, grassy headland is rounded when entering the inner part of the bay.

Bechevin Bay is about 4 miles long and 1 mile wide. It is fairly open and exposed. Strong, gusty winds drawing through the mountain passes are common. Large ships anchoring in the outer bay will find less wind in the lee of the prominent 1,460-foot hill just southwest of Portage Lagoon. The survey ship frequently anchored 0.5 mile off the shore under this hill in 20 fathoms of water, with the north tangent of the hill bearing 090° and the low, grassy headland on the north side of the entrance to the inner bay bearing 250°. The bottom is even and consists of coarse, dark sand with broken shell.

The inner bay offers good anchorage to shallow-draft craft. The north side is shoal and has a boulder bottom; it should be avoided. A broad, sandy beach stretches across the head of this bay. Anchorage in 3 to 5 fathoms with sandy bottom is found off this beach, which is a good landing place for small boats.

Medium-draft vessels will find anchorage in 11 fathoms at the entrance to the inner bay midway between the south shore and the low, grassy headland on the north side. This grassy headland and the whitish, gray cape beyond should be on range. The bottom is sand and is fair holding ground.

The peninsula to the north and west of Bechevin Bay consists of two rounding points, White Point and Stripe Point. Between the east and west points is a low valley in which is a lake, the overflow of which empties into the Bering Sea at a waterfall. This waterfall can be distinguished well offshore. To the east, **White Point,** which is the west shore in approaching Bechevin Bay, is identified by light-colored gray bluffs. **Stripe Point** consists of two ridges which rise gradually to a common peak. Conspicuous gray-colored rock slides mark this point with a striped effect which identifies it. Between the two heads at Stripe Point is a light-colored boulder beach.

Crescent Bay, southwest from Stripe Point, is a bight in the shoreline of 1 mile depth. The head of this bight shows a low pass across the island. The shores are rocky except at the western end of the head of the bight which is sand and gravel. Two inner bays are suitable for small craft. One, at the east end of the head of the bay, is 0.5 mile long and 0.2 mile wide with anchoring depth of 3 fathoms, and is open to the west. The other is a small lagoon, at the middle of the head of the bay, suitable only for the smallest launches.

Slope Point, the west side of Crescent Bay, is a grassy, sloping ridge, rising gradually to a hill 880 feet high. Several rocky islets 1 to 5 feet in height extend from the end of this point.

Kigun Bay, the bight between Slope Point and Cape Kigun, is backed by low hills appearing as a low pass through the island. The head of the bay is light-colored sand which is evident from seaward. In the eastern half of this bight, a low point of scattered, rocky islets makes out from the shore; the point is surrounded by kelp. Hydrography in this bay has not been completed.

Cape Kigun, the western extremity of Atka Island, is a bold point of brownish cliff with close, alongshore reefs. The ridges making up from the several small points converge on a round-topped peak, about 1,100 feet high, which is prominent in clear weather. It is a single peak 0.6 mile east from the extreme west end of the island.

Koniuji Island is 14 miles northeastward from Cape Kigun. The island is volcanic, and all sides, except the south and southeast, are sheer and precipitous, rising to two sharp summits of 880 feet and 760 feet elevation. The south side of the island, above lower bluffs at the shore, slopes gradually to a ridge about 0.2 mile north and drops off again into a ravine which passes through the island at some elevation. The slope up from the south side is grass-covered. The northwest end of the island is a low, flat, rocky point about 200 yards long. About 75 yards off the north shore is a detached rock, height 8 feet, which is distinguishable from certain directions. An extensive kelp patch makes out to the south of the island. Also, in the summer, heavy kelp is found along and well off the west shore. The island is clear of dangers at a distance of 0.5 mile from the shoreline.

This island is the nesting place of thousands of sea fowl, which make their nests among the grass-covered, volcanic boulders that cover many parts of the island.

Kasatochi Island is 10 miles northwestward from Cape Kigun. This island is an extinct volcanic crater rising to a height of 1,038 feet from the water. The south and southeast sides are grassy slopes; the west and southwest sides are high, rocky bluffs. There is a small islet adjacent to the southwest side. As seen from the south and southwest, the sides are gradual slopes, and the summit (rim of the crater) shows as a ridge with several nobs of varying heights. The north side, as seen from the east and west, appears abrupt and sheer, with the north part of the crater rim showing as a sharp nob. As one proceeds to the north or south of the island, these nobs, being parts of the crater rim, change to ridges.

The island can be approached by deep-draft vessels to within 1 mile. An exposed anchorage is available in an emergency on the south side in 15 to 20 fathoms of water, hard bottom; small vessels anchor in depths as required. A trapper's cabin is on the slope on this side.

Chart 9138.—Oglodak Island is about 4.5 miles southwest of Cape Kigun, the western extremity of Atka Island. It is about 1.3 miles long and 0.7 mile wide and is steep and mountainous. The shores are precipitous and rocky, and fringed with offlying islets and rocks.

Atka Pass is between Atka Island and Oglodak Island. Heavy tide rips and strong currents have been reported here.

Ikiginak Island, 1 mile west of Oglodak Island, consists mainly of an almost cone-shaped mountain, 831 feet high. The island is about 700 yards in diameter and there are detached islets at the eastern and western ends. The shores are steep and rocky and fringed in places by offlying rocks.

The pass between Oglodak and Ikiginak Islands is reported to be studded with rocks and unsafe to traverse unless thoroughly familiar with the area.

Fenimore Rock is 1.7 miles west of Ikiginak Island and 1.6 miles northeast of the easternmost of the rocky islets extending east of Tagalak Island. The rock is about 300 yards long and 214 feet high.

Fenimore Pass westward of Fenimore Rock has depths of 17 to 25 fathoms. Tide rips are found in various parts of the pass.

Tagalak Island is mountainous, roughly triangular in shape, and about 3.2 miles long and 2.5 miles wide. From the eastern point of Tagalak Island, a chain of small

rocky islets extends to the eastward about 2.7 miles. The highest peak on Tagalak Island reaches an elevation of 1,783 feet. The shores in general are steep and rocky with a few small beaches. The shoreline in most places is fringed by detached rocks. The chain of islands extending eastward is fringed almost everywhere by foul ground.

On the north side of the island chain is a bight which affords temporary anchorage in good weather, with fair protection from the south and west. Depths are 10 to 15 fathoms over sand bottom; holding ground is fair. Currents are quite strong.

Tagalak Pass, 1 mile wide in its narrowest part between Tagalak and Chugul Islands, is not highly recommended. It has been sounded and swept, the least depth found near mid-pass being 6 fathoms, but it has the strongest tide rips and overfalls encountered in the Andreanof area. To approach the strait from the southward, positions can be plotted using tangents on Anagaksik Island, the cone-shaped island of Ikiginak, Fenimore Rock, and for a while, a prominent, two-fingered pinnacle near the southwest end of Chugul Island. Course **324°** should be made good to pass midway between **Cape Kagalus,** the southeast tip of Chugul Island, and **Cathedral Point,** the south point of Tagalak Island. After passing through the tide rips, course can be changed to **335°** and held until the northeast point of Chugul Island is abeam. A change of course to **north** at this point carries the ship out into the Bering Sea.

Chart 9139.—Chugul Island is about 4.5 miles long from northwest to southeast and 2.5 miles wide from north to south. The highest summit reaches an elevation of approximately 1,700 feet. There are several small lakes and streams on the island. The coasts are, in general, steep and rocky, but there are indentations with sandy beaches at the heads.

A **light (lat. 51°55′.0 N., long. 175°47′.3 W.)** is on the south coast of Chugul Island about 1.0 mile west of Cape Kagalus. The light, shown from a skeleton tower, is 105 feet above the water and visible 10 miles. It is obscured from 109° to 274°.

Igitkin Island, about 1 mile northwest of Chugul Island, is 5.5 miles long and quite narrow. It is divided into two parts, connected by a low isthmus about 0.3 mile wide. Aside from this isthmus, the island is mountainous and rocky. North of the isthmus is a small cove, Igitkin Bight, and to the south is a somewhat larger indentation, Shelter Cove. The coast of Igitkin Island is in general steep and rocky and fringed with islets and detached rocks.

Igitkin Bank extends 2 miles westward of **Igitkin Point,** the western extremity of the island.

Shelter Cove is a small cove opening on Igitkin Pass. It is not recommended as an anchorage due to its small size, lack of holding ground in its rock bottom, and its exposure to draw winds from north and south.

Igitkin Bight probably affords partly sheltered anchorage for small vessels; it is presumably subject to the same draw winds that prevail at Shelter Cove. It is about 0.8 mile long and has an entrance about 0.3 mile wide, with bottom characteristics in the entrance, black sand. The bight is open to the north.

Igitkin Pass, separating Chugul and Igitkin Islands, is clear and deep and is perhaps the best pass from the north and east to Kuluk Bay. It is 3.5 miles long and the navigable channel is about 0.5 mile wide at the narrowest point at the western end. A mid-channel course of **248°** leads directly into the pass north of Umak Island through which entrance into Kuluk Bay can easily be made. Tide rips have been reported

between **Kingfisher Point,** on Igitkin Island, and the northwest point of Tagalak Island between Kingfisher Point and the east end of Chugul Island, and also at the west end of Igitkin Pass. A strong southward current has been reported at the western end of Igitkin Pass.

Chugul Pass, between Chugul Island on the east and Anagaksik and Umak Islands on the west, is about 4 miles wide, and is deep and clear.

Next to Atka Pass, Chugul Pass, in combination with Asuksak Pass, is considered the best passage from the Bering Sea to the Pacific between Seguam and Adak Straits. It is the best passage to Kuluk Bay from the southeast. Prominent landmarks that can be used during the approach from south and east are the island of Anagaksik; Cape Azamis, the southeast tip of Little Tanaga; the prominent, two-fingered pinnacle near the southeast end of Chugul; and the conical-shaped island of Ikiginak. From a position 3 miles east of Anagaksik, a course made good of **303°** will pass **Cape Ruin,** the northeast tip of Umak, at a distance of 1 mile. From this point, making good a course of **263°** will lead down the middle of Asuksak Pass, passing 1.5 miles off Cape Chakik, the western tip of Umak. Throughout Chugul Pass are strong tidal currents. In thick weather, dead reckoning is difficult because of these currents.

Chart 9193.—Great Sitkin Island, about 24 miles westward of Atka Island, is about 10 miles long and 8 miles wide. It is volcanic and extremely mountainous, the highest summit, an active volcano, attaining an elevation of 5,740 feet. Much of the shore is steep and rocky, but with considerable stretches of sandy beach. It has some off-lying rocks both exposed and submerged. Two large indentations are Sand Bay, on the southwestern side, and Yoke Bay, on the southeastern side.

Teapot Rock is a large teapot-shaped rock lying about 150 yards off the northeastern extremity of Great Sitkin Island.

Swallow Head, the northwestern extremity of the island, is marked by a **light (lat. 57°07′.0 N., long. 176°09′.2 W.),** 80 feet above the water and visible 10 miles, which is shown from a 60-foot white skeleton tower. The light is obscured from 245° to 046°.

Chart 9139.—Ulak Island, lies about 2.3 miles east of **Bugle Point,** the eastern extremity of Great Sitkin Island, and about 2.5 miles north of Igitkin Island. It is a barren rock, about 0.9 mile long and 0.2 mile wide and reaching an elevation of 688 feet. Deep water will be found close-in to this island on all sides, except the southwest point where rocks extend out 300 yards.

Yoke Bay, on the southeast coast of Great Sitkin Island, has three arms. The best anchorage of the three is the middle or **West Arm;** it is about 1,500 yards in extent and affords anchorage in about 20 fathoms of water. The bottom is sticky hard mud, affording good holding ground. Limited anchorage space is available in both **North Arm** and **South Arm.** The bay is subject to williwaws, but their effect is not serious on ships equipped with good ground tackle. Yoke Bay is open to swells from the Pacific Ocean from the southwest, although they are somewhat broken in their approach by nearby islands; it is entirely open in a northeasterly direction to the Bering Sea.

Great Sitkin Pass lies between the southern peninsula of Great Sitkin Island and the islands of Igitkin, Tagadak, Kanu and Tanaklak. The pass has been swept to 7 fathoms. Between **Zalvia Point** and **Passage Point** currents of 2½ knots have been

observed and greater velocities are to be expected. **Yoke Pass** is at the northern entrance to Great Sitkin Pass, between Igitkin Bank and Rip Point. Due to tide rips, currents, and the frequent changes of course required, Great Sitkin Pass is not recommended. However, directions for making the transit from eastward are given below.

From a point bearing 310°, distant 2 miles from Igitkin Point, the western tip of Igitkin Island, course **180°** should be laid to pass 1,500 yards off **Rip Point,** on Great Sitkin Island. Seven hundred and fifty yards after passing this point on the starboard beam a change of course to make good **245°** will head the ship 400 yards to northward of Box Island. Soundings will decrease rapidly while passing through the tide rips between Igitkin and Great Sitkin, but no less depth than 7 fathoms will be found if the aforementioned directions are followed. It is not safe to pass Rip Point at a distance less than 1,000 yards; pinnacle rocks, not awash except at low tide, extend out from the point; nor should Igitkin Point be passed at a distance of less than 2,500 yards because of the shallow depths and submerged rocks found.

On passing Box Island abeam to port, course should be changed to **258°.** This course is to be made good for a distance of 1 mile, after which a course of **298°** should be laid to pass midway between Tanaklak and Great Sitkin. Five hundred yards after passing the narrowest point of this strait, course of **270°** is made good until the west tangent of Aziak is abeam.

Tagadak Island, about 2 miles southwest of Igitkin Island, is small and roughly triangular in shape. The island is very rugged; the shores are steep and rocky except part of the western side which has a sandy beach. The coast in most places is fringed with reefs or shoals. It has been reported that Tagadak Island is used as a breeding ground by geese and ducks.

Kanu Island lies about 0.5 mile southwest of Tagadak Island. The island is rocky and mountainous and about 1.5 miles long and 1 mile wide. The greatest elevation is 995 feet. The shores in general are steep and rocky, except on the west side where there is a sand or gravel landing beach about 0.5 mile long, protected by other islands from all except southwest winds. The coasts are mostly fringed with reefs and exposed and sunken rocks. A relatively shoal area extends to the northward for nearly 0.7 mile. Near the northern end of this area lies **Box Island,** a small rocky islet about 20 feet high. A small cove on the east side of Kanu Island might afford some shelter for small craft.

Tanaklak Island, about 1.5 miles west of Kanu Island, is about 1.8 miles long and 0.5 mile wide and is rocky and rugged. The island is one of low relief and rolling hills.

The channels between Tanaklak Island and Kanu Island and between Tanaklak Island and Asuksak Island appear to be deep and clear.

Asuksak Island, 0.5 mile south of Tanaklak Island, is steep and rocky and consists mainly of one mountain 945 feet high. The island is about 0.7 mile long and about 0.5 mile wide. A **light (lat. 51°55.9 N., long. 176° 06.5 W.)** is on the southern shore about 0.1 mile east of the southwest point of the island. The light, shown from a small white house, is 34 feet above water and visible 10 miles; it is obscured from 100° to 272°. On the northeast end of the island is a low point with a gravel beach on each side.

Aziak Island, 0.5 mile west of Tanaklak Island, is about 1 mile long and 0.6 mile wide and is rocky and hilly, reaching an elevation of 706 feet.

Sand Bay, on the southwest coast of Great Sitkin, has an area of about 4 square

miles with 30 fathoms or less water in which to anchor. Suitable anchorage in 12 to 15 fathoms is about 1,000 yards offshore. The bay is protected on the north and east, but is undoubtedly subject to heavy seas during a westerly gale. Strong tidal currents run in the bay.

In 1946 the long pier in the northeast corner of Sand Bay had 750 feet of berthing space in depths of 36 feet along the south side. No vessels are allowed on the north side of the pier. A current of 2 to 3 knots sets southeastward along the pier during the ebb, making it almost impossible for large vessels to make a landing on the south side of the pier. Four mooring buoys are maintained in the bay.

An aeronautical radiobeacon is near the shore end of the long pier. The identification signal is NU1 (_ . . . _ . _ _ _ _). The frequency is 335 kc.

Chart 9140.—Anagaksik Island is about 2 miles east of the eastern end of Umak Island and on the southern side of the entrance to Chugul Pass. The islet is a precipitous rock about 1 mile long and 0.5 mile wide and has a greatest elevation of 842 feet. It has a few offlying rocks, but in most places deep water extends close to the shore.

Umak Island, about 5 miles southwest of Chugul Island, is a mountainous, irregularly shaped island about 6 miles long and 3 miles wide. Its main feature is a bay, Umak Bight, indenting the northeast coast. From this bight a low pass extends to the opposite side of the island. The shores are in general steep and rocky, though with occasional stretches of sandy beach. The north coast is foul, with many detached rocks, exposed and submerged. A number of islets lie off the east coast. The south coast is in general clear, with few offlying rocks, except towards **Cape Chakik,** the western extremity, where there are stretches of fringing reefs. Birds of many species frequent the island; there are also seals on the island.

Umak Bight is about 2 miles in extent and its principal arm is about 0.6 mile wide at its entrance. The bight is open on the east to Chugul Pass, and a considerable swell from the ocean has been reported. Anchorage, over a bottom of sand and rock, is in approximately 28 fathoms. It is probable that the low pass to the west of Umak Bight would often cause strong winds to sweep over the bight. At the head of the bight is a sand beach which is crossed by a stream.

Asuksak Pass separates Umak from Kanu and Asuksak Island. It is about 1.3 miles wide at its narrowest point and is deep and clear, but the currents are strong between Kanu and Umak Islands. These have a marked influence on the course made good and make it highly inadvisable to attempt the pass in thick weather.

Umak Pass lies between Umak and Little Tanaga Islands. It is about 0.6 mile wide at its narrowest point and is about 7 miles long. The pass is deep and clear but has strong currents and tide rips. Sailing directions for the pass are given below.

From a position 1.7 miles due south of the western end of Anagaksik Island, make good course **270°** for 2.7 miles to a point midway between **Cape Agumsadak** and **Cape Azamis.** From this mid-channel point make good course **315°** for 2.2 miles. From the end of the 2.2-mile run, make good a mid-channel course of **283°** through the narrowest part of the pass. Soundings will decrease when nearing this narrow part but the least water which has been noted at any point is 8 fathoms.

When opposite the entrance to Scripps Bay, make good course **324°** so as to bring

the prominent indentation in the coast just east of the entrance to the bay dead astern. This course leads to open water.

Umak Pass is considered perfectly safe, and the only obstruction is a rock awash on the eastern side about 1,100 yards 150° from Cape Chakik, the western tip of Umak Island.

In thick weather it is recommended that the eastern shore be favored and kept in sight, as by doing so a ship can be worked safely along the shoreline. After passing the narrowest part of the strait it is best to favor the western side.

Currents of 3 knots have been observed in Umak Pass and larger velocities probably occur. The changes of current are accompanied by erratic movements and tide rips.

Little Tanaga Island is about 8 miles long and has a greatest width of about 7 miles. The island is extremely irregular in form. Two long bays, separated by a narrow isthmus, nearly cut it into two parts. The island is very rocky and mountainous, the highest elevation being 1,731 feet. The shores in general are steep and rocky, and the coast in most places is fringed with reefs, islets, and detached rocks. Several streams and small lakes are on the island.

Scripps Bay, on the north coast of Little Tanaga Island, is a well-protected anchorage though subject to williwaws. The bottom is coarse sand with pebbles, but appears to hold fairly well. A sandy beach, intersected by a stream of fresh water, lies at the head of the bay. Scripps Bay is subject to fog and reduced visibility; it is frequently thick here when the western and northern sections of Kuluk Bay (Adak Island) are clear.

To enter Scripps Bay from the north, a course should be steered to pass through a point midway between the northeast cape of Little Tanaga and Cape Chakik. From this point make good a course of 144°, heading for a small indentation 300 yards to the eastward of the mouth of the bay. A bare, low islet will be visible near the east shore of the bay about 500 yards inside the mouth. To approach the anchorage, course should be changed to 200° to pass 400 yards off the rocky islet. Anchorage is afforded in 18 fathoms of water, with the islet bearing 061°, distant 750 yards. Anchorage for smaller vessels is in shallow water near the shore. The eastern shore must be favored on entering, in order to avoid a shallow spot off the west point at the entrance.

Chisak Bay, on the south coast of Little Tanaga Island, is about 2.5 miles long and 0.8 mile wide. Depths are suitable for anchorage, but the anchorage space is reduced by numerous small islands. The upper end of the bay is clear, but the channel to it is very narrow. The bay is almost landlocked, but is reported to be exposed to swells and seas from the Pacific Ocean. A stream of fresh water enters the head of the cove. The shores of Chisak Bay consist of narrow rocky beaches.

Azamis Cove, on the south coast of Little Tanaga Island, is about 2 miles long and 1 mile wide at the entrance. Depths are suitable for anchorage. The bay provides shelter from the north and west, but is open to seas and swells from the Pacific Ocean.

Round Cove, eastward of Azamis Cove, is about 1 mile in diameter and the depths are not too great for anchorage. It is open to the south and southwest and is reported moderately subject to heavy seas and ground swells.

Chart 9141.—Little Tanaga Strait, between Little Tanaga and Kagalaska Islands, is about 7 miles long and at its narrowest point about 1.2 miles wide; however, the navigable channel between Little Tanaga and Silak Islands has a width at one point of less

than 0.5 mile. A sunken rock lies 200 yards east of Silak Island. Erratic currents, rips, and swirls prevail and this pass is not recommended. Directions for transiting the strait are given below.

From a position 2.8 miles 270° from Cape Chisak make good a course of **000°**, keeping **Silak Island** a little on the port bow and heading for **Tana Point** on Little Tanaga. Hold the **north** course until abeam of Silak Island, then change to **330°** to pass through the channel. This course is held until **Cemetery Point** is abeam, when a course of **000°** may be shaped to pass clear of the strait. The waters between Kagalaska Island and Silak Island are foul, and vessels must always pass between Little Tanaga and Silak. Erratic currents, rips, and swirls are to be expected and a tidal current of from 4 to 5 knots has been reported.

Tana Bight is an indentation on the western coast of Little Tanaga Island, facing Little Tanaga Strait. It is reported to afford temporary anchorage for a medium-sized vessel. Depths are suitable for anchorage but the bight is probably subject to the strong currents flowing through the strait.

Piper Cove, on the western coast of Little Tanaga Island, is open to the west and southwest and is probably subject to ground swells from the Pacific Ocean. It is reported to afford temporary anchorage for a medium-sized vessel.

Kagalaska Island lies west of Little Tanaga Island, being separated therefrom by Little Tanaga Strait. The island is about 8 miles long and 5 miles wide. It is extremely rugged and mountainous; the greatest elevation reported is 2,547 feet. The shores are, in general, steep and rocky except on the west coast, where they have a more gradual slope, becoming steeper inland. The south shore consists of jagged cliffs. The east and north coasts are also steep in many places. The brief stretches of sand or gravel beach are often backed by vertical cliffs. The coasts are, in general, clear except the south and southeast coasts and part of the north coast, which are fringed by islets and detached rocks. Several lakes and streams are on the island.

Cabin Cove, opening into Little Tanaga Strait, is a two-armed bay which indents the east coast of Kagalaska Island deeply. Cabin Cove may be divided into three parts, Cabin Cove proper, Upper Arm and Lower Arm.

Upper Arm is about 1.5 miles long and 0.5 mile wide. It is bordered by steep, sloping hills on all sides. The entrance and the bay are free of dangers. Approaching the entrance, the 10-fathom curve makes out from the north shore 200 yards and 100 yards off the low gravel point on the north shore at the entrance. Depths in the center of the bay are between 40 and 50 fathoms. In the head of the bay anchorage can be had in depths between 30 and 40 fathoms, the 30-fathom curve lying about 400 yards off the high waterline. The shores are free of offlying rocks and shoals.

Lower Arm is about 1 mile long and the entrance is about 800 yards wide. The area of the arm is less than that of Upper Arm, but in most of it the depths are suitable for anchorage. The surrounding terrain, especially at the head of the arm, rises in gentler slopes than is the case in Upper Arm, but the summits are more than 1,000 feet high. A fresh-water stream flows into the head of the arm.

Kagalaska Strait separates Adak and Kagalaska Islands. Although narrow, it can be navigated by moderate-sized vessels without difficulty at or near slack water. A 9-fathom shoal is in mid-channel off the southern end of Adak Bight in lat. 51°45′.8 N., long. 176°24′.6 W. This shoal has been cleared with the wire drag to 54 feet. Southerly winds with ebb current cause heavy tide rips from the southern entrance north

as far as Adak Bight, and are apt to cause a vessel approaching from the south to yaw badly. Because of strong currents, rips and whirlpools are encountered in the narrow parts of the strait except at slack water.

Both north and south entrances are clear, with deep water close to the shores. Care must be taken not to mistake Blind Cove for the north entrance since the former, lying about 1 mile west of the strait, has a much wider appearance. The shores of the north entrance are bold and precipitous while those of the south entrance are relatively low, with outlying rocks. Navigators not familiar with the area are cautioned against attempting an entrance in any but clear weather.

Ragged Point, the southeastern extremity of Kagalaska Island, is 4.5 miles eastward of Kagalaska Strait and is an unmistakable landmark for the southern approaches to the strait because of its serrated ridge forming the summit of the point. A natural arch in the tip of Ragged Point is noticeable when the point bears 017°.

Adak Bight, about 2 miles from the south entrance to Kagalaska Strait, affords good shelter to vessels up to about 100 feet in length. A 3-fathom shoal, marked with kelp, lies 0.3 mile 108° from the north point of the bight. Vessels approaching from the north should clear this shoal 0.3 mile before turning to enter. Either arm of the bight is suitable for anchoring, but the northernmost affords more swinging room. A shoal lies just off the point between the two arms. In entering either arm, a vessel should keep in mid-channel.

Campers Cove, just north of Adak Bight, is suitable only for small boats because of the narrow, shallow entrance. Relatively small vessels can anchor in about 10 fathoms in the indentation just north of **Campers Point** and thus avoid currents and rips in the strait.

Laska Cove, on the east side of Kagalaska Strait, is deep and well protected. Small vessels usually anchor in the northeast portion of the cove.

Chart 9193.—Adak Island, the most important of the Andreanof Group, is about 30 miles long and 20 miles wide at its widest part. The island is rugged and mountainous and has numerous small bays and indentations. **Mount Moffett,** near the northwestern end, attains an elevation of 3,900 feet and is the highest point of the island; it is snow-covered the greater part of the year. The island is grass-covered on the lower levels; the higher levels have a heavy growth of moss. Small lakes are numerous and there are many small streams.

Chart 9141.—Boot Bay is on the south coast of Adak Island about 3 miles west of Kagalaska Strait. The inner harbor has depths of 11 to 35 fathoms over bottom varying from rock to mud; the mud bottom is in the deeper water. Seas and swells from the Pacific Ocean are broken up by the islands in the bay; however, the islands offer little protection from southerly winds. As the land to the north is mountainous there is a probability of williwaws with north winds.

Blind Cove, on Adak Island just westward of the north entrance to Kagalaska Strait, is suitable for temporary anchorage only as it is exposed to the northward and is subject to williwaws from the south. Small vessels have found a clear entrance by keeping in mid-channel, and have anchored at the south end of the cove in about 17 fathoms. A 2-fathom spot is 175 yards northward of **Blind Point** and a 5-fathom spot is 275 yards westward of the point. A 6-fathom shoal is about 90 yards west of the

small island on the eastern side of the mouth of the cove. A kelp patch was noted just north of the spit that juts out from the southeast corner of the cove.

Kuluk Bay, on the northeast side of Adak Island, is about 4 miles long and 4 miles wide, and is one of the best natural harbors in the Aleutians. It is entered between Zeto Point on the north and **Thunder Point** on the south, and includes Kuluk Bay proper, Clam Lagoon, Sweeper Cove, Finger Bay and Scabbard Bay. Tidal currents in the bay are weak and the flow appears to depend mainly upon the winds.

Zeto Point is a prominent butte rising well above the surrounding land and has several jagged pinnacles along its southern face. About 1.5 miles northeast of the point is **Head Rock,** which is large and bare.

Kuluk Shoal, consisting of several rocks covered 1¼ to 7 fathoms and marked by kelp, is about 0.8 mile south of Head Rock and 1 mile eastward of Zeto Point. A lighted whistle buoy is moored about 0.6 mile east of the shoal.

A 9-fathom shoal with rocky bottom is 0.5 mile 012° from the Head Rock; a 17-fathom bank with rocky bottom is 2 miles 096° from the rock.

Clam Lagoon, 0.5 mile northwest of Zeto Point, can be entered only by small boats. In the southern part of the lagoon and outside the entrance are mud flats. The ruins of a long pier are 0.5 mile west of the lagoon entrance.

An aeronautical radiobeacon is near the mouth of Clam Lagoon. The identification signal is NUD (_. .._ _..). The frequency is 347 kc.

The best anchorage in Kuluk Bay proper is southwest of Zeto Point in 12 to 18 fathoms, black and gray sand bottom. It is protected on the north, west, and south, but is exposed in an easterly direction to the 20 miles of open water between Adak and Great Sitkin Islands.

Chart 9119.—Sweeper Cove, on the southwest side of Kuluk Bay, is about 1 mile long and 0.5 mile wide. Depths range from 11 to 24 fathoms, over a bottom of gray sand. A breakwater on the north side of the entrance provides good shelter for vessels moored inside. A light, 30 feet above water, marks the end of the breakwater.

Caution.—A naval operating base and an Army base are located in Sweeper Cove. Permission to enter or move about the cove must be obtained from the harbormaster, who will assign a berth or mooring and provide a pilot and tug if needed. The harbormaster's office and signal tower are at the north end of the Administration Building; the radio voice call is NUD–3 on 2188 kc. Storm warnings are displayed from the tower.

The piers on the north and west sides of Sweeper Cove can accommodate vessels of 30-foot draft.

At the southwest end of Sweeper Cove is a small-boat basin which was dredged to a depth of 10 feet. In 1945 the pier on the north side of the entrance had a depth of 8 feet along its south face.

About 0.4 mile east of the small-boat basin is **Hammerhead Cove,** which has two piers for small boats.

The **tide** in Sweeper Cove is chiefly diurnal. The diurnal range is about 3½ feet. Daily predictions are given in the *Tide Tables.*

On the north side of the main approach to Sweeper Cove are **Gannet Rocks,** a group of bare rocks surrounded by shoal water. Between Gannet Rocks and the shore are a

detached shoal with a least depth of 3½ fathoms and a group of small islets surrounded by shoals. A **light (lat. 51°52′.1 N., long. 170°36′.4 W.)**, 35 feet above the water and visible 8 miles, marks the south end of the largest Gannet Rock. It is obscured from 102° to 214°.

Pit Rocks, a group of bare rocks surrounded by shoal water, are about 0.3 mile northward of **Lucky Point,** which is on the west side of the entrance to Finger Bay. **Finger Shoal,** on which is a rock bare at low water, is about 0.4 mile eastward of the largest rock.

Finger Bay, on the south side of Kuluk Bay, is about 1 mile long and 1 mile wide and has two narrow arms extending in southerly and southwesterly directions. Both arms are open to the northeast but no sea penetrates their narrow entrances. In the outer part of the bay depths are generally too deep for suitable anchorage, although temporary anchorage may be found in about 30 fathoms 400 yards southwest of Lucky Point and in 24 fathoms off the entrances to the two arms.

The southwest arm is narrow but clear in mid-channel, with a least depth of 5 fathoms. Piers at the head of the arm have depths alongside of 24 to 37 feet. Holding ground off the docks is good.

Scabbard Bay, just eastward of Finger Bay, is open to the northward. Anchorage can be had near the entrance in 20 fathoms, gray sand and broken shell bottom. At the south end of the bay is good shelter in 15 to 20 fathoms, brown mud bottom. Fresh water is obtainable.

Moderate-sized vessels should not encounter dangers in Scabbard Bay as long as they steer mid-channel courses. Shoal dangers are shown on the chart but it is possible that lesser depths exist.

Chart 9193.—Cape Adagdak, the northernmost point of Adak Island, is a bold headland about 2,072 feet high. From Cape Adagdak the coast trends southwestward, then curves westward to form **Andrew Bay,** which is about 3 miles wide and 1.3 miles in depth. A rocky dike about 200 yards wide and 20 feet high separates the head of the bay from **Andrew Lake,** a fresh-water body about 2 miles in diameter.

Cape Moffett, about 8 miles southwestward of Cape Adagdak, is a cliff about 600 feet high behind which the land rises gradually to Mount Moffett. The cape is the northwest headland of Adak Island and is a prominent mark for entering Adak Strait.

Shagak Bay, (*see also Chart 9121*) indents the west coast of Adak Island about 5 miles south of Cape Moffett. The bay is about 2 miles by 1 mile in extent, but its entrance is only 300 yards wide between sand spits projecting out from the north and south shores. Inside the bay are depths of 20 fathoms but only 4 feet can be carried through the entrance. The bay is well protected from swells by the two sand spits; the bottom is mud and is probably fair holding ground. It is probable that the anchorage is untenable in heavy gales from the northeast and north. A number of freshwater streams empty into the bay.

Careful Point, the southern entrance to Bay of Islands, is about 8.5 miles south of Cape Moffett.

Whirlpool Rock, 0.6 mile 300° from Careful Point, is about 10 yards in diameter, flat on top and awash at extreme high tides. Kelp grows close to the rock; there is deep water 150 yards to the west, south, and east of the rock and the water north of

the rock appears to be deep. It is an excellent landmark for approaching an anchorage in the Bay of Islands.

Chart 9120.—Bay of Islands is a large bay with many islands on the northwest side of Adak Island. It is a fairly secure landlocked harbor about 2.5 to 3 miles in length by 0.8 to 1 mile in width. The average depth except off Unalga Bight and Gannet Cove is about 50 fathoms. The bay is protected on the north by a group of small islands, **North Island** being the northernmost, then **Dora Island, Argonne Island, Staten Island,** and at the western end of the bay is **Ringgold Island. Green Island** lies at the northwestern end of Ringgold Island.

Cascade Rock, a low rock almost awash at high water, is a prominent landmark when entering Bay of Islands. It lies 1.5 miles 092° from Careful Point.

The main part of the Bay of Islands, **Expedition Harbor,** is too deep for use as an anchorage.

The Bay of Islands, though protected from sea swells, is subject to violent and severe gales, especially with winds from east and south, and gusts in excess of 80 miles have been reported. The suddenness with which these gales come up and the generally unsatisfactory weather conditions, poor holding ground, confined maneuvering space and dangerous channels, tend to make the Bay of Islands the least satisfactory anchorage in this locality.

The approaches to the Bay of Islands are clear north of Whirlpool Rock. Strong currents were noted in the outer bay as far east as Whirlpool Rock; the velocity decreases from this rock toward the head of the bay.

A course of **120°,** with Cascade Rock dead ahead, clears Whirlpool Rock and Careful Point by 0.7 mile. To make the passage into the bay via **Argonne Channel,** continue on course **120°** to within 600 yards of Cascade Rock, then shape courses through the dragged section of the channel to anchorage in **Unalga Bight, Gannet Cove** or **Beverley Cove.** The entrance to the channel and the narrowest part are buoyed; a daybeacon marks a group of rocks 300 yards southeastward of Green Island.

To make the alternate passage via **Ringgold Sound,** shape a course for the northwest point of Ringgold Island from abeam of Careful Point, and keep in the dragged channel east of **Plum Island Rocks,** thence into Ringgold Sound, Fisherman Cove, and through Hell Gate.

The Race is dangerous on account of having to pass very close to Plum Island Rocks. With a large single-screw vessel, a speed of 8 to 10 knots is necessary in order to make changes of course in passing through The Race.

The passage through **Hell Gate** is sufficiently deep for all vessels; however, the channel is very narrow and is not buoyed. A course of **100°** heading for **Range Point,** leads through mid-channel in Hell Gate. When the east tangent of **Eaglet Rocks** is on the port beam, change course to **110°** for 0.3 mile, then proceed to an anchorage in Unalga Bight in 16 to 25 fathoms, mud bottom; to Gannet Cove in 16 to 25 fathoms, mud bottom; or to Beverley Cove in 10 to 18 fathoms.

The 10-fathom channel in Hell Gate narrows down in one place to about 70 yards in width and is dangerous for a large vessel in case of strong beam winds, breakdown of steering gear or main engine, or a slight error in course.

At the eastern end of Hell Gate, the kelp-covered rocks on the southern side and Eaglet Rocks on the northern side narrow the entrance into the Bay of Islands and are

a source of danger. This is especially true in going out of the bay, as it is necessary to head for Eaglet Rocks and, when the rocks are close at hand, to make a sharp change of course in order to pass through the deep and narrow part of Hell Gate.

For an anchorage southward of North Island, from a position 1 mile 020° from Cascade Rock, head for the easternmost tip of **South Island** on course **148°**; when Cascade Rock is due west, change course to **110°** which should pass between two 6-fathom spots at the entrance to the anchorage.

An excellent anchorage for small vessels is in **Fisherman Cove,** on the south side of Ringgold Sound, in 22 fathoms, mud bottom.

An anchorage which has not been dragged in 20 to 30 fathoms is 0.35 mile eastward of Argonne Island.

Several waterfalls in the Bay of Islands afford an ample supply of fresh water which in most cases must be barged to a vessel. The waterfall 0.3 mile southeast of **Vincennes Point** has the most accessible natural water supply in the bay. A small vessel may anchor off this waterfall in 18 fathoms and run a stern line to projecting rocky ledges on the beach. Water may be taken aboard a vessel direct from a hose attached to a tank or drum set in the waterfall about 20 feet above high water, and of sufficient length to reach from the waterfall to the vessel's tanks. One thousand gallons an hour may be obtained with a 1½-inch hose by this method.

Chart 9121.—Three Arm Bay is 5 miles south of Bay of Islands. The inner end of the north arm is 0.6 mile from the south shore of Unalga Bight. No detailed information regarding weather, tides or surrounding country is available.

North Arm is a narrow strait about 0.2 mile wide and extending 2 miles inshore. A short trail extends from near the eastern end of the arm to the south shore of the Bay of Islands. A fair anchorage for small vessels is in **Middle Arm,** in 18 fathoms 0.5 mile north of **Split Point.** **South Arm** is an excellent anchorage for small vessels and launches in 10 fathoms, sand and mud bottom. The least depth found in the channel by the survey ship *Patton* while entering and leaving South Arm was 4 fathoms.

To enter South Arm from Middle Arm, steer course **180°,** heading midway between the west shore of the small island off Split Point and the shoreline to the westward. When the island off Split Point bears east change course to **123°** and head for a desired anchorage. The passage between Split Point and the island is foul.

Chart 9193.—Adak Strait separating Adak and Kanaga Islands is 15 miles long and 6 miles wide at the narrowest part; the average depth is about 50 fathoms. Except for the reefs at the northeastern end of Kanaga and at **Argonne Point** on the Adak shore no obstructions have been found in the strait and vessels of any size may safely pass through it. Passage through the strait in heavy fog is not advisable on account of the strong current which attains an estimated velocity of 6 knots. **Round Head,** a cliff 1,128 feet high on the northeastern end of Kanaga, is a prominent landmark when entering Adak Strait. The wind in the strait is practically never east or west.

The east coast of Adak Strait is bordered by rocky bluffs, and islands and reefs lie close to the west shore of Adak Island from the southwest end of the island to Argonne Point. From Argonne Point to **Eddy Island,** reefs, rocks, and shallow water, marked by kelp, extend as much as 0.6 mile from the shore. A rock awash at low water is about 0.3 mile west of the northern extremity of Eddy Island. Prominent points are

Lake Point, 2 miles northward of the southwestern extremity of Adak Island; **Hook Point,** 2 miles northward of Lake Point; and **Gorilla Point,** a prominent bluff scarred in such a manner as to resemble the head of a huge gorilla, 1.5 miles northward of Hook Point. **Wedge Point,** a prominent, rocky bluff marking the south side of Three Arm Bay, may be approached close-to.

Along the Kanaga shore of Adak Strait are several anchorages which provide protection from westerly weather. Anchorage may be had in 17 fathoms, gray sand bottom, midway between **Naga Point** and **Sharp Point** or westward of the line connecting Sharp Point and Round Head.

Bay of Waterfalls, just east of the southern entrance to Adak Strait, comprises Bay of Waterfalls proper, Chapel Roads and Chapel Cove. **Cape Yakak** and **Turret Point,** the two entrance points, are important landmarks for vessels passing southward of the islands. Cape Yakak is a long, flat tableland, well defined and easily distinguished, as it has no high peaks on it and is the only point of that nature in the vicinity. A **light (lat. 51°35′.7 N., long. 176°56′.6 W.)** on the cape, shown from a small white house, is 194 feet above water and visible 10 miles.

Bay of Waterfalls is about 5 miles wide at the entrance, but narrows to 0.5 mile at the northerly end; it is 8 miles long. Most of the bay is too deep for anchorage, but vessels can anchor in 16 fathoms within 0.5 mile of the head of the bay. Bay of Waterfalls is not a desirable and safe anchorage, as it is exposed to the seas and swells of the Pacific Ocean and to heavy gusts sweeping through the mountain passes of Adak Island.

Chapel Roads (*also see Chart 9121*), the eastern arm of the Bay of Waterfalls, offers anchorage in 20 fathoms, rocky bottom, but is exposed to the same degree as Bay of Waterfalls proper. **Chapel Cove,** the inner bight of Chapel Roads, affords temporary anchorage in 10 fathoms, bottom hard to soft gray sand. The entrance is narrow and almost in the middle of it is **McCulloch Rock,** a pinnacle with 2½ fathoms over it. Inside the cove is a ledge of rock above water, called **Pulpit Rocks.** The cove is subject to strong gales coming through the mountain passes of Adak Island.

Cataract Bight is on the eastern shore of the Bay of Waterfalls near its head, and affords an anchorage in 24 fathoms about 200 yards off the beach where fresh water can easily be obtained. With southerly winds a perceptible swell reaches the bight from the sea.

Kanaga Island, on the west side of Adak Strait, is roughly right-angled; it extends 18 miles north and south and 28 miles east and west, and has a maximum width of 7 miles. The eastern coast trends in a southerly direction to **Cape Chlanak,** then trends to the southwest and west.

Kanaga Volcano, 4,416 feet high, regular in outline and cone-shaped, is at the northern end of the island. It is an excellent landmark from all directions in clear weather since it is the only high peak in the vicinity of regular conical shape. During the summer of 1953 a conspicuous jet of steam was issuing from a vent on the southeast slope of the volcano below its summit. The south part of Kanaga Island is low and rolling tundra with hills 100 to 540 feet in elevation. From the volcano, the land slopes abruptly down to a height of about 150 feet, and the remainder of the island is rolling tableland, with numerous small lakes and streams and a rough uneven surface. The shores are in general rocky and the usual kelp beds occur offshore.

The Bering Sea Aerological Unit stationed at Kanaga Bay found that the Kanaga

Volcano could be utilized as a means for forecasting bad weather. The volcano peak is seldom absolutely clear of clouds. During April 1934, it was observed that invariably the day or night before a gale the peak made its appearance, shorn of all clouds and with wisps of steam around the crater. During the summer of 1953, the phenomenon was noted upon several occasions, but it is not infallible, as evidenced by the fact that upon several other occasions bad weather did not follow clear visibility of the peak.

Most of the east coast of Kanaga Island is fringed by kelp beds, islets, and rocks. A detached shoal marked by heavy kelp is 1.2 miles northeast of Naga Point. Reefs and rocks extend 0.8 mile eastward of Sharp Point.

Pass 1 mile offshore when rounding Cape Chlanak. The shallow water in the vicinity of Cape Chlanak is close to the shoreline and is marked by kelp.

Pass 2 miles southward of **Cape Tusik,** Kanaga Island (*Chart 8863*). A depth of 16 fathoms and very irregular bottom was found 0.8 mile southward of Cape Tusik during exploratory surveys. The waters in the vicinity of Cape Tusik during calm weather were much disturbed and indicate an area of shoals and probably strong currents. The cape is not conspicuous.

False Bay is about 0.5 mile northward of Cape Chlanak. The inner bay has a north arm and a west arm. Both arms provide excellent landings protected from all but heavy southeast swells. Sand beaches are near the heads of these arms. The remaining shoreline is rocky. A rocky island is in the north arm. A rocky ledge with less than 1 fathom is on the west side of the entrance to the west arm. A shoal marked by kelp is at the entrance to the bay proper. False Bay may be used as an emergency anchorage for small vessels, in 10 fathoms, sand bottom; it affords protection from west and north winds.

Kanaga Bay (*also see Chart 9121*) is located on the south coast of Kanaga Island. It is a long, narrow arm of the sea, approximately 2 miles long, north and south, and 0.4 mile wide. The depths vary from 3 to 10 fathoms except in the northerly part, which is shallow. The entrance channel is narrow—approximately 400 feet wide—and is flanked by rocks, which are plainly marked by kelp beds. The shoreline consists of rocky cliffs or steep slopes, with a sandy beach and low ground at the head of the bay. Kanaga Bay affords good anchorage in shallow water for medium-sized vessels. The bottom is sticky mud and black sand mixed, and is excellent holding ground. The anchorage is protected from all winds except southeasterly. The bay is apparently not subject to williwaws; the heaviest gusts come from northeast. With heavy swells from south to southeast, the entrance is impassable; in thick weather the entrance is difficult to find.

To enter Kanaga Bay run **west** for 1.2 miles from a position 1 mile south of Cape Chlanak. Swing right and line up the entering range into Kanaga Bay on course 321°. The white front range is rectangular in shape and is set on a bluff; in the center is a vertical red stripe. The rear range is a diamond-shaped target on a 16-foot pole.

The channel is marked by kelp on the right, 0.5 mile from the front range, and by kelp on both sides when within 0.3 mile of the front range. Breakers are on each side of the channel as a ship approaches the turn into Kanaga Bay. The wreck of the *Swallow*, close to the west shore and 0.2 mile southward of the front entering range, is a prominent landmark appearing red in color from offshore.

When 0.2 mile from the front range and with the wreck of the *Swallow* forward of

the beam, change course to 350° and maintain a range on the east side of Kanaga Bay, marked by a whitewash on a rock on the shore for the front range, and a square target on a pole on a hill for a rear range. Both sides of the channel are marked by kelp. Proceed 0.3 mile on this range, then change course to 337°. Keep in mid-channel until the end of the dock in Kanaga Bay is sighted clear of the point on the west shore.

In 1943 the outer part of the dock was in good condition. A small vessel can berth at the face of the dock or along the wide outer part of the south side. The depth along the face of the dock is 13½ feet at low water. The inshore end of the dock has been gutted by fire and buildings on the waterfront have been burned; the concrete footings of these buildings were still in place. Two white buildings 75 yards eastward of the shoreline were still standing. The larger building was used for sheltering animals, and the smaller for a house. A water tank is on a hill near the shore. A prominent radio mast is on a higher hill 175 yards northeast of the inner end of the dock and a small radio mast is 100 yards inshore from the dock. A cabin is near the west shore of Kanaga Bay, 0.8 mile northwest of the end of the dock.

The northern part of Kanaga Bay is nearly dry at low water.

Chart 9145.—Kanaga Pass separates Kanaga and Tanaga Islands. **Cape Sasmik,** the southern extremity of Tanaga Island, is the point on the west side of the south entrance to the pass; the cape is relatively flat grassland with steep grassy bluffs and rock cliffs rising abruptly from the shoreline to heights of about 100 feet. Rocky islets and reefs border the coastline close inshore, and the 20-foot detached black rock islet off the southwest tangent is conspicuous from the southeast and northwest. Vessels rounding the cape should pass 1 mile offshore.

Opposite Cape Sasmik is **Cape Chunu,** the southwestern extremity of Kanaga Island and the point on the east side of the south entrance to Kanaga Pass. This cape is characterized by grassy bluffs and rocky cliffs from 100 to 200 feet high, rising steeply from the shoreline; and is rolling grassland in the interior, with hills up to 325 feet high. The shoreline is ragged and rocky, and is fringed with rock islets, prominent pinnacles and rocky reefs. The small grass-covered rock islet off **West Chunu Point** is 160 feet high and is prominent from the southeast and northwest. A series of pinnacle rocks extends from this islet inshore to the point, and a sunken rock covered by 5 fathoms lies ½ mile off its southwest tangent.

Vessels are cautioned to pass at least 1½ miles south of Cape Chunu to avoid a shoal area of very irregular rocky bottom with least depth of 2 to 6 fathoms. The waters for several miles south of the cape are usually much disturbed; indicating strong currents.

The south coast of Kanaga Island between Cape Chunu and Cape Tusik is particularly irregular and foul. Numerous reefs, shoals and areas of heavy kelp border the shoreline, and underwater pinnacles are found in otherwise regular bottom up to 2 miles offshore. Vessels approaching closer than 2 miles should proceed with caution.

Off the prominent headland located 2 miles northwest of Cape Tusik a dangerous shoal extends south-southwestward for a distance of 2 miles. Least depths of 16 fathoms were found at its outer extremity (lat. 51°40′.0 N., long. 177°20′.5 W.) and much shoaler depths are encountered closer inshore.

The 101-foot black pinnacle rock located 1 mile off the south coast of Kanaga

Island in long. 177°29′.8 W. is a conspicuous landmark. Passage between this rock and Kanaga Island should not be attempted.

From Cape Sasmik, the coastline of Tanaga Island trends northward to Twin Bays; forming the west side of the southern portion of Kanaga Pass. Good anchorage in westerly weather is afforded 3 miles north of Cape Sasmik and 0.75 mile offshore; in 18½ fathoms with flat sand bottom. A 2½-fathom shoal at the outer end of a reef lies 2 miles north of Cape Sasmik and ½ mile offshore.

Twin Bays is a good small-boat anchorage in westerly and northerly weather, and larger vessels may anchor just off the entrance. A distinctive rock, about 75 feet high, undercut by surf action to balance on a small pedestal, and resembling a Christmas tree in profile outline, is located on the beach at the eastern extremity of the point on the west side of the entrance. A reef, awash at low water, 0.3 mile west of this rock extends 0.5 mile southeastward from the shoreline. Vertical cliffs, about 100 feet high, constitute the shoreline to either side of the entrance, and the surrounding country is rolling grassland. A boulder beach, with very shallow valley beyond, lies at the head of the northeast arm, and a sand beach backed by a narrow, deep valley lies at the head of the northwest arm. An unoccupied trapper's cabin is near the beach in the northwest arm, and a stream of medium size empties into this arm about 150 yards east of the cabin. Boats should enter the bay on course **335°**, heading for the exact center of the outer portion. When the Christmas tree rock bears 242°, anchor in 8 fathoms, flat sand bottom. Larger vessels should approach the entrance on course **310°**, with the Christmas tree rock bearing 310°, and anchor when the rock is 0.6 mile distant; in 16 fathoms, flat sand bottom.

From Twin Bays to the narrow part of Kanaga Pass the coastline trends east and northeast for 3.0 miles. It is very broken and irregular, and is characterized by low cliffs, and numerous close to shore rocks and reefs. Vessels should not approach closer than 1.0 mile except in vicinity of Twin Bays.

The waters along the west side of Kanaga Island from Cape Chunu northward into Kanaga Pass are generally foul for a distance of 1 mile offshore. Vessels approaching closer than 1½ miles should proceed with caution.

The narrowest part of Kanaga Pass is the 3.8-mile width lying due west of **Western Point,** the west end of Kanaga Island. It is characterized by small rock islets, dangerous reefs, and strong currents, and its passage is not recommended except during periods of good visibility and calm seas.

Goose Rocks, 35 feet high and prominent, are 0.8 mile off Western Point, Kanaga Island. **Eddy Rock,** 15 feet high, is 0.9 mile southward of Goose Rocks, and **Annoy Rock,** 8 feet high, is 2 miles westward of Goose Rocks and 1 mile east-northeastward of the easternmost point of Tanaga Island at the narrowest part of the pass. A dangerous reef area with least depths of 1 and 3 fathoms lies 0.6 mile north and 0.5 mile northwest of Annoy Rock, and the entire area from this reef and Annoy Rock eastward to Western Point on Kanaga Island is interspersed with dangerous underwater reefs, marked by kelp during the summer months. The bottom in this shoal area is rocky and very irregular and innumerable underwater pinnacles exist. The kelp is towed under by current except at slack water and cannot be relied upon as a shoal indicator.

Currents over the reefs between Annoy Rock and Western Point, Kanaga Island, appear to exceed 3 knots. Medium tide rips have been observed throughout this same area in calm weather, and they become heavy with a swell making into the pass.

A clear channel exists between **Annoy Rock and Tanaga Island**, and no other passage is recommended. Ten fathoms may be carried through the pass over relatively smooth sand and gravel bottom by proceeding as follows: Approaching from the south, steer a mid-channel or true **north** course to a point 1 mile south of Annoy Rock; then proceed on course **338°** between Annoy Rock and Tanaga Island, passing 0.35 mile southwest of Annoy Rock. After passing Annoy Rock, continue on course **338°** for 1.3 miles, to a position at lat. 51°43′.6 N. and long. 177°48′.3 W.; then proceed on course **061°** to a mid-channel position between Barnes Point, Tanaga Island, and the prominent rock off the northwest point of Kanaga Island.

Fourteen fathoms may be carried through the pass by proceeding as above between Annoy Rock and Tanaga Island to the position at lat. 51°43′.6 N. and long. 177°48′.3 W. From this position steer **017°** for 1.73 miles to a position at lat. 51°45′.3 N. and long. 177°47′.4 W.; then steer **048°** for 2.5 miles, passing 0.2 mile off the southeast tangent of Trunk Point, Tanaga Island, until lat. 51°47′.0 N. and long. 177°44′.4 W. is reached. At this point set a due **east** course to pass midway between **Barnes Point**, Tanaga Island, and the northwest point of Kanaga Island.

The above passage off Trunk Point has a least depth of 20 fathoms and is between the southeast tangent of the point and a dangerous reef, awash in places at half tide, which lies 0.5 mile to southeastward.

Cape Sudak is the long finger-shaped easternmost point of Tanaga Island, on the north side of the northeast entrance to Kanaga Pass. It terminates in a small flat-topped, steep-sided promontory, about 70 feet high, which from offshore appears detached from the mainland. A dangerous unsurveyed shoal, with rocks bare at low water and heavy kelp, extends eastward from the cape, and exploratory surveys indicate that the 30-fathom depth curve is located about 2 miles offshore to east and southeast of the cape, and 1 mile offshore to the north. The waters within a 3½-mile radius appear greatly disturbed at all stages of tide, indicating strong currents. Pending completion of surveys in the vicinity, vessels are advised to stay outside the 100-fathom depth curve; or 3½ miles north of the cape, 3 miles east and 2½ miles southeast.

The deep-water passage between Bobrof Island and Cape Sudak is clear if Bobrof Island is approached not closer than 0.75 mile and Cape Sudak not closer than 3 miles.

A prominent twin-pinnacled rock, 75 feet high, is 0.3 mile north of the northwesternmost point of Kanaga Island in long. 177°39′ W. A dangerous unsurveyed shoal area, with a rock awash at low water located near its outer extremity, extends for a distance of about 2 miles east-northeastward from the rock.

A distinctive and prominent black cinder hill, 282 feet high and shaped like the crown of a coolie hat, is located on the relatively flat mainland of Kanaga Island; 1.3 miles southeast from its northwestern extremity, and 0.4 mile inland from the shore.

The inshore waters along the north coast of Kanaga Island east of long. 177°39′ W. have not been surveyed. Vessels should not approach inside the 45-fathom depth curve, which is from 1 to 2 miles offshore.

Hot Springs Bay (*also see Chart 9121*), on the Tanaga shore of Kanaga Pass, is a small bay offering good protection from westerly weather. The north side of this bay is lined by steep bluffs rising toward the mountains. The head of the bay has a good sand beach at the foot of a low valley; a stream enters the bay at the south end of this beach. Two cabins are located just in back of the beach near its northern end. Low bluffs line the south shore of the bay, with a rise at the head to a high ridge. Warm

springs are found along the central part of the south shore. Good anchorage is found in 13 to 17 fathoms, sand bottom; small craft may anchor in shoaler water close to the beach. The only offlying danger in the bay is a reef area, 600 yards off the south shore about midway in from Trunk Point to the head of the bay. In entering this bay, the foul-ground area extending 1.2 miles east and east-southeast off Trunk Point should be avoided. **Trunk Point** shows as a low rounded knoll at the south side of the entrance to the bay.

Prominent features approaching the bay are Cape Sudak, Barnes Point, 2 miles inside Cape Sudak, and Trunk Point. A prominent waterfall on the north shore of the bay is about 0.3 mile from its head.

Approaching Hot Springs Bay from a position 3 miles south of Bobrof Island, steer **253°** to pass 0.8 mile southward of Barnes Point. From here lay a course to the outer bay northeastward of the reef near the south shore, or midway between the reef and the north shore to the inner bay.

Chart 8863.—Bobrof Island is about 6 miles northeast of Cape Sudak. The island is about 2 miles long and almost 2 miles wide and consists mainly of one volcanic mountain; **Bobrof Volcano** is 2,875 feet high. The waters around Bobrof Island are unsurveyed.

The shoreline of Bobrof Island is rocky. Viewed from eastward, from off the north coast of Kanaga Island, Bobrof Island appears to be two islands; the northern part appears steep-to and flat on top. There is a valley between this part and the southern part of the island. The southern section, which comprises about 0.9 of the island, slopes from the shoreline to the top. The southern part of the island is very rugged.

The waters on the southwest side of Bobrof Island have been surveyed to within 0.3 mile of the shoreline, where the 30-fathom depth curve lies 0.4 mile offshore. Elsewhere exploratory soundings indicate that 50 fathoms can be carried to within 1.0 mile of the shore.

Ship Rock is a rocky islet, 49 feet high, resembling a ship. It is located about 1 mile off the north coast of Kanaga Island in approximate long. 177°23′ W. The deep-water passage between Bobrof Island and Ship Rock has been surveyed to within 2.0 miles of the southeast shore of Bobrof Island, and to within 0.4 mile of Ship Rock.

Chart 9145.—Between Cape Sudak and Gusty Bay the coast of Tanaga Island trends east and west and rises abruptly from the water to peaks and ridges in the interior. The 30-fathom depth curve lies from ½ to 1 mile offshore and there are no dangers. The open bight 5 miles west of Cape Sudak affords good anchorage in good weather; anchor 0.9 mile off its south and southwest shorelines, respectively, in 18 fathoms, sandy bottom.

The deep bight 8 miles west of Cape Sudak is not recommended as an anchorage because of violent williwaws in southerly and westerly weather. A dangerous rock awash at low water is 0.4 mile northeast of the point on the northwest side of its entrance, and a large shoal area, marked by kelp, makes out from the southeast shore to the middle of the bight. A sand beach is at its head and a deep valley extends inland.

Gusty Bay, on the northeast coast of Tanaga Island, affords good anchorage in southerly weather, but is exposed to the north and northeast. Winds in the bay are

gusty due to the surrounding mountainous country, but not to the extent that safe anchorage is impaired. Two shallow valleys, separated by a bold headland lie at the head of the bay, and an unoccupied trapper's cabin is in the southeast corner, at the mouth of a large stream. A conspicuous pinnacle rock, dome-shaped, grass-topped, and about 80 feet high, is on the southeast side of the entrance; 0.1 mile off the northerly tangent of the steep-sided, square-faced entrance point. A lesser pinnacle, sharp pointed and about 30 feet high, lies immediately north of the dome-shaped one. Approach to the bay is clear from all directions provided a distance offshore of ½ mile is maintained. Anchor at the center of the bay, 0.75 mile off the center headland, with the cabin bearing 170° and the above-mentioned sharp pinnacle bearing 118°; in 16 fathoms, sand bottom.

Chart 9146.—Tanaga Island is of extremely irregular shape and is about 21 miles long, with a maximum width of 17 miles. The northern part of the island, north and northwest of Tanaga Bay, is very high and mountainous and consists mainly of two peaks, connected by a saddle. The eastern peak has an elevation of about 5,500 feet; the western peak, **Tanaga Volcano,** dormant in 1953, attains an altitude of 6,975 feet. The eastern peninsula ending in Cape Sudak is also quite mountainous, with elevations reaching 2,000 feet. Like Kanaga, the entire southern half of Tanaga Island is low, undulating plateau, 75 to 100 feet in elevation with many streams and small lakes or ponds.

The shores of the north side of the island from Cape Sudak to **Cape Sajaka** are precipitous rocky cliffs or very steep slopes which rise abruptly, except in the valleys, to the ridges and peaks in the interior. All other shores of Tanaga Island are rocky cliffs or reefs with numerous alongshore pinnacles. Exceptions to this are the north and east shores of Tanaga Bay which are low, sand or gravel beaches. A few other short stretches of gravel beach are on the island. The south coast and much of the east coast of Tanaga Island are fringed with detached rocks, reefs and foul ground. Extensive kelp patches are in the foul areas and also along the south side of Tanaga Bay.

A dangerous reef extends 1.0 mile westward from the southwest tip of **Cape Amagalik,** the south side of Tanaga Bay, and is marked with heavy kelp and rocks awash. A shoal with a least depth of 13 fathoms at its outer extremity extends 0.5 mile west from the reef, or 1.5 miles off the cape. The 20-fathom depth curve lies 1.9 miles westward of the cape and the 30-fathom curve is about 3.5 miles off. Tide rips are severe off this cape. With a moderate swell running against the current, all vessels should pass Cape Amagalik at least 4 miles off. Small vessels should not attempt this passage with a heavy swell running. Vessels have encountered 12- to 14-foot seas in this area in moderate weather. A flood current of 3 knots has been observed and larger velocities probably occur. The flood sets northward and the ebb southward.

A 26-fathom bank lies 4 miles west by north of the northern part of Cape Amagalik. Tide rips have been observed in this vicinity. A 20-fathom bank is in latitude 51°35′3 N., longitude 178°07′2 W.

Tanaga Bay, on the west side of Tanaga Island, affords protection from all winds northwest through north, east and south. The bay is open to the west and affords only limited protection from southwest unless anchored close under the south shore. It is a good anchorage for vessels of all sizes, and anchoring depths and positions can be selected as desired. The bottom is uniformly fine, black, hard sand with only fair holding qualities in heavy weather. The survey ship *Explorer* rode out several storms

in May and June 1952 at anchor off the south shore of Tanaga Bay, 2.5 miles east-northeast of Kulak Point, and in Cable Bay.

The head of Tanaga Bay shoals vary gradually from 2 to 3 miles out and the shoreline at the high water line is sand. The south shore is irregular both as to shoreline and bottom. Many close-inshore reefs and kelp beds are off this section of the shore. Medium and large craft should not approach the south shore closer than the 20-fathom curve which lies about 0.7 mile offshore. In the bay are no definite features that may be readily identified except **Cape Agamsik** on the north side of the entrance, and the north tangent of Cape Amagalik, which is low but is backed by higher grassy hills. A rocky reef, about 0.2 mile offshore from the center of the sand beach at the head of Tanaga Bay, is bare about 3 feet at high water and is of some assistance when anchoring at the head of the bay.

A 5½-fathom spot is about 0.5 mile north of **Kulak Point** which is the northwest point of Cape Amagalik. No other dangerous shoals were found.

Cable Bay is a small cove on the north side of Tanaga Bay immediately eastward of Cape Agamsik. For small craft, Cable Bay affords some protection in westerly weather; other parts of Tanaga Bay are exposed to winds from that direction. The survey ship weathered a westerly storm with winds of 60 miles per hour blowing steadily for 24 hours, anchored in 6 fathoms in Cable Bay. Two anchors were down as the vessel dragged slightly with one anchor. Fresh water is available at the head of Cable Bay.

From Cape Agamsik to Cape Sajaka, a distance of 9.3 miles, the coastline trends northwestward. The most prominent feature of this stretch of coast is a headland with black rock cliffs near the top of steep grassy bluffs 2.0 miles northwest of Cape Agamsik. Several shallow valleys with black sand or gravel beaches across them indent the otherwise mountainous interior, and in the vicinity of Cape Sajaka the mountain slopes rise directly from the water. The 30-fathom depth curve lies from 1.0 to 1.5 miles offshore except in the vicinity of Cape Sajaka, where the 100-fathom curve is less than 0.5 mile off. In good weather vessels may anchor 3 miles northwest of Cape Agamsik, 0.8 mile off the sand beach, and midway between the headlands at either end of the beach; in 15 fathoms, flat sand bottom.

From Cape Sajaka to **Bumpy Point** the mountain slopes rise precipitously from the water, and vertical lava cliffs are frequent. The 100-fathom curve lies 0.5 mile offshore between the cape and longitude 178°05′ W.; then about 1.0 mile offshore between this meridian and Bumpy Point. Currents are strong along this stretch of coast.

A large waterfall, 348 feet high and pouring from the top of a vertical cliff in an unbroken fall, is 2.5 miles west of Bumpy Point. It is conspicuous from the north and northwest.

Lash Bay lies about 3 miles east by south of Cape Amagalik. This is the site of an abandoned World War II military installation. The bay should not be entered except by small craft proceeding with utmost caution under favorable weather conditions. The inshore portion of an original 600-foot wharf remains at the head of the bay, and the water is 8½ feet deep off its outer end. Broken piling of the original outer portion of the wharf lies just below the water surface and constitutes a real danger. Two diamond-shaped targets set on a hill just westward of the wharf form an entrance range into the bay on course 002°. A 1½-fathom shoal marked by kelp in summer, is in the approach to the bay on the range line and several dangerous rocks awash and sunken

rocks are just eastward of the range line. A wreck on the west side of the bay is breaking up and is not prominent.

Anchorage in Lash Bay is practicable only for temporary purposes. Swinging room is limited and with southerly swells a vessel rides poorly in shoal water and with little scope.

The 112-foot skeleton steel tower 1.4 miles west of Lash Bay on top of a 145-foot bluff is prominent. The 10-foot rock 0.7 mile southwest of the tower is also prominent; it is usually marked by heavy breakers.

South Bay, midway between Cape Sasmik and Lash Bay, affords anchorage sheltered from winds from northwest through north to southeast. A reef bare at low water extends 0.5 mile southward from the center of the head of the bay, and a 5-fathom shoal lies 0.5 mile off its southern extremity. An unoccupied trapper's cabin is near the mouth of a stream just to northeast of the reef. Anchor in the eastern half of the bay, in 12 fathoms, flat sand bottom; with the west gable of the cabin bearing 007° and the south tangent of **Tidgituk Island** bearing 257°.

The 50-foot black rock 0.6 mile west-southwest of Tidgituk Island is a conspicuous landmark.

Chart 8863.—Tanaga Pass is between Tanaga Island and the Delarof Islands, the nearest of which is Ilak Island, 13 miles southwest of Cape Amagalik. Surveys in 1952 show the pass to be clear of dangers. Depths of 50 to 150 fathoms may be carried through the pass by keeping 5.5 miles off Cape Amagalik and 2.5 miles off Ilak Island.

The **Delarof Islands,** comprising Gareloi, Skagul, Ogliuga, Kavalga, Unalga, Ilak, Ulak, Tanadak, Amatignak, and several smaller islets and rocks, lie between latitudes 51°13′ and 51°50′ N. and longitudes 178°16′ and 179°09′ W. The Delarofs are bounded by Tanaga Pass on the east, the Pacific Ocean on the south, Amchitka Pass on the west and the Bering Sea on the north.

Currents.—It is probable that the flood current sets in a general northwesterly direction from the Pacific. The direction and velocity of the current is radically affected by the land areas and the banks. It appears that the flood is diverted by the chain of islands—Skagul to Unalga—and the relatively shoal water between them to an east and west direction in moving around this chain. It was observed that south of Skagul Island the flood sets about northeast, east of this island it sets north, and north of the island it sets north to northwest.

With erratic currents of this nature, dead reckoning cannot be depended on and the navigator may find his vessel a mile or more off his reckoning after a run of 1 hour.

Four days of current observations covering a period of the moon's maximum declination were made at a location about 4½ miles southwestward of Cape Amagalik. The current was rotary, turning clockwise and during the period of the observations followed a definite pattern. Referred to the predicted tide for Sweeper Cove the current movement was as follows: A minimum current averaging about ¾ knot and setting north to northeast occurred about midway between higher high water and lower low water. As the current turned through east to south, the velocity built up rapidly and 2 hours before lower low water reached 3 knots. The velocity decreased to about 2 knots and at time of lower low water set west-southwest. The current turned northwestward, and the velocity increased to a maximum of 3 knots 2 hours after lower low water. The current continued northwestward to north with a decreasing velocity,

and 2½ hours before higher high water the average velocity was about ¾ knot. About 1½ hours after higher high water the velocity had again increased to 2 knots and the current set northwestward. The current turned through north to northeast as the velocity decreased and about midway between higher high water and lower low water reached a minimum of about ¾ knot.

On the opposite side of the pass about 4 miles eastward of Ugidak Island, velocities of over 3 knots were observed.

Between Kavalga and Ulak Islands, the flood was observed to set to the northwest.

Tide rips and swirls may be encountered in any part of this area, except well off the land areas in deep water. Generally they will be encountered where a radical change in depth deflects the natural flow of the current or where land masses affect this flow. The ebb appears to produce the heaviest rips and they are most pronounced during the greatest range of tides. Also, strong winds and heavy seas, opposing the flow of the current, cause large rips.

Rips and swirls were observed by survey vessels to be particularly heavy to a distance of approximately four miles westward of Cape Amagalik. This area is dangerous to small craft except in favorable weather and should be avoided by medium-sized craft under adverse conditions of current and sea or swell. Under unfavorable weather conditions, it is advisable to round this cape outside the 50-fathom curve.

Heavy tide rips have been observed off Cape Sajaka; on the bank between Skagul and Ilak Islands; and on the shoal extending west from Unalga Island.

Ilak Island is the easternmost island in the Delarof Group. The highest point of the island, about 190 feet, is on a ridge near the northeast shore. The highest bluffs are on the north and east sides of the island. From seaward the island appears table-like; the top slopes gently from east toward the west shore. The shoreline is broken and surrounded by detached rocks and inlets. A series of islets, rocks, and reefs extend more than two miles west of Ilak Island. The large islet 1.5 miles westward of Ilak has an elevation of 34 feet. It is the breeding ground for a large herd of sea lions. The bank between this islet and Ilak has 2 to 7 fathoms of water. A prominent pinnacle rock, about 15 feet high, is about 0.5 mile off the north shore of Ilak Island.

The waters in the vicinity of this island were surveyed in 1952. Strong currents and rips are encountered near the island, on reefs west of the island, and on the bank with 24 to 50 fathoms between Ilak and Ugidak Islands.

Fairly deep water extends comparatively close to the visible rocks and islets. The 30-fathom curve extends 1.5 miles west-northwest of the westerly islet, 0.5 mile north and south of this islet, 0.6 mile north and south of Ilak Island, and 1.4 miles southeast and east of Ilak Island. No ship anchorages are recommended near Ilak Island.

Gareloi Island, the northernmost of the Delarofs, is about 20 miles westward of Tanaga Island. The island is approximately circular in form and is about 5 miles in diameter. The summit, **Mount Gareloi,** is an active volcanic crater 5,334 feet in elevation, located near the center of the island. A peak of lesser elevation is south of the summit. The shores slope steeply from the water's edge to the summit of the island, except near the northwestern side where the slopes are more gradual. Lava rock, black lava, eroded lava, and ashes constitute the soil. The lower slopes and the valleys are covered with grass and tundra in many places but otherwise the island is bare of vegetation. The island can be identified by its nearly symmetrical volcanic cone rising from the sea. The waters in the vicinity of Gareloi Island are deep. Deep-draft

vessels may approach close in to the island on all sides. The shores in general are characterized by steep cliffs with rocks and boulders at their bases. Boulders, pinnacles, and rocks awash extend around the shoreline. Heavy kelp surrounds most of the island and extends offshore to depths of 10 fathoms. The most prominent submarine features of the island are shoulders on the north, west, and southeast sides where the 100-fathom curve extends 1.5 to 2.5 miles offshore. Because of the deep waters, the vicinity of Gareloi Island has no good anchorages. In moderate weather the survey ship occasionally anchored off the lee shore in the bight of the southeast side, 800 to 1,000 yards offshore in depths of 25 to 35 fathoms. An unoccupied trapper's hut is on the beach above the north shore.

Along the southeast shore the tidal currents set northeastward and southwestward. The average strength of the northeastward current is about ¾ knot and occurs about 3 hours after predicted lower low water at Sweeper Cove. The average strength of the southwestward current is ½ knot and occurs about 3½ hours after predicted higher high water at Sweeper Cove.

Ugidak, Tag, Skagul, Ogliuga, Kavalga, and Unalga Islands form a separate chain in the Delarof Group and are about midway between Ilak and Gareloi Islands.

Ugidak Island, the easternmost, is small, rocky, prominent and about 65 feet high; it borders Tanaga Pass. The waters around this island are deep and have been surveyed. Between Ugidak and Skagul Islands is a deep channel. Currents are very strong in the vicinity of this island, and tide rips dangerous to small boats may be encountered in the vicinity.

Skagul and **Ogliuga Islands** are 2.5 to 7 miles west of Ugidak Island. The highest point of these islands is about 90 feet. The waters in the vicinity of these islands have been surveyed. An emergency landing field and buildings are on Ogliuga Island. The most prominent object on Ogliuga Island is a tower near the north shore.

A good anchorage in 20 fathoms, sand and gravel bottom, for northerly winds, is 1.2 miles south of the pass separating Skagul and Ogliuga Islands and 1.2 miles west-northwest of Tag Islands.

The pass separating Skagul and Ogliuga Islands is useful only for small launches. Currents in the pass are very strong and when sea and current are opposed, tide rips develop. Currents have been observed at a location near the northern end of the pass. Current predictions for that location may be obtained from the *Current Tables*. Heavy kelp beds are close to the shores of the islands and kelp grows throughout the pass. This kelp in the channel is towed under when the current is running.

Numerous rocks, reefs, and kelp beds lie close to the shores of Skagul and Ogliuga Islands and offlying islets are east and southeast of Skagul Island.

Tag Islands are a group of rocky islets about 1.5 miles south of Skagul Island. The highest point of this group is 65 feet high. The northwest shores of Tag Islands are the breeding ground of a very large herd of sea lions. Several rocky islets lie between Skagul and Tag Islands.

Between Ogliuga and Kavalga Islands are several reefs and rocks, large kelp beds, and winding channels 2 to 5 fathoms deep. The channel close to Ogliuga, called **Ogliuga Pass,** is useful for launches only. Large numbers of sea otter have been seen in this area.

Sea Otter Pass is a 5-fathom channel, about 0.4 mile wide, lying 0.7 mile northeast of Kavalga Island. This channel, with a lighter volume of kelp growing in parts, is

fringed with heavy kelp and prominent rocky islets that project about 3 feet above high water. Currents in the pass are moderate.

Kavalga Island is about 5 miles long and averages 1 mile in width. The highest point is 315 feet above sea level. The shores of the island are fringed by prominent rocks and reefs. The western end is a prominent headland about 1 mile long, 180 feet high, and connected with the main island by a low gravel beach. Most of the island is covered with tundra.

A good anchorage during southerly gales is about 1 mile north of the north shore of Kavalga Island. The depth is about 22 fathoms, sand and gravel bottom.

Between Kavalga and Unalga Islands is a bank with least depths of 18 to 36 fathoms. The waters north and south of this bank are much deeper. Currents in this area are very strong and with sea or wind and current opposed, very dangerous tide rips develop. The waters are extremely dangerous for small boats and under extreme conditions of sea, current and wind may be dangerous for larger vessels. The pass has been surveyed.

It is recommended that launches and small vessels navigate with caution and keep within one-half mile of offlying rocks west of Kavalga and east of Unalga Islands. Large vessels using the pass should keep more than 2 miles from the shores of Kavalga and Unalga Islands. A mid-channel course between the islands is recommended for large vessels.

Unalga Island is about 1 mile in diameter, grass covered, rimmed with steep bluffs, flat on top and about 200 feet in elevation at the highest point. A prominent rock about 50 feet high is 0.5 mile northwest of Unalga Island and a small prominent island 65 feet high is 0.8 mile southwest of Unalga Island. The shore of Unalga Island is fringed by rocks and reefs of lesser prominence. Surveys have been made close to the island and on the shoal extending to the westward.

Amatignak Island, the southernmost of the Delarofs, is also the southernmost island in the Aleutian Chain; it is within 40 miles of the composite course from Seattle to Yokohama. The island is about 5 miles long by 3 miles wide and is very rugged. The shores are generally steep and fringed with rocks, and are backed by high tundra-covered hills, bare ridges and mountains, the highest of which is about 1,700 feet in elevation. A hydrographic survey of the waters surrounding the island was completed in 1952. The west and northwest coasts are steep-to, with the 200-fathom curve approaching to within 0.7 mile of shore. The jagged main ridge of the island continues as a submarine feature off **Nitrof Point,** the southern extremity of the island. A bank with depths of 20 to 60 fathoms extends off the east and southeast sides of the island. A small-boat anchorage is in **Ulva Cove** on the east coast of Amatignak. The survey ship occasionally anchored off the entrance of this cove in 25 fathoms. Protection is fair from west and southwest gales except when there is a south or southeast swell from the Pacific. A boulder beach is in back of the cove, and a trapper's cabin is on the small flat area at the head of the cove. A prominent waterfall is one mile north of Ulva Cove.

Knob Point, a peninsula with a conspicuous knob-shaped hill, forms the south point of Ulva Cove and the eastern point of Amatignak Island. The western coast of Amatignak is very broken up, with prominent pinnacle rocks, steep cliffs, and small coves, and is fringed by rocks awash. A prominent 170-foot dome-shaped pinnacle off the northwest coast makes a good landmark. Also on the northwest coast is a small,

deep cove which affords more protection for landings than any other part of the western shore of Amatignak Island. The south point of the island is a narrow, steep, rocky peninsula with conspicuous offlying pinnacles. A rock awash with frequent breakers is 0.5 mile south-southwest of the most southerly pinnacle rocks. A foul area extends for 0.6 mile off the southeast shore midway between Knob and Nitrof Points.

Three miles northeast of Amatignak Island is **Ulak Island.** This island is irregular in shape. The two high points on the island are about 560 feet high, on ridges one of which is near the north shore of the island and the other near the center. The two emergency anchorages are in **Pratt Cove** on the west coast north of Tanadak Island, and in **Patton Cove** on the south coast. Currents are noticeable in Pratt Cove and the bottom is rocky. The anchorage in Patton Cove has very little current and the bottom is sandy. It is a good anchorage for north and northwest winds.

The waters around Ulak Island have been surveyed. Numerous rocks and islets, two of 30-foot elevation, border the island. Several reefs lie close to the shore and in the vicinity of offlying rocky islets.

Strong currents and tide rips have been observed as far as 3 miles southeast of Ulak Island and in the channel between Ulak and Amatignak Islands.

Ulak Pass between Ulak and Amatignak Islands is 35 to 50 fathoms deep. Mid-channel courses are recommended. The current floods northwestward and ebbs southeastward. To obtain an approximate time of slack before flood and slack before ebb in 165° W. meridian time, subtract 3 hours from the predicted times of high water and low water, respectively, for Nushagak Bay.

Tanadak Island lies about 1 mile off the west coast of Ulak Island and is low and not very prominent. A prominent rock about 30 feet high is about 0.2 mile northwest of Tanadak Island. A channel 9 or more fathoms deep is between Ulak and Tanadak Islands. The survey ship occasionally used an anchorage 0.7 mile east of Tanadak Island in 26 to 30 fathoms.

Amchitka Pass is between the Delarof Islands and the Rat Islands; the minimum width of 50 miles is between Unalga Island and Semisopochnoi Island. Depths in the pass range to more than 1,000 fathoms, but there is a comparatively shoal depth of 49 fathoms in latitude 51°22′ N., longitude 179°31′ W. The area off the east end of Amchitka Island is foul, and vessels should stay outside the 50-fathom curve; heavy tide rips have been observed in this vicinity. It is reported that Amchitka Pass is dangerous in heavy weather, particularly for small and medium craft, but under storm conditions this is true of most of the passes in the Aleutians. Currents in the pass appear erratic as to direction, and velocities may be strong, which may account for reports of very large seas and strong tide rips.

Charts 8863, 8864.—The **Rat Islands** include Semisopochnoi, Amchitka, Rat, Little Sitkin, Segula, and Kiska Islands; the group also includes several smaller islands.

Strong williwaws frequently occur on the leeward sides of the northern islands in the group during periods of light to moderate breezes on the windward sides. Areas of clear weather are often found on the leeward sides during periods of general heavy fog.

Chart 8863.—Semisopochnoi Island, the northeasternmost of the Rat Islands, is 11 miles long in an east-west direction and 9.5 miles wide in a north-south direction. The island differs from the other central-peaked volcanic islands along the northern part of the Aleutian Chain. Its numerous rugged ridges and peaks, 1,200 to 4,000 feet high, surround an interior valley with a small lake about 300 feet above sea level. The lake is in the northeastern part of the valley, which at some earlier date was apparently larger but which at present is reduced in size by three large cones which erupted from the floor of the original valley to fill the southwestern part within the original crater wall. These peaks, or cones, which appear flat-topped from offshore, rise to heights of nearly 2,700 feet and have deep craters.

The valley drains to the southeast coast of the island between the slopes back of Sugarloaf Head and a jagged ridge with twin pinnacles more than 3,000 feet high to the northeast. **Sugarloaf Head,** at the southern end of the island, is a rounding, low, irregular, rocky point forming the southerly base of a 2,862-foot snow-capped conical peak which has a prominent secondary conical crater peak 1,620 feet high on its southern slope. Eastward from the lake area, a low pass 600 to 800 feet in elevation leads between steep cliffs to a broad grass-covered valley at the head of a small bay immediately south of **Pochnoi Point,** the easterly point of the island. The point is broad, somewhat flat, and terminates in sheer rock cliffs about 300 feet high.

Northwest of the lake area, the old crater wall rises steeply to a ridge trending northeast and southwest and having two prominent cones, the northeasterly of which is 4,002 feet high and the highest on the island.

The coast of the island consists almost entirely of steep cliffs or bluffs fringed with a narrow, rough, boulder beach. Kelp is alongshore around the entire island. The best landing on the island is on a small stretch of sloping sand beach at the head of the bight south of Pochnoi Point; this landing is fronted by a small intermittent sand bar about 25 yards offshore.

The small bight just east of Sugarloaf Head has a section of sloping sand beach which is fronted by several lines of breakers. Two small bights with sloping boulder beaches are about 1 and 2 miles westward of Sugarloaf Head. In the broad but slight bight at the west end of the island are small stretches of sloping sand beach, but they must be approached through heavy kelp growing on large boulders.

Tuman Point, at the western end of the island, is faced with steep bluffs. About 1.5 miles eastward along the north shore of the point is the triangular-shaped face of a peak 1,200 feet high that drops steeply to the shore and is a prominent landmark. A sloping boulder beach is about 2 miles eastward of the point.

Petrel Point is marked on its northwestern tip by a prominent waterfall that makes a sheer drop from the top of the bluff to the shoreline. Between Petrel Point and Tuman Point are numerous intermittent waterfalls. Two small bights with sloping boulder beaches are about 2 and 4 miles along the northeast shore of the island from Petrel Point.

The only known dangers to surface navigation around the island are within 400 yards of the shore but it is recommended that all points be cleared by 1 mile. Westward of Sugarloaf Head tidal currents setting westward and eastward about the time of predicted lower low water and higher high water, respectively, at Sweeper Cove have been observed. The strength of the westward current was about 1 knot and the strength of the eastward current about 1½ knots. Strong currents, at times as much as 3 knots,

may be encountered all around the island, particularly off Pochnoi Point, Petrel Point, west and southwest of Tuman Point, and southeast of Sugarloaf Head. The currents are usually accompanied by tide rips off the points.

The best anchorage in the vicinity of the island is between Tuman Point and Petrel Point. Depths are 18 to 22 fathoms, sand and gravel bottom, and ample swinging room is available 1 mile from shore. This is inshore of the strength of the current, the approach is unrestricted, and it is well protected from east-northeast around through southeast to south-southwest.

Good anchorage also is available in depths of 15 to 22 fathoms, sand bottom, in the center of the bight south of Pochnoi Point. This anchorage is free of tide rips and the current which prevails around the point. Fair anchorage, subject to a 1- to 1½-knot current, is available in depths of 27 fathoms, sand bottom, about 1 mile offshore midway between Pochnoi Point and Petrel Point. Fair anchorage also is available, subject to 1- to 1½-knot current, in depths of 25 to 30 fathoms, sand and gravel bottom, about 2 miles west of Sugarloaf Head.

Within the 100-fathom curve, **Petrel Bank** is a broad submarine ridge 16 to 20 miles wide and extending about 28 miles northeastward from Semisopochnoi Island. The high point of the ridge is a least depth of 21 fathoms 15 miles northeast of the island. The ridge is useful in determining the position of a ship by soundings when navigating north of the Rat Islands. The shoalest depth found northeast of the bank was 38 fathoms in latitude 52°29′ N., longitude 179°45′ W. The tidal current over Petrel Bank is rotary, turning clockwise. For additional information, see the *Current Tables.*

Chart 9102.—Bowers Bank lies in approximately latitude 54°18′ N., longitude 179°30′ E. The least depth is 12 fathoms. In 1935, the Coast Guard Cutter *Chelan* discovered and developed a submerged mountain range extending from Petrel Bank north to Bowers Bank, thence westward to latitude 55° N., longitude 176° E. This range has a well-defined ridge with hardly a break, approaching the surface in places from 40 to 150 fathoms, but averaging around 300. At the western end, the mountains rise abruptly nearly 11,000 feet from an ocean floor of 2,100 fathoms. The area between 1,000-fathom curves is regular in width, being about 30 miles. Soundings, however, were irregular, and although no dangerous shoals were found, it is not to be concluded that they do not exist.

Chart 8864.—Amchitka Island, about 27 miles southwest of Semisopochnoi Island, extends 34 miles in a northwest-southeast direction and is very narrow, averaging about 3 miles in width. The southeastern part of the island is very low, the greatest elevation being 351 feet. The northwest section is more rugged and much higher, with peaks attaining elevations of about 1,200 feet. At this end of the island, although no one peak forms an outstanding landmark, is a series of hills, deeply indented by gullies and ravines. This high ground gradually levels out toward the middle of the island, and by the time the southeast portion has been reached, it has become a low, rolling tundra and flat tableland. The whole south half of Amchitka Island, and a portion of the north half, is dotted with lakes and ponds. On most of the coastline is a fringing reef and around the island are extensive kelp beds. In general, the shores are steep with many offlying, submerged rocks, especially on the north shore and the eastern part of the south shore. It is recommended that vessels stay outside the 50-fathom curve un-

less proceeding to an anchorage. Along the south side of the island weak tidal currents have been observed.

South Bight is an excellent anchorage on the south coast of Amchitka Island 3 miles from **East Cape,** the eastern extremity. This harbor provides excellent shelter in storms from northwest through north to east-northeast. The anchorage and approaches to South Bight have been surveyed and the following depths found: 4 fathoms in latitude 51°20′.3 N., longitude 179°14′.7 E.; 5½ fathoms in latitude 51°21′.5 N., longitude 179°11′.2 E.; 8½ fathoms in latitude 51°23′.7 N., longitude 179°06′.8 E.

Constantine Harbor (*also see Chart 9123*) is on the north side of Amchitka Island about 6 miles from the eastern end. This end of Amchitka Island is low and has no prominent features or landmarks of much aid to the navigator. Other indentations can easily be mistaken for Constantine Harbor. The jetty, extending off from **Kirilof Point** on the west side of the harbor entrance, has practically disappeared.

The harbor proper is about 1 mile wide and 1.5 miles long. The south shore at the entrance is foul. Also, north of the channel at the entrance is a long reef marking eastward from the head of the jetty. A minimum depth of 2 fathoms at the eastern end of this reef, marked by heavy kelp, is about 0.2 mile northwestward of the channel. The head of the bay is a sand beach; other shores are rocky bluffs. Disturbances affecting the magnetic compass as much as 5 degrees have been reported off **Constantine Point,** the eastern entrance point of Constantine Harbor.

Currents in the entrance to Constantine Harbor are strong and set across the narrow entrance channel. North to northeast gales make directly into the harbor so that ships are forced to put to sea. The harbor is reported free of williwaws.

An unlighted range at the head of Constantine Harbor marks the approach from the sea buoy; the bearing of the range is 233°. Continue on the range until abeam of the jetty, then haul to anchorage or dock. Anchorage is available in 6 to 20 fathoms, sand and shell bottom and fair holding ground.

Two ship docks and one launch dock were in Constantine Harbor in 1945. **White Dock,** at the head of the harbor, had 30 or more feet of water alongside the outer 360 feet of its length on both the north and south sides. The small dock, 0.4 mile north of White Dock, could be used in smooth weather by launches drawing not more than 6 feet. **Kirilof Wharf,** just inside the jetty, had nearly 900 feet of berthing space in depths of 42 or more feet.

Ships lying at Kirilof Wharf are likely to surge when northerly swells are running in the Bering Sea. When a heavy swell is entering the harbor from the northeast, this wharf is untenable. Ships lie much easier at White Dock when berthed bow out with an anchor well off the end of the dock in 6 fathoms.

Kirilof Bay, immediately west of Constantine Harbor, is suitable only for small boats and should be avoided by larger vessels. It was reported in 1934 that breakers appeared to run across the entire entrance to the bay.

Chitka Cove, on the north coast of Amchitka Island and 18 miles northwest of Constantine Harbor, affords good protection from southerly and westerly winds 0.7 mile offshore in depths of 18 to 20 fathoms, sand bottom; the holding ground is good. The approaches to Chitka Cove are clear except for the 2½-fathom shoal 0.7 mile northwest of **Chitka Point.** This anchorage is easily entered in thick weather by ships having radar because of its distinctive features.

Good protection from southerly winds can be had 0.7 mile offshore in depths of 20

to 23 fathoms, sand bottom, 1.5 miles east of **Bird Cape,** at the northwest end of the island. The anchorage is midway between a kelp patch off the east side of the cape and a rock awash off the first small point to the east of the cape. The anchorage is entered on a course of **170°,** heading for a prominent pinnacle rock 50 feet high.

Protection from north and northeast winds can be had about 1 mile offshore in depths of 29 to 30 fathoms, sand bottom, midway between two prominent offshore rocks or islets about 11 miles along the south coast of Amchitka Island from **Aleut Point,** which is also at the northwest end of the island. The anchorage is approached on a due north course, heading midway between the two rocks and anchoring when they are abeam.

Oglala Pass, between Amchitka and Rat Islands, has depths of 22 to 40 fathoms over a middle width of 5 miles. A current velocity of 4 knots has been measured in the middle of the pass and currents exceeding 7 knots have been encountered 1.5 miles northwest of Amchitka Island. A velocity of 9 knots has been reported. See the *Current Tables* for current predictions for the Pass. During moderately heavy southerly weather, heavy tide rips along both sides of the pass extend completely across the pass at maximum ebb and attain heights of 30 to 40 feet under storm conditions. The pass should not be attempted by small vessels during southerly weather when the current is ebbing strongly.

Rat Island, 12 miles northwest of Amchitka Island, is 8 miles long and has a maximum width of 2 miles. The island is rugged and mountainous and the shores are mostly rocky. Most of the northeast coast is precipitous and fringed with reefs. Small islets and a sunken reef extend more than a mile from **Ayugadak Point,** the southeastern extremity of the island.

During southerly blows, fair anchorage can be found in depths of 28 fathoms about 2 miles east of **Krysi Point,** the northwestern extremity of Rat Island. The slope between the 20- and 30-fathom curves is less abrupt at this anchorage than elsewhere along the northeast coast; however the bottom is irregular inside the 20-fathom curve.

In westerly weather, small vessels will find better protection in depths of 17 fathoms off the entrance to **Gunners Cove,** which is midway along the northeast coast. Rocks and reefs on either side of the cove restrict the swinging room. Larger vessels can anchor farther off the cove, in depths of 28 fathoms, sand bottom. This anchorage and the one on the southwestern coast of Little Sitkin Island are of special interest in that each affords protection from blows to which the other is exposed.

Gunners Cove has depths of 1 to 12 fathoms, but is not a suitable anchorage even for small boats. The bottom is smooth rock and the wind funnels through the cove. At the head of the cove is a prominent 50-foot cataract.

In northerly and easterly weather, good anchorage can be found 1.2 miles offshore midway along the southwest coast of Rat Island. The anchorage is 0.8 mile northwestward of the offshore group of rocky islets about 20 feet high which are the dominant feature along this coast and an excellent radar target. In approaching the anchorage, avoid the broken bottom extending 2 miles south-southwest from the islets on the eastward and 2 to 3 miles from the coast on the westward. From outside the 40-fathom curve, head for the islets on course **065°** until depths of 32 fathoms are reached; then steer **000°,** passing 0.6 mile off the islets, and anchor in depths of 18 to 25 fathoms.

Rat Island Pass, between Rat Island and the group of islands to the northward,

is deep throughout. Currents in the pass are moderate and some set may be expected opposite Little Sitkin and Khvostof Passes. See the *Current Tables* for predicted currents.

Little Sitkin Island, 9 miles northeast of Rat Island, is the most easterly of a group of volcanic islands bordering the north side of Rat Island Pass. The island is roughly quadrilateral and extends 5.5 miles from **Patterson Point** on the north to **Prokhoda Point** on the south, and about the same distance from **Pratt Point** on the east to **Sitkin Point** on the west.

The island is extremely rugged and mountainous and only the lower slopes are grass-covered. It has two prominent peaks, the highest rising to 3,921 feet in the northeastern part of the island, and the other to 2,113 feet in the southern part. The island has numerous streams but no lakes or ponds. Small steam jets and hot springs are in the valley at the head of **William Cove,** in the northwest corner of the island.

The outer limit of a bank with a least depth of 10 fathoms extends about 1 mile north of Patterson Point. Elsewhere the coast is generally bold, rocky and precipitous, with a fringe of kelp 200 to 400 yards wide. No dangerous rocks are more than 600 yards from the beach.

Of the three small bights with sloping beaches on Little Sitkin Island, those at the head of William Cove and a mile to the eastward of Prokhoda Point are abrupt and are composed of large, irregular boulders. The beach at the head of **Williwaw Cove,** on the west side of Patterson Point, is flat and sandy, but bordered by several lines of breakers.

Anchorage protected from the northeast is available in depths of 25 to 30 fathoms 0.5 mile off the southwest shore of Little Sitkin Island. The anchorage is 0.7 mile southeast of a prominent 200-foot islet 1 mile south of Sitkin Point. The anchorage also is fair in moderate northwesterly and easterly winds. See the *Current Tables* for predicted currents for this area.

A vessel anchored about 2 miles northwest of Pratt Point and 600 yards off the shore, lat. 51°58′.7 N., long. 178°34′.2 E., in a depth of 20 fathoms, sandy bottom. The wind blew from the southwest at 65 knots all night with gusts up to 100 knots. At no time did the anchor drag.

Anchorage off Williwaw Cove is not recommended, but considerable swinging room is available in depths of 20 to 25 fathoms, sand bottom, 0.7 to 1 mile off the beach just eastward of Patterson Point. The anchorage is protected from southerly swells, but the williwaws off the volcano reach gale force with only a moderate southwest wind, and currents setting around the island cause tide rips.

Small craft can anchor in the bight just north of Sitkin Point, but strong williwaws are prevalent in easterly or northeasterly weather. At the head of the bight is a large, prominent, tan-colored bluff.

Temporary anchorage, protected from west and northwest winds, can be had 3 miles southwest of Pratt Point and 0.5 mile offshore in depths of 22 to 25 fathoms, sand bottom.

Little Sitkin Pass, between Little Sitkin Island and Davidof Island, is deep and clear, but is subject to moderately heavy tide rips during the strength of the tidal current. Depths of almost 50 fathoms can be carried through the pass.

Davidof Island, 3 miles west of Little Sitkin Island, is 2 miles long, 0.7 mile wide, and irregular in shape. The island has two principal summits, the highest rising to 1,074 feet in the southern part and the other to 922 feet in the northern part. The pro-

jecting easterly point of Davidof Island is marked by a prominent cone-shaped grayish-tan summit, which is the most easily identified feature in the islands north of Rat Island Pass. An islet and a knife-edged pinnacle lie close off the north end of the island.

Khvostof Island, 1 mile northwest of Davidof Island, is 1.5 miles long and 0.8 mile wide. The island is rugged and mountainous and reaches an elevation of 867 feet in its western part. Prominent twin rock pinnacles lie close off the north end of the island, and a low flat rock is about 700 yards off the northwest shore.

The passage between Davidof and Khvostof Islands is partially blocked by small rugged **Pyramid Island,** which is 538 feet high. The openings on either side of Pyramid Island are narrow and foul, and have extremely heavy growths of kelp. The blocked passage helps protect the bight north of Pyramid Island from southeast to southwest weather. Use of the bight is restricted by a 2-fathom shoal 0.6 mile north of Pyramid Island. The part of the bight between Pyramid Island and Davidof Island is clear but too deep for anchorage except close under the shore of the latter, where small craft can find excellent protection. Small craft also can anchor, with limited swinging room, close under the northeast shore of Khvostof Island. Large vessels can anchor, free from tidal current, just inside the 30-fathom curve midway between the north end of Khvostof Island and the knife-edged pinnacle off the north end of Davidof Island. **Khvostof Pass,** between Khvostof Island and Segula Island, is deep and clear and may be navigated without difficulty. The pass is subject to heavy tide rips at strength of spring currents, especially with moderate breezes from any direction.

Chart 9180.—Segula Island, 10 miles northward of Rat Island and the same distance westward of Little Sitkin Island, is the most westerly of the group on the north side of Rat Island Pass. The island is roughly square and measures about 4 miles north and south by 3.6 miles east and west. It consists entirely of a lone crater-topped mountain about 3,799 feet high. On the south face of the mountain is a prominent deep fissure immediately west of which is a broad, grassy slope that extends to the rocky bluff on the point midway along the south shore. A distinctive, dark, round-topped hill is at the end of the long ridge east of the small cove on the north side of the island. The entrance to the cove is nearly closed by reefs.

Iron Point, on the southeast corner of Segula Island, is a narrow, grass-covered, rock bluff 72 feet high; foul ground, marked by kelp and a breaker, extends 500 yards from the point. **Gula Point,** the northernmost tip of the island, is low, narrow, and grass-covered.

A line of high, steep pinnacles extends westward from **Chugul Point,** at the southwest corner of the island. Between Chugul Point and **Zapad Head,** at the northwest corner of the island, irregular bottom, marked by heavy kelp, extends 800 yards offshore. On the south side of Zapad Head, a prominent grass-covered slope rises gradually from the gravel beach of a small bight which affords protected anchorage for small craft in moderate northeast to southwest weather.

Segula Pass, between Segula Island and McArthur Reef, is wide, deep, and clear. Courses through the pass should be shaped to clear Segula Island by at least 1 mile and McArthur Reef by at least 2 miles.

McArthur Reef, 8 miles west of Segula Island and about the same distance east of Kiska Island, is a serious menace to navigation. The reef is about 0.8 mile in diameter, it does not uncover, and it does not break continuously even in a moderate swell at low

water. It is not readily visible except close aboard, and then can be identified only by a small area of slick water surrounding kelp.

McArthur Pass, between McArthur Reef and Kiska Island, is deep and clear and can be navigated without difficulty, even in thick weather.

Krysi Pass is between Rat Island and Sea Lion Rock. A jagged, submerged ridge extends across the pass, and depths of 2 to 4 fathoms have been found in several places. Tide rips dangerous to small vessels may occur during spring tides. Current predictions for Krysi Pass can be obtained from the *Current Tables*. Use of the pass is not recommended.

Sea Lion Rock, 9 miles west-northwest of Rat Island and 8 miles east-southeast of Tanadak Island, is less than 200 yards in extent and is about 10 feet high. A thick kelp bed around the rock extends 2 miles eastward and the same distance westward.

Sea Lion Pass, between Sea Lion Rock and Tanadak Island, has depths of more than 20 fathoms over a 2-mile width near the middle. Tanadak Island is a good radar target for use in negotiating the pass. Sea Lion Rock is an uncertain target except in calm weather. Tide rips dangerous to small vessels may occur in the pass during spring tides. Tidal currents of 4 knots have been observed. See the *Current Tables* for predicted currents.

Kiska Island is about 600 miles west of Unalaska Bay and is the most important of the Rat Islands because of its well-sheltered anchorage.

Caution.—Kiska Island is a **Naval Defensive Sea Area and Airspace Reservation,** and is closed to the public. No vessels or aircraft, except those authorized by the Secretary of the Navy, shall be navigated in or above the area within the 3-mile limit.

Kiska Island is about 22 miles long and varies in width from 1.5 to 6 miles. The island is very rugged and mountainous, the northern end being dominated by **Kiska Volcano.** The crater of the volcano has two tips, the westerly and slightly higher one having an elevation of about 4,000 feet. Immediately south of the volcano is a low valley about 2 miles wide in which are several salt-water lakes. The valley extends nearly across the island from a long, low stretch of shoreline on the west coast, and a narrow draw leads over a low ridge at the head of the valley to a small steep-to sand beach on the east coast.

Flat-topped, boulder-strewn ridges rise to elevations of 1,000 to 1,400 feet between the lake area and Kiska Harbor. A low, narrow pass cuts across the island from the southwest corner of Kiska Harbor to a small, foul bight on the west coast. South of this pass, sharp, rugged ridges 1,500 to 1,700 feet high extend to the southwest corner of the island. These ridges are precipitous on their western sides, but slope gradually on their eastern sides to the shore of Vega Bay. The valleys and lower slopes of the island are covered with tundra and grass, while the higher parts are generally bare and strewn with boulders, especially the ridges north of Kiska Harbor.

The shores of Kiska Island are mostly rocky and steep, and are bordered in many places by exposed, uncovering, or submerged rocks. Kelp fringes most of the island. Kiska Harbor and Vega Bay are the two principal indentations of the coast.

Sirius Point is a jutting rock ledge at the northern tip of Kiska Island, and the coast for more than 2 miles in either direction is formed of irregular, steep, rock cliffs and minor points. Deep water extends to within 0.5 mile of the shore. The sharp rocky point at the northeast corner of the island is topped by a grass-covered hill conspicuous from the northwest and southeast.

Pillar Rock, 119 feet high, is a perpendicular rock of remarkable form 9 miles westward of Sirius Point and 6.6 miles from the nearest part of the island. **Sturdevant Rock,** covered about 7 fathoms at low water, is 3 miles 281° from Pillar Rock.

Northeast Rocks, with a high point of 115 feet, and **Haycock Rock,** a lone 113-foot pinnacle 1 mile to the southward, are 0.4 mile off the coast eastward of the volcano. These rocks mark the outer limits of an extensive foul area and are excellent landmarks for visual or radar navigation. On the shore behind Northeast Rocks is a sheer, sand-colored bluff which is frequently visible when other parts of the island are obscured by low clouds or fog.

Between Haycock Rock and Sredni Point, 2.5 miles to the southwestward, is **Sredni Bight,** an open bight that affords good shelter from northwesterly weather in depths of 15 to 20 fathoms, sandy bottom, 0.7 to 0.9 mile from the beach. The anchorage may be entered on a course of 285°, heading for the end of the bluff that marks the south side of the small, sandy beach at the head of the bight. Moderate williwaws may be expected, and swells enter the anchorage after a storm in the Bering Sea.

Sredni Point is sharp, sheer, and high. Southwestward from the point to Reynard Cove and Salmon Lagoon, the high cliffs are bordered by detached pinnacles, rocks awash, and sunken rocks. This section of coast should not be approached closer than 1 mile.

Reynard Cove, 2 miles southwest of Sredni Point, is blocked by a reef that extends nearly the entire width just inside the entrance.

Salmon Lagoon, 2 miles southwest of Reynard Cove and the same distance north of Kiska Harbor, can be entered with a pulling boat at high water, but the channel through the low, sand, outer beach is sometimes closed and often shifts position.

Kiska Harbor and Little Kiska Island are discussed later in connection with Chart 9124.

In general, the waters adjacent to the Pacific side of Kiska Island, from Little Kiska Island to Cape St. Stephen, are irregular in depth. Broken bottom, within the 30-fathom curve, extends 1.5 to 2 miles offshore. Submerged pinnacles rise in deep water in Vega Bay, off Sobaka Rock, and off Cape St. Stephen. The several small bays and coves between South Pass and Vega Bay are unsuitable for anchorage.

Vega Bay is a broad indentation between **Bukhti Point** and **Vega Point.** The western part of the bay has irregular bottom, with a 2½-fathom shoal 1 mile 070° from Vega Point. The rest of the bay is clear except for inshore rocks. In northerly or westerly weather, good anchorage can be found in depths of 22 to 30 fathoms, sand bottom, off the entrance to **Gertrude Cove** in the northeast corner of the bay. A pair of gray pinnacles on the shore west of the cove bears 000° from the anchorage. The cove is a good anchorage for small vessels in all except southwesterly weather.

Sobaka Rock is 1.4 miles 155° from Vega Point. About 2.4 miles due west of the rock is a 2½-fathom shoal. Because of possible set by currents, particular care is necessary to avoid this shoal in rounding the south end of Kiska Island. Heavy tide rips occur in this area.

Dark Cove, small and shallow, is on the southwest side of Kiska Island just eastward of Cape St. Stephen. When the weather is rough outside, small boats have been able to land safely in the northeast corner of the cove. Landing is impracticable with a swell from the south-southwest.

Cape St. Stephen, the southwesternmost point of Kiska Island, should be passed

not closer than 3.5 miles to avoid broken ground in the area of the 8-fathom shoal 1.8 miles 230° from the southern tip of the cape. Heavy tide rips occur in this area at strength of current.

From Cape St. Stephen, the shoreline, extending about 15 miles in a northeasterly direction to Witchcraft Point, is in general steep and rocky, and is indented by several small bights. Deep water extends to within 0.5 to 0.8 mile of the shore for the first 12 miles. Several pinnacle rocks and rocks awash fringe this part of the coast.

A prominent line of high rock pinnacles extends 700 yards offshore from **Witchcraft Point** on the northwest side of Kiska Island. Southward of Witchcraft Point low grass-topped bluffs, interrupted by the valleys of two stream beds, extend 2.7 miles to a sharp and sheer rocky point at the foot of a razor-backed hill about 1,270 feet high. A 2¾-fathom shoal is about 0.5 mile west-northwestward, and two reefs with depths of 4 and 6 fathoms, respectively, are about 1 mile off the latter point.

Temporary anchorage for small boats can be had in the small bight on the south side of the razorback, having due regard for charted dangers. The bight has a sand beach.

Anchorage, protected from moderate northeast to southeast breezes and swells, can be found in depths of 25 fathoms, sand bottom, 0.8 mile off the coast 1.1 miles south of Witchcraft Point. The anchorage should be approached on a course of **110°**, heading for the small valley about midway between Witchcraft Point and the razorback to the southward. In this anchorage Witchcraft Point is on range with Vulcan Point.

A low sand and gravel beach, with a prominent grass-topped knoll about midway of its length, extends 2.5 miles northeastward from Witchcraft Point. Then begins a rock cliff coast that extends 1 mile northward to **Vulcan Point.** Northeastward from Vulcan Point to Sirius Point, a distance of 3 miles, the coast is rocky and steep with deep water close to shore.

A reef, covered 6½ fathoms, extends northwestward from Witchcraft Point for 2 miles toward Pillar Rock, then eastward to a point inshore about 2 miles south of Vulcan Point. Heavy kelp marks the reef in the summer, and extremely large tide rips occur in the area at strength of current, especially during spring tides. It is not advisable to approach the reef closer than the 30-fathom curve. Small craft passing between the reef and Pillar Rock should do so when the currents are near slack, which periods occur approximately at the same time as in Krysi Pass.

Directions.—The shortest route to Kiska Island from Seattle is via Unimak Pass and the visibility is better by taking this route through the Bering Sea. A pass near Kuluk Bay is the shortest distance from San Francisco, but there would be very little difference to come direct toward Amatignak Island and Amchitka Pass. Amatignak Island is frequently sighted by merchant vessels in the composite Seattle-Yokohama route. The 1,000-fathom curve is only 10 miles south of Amatignak Island and 13 miles south of East Cape, Amchitka Island. Vessels in this vicinity with only an approximate position could easily feel their way by soundings in a fog from between Amatignak and Amchitka Islands—53 miles apart—to the Bering Sea, going between Semisopochnoi and Little Sitkin Islands—33 miles apart—then over to the north end of Kiska Island where the lee of Kiska Volcano is generally clear of fog for several miles when the summer southwest wind blows.

If a vessel is approaching Kiska Island from the northward in thick weather and has not sighted any of the islands, it should navigate with caution trying to find good

visibility clear of Kiska Volcano. The 500-fathom curve is within 2 miles of the north shore. McArthur Reef and Segula Island must be avoided. If the north coast of Kiska Island is sighted, it can be approached close-to. Haycock Rock is a prominent landmark on the northeast coast.

Vessels approaching Kiska Harbor from eastward could proceed between Amchitka and Semisopochnoi Islands, thence through Rat Island Pass. Segula, Tanadak, and Little Kiska Islands are good radar targets along this route. The offshore dangers are McArthur Reef and the submerged rock 1.3 miles 340° from Tanadak Island.

Chart 9124.—Kiska Harbor, midway along the east shore of Kiska Island, is formed by a small peninsula to the northward which terminates at **North Head,** and a broad peninsula to the southward which is separated from Little Kiska Island by South Pass. **South Head** is the northeast point of the lower peninsula. The harbor proper is roughly circular and about 1.3 miles in diameter although anchoring depths extend an additional 0.5 mile to eastward. The northeastern and southern sides are rocky cliffs; the entire western side of the harbor is low and sandy except for several ridges which extend to the water's edge. A low valley opening out at about the middle of the west shore extends well back into Kiska Island. A low ridge parallels the north shore at a distance of about one-half mile.

Depths do not exceed 17 fathoms inside a line between North and South Heads. The 10-fathom curve is 0.3 to 0.5 mile off the shores. In 1943–44, the harbor was wire-dragged, and sunken vessels and other obstructions were found in such numbers that anchorage involves the possibility of fouling. The masts of one derelict show above water in depths of 15 fathoms near the center of the harbor, and a 2¾-fathom obstruction is just inside the 10-fathom curve off the western shore.

Anchorage is recommended in the central part of the harbor in depths of 13 fathoms 0.7 mile 185° from North Head. Shelter from northeast to northwest weather can be found in depths of 15 fathoms 700 yards 150° from the outer end of the main wharf. The bottom is hard, with surface sand, and has fair holding qualities.

A ship wharf and a small-craft wharf are on the north side of Kiska Harbor. The ship wharf extends 500 yards out from the shore in a southeasterly direction and can berth a large vessel on either side of the outer end. Depths along this part of the wharf decrease from 36 feet at the offshore end to 28 feet at a point 400 feet inshore. As depths shoal gradually smaller craft may berth inshore of the ship's berth.

The small-craft wharf eastward of the ship wharf is 450 feet long and will berth medium-sized craft up to 12 feet in draft. Depths of 15 feet were obtained at the outer end and 12 feet about 100 feet inshore.

Sailing directions for the approach to Kiska Harbor from the north are included in Chapter 3. Oglala Pass is recommended for the approach from the south.

Tides.—The tide in Kiska Harbor is chiefly diurnal. The diurnal range is about 3½ feet. Daily predictions are given in the *Tide Tables.*

Little Kiska Island is about 0.5 mile northeast of South Head on Kiska Island. It is about 3.2 miles long and 1 mile wide. The island is low and rocky, the greatest elevation being 426 feet. The shores are, in general, rocky and often precipitous, although there is a small stretch of low beach facing on South Pass. The coasts in most

places are fringed by detached rocks, exposed, uncovering or submerged, and a group of islets or rocks extend about 700 yards from the western extremity of Little Kiska Island.

Anchorage with fair protection from the north can be found in depths of 20 fathoms, irregular rocky bottom, south of the center of Little Kiska Island. The highest peak, with two knobs at the summit, should bear due north.

South Pass, between Kiska and Little Kiska Islands, has a navigable width of about 0.2 mile and is an approach to Kiska Harbor from the southeast. On the west side of the south entrance to the pass are **Twin Rocks,** a group of small islets. On the east side of the south entrance, and 1.2 miles 030° from Twin Rocks, is a rock, covered 2 fathoms, that breaks in rough weather; this rock is a danger to vessels approaching the pass from the south.

This pass has been sounded and wire-dragged. An 11-foot pinnacle was found 230 yards northeast of South Head. A narrow clear channel, between the pinnacle and the near shore, is 100 yards in width and was swept to clear depth of 24 feet. East of this narrow channel, kelp patches show across the pass to Little Kiska during slack water. South Pass is recommended only for light-draft vessels and personnel familiar with it.

The flood current sets northward, and the ebb current sets southward. The current immediately south of South Pass is particularly strong during the ebb period. The maximum strength of the tidal current in South Pass is 4 knots.

Tanadak Island, 56 feet high, is about 8 miles west-northwest of Sea Lion Rock and about 2.7 miles east of Little Kiska Island. Tanadak Island is grass-covered and its shape is roughly triangular, each side measuring 500 to 600 yards in length. The island consists of a low, fairly level plateau, rising in cliffs from the water's edge or close behind it. Tanadak Island is almost surrounded by foul ground containing many rocky islets and detached rocks.

Tanadak Pass, between Tanadak and Little Kiska Islands, is not recommended for deep-draft vessels. A short straight reach of channel, with a controlling depth of 12 fathoms over a width of 225 yards, is 0.6 mile west of a prominent 20-foot rock, the most westerly of those off Tanadak Island. Kelp shows in this pass at slack water during the summer months. A current velocity of 2¾ knots has been measured in the pass.

Chart 8864.—Buldir Island is an isolated island between Kiska Island and the Semichi Islands. This island forms an excellent landmark for the western Aleutians. The island is about 4 miles long and 2 miles wide, rugged and mountainous. The highest summit, 2,150 feet, is on the southern part of the island. Two lesser summits, 2,013 and 1,768 feet, are on the northeastern end. High, steep landslides are along the eastern end and on the southwest side. The shores, in general, consist of cliffs either rising from the water's edge or backing, narrow rock and sand beaches. The island is a bird refuge.

A chain of bold rocks and conspicuous islets extends 1.2 miles northwestward from Buldir Island. The outermost of the three islets is 442 feet high, dome-shaped, and an excellent landmark. It can often be seen by vessels passing to the northward when Buldir Island is obscured by fog or thick weather. Tide rips are generally in evidence along the submerged ridge extending 1.8 miles northwestward from the islet, but no dangerous shoals or reefs are on the ridge.

At the east end of the island are several groups of rocks, the farthest being about 0.3 mile offshore. The south coast is foul alongshore and should be approached with caution. Other shores are less rocky. Heavy kelp nearly encircles the island and probably marks all inshore dangers. Vessels passing Buldir Island on any course should stay outside the 50-fathom curve.

The anchorage on the northwest side of Buldir Island is the shallow bight formed by the island and the chain of rocks and small islets extending to the northwest. With the exception of the narrow valley opposite the anchorage, the slopes rise precipitously from the shoreline to the peaks. The sandy beach at the mouth of the valley affords the best landing on the island and a small stream empties into the bight at this point. Good anchorage, free from strong currents, can be found in depths of 15 fathoms, sand bottom, with the middle of the beach bearing 170°. The anchorage affords adequate protection in fresh southeasterly to southwesterly weather but not in severe storms from any direction. Anchorage suitable for moderate easterly weather can be found in depths of 15 to 20 fathoms 1 mile from shore just south of the chain of rocks and islets.

Extending southeastward from Buldir Island to Kiska Island is a submerged ridge which is marked by heavy tide rips. **Buldir Reef,** 18 miles along the ridge from Buldir Island, is about 5 miles long and 0.5 mile wide. The dangerous part of the reef includes two areas where breakers can be observed. The easterly area is estimated to have depths of 2 to 3 fathoms over it. The westerly area is of considerable extent, has definitely less water over it, and is marked by heavy kelp beds.

Currents up to 5 knots were encountered in the area of shoals between Kiska and Buldir. The set was to the north or northeast on the flood. Northwest of Buldir Island the set was always northward. Currents are believed to be moderate except near shoals or islands.

Middle Reef, a rocky shoal, is about 22 miles south of Buldir Island. A depth of 3 fathoms, not marked by kelp, was found. Thin kelp extends for 1 mile south of this sounding and from the appearance of the area on the swell, depths of less than 3 fathoms probably exist.

Tahoma Reef, upon which the cutter *Tahoma* was lost in 1914, is about 33 miles southward of Buldir Island. The main reef, which is 1.3 miles long in an east and west direction, breaks at the east end in a light swell, and for its entire length in a moderate swell. Kelp beds extend 1 to 3 miles from all sides of the reef. A current velocity of 1½ knots was observed in the vicinity of the reef; for predictions, see the *Current Tables.*

Chart 9198.—The **Near Islands** include the Semichi Islands and Attu and Agattu Islands.

The **Semichi Islands** are Shemya, Nizki and Alaid. Shemya Island, the easternmost of the group, is about 65 miles west-northwest from Buldir Island. Alaid Island, the westernmost, is about 16 miles east by south from Attu. Inshore hydrographic surveys have been completed around the Semichis. The group trends west-northwest over a distance of 11.5 miles. The islands have numerous lakes, are covered with tundra, and are treeless. The shores are fringed with reefs and rocks, some as far as 1 mile offshore.

Current velocities estimated to exceed 1 knot occur east and west of the Semichi

Islands and in the passes between them. Southward currents have been reported in the area between the Semichi Islands and Agattu.

Ingenstrem Rocks (lat. 52°38′ N., long. 174°31′ E.), 14 miles 108° from the east end of Shemya Island, are a group of four bare rocks and several others that bare at various stages of tide. The highest and northernmost of the group has an elevation of 9 feet. The bare rocks are in an area about 350 yards in diameter.

Depths of 4 to 8 fathoms extend 2.2 miles southeastward from the bare rocks. This reef probably breaks along its entire length during heavy weather. Vessels should not approach the bare rocks closer than 3 miles on the southeastward, and 2 miles on the north and west.

Chart 9125.—Shemya Island is about 3.8 miles long and 1.8 miles wide. Its surface slopes gradually from the shoreline on the south to a round bluff about 250 feet in elevation along the north shore.

The shoreline of Shemya Island is generally fringed with reefs except for a few short stretches of sand beach. Rocks, kelp, and shoals extend 0.6 mile northward of the north point of Shemya. The outermost offshore danger is a 4¼-fathom shoal, 0.6 mile off the north shore.

Several prominent rocky islets, maximum elevation 56 feet, are 0.7 mile off the northeast coast of Shemya Island. About 0.3 mile northwest of these islets is a rock, covered 3 feet, which breaks much of the time. Foul area extends out from shore to within 0.2 mile of the rocky islets. Between the outer end of the foul area and the islets is a channel which may be used by launches.

The waters for 1.2 miles east and south of the eastern point of Shemya Island are foul and marked by kelp and rocks, some bare at all stages of the tide and some covered. Shoals with depths of 9 fathoms or less and marked by kelp in summer were found as far as 4 miles south and south-southeast of the point.

Alcan Harbor, on the northwest side of Shemya Island, is somewhat protected on the east, south, and west but is wide open to northerly weather. The original breakwaters and piers have been largely washed away and, although partially rebuilt, deteriorate further with each severe winter storm. Depths charted in the harbor cannot be relied upon, because of the frequent changes, and vessels should be extremely careful of the natural and structural hazards. The **tide** in Alcan Harbor is chiefly diurnal, and the range is about 3½ feet.

The south side of Shemya Island is mostly fringed with reefs and rocks which extend as much as a mile off, but there are short stretches of sandy beach. **Skoot Cove,** 0.7 mile from the west end of the island, has depths of about 2 fathoms, and small boats may find it possible to come alongside the piers when weather conditions prevent landings in Alcan Harbor.

Hammerhead Island, 55 feet high and 0.5 mile west of Shemya Island, is the southernmost of several small islands surrounded by foul ground near the middle of **Shemya Pass,** which is between Shemya Island and Nizki Island. The controlling depth through the passages on either side of Hammerhead Island is about 13 feet, but the eastern passage is the preferable of the two. During stormy weather or when swells are running high in the Bering Sea or the Pacific, heavy breakers are likely to be encountered in the passages.

Chart 9130.—**Nizki Island,** between Alaid and Shemya Islands, is about 3 miles long and 1 mile wide, and is nearly connected to Alaid by a shifting sand spit. Nizki is lower than either Alaid or Shemya, its highest elevation being about 165 feet. The shoreline is very irregular and is fringed by numerous rocks, reefs and kelp-marked shoals. Narrow channels between the reefs lead to small coves which provide shelter for small boats.

During northwest to northeast weather there is good protection in an anchorage 1 to 2 miles south of the narrow passage separating Nizki and Alaid Islands in 10 to 20 fathoms, hard bottom.

Alaid Island is 3 miles long and about 1 mile wide. The eastern part is low rolling tundra; the western part is made up of four hills, two of which are over 600 feet high. Most of the shoreline of Alaid is rocky and fringed with reefs, but there are several stretches of sand beach. The island has several bights which might provide anchorage for small boats in an emergency.

One mile west of the west tip of Alaid is a dangerous 1-fathom shoal. Seas pile up on this shoal and much of the time it is marked by a breaker. Currents are strong in the vicinity and cause rips when the wind and sea are opposed. The deep channel between this shoal and the shore reefs may be used by launches under favorable conditions but is not recommended for large vessels.

Chart 9198.—**Attu Island,** the westernmost of the Aleutians, is approximately 15 by 35 miles in extent and is indented by many bays and long inlets. The terrain is rugged and has practically no large level area. The bays on Attu Island offer a striking similarity. They are apparently formed by submerged valleys between mountain ridges. The heads of the bays are fed by streams which have carried down enough sand to give a good holding ground. The exception to this is Heltz Bay, which is part rock and part sand. At the head of each bay is always a crescent-shaped, sand beach with a more or less high bank of sand across the middle. A course down the middle of the bay, with the exception of Massacre Bay, was found to be clear; all that have been investigated show deep water close inshore. Some have rocks along the shore but these are easily seen. Anchorages are in from 10 to 15 fathoms, sand bottom. The best method is to head into the bay until these depths are reached and anchor. At the heads of most of the bays are *barabaras* (huts) built by the Aleuts for use during the fur-trapping season.

Currents.—Strong currents may be encountered along the north coast of Attu Island, and while variable, the consensus of opinion seems to be that they follow strong winds and are noticeably affected by the weather. In calm weather the set is generally southeastward.

Survey operations in recent years have roughly defined tidal currents crossing the chain here, setting in a general northwest and southeast direction at the flood and ebb respectively, except as diverted by shoal and land areas. Slacks follow the times of local high and low water except for a lag at times as great as one hour.

Chart 9128.—**Chirikof Point** is the end of the long peninsula jutting eastward from Attu Island. This peninsula forms the north side of Massacre Bay and its approaches and the south side of Sarana Bay. It is mountainous and has several deep valleys running approximately north and south across it. Its shores are rock or boulders; it

has rocky bluffs on the north shore and, like most of the land areas in the Aleutians, gentler slopes and fewer bluffs along the south shore. **Alexai Point,** midway along the south side of the peninsula, is flat and low with sand beaches in the east and west bights. Foul areas surround this point to a distance of 1 mile. The channel to Massacre Bay passes 0.8 mile southwestward of this point.

As a rule the peaks on Attu Island are clouded in and are of little use to the navigator in making a landfall. Peaks on the peninsula are no exception to this rule. The lower hills and summits on Chirikof Point are frequently clear when the peaks are cloud-covered and consequently a landfall here is not as difficult. The end of the point is paralleled by a ridge of varying elevation, more or less crescent shaped, extending from the southeast to the northeast extremities of the point. The highest part of this ridge is a peak of 1,315 feet elevation, approximately at the center of the point (north and south). The ridge terminates at its northeast end in **Buchanan Point,** a prominent nob and headland of about 320 feet elevation. To the south and southeast of the summit, the ridge slopes down to a prominent 755-foot nob-topped hill and then drops still lower to a flat ridge carrying out eastward to the end of the point.

A prominent black islet of about 10-foot elevation is 0.5 mile north-northeast of Buchanan Point. Low rock ledges, mostly bare at high water, make out in an easterly direction from the south part of the point. A fair anchorage, sand bottom, can be had in the bight between the two extremities of the point in 15 to 25 fathoms of water, affording good protection in southwest to northwest weather.

A rocky islet of about 2-foot elevation is 2 miles east-southeast from the south tip of Chirikof Point. East, south and southwest of this islet to a distance of 0.8 mile are shoal areas of 7 to 10 fathoms. No dangers were found except close in to the islet, but the area should be avoided and the rocky islet approached no closer than one mile as the bottom is ragged and currents are strong. A safe channel exists west of this islet and east of Chirikof Point. Pass about 0.8 mile east of the southeast end of Chirikof Point.

Reefs and kelp patches extend off the shoreline between Alexai Point and Chirikof Point to a distance of 0.5 mile. Anchorage can be had under this shore inside the 20-fathom curve, having due regard for the charted foul areas. The bottom is hard, however. A prominent waterfall on this shore is about mid-distance between the two points.

Massacre Bay, on the south side of Attu Island about 6 miles west of Chirikof Point, is 4 miles wide between Alexai Point on the east and **Murder Point** on the west, and recedes for about 3.5 miles in a northerly direction. Numerous shoal areas obstruct the bay but wire-dragged channels lead to the harbors.

Attu Island aeronautical radio range is on Murder Point in lat. 52°48′.2 N., long. 173°10′.5 E. The identification signal is NU2 (— . . . — . . — — —). The frequency is 385 kc.

The approach to Massacre Bay from eastward is through **East Channel** on a course of about **315°** from a position 1.5 miles due south of Alexai Point. From westward, the harbor area can be entered through **West Channel,** between rocks and reefs eastward and northeastward of Murder Point.

Anchorage depths in Massacre Bay are 10 to 20 fathoms; the bottom is volcanic ash and sand with some clay. The bay is protected on the north, east, and west by

Attu Island, and in southerly weather heavy swells are broken up by the offlying reefs.

The tide in Massacre Bay is chiefly diurnal, and the range is about 3½ feet. Daily predictions for Massacre Bay are given in the *Tide Tables.*

The Army piers at the head of Massacre Bay were in poor condition in 1953. The Navy piers in **Pyramid Cove,** 1.3 miles to the southwest, were in somewhat better condition. Numerous obstructions were reported to exist in Pyramid Cove and in the rest of the bay. Shallow-draft craft can tie up to dolphins behind the breakwater in the southwestern part of **Casco Cove,** which is midway between Pyramid Cove and Murder Point, 2.3 miles to the southward.

Chart 9127.—Sarana Bay is 5 miles west of Chirikof Point and on the opposite side of the peninsula from Massacre Bay. From Buchanan Point to the head of Sarana Bay the shoreline is rocky and precipitous with few valleys of appreciable depth. Mountainous terrain carries abruptly to the water with few offlying rocks or ledges except at the small points. The south side of the bay and approaches consist of rock bluffs with close inshore rocks and pinnacles. **Square Point,** 3.5 miles west of Buchanan Point, is difficult to identify as none of the numerous points in this locality are prominent; however, the waterfalls on either side of Square Point are fairly prominent.

The head of Sarana Bay and also Hodikof Bay are low sand beaches. At **Hodikof Point** rocky bluffs begin again and continue to Holtz Bay. A chain of rocks and reefs, including **Hodikof Island,** makes out about 1.2 miles eastward from the small point at the north side of the inner bay. North of this chain of reefs is **Hodikof Bay.** A small-boat passage is west of Hodikof Island between Sarana Bay and Hodikof Bay. A low single-pinnacle rock, 4 feet high, is off the approaches to Hodikof Bay about 0.5 mile southeast of Hodikof Point. About 0.7 mile east-northeastward of Hodikof Point is an extensive area of irregular bottom with a least depth of 1½ fathoms, which breaks in a heavy swell.

Sarana Bay is not at present recommended as an anchorage except for medium and small craft, as a cable area extends through the middle of the bay and in the position of the only ship anchorage. Smaller craft may anchor north or south of this area depending upon weather conditions, or in Hodikof Bay. Also an emergency anchorage may be had along the shore westward of Chirikof Point in not less than 15 fathoms but the bottom is hard and irregular and is subject to considerable current. Hodikof Bay seems to be the best anchorage for medium and small craft in this locality but it should be entered with suitable visibility. Approach on a west course, passing 400 yards south of the 4-foot rock off Hodikof Point. Anchor in the middle of Hodikof Bay in 10 to 12 fathoms. The bottom is sand. This anchorage is exposed to weather from the north around to the southeast. Southeast to southwest winds blow with considerable force in Sarana Bay, probably augmented in funneling through the passes across the peninsula. Their effect in Hodikof Bay is not known.

Kelliher Cove is a small bight 0.5 mile south of **Khlebnikof Point.** Small craft may obtain shelter from weather from south to northwest. The shores are rocky except at the head of the cove which has a short gravel beach. The bottom is hard.

From inner Sarana Bay to Holtz Bay the coast is rocky bluffs but with gentle slopes back to the mountains in the interior. East of and close inshore from Khlebnikof Point

are offlying rocky islets of 5 to 15 feet elevation which serve as a landmark when cruising close inshore. The highest elevation between Sarana Bay and Holtz Bay is **Middle Peak** of about 2,200 feet elevation. This peak is generally clouded in.

Gibson Island, on the north side of the entrance to Chichagof Harbor, is a flat-topped grass-covered island 104 feet high. The smaller islets at the southeast limits of this group are bare pinnacles. **Cooper Islands,** 1 mile west of Gibson Island, may be identified by the sheer pinnacle, 125 feet in height, constituting the southern half of the middle island.

Kennon Island, a grass-covered island about 0.3 mile long with an elevation of 92 feet, is at the northwest side of the mouth of Chichagof Harbor. A narrow and shoal channel into the harbor lies west of this island. **Middle** and **Inner Rocks** are low bare rocks 10 to 20 feet high. Middle Rocks are adjacent to and east of Kennon Island; Inner Rocks are adjacent to and south of the island. The main channel is southeast of these rocks.

Pisa Point, on the south side of the harbor entrance, is a low point ending in reef. **Pisa Tower** is a prominent leaning pinnacle 44 feet high on this point. A rock 1 foot above low water is 150 yards north of the point.

Chichagof Point lying between Chichagof Harbor and Holtz Bay is reasonably flat and of about 300-foot elevation. The shores are rocky bluffs. In 1945 a prominent Army Control Tower was on this point.

Chichagof Harbor is small in area, shoal, and holding bottom is poor, but it is well sheltered, although southeast to southwest winds appear to funnel through the valleys into the bay with augmented velocity. There is little or no current effect. The bay is about 0.7 mile wide and allows little swinging room except for small craft. About 18 feet at low water can be carried into the head of the harbor where depths are about 6 fathoms. Temporary ranges into this part of the bay were established in 1945. Turns are sharp for medium craft. Fifteen feet is recommended as the maximum draft of vessels entering this harbor because of the concrete anchor clumps which stand 3 to 4 feet above the bottom. The bottom is mostly hard or gravel.

The head of Chichagof Harbor is a sand beach divided into two parts by a rocky point. Other shores of the bay are ledge or boulders. The northern part of the bay, southwest of Kennon Island, is shoal and is recommended for small craft only. In the central part of the bay is a relatively large area of depths from 15 to 18 feet, with scattered kelp. The channel lies north and west of this area. The village of **Attu,** once located at the head of the bay, has been razed. There is a dock, suitable for small craft, on the southwest side of the bay. A road leads across the island to Massacre Bay.

Range Point is 400 yards southwestward of Inner Rocks. A 2½-fathom spot is 200 yards north of Range Point.

The tide in Chichagof Harbor is chiefly diurnal. The range is about 3½ feet.

To enter Chichagof Harbor, steer **249°** from southeast of Gibson Islands to pass 150 yards off the rock awash north of Pisa Point; when the rock is abeam and on range with Pisa Tower, change course to **244°,** heading about 50 yards off Range Point. When the innermost of the Inner Rocks is abeam haul right to **269°,** the bearing of the first temporary range. Continue the course to within 350 yards of the west shore, then haul left to **220°,** the bearing of the second temporary range, which is over the dock at the

head of the harbor. Depths at the dock shoal from 10 feet at the outer end to 4 feet 50 yards inshore.

Holtz Bay, the first bay west of Chichagof Harbor, is the largest and most spectacular on the north coast of Attu Island. It is a broad-mouthed bay thrusting deeply into the island and having bluff-bordered beaches backed by tundra-covered mountain masses on both sides.

The head of the bay is divided into two arms, separated by **Center Point,** a promontory about 500 feet high and having moderate, tundra-covered slopes. At the head of each arm is a broad sandy beach with low valleys beyond cutting back into the interior.

Holtz Bay is free from dangers except for inshore reefs. It may be entered on any course provided the shoreline is given a berth of at least 0.5 mile until the inner arms are reached. The recommended course is **225°,** heading for Center Point. When 0.5 mile from Center Point and about abeam of a rocky islet off the western shore, take up a mid-channel course down either arm. Anchor in 5 to 6 fathoms in **West Arm** and in 6 to 7 fathoms in **East Arm.** Vessels also anchor at the entrance to West Arm in 10 fathoms of water. The bottom in most of Holtz Bay is a fine gray sand, with shells and some boulders. The holding properties are fair.

Holtz Bay offers protection from southerly and westerly weather, but strong winds may draw up through the passes, especially in the fall and winter months. One vessel reports having had an excellent lee from strong westerly winds when anchored in 17 fathoms in the central part of the bay about 0.6 mile off Center Point. The bay is wide open to storms from the north and east.

Chart 9198.—West of Holtz Bay the coast is precipitous, rugged and fairly straight for a distance of 7 miles. A number of reefs and rocks, all less than 0.3 mile from shore, lie off this coast. Except for these inshore rocks this stretch of coast is free from dangers.

Austin Cove is an open bight about midway in this 7-mile stretch of coast. It offers some protection from southerly weather to small boats anchoring close inshore. A ledge terminating in a rock awash at high tide makes off the west side of the cove. A rock ledge, which projects from the inner part of the cove for 0.3 mile, must be avoided.

Steller Cove is a wide bight in the coast about 10 miles west of Holtz Bay. Three open coves further indent the coastline of this bight. The shoreline is bluff-lined except for the stretches of sandy beach in the middle and western coves. The only dangers to navigation are the close inshore rocks.

The westernmost of these coves offers the best anchorage. Some protection from southerly and westerly weather may be obtained here. To enter the anchorage, steer **210°,** heading about 200 yards west of a prominent grassy knoll at the head of the cove. Anchor in 8 or 9 fathoms of water, with a fine gray sand bottom. The holding properties of this anchorage are fair. The anchorage offers no protection, however, from northerly weather. A current setting easterly along the shore may cause a vessel to lay in the trough of the sea and roll excessively.

Red Head, on the west side of Steller Cove, has a bluff-lined shore with a tableland sloping inland to mountains 1,800 feet high. The upper slopes of these mountains show bare and red and form a distinctive landmark in this region. A shoal area extends north

from Red Head and marked currents swirl around this point. Red Head should be passed at least 1 mile off.

The north coast of Attu from Steller Cove to Cape Wrangell was surveyed in 1946. No dangers are along the coast except inshore reefs. Vessels may proceed with safety at 1 mile distance offshore.

For several miles west of Red Head a low flat strip of land about 0.5 mile wide lies between the shoreline and the mountains. Several conspicuous boulders are scattered over this flat. The most conspicuous, a block of rock about 20 feet high in latitude 53°00′.8 N., longitude 172°46′.4 E., forms an excellent landmark.

Earle Cove, a small cove about seven miles west of Steller Cove, is at the west end of the belt of flat land. At the entrance to this cove are several rocks but anchorage for small boats (40- to 60-foot launches) may be had in 10 fathoms of water 0.2 mile southwest of the larger rock in the entrance of the cove. Another anchorage in 11 fathoms may be had 0.2 mile south of this same rock. Care should be taken in approaching the anchorage to avoid the kelp and foul ground off the eastern point of the cove.

The shoreline for several miles west of this cove is craggy and precipitous, rising rapidly to peaks 2,000 feet high. Kresta Point marks the west end of this section of rugged coastline.

Kresta Point, 8 miles northeast of Cape Wrangell, is a bold headland and a landmark for vessels rounding this part of the coast.

West of Kresta Point two small valleys make down to the coast, ending in a stretch of easy sloping shoreline about 1 mile long. West of these valleys is another region of high mountains and craggy, precipitous shoreline, with a bold headland at its western end. This headland is 5 miles east of Cape Wrangell.

Two small coves lie southwest of this headland. Westward, between the coves and Cape Wrangell, the shore is bold and precipitous, with a few islets, rocks and reefs near the shore.

Along the north coast of Attu Island near Cape Wrangell the current sets east on the flood and west on the ebb. Velocities of 1½ knots have been observed and it is believed that velocities approximating 3 knots are prevalent during spring tides. Five miles northeast of Cape Wrangell the flood current sets east-northeast with an average velocity of 1 knot.

Chart 9149.—Cape Wrangell is the westernmost extremity of Attu Island. The cape appears as a string of rocky, rugged islets, about 150 feet high, reaching out from a mountainous ridge. This ridge is bold and steep with a summit about 1,800 feet in elevation.

On **Peaked Island,** just off the cape, a natural bridge and buttress forms an opening which has the deceptive appearance of a large patch of snow against the dark rocks. This is a distinctive landmark to vessels north and south of the cape.

A rock baring 3 feet at low water is about 0.3 mile west of Peaked Island. Breakers usually mark the location of this rock.

Cape Wrangell should be rounded at 1.5 miles distance. At maximum current the heavy tide rips extend for a distance of about 3 miles off the cape.

Southeast of Cape Wrangell, inshore currents were observed setting east at times.

Between Cape Wrangell and Etienne Head, the mountainous coastline is indented by two coves. A shingle beach lies at the north end of **Wrangell Cove,** the easterly of

the two. A group of buildings stood inshore from the beach in 1945. Small boats made landings on this beach regularly during that year.

Etienne Head is a moderate-sized headland about 120 feet high. A group of large black rocks and reefs lie off the headland.

Etienne Bay is the first large bay east of Cape Wrangell. It is broad and open, and has high mountains on both sides and a long sandy beach at its head. A low valley and a pass run inland from this beach.

The bay is clear of dangers to navigation except for the reefs and kelp patches which border the eastern and western shores. The western shore should be given a berth of at least 0.5 mile. The bottom shoals gradually as the bay is entered. Deep-draft vessels can anchor in 14 fathoms of water in mid-bay about 1 mile from the head. The bottom is fine green sand and pebbles and has fair holding properties.

A perpendicular-sided table-topped shelf about 500 feet high is located on the east shore 1.5 miles from the head of the bay. This makes a good landmark in Etienne Bay.

Etienne Bay is wide open to southerly and westerly storms, and due to lack of protection is not recommended as an anchorage except in northerly or easterly weather.

Mikhail Point marks the southeast approach to Etienne Bay. It is a broad, gently sloping headland with a terrace-sided shoulder near its northwest part.

A narrow-mouthed cove cuts into the southeast tip of Mikhail Point. This cove offers good protection to small boats, but the swinging room is very limited.

Mikhail Point should be given a berth of at least 0.5 mile by deep-draft vessels.

Abraham Bay, east of Mikhail Point, is the second major bay east of Cape Wrangell. It is wide-mouthed, narrowing to an inner arm at the northeast end. This arm has parallel shores and a short, sandy beach at its head. The mountains surrounding Abraham Bay rise steeply from the shoreline to heights of between 1,500 and 2,000 feet. The steep, rugged slopes of the inner arm give it a fiordlike appearance.

An unusually large waterfall on the northwest shore of Abraham Bay, 2.5 miles east of Mikhail Point, is a conspicuous landmark, even to ships offshore.

A group of rocks and reefs mark the west side of the approach to the inner arm of Abraham Bay. The highest of these, a steep-sided rock 48 feet high, is an excellent landmark for vessels entering the bay. Vessels should steer a course to pass not less than 0.5 mile off this rock, rounding it at that distance and then heading toward the middle of the sand beach at the head of the inner arm. Anchorage is found east of the innermost low flat reef in 13 fathoms of water with a gravel bottom. The holding properties are only fair. This anchorage offers some protection from north and east storms, but is exposed to the west and south. In addition, fierce strong winds often draw through the inner arm, when no winds are noticeable off the approaches to the bay.

The east shore is clear of danger except for the almost continuous string of reefs close inshore. Two rocks, 2 feet high and 0.3 mile offshore are the greatest dangers to navigation. One is 1 mile north of Chuniksak Point and the other 2.5 miles north of the point.

Chuniksak Point is between Abraham Bay and Nevidiskov Bay. It is a broad, three-pointed promontory sloping moderately upward and back to two mountain ridges. In 1945 a group of buildings and a prominent steel tower were situated on the tableland 0.5 mile north of the shore.

Small-boat landings were made regularly that year in the cove just northwest of the easternmost point of Chuniksak Point.

A current with a westerly set has been noticed close inshore around this point.

Nevidiskov Bay, on the southeast side of Chuniksak Point, is a fairly open, two-armed bay, surrounded by an irregular terrain of mountain ridges and valleys. Nevidiskov Bay is fairly clear of dangers and may be entered on any course, except that Chuniksak Point should be given a berth of at least 0.5 mile and Theodore Point a berth of at least 1 mile.

The steep sided, rocky islet, 38 feet high, south of the point separating the two arms of the bay is a landmark for vessels entering the bay.

At the head of the east arm of Nevidiskov Bay is a flat, sandy beach. Vessels of any draft can anchor off this beach in 15 to 17 fathoms of water, 0.7 to 1 mile east of the 38-foot islet. The bottom is fine gray sand mixed with small round boulders. It has fair holding properties.

This bay offers shelter for any draft vessel from northwesterly through northeasterly to southeasterly storms. It is open and exposed, however, to storms from the southwesterly quadrant.

Low rocks and reefs fringe most of the east shore of the bay for as much as 0.3 mile offshore. Kelp is found over and around these rocks.

The west arm of Nevidiskov Bay is constricted and has a rocky, submerged ledge across its inner part.

Theodore Point, between Nevidiskov Bay and Temnac Bay, is a bluff promontory sloping moderately to a knoll-like shoulder and then steeply to the mountain ridge behind. Theodore Point is the southernmost promontory of Attu Island and the knoll-like shoulder is a conspicuous landmark for vessels southeast or southwest of the point.

Reefs and rocks fringe Theodore Point on all sides for a distance of about 0.3 mile. Kelp patches cover and surround most of these reefs. A dangerous submerged, pinnacle rock, having a least depth of 5 feet at low water, is 0.5 mile southwest of the west end of the point.

A group of buildings is located above the bluffs near the south end of the point. In 1945 small boats landed regularly in the cove on the southwest side of Theodore Point to service the shore establishment.

Westerly currents were encountered close inshore off Theodore Point during the summer.

Weather.—Fog covers the land above the 100- to 200-foot level much of the time in the late spring and summer.

Chart 9129.—Temnac Bay, the first bay westward of Massacre Bay on the south coast of Attu Island, is about 8 miles wide between Theodore Point on the west and Krasni Point on the east, and indents the island about 4 miles.

Coming from the east and Massacre Bay it is best to keep at least 1.5 miles off Krasni Point to clear the reef, which extends 1.2 miles south of the point, and the islands along the shore northwest of the point. A rock uncovers 4 feet at low water 700 yards south of the westernmost island. The western shore should be given a berth of 0.8 mile until well into the head of the bay.

Large vessels can anchor about 1.5 miles from the head of the bay in 20 fathoms, fine gray sand bottom, of fair holding qualities. Smaller vessels can anchor farther in.

The anchorage offers some shelter from strong southeasterly breezes. No williwaws were experienced while survey operations were in progress.

Temnac Bay is not, in general, recommended for anchorage but it might prove useful in an emergency, and it would be easy to get out of in case of undesirable weather conditions.

Chart 9102.—The area west of Cape Wrangell was surveyed to longitude 170° E. in 1946. **Stalemate Bank** is a large shoal area about 55 miles west of Cape Wrangell with a least depth of 18 fathoms. The only danger is the rock baring 3 feet at low water west of Peaked Island.

Chart 9147.—Agattu Island, lying about 22 miles southeastward of Attu Island, is the second largest and the southerly island of the Near Islands. This island is roughly triangular in shape with the north shore or base of the triangle trending in a west-southwest direction. The north shore is about 17 miles in length, the south shore 14 miles and the east shore 9 miles in length.

It is reported that at the time of the Russian voyages of discovery to Alaska that 35 native Aleutian villages were on the island. Many of the sites are in evidence at this time. The island is not at present populated.

The island is volcanic in origin, and similar in terrain, shoreline, and vegetation to the other islands of the Aleutians. Mountain peaks to an elevation of 1,992 feet are adjacent to the east half of the north shore and 2,080 feet to the southwestward. The shoreline is rocky and precipitous and fringed with close-inshore pinnacles. Boulder or pebble beaches are at the heads of most of the bights; frequently the boulders are outside the low water line which renders landing in small boats, except in a smooth sea, difficult. Water may be boated from streams in most of the bights. Most of the points rise 50 to 200 feet from the water to headlands and then slope more gradually to the interior.

The peaks are generally obscured by a low ceiling. For this reason the points are the most suitable features for navigational purposes. **Krugloi Point,** the northeastern end of the island; **Cape Sabak,** the southeastern end of the island; and **Gillon Point,** the west end of the island, are hills and plateaus sloping to the water's edge or ending in sheer headlands. Gillon Point ends in a low flat-topped headland which appears separated from the island. **Kohl Island,** 156 feet in elevation, is about 2.5 miles west of Cape Sabak and is prominent. Gillon Point should be given a berth of at least a mile and Krugloi Point 3 miles. A charted breaker is 0.5 mile off Krugloi Point and a 12-fathom shoal is 0.7 mile northwest of Gillon Point.

Armeria Point, 5 miles northeast of Gillon Point, is a sheer headland of about 100 feet elevation, fringed with high pinnacles, and rising to greater elevations a short distance inland. It is a double point. **Patricia Point,** 6 miles west of Krugloi Point, is low and slopes gradually back to the hills inland.

Nile Point on the south side, 2.3 miles eastward of Gillon Point, is a bold headland. A dangerous breaker lies about one-half mile off this point. This is one of the few offlying dangers.

The hills and plateaus constituting most of the island give the appearance of flat tableland from a distance but in most of the areas are interspersed with numerous valleys.

It is recommended that medium craft keep outside the 20-fathom curve around the island except when seeking shelter, and large craft outside the 40-fathom curve.

All anchorages about the island are limited as to shelter, but the island is not large and both medium and large craft can proceed to such anchorages as the prevailing weather requires.

The currents are weak and heavy tide rips will not be encountered about this island except in rare cases.

Patricia Bight is the best anchorage off the north shore. Extensive kelp beds make well out from the east side of this bight and a long reef makes out from about the deepest part in a northerly direction, ending in a rock which bares at low water. This reef is surrounded by extensive kelp beds. Small craft may proceed to an inner anchorage east of this reef and into the deepest part of the bay. A fox farmer's cabin is at the head of this bight.

No evidence of kelp or dangers has been found in other parts of the bight except very close inshore. Large or medium craft should anchor in 15 to 20 fathoms, sand bottom, 0.5 to 0.8 mile off the west shore and about east of the end of Patricia Point. Shelter is afforded from southeast to southwest. Westerly and easterly swells and sea make into the bay.

Binnacle Bay is a bight 1 mile southwest of the end of Patricia Point. Kelp beds are off the north part of the east shore. A kelp bed also makes out from the point at the west side of the deepest part of the bay. The balance of the area seems to be clear of kelp beds and anchorage can be had as needed, but depths are somewhat deep, 17 to 21 fathoms, hard bottom.

In **Armeria Bay** no dangers were found outside the kelp area. A 10-fathom bank is 1.5 miles eastward of Armeria Point. Anchorage may be had 0.5 mile southeast of the bank in 24 to 25 fathoms, hard sand and rocky bottom.

West Cove, a two-armed bight 1.5 miles southwest of Armeria Point, is a fair anchorage for small craft. The bottom is hard and there is insufficient sea room for medium craft. Enter 200 to 300 yards eastward of an islet off the west side of the entrance. Anchor in the middle of the bay in 15 fathoms or as desired.

A bight on the south side of the island, 1.5 miles eastward of Gillon Point, is free of dangers except for the breaker off the end of Nile Point. Anchorage can be had in 17 fathoms, sand bottom, about 0.5 to 0.7 mile from the shore. The bottom is hard sand, scattered rocks and broken shell. Reefs are close inshore and a black detached islet is at the west side of the head of the bight.

Otkriti Bay, on the south side of Agattu Island, is the largest bay on the island affording any protection; it is about 1 mile long and 2 miles wide. Two long narrow islands extend westward from the eastern entrance point; the highest point, 83 feet, of the outer island is a good landmark. About 0.6 mile southwest of the outer island is a ½-fathom shoal which breaks in a moderate sea. Anchorage can be had in 20 fathoms, coarse sand and shell bottom, southwest of the bold point between Karab Cove and Otkriti Bay proper. Holding properties are fair, but there is no protection from the south and west.

Karab Cove, the bight on the east side of Otkriti Bay, is small—1 mile long and 0.5 mile wide—but affords the best protection of any anchorage on the island for vessels less than 125 feet in length; it is open only to the southwest. The anchorage is in the

center of the cove in 12 fathoms, sand and gravel bottom; it is not recommended in southerly or southwesterly weather.

Agattu Roadstead, on the east side of Agattu Island, is an extensive open bight. Numerous monolithic pinnacles are along the shoreline; **Monolith Point,** which appears black against lighter background, is on the north side of the entrance to **McDonald Cove.** There are no dangers to navigation if the shoreline is given a berth of 0.5 mile. The depth of the roadstead slopes gradually up from about 45 fathoms to 10 or 12 fathoms. The bottom is sand, although there is some rock opposite rocky promontories. Where there is sand it appears to be deep and affords good holding ground. Agattu Roadstead offers little protection from east and but little from north and south, but it is protected from the west, subject, however, to draw winds from that direction. The bight offers suitable anchorage for any type of vessel if weather conditions are favorable.

A good anchorage is available in this locality off McDonald Cove in 15 to 20 fathoms, sand bottom. Depths seem to be suitable for anchorage alongshore for some distance towards Krugloi Point. Reefs, making out 0.3 to 0.5 mile from shore, extend for 2 miles from Krugloi Point.

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CHAPTER 8

Bering Sea to Arctic Ocean

Charts 9302, 9400

DISCUSSED here are the coast and offlying islands of Bering Sea from Unimak Pass northward to Bering Strait, thence the Arctic coast as far northward as Point Hope. Much of the area has been only partially surveyed, and the charts must not be relied upon too closely, especially near shore. The currents are much influenced by the winds and are difficult to predict; dead reckoning is uncertain and safety depends upon constant vigilance.

The chapter area is entirely within the 100-fathom-depth curve, which extends northwestward from Unimak Pass and passes to the southwestward of the Pribilof Islands. Depths vary more or less uniformly in the open sea except near the offlying islands, which are volcanic and rocky and range in height to more than 2,000 feet.

From the head of Bristol Bay to Norton Sound, shoals or banks formed by river deposit extend many miles from the mainland, in some places completely out of sight. Kuskokwim and Yukon Rivers are the principal drainage systems along this stretch of coast. As fog and thick weather are common during the navigation season, coasting vessels are advised to sound constantly and to stay in depths greater than 10 fathoms unless feeling their way in to the land.

Navigational aids are few. The rocky islands and the rocky parts of the mainland are frequented by thousands of birds whose constant cries may serve to indicate the approach to these places in thick weather. Port facilities are rare, and most of the villages scattered along the coast lighter their supplies from vessels anchored offshore. Good water can always be found in the vicinity of high land.

The navigation season depends largely upon ice conditions, discussed later. During the winter months, the ice and snow along the shore, as well as inland, are suitable for travel by dog team over many miles of established trail. Tractors could be driven over long stretches of this beach area when the lakes and protected bays are frozen solid enough to support them. Airplanes equipped with skis can also operate in winter from many points along the coastal and inland areas.

CURRENTS.—Strong tidal currents flow through the Aleutian Islands passes, setting into the Bering Sea on the flood and into the Pacific Ocean on the ebb. Velocities have been observed to exceed 8 knots in some of the passes, but decrease rapidly once the passes are cleared. The tidal currents set northward and southward along the Bering coast and into and out of the various bays. The periodic tidal flow along the

coast is completely masked at times by wind currents. In the constricted bay areas the currents may have considerable velocity. The tidal current has an average velocity of ½ to 1 knot at the offlying islands.

Most reports indicate that during the open season there is a general drift northward along the Bering coast and thence through Bering Strait into the Arctic Ocean. During the winter, ice moves from the Arctic into the Bering Sea. The northward drift is probably not more than ½ knot in the open sea well northward of the Aleutian passes. Wind and atmospheric pressure are said to materially affect the drift. In a disturbed area the current will generally set with a strong wind or toward an atmospheric depression, and such a current may serve as a storm warning.

Along the north side of Unimak Island, the currents are fairly strong and generally parallel the coast. They attain a maximum velocity of 2 knots a mile off Cape Mordvinof and probably do not exceed 2½ knots anywhere along this coast. Velocities have been estimated at 2 to 2½ knots as far as 12 miles from shore in depths of about 40 fathoms.

Between St. Matthew Island and Nunivak Island, the current sets northwest with prevailing northeast winds during the navigation season and northeast with northwest or southwest winds. This northerly current continues and increases between St. Lawrence Island and the mainland, being stronger toward the mainland north of Yukon River where it has a velocity of about 1 knot except in early summer when the Yukon freshets may increase it to 2 knots or more. A strong northward current, amounting at times to 2½ knots, has been observed setting on the Yukon flats. The current sets north across Norton Sound to Sledge Island and is strongly marked along the coast between Sledge Island and Bering Strait.

Captain Covell, of the Coast Guard Cutter *Bear*, said of the currents in this area, "After a southeast gale in the Bering Sea, during which the water is banked up against Siberia, a very marked current sets in the opposite direction. The reverse is true for a southwest gale. The exact interval between the gale and the strong countercurrent is, so far, undetermined. Of the existence of this countercurrent under such conditions, there is no doubt, and it demands consideration."

Short series of current observations totaling about 6 days were made in July, August, and September of 1950 in Bering Strait off Cape Prince of Wales. When not opposed by northerly winds, the current flowed northward with velocities that exceeded 2½ knots at times.

From Bering Strait to Point Hope, the current sets northward along the shore—stronger close-in—and has a velocity of not less than 1 knot when not opposed by winds or stopped by ice. From Eschscholtz Bay a current sets northwestward along the northeast shore of Kotzebue Sound and has a velocity of ½ to 1 knot at Cape Blossom. The latter current is increased by the flow from Hotham Inlet to a velocity of 1 to 2 knots at Cape Krusenstern and joins the current from Bering Strait northward of the cape, where the velocity is 1½ to 2 knots in the latter part of July and August. After rounding Point Hope, the current decreases to a velocity of about 1 knot.

WEATHER.—The weather over the Bering Sea and Arctic Ocean is generally bad and very changeable. Good weather is the exception and does not last long when it does occur. Wind shifts are both frequent and rapid. The late spring and summer seasons have much fog and considerable rain. In early fall the gales increase, the fogs

lessen, and snow is likely any time after mid-September. Late fall and early winter is the time of almost continuous storminess. Heavy winds from any direction are usually accompanied by precipitation; however, the rain or snow which comes with easterly or southerly winds is likely to continue steadily until the wind shifts while rain or snow squalls are characteristic of the westerly and northerly winds. Skies tend to clear quicker with the slackening of the velocity if the winds have been blowing from northerly or westerly directions.

Taking the area as a whole, the winds are most frequently from northerly and northeasterly directions from October through May and are variable, with predominating winds from directions in the south half of the compass at most stations during the period from June through September. The local topography, however, influences the prevailing wind so that the general wind circulation does not show conditions at the individual stations. Winds are quite variable at St. Paul Island, even in winter, with an average velocity of 16 knots and a maximum reported since 1939 of 49 knots. In November 1932, a velocity of 99 knots was reported.

Over much of Bristol Bay the winds are from northeasterly directions from October to March, and most frequently from southwesterly directions during the late spring, summer, and early fall. The average wind velocity at Port Heiden is 15 knots. At Naknek, near the head of Bristol Bay, the prevailing winds are northerly except during the summer; the average velocity is about 9 knots

At Bethel, the head of ocean navigation on Kuskokwim River, the winds are from the northerly directions most frequently from September through June, with southerly winds prevailing in July and southwesterly winds in August. The average wind velocity at Bethel is 9 knots. At Hooper Bay the prevailing winds are northeasterly from November through February and are quite variable during the other 8 months. The prevailing winds at Nome are northeasterly from September through May and are southwesterly in mid-summer. The average wind velocity at Nome is 11 knots, and a maximum velocity of 65 knots was reported in January 1950. At Gambell, on the northernmost point of St. Lawrence Island, the prevailing winds are southwesterly during the summer, but are generally northerly or northeasterly during the other seasons. Few Greenwich noon ship observations are available over this part of the Bering Sea for the winter and spring seasons. In mid-summer the ship observations indicate a general tendency to winds from southerly directions while in the fall the winds are shifting to the north. Gales of force 8 or higher appear to be rather unusual in summer over the waters of this area, but possibly 6 percent of the ship observations show such gales in the month of October.

At Shishmaref, on the north coast of the Seward Peninsula, the prevailing winds are generally from the north except in July when they are most frequently from the south. However, the winds at Shishmaref are often from the northwest in January, April, and in June. At Candle, near the southern shore of Kotzebue Sound, the winds are most frequently from northerly or northwesterly directions from October through April; they are somewhat variable but most frequently from the southeast from May through September. At the outermost tip of the Baldwin Peninsula, which extends in a north-northwestward direction from Seward Peninsula into Kotzebue Sound, is the station of Kotzebue; the winds at this location are westerly in early summer and easterly during the rest of the year. Exactly the same prevailing wind conditions are reported at Noorvik, on Kobuk River.

At Point Hope the average wind velocity is 14 knots, with a maximum velocity of 20 knots in November and a minimum of about 10 knots in April, May, and June. About 8 percent of all the hourly wind observations at Point Hope record velocities of over 28 knots, with 1 out of every 8 of these gales reaching a velocity higher than 41 knots. November has the largest number of gales, 29 percent of all hourly observations showing velocities over 28 knots, and 1 out of 6 of these gales having velocities over 41 knots.

Most of the precipitation over Bristol Bay and the Bering Sea is in July through September, with August the rainiest month at most stations. The total annual snowfall ranges from 30 inches at Hooper Bay to 67 inches at Nome; Naknek has a total of 38 inches.

Precipitation over the Arctic Ocean is very light, ranging from a lowest observed annual average of 3 inches at Point Hope to a highest of 16 inches at Noorvik. The most precipitation usually occurs from July to October, one-half of the annual amount falling during this third of the year at all stations. The total snowfall is not heavy, ranging from 34 inches at Shishmaref to 60 inches at Noorvik. It is evident, however, that somewhat more than half of the precipitation over the Arctic falls in the form of snow.

The annual mean temperatures along the Bering coast range from 21° F. at Wales, on the north edge of the area, to 38° F. at Port Heiden. The highest temperature recorded in the area is 90° F. at Bethel in June while −55° F. is the record low value recorded at Golovin and at White Mountain in January and also at St. Michael in February. The Japan Current system does not moderate the winter temperatures even over the southern edge of the Bering Sea to the extent that it moderates temperatures south of the Aleutians. Over the eastern half of the Bering Sea the average of the daily minimum temperatures is less than 32° for about 8 months of each year, and is lower than 0° F. for 1 or 2 months at most coastal stations of the area.

Along the Arctic coast the annual mean temperature is about 20° F. Temperatures above 80° F. are occasionally experienced in mid-summer; Kotzebue, Candle, and Noorvik have reported extremes in July of 82°, 85°, and 87°, respectively. The highest temperature recorded at Shishmaref was 72° in July. The higher temperatures occur infrequently, however, since the average of the daily maximums is higher than 50° F. at Shishmaref and Candle only in July and August. The mean monthly maximum exceeds 50° F. at Noorvik and Kotzebue in June, July, and August, but remains below 50° at Point Hope during all 12 months. Extreme low temperatures recorded for the area range from −38° F. at Point Hope in February to −60° at Candle in January. The mean of the daily minimum temperatures is less than 32° F. at several stations in each of the 8 months from October through May.

Fog occurs in every month of the year at most localities along the Bering coast; the maximum is in mid-summer and the minimum is in the fall. It is reported that summer fogs in the Bering Sea, while sometimes very dense, often extend less than 100 feet above the water. It is, therefore, often possible to make a landfall by sending a man aloft where he will be able to see over the fog. It is also often possible to make high islands and capes by working up to them from leeward and taking advantage of a rift in the fog that prevails to leeward of such features. This rift in the fog is called the *Ookah* by the natives; it does not exist in the lee of lowlands, small islands, or during a

calm. See Chapter 2 for a description of the three possible variations in this phenomenon.

There is considerable fogginess over the Arctic coast, with a maximum of dense fog at about 8 percent of all mid-summer observations and a minimum of about 2 percent of the fall observations at Kotzebue.

Thunderstorms are rare over the Bering Sea and Arctic Ocean. No station records an average of more than 1 day per year on which a thunderstorm has occurred. Such storms are usually observed in mid-summer.

There is much cloudiness over the area, with an average of from 60 to 80 percent of the sky covered the year around. Cloudiness usually is more prevalent in mid-summer than during the winter months.

ICE.—Except in bays and sheltered places the ice of Bering Sea is in detached fields, floes, and cakes, which are continually kept in motion, breaking up, piling, and telescoping by the action of variable winds and currents. At no time is the sea one solid sheet of ice, and in the winter, when it is forming, the ice is more scattered than in the spring, when the northerly movement begins and packs it closer together. The general southern limit of ice is from Bristol Bay to the vicinity of St. George Island, and thence about west-northwest to the Siberian shore. The southern edge is ragged and very much scattered, and continued northerly winds sometimes drive fields of it far southward. As a rule, no heavy ice will be encountered south of the Pribilof Islands, and the ice in their vicinity is likely to be nothing more than detached fields.

In the spring, beginning with April, there is a general northward movement of the ice, the shore clearing ahead of the center of the sea; but the ice sometimes hangs on in the bays and around the islands later than in the open sea. The movement and position of the ice depend greatly on the winds. Generally, by June 1, the whole body of ice is well up with St. Lawrence Island, and a passage opens to its west side. The eastern side of the sea is likely to be obstructed a little later than the western side, and ice is often met between St. Lawrence Island and Nunivak Island in the early part of June. The breaking out of the rivers in the latter part of May clears the shores, but the ice is likely to hold in Norton Sound several weeks later. In general, for a vessel not fitted to encounter ice, Norton Sound is not navigable before the middle of June. At the opening of navigation the ice is likely to be heaviest and to remain longest on the north shore of Norton Sound and in general it is the latter part of June before that portion of the sound is altogether clear.

In the fall, young ice begins to form on the rivers, and in the bays and sheltered places, in October and grows stronger and spreads according to the severity of the advancing season. At Nome, on the north side of Norton Sound, navigation is difficult from early December to early June and is usually suspended from late December to mid-May.

Weather Bureau records of ice breakup and freezeup are available for many places along the Bering and Arctic coasts. Brief summaries are given in the port descriptions that follow in this chapter, and tabular detail is given in the *Appendix*.

Chart 8802.—Bristol Bay may be said to include all that part of Bering Sea lying east of a line drawn from Cape Sarichef, Unimak Island, to the Kuskokwim River. Unimak Island and the Alaska Peninsula bound it on the south and east, and separate it

from the Pacific Ocean. The Naknek River is at the head of deep-water navigation, while the bay itself terminates in the Kvichak River a few miles northward. The region about Nushagak River, Kulukak Bay, and the Kuskokwim forms its northwest boundary.

The shores are usually low and without distinctive features, but high mountain ranges and volcanic cones extend along the central parts of Unimak Island and the Alaska Peninsula. These rugged snow-covered mountains and lofty peaks would serve as unmistakable landmarks were they not obscured by the almost constant fogs which prevail during the summer months. The shore and objects near sea level are often seen beneath the fog when the higher lands are obscured, and, therefore, most of the available landmarks are found on or near the beach.

Recent reconnaissance lines of soundings run from a position 6 miles northwest of Cape Mordvinof directly to within 8 miles of Amak Island and then to the entrance of Izembek Bay disclosed no dangers to navigation. There were indications of shoals off the point of land 20 miles east-northeast of Cape Mordvinof which should not be approached closer than 8 miles. Steamer traffic has been known to use the passage between Amak Island and the peninsula. Although unsurveyed, it is believed that this passage is clear if Amak Island is passed not closer than 2 miles. An 8-fathom spot is reported about 1 mile southeast of the south end of Amak Island. There may be considerably less water there.

The approaches to Cape Glazenap from west-northwest are clear to deep water.

Bristol Bay proper has been only partially surveyed, but reconnaissance lines run along regular steamer routes from a few miles off Amak Island to Kvichak and Nushagak Bays disclose no dangers. The surveys that have been made disclose wide changes in Kvichak and Nushagak Bays. Strangers are cautioned to use a local pilot when navigating these waters.

Vessels operating in Bristol Bay, particularly at the head waters, are warned concerning the use of sea water as a cooling agent in internal combustion engines, heat exchangers, condensers, and evaporators. The heavy amount of silt in suspension in this area can do great damage to the machinery or equipment if overlooked. This is especially true of small diesel or gasoline engines equipped with gear-type water pumps, since the fine sand will pack itself between the gears and cause them to bind. Also, the silt is likely to settle in various parts of the cooling system and accordingly the system may need regular flushing. Most small-boat operators in the salmon fishing areas, such as Kvichak and Nushagak Bays, use fresh-water cooling systems with piping led outboard.

Reports of ice conditions at the head of Bristol Bay usually can be obtained from the Alaska Communications System station at Naknek Airfield or the nearby canneries. On 17 May 1948, the survey ship *Pathfinder* encountered floe ice about 20 miles northwest of Port Heiden and a solid field of drift ice about 10 miles west of Egegik Bay. At this time of the year, the run from off Port Moller to the head of Bristol Bay should be made during daylight because of possible ice. In 1948, several commercial vessels encountered difficulties attempting the run at night.

Chart 8860.—Cape Sarichef, described in Chapter 7, the western end of the south coast of Bristol Bay, is low, with detached rocks close inshore, around which strong tidal currents sweep. The land falls away eastward in a gentle curve forming **Dublin Bay,** about 3 miles in depth and 16 miles across between the cape and Cave Point. This bay may be used as a temporary anchorage by vessels of any size. The holding ground is said to be good. From offshore the first 8 miles of this indentation present themselves as a smooth grassy slope gradually rising from low, rocky, grass-covered bluffs, about 60 to 100 feet in height, to the mountains several miles inland.

The beach is steep, and the surf breaks almost at the shoreline. The terrain leading back is quite rugged and is cut by numerous gullies. Along this part of the coast there are several prominent hills ranging in height from 800 feet to 2,000 feet at distances of 2 to 4 miles back from the shore. **Red Hill,** a very distinctive formation near Cape Sarichef, is not comparatively high, 798 feet, but is isolated and closer to the shore than the other peaks in the vicinity. It is easily recognized by its reddish hue and is prominent from the north, northeast, and west. It is often clear when higher peaks are obscured by fog or clouds.

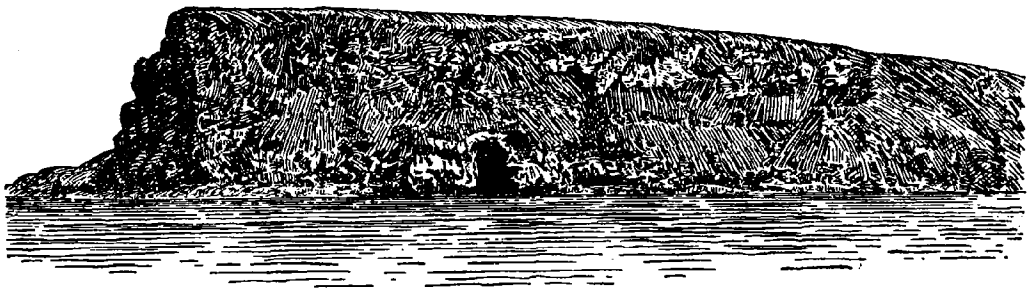
A large valley, appearing not as a pass but as an indentation into the hills, is easily recognized from offshore. **Beartrack Creek,** having a considerable drainage area, is a swift stream flowing through a bed strewn with small boulders. About 6 miles northeast of Cape Sarichef are several waterfalls that may serve as landmarks for vessels close inshore.

The coast in the northern half of this moderate indentation is a series of low sand dunes, and the shore is sandy. From the line of dunes along the beach a large marshy area extends back for 2 or 3 miles, where a low pass begins and leads between the peaks to the south side of Unimak Island. Two moderate-sized streams and a number of small ones empty into the Bering Sea.

Southwest of Cave Point the bottom is generally even, of fine black sand, and good holding ground; the 10-fathom curve is from 0.4 to 0.8 mile from the beach. There are no charted shoals of any consequence, although the 10-fathom curve is a little farther off the points than off the bights and coves. The best anchorage is in about 19 fathoms, 7.5 miles 048° from Cape Sarichef Light. This anchorage affords protection from the northeast through the southeast, and around to the southwest. In northerly and northwesterly weather the current may prevent a vessel at anchor from heading into the sea.

Cave Point is a vertical rocky cliff, about 360 feet in height, formed by a ridge about 400 feet in elevation, extending from the north side of Black Hill. It is named for a cave on its face, inhabited by sea birds, which in summer hover about it in thousands, making it conspicuous in clear weather by their numbers and in fog by their constant cries.

The point is very prominent and can be seen easily in clear weather from Cape Sarichef or from Cape Mordvinof. The water off Cave Point is deep; no shoals have been found. The 20-fathom curve runs about 1 mile off the point.



Cave Point from 1 mile westward

Black Hill is a black-looking hill about 3 miles east-southeast from Cave Point. It has an elevation of about 1,524 feet and is the highest peak near the shore. Being a good landmark, it can be seen plainly from the west to the north. Black Hill is covered with snow in the winter but is bare in the summer.

Between Cave Point and Oksenof Point, the most westerly point of Cape Mordvinof, is another moderate indentation in the coastline about 6.5 miles by 0.8 mile in size. The shore for a distance of 4 miles northeastward of Cave Point is a sandy beach with a series of grass-covered dunes just back of the high-water line. From the line of dunes a large flat area extends back for several miles; in this area is a large pond which is about 0.5 mile northeastward of Cave Point. Between this pond and the hills comprising Cape Mordvinof is a large swamp. One large stream empties into the sea at the north end of the sand beach. Offshore the bottom is even and no shoals of any importance have been found. The 20-fathom curve runs from 1 to 1.5 miles off the beach. The indentation in the coastline between Cave Point and Cape Mordvinof is a fair anchorage, giving some protection from the northeast around to the south. In northerly and northwesterly weather, currents affect the heading of an anchored vessel.

The snowclad peak, Pogromni Volcano, described in Chapter 7, rising to an altitude of 6,500 feet above the sea, forms a striking background to the low, monotonous coast. Peak I, adjacent to Pogromni Volcano is, about 4,100 feet in elevation. The top of the peak is a ridge with no definite point. It is covered with snow most of the year, and usually capped by clouds. However, at times, it is clear when Pogromni Volcano is not. On the northwestern slope of the volcano is a prominent arrowhead-shaped peak about 1,300 feet high. It is very prominent on the skyline from the north and northeast but is covered by clouds a great part of the time.

Cape Mordvinof consists of a succession of points and coves at the end of a series of round-topped ridges separated by shallow valleys. The point, including **Oksenof Point,** are characterized by precipitous rocky bluffs ranging in height from 450 feet on the western side of the cape down to 100 feet on the east end. Small clear streams run through the valleys and the terrain slopes upward from the bluff-line to a group of rocky peaks approximately 2,000 feet in elevation. These peaks are snow-covered in the winter and bare in the summer. The valleys and ridges are covered with grass and tundra. Good landmarks are lacking on Cape Mordvinof; the peaks are not distinctive and usually are hidden by clouds.

Good anchorage for large vessels is not found off the cape, but shelter from southerly winds can be had in two of the coves indenting the cape for boats no larger than 65

feet in length. The water deepens rapidly and evenly off the cape, and the 20-fathom curve is from 1 to 2 miles off the shoreline. No shoal of importance is known off the cape, and no danger to navigation has been found at distances greater than 1 mile offshore.

By making good a course of **036°** from about 3 miles due west of Cape Sarichef for 23 or 24 miles, vessels will be well outside the 20-fathom curve and the known dangers to navigation.

Eastward of Cape Mordvinof, the coast falls away slightly for 6 miles, where it turns abruptly eastward for 5 miles, and then takes a northerly direction forming **Urilia Bay.** This bay is open northward, but affords protection from all winds from southward of east or west. The approaches are clear, and the water shoals gradually to 6 fathoms, black sand bottom, about 0.8 mile from shore.

From Urilia Bay to Isanotski Strait the coast trends in a northeasterly direction, is very low, and has several rocky patches extending 0.5 to 1 mile from shore, making navigation unsafe inside the 12-fathom line. Shishaldin Volcano rises 9,372 feet about midway between the above points and 7 or 8 miles inland; see Chapter 7. Isanotski Strait is available only for small vessels.

Swanson Lagoon is a shallow lagoon on the north side of Unimak Island 7 miles westward from **Chunak Point.** It has a narrow entrance and during some years light-draft launches can enter, but at other times only pulling boats can. Inside it is, for the most part, a mud flat at low water with crooked channels 1 to 3 feet deep flowing between tidal flats. The lakes draining into the lagoon are spawning places for salmon, and the lagoon is important only as a fishery. About 0.8 mile eastward of the entrance is a cone-shaped hill 85 feet high.

Isanotski Strait (False Pass) is described in Chapter 6. The strait is shown on Chart 8701.

From Isanotski Strait to Cape Glazenap, about 19 miles, the coast retains the same general direction. It is low with grassy bluffs in places, 50 to 100 feet high.

Cape Glazenap, at the southwest side of the entrance to Izembek Bay, is prominent in that it is higher—about 100 feet—than any part of the coast in this general locality. The northeast end of the cape, for about 0.8 mile in approximately a north and south direction, consists of a flat-topped grass-covered sandy head of the aforementioned height. This high land marks the entrance to Izembek Bay. The balance of the cape, trending to the southwest, consists of low, grass-covered sand.

Izembek Bay covers a large area bordered mostly by low marshes and lagoons. It appears to be crossed in many directions by sloughs, which undoubtedly are changeable in depth. The bay is unsurveyed except the approaches and the entering channel, on the northeast side of Cape Glazenap, and a small area inside the entrance. The bottom is sandy.

About 15 feet at low water can be carried into the bay by passing midway between the point at Cape Glazenap and the southwest end of **Operl (Glen) Island,** which is low and grass-covered. Breakers make out for about 1 mile north of the northwest end of Cape Glazenap and about 1 mile northwest of the south end of Operl Island. The entering channel is between these breakers on about a **140°** course. The werck of an old schooner is a conspicuous landmark.

Depths and location of breakers are subject to change, and local knowledge should

be obtained. Mud beaches inside the bay are numerous, and the channels that exist are difficult to follow, partly because of muddy water.

To enter Izembek Bay, steer approximately southeast with the west tangent of Amak Island astern, to pass mid-channel between Cape Glazenap and the southwest end of Glen Island. Keep about 200 yards northeastward of the line of breakers extending well off Cape Glazenap in a northwest direction. When abeam of the near point of Cape Glazenap, turn sharply eastward until about 250 yards from the Operl Island shore. Follow the trend of the low-water shoreline at about this distance off. An extensive shoal area is south of the point 1 mile east of the entrance.

The channel from Cape Glazenap to **Grant Point** is narrow and crooked, with few landmarks as a guide. It is therefore recommended that the channel be temporarily buoyed from a small boat at low water, when the low-water banks of Operl Island can be seen, before attempting to navigate it with a boat of 6-foot draft.

Chart 8802.—Amak Island is of volcanic origin, about 2.5 miles in length, 1.5 miles in width, and 1,682 feet in height. It is 12 miles northwest from Cape Glazenap. The beaches are mostly huge boulders and bluffs 30 to 150 feet high. The central peak is a dark-brown rock, bare, rugged, and precipitous. There is foul ground off the northwest end of the island, several rocks awash or under water, and **Sealion Rock** between 2 and 3 miles distant. The latter is several hundred yards in extent and about 150 feet high, its slopes being occupied by an extensive rookery of sea lions.

Sealion Rock Light (lat. 55°28′.5 N., long. 163°11′.0 W.), 170 feet above the water and visible 8 miles, is shown from a small white house on top of the rock. In 1953 it was reported that a depth of 3½ fathoms was about 18 miles north of the light.

A reef about 0.3 mile long lies off the southeast end of Amak Island; about 250 yards of this reef bares. A reef which breaks in a moderate swell has been reported 3 miles about 063° from the summit of the island. An 8-fathom sounding was obtained in 1943, 1 mile south of the south end of Amak Island. There may be shoaler depths.

It is reported that a fair lee and anchorage with hard bottom can be found on the southeast side of Amak Island, and one not so good on the southwest side, but the foul south point of the island must be given a wide berth.

The **Kudiakof Islands** extend about 19 miles between Cape Glazenap and **Moffet Point.** They are but little above high water, and some of them are connected by narrow spits at low water.

From Moffet Point the low coast extends 15 miles to **Gerstle Bay,** then northward and eastward about 60 miles to Wolf Point, on the western side of the entrance to Port Moller.

Black Hill, 1,500 feet high, is about 24 miles northeastward of Moffet Point and 3 miles back of the shoreline.

Chart 8833.—The **Kudobin Islands** lie along the coast westward of Port Moller. They are very low, and it is difficult to distinguish them from the mainland, the only distinctive feature being a knob about 20 feet high on the east end of Walrus Island.

Chart 8802.—**Nelson Lagoon** lies back of **Lagoon Point** and the Kudobin Islands. The land between Herendeen Bay and Nelson Lagoon is very low. The cannery

in Nelson Lagoon has not been in operation for several years. Fish caught in the lagoon are taken to the cannery at Port Moller.

Chart 8833.—The survey of **Port Moller** is incomplete. A party of the Coast and Geodetic Survey made a partial examination in 1910, the work being confined to the vicinity of Entrance Point. The following information is from the report and examination by that party supplemented by later information furnished by the Pacific American Fisheries, which company operates a cannery in the port.

Port Moller (*pop. 33 in 1950; P. O.*) is surrounded by high mountains, and there is a high ridge across its head. The shore is steep and rocky except at the spits. Kudobin Islands are low and afford no definite features on which a bearing can be taken.

Walrus Island, the most easterly of the Kudobin Islands, lies on the west side of the entrance. **Wolf Point** is the eastern extremity of this island.

Doe Point and Point Divide are bluffs and can be seen from some distance outside of Entrance Point. **Harbor Point** is a low, narrow, grassy, sand and shingle spit, which cannot be made out distinctly until nearly up with Entrance Point.

Port Moller and Herendeen Bay are indicated from seaward by a valley receding into the mountains. The land at the entrance is low and the chart indicates extensive shoals in the approach, so that access would be somewhat difficult in bad weather even if the charts were based on an accurate survey. The only channel of which we have any knowledge is on the eastern side of the entrance; **Entrance Point,** a low grassy spit, is the leading mark for entering. It is marked near the end by sand knolls, some noticeably eroded on the offshore side. A least depth of 8 feet at low water is reported in this channel, but local knowledge is required for its use, as the ice changes the channel each year.

Anchorage is available off Port Moller in depths of 9 fathoms 5.5 miles 302° from Entrance Point. This anchorage can be easily reached during fog by use of radar, since Walrus Island and Entrance Point are readily identified on the scope.

A 2-fathom shoal of small extent has been reported 0.5 mile 311° from Entrance Point.

The cannery buildings and wharf of the Pacific American Fisheries are located just inside Entrance Point. The cannery wharf is 245 feet long with a face of 145 feet. In 1941, the controlling depth was 15 feet along the face. Fresh water is available and the dock has a 2-ton crane. Gasoline, fuel oil, and diesel oil are stored for cannery use. Mooring buoys are maintained by the cannery in season to help vessels haul away from the wharf during strong onshore winds. The marine railway at the cannery can handle small boats.

Northwestward from Entrance Point is a large shoal with depths of 9 feet and less over it. A channel suitable for fishing boats is between this shoal and the shore.

A shoal with little water over it and on which the sea generally breaks at low water lies about 0.7 mile westward from the end of Harbor Point and extends in a northerly direction for a distance of about 4 miles where it forms the southeastern side of the channel which leads to Entrance Point. The Pacific American Fisheries report that there has been considerable change in the flats off Port Moller during the past few years, but that the entering channel has remained about the same.

The cannery company maintains a radio station (call letters KJW) during the canning season, from April to August of each year. There is a store from which a limited

amount of provisions may be obtained. During the salmon season a company steamer from Bellingham, Washington, makes regular calls at Port Moller. A trail leads overland from Port Moller to Balboa Bay on the Pacific side of the peninsula.

Directions.—A stranger approaching Port Moller should notify the cannery by radio and a pilot will be sent out. Buoys are maintained by the cannery during the fishing season, but they should not be depended upon.

Tides.—High and low water at Port Moller occur about 5 hours earlier than at Nushagak Bay. The diurnal range of tide is about 10½ feet.

Herendeen Bay is westward of Port Moller. There is no information regarding this region other than that which may be taken from Chart 8833. In using the chart it should be borne in mind that, except for the area already described, the surveys upon which it is based were made in 1890, and that all information available points to extensive changes since that time, particularly in those areas exposed to the action of the sea.

Mine Harbor is small but free from dangers, except **Midway Reef,** between **Low Point** and **Gull Island,** which extends 0.4 mile from the eastern shore of the harbor and shows at half tide. Anchor northwestward of Midway Reef in 12 to 15 fathoms, and if intending to remain any time it is advisable to moor. A reef extends 600 yards westward from **Crow Point,** the south point of Mine Harbor. **Crow Reef,** bare at low water, is 0.9 mile westward of Crow Point and 0.5 mile southward of **Bluff Point.**

Hague Channel is 1 mile wide at its northern entrance, and is contracted to less than 0.5 mile between Point Divide and Doe Point. The tidal currents are very strong, and near high water they sweep across the narrow channel and over the flats, making it impossible to steer a compass course. The currents are more regular near low tide, which is the best time to make the passage, as the channel is indicated by the flats showing above water on either hand.

Johnston Channel, Herendeen Bay, has 7 to 15 fathoms, but is very narrow with steep sides. It is difficult to find, but once in, the navigation is comparatively simple, as the tidal currents follow the general direction of deep water. The width of the channel at the northern entrance, 0.9 mile south of Point Divide, is 0.2 mile, with little variation until near the southern extremity, where it contracts to 250 yards. A rock with 11 feet of water over it has been reported on the eastern side of Johnston Channel, abreast **Eagle Rock.** Having passed through the channel, Crow Reef off the south point of Mine Harbor is the only outlying danger known.

Anchorages may be found anywhere between Walrus Island and Entrance Point in case of fog, and a vessel may anchor in Hague Channel, but the tidal currents are strong. There are fairly good anchorages under the north side of Point Divide and Doe Point, where near the bank, a vessel will be out of the strength of the current. The *Albatross* anchored in mid-channel, 1 mile inside of the above points, at the time of spring tides, and the flood came in with a bore between 2 and 3 feet in height, the patent log registering a 9-knot current for some time, with a swell which occasionally splashed into the scuppers. There is a fair anchorage off the northern entrance to Johnston Channel, and an excellent one at its southern extremity off **Marble Point,** just north of **Shingle Point,** or in fact, almost anywhere in the upper bay. The last quarter of the rising tide is the best time to pass through this channel.

Point Divide, on the mainland opposite Deer Island, is 50 feet in height, and moun-

tain ranges rise a few miles back. The coal measures are found between Mine Harbor and the head of Port Moller. **Doe Point** is 40 feet high, the bluff midway between Doe Point and **Fawn Point** is 150 feet high, while the rest of **Deer Island** and the mainland south and west of it are generally lower. The southern shores of Herendeen Bay are mountainous, with intervening valleys. The whole face of the country is covered with rank grass and wild flowers during the summer months, but there is no timber except occasional small poplars, alder bushes, and willows. Fresh winds, with fog and mist, blow across the low divides from the Pacific, obscuring the sun and greatly increasing the rainfall in Port Moller and vicinity.

No large fresh-water streams enter the bay.

At one time coal was mined in the Herendeen Bay area, but the mines have long since been abandoned. A portage from the head of Herendeen Bay to Balboa Bay, on the south side of the Alaska Peninsula is used frequently.

Chart 8802.—Directions, Cape Sarichef to Port Moller.—From a position 3.5 miles west from Cape Sarichef Light, steer **040°** for 29.5 miles to a point with Cape Mordvinof abeam, distant 3 miles. Then steer **051°** for 53 miles to a point with Amak Island on the starboard beam, distant 7.5 miles. From this point steer **060°** to a position 9 miles offshore, with Black Hill, near **Cape Lieskof,** abeam. Then steer **076°** for about 35 miles until the cannery buildings at Nelson Lagoon are abeam.

About 16 miles to the eastward of Black Hill and 2 miles inshore is a low prominent sandhill known locally as **Last Knoll,** as it is the last knoll on the coast to a vessel bound eastward. Local vessels use this hill extensively in checking their distance en route to Port Moller.

With the cannery buildings at Nelson Lagoon abeam, continue on the same course to a position off Walrus Island.

On the courses east from Amak Island a strong inshore set is frequently noted and should be guarded against.

Directions, Cape Mordvinof to Kvichak Bay.—The route followed by commercial ships is as follows: From latitude 55°00′ N., longitude 164°36′ W., off Cape Mordvinof steer **053°** to Cape Greig Light abeam, distant 6.5 miles. Steer **000°** for a distance of 31 miles. Steer **028°** to Middle Bluff Light abeam, distant 6.5 miles. Steer **045°** to Naknek Anchorage.

From Nushagak Bay to Cape Mordvinof the following route is used by commercial ships: From a position 0.3 mile westward of Nushagak Bay Entrance lighted bell buoy 2, steer **180°** a distance of 23.3 miles. Steer **227°** to latitude 55°00′ N., longitude 164°36′ W., off Cape Mordvinof.

The coast is low between Port Moller and **Cape Kutuzof,** 20 miles to the northnortheastward. The cape rises in a rounded bluff to an elevation of 150 feet.

Cape Seniavin, 8 miles northeastward of Cape Kutuzof, is a rocky point 175 feet high. **Cape Seniavin Light (lat. 56°23′.0 N., long. 160°08′.0 W.),** 175 feet above the water and visible 8 miles, is shown from a small white house. Except for a cluster of small hillocks about 12 miles from the cape, low beach extends from Cape Seniavin to the Seal Islands.

The Seal Islands, 30 miles northeastward of Cape Seniavin, are several barrier islets, barely above high water, strung along the coast for about 10 miles. It is reported

that small boats can find protection behind the islands. The coast continues low from the Seal Islands to Port Heiden.

Port Heiden, about 50 miles northeastward of Cape Seniavin, is 9 miles in greatest width and extends inland about the same distance. The seaward side of the bay is formed by barrier sand bars 5 to 10 feet above high water. **Strogonof Point** is the northeast end of the barrier beach that extends from the southwest. Farther to the northeastward is crescent-shaped **Chistiakof Island,** which extends nearly to the mainland on the northeast side of the bay.

The approach to Port Heiden should be recognized by the high, bold headlands and the airfield installations on the northern side, but the bight back of Seal Islands, 20 miles to the southwest, has been mistaken for the bay. **Aniakchak Crater** is about 15 miles eastward of Port Heiden, and **Black Peak** is about the same distance to the southward.

On the mainland back of Chistiakof Island is the village of **Meshik.** The commercial airfield north of the village has numerous radio towers and silver-roofed buildings which are easily identified from southwest to west, but cannot be seen at all from northwest to north.

In 1953, a 10,000-ton vessel anchored 3 miles northwest of Strogonof Point in depths of 13 fathoms; the bottom was reported to be very fine black volcanic sand and excellent holding ground. The vessel recommended that the coast be approached well to the southwest, then paralleled in a northeasterly direction at a distance of about 5 miles until identification is certain of the buildings at Meshik.

The passages into Port Heiden between Strogonof Point and Chistiakof Island are narrow and nearly dry at low water. Drafts of about 4 feet have been taken at all stages of tide through the passage between the northeast end of Chistiakof Island and a reef, 2 miles to the northward, that extends 3 miles westward from the mainland. Another reef is reported to extend 1.5 miles off the northwest side of the island.

The bottom in Port Heiden is sand and mud, and the holding properties are considered poor. The landing area off the cannery at Meshik is long and sloping, and heavy loading should be done in the latter stages of a rising tide because of the flats that uncover at low water.

The diurnal range of **tide** in Port Heiden is said to be about 15 feet. The ebb **current** has a velocity of about 3 knots and seems to be increased by a southeast wind. Sea **ice** conditions are variable, with navigation seldom entirely suspended; drift ice usually restricts navigation to full-powered vessels from January through April.

Caution.—Until a proper survey of the Bristol Bay region has been made it must be regarded by mariners as a dangerous locality to navigate; it is only by the greatest vigilance and constant sounding that disaster can be avoided upon approaching the land. This is particularly true of the northeast arms and approaches which receive the waters of the great salmon streams on which all the Bering Sea canneries are located.

These rivers are the Igushik, Wood, and Nushagak, emptying into Nushagak Bay; the Kvichak, Alagnak, Naknek, and Egegik, which empty into Kvichak Bay; and the Ugashik, next southward of the Egegik. These large rivers discharge a great quantity of water into wide indentations which open on the arms of the great bay. The banks of the rivers are frequently marshy and generally muddy. The discolored

water of the rivers is charged with a large amount of sediment, which, when deposited forms shoal areas.

On account of the funnel-shaped configuration of the bays and river entrances, the tidal currents run with great force, having a velocity at times of at least 6 knots. The tides have a rise and fall of 15 to 24 feet; vast areas of shoals are uncovered at low water, leaving only pools and shallows, and generally narrow channels between.

From Port Heiden the same low coast extends in nearly a direct line to **Cape Menshikof,** where the high land of Port Heiden gradually recedes from the coast. Cape Menshikof is a high bluff, extending some distance along shore, with hilly country back of it.

False Ugashik (Cinder River) is about 20 miles below Ugashik River, and because of the similarity of the shoreline of the two, False Ugashik has often been mistaken for the Ugashik.

Ugashik River empties into the wide indentation between Capes Menshikof and Greig, a distance of about 15 miles. The capes can be approached from westward to within about 2 miles. The coast between the capes, including the river valley, appears low. **Smoky Point,** marked by a light, is a bluff on the north side at the entrance, about 7 miles southward of Cape Greig. Here the river is about 4 miles wide at high water. The indentations between the capes, including the mouth of the river, are filled with shoals. A channel with about 10 feet at low water is buoyed during the season for the use of the cannery vessels, but a stranger could not follow it with safety. Only launches can approach the cannery at low water because of boulders in the channel. Fresh water may be obtained at the canneries. The river is fresh, at low water, about 5 miles above Ugashik.

A lighted bell buoy is maintained off the entrance from May 1 to September 30. Each year the cannery company anchors two floats on the north side of the channel at the entrance.

The Alaska Packers Association cannery is near the entrance at **Pilot Point.** The wharf is 144 feet long but dries at low water. Fresh water is available on the wharf. Gasoline, fuel, and diesel oils are stored for cannery use.

The settlement is named **Pilot Point** (*pop. 67 in 1950; P. O.*). A radio station, machine shop, and scowway are maintained by the cannery. A 4-ton crane is on the wharf.

The Red Salmon Canning Co. at the village of **Ugashik** (*pop. 48 in 1950; P. O.*), 13 miles from the entrance, has a wharf 200 feet in length with a depth of 14 feet at high water but is reported dry at half tide. Fresh water is available on the wharf and by barge at the anchorage. Gasoline and diesel oil are stored for cannery use and there is a 2-ton crane on the wharf. The cannery has a radio station, a machine shop and a scowway. Small tenders are beached for light hull repairs.

Cape Greig is a prominent brownish bluff, with a few yellow vertical stripes extending several miles along shore. It appears to be the seaward end of a low ridge with low land on each side. This and a peculiar notched mountain some distance inland are good marks. **Cape Greig Light (lat. 57°44′.0 N., long. 157°42′.2 W.),** 350 feet above the water and visible 12 miles, is shown from a white house; the light is maintained from May 1 to Nov. 1.

Cape Greig is probably the best landfall for the approach to Kvichak and Nushagak Bays from southwestward. North of Cape Greig, the coast is low and has no

distinguishing features, and even radar is not of much assistance until abeam of Egegik Bay. Particular care should be taken to clear the shoals off the entrance to this bay. After passing the bay, Middle Bluff can usually be identified, although the lights on this bluff and on Red Bluff are small structures not easily seen from offshore. **Johnston Hill,** 350 feet high, is not readily identified by a stranger approaching from the southwest, but abeam of the hill and thence to the northeastward a sharp tip on the northern side is very prominent.

Chart 9051.—Kvichak Bay, the large arm at the head of Bristol Bay, extends northeastward from a line between the south entrance point of Egegik River and Etolin Point. The bay is an important fishing area for red salmon and there are several canneries in its northern part. Kvichak Bay is navigable for deep-draft vessels as far as the anchorage about due west of the entrance to the Naknek River. The approach from the southwest is restricted to a channel about 3 miles wide by extensive tide flats extending off the east shore and by **Dead Man Sands,** the large shoal in the middle of the bay northwest of Johnston Hill. This shoal bares about 8 feet at low water and the area north of it is very foul. Fishing boats and collecting barges use the area at half tide or higher. Caution is necessary as a number of fishermen have been lost when trapped by the tides.

About midway between Middle Bluff Light and Johnston Hill are two low spits which, while not discernible visually from a vessel in mid-channel, are quite prominent on a radarscope and hence are valuable landmarks during periods of low visibility.

North of the Naknek River are numerous shoals and uncovered banks. The best water is on the east side of the bay between Naknek River and Koggiung, but local knowledge is needed to avoid the shoals. The land is low and flat but the tanks and buildings of the canneries and the lights, which are maintained during the canning season, are good landmarks.

Kvichak River, which empties into the head of Kvichak Bay, is the outlet for Lakes Iliamna and Clark, on the western side of the mountain system that borders Cook Inlet. At maximum ebb, the confluence of discharges from the Naknek and Kvichak Rivers is apt to cause overfalls which are dangerous to small boats. Winds in excess of 20 knots, opposed to currents, make the bay quite rough for vessels of light draft.

Good holding ground is available anyplace in Kvichak Bay where depths are suitable for anchorage. The bottom appears to consist of a layer of coarse gravel, sand, and stones, with mud beneath. The shoal depths permit a generous scope of cable which is necessary because of the strong currents and frequent blows. Only one anchor is recommended because of the tendency of a vessel to swing to the direction of the current, despite wind direction, with consequent fouling of cables if moored with two anchors. Experience has shown that a scope of 8 or 10 to 1 will withstand the effects of a 60-knot wind and a 3½-knot current. With a strong wind opposed to current, a vessel will usually lie broadside to both, and while such a condition sometimes causes an anchor to walk, no such tendency has been experienced in this area.

Tides.—The rise and fall of tide at the Naknek River entrance is normally about 24 feet. Daily tide predictions for Nushagak Bay are given in the *Tide Tables*. Tidal differences and constants for a number of stations in the Kvichak Bay area are listed in the *Tide Tables*.

Navigators are reminded that the great range of tide in this bay must be considered when selecting an anchorage.

Currents.—In Kvichak Bay and River the current is very strong, and consequently the channel shifts more or less each year. The average velocity at strength of flood and ebb is about 3½ knots in the lower part of the bay and about 2½ knots in the main ship anchorage off Naknek. In Naknek River at the "hole" off Morakas Point, about 4 miles above the entrance, the average velocities at strength of flood and ebb are approximately 1 and 2 knots, respectively. See the *Current Tables* for information on this area.

It is recommended that vessels anchor against the current, when it is at maximum strength, so that engines may be used to offset the sudden strain when the anchor is let go. Caution must also be exercised, on flood current, to keep the vessel from being carried beyond the anchorage area while maneuvering. Since the currents usually follow the axes of the bay channels, navigators should make ample allowance for them when proceeding between Kvichak and Nushagak Bays; otherwise they are apt to be set to the north or to the south when they are on an easterly or westerly course.

Weather and ice.—The best weather in Kvichak and Nushagak Bays appears to be from the latter part of May through July. The bays are frozen over during the winter months and the ice usually does not break up until May. Vessels approaching the bays during this time of the year, which they frequently do in preparation for the fishing season, are cautioned to do so during daylight hours because of possible ice.

Storms have a tendency to move into this area from the Aleutian Islands during August and September and, while their intensity usually is diminished, their rate of movement is decreased and at times they remain stationary while the depressions fill, thus causing extended periods of poor weather. Fog is not as prevalent in these bays as farther to the southwestward in Bristol Bay proper. Storms south of the Alaska Peninsula at times cause strong winds to draw through the valleys, such as that of the Egegik River, thus giving the effect of williwaws near the valley entrances.

Ice begins to form in November but the salmon pack usually is shipped out in August and most canneries go on a caretaker status in September, with all floating equipment hauled out on ways. Winter activities in the area consist mostly of hunting and trapping, with transportation by ski-planes and dog sleds. During the ice-free months practically all transportation is by water or air, since there are virtually no roads.

Mirages are seen frequently in the Kvichak Bay area during periods of calm, and particularly at low tide. They distort the appearance of bluffs and shorelines and make tanks and other elevated structures visible at greater distances than their altitudes warrant.

Pilots.—Practically all of the canneries in this region are equipped with radio communication, and strangers should arrange for a pilot in that manner. The captains of the local cannery tenders are all familiar with local waters, and no trouble is experienced in getting a competent pilot.

Egegik River empties into Kvichak Bay about 30 miles north of Cape Grieg, and has **Cape Chichagof** for its northern entrance point. It is a large river, 1 mile wide at the canneries, and is the outlet of **Becharof Lake.** It flows in a westerly direction for 28 miles by airline.

The lower part of the river is a wide bay. At low water a large part of its area is

bare. At the entrance, shoal water extends 6 miles offshore and should be given a wide berth by passing vessels. Entering vessels, depending upon their draft and condition of the sea, generally cross the entrance bar between half and full tide stages only. A dangerous obstruction is reported to exist about 4 miles off Cape Chichagof.

A lighted bell buoy is maintained from May 1 to September 30 in 31 feet of water 2.5 miles off the entrance bar. Moderately heavy seas will break over this bar with any stage of tide although it has 4 fathoms over it at high water. It is considered the most dangerous bar in the Bristol Bay area. Boats and men have been lost over it in very recent years.

To run a mid-channel course, enter from a position approximately 0.5 mile north of the buoy and hold just north of the median line between **Coffee Point** and **Red Bluff Light.** The former is the tangent on the north side of the bay. The latter, atop the most prominent bluff, is maintained from May to October. The light is on a very small white house which is often difficult to pick up from seaward in the daytime.

Follow the mid-channel course until the light bears north, distant approximately 0.5 mile. The channel then bears southeasterly and gradually nears the beach. Mud and sand shoals with only 2 fathoms of water over them at high water extend off Coffee Point to completely across the channel. Inside Coffee Point a 3- to 4-fathom high water narrow channel follows the west shore of the river until the Alaska Packers' buildings bear approximately east-northeast. From there a straight course for this cannery's dock provides 2½ fathoms depth at high water.

The area has two partially protected anchorages, with limited swinging room, that are used by power scows and large tugs. The principal one is the channel inside Coffee Point, with depths up to 5 fathoms. A smaller anchorage lies just east of the Alaska Packers' dock, with 4 fathoms of water at high water. Ebb current at the smaller anchorage is very strong.

The river is navigable to small boats for its entire length into and across Becharof Lake. Although tidal to the foot of the rapids, mean range in its lagoons is only 1 foot; 5- to 6-foot drafts can be carried though the river, but the small lagoon reduces this to 3 or 4 feet, depending upon water stage. The controlling depth of the ¼-mile rapids of the Lake outlet is 4 feet at low water stage. Although its mid-channel current averages 5 knots, slow-speed powerboats run it frequently with and without handline aid from the shore. The river is open from May to October.

Freight from oceangoing vessels is generally lightered into Egegik from the ship anchorage off Naknek. **Egegik** (*pop. 119 in 1950; P. O.*) has but very limited facilities. The Alaska Packers Association cannery wharf is 80 feet long and dries at low water. Fresh water and a 5-ton crane are available. Boat gasoline and diesel fuel are available for local use only. Across the river the Libby, McNeill and Libby cannery wharf is 150 feet long and has less water at its face. This cannery is now inoperative, but its marine railway is active and hauls out Libby barges, drivers, and tugs for the winter layup. Two stores remain open for the year in Egegik. Their supplies are principally food staples and clothing. Since no refrigeration is available, no meat is to be had locally.

Ice.—Weather Bureau records for Egegik River at Egegik show an average ice breakup about the middle of April and an average freezeup about the second week in December. See *Appendix* for tabular detail.

During the cannery season, from May to August, the Alaska Packers maintain radio station KUD, also radiophone communication with Naknek. The latter com-

munication is still available through the winter via the Indian Affairs radiophone at the schoolhouse.

Mail delivery and pickup is very uncertain. One month often elapses between mailplane stops. Transportation is available by itinerant floatplane from May to October, and is usually obtained from Naknek village or Naknek airfield.

Middle Bluff Light (lat. 58°24′.4 N., 157°31′.5 W.), 165 feet above the water and visible 12 miles, is shown from a small wooden house on the top of the bluff, between May 1 and September 25. It is difficult to distinguish in the daytime unless close-to.

Naknek River enters Kvichak Bay on the eastern side, about 15 miles southward of Koggiung. **Cape Suworof** is the point on the north side of the entrance. The river has its source in **Lake Naknek,** on which two villages are located. The river is large and about 60 miles in length.

Anchorage can be had off Naknek River in latitude 58°42′ N., longitude 157°15′ W., which is the head of navigation for deep-draft vessels. The approach channel to this anchorage has depths of 37 to 60 feet, and there are depths of 38 to 40 feet in the anchorage area.

The extreme range of **tide** at the river mouth is more than 25 feet. Tidal data for the river is given in the *Tide Tables*.

Shoals and banks, many of which uncover at low water, fill the lower course of the river and extend 3 or 4 miles off the mouth, then trend around northward and join the body of the banks that fill the upper end of Kvichak Bay. With local knowledge, boats of 4-foot draft can enter the river at low water and proceed as far as the Alaska Packers Association Diamond NN Cannery.

Two lights are at the entrance; the northerly one, **Naknek Entrance Light (lat. 58°43′.4 N., long. 157°02′.8 W.)**, 104 feet above the water and visible 8 miles, is shown from a small white house. The light is maintained from May 1 to September 25. The light on the southerly point is 70 feet high, shown from a water tank.

Ice.—Weather Bureau records for Naknek River at Naknek show an average ice breakup in early April and an average freeze-up in mid-November. See *Appendix* for tabular detail.

There are several large salmon canneries along Naknek River, and all have wharves that bare alongside at low water. Some of the canneries have not operated for years. Deep-draft vessels anchor about 6 miles off the entrance to the river and lighter their freight ashore in barges which are available at Naknek; the approaches to the anchorages vary little from year to year. Vessels drawing up to 10 feet can go alongside the cannery wharves at half tide but can remain afloat at low water only by shifting to what is called the "**hole**," just eastward of **Morakas Point,** which is 4 miles above the river mouth. The "hole" has depths of 9 to 17 feet at low water over a narrow crooked area 200 to 300 feet wide and about 0.5 mile long. Mooring buoys are maintained in this "hole" by the canneries from about May 15 to October 1 for use of power scows, tugs and barges. Craft of these types, drawing up to about 12 feet, can proceed up the river, with local knowedge, as far as the Naknek airfield, some 12 miles from the mouth. In order to do this, the vessel leaves Naknek village 1 hour before high water. Beyond the airfield, small boats of 3-foot draft can proceed as far as the rapids, a distance of about 7.5 miles.

All active canneries operate radio stations during the fishing season and some stand watch at certain hours during the off season. The call letters of the Alaska Packers

Association Diamond NN Cannery at South Naknek are KOZ, operating on 2430 kc. This station stands 24-hour watch during the fishing season and listens at 0800 and 1545 during the remainder of the year. The Pacific Northern Airlines maintains a radio station at Naknek, with call letters KAYU, operating on 5652 kc. for calling and 5622 kc. for conversation. During the summer months, this station stands watch from 0800 to 2400, and in the winter months from 1000 to 1700.

The only marine railways in the Naknek River are those which each cannery maintains. These have a capacity up to 70 tons, draft of 10 feet, and approximate length of 120 feet. Limited repair facilities, including machine work, are available at the canneries, as well as fresh water in any quantity. During the fishing season, fresh water is available at the main ship anchorage by water barge.

Naknek (Pawik) (*pop. 174 in 1950; P. O.*) is a village on the north bank of the Naknek River about 1.5 miles from the mouth. The village has a United States deputy marshal, a United States commissioner, and a Government school. A Government nurse is on duty during the winter, and, during the cannery season, each cannery employs a doctor whose services are available to the public for a fee. Weekly mail service is by plane throughout the year. In the summer, mail comes by regular scheduled steamers also. Land transportation in this area is entirely by plane, since there are no roads except in the village and one leading to a lake about 0.8 mile inland which is used as a landing for floatplanes. Several floatplanes are available for hire or charter. The Pacific Northern Airlines operates regularly on Mondays and Fridays to the Naknek airfield, a distance of about 12 miles, from which passenger and freight planes fly regular schedules to the town of Anchorage. Naknek and the airfield are connected by telephone. Diesel oil, gasoline, and lubricating oil are available in quantities sufficient for normal demands, and limited amounts of coal and stove oil also are available. Delivery can be made alongside the fuel dock for vessels drawing up to 10 feet at better than half tide or by drums to ships at anchorage. There is no fuel oil. Provisions in limited quantities are available.

South Naknek (*P. O.*) is a village on the south bank of the Naknek River, directly across from Naknek. The village has a Government school and a cannery that operates a general merchandise store.

Libbyville, on the east side of Kvichak Bay 3 miles north of the Naknek River entrance, is the site of a Libby, McNeill and Libby Co. cannery. The wharf at Libbyville is 100 feet in length.

A channel used by tugs and barges leads from the general anchorage area south of Naknek River in a northeasterly direction to the cannery of the Bristol Bay Packing Co. which maintains a range for this channel. The rear target is a white diamond-shaped daymark; the front target is the cannery tank. The range must be held slightly open to the northward to effect a mid-channel course.

From a point 0.4 mile off the Bristol Bay Packing Co. wharf (bare at low water) the channel veers to the northward and passes about 0.3 mile off the wharf at Libbyville, thence it cuts through the reef at a depth of about 4 feet and enters the main north-south channel from the Kvichak River.

Common practice in this area is to avoid all movement of vessels north of Naknek River at the lower stages of the tide or on a falling tide. At or near high water it is safe to navigate almost any part of the area with vessels drawing up to 7 or 8 feet; vessels

going aground on a rising tide are floated in a very short time and may proceed. No rocks exist on the shoals, and temporary groundings do not often damage vessels.

Most of the area between Naknek and Kvichak Rivers bares at some stage of the tide.

Vessels of shallow draft and barges use the eastern channel from Libbyville to Koggiung where depths vary from 4 to 20 feet at low water. Local knowledge is necessary to avoid grounding on a falling tide.

Koggiung is a village on the east bank of Kvichak River. Several canneries are in the vicinity. All of the wharves are dry at low water and have mud bottom alongside. All have freshwater connections. Fuel oil, diesel oil, and gasoline are stored for cannery use.

The Libby, McNeill, and Libby wharf at Koggiung is 450 feet long. The marine railway is capable of hauling vessels of 60 tons at high water, draft 7 feet forward, 10 feet aft.

Kvichak River, from Koggiung to Iliamna Lake, is 50 miles long. In the upper half of its course it is much broken by islands and bars into narrow, shallow channels. The lower half is tidal.

Occasionally vessels drawing 14 feet have ascended the river as far as the mouth of Alagnak River, but anchorage is difficult to find. Kvichak River is navigable for cannery tenders of 10-foot draft to **Alagnak River,** 22 miles above the mouth of Kvichak River. Launches of 3- to 4-foot draft can go on up into Iliamna Lake.

On Kvichak River are four recommended anchorages. During fishing season mooring buoys are established at these anchorages. Fresh water is available at the canneries near the anchorage. The first anchorage is at **Graveyard Point** near the mouth where fair protection is available in depths of 10 to 12 feet in all weather except strong southeasterly storms. The bottom is fine gray sand and good holding ground.

The second anchorage is off **Nakeen** and the mouth of **Squaw Creek.** Good protection in all weather is afforded in depths of 15 to 17 feet. The bottom is fine gray sand and the holding ground is good.

At **Kvichak** good protection is afforded in depths of 8 to 10 feet in all weather excepth a strong northerly storm. The bottom is gray sand and the holding ground is good.

At **Levelock** good protection is afforded in all weather. Depths range from 8 to 10 feet, bottom fine gray sand, and holding ground good. Common practice on the Kvichak River is to restrict navigation to the direction of the current and to a stage above half tide, if possible. Vessels grounding on a rising tide are floated in a short time and temporary groundings cause no damage since there are no rocks on the shoals.

Local knowledge of the channels is necessary and anyone not thoroughly familiar with the river is strongly advised to obtain a pilot from one of the canneries.

Chart 8502.—Iliamna Lake is about 70 miles long and generally from 7 to 17 miles wide. It is about 50 feet above tidewater. Reported soundings indicate a depth at the east end of many hundred feet. The lake is usually frozen from late in December until late in May; the snow leaves the low ground in April, remaining until June in the pass between Iliamna Lake and Cook Inlet. Some snow may be expected in September, but the ground is not permanently covered at low altitudes until some months later.

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Old Iliamna is a native village 3.5 miles above the mouth of the **Iliamna River** which drains into the eastern end of Iliamna Lake. In 1952, it was reported that this village had been abandoned.

A good horse trail leads from the head of Iliamna Bay, Cook Inlet, to Old Iliamna, a distance of 10 miles, crossing a 900-foot summit 3 miles west of the bay. A part of this trail has been improved and can now be used as a wagon road. A few horses are usually available for packing and hauling jobs over the trail. Another trail leads from the western arm of Iliamna Bay to Old Iliamna, 17 miles, crossing three summits 1,700, 1,500 and 1,975 feet high, at 3.5, 5, and 13 miles from Iliamna Bay, descending to 1,400 and 600 feet between the summits. These trails can generally be used by horses from June 1 to November 1. Dogs are used during the remainder of the year.

Old Iliamna can also be reached by a portage from the head of Kamishak Bay, Cook Inlet, to the head of **Kakhonak Bay,** an arm of Iliamna Lake. The portage is said to be an easy one over a low pass, but it is not much used except by natives because of the difficulty of landing supplies on the uncharted coast of Kamishak Bay.

From Old Iliamna all parts of Iliamna Lake and Kvichak River can be reached in boats. Gasoline launches are available at the village.

Newhalen River, about 20 miles long, connects Iliamna Lake with Lake Clark. The upper 10 miles can be navigated by canoes and poling boats. Rapids and reported falls make even canoe navigation impossible for the lower 10 miles. These rapids may be avoided by a 5-mile portage.

The village of **Iliamna** (*pop. 44 in 1950*; *P. O.*) is near the mouth of Newhalen River. An airfield is adjacent to the village.

Lake Clark is about 45 miles long and from 1 to 3.5 miles wide. It is about 220 feet above tidewater, and is tributary to Iliamna Lake and Newhalen River.

Chart 9052.—Nushagak Bay and **River,** on the north side of Bristol Bay near its head, are important for the extensive salmon fishing and a number of large canneries which are operated during the summer. The bay is 15 miles wide at the entrance between Protection Point and Etolin Point. The surveys of 1948–49 show that the bars and channels in the upper bay and river have changed considerably. Local authorities state that the area between Clarks Point and Dillingham (Snag Point) is particularly subject to change on the ice run-out each spring.

Nushagak River is navigable for small vessels of 2½-foot draft to **Nunachuak** (*pop. 44 in 1950*) about 100 miles above the mouth.

Nushagak Bay and River are obstructed by extensive shoals near the shores, and by long bars, partly bare at low water, which generally extend in the direction of the channels. In the absence of aids, navigation is safe only in the daytime when the marks and distant peaks can be seen. The worst dangers in the approach are the extensive shoals southward and southeastward of Cape Constantine, the outer one being nearly out of sight of land.

Northward of Dillingham is a sparse growth of timber, which becomes heavy farther inland but to the southward are only occasional clumps of alder bushes.

The peninsula of **Cape Constantine** is low rolling tundra country, with bluffs in places. **Nichols Hills,** 125 feet high, are small sand knolls, the highest part of a ridge that follows the eastern side of the cape, and lie 5 miles northwestward of Protection Point. A daybeacon on the 125-foot knoll is a 28-foot white skeleton structure

with a large white square daymark. At the southwest end, and on the southeast side, of the cape are the entrances of two lagoons that can be entered by boats at high water when there is no surf. At low tide, water remains in the entrance and for a short distance inside the first lagoon; the second lagoon is bare.

Shoals with little water on them in places extend 6 miles southward from Cape Constantine, and the outer shoal, Ustiugof, lies 8 to 9 miles southeastward from the cape. These shoals are in the form of long ridges trending in the direction of the set of the tidal currents around the cape to and from Nushagak Bay. They are steep-to, especially on the offshore side, and soundings will not give sufficient warning to avoid them. The tidal currents northeast of Sterling Shoal, off Cape Constantine, have a velocity of about 2 knots at strength. The direction of the flood is about 060° and that of the ebb is about 235°.

Ustiugof Shoal is a narrow ridge with a least depth of 13 feet, and has a length of 15 miles in a 052° direction. Its southern end is in lat. 58°14′.5 N., long. 158°46′ W. Close to its southeast side are depths of 11 fathoms or more. From a vessel near the shoal, Cape Constantine can be seen in clear weather. The greatest care is required when southward or southeastward of the cape. The shoaler ridges are generally indicated by rips or breakers at low water, but there is generally nothing to indicate Ustiugof Shoal.

Protection Point, the eastern end of Cape Constantine, is a low marshy spit which extends 1.5 miles from the higher land. On the north side of the point 2 miles westward of its end is the entrance to a lagoon; small boats can anchor in, or close inside, the entrance, but the current is strong on the ebb. A narrow shoal awash in places at low water extends 4.2 miles southward from the point. The southern half of the shoal is about a mile from shore; between the point and the north end of the shoal is a narrow channel. A detached shoal 2 miles eastward from the point has a least depth of 15 feet.

Nichols Spit eastward of Nichols Hills forms a cove, dry at low water, that can be entered by boats at high water and affords shelter except from northerly winds.

Igushik River is a crooked winding river on the west side of the bay; vessels up to about 24-foot draft have been taken out. The channel into the river is not surveyed. The flat on the eastern side of the channel leading to the mouth of the river shows for nearly its full length at low water. The bar at the entrance of the channel has a depth of 12 to 14 feet on it, and lies about 7.5 miles southeastward of the mouth of the river and 8.8 miles northward from Protection Point.

Igushik Ridge, on the west side of Igushik River, is prominent, having a greatest elevation of about 260 feet near its northern end, where it breaks sharply to the river. The peninsula eastward of the river is low.

Snake River is used only by fishing boats. The entrance is about 10 miles north of the mouth of Igushik River. The channel leading to the mouth of Snake River has a depth of about 8 feet, and is well defined at low water by the flats, which uncover, except at the entrance.

The land on the eastern side of the bay is low rolling tundra, and the entrance point is rounding without a distinct point.

Etolin Point, the larger rounded point between Kvichak and Nushagak Bays, is flat, tundra-covered, with several shallow lakes, some of which have been used for

float plane landings. The western extremity of the point is a bluff 90 feet high. About 0.2 mile north-northwestward of its summit is a white skeleton daybeacon. About 1.7 miles east-northeastward of the daybeacon is a rounded hill, 149 feet high, which is a prominent landmark when approaching from seaward.

The 3-fathom curve lies 6.5 miles, and the 5-fathom curve 8 miles, from the shore southeastward of Etolin Point. The shoaling is gradual, and sounding is a good guide in approaching the eastern shore when just outside a line joining Etolin and Protection Points. Above this line in the eastern half of the bay there are long shoals, most of which show in places at low water.

Ekuk Bluff is 170 feet high and is prominent from Nushagak Bay. A light, 82 feet above the water, is shown from a white skeleton tower at the northwest end of the bluff; the light is maintained from May 1 to August 1. A spit extends 1.3 miles northward from the bluff. **Ekuk** is a native village on **Ekuk Spit,** at the foot of the bluff. The lagoon inside the spit is bare at low water. The Libby, McNeill, and Libby cannery wharf is 150 feet in length and has a depth alongside of 7 feet at high water. Gasoline, diesel and fuel oils are stored for cannery use and fresh water is available. A small marine railway is capable of hauling, at high tide, vessels of 60 tons having a maximum draft of 2.5 feet forward and 3 feet aft. The cannery operates a radio station during the summer months.

Clarks Point is low and has an extensive gravel beach; on the point are a large Alaska Packers Association cannery and a small village. The ridge, 169 feet high, terminates in a bluff at the shoreline 0.6 mile south of the point and is prominent from seaward. Four large water tanks near the shore end of this bluff are prominent landmarks.

Clarks Point (*pop. 128 in 1950; P. O.*) is the name of the village. The Alaska Packers Association wharf is 175 feet long and has a depth alongside of about 8 feet at high water. A temporary T-pier is extended out 90 feet from the face of the main wharf during the cannery season; the face of the T is 80 feet long and has a depth alongside of about 13 feet at high water. The main wharf has a 20-ton crane on the northeast corner and a 3-ton crane on the southwest corner. A radio station is operated by the Alaska Packers Association.

Water is piped to the wharf. A general store is operated throughout the year. Gasoline, diesel oil, and fuel oil are stored for cannery use. The marine railway can haul out, at high tide, vessels of 150 tons with maximum draft of 7 feet forward and 9½ feet aft, and a small machine shop is nearby.

Clark Slough, 1.5 miles northeastward of Clarks Point, is navigable for launches at high water for about 17 miles. The bar which must be crossed at the edge of **Combine Flats** when entering the slough bares at lower low water. The Columbia River Packers Association cannery on the northern side of the entrance to the slough was not operated in 1947–49. The wharf and marine railway at the cannery are in poor condition. Fishing craft and tenders use Clark Slough and the part of Combine Flats behind Clarks Point for storm shelter during heavy southwest weather. Mooring piles are maintained by the Alaska Packers Association on Combine Flats near Clarks Point.

From **Coffee Point** to **Snag Point,** 9 miles to the northeast, the western shore of Nushagak Bay consists mostly of bluffs. **Bradford Point,** between Coffee Point and Snag Point, is opposite **Grassy (Williams) Island,** which is grassy and awash at highest tides.

Kanakanak (*pop. 54 in 1950*), at Bradford Point, is a small settlement which includes the former sites of Dillingham and Kanakanak and is connected by road with the present site of Dillingham at Snag Point. A Government hospital and a radio station are operated at Kanakanak by the Bureau of Indian Affairs.

Dillingham (*pop. 577 in 1950; P. O.*) is the principal settlement and source of supply in Nushagak Bay. A United States deputy marshal is stationed in the village. The post office receives mail of all classes twice weekly by air when weather permits. The village has a school and churches, and hospital facilities at Kanakanak may be reached by road. Canneries are operated by Pacific American Fisheries and Bristol Bay Packing Co. (Alaska Salmon Co.). Ordinary supplies are available at several general stores. Petroleum products, except fuel oil, can be obtained from the Standard Oil Co. plant. Fuel oil for the canneries in Nushagak Bay is generally brought in by tanker early in the season and transferred to cannery barges at the anchorage off Clarks Point. Limited quantities of fuel oil can be obtained from the tanks of supply vessels handling general cargo for the bay.

Dillingham Air Service and Western Air Lines serve the village. Floatplanes are available for charter during the summer, and skiplanes are available during the period when the lakes are frozen. A few planes operate on wheels from the beaches or from the 1,700-foot runway about 0.5 mile north of the village. A commercial radio station maintains regular schedules with the Alaska Communications System. Incoming vessels may request local pilots through this station.

Vessels drawing 23 feet ascend the bay on high tide and anchor just below Snag Point. Supplies are lightered to Dillingham either by the canneries' equipment or by private equipment. The oil and cannery wharves can be approached only at high tide; vessels drawing 12 feet moored at these wharves on higher high tides in 1948.

The Pacific American Fisheries cannery at Dillingham has a wharf 178 feet long with a depth alongside of 2 feet at low water and can be used only by small tenders at high tide. Gasoline, diesel oil, and fuel oils are stored for cannery use. The cannery has a radio station. A marine railway at the cannery has a capacity of 100 tons, and vessels drawing 6 feet forward and 8 feet aft can be hauled out at high tide.

Wood River has its entrance northward of Snag Point, and has a length of about 24 miles to **Lake Aleknagik.** Its width varies from about 600 yards in its lower part to about 50 yards where it joins the lake. A depth of 3 to 3½ feet at low water can be carried 15 miles up the river and not more than 2½ feet to the lake, though at high water 4 feet can be carried this distance. The lake is about 24 miles long and is navigable for its entire length.

The Alaska Salmon Co. has a cannery on the south bank of Wood River just inside Snag Point. The mud flats in front of the cannery wharf bare at low water. Gasoline, fuel, and diesel oils are stored in small quantity for cannery use. The tenderway, only skid shoes, is capable of hauling 75 gross tons with maximum draft of 8 feet forward and 9 feet aft at high tide. The cannery operates a radio station during the canning season.

Nushagak Point, on the east side of Nushagak Bay and 7 miles northward from Clarks Point, is the outer end of a prominent 250-foot ridge, to the eastward of which is a deep valley. **Nushagak,** a small village on the point, has two unused canneries, a school, and a Russian church. There are no wharves. Vessels may approach as closely as their draft permits and use small boats or barges for reaching the shore.

Landing at low water is difficult because of the very sticky mud on the flats, but a good landing can be made on the gravel beach at high water. Nushagak has no post office, mail being received through Dillingham, and no supplies are available.

Channels.—The principal channel favors the western shore of Nushagak Bay. Good water is carried to a point about 2 miles southeast of Ekuk Bluff, where the channel crosses a narrow bar and which had a depth of 10 feet at lower low water in 1949. The crossing is facilitated by ranging the light on Ekuk Bluff with the easterly two of the three radio masts at Ekuk Cannery, northward of the light.

From Clarks Point, the channel leads along the eastern shore to within about 1 mile of Nushagak Point, then crosses over to Bradford Point on the west shore and follows the trend of that shore to Dillingham. A depth of 12 feet at lower low water will be crossed about 1.2 miles below Nushagak Point. The edges of this channel are marked by local buoyage during the cannery season.

Prominent features.—Northward of Nushagak Bay is a chain of prominent mountains, which are snow-covered in early summer but bare except in the ravines by the middle of July. In clear weather the peaks show from a long distance seaward, but much of the time they are obscured by clouds and haze. Many of the summits are shown on the chart.

Anchorages.—There is no anchorage, sheltered from all winds, in the outer part of Nushagak Bay. In southwest weather the western side of the bay should be selected, and in northeast weather the eastern side. With winds from east to south there is no shelter, and a heavy sea makes into the bay. The strong current causes a vessel at anchor to lie stern or broadside to the sea when the wind opposes the current. The bars seem to afford little protection. In northerly weather any part of the bay is sheltered. The wind does not appear to blow with force from that direction during the summer.

During the cannery season, mooring buoys are maintained for tally barges in the area south of Ekuk Bluff and east of the main channel. Good anchorage can be found in depths of 30 to 35 feet, mud bottom, and the current is not strong. These buoys are planted in a line parallel to the beach.

A good anchorage, sheltered from southwest winds, for vessels of 12 feet or less draft is 1 mile 021° from Protection Point in about 3½ fathoms. Deeper-draft vessels should anchor farther northeastward.

Above Ekuk Spit good anchorage will be found wherever the depth will permit. This part of the bay is very choppy in heavy weather, but the sea seldom, if ever, is heavy enough to endanger a vessel. The bottom is sand, but the anchor holds well if given sufficient scope, say 60 fathoms. The currents are strong, and care should be taken to avoid dragging. Vessels remaining long are anchored in line in the channel to interfere as little as possible with the nets. During the cannery season, mooring buoys are planted by the canneries in lines parallel to the channel off Ekuk Bluff and Clarks Point.

Tides.—The tides in Nushagak Bay are influenced to some extent by strong winds. The diurnal range of tide at Clarks Point is about 19½ feet. Daily tide predictions for Nushagak Bay (Clarks Point) are given in the *Tide Tables*.

Currents.—The currents in Nushagak Bay have considerable strength; velocities of about 4 knots have been observed on both the flood and the ebb. The ebb usually begins shortly before high water and continues to run after low water, roughly about

7 hours ebb and 5½ hours flood. The period of slack water is usually short. The currents generally set fair with the channels, but in navigating the bay the course is often across the current and allowance must be made for it. The velocity is influenced by freshets and continued winds, which also affect the times of slack water. A current of over 5 knots may be experienced at times. See *Current Tables* for current predictions in Nushagak Bay.

Weather.—The weather is variable, but it is considered better than farther westward. Spells of bad weather occur, and their duration increases in the late summer. Southwesterly winds sometimes predominate in the early summer and easterly winds later. Easterly winds bring thick weather and rain, and are accompanied by low or falling barometer. Southwesterly winds, if moderate, bring fair weather, but if strong bring rain. Northwesterly winds bring fine clear weather, but seldom blow steadily. In settled weather the wind may be light from any direction, accompanied by showers. After a gale there is usually no shifting of the wind or sudden breaking of the storm, but the wind decreases, and there is a gradual return to fair weather. Fog sometimes sets in from sea, but there is little fog during the summer.

Ice.—Weather Bureau records for Nushagak Bay at Dillingham show an average ice breakup in early May and an average freezeup in early November; see *Appendix* for tabular detail. The movement of the ice is variable, depending upon the direction of the wind. It is said that the arrival of cannery vessels has been as late as June 17. The ice is not solid but drifts in floes with the wind and current. Northeast winds drive the ice out of the upper bay to ground and break up on the shores and sand bars of the western side of the bay. Cannery floating equipment is hauled out upon completion of the season in mid-August and the salmon pack is taken out at that time. One winter supply vessel generally makes the last trip into the bay about the middle of September.

Repairs.—The large tides and the flats make it easy to beach a vessel of drafts up to about 18 feet. A good place is at Clarks Point. Small machine repairs can generally be done at the companies' shops.

Communication.—The Alaska Steamship Co. makes about five trips a year into the Nushagak Bay area, the earliest being about May 15 and the latest about September 15, depending upon ice conditions. Commercial air lines serving the area use small floatplanes during the summer and skiplanes during the winter. Nearly all passenger travel is by air. Dog teams are used to some extent by natives and trappers during the winter and small boats are used for local travel during the summer. Tankers and barges bring in diesel oil, gasoline, lubricating oil, and fuel oil. All canneries and their tenders are equipped with radiophones, and radio traffic can be handled through the cannery shore stations during the season. Radiophones are maintained by cannery caretakers during the winter. The commercial air services and the hospital at Dillingham also maintain radiophones, and the commercial radio station at Dillingham maintains regular schedules.

Directions, Nushagak Bay and River.—The channels and bars are probably subject to constant change, due to the action of currents, and to a smaller extent by the action of the sea. Changes of considerable extent are reported by those of long experience. A margin of safety should therefore be allowed for the soundings found by the survey.

It is also well to remember that with a very low tide the water may fall as much as 4½ feet below the plane of reference of the chart.

The navigation of the bay is not easy, and a stranger should proceed with great caution. Tide rips may be taken as good evidence of shoals. The shoals are long ridges trending in the same directions as the tidal currents, and the danger of stranding is greatly increased if a course is laid across the currents. A stranger should navigate only on a rising tide and is advised to communicate by radio with the commercial station at Dillingham, or with one of the canneries, and arrange to have a pilot sent out.

It is recommended that vessels bound to Nushagak make Cape Greig, which is high and easily recognized and marked by a light, then shape the course for the entrance, favoring the Etolin Point side in preference to the Cape Constantine side. The currents that may be experienced when crossing from Cape Greig are not known, but there may be considerable set. Great care should therefore be exercised in approaching the entrance. The land at the entrance when first seen in approaching is indefinite, and presents no feature that can be readily identified.

The following suggestions have been made by a shipmaster who was on a regular run to Nushagak with a vessel of about 7 knots' speed:

"From Amak Island steer to pass about 10 miles off Port Heiden, as there are some large houses there which are easily seen over Chistiakof Island. A good departure can be taken from here in daylight, as the shore along the coast has no other landmarks to be taken as a guide. From Port Heiden run up along the coast until Cape Greig is abeam, distant about 10 miles, then haul up for Nushagak Bay, course 343°; if the current is ebbing allow about ¾ point to the right, and the same to the left if the current is flooding. This course should lead to Nushagak Bay entrance buoy."

The main channel favors the eastern side of the bay. The lighted bell buoy at the entrance and the light on Ekuk Bluff are maintained during the season of navigation. When entering the bay, leave the entrance buoy close to starboard and place the vessel on a line between the buoy and the light on Ekuk Bluff. The bluff, which drops away abruptly to westward and rises gradually to eastward, is readily identified for distant use as a front range. A good rear range is the notch between two mountains to the northward and one-third the distance up the western slope. Carry this range, favoring the eastward side, until within 5 miles of the bar. By this time the light structure on Ekuk Bluff can be readily identified but should not be confused with the white church cupola close to eastward.

A definite rear range, consisting of two closely adjacent radio towers, is now available. A third radio tower is westward of the other two, and a white flagpole is eastward and in front of the church. Ordinarily, the church and flagpole are seen before the light structure or radio towers become visible. Hold the range of the light structure and radio towers (344°–164°) open, with the vessel to eastward until within 2 miles of the bar, thus avoiding the 15-foot shoal 3.8 miles 164½° from the light; then cross over, placing the vessel to westward of the range until it is opened to about one-third the distance between the pair of radio towers and the single tower to westward. This will insure passsing over the bar in a depth of 17 feet and between two 9-foot shoals about 0.25 mile south-southeast of the bar.

As the bar is approached on the range, three cuts in the bank off the starboard side appear. When the easternmost is about ¾ point forward of the beam, the ship is on the bar. When the middle cut is abeam, leave the range and steer a course following

the general trend of the shore. Give a wide berth to the spit off Ekuk cannery before heading for Nushagak Point on a 027° course.

NOTE.—On the flood, just inside the bar, cross a distinct rip and keep it about 150 feet off the port side. The waters of the upper bay and river carry heavy sediment, and the only indications of shoals usually are swirls or rips. On the ebb the waters of the upper bay are practically fresh but they become brackish on the flood.

From Clarks Point to the upper canneries, numerous mud and sand bars are exposed at low water in the central and western parts of the river. Shoal water in the middle of the river is extensive and restricts crossing during low water; nearly all navigation of this section is done on a rising or high tide. Navigation of this area should not be attempted by large vessels except on a rising tide and then only with local knowledge or with a local pilot. Local authorities state that the area is subject to change on the ice runoff each spring.

Present traffic follows the eastern shore above Clarks Point, keeping about 1 mile off. The channel follows close along the edge of the eastern mud flats and is marked by local buoyage during the summer. The western line of this buoyage marks the east edge of the channel and the other two or three lines mark set-net sites. The channel is 0.8 mile offshore at the northern end of Combine Flats and 0.5 mile off at Nushagak Point. A mile below Nushagak Point, vessels cross over and pass 0.2 mile off Bradford Point, then follow the western shore at this distance to the anchorage off Dillingham. Traffic generally starts up river on half-flood tide.

Chart 8802.—The area between Cape Constantine and Cape Newenham is unsurveyed, and there are indications that the present charts are considerably in error. Vessels laying a course from outside Ustiugof Shoal to pass about 2 miles off Cape Peirce, in thick but otherwise moderate weather, have reported making Hagemeister Island dead ahead. This undoubtedly is due to a northerly set in this vicinity. In the thick weather which prevails in this locality safety is assured only by constant sounding.

Walrus Islands are three islands and three rocks, all above water, extending 16 miles east and west and about 6 miles north and south. A reconnaissance survey in 1948 found shoal water between several of the islands as well as south of the group. The water tends to shoal very rapidly after a depth of about 3 fathoms is reached, hence the lead should be used continually while navigating these waters. The range of tide is slightly less than half of that at Nushagak. Thick weather is frequent in this area, and often the higher islands are fog-capped when the weather is otherwise clear.

Round Island, the easternmost of the group, is 1.5 miles long, 1 mile wide, and about 1,421 feet high. The west side of the island is precipitous and bare of all vegetation in the lower elevations. A narrow bench makes around the east side. To the north the island terminates in a distinct pinnacle rock. A reef, baring in places at extreme low water and consisting of sand and smoooth boulders, extends about 1.3 miles northwestward of the pinnacle rock.

Indifferent anchorage may be found about 1 mile northeast of the island in about 11 fathoms, hard sand bottom.

Crooked Island is 6 miles in length, about 1.3 miles in greatest width, and is almost entirely covered by tundra. Large coves are on both the southwest side and east sides of the island, between which the land is low. To the southward the land rises gently,

and toward the northward the elevation reaches 1,021 feet, then gradually slopes to the extreme north end of the island. The coves have not been examined in detail but are known to be shoal, the 3-fathom curve extending approximately 1 mile offshore. The holding ground is good, but little protection from either sea or wind is afforded a vessel anchored in 4 or 5 fathoms. Fair anchorage in southeast weather can be found about 0.5 mile west of the northern tip of the island in depths of 5 to 6 fathoms, sand bottom. A bank of unknown extent, and with depths of 2 fathoms or less, is off the west side of the island about 1 mile south of this anchorage.

High Island, the westernmost of the group, is about 5 miles in length, about 1.5 miles in width, and 1,671 feet in height. The island is steep-to on both the east and west sides, with a few strips of sand beach. Good water can be carried around the north end of the island to the west side where anchorage, protected from the southeast, may be had. To make the anchorage, clear the north tangent of the island about 1 mile, passing over depths of 12 to 14 fathoms and anchor about 1.5 miles south of the north end and about 0.8 mile offshore in 6 to 7 fathoms, sand bottom. About 1.5 miles south of this anchorage the water shoals to less than 2 fathoms.

Summit Island is about 2.5 miles long and 1 mile wide, with elevations of 801 feet near the south end and 505 feet near the north end, and low ground between. Abreast this low ground on the east side is a bight which affords good anchorage in southwesterly weather. To enter from southward, range the west end of the low point making out from the mainland on a double-pronged mountain in the distance, steering **320°**. Anchor about 0.5 mile off the middle portion of the island in 5 to 6 fathoms, sand bottom.

The Twins are two isolated rocks 4 miles southward of Crooked Island. The larger is 300 feet in height; the lower and southwesterly of the two is 100 feet in height.

Black Rock, about 150 feet high, is about 4 miles east of the northern part of Crooked Island. From the air the rock appears to be an upthrust on a submerged ridge, the axis of which parallels that of Crooked Island. Black Rock, the southeast tangent of Crooked Island, and the Twins are very nearly on range.

No other outlying dangers were seen in passing between the islands and the mainland. Except for a 6- to 10-fathom shoal abreast the group of islands, the depth gradually decreases to 3 fathoms off the north end of Hagemeister Island. The course was near the shore, however, and more water would doubtless have been found in mid-channel.

Kulukak Bay is reported as having shoal water in the entrance, and 3 fathoms just inside the entrance. The northern half of the bay dries at low water. The buildings of an abandoned native village and Government school are above the bluff at the northwest corner of the bay.

Togiak Bay, about midway between Capes Constantine and Newenham, is shoal, the head of the bay drying to the southward for 5 or 6 miles at low water; detailed information is not available. The abandoned native village of **Togiak** is on the eastern shore at the head of the bay, and it is reported as being 4 miles northward of the position shown on Chart 8802. **Nasaugluk (Togiak Village)** (*pop. 108 in 1950*), a native village, is near the northwest shore about 2 miles southwest of the head of the bay.

Hagemeister Island, 9 miles west of High Island, is 14 miles in length and 8 in width. It is mountainous except for about 5 miles at the north end. Shoals surround the island and extend eastward 20 to 25 miles, including the area between Hagemeister Island and the Walrus Group.

Shoal water has been reported as extending eastward from Hagemeister Island in the direction of High Island. Ice has been observed grounded there. Foul ground is also reported as extending northward of the north point of the island.

Current observations were made in June 1948 for a period of about 10 hours at a location about 8 miles southwestward of Hagemeister Island. The current set approximately 335° and 165°, with velocities at strength of about ¾ knot and 1½ knots, respectively.

Hagemeister Strait is about 16 miles in length between the island of that name and the mainland. It is 3 to 4 miles wide, but shingle spits contract it in two places to less than 2 miles. On a passage through the strait by the *Albatross*, the least water found was 4½ fathoms. Good anchorage was found under **Tongue Point,** the shingle spit making out from the mainland about midway of the channel. From the above anchorage, the *Albatross* stood directly to sea, passing within a mile of the southwestern extremity of Hagemeister Island; thence steered **206°**, shoaling the water to 3 fathoms 7 miles from the island. Greater depths might possibly be found by taking a more westerly course. It is reported that there is anchorage under the spits at both ends of Hagemeister Island. The tidal currents are very strong through the channel.

The **Osviak River** empties into the strait about 13 miles west of Tongue Point. The native village of **Osviak** is on the west bank of the river about 3 miles from the mouth.

Cape Peirce is of moderate height and symmetrical form. Depths of 10 fathoms are found 2 miles southward of the cape, and good anchorage in 10 fathoms of water is found inside **Shaiak Islet,** just eastward of the cape. There are reports of good anchorage, sheltered from northerly weather, in the bight northwestward of Cape Peirce.

The same reports state that a shoal area makes off westward from the cape, with depths of from 2 to 3 fathoms. The extent of this shoal and the least water to be found on it are unknown. To make the anchorage from eastward, give Cape Peirce a berth of about 3 miles and steer **009°** for the junction of the northwest end of the sand beach with the rocky shores; select anchorage at will off the sand beach. The approaches from westward are clear except for the shoal above mentioned.

Chart 9103.—Kuskokwim Bay and **River** open into the Bering Sea north of the entrance to Bristol Bay. The bay and river from Cape Newenham to Bethel are shown on Charts 9103 and 9104. In **Eek Channel,** at the entrance to the river, some changes in the mud flats and channels occur, owing to the action of the sea, currents, or ice. The channel is buoyed from June 15 to October 15 as far north as lat. 59°35′ N. However, the possibility of changes due to natural causes should always be borne in mind.

Cape Newenham is the landfall for this region, and can be approached close-to with deep water. It is the end of a peninsula formed by a series of rough sawtoothed mountains. These mountains terminate in a level plateau which forms the immediate cape. In southerly weather a heavy sea and tide rips occur off Cape Newenham. Satisfactory anchorage for southerly or easterly weather can be had in about 8 fathoms of water off the small cove on the north side of the cape and about 3.5 miles from its outer end.

Jagged Mountain is a well-defined peak, the highest of the Cape Newenham group. Viewed from northward, its slopes appear jagged.

Security Cove, 9 miles northeastward of Cape Newenham, is a good anchorage except with northwest winds; the usual summer gales are southeasterly. The bottom is even and shoals gradually. The best anchorage is about 0.8 mile northeastward of Castle Rock, on the range of Castle Rock and the first promontory southwestward, in 3½ fathoms, mud bottom. Fresh water can be procured from a stream which enters the cove. There is also good anchorage in 3½ fathoms with good holding ground in the middle of the small bight on the southwest side of Castle Rock. This anchorage is less affected by the ground swell making along the coast from Cape Newenham than the anchorage in Security Cove.

Castle Rock, the southwest point of Security Cove, is a small, prominent headland, 295 feet high, joined to the land by a low neck. At the northeast point of Security Cove is a conspicuous pinnacle rock, 169 feet high and covered with light tundra.

Chagvan Mountain is a smoothly shaped mountain, terminating in two rounded knobs about 1,540 feet high, which lies between Security Cove and Chagvan Bay.

Chagvan Bay has a narrow shoal entrance. Inside it is very shoal and cut up by bars that are bare at low water.

Red Mountain is a conspicuous reddish-colored mountain just south of Goodnews Bay. From northward it appears as a long ridge with the highest part at its northern end.

Goodnews Bay is shoal except for the deep channel which leads through the entrance to a point about 1 mile inside. This channel affords good anchorage, either in the middle of the entrance or up to 0.8 mile inside the bay on a line approximately northeast of the south tangent of the north spit. Inside the entrance the strength of the tidal currents reaches a maximum of about 2½ knots in a direction parallel to the axis of the channel. Along the northeast shore of the south spit the ebb current is very strong, and during the flood an eddy sets northward along this shore. The holding ground is good. Small craft can select from the chart a berth that affords the best shelter. A restricted anchorage for small vessels is about 1 mile southward of the south entrance point, but local knowledge is necessary for its use. The sea from the outside is broken by the shoals off the entrance and does not reach the anchorage. With southerly or easterly winds, tide rips dangerous for small craft occur in the channel. The spits at the entrance are of shingle and steep-to.

Platinum (*pop. 72 in 1950; P. O.*), at the inner end of the spit on the south side of the entrance of Goodnews Bay, is the headquarters of the mining company and of most of the commercial activity in this area. The village has semiweekly airmail service during the summer and weekly service during the winter, a landing strip usable by two-engine transport planes such as the C–53, a year-round radio station which guards the airway frequencies (especially 3105 and 5652.5 kc.) during most daylight hours and maintains communication with Bethel and the larger communities.

Groceries, general supplies, petroleum products, and fresh water are available at Platinum. The small-boat basin just south of the oil-storage tanks on the northeast side of the south spit can be entered only at high water as the entrance bares at low water. A road leads from the village to the storage tanks and boat basin. The platinum mines are about 15 miles southeast of the village. Prior arrangements can be made to have a pilot meet inbound vessels off Goodnews Bay for the trip north.

Beluga Hill is a prominent conical hill 886 feet high, with a steep, rocky face that

rises abruptly from the north side of the bay. Although lower than the mountains behind it, Beluga Hill usually stands out prominently from all parts of Kuskokwim Bay.

Shoals extend 2.5 miles off the entrance of Goodnews Bay. In 1938 an examination of the critical depths of the shoals to the southward showed a least depth of 11 feet about 2.5 miles southward of the entrance. Two sets of ranges were erected.

To proceed across the bar and through the entrance the following directions apply. From a point about 2.5 miles south by west of the entrance, stand in on the northeast-southwest range on course **037°** until the east-west range, bearing 090½°, closes; then steer **000°** for about 0.7 mile or until abeam of west tangent of the spit; then follow the south spit at a distance of 0.25 mile, and cross the entrance to the above anchorage.

The diurnal range of the **tide** in the entrance to Goodnews Bay is about 9 feet.

To go to the anchorage in the northern part of the bay, round the north spit at a distance of 300 yards and steer **312°** for the high bluffs on the west side of the bay. Hold this course for about 2 miles, or until the eastern side of Beluga Hill is in range with the flat-topped mountain just back of Goodnews village. Then head up for Beluga Hill and hold the range until up to the anchorage under the mountain.

About 6 feet of water will be found here at low tide. In 1913 the survey ship *Yukon* laid at anchor here during a northerly gale. There is no protection in southerly or easterly weather. A stream enters the bay here. The bay has a good shingle beach.

It should be noted that this route has not been surveyed, and that there may be, in places, less than 6 feet at low tide. This route should, therefore, be used with caution and only on a rising tide. Keep sounding constantly. On the bluffs at the foot of Beluga Hill is a cabin.

The *United*, drawing 16 feet, was taken into Goodnews Bay. The master reports that there is good anchorage in 7 to 11 fathoms of water, 2 miles north-northeast from the bay entrance on line to Beluga Hill. This indicates that deep water can be carried farther into the bay in the main channel than indicated on the chart.

Goodnews (*Goodnews Bay P. O.*) is a small village with a Government school at the head of Goodnews Bay. The channel to the village is shallow and winding so that local knowledge is desirable, but it can be followed by small boats at low water when the bars are visible.

Carter Spit, on the east side of Kuskokwim Bay, is a low sand spit about 4.5 miles long and from 50 to 300 yards wide. A white painted daybeacon, 35 feet high, stands on the spit 1 mile south of the elbow. Carter Spit incloses **Carter Bay,** which is a wide area of shoals and mud flats. Around the end of the sand spit a narrow channel is scoured out, affording anchorage for launches and small craft, but without protection from northward. A small stream, known as **Indian River,** flows into the east side of Carter Bay near two abandoned cabins formerly called **Carter.** Fresh water can be obtained by boats from Indian River at high water.

Explorer Mountain is the highest peak northward of Goodnews Bay. From southward it appears as a long ridge, and is recognized by three deep gulleys on its side. From westward it appears as a pyramid peak, the highest of the group.

Tooth Mountain, a flat-topped mountain in the front range, has a sharp, rocky pinnacle on the northern edge of its summit. It is easily recognized from the vicinity of Carter Spit.

Figure IV Mountain is a sharp peak in the front range eastward of Jacksmith Bay. The deep ravines on the side of this mountain form a numeral IV, which is conspicuous from westward when the ravines are filled with snow. In the later part of the summer, the snow disappears from the ravines.

Cone Mountain is a large conical mountain in the first range.

Yukon Hill is low but is the north end of the front range paralleling the coast; it is visible from the entrance of Eek Channel. From westward the hill is not distinguishable, as it has the receding range for a background.

Thumb Mountain is a fairly sharp summit in the range that recedes from Jacksmith Bay. From off Kwinhagak it resembles a huge thumb placed on a high flat mountain plateau. As Eek Island is approached, the mountain appears as a less distinctive ridge. Navigators accustomed to using the sextant and three-arm protractor should have no difficulty in piloting their ship to the entrance of Eek Channel.

Jacksmith Bay, the large indentation 14 miles northward of Carter, is entirely bare at low tide.

Kwinhagak (*pop. 194 in 1950; Quinhagak P. O.*) is almost inaccessible by water because of the great mud flats bordering its shores. Launches can enter the creek here only at the highest tides, and even small craft can hardly get within sight of the village and remain afloat at low water. Supplies are landed with great difficulty, owing to the extensive flats and their exposure. Kwinhagak has a Moravian mission, a store, and a Government school. A limited amount of supplies may be procured. The church steeple is sometimes visible from Eek Channel. The **Kanektok River** here runs fine clear mountain water at all stages of the tide.

Warehouse Bluff, a long dark-colored bluff about 11 miles northwestward of Kwinhagak, is an important landmark, as it is the first land on the east bank to be sighted when ascending Eek Channel. No objects on the west shore are visible until approaching the head of Eek Channel.

Warehouse Creek, a deep creek about 2 miles above Warehouse Bluff, is approached through a long tortuous channel that can be followed by small craft when the mud flats are bare. Small craft may find shelter here. The greatest range of tide in the bay occurs in the vicinity of Warehouse Creek. Inside the creek there is just swinging room for a 75-foot vessel riding to 15 fathoms of chain.

In the early days trading schooners ascended the bay only to Warehouse Creek. Natives and traders from various bay and river points assembled here to await the coming of the schooner. At one time some small warehouses were built here, but no traces of them now remain.

Kuskokwak Creek flows into the east side of the bay about 4 miles southward of Beacon Point. It is approached through a short channel across the flats and affords a good shelter for launches and other small craft. Just inside the mouth of this creek is a depth of 4 fathoms.

Kwigillingok (*pop. 245 in 1950; P. O.*) is a native village on the west side of the entrance to the bay.

At **Cape Avinof** (*see Chart 9302*) the east shore of Bering Sea turns northwestward.

Chart 9104.—Beacon Point, 12 miles north of Warehouse Bluff, is flat and barely above storm high water. A line between Beacon Point and **Popokamute** (**Pepokamuit**), a native fishing village on the west shore opposite Beacon Point, is considered the

dividing line between **Kuskokwim River** and Kuskokwim Bay. The west shore of Kuskokwim Bay has not been surveyed.

Eek Island is a grass-covered mudflat cut up by deep sloughs, and is covered by the higher tides. The island is a feeding ground for many thousands of ducks and geese.

West Point is a fishing camp on the west bank of the river just above Eek Island. The mudbank making out from West Point has extended itself considerably since the time of the survey.

Eek River is a large tributary flowing into the Kuskokwim on its eastern side just above Eek Island. It is navigable by launches for 15 or 20 miles. The river rises in the mountains about 60 miles distant; its waters are muddy and silt-laden.

Eek Village (*pop. 141 in 1950; P. O.*), on the east bank of the Eek River about 8 miles by boat from its mouth, is a large Indian village with a general store and Bureau of Indian Affairs school. Daily radio schedules are maintained with Bethel. Limited supplies of aviation and low-test gasoline and canned goods are available.

Bethel (*pop. 651 in 1950; P. O.*) 65 miles up the river, is considered the head of ocean navigation. From here river boats operate to points on the upper river. The diurnal range of **tide** is about 3½ feet, but the stage of the river influences the depth.

At Bethel are a Moravian Mission, a school, and several stores which are the distributors for the Kuskokwim district. The Alaska Communications System station maintains hourly schedules with Anchorage and Fairbanks. Provisions, gasoline, and fuel oil are available. A limited amount of coal is kept on hand.

The Civil Aeronautics Administration maintains a large well-equipped airfield and radio station across Kuskokwim River from Bethel. Daily airmail and transportation services to and from the States are maintained.

Communication between Bethel and the numerous outlying villages is by floatplanes.

Ocean vessels load and discharge cargo on the airport side of the river near a warehouse where supplies for Bethel, and for transfer up river, are unloaded. These vessels usually make three trips during the summer between Seattle and Bethel, transporting freight and equipment which is distributed from Bethel over a large area. A considerable amount is shipped up river on barges and river steamers to the many native villages along the river.

At **Aniak,** about 125 miles from Bethel by river steamer, is an airfield maintained by the Civil Aeronautics Administration. Limited supplies of gasoline, fuel oil, and provisions are available. Two general stores and a hotel are in the village.

McGrath (*pop. 175 in 1950; P. O.*) about 400 miles above the mouth, is the head of navigation on the Kuskokwim River.

Directions, Kuskokwim Bay and River.—Before entering Kuskokwim River, a 40-mile approach through Kuskokwim Bay must be made through a maze of sand bars, both visible and invisible. These bars shift every year and the channels are never in the same places from one season to the next. The procedure usually followed is for a small pilot boat from Goodnews Bay to precede the vessel through these waters, constantly feeling out the channels and sounding. It is necessary for the ship to take continual soundings also. Many blind channels are encountered, and the ship sometimes will spend an entire day following a channel only to find that it ends abruptly. The vessel must then return as much as 20 miles and try another channel. During all this time, there is constant danger of running aground unless proceeding at the very

slowest speed. Watch must be maintained constantly so as to be able to put the engines in full reverse immediately and let go both anchors.

The same tedious procedure must be followed by every vessel entering Bethel, and if the ship should run aground in these waters no assistance of any kind could be available and the result would probably be total loss of the vessel. Outbound passage is considerably easier because of shallower draft after discharge of cargo.

From the entrance of the river to Bethel, it is necessary for the pilot boat to precede the ship, but the channel is now better defined, being marked by several buoys which are maintained from June 15 to October 15. The deepest draft that should attempt to reach Bethel is about 15 feet.

The navigation of Kuskokwim River and its approaches is difficult. In the bay, the shoals are generally hard and steep-to. In a southerly storm a heavy sea makes up the bay nearly to Eek Island, and vessels caught on a shoal are in danger of being pounded to pieces.

Constant sounding is the navigator's best aid. No definite rules can be given for following the channels by the surface indications of the water. At certain times the channels will be smooth with rips on the shoals, but again for no apparent reason the indications may be reversed, with rips in the channel and a slick on the shoals. The edge of a channel is often marked by a long line of foam, although cases have been known where the line of foam extended across the channel. It is always well to approach such a line with caution.

Mariners are strongly cautioned against attempting to follow the channels in the bay at high water. Owing to the inequality of the tides, a vessel grounding at high water may not float again for several days. By waiting for low water the mudflats become natural aids instead of dangers.

Passing about 2 miles westward of Cape Newenham, make good a **028°** course for about 6 miles until the cape bears 190°; thence steer **010°** with Cape Newenham directly astern for about 18 miles until Beluga Hill bears 065° and Red Mountain 121°. From this position, steer **341°** for about 13 miles to a position 4 miles 256° from the elbow of Carter Spit and 4.5 miles 270° from the daybeacon on the spit.

In thick or hazy weather a route nearer the coast may be taken as follows: Pass 0.5 mile off Cape Newenham and Bird Rock, and then make good a **070°** course for about 6.5 miles until Castle Rock, the southwest headland of Security Cove, bears 177°. Strong tidal currents occur along the north shore of Cape Newenham. From here steer **357°** with Castle Rock astern for 14 miles until the summit of Red Mountain is abeam, thence **341°** for 19.5 miles to a position 4 miles 256° from the elbow of Carter Spit.

Next, steer **302°** for 5.5 miles with Beluga Hill in range with Pyramid Mountain astern. This range should be held until the water begins to deepen after crossing the 8-fathom ridge shown on the chart; then head up the channel on a **006°** course.

Vessels should arrange to make this point at the last of the ebb, and go up the channel with the flood. After heading on the **006°** course, the long shoal on the east side of the channel should be made out, either heaping or breaking. It is only with a very smooth sea that this shoal is not in evidence at low water. After continuing on this course for about 10 miles, the long shoal on the west side of the channel should be made out, either heaping or breaking. This shoal should be followed at a distance of about 1 mile until its northern extremity is reached. Here it becomes a mudflat,

bare at about half tide, of a yellowish color with deep water close-to. This flat is the leading mark for entering Eek Channel, therefore it should always be made at low water.

From here, the track veers westward and follows the flats on the west side of the channel on a course of about 000° for some 13 miles.

It is reported that extensive changes have taken place northward of latitude 59°36′ N. The chart is no longer a sufficient guide with respect to the channels.

In proceeding up the river the passage west of Eek Island is used. A crossover from Eek Channel to the west channel is made in an area subject to considerable change. It is generally necessary to wait for nearly high water before making a crossover to the west channel. Navigation in this region is difficult and the pilot and his launch should be employed. There are no landmarks visible unless the daybeacons on shore are in place. If buoys are in place the crossover is much easier.

East side of Eek Island.—The channel along the north side of Eek Island, once used by power schooners, has shoaled until it is now bare at low water and is used only by small fishing boats. Small vessels now go as far as Apokak Slough. From Beacon Point the channel follows the east bank of the river.

Passage west of Eek Island.—Once in the west channel, follow the west bank of the river southwestward of Eek Island for 4 miles. The course then bears out into the river towards Eek Island. From here the channel crosses to the east bank and continues to Bethel, crossing back and forth many times. There are no leading marks, and at some of the crossings it is necessary to wait for high water. A pilot is necessary.

Vessels coming down the river stand out to sea from abreast of Carter Spit. In entering, this track is not used because of the possibility of running up a blind channel.

Tides.—The diurnal range of tide is about 12 feet at Kuskokwak Creek entrance and 3½ feet at Bethel.

Currents.—The currents of Kuskokwim Bay and River are strong, attaining velocities of 5 knots at times. A strong tidal current sweeps past Cape Newenham, setting approximately north and south. Along the north side of the cape, tidal currents of about 1 knot have been observed setting northeastward and southwestward. In general, the currents set in directions parallel to the axes of the channels between the shoals. In the channel leading to Goodnews Bay, about 1 mile from the north end of the south spit, flood and ebb each has a velocity of about 2½ knots, setting northeast and southwest, respectively. In the deep channels off Jacksmith Bay the flood current has a velocity usually of about 2 to 2½ knots at strength, and the ebb from 2½ to 3 knots. In the vicinity of Apokak Slough, the strongest current observed was 3½ knots. The flood current is felt only about as far as Bethel.

By arriving at the entrance to Eek Channel on the last of the ebb, a favorable current can be carried nearly to Bethel, providing there are no delays.

See *Current Tables* for current predictions in Kuskokwim Bay and River. Variations from the predicted times and velocities, due to freshets and winds, may be expected.

Weather.—The best weather usually occurs in March and April. During the summer, southeast to southwest gales are frequent and last from 2 to 5 days. These storms gradually blow themselves out and are generally followed by a few days of good weather. In the early fall, northerly winds are frequent and are usually accompanied by clear skies. After mid-September, strong gales become frequent and prolonged.

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Ice.—Weather Bureau records for Goodnews Bay and Kwinhagak show an average ice breakup about the first of May and an average freezeup about mid-November. Breakup is about 2 weeks later at Bethel, and freezeup is about two weeks earlier. See *Appendix* for tabular detail.

Pilots.—The services of a pilot should be arranged for by radio to allow sufficient time for him to meet the vessel at Goodnews Bay. The pilot generally uses a launch and proceeds ahead of the vessel. There is no established fee for such pilotage.

Fresh water can be obtained from small streams in Security Cove, Goodnews Bay, and Carter Bay. In the vicinity of Eek Island, the river water is fresh at all stages of the tide; it is very muddy but the silt settles readily.

Chart 8995.—The **Pribilof Islands,** in the Bering Sea about 200 miles northwestward of Unimak Pass, consist of St. Paul, St. George, Otter, and Walrus Islands; the latter two are small and uninhabited. St. Paul and St. George have the largest and most numerous seal rookeries in the world. The group is under the jurisdiction of the United States Fish and Wildlife Service and is patrolled during the sealing season by vessels of the United States Coast Guard, under provisions of the international treaty governing sealing. In 1950, about 60,000 seals were killed under Fish and Wildlife supervision. Vessels other than those of the United States Government are forbidden to land on the islands.

A radiobeacon is located on St. Paul Island. The Fish and Wildlife Service maintains a radio station, call letters KVR, on St. Paul which can furnish information on local conditions of weather and sea. This station has no fixed hour of service but can be contacted on 2616 kc. through Cold Bay radio station ALB–66 or Unalaska radio station ALD–33. Radio station KVR–1 is used principally for inter-island communications and can also be contacted by voice on 2616 kc. The Weather Bureau maintains a radiotelephone station, call letters WWQ 49, near the southern end of the airstrip located immediately northward of Tonki Point. This station has no fixed schedule but can usually be contacted by voice on 2616 kc. during daylight hours.

There are no landlocked harbors about the islands, but safe anchorage is always available on the lee sides. Residents of St. Paul Island say that the prevailing **winds** during the summer months are from the northeast, which makes Village Cove on St. Paul Island a good anchorage in all but severe southwest winds. The bottom in Village Cove is black sand and the holding ground is good. During southwest winds good anchorage is available in Lukanin Bay on the southeast side of St. Paul Island.

Fogs are especially thick and prevalent in this vicinity in the summer, and navigation is attended with difficulty and danger. A navigator should plan to make landfalls in the Pribilof Islands during the summer based on no land being visible. One annoying characteristic of the area is very thick fog accompanying strong winds. Logs from survey vessels indicate that a typical summer day in the Pribilof Islands is as follows: Dense fog at daylight, vessels anchored 200 yards distant not visible, calm sea, light airs; by noon intermittent sun, a wet drifting fog, gentle breeze; by evening a dense fog, winds increased to force 6. Dense fog with visibility less than ½ mile is more common around St. Paul Island than around St. George Island. An unusual characteristic off North Anchorage, St. George Island, was clear visibility along the shore accompanied by dense curtainlike fog to seaward.

Winds do not continue to blow from the same quarter for any length of time.

From December through April winds blow from the northeast more than from the other directions. After September 1, gales are frequent and violent, and blow from all directions.

Ice.—The Pribilofs are near the southern limit of the ice in Bering Sea. On rare occasions the icefields extend as far as 35 miles south of St. George Island. In 7 years of Weather Bureau ice records at St. Paul Island, there was no sea ice at all reported in 3 years. In the other 4 years, navigation remained easy throughout 1 year and became restricted to full-powered vessels for short periods in March and April of 3 years; at no time did navigation become suspended or require the use of an icebreaker.

Chart 8993.—St. George Island, the southernmost of the Pribilof Islands, consists mainly of high volcanic hills and ridges, and its entire coast is a precipitous cliff except for a few miles on the north side and short intervals at Garden Cove and Zapadni Bay. The east and west extremities of the island, **Tolstoi Point** and **Dalnoi Point,** are bold promontories. **High Bluffs,** on the north side of the island, 1,012 feet high, is a prominent landmark, and is visible from St. Paul Island, a distance of nearly 40 miles, on a clear day.

There are no harbors, but vessels anchor at North Anchorage, Garden Cove, and Zapadni Bay, according to the direction of the wind; the anchorages are poor except with the wind directly off the land. At a distance generally not greater than 2 miles from the island the depth of the water is but little less than the surrounding sea, and in thick weather it is not safe to depend upon soundings for picking up the land unless sure of the position. Vessels should not approach the island in less than 12 fathoms of water. There are no outlying dangers except the small reefs at Zapadni Bay and at North Anchorage. A rock covered 1½ fathoms is 9.3 miles 078° from Tolstoi Point.

The anchorage in **Zapadni Bay,** on the southwest side of the island, in 10 fathoms of water, affords shelter with winds from east-northeast to north-northwest. The landing is on the open sand beach, and can usually be made with northerly winds. A reef extends about 0.2 mile offshore southward of the anchorage.

With northerly winds, a landing may sometimes be made at **Garden Cove,** on the sand beach. The anchorage affords good shelter from northwesterly winds, but with the exception of a small area the bottom is rocky.

Tidal currents.—In the open water the current is rotary, turning clockwise. Along the north and south shores of the island the current in general sets eastward on the flood and westward on the ebb. The largest velocity observed over a period of approximately 6 days in July and August was about 1½ knots. With opposing wind and current, the tide rips occur off Tolstoi and Dalnoi Points. These rips are not heavy enough to be of any moment, except that to strangers they may appear to be breakers. The water is deep off both points, which can be passed close-to with safety.

On approaching **North Anchorage** from seaward, the most prominent landmarks in the village of **St. George** (*pop. 187 in 1950*) are the white G I roofs of a quadrangle of sheds, low down at the water's edge. The roofs loom up first through the fog. Also conspicuous is a tight group of buildings on the slope and ridge back from the beach. Most easily identified is the Greek Orthodox church whose bell tower has a green

onion-shaped roof topped by a white St. Andrew's cross. Vessels should keep the street which extends through the village bearing 164°. Good anchorage will be found about 700 yards from the crane on the landing. There is swinging room for a 400-foot vessel riding to 45 fathoms of chain.

The landing is a square block of reinforced concrete next to a cutting in the rocks. The area around the landing, and for about 75 feet to seaward, practically bares at extreme low water. The landing can be used by small shallow-draft boats 3 hours either side of high water.

East Landing, just northeast of the village, is better protected from a westerly swell. A ledge awash is a short distance off the landing. If desired, a boat will come out to anchored vessels when landing is practicable.

Communication can be established with St. George Island on radiotelephone by calling Fish and Wildlife Service radio station KWL–41 on 2616 kc.

Local attraction.—Magnetic observations at 25 points on St. George Island gave results varying from 5°14′ E. to 20°03′ E. variation.

Chart 8994.—Otter Island, off the south side of St. Paul Island, has an abrupt bluff 288 feet high at its southwest end, slopes gradually to the north, and rises again in a crater, about 150 feet high, at its extreme east end. Foul ground, marked by kelp, extends about 0.8 mile from the island on its south, southwest, and north sides. The north side, from **Crater Point** to **Northwest Reef,** is clear of dangers. Probably the best anchorage near the island is in 9½ fathoms, black sand and broken shells, with the northeast extremity of Crater Point bearing 185°, distant 0.5 mile. This island must be approached with great caution in thick weather, and at all times a vessel should keep out of kelp. A 38-foot shoal is 2.5 miles east-northeast of Otter Island.

Between Otter Island and Reef Point, St. Paul Island, the tidal currents are strong, and with heavy winds dangerous tide rips occur, especially on the ebb current.

Walrus Island, off the east side of St. Paul Island, is low, about 39 feet above the water, level on top, and composed of irregular masses of volcanic rock. It is very hard to pick up in thick weather. It is about 0.4 mile long and 0.1 mile wide. Anchorage can be had on either side of it, 0.3 to 0.5 mile offshore, in 10 to 15 fathoms. Landing can be made with smooth water, the best place being in a small cove at the southwest corner. The island is a bad place to make in a fog.

Parts of Otter and Walrus Islands are covered with seabirds in the breeding season, and at the proper time a plentiful supply of eggs may be obtained. Walrus Island is a major sealion rookery and trips ashore are dangerous during the mating season.

Current observations made in July and August west of Walrus Island show that the current is rotary turning clockwise, with velocities exceeding 2 knots at times.

St. Paul Island, the northernmost of the Pribilof Islands, is about 235 miles northwestward from Unimak Pass. The west and southwest parts of St. Paul Island are high and mountainous, with precipitous cliffs at the coast. The rest of the island is a comparatively low, rolling plateau, with a number of extinct volcanic peaks scattered over its surface. **Bogoslof Hill,** 590 feet high, a conical crater near the center of the island, and **Polovina Hill,** double-peaked and 470 feet high, near the east end, are conspicuous and the best landmarks in clear weather when coming from southward. From this latter hill the island stretches away, in a low, narrow neck to **Hutchinson Hill,** about 100 feet high, on **Northeast Point.** West of **Lukanin Bay** the coast of the south side of

the island is rocky, with bluffs at the points. The shore of the rest of the island is generally a sand beach, with rocks in the vicinities of the seal rookeries. St. Paul has a flight strip 3,750 feet long and 130 feet wide which is surfaced with volcanic ash. A commerical airline furnishes weekly mail and passenger service to and from Anchorage, via Cold Bay or Dutch Harbor when weather permits.

The Fish and Wildlife Service vessel *Penguin* (500 tons) makes 5 round trips a year between Seattle, Washington, and St. Paul via Dutch Harbor, carrying passengers and freight. The vessel is used for the administration of sealing activities at St. Paul.

Dangers.—Kelp-marked reefs extend about 0.4 mile southeastward from the two low points 0.6 mile and 1.1 miles southward of Northeast Point. A dangerous ledge, marked by kelp, lies 1 mile 355° from Hutchinson Hill. It is about 0.2 mile in diameter, and its least depth is found on two rocks with 1 fathom over them. With a moderate swell the sea breaks over these rocks for a short distance off Northeast Point. Depths of 8 to 10 fathoms can be carried between the ledge and Hutchinson Hill by keeping the shore distant 0.4 to 0.5 mile. A rocky ledge with a least depth of 3 fathoms, no kelp visible, lies 5.0 miles northeast of Northeast Point.

A sunken rock having a depth of about 3 fathoms or less has been reported between Hutchinson Hill and **North Point,** approximately 1.8 miles 353° from **Little Polovina Hill.**

Off North Point a shoal extends about 0.3 mile northward, the depths gradually increasing to 4 and 6½ fathoms at 1 mile from the coast.

A survey party has reported a depth of 2¼ fathoms about 7.5 miles west of St. Paul Island.

Breakers extend 0.5 mile or more off **Southwest Point.**

A dangerous ledge, usually marked by breakers, extends 0.5 mile southwestward and southward from **Reef Point,** the south point of the island.

Sealion Rock, about 0.3 mile south of Reef Point, is prominent when approaching the point from an easterly or westerly direction.

A reef extends about 0.3 mile off **Tonki Point,** the northeastern point of Lukanin Bay.

Anchorage.—The usual anchorage at St. Paul Island is westward of Village Cove between Zapadni Point and Reef Point in the vicinity of the 10-fathom curve. The bottom, in general, is sandy but rocky bottom will be found in the vicinity of Zapadni Point and Tolstoi Point. Anchorage can be found northeastwardly from Reef Point, off **Black Bluffs,** and East Landing, and in Lukanin Bay.

Lukanin Bay has a sandy bottom and is used when westerly swells makes the Village Cove anchorage undesirable. From the Village Cove anchorage the village of St. Paul is obscured by a bluff although it is in full view from the Black Bluff anchorage.

Vessels should not attempt to ride out a gale at anchor near the islands, unless to leeward and well sheltered. The surf is apt to make quickly and is dangerous on the weather side of the island.

When approaching the anchorage off **Village Cove,** the most prominent objects seen will be the white frame house on the highest point of ground just west of the village, and the steel stacks of the byproducts plant. Vessels should steer **082°** for the stacks and anchor in about 8 fathoms of water with Reef Point and Sealion Rock in range.

Landing.—There is no protected harbor nor satisfactory landing facilities. Vessels

are often delayed at St. Paul in landing cargo and personnel due to strong winds which build up heavy seas and makes landing dangerous or impossible. In Village Cove, on the west side of Reef Point, the landing is at a reinforced concrete pier just northward of the bluff point. The approach to this landing is shoal and incoming swells frequently break across the entire entrance. Extreme caution should be used when any swell is running as the swells build up as they approach the shoal water, or round the bluff point, and break unexpectedly. The pier has a face of approximately 100 feet, with depths alongside of 3 to 4 feet at low water. Supplies are lightered ashore by barge or bidarkas (native skin boats). A self-propelled crane is used on the pier to load and unload lighters.

The village of **St. Paul** (*pop. 359 in 1950; P. O.*) is composed of a number of small wooden dwellings painted white with dark-colored roofs, a church, a small hospital, and several large buildings. The village has a machine shop with limited facilities. A marine skidway with a capacity of about 10 tons is available for emergency repairs.

St. Paul Island radiobeacon operates from May 1 to October 31 on a regular schedule and from November 1 to April 30 on request only. Such request shall be made through the St. Paul radio station KVR as the St. Paul radiobeacon station is not equipped to receive messages direct from ships.

Tides.—The diurnal range of the tide at St. Paul Island is about 3 feet. Around the island the current sets eastward on the flood and westward on the ebb, following the trend of the shore. The greatest velocity occurs at Northeast Point and between Reef Point and Otter Island. Average velocity at strength of current is 1 to 2 knots, but with continued strong winds from one direction it may be increased to 3 knots.

There are heavy rips around Northeast and Southwest Points, also between Reef Point and Otter Island, where they are worse on the ebb. The tides and tidal currents are greatly influenced by the winds.

Chart 9302.—Nunivak Island, in Bering Sea near the Alaska mainland, is about 330 miles northward of Unimak Pass. Dangerous shoals and uneven bottom have been reported and are shown on the chart; the island should be approached with extreme caution.

From westward, Nunivak Island shows gentle slopes terminating seaward in reddish cliffs 150 to 462 feet high. The highest point of the western part of the island rises to 866 feet 12 miles eastward from Cape Mohican. Near the center of the island is **Roberts Mountain,** 1,675 feet in altitude, the highest of a group; this mountain is built up of a series of volcanic benches, the top being the steep side of a breached crater. The east end of the island is low for the most part, except for some low hills and **Twin Mountain,** a breached crater 627 feet high.

In clear weather the island generally can be made out at a distance of 30 miles from any direction. The island is inhabited by herds of reindeer.

In 1899 the U. S. S. *Corwin* cruised completely around Nunivak Island, following the shore and outlying islands at a distance of about 2 miles, and found general depths of 7 to 10 fathoms. The coast is generally abrupt and rocky, with numerous bights in which anchorage was found with 3½ to 7 fathoms of water.

Cape Mohican, the western point of Nunivak Island, is a narrow promontory about 2 miles long. The point of the cape is a cliff 266 feet high from which the terrain de-

scends eastward to an elevation of 150 feet over a distance of 2 miles before ascending gradually to the higher ground inland.

Cape Mohican Light (lat. 60°12.7 N., long. 167°27.0 W.), 278 feet above the water and visible 8 miles, is shown from a small white house on the end of the cape.

A shoal about 1 mile wide extends 5 miles 050° from Cape Mohican and has depths of 1½ to 5 fathoms over it. The shoal area should be avoided until it has been completely surveyed. The 10-fathom curve extends 7.5 miles 058° from the cape.

Chart 8851.—Nash Harbor, 20 miles along the north coast of Nunivak Island from Cape Mohican, is a good anchorage except with winds from northwest through north to northeast. The coast to the westward of the harbor is fairly high and is backed by cliffs, while to the northeastward it is low. The south side of the harbor has a sand-and-gravel beach at the foot of a 30-foot bluff. The bottom slopes gradually from depths of 10 fathoms outside Nash Harbor to the beach at the head.

The harbor is 1.5 miles wide and about a mile in depth. The bottom is sand except near the rocky portions of the shore, and there are no indications of dangers over a large 4- to 6-fathom area in mid-harbor. Boats usually land off the village of **Nash Harbor** (*pop. 49 in 1950*), on the west side of a creek that empties into the southwestern part of the harbor; however, there are boulders close to shore at this landing as well as in the cove on the western shore. The creek drains a lake, but the water is brackish because the lake level is affected by the tides. The lake freezes every winter and makes an excellent landing place for airplanes fitted with skids; it is also large enough for seaplanes to use during the summer.

In 1951, the survey ship *Pathfinder* made the approach to Nash Harbor on course **090°** for 21 miles from a position 4.5 miles north of Cape Mohican until abeam of the harbor, then steered **180°** for mid-harbor to anchorage in depths of 6 fathoms.

Cape Etolin, 40 miles east-northeastward of Cape Mohican, is the northernmost point of Nunivak Island. The cape is a narrow strip of land with a ridge of low hills midway along its outer part. A small island is about 2 miles off the end of the cape; between are ledges. A dangerous rocky area extends westward from Cape Etolin for about 1.5 miles.

Mekoryuk (*pop. 156 in 1950; P. O.*), about 2 miles west of the inner end of Cape Etolin, and Nash Harbor, mentioned before, are the only villages on Nunivak Island that are inhabited the year around. A weather station is maintained at Mekoryuk, and the village has biweekly mail service by air.

In 1951, the *Pathfinder* anchored on the west side of Cape Etolin 4.5 miles northwest of Mekoryuk in 5 fathoms of water, sand bottom, on bearings 080° to north tangent of Cape Etolin, 089½° to highest knoll on Cape Etolin, 122° to center of yellow schoolhouse, the largest building in Mekoryuk, and 246° to north tangent of point 5.5 miles to the southwest. From this anchorage the north tangent of Cape Etolin was open 1½° from the south tangent of Cape Vancouver. The anchorage was approached from westward on a heading of **092°** for the highest knoll on Cape Etolin. The approach should be made with caution as the area shoals rapidly and the reference points are apt to be obscured by fog except during northerly winds. From the anchorage, a launch ran on a general course of **120°** toward Mekoryuk for 3 miles and obtained a minimum depth of 25 feet. It is recommended that ships not approach Mekoryuk closer than the anchorage position until the area has been completely surveyed.

In 1900, the *Manning,* in a reconnaissance of Nunivak Island, found a shoal with 3 fathoms over it about 10 miles 355° from Cape Etolin, with deep water between. Keeping Cape Vancouver bearing northward of 086°, Cape Etolin can be rounded when coming from westward in 10 fathoms of water. With Cape Vancouver bearing 086° or eastward of this bearing, considerable shoal water and irregular depths are found.

Cape Etolin Anchorage, the bight on the east side of the cape, has fair holding ground in depths of 2 to 5 fathoms but is open to the northeast. Near the southerly side, and about 0.3 mile from the head of the bight, is anchorage in depths of 3 fathoms; the holding ground is gravel and only moderately good. Farther out, it is deeper but more exposed to the strong tidal currents and rips of **Etolin Strait** (*see Chart 9302*), the wide passage between Nunivak Island and the mainland.

Chart 9302.—Cape Manning is about 15 miles southeastward of Cape Etolin. **Triangle Island** is about 5 miles northwest of Cape Manning and 2 miles from the nearest shore of the main island, with foul ground reported between.

Cape Corwin, about 20 miles southward of Cape Manning, is the easternmost point of Nunivak Island. The cape is low and has a rocky shore on its north side. The two peaks of Twin Mountain, described previously, are about 7 miles north-northwest of the point of Cape Corwin and can be seen for 25 miles in clear weather.

Cape Mendenhall, about 18 miles west-southwestward of Cape Corwin, is the southernmost point of Nunivak Island. The cape is about 200 feet high and has a low rock bluff 10 to 20 feet high on its east side. A 2¾-fathom shoal is charted 6 miles southwestward of Cape Mendenhall.

During a northerly blow in August 1951, the survey ship *Explorer* found satisfactory anchorage in depths of 8½ fathoms about 10 miles northwest of Cape Mendenhall. The anchorage is about 1.5 miles off the beach of the second bight northwest of the cape and is protected from northwest through north to east. As the ship approached on a northeasterly course, the water shoaled uniformly from 14 to 8½ fathoms. The fine gray sand bottom is good holding ground. Currents along the coast had velocities estimated to be as much as 1 knot.

From Cape Mendenhall the coast extends northwestward for about 40 miles to what may be called the southwest cape of Nunivak Island. The few soundings obtained show deep water fairly close to shore, and it is apparently safe to follow the shore at a distance of 2 miles. Depths of 4¾ to 6 fathoms have been found on an extensive shoal about 10 miles off this stretch of coast.

The southwest cape has cliffs 100 to 150 feet high; the summit is gently sloping tundra. In the small cove eastward of the cape, landings can be made on the sandy beach in front of the few barabars of **Tachikuga,** an abandoned native village. Fresh water can be obtained from the stream just east of the village; at low water the stream is fresh to its mouth. Temporary anchorage is possible in depths of 7 to 9 fathoms about 0.8 mile off the entrance to the cove.

From the southwest cape, the coast of Nunivak Island extends northward for about 8 miles to Cape Mohican. Along this stretch are impassable cliffs 150 to 450 feet high, and there are no landing places. The 6-fathom curve is about 1.3 miles offshore.

Tides.—The diurnal range of tide at Tachikuga, on the southwest side of Nunivak Island, is about 4¼ feet. At Nash Harbor, on the north side, the diurnal range is 5½ feet, and the tide occurs about 1 hour later than at Tachikuga.

Currents.—On the north and southwest sides of Nunivak Island the current has a large diurnal inequality, and becomes diurnal near the time of maximum declination of the moon. Northeastward of Cape Mohican a 4-hour series of current observations in July 1951 showed a northeastward current which at strength had a velocity of 1¾ knots. Observations made in June and August 1951 at a location westward of Cape Etolin showed tidal currents setting along the shore in both directions with velocities of about 1 knot at strength of current. On the east side of the island in Etolin Strait it is stated that tidal currents are so strong that the middle portion does not freeze over in winter. For predicted times and velocities of the current off Tachikuga, see the *Current Tables*.

Ice.—Weather Bureau records for Mekoryuk show an average ice breakup about mid-May and an average freezeup in late November; see *Appendix* for tabular detail. Navigation is difficult from mid-December to mid-May and usually is suspended from early January to late March.

Chart 8851.—St. Matthew Island and adjoining islands lie about 135 miles westward from Nunivak Island. They are rocky, uninhabited islands, whose shores are poorly charted except for a small area between Sugarloaf Mountain and Pinnacle Island. During the season of navigation, fog is prevalent in this vicinity. Anchorage can be made with an offshore wind on the north or south sides of the island.

Cape Upright, the eastern point of St. Matthew Island, is high and vertical, and the land in its immediate vicinity is mountainous. A mountain 1,505 feet high is 0.7 mile back of the cape and another mountain 1,280 feet high is 0.9 mile southwest of the cape. Off the cape is a detached rock 25 feet high. Westward of the high land of the cape is a low neck, apparently of sand, and the cape might easily be mistaken for a detached island.

A seasonal waterfall is on the north side of the island 0.5 mile southwestward of the west end of the headland which is about 5 miles from Cape Upright.

Glory of Russia Cape, the north point of St. Matthew Island, is also high and mountainous. A 1,475-foot peak is about 1.3 miles southward of the cape. The land between Cape Upright and Glory of Russia Cape is a succession of hills and low valleys that extend across the island from north to south.

Numerous detached rocks along the shores of St. Matthew Island should not be approached too closely. On the island is an abundance of fresh water in streams and lakes.

Sugarloaf Mountain, 1,380 feet high, is 11.5 miles 275° from Cape Upright. From Sugarloaf Mountain the coast trends about 0.8 mile southeastward to the westernmost point of a wide bight extending to Cape Upright. A rock is about 350 yards southward of this point.

A good anchorage on the north side of St. Matthew Island is in a bight 10 miles north-northwest of Cape Upright with Sugarloaf Mountain bearing 220° and westward of some outlying rocks which show well out of water and should not be approached closely. This anchorage is protected from southerly winds between southeast and southwest. Landing is difficult with any swell at all, as the beach is of stone and rather steep. In 1951, the *Pathfinder* anchored frequently in 9 to 10 fathoms of water about 3.5 miles west-northwest of Sugarloaf Mountain; the bottom is broken and the holding ground is satisfactory. The *Pathfinder* also anchored in about 14 fathoms of water 4

miles east by south of Sugarloaf Mountain; this anchorage afforded excellent protection during a northerly gale.

Sarichef Strait is the passage between St. Matthew and Hall Islands. Tidal currents and rips were not found to be strong in 1951. The *Pathfinder* obtained a least depth of 10 fathoms in two passages of the strait near its middle, but the records indicated that shoaler depths could be expected.

Hall Island, about 3 miles north of St. Matthew Island, is 1,665 feet high and is rugged on its northeast, north, and west sides; the southeast point is low. **Elephant Rock** is a large detached rock off **Cape Hall,** the northern point of the island, and **Arre Rocks** are several smaller detached rocks off the southwest side of the island. Anchorage is available in depths of 10 fathoms in the bight on the southeast side of the island.

Pinnacle Island, with its spires and needle formations making a striking appearance, rises abruptly from the sea with scarcely a place for a boat landing. The northern end of the island is 8 miles south-southwest of Sugarloaf Mountain. Pinnacle Island is 1.4 miles long, 0.3 mile wide, and rises to a height of 1,250 feet midway of its length.

An unusual submerged ridge extends from the north end of Pinnacle Island in a 021° direction to the shore of St. Matthew Island. The ridge is about 300 yards wide between the 10-fathom curves. The least depth found in 1951 was 4 fathoms, and there were several depths of 5 fathoms. The best water over the ridge was 9 fathoms 1.6 miles southwest of the point below Sugarloaf Mountain. Tide rips occur along the ridge with fresh winds.

Rocks and islets 55 to 95 feet high are off the southern shore of Pinnacle Island. **Gull Island,** 93 feet high, lies 0.5 mile west-northwest of the southern end of Pinnacle Island.

Tides.—A 4-day series of observations in 1951 showed a diurnal range of tide of about 2 feet at St. Matthew Island. The maximum range observed was 3¼ feet.

Currents.—For predicted times and velocities of the current, see the *Current Tables.*

Chart 9302.—St. Lawrence Island is in the northern part of Bering Sea about 120 miles southward of Bering Strait.

The eastern end of this island is usually made by vessels bound into Norton Sound, and in clear weather can be seen from a distance of 30 to 35 miles. From Southeast Cape a ridge of mountains extends in a northerly direction across the island, and another ridge extends in a northerly direction from East Cape to Northeast Cape. Between these two ridges a deep bight makes in from southward and at its head very low land extends northward across the island. The shore of the eastern end of the island is generally a low sand beach with outlying rocks; the mountain ridges begin 0.5 to 2 miles back from the beach.

Northeast Cape, eastern end of St. Lawrence Island, is low tundra land, with numerous fresh-water lakes. The cape is 2 miles wide to the foot of a mountain which rises abruptly and has a peak 1,435 feet high. This peak can be seen on a clear day a distance of 35 miles or more. At 0.3 and 0.6 mile from the end of the cape are two hummocks 94 and 280 feet high, respectively; the lower hummock is in latitude 63°18′ N., longitude 168°42′ W., as determined by the Coast and Geodetic Survey in 1902.

Although the bottom is irregular off the point of the cape, no breakers were noticed while passing it in rough weather. The north shore of St. Lawrence Island, for a distance of 10 miles westward of Northeast Cape, is a low sand beach and grassy tundra

with numerous fresh-water lakes. Anchorage with shelter from southerly or southeasterly winds can be had along this shore about 2 miles from the beach in 8 to 9 fathoms of water; the holding ground is not good, the bottom being gravel. At a point on the north shore 6 miles westward of Northeast Cape, breakers extend 1 mile offshore.

Current observations 1 mile from the shore 2 miles southward of Northeast Cape showed a maximum velocity of 1½ knots on both flood and ebb; the flood sets northward and the ebb southward alongshore. Add 1½ hours to the published times of high and low waters at Nushagak Bay to obtain the respective 165th-meridian times of flood and ebb strengths.

Four miles northwest of Northeast Cape the tidal current has an average velocity of ¾ knot at strength. There are two floods and two ebbs each day; the flood sets westward and the ebb eastward. Add 2 hours to the published times of high and low waters at Nushagak Bay to obtain the respective 165th-meridian times of flood and ebb strengths.

From the Northeast Cape the east coast of St. Lawrence Island has a general southerly trend for 4 miles to a point where a 450-foot-high spur from the higher hills reaches to within 0.5 mile of the beach; along this stretch the 6-fathom curve is 0.8 to 1 mile offshore.

The coast then trends south-southwestward for another 4 miles, then curves westward and northward for 5 miles, forming **Apavawook Cape (East Cape),** which is so rounding that it has no definite point. This entire stretch of coast is a low, narrow strip behind which is a large lagoon. The mountains are about 2 miles inland and about 900 feet high.

Punuk Islands, lying 4 to 5 miles 164° from Apavawook Cape, are a group of three small islands 1.5 miles long; the northeastern end of the group is about 13.2 miles 192° from Northeast Cape. The northernmost and largest island has two marked rocky hummocks, the higher having an elevation of 100 to 150 feet; on the southwestern end of the island are the remains of a native village. The southernmost island is an irregular mass of rocks, the highest point about 75 feet above water. Between these islands is a low, sandy islet, which is separated from the other two by narrow channels completely obstructed by ledges, over which the sea breaks. The shores of all the islands are foul, and a ledge extends southward from the southernmost island; the *Patterson* passed 2 miles southward of the islands in a least depth of 8 fathoms. Vessels should approach these island with caution.

A reconnaissance survey in 1951 indicated a clear approach to good anchorage in northerly and westerly weather off **Maknik Lagoon (Lake Cynthia),** northwest of the Punuk Islands. The anchorage is in depths of 6½ fathoms at latitude 63°09′ N., longitude 169°15′ W., about 1.5 miles off the beach. All soundings showed a uniform slope in to the 6-fathom curve, where there is a break and a steeper slope to the beach. Maknik Lagoon is actually behind the low sand barrier beach.

A heavy break was observed in the channel between Punuk Islands and Apavawook Cape, and vessels should not attempt to pass through. From eastward the islands can be approached as close as 2 miles. It is reported that 2.8 miles 220° from Punuk Islands the flood current was observed setting about 024° with a maximum velocity of 1.1 knots.

Southeast Cape is about 5 miles across on its southern face; the eastern point of the cape slopes gradually to the water for a distance of 0.3 mile from the high land, and

a reef extends about 0.5 mile southeast from the point. The western point is lower and slopes more gradually to the water for a distance of 3 miles from the high land, and a reef makes off from the point in a southerly direction for a distance of 2 to 3 miles. The bight between these points is very foul and should be avoided.

Kialegak Point, about 5 miles northward of Southeast Cape, is a long sand spit strewn with rocks, extending in an easterly direction from the high land of the coast. There are breakers about 0.8 mile 355° from the end of the cape, and there may be others inside; a reef extends southward from the south side of the sand spit for a distance of about 1 mile. The remains of a native village on the sand spit serve to identify the locality.

The deep bight westward of Apavawook Cape is little known; vessels have anchored well up toward the head of this bight. Vessels entering should give the points a good berth and exercise caution.

Northwest Cape (Cape Chibukak), the northwest end of St. Lawrence Island, probably 600 feet high, is a steep, black bluff, flat on top. A wide sand beach is west of the bluff. The native village is **Gambell** (*pop. 309 in 1950; P. O.*). **Chibukak Point,** 660 feet high, is slightly southeastward of Northwest Cape.

The water is deep close to Northwest Cape, and anchorage may be made on either side of the point of the sand beach off the village. Anchor in 9 fathoms 0.5 mile offshore with Gambell village bearing 225°, rocky bottom. A U. S. Coast Guard cutter reported that during westerly winds on August 23, 1953, breakers were observed extending 400 yards northwest from the northwest tip of land lying 3,500 yards west of Northwest Cape. For protection from southerly and westerly winds, shift about 6 miles to the bay southeast of Northwest Cape. Anchor in 9 fathoms, rocky bottom, off the house on the beach.

In May and June fresh water may be obtained in the center of the bight on the northeast end of Northwest Cape.

The western end of the island, south of Northwest Cape, is rolling land. From **Tatik Point (West Cape)** around to the bay east of **Southwest Cape** the land is mountainous and abrupt close to the coast, being highest at Southwest Cape. One or two families live at Southwest Cape.

Between the highland east of Southwest Cape and **Siknik Cape (Cape Chitnak)** the land is low. A vessel has reported striking a sunken rock about 2 miles offshore at a point about 16 miles northeastward of Southwest Cape. The danger is marked as a PD rock on the chart.

A reef makes off 1 mile in a 220° direction from Siknik Cape; it is bare at low water. The submerged part of this reef extends about 4 miles in a general 175° direction from the bare part. This reef is dangerous, as the water shoals abruptly when approaching the cape.

The rest of the island is generally high and rolling. There are some sunken rocks in the bight westward of Southeast Cape, and also some detached rocks showing off the north shore near **Kookoolik Point (Cape Kukuliak)** and **Savoonga Point (North Cape).** It is probable that with care an anchorage may be found almost anywhere around the island, but the shores must be approached with caution.

Savoonga (*pop. 249 in 1950; P. O.*) is a village at the extreme end of Savoonga Point. The village has a United States Bureau of Education schoolhouse. The Bureau of Education operates a radio station, call letters WWP. Savoonga is also the head-

quarters of the Reindeer Commercial Company, which controls about 7,000 deer on the island.

A bar, extending on approximate bearing of 035° from the village, breaks at low water. Anchor just west of Savoonga village in 6 fathoms.

Tides.—The diurnal range of the tide at St. Lawrence Island is about 3 feet.

Currents.—About 0.8 mile off Savoonga the flood sets northwestward and the ebb eastward. The flood has a velocity at strength of about 1 knot and the ebb 1½ knots. Add 1¼ hours to the published times of high and low waters at Nushagak Bay to obtain the respective 165th-meridian times of flood and ebb strengths.

Climate.—During the ice-free months of May to November, the diurnal temperature range is only 5° to 10° F. From January through March, the range is 10° to 12° F. In the winter months, passing cyclonic storms exert the major control on air temperatures. Mean monthly temperatures at Gambell range from 2.8° F. in January to 49.3° F. in August. Extremes of −28° F. have been recorded in March and 71° F. in July.

Relative humidity at Gambell is high, usually 80 to 90 percent or more. At least a trace of precipitation occurs on 275 to 300 days a year, yet the annual total is only about 15 inches, about half of which falls during July to October, the ice-free months. The greatest rainfall comes with southeasterly winds of cyclonic centers to the south of the island. Snow accumulation is at a maximum of about 2 to 2½ feet in March, and by the first week in June it remains only in drifts, some of which persist through the summer.

During the winter months, from October through April, the wind is prevailingly from the north or northeast and averages over 20 miles per hour. The peak recorded velocity was 80 miles per hour in October 1947 and was from the north. During the summer months the wind is more variable, being from the north or northwest about 30 percent of the time and from the southwest or southeast about 40 percent of the time. The mean summer velocity is 12 to 13 miles per hour; the mean maximum is 38 to 40 miles per hour.

Throughout most of the year, and particularly in the summer months from May to September, broken to overcast sky conditions prevail. Clear skies are seldom seen more than 2 or 3 days a month. The principal cloud types consist of fog, stratiform, and rarely cumuliform clouds at various levels. Most are generally below 10,000 feet. Low ceilings are most common during the summer months. The visibility is over 7 miles for about 70 percent of the period June through September. The best visibility is in September.

Ice.—Weather Bureau records for Gambell and Savoonga show an average ice breakup in late May and an average freezeup about the third week in November; see *Appendix* for tabular detail. Navigation is difficult from mid-December to late May and is suspended during most of March and April.

Transportation.—A Federal mail contract provides for biweekly plane trips to St. Lawrence Island during the winter when the tundra at Savoonga and Gambell is frozen. From June to October, seaplane landings can be made on a lake near Gambell but no regular service is maintained.

Ships visit St. Lawrence Island infrequently. An Alaska Steamship Co. freighter calls at Savoonga and Gambell once a year. An Alaska Native Service vessel makes a

trip or two each year and one or two visits by Coast Guard cutters can be expected. Local vessels from Nome call occasionally.

Transportation about the island in summer is most easily accomplished by use of native walrus-hide boats or whaleboats, which usually are powered by outboard motors mounted inboard in a specially constructed well. Dog sleds are used in winter and summer on tundra, but are not particularly efficient in summer. There are no roads. Trails are unmarked but are readily followed in the areas around Gambell and Savoonga.

Caterpillar tractors are operated at Gambell and Savoonga by the Civil Aeronautics Authority and by the Alaska Native Service, but their use for ordinary transportation is prohibitively expensive. Trains of tractors and go-devils can be used in many parts of the island if heavy transportation is necessary. Weasels have proved their value on snow, on the tundra, and in small lakes; such vehicles can move over most of the island, except on the coarsest boulder fields and the steeper slopes.

Landings.—Boats can land on almost any part of St. Lawrence Island during the summer. The surf is not heavy, except where brisk offshore winds pile up the shallow offshore water into large breakers. Supplies for Gambell are landed by whaleboat on both the north and west sides of the spit, depending upon weather and sea conditions. At Savoonga, supplies can only be landed during periods when a north wind is not blowing, because of the heavy surf.

Cape Vancouver is a bold promontory, possibly 1,000 feet high. The shoal from the mouth of the Kuskokwim River is thought to extend along the coast to Cape Vancouver, so that on the south side of the cape the water is shoal. Immediately off the end of the cape is deep water, which extends about 5 miles along the north side of the bight on which the native village of **Tanunak** (*pop. 112 in 1950; P. O.*) is situated. This bight is a series of mud flats, mostly bare at low water. The *Bear* anchored in 4½ fathoms about 1 mile off the south point of the bight. From observation on that vessel, shoals extend off the mouth of that bight northwestward, and **Hazen Bay** is supposed to be shallow.

Hooper Bay, the second bay south of Cape Romanzof, appears to offer the best anchorage for moderate-draft vessels in the area between Cape Vancouver and Cape Romanzof. The recommended anchorage is 0.2 mile southeast of the east end of the sandspit, about 2.5 miles southeast of the village of Hooper Bay. The least depth found in the approach to the anchorage was 3½ fathoms on the series of sand ridges that parallel the beach. The anchorage is in depths of 8 fathoms in the channel between the sandspit and a sand bar to the eastward that bares at low water.

Off the end of the sandspit, the channel is about 0.3 mile wide and its axis lies in a northeast-southwest direction. Both sides of the channel are very steep, and depths of as much as 13 fathoms were found close to the spit.

Currents.—See the *Current Tables* for predictions for Hooper Bay entrance. There are two floods and two ebbs each day; the flood sets northeastward and the ebb southwestward. Add 1 hour to the published times of high and low waters at Nushagak Bay to obtain the 165th-meridian times of flood and ebb strengths.

Ice.—Weather Bureau records for Hooper Bay show an average ice breakup in late May and an average freezeup about the second week in November. See the *Appendix* for tabular detail.

The village of **Hooper Bay** (*pop. 307 in 1950; P. O.*), 62 miles north-northwestward

of Cape Vancouver and 17 miles south of Cape Romanzof, is the most prominent feature in the area. It is on the highest ground, and the school and tin-roofed buildings are visible for about 10 miles. To reach the anchorage, steer **075°** for the village until within 2.5 miles of shore, then steer **130°** until abeam of the east end of the sand dunes and within 1.1 miles of shore, then head for the anchorage off the sandspit.

The village can be reached from the anchorage by small boat across the west end of the bay and up the creek along which the village is situated. The entrance to the creek is marked by stakes. The limiting depth is dependent upon the stage of the tide. The entrance to the creek bares at low water, and the entire west end of the bay is very shallow, but there is deeper water inside the creek. Emergency supplies can be obtained from the Alaska Native Service store. Airmail service is weekly during most of the year, and the mission priest maintains radio communication with the larger settlements in the area on a frequency of 3385 kc. at 5 p. m. daily.

Small boats drawing 1 to 4 feet of water, depending on the season of the year, can travel inland from Hooper Bay to the Yukon River. The route follows the **Keoklivik River,** southerly and larger of the two emptying into Hooper Bay, to a junction with the **Kashunuk River** at old **Chevak Village;** thence through a cut-off to the **Aphrewn River,** up this river, also called the Kashunuk on some charts at this point, and into Driftwood Slough about 5 miles south of the Yukon.

Driftwood Slough has two entrances from the Yukon. The one most used is about 2 miles down river from **Pilot Station,** which is about 115 miles above the mouth of Apoon Pass. The other entrance is about 12 miles above **Mountain Village,** which in turn is about 85 miles above Apoon Pass. The part of the slough leading from this latter entrance meanders considerably and is little used. At the Yukon, Driftwood Slough is about 250 feet wide and is 1½ to 2 feet deep during the dry season.

Following the ice breakup in the spring, the least depth along the inland route is about 3 feet; by early July it is about 1 to 1½ feet; and by early September, after the rainy season in August, it may be as much as 4 feet. The shallowest part of the passage is about 20 miles south-southwest of Pilot Station.

This inland passage may also be entered from Bering Sea by way of the Kashunuk River, which empties into the sea between Hooper Bay and Hazen Bay, or from Hazen Bay by way of the Aphrewn River.

Kokechik (Igiak) Bay is the funnel-shaped body of water on the south side of Cape Romanzof. The neck of the funnel is at the east end of the bay and is the mouth of the **Kokechik River.** On the seaward side of the bay a long narrow sandspit extends northward from **Dall Point** for about 6 miles. On the spit is a ridge of low dunes which are visible about 5 miles to seaward on a clear day.

About 0.8 mile north of the spit, a long narrow sand and mud flat, part of which bares at all stages of the tide, begins and extends to within 0.5 mile of Cape Romanzof. The gap between the spit and the flat is the best entrance to Kokechik Bay. Except for the deep water that extends 1 mile inside the entrance, the bay consists mostly of extensive flats 4 to 5 feet deep with numerous bars that bare at low water.

About 1 mile off the entrance to Kokechik Bay is an extensive breaking shoal that bars approach from the north-northwest and west. The best approach to the bay is on an east-northeast course for Dall Point, which shows very well and is easily identified on the radar screen in thick weather. From off Dall Point, steer a northerly course, paralleling the sandspit and about 0.8 mile off, and round the end of the spit at a dis-

tance of about 0.5 mile. The controlling depth along this course to the end of deep water 1 mile inside the entrance is 12 feet.

Large vessels must anchor at least 5 miles west of the sandspit where the depth is 5 fathoms and the bottom is sand. Vessels up to 12 feet in draft will find protected anchorage in the 10-fathom holes, one outside and the other inside the entrance to the bay. The outer anchorage, 0.8 mile northwest of the end of the sandspit, is between the previously described shoal and the spit, and has mud bottom. The inner anchorage is 0.8 mile northeast of the spit and has sand and mud bottom.

The diurnal range of **tide** is 6½ feet in Kokechik Bay. Tidal **currents** are estimated to have a velocity at strength of 1½ to 2 knots in the entrance.

Chart 9370.—Cape Romanzof is a bold and prominent headland with cliffs rising abruptly from the water over 1,200 feet along its western face; at the sharp extremity of the cape are remarkable perpendicular shafts of rocks on the side of the cliff. The cape is the western termination of the **Askinuk Mountains,** the highest of which, 2,363 feet, is about 5 miles from the cape and can be seen a considerable distance at sea.

Current observations made in August about 7 miles southwestward of Cape Romanzof show a diurnal tidal current of nearly ½-knot average velocity at strength. On the average, when unaffected by wind, this current sets northward for about 17 hours, beginning 1½ hours after higher high water at St. Michael, and southward for 8 hours, beginning 6½ hours before higher high water at St. Michael.

Wind effects are important at this location. Continued strong southerly winds will cause the current to set northward continuously for days at a time and a similar southward current results from northerly winds. The greatest velocities during nearly a month of hourly surface observations were 2¼ knots northward and 2 knots southward; in each case the current was setting approximately with a wind of about 40 knots.

Northeastward of the cape, 4.5 miles, is the southern end of the **Sand Islands.** These two islands, **Neragon** and **Krekatok,** extend in a general north and south direction about 13 miles, including the interval between them, and at a distance from the coast diminishing from 7 to 5 miles. The north island is mostly covered at high tide.

The coast trends in an easterly direction from Cape Romanzof 15 miles to the mouth of **Kun River,** and throughout most of this distance is bordered by abrupt cliffs and hills gradually diminishing in elevation.

Scammon Bay is between this shore and the south Sand Island. In general it is very shoal, with numerous bars bare at low tide. There are two small coves along its south side, **Windy** and **Edmonds Coves,** respectively 1 and 9 miles from Cape Romanzof, but both are quite shoal. A limited area with depths of 5 fathoms is just south and east of the southern end of Sand Island, and a channel of the same depth leads into it and passes about 2.2 miles north of Cape Romanzof. A narrow channel with a minimum depth of about 2 fathoms continues through Scammon Bay and into the Kun River. The depths are from 2 to 4 fathoms off Cape Romanzof but the water shoals quickly northeastward, so there is little protection except for very light-draft boats. A large shoal area with breakers lies about halfway between the cape and Neragon Island, and another shoal with less than 2 fathoms lies 2.5 miles 338° from the cape. Along the highland forming the south shore of Scammon Bay the water is 1 fathom or less in depth throughout its length, excepting just inside Cape Romanzof. The mean rise and

fall of tides at the entrance to Scammon Bay is about 5 feet. **Kongishluk Bay** is the native name for Edmonds Cove.

Scammon Bay (*pop. 103 in 1950, P. O.*) is on the south shore at the entrance of Kun River.

The coast is low and marshy from Kun River northward to the Yukon Delta. The waters along this stretch are extremely shallow and are navigated only by river boats.

Chart 9302.—Norton Sound is one of the important arms of Bering Sea. Some supplies for Yukon River by way of St. Michael pass through it. The north shore is important because of the mining operations conducted there. The south side of the entrance to the sound is occupied by the extensive Yukon Flats, and should be avoided by deep-draft vessels. The rest of the sound generally has soundings of 8 to 12 fathoms, the greater depths being near the north side. Off Cape Nome and Cape Darby are spots with depths of 15 to 19 fathoms. The bottom of the sound is very even, the depths decreasing to the shore with marked regularity. There is driftwood on all the shores of the sound.

Weather.—During the season of navigation the prevailing winds are southerly with variable force. Severe storms are usually from the southwest. The month of June, with less severe winds, appears to be the best month for navigation. July is about the same but the rainy season and southwesterly winds pick up in the latter part of the month and continue through August and part of September. September is usually somewhat drier, with more frequent winds from the north. Prevailing winds during October are north to northwesterly, the general weather being clearer and colder.

Fog.—The remarks on fog in the Bering Sea apply to the region west of Cape Nome, but not to Norton Sound east of it. On entering the sound with thick weather in Bering Sea, the fog will almost always thin out and gradually clear as the vessel proceeds up the sound. At St. Michael fogs are rare except in the spring when ice floes are close in to Norton Sound and the winds are westerly. With easterly winds the area is clear of fog.

Mirage.—In the vicinity of St. Michael and Stuart Islands and the coast southward, mirage often distorts the appearance of the land, small objects being sometimes greatly magnified.

Due to this abnormal refraction, positions obtained by astronomic sights (especially on the flats) cannot be depended on and may be several miles in error although the sight seemed good.

Chart 9370.—The **Yukon Delta** extends from the **Black River** to Apoon Pass, a distance of about 90 miles. The land along the coast is only a foot or two above high water, is covered with low marsh grass, and is entirely lost to view when but a few miles offshore. The only landmarks visible in clear weather are the sharp peaks of **Kusilvak Mountains** and the Askinuk Mountains back of Cape Romanzof, all very distant and often obscured by clouds or mist. The extreme flatness of the land and the remarkable mirage effect, often seen over the shoals when bare, make the whole region deceptive at times.

The river discharges by many mouths through the delta. The bars at the entrance

have little depth, and the channels through the flats are narrow, crooked, and bordered by shoals bare at low water. They are also subject to constant change. **Apoon Pass** is the entrance used by the river boats.

When well inside the confined bank the country on each side is covered with an almost continuous growth of willow and alder bushes. The water has a brownish-white appearance, something like glacial water, without its fine, sharp grit. It has no unpleasant taste, and is always fresh in the inner channels.

The main channels are everywhere free from snags, though trees sometimes become temporarily lodged on the bars and quantities of driftwood are piled along the shores in places. Undoubtedly the ice carries off the snags when it goes out each season. The channels and banks show indications of changing rapidly both from erosion and deposits. Very probably much of this is effected each year during the breaking up of the ice, its consequent jams, and the great floods following.

The 3-fathom curve is about 6 miles off Cape Romanzof and about 18 miles off the Yukon Delta and the shore of Pastol Bay, then comes close in to the shore of Stuart Island. From the cape to the Delta, detached shoals with depths of 2¾ to 6 fathoms are as much as 30 miles from shore. Deep-draft vessels should avoid depths less than 8 fathoms.

There are several permanent **settlements** along the passes of the Yukon Delta. In each settlement are several English-speaking natives, most of whom will attempt to pilot boats with more or less success.

Currents varying from ½ to 1½ knots have been observed in the Delta channels. Greater velocities occur in the bar channels and up the river. None was observed to exceed 3 knots.

The prevailing **winds** in summer are northeasterly, easterly, and southeasterly. The strong blows are from the same directions, the most severe being the strong easterly winds that funnel from the Yukon valley down low Unalakleet River valley. In winter, 50-knot winds are common. The area has considerable mist and rain.

Chart 9373.—Kwemeluk Pass, 54 miles northeast of Cape Romanzof, is the most southerly of the Yukon Delta passes. **Sheldon Point** (*pop. 43 in 1950; P. O.*), on the south side 5 miles above the mouth, has radiotelephone service, and river barges of the Northern Commercial Co. call at irregular intervals during the summer months.

Kwikluak Pass, which empties into Bering Sea along the north side of the islands that separate it from Kwemeluk Pass, is the main southern mouth of Yukon River. The bars at the mouth of the pass were reported, in 1952, to have an average minimum depth of 17 feet, but constant shifting of the bars and the shoals in the pass make navigation hazardous. Entrance should be attempted only by persons familiar with existing conditions. The diurnal range of **tide** is 2¼ feet at the mouth of the pass.

Alakanuk (*pop. 140 in 1950; P. O.*) and **Kwiguk** (*pop. 19 in 1950; P. O.*), on the northwest bank 12 and 18 miles, respectively, above the mouth of Kwikluak Pass, have salmon canneries where emergency supplies and fuel may be obtained; both villages have radiotelephone service and connections with an airline for transportation inland the year around. **Akulurak** (*pop. 197 in 1950*), is on the southeast bank 17 miles above the mouth.

Chart 9370.—Kawanak Pass and **Kwikpak Pass** have a common outlet to the sea about 30 miles northward of Kwikluak Pass. The diurnal range of **tide** is 2¾ feet inside the mouth of Kawanak Pass.

Head of Passes on Yukon River is the junction of Kwikluak and Kwikpak Passes at about **latitude 62°30′ N., longitude 163°51′ W.;** the junction is 42 miles from the mouth of Kwikluak Pass and 53 miles from the mouth of Kwikpak Pass. Kawanak Pass and Apoon Pass join Kwikpak Pass 26 and 22 miles, respectively, above its mouth. By way of Kwikpak Pass, Head of Passes is 49 miles from the mouth of Kawanak Pass and 55 miles from the mouth of Apoon Pass.

Chart 9372.—Pastol Bay, at the northeastern extremity of the Yukon Delta, is about 25 miles wide between the Delta on the west and Cape Romanzof on the east, is about 10 miles in depth, and has general depths of 1 to 6 feet.

Apoon Pass, at the head of Pastol Bay, is the principal approach to Yukon River from St. Michael. In common with the rest of this region, the surrounding country is only 1 to 2 feet above high water. The banks of Apoon Pass, to within about 2 miles of its mouth, are mostly grown over in willow and alder bushes 8 to 10 feet high. At the mouth the land is more marshy, and a large area to the westward appears to be entirely an open marsh. The channels and banks of the pass are subject to rapid changes from erosion and deposit.

The open country eastward of Apoon Pass is mostly marsh, ponds, and tundra. The only high ground is **Hogback Hill,** a rounded ridge about 300 feet high, 7 miles eastward of the pass and 2 miles back of the coast. A range of hills and mountains 10 to 20 miles back of the coast extends southeastward to the first great bend in the Yukon.

Several **lights,** maintained from August 1 to November 1 by contract, mark the mouth of Apoon Pass and the approach from northeastward; caution should be exercised as some of the lights may be missing. The channel across the flats is also marked by stakes during the season of navigation. As the depths across the outer flats are only 1 to 2 feet at low water, all but the shallowest draft vessels must cross at or near high water.

The **tide** in Apoon Pass is more or less diurnal (one high and one low each day); the diurnal range is about 4 feet at the mouth of the pass and about 1 foot at the Head of Passes. The tides at the entrance are greatly affected by winds, which may be strong enough to entirely obliterate the natural tides; northerly and easterly winds lower the water level, and southerly and southwesterly winds raise it. The ordinary outflowing **current** in Apoon Pass is much less rapid than that in other passes, but there are a tidal inflow and outflow with velocities that depend upon the particular range of the tide.

Chaniliut, (Chaneliak) (*pop. 100 in 1950*), on the south side a mile above the mouth of Apoon Pass, has an Alaska Native Service school and radiotelephone service. **Kotlik** (*pop. 44 in 1950*) is at the mouth of **Kotlik River,** which empties into the south side of the pass 5 miles above the mouth.

Hamilton (*pop. 43 in 1950; P. O.*), on the southeast side 22 miles above the mouth of Apoon Pass, is headquarters for the Northern Commercial Co. in the Delta area. Gasoline, diesel oil, and supplies can be obtained at the village, and mail and radiotelephone service are available the year around.

Nunachik Pass and **Little Apoon Pass** make off to the westward from Apoon Pass just above Hamilton. Apoon Pass joins Kwikpak Pass 25 miles above the Apoon mouth. **New Fort Hamilton** (*pop. 27 in 1950*), on the east bank of Kwikpak Pass, is 40 miles from the Apoon mouth.

Chart 9370.—Yukon River, one of the largest of the world, is the largest and most important river in Alaska. It is navigable for flat-bottom boats along its entire course from the mouth to near the head of **Lake Bennett.** No one company operates vessels along the entire river. Transfer points are at Marshall, Tanana, Nenana, and Dawson. The **Porcupine, Chandalar, Tanana, Koyukuk,** and **Innoko Rivers** are the principal tributaries of the Yukon in Alaska.

Between Tanana and the delta, Ruby is the only town located on the south side of the river. The river is not shown on the chart above the native village of **Ingrakak.**

River steamers may ascend to Whitehorse, Yukon Territory, Canada. The White Pass and Yukon Railway connects Skagway, Alaska, and Whitehorse, Canada, the head of river-boat navigation. The Alaska Railroad connects Seward and Fairbanks; the latter is on Chena River. **Chena River** flows into the Tanana River.

Although the Yukon River is navigable all the way from the Bering Sea to Whitehorse, it can neither be entered by oceangoing ships nor navigated by them. The river itself is shallow in many places and, like the Mississippi, is a maze of bars, bayous, and side channels for much of the length. At the river mouth is a vast delta with sand flats reaching far out to sea. Such channels as the currents have made are too shallow for the passage of oceangoing ships and are perpetually shifting. The river boats are built especially for this shallow-water work, as are those used on the Mississippi.

Yukon River

DISTANCES ABOVE APOON PASS; POST OFFICES, 1950 POPULATION, ICE BREAKUPS AND FREEZEUPS

Place—*PO, 1950 population	Nautical miles above Apoon Pass	Ice breakup			Ice freezeup			Average years record	Period
		Average	Earliest	Latest	Average	Earliest	Latest		
Akulurak—*197		May 27	5/20/42	6/ 4/20	Oct. 24	10/11/39	11/ 7/23	14	1917–1948
Hamilton—*43	22	May 22	5/ 6/40	6/ 5/52	Oct. 25	10/15/39	11/ 2/38	14	1938–1952
Azacharak (*Mountain Village)—221	85	May 20	5/ 3/38	6/ 6/52	Nov. 13	11/ 1/39	12/22/49	12	1937–1952
Pilot Station—*52	115	May 17	5/ 1/26	5/24/24	Nov. 8	10/27/24	11/13/25	5	1924–1943
Marshall (*Fortuna Ledge)—95	153								
Russian Mission—55	195	May 12	4/25/40	5/25/39	Nov. 4	10/21/28	11/15/37	8	1928–1944
Paimiut—*	231								
Holy Cross—*157	257	May 17	4/25/40	5/28/52	Oct. 31	10/12/31	11/30/34	32	1917–1952
Anvik—*99	292								
Kaltag—*121	409								
Nulato—*176	438								
Koyukuk—*79	453								
Galena—*176	481	May 17	5/ 8/51	5/26/52	Nov. 6	10/11/47	12/ 8/50	10	1943–1952
Ruby—*132	526	May 15	4/30/40	5/22/20	Nov. 7	10/28/17	11/18/37	11	1917–1946
Kokrines—*68	556								
Tanana—*228	628	May 14	4/29/40	5/25/35	Nov. 4	10/13/30	11/22/37	33	1917–1952
Rampart—*94	688	May 16	5/ 1/30	5/25/52	Nov. 6	10/13/30	11/23/45	21	1917–1952
Stevens—*84	762								
Beaver—*101	835								
Fort Yukon—*446	896	May 14	5/ 7/40	5/22/27	Oct. 28	10/14/41	11/15/52	30	1918–1952
Circle—*83	959								
Coal Creek—*	1,002	May 12	5/ 7/43	5/18/45	Nov. 9	11/ 1/38	11/20/40	8	1938–1950
Nation—45	1,047								
Eagle—*55	1,089	May 9	4/25/40	5/18/52	Nov. 19	10/18/30	12/11/49	29	1917–1952
Boundary U. S.—Canada	1,099								
Fortymile—*	1,149								
Dawson—*783	1,197	May 8	4/28/40	5/16/45	Nov. 17	11/ 3/41	12/18/42	12	1917–1947

St. Michael is about 55 miles, via Stephens Pass, from Apoon Pass.

The mouth of **Pastolik River,** about 2 miles from the outer end of Apoon Pass, affords anchorage for steamboats under medium size. The Apoon flats extend in front of the entrance, and it can only be entered at high tide.

The eastern entrance point of Pastolik River is marked by a fixed white light maintained from about August 1 to November 1.

With the exception of the promontory of Point Romanof, the immediate coast is low and flat all the way from Apoon entrance to St. Michael Island. **Point Romanof,** 340 feet high, stands well out about 12 miles westward from the high hills of the coast range. It appears in clear weather like an island in the sea. A light is shown on the point from about August 1 to November 1 of each year.

After passing Point Romanof, **Crater Mountain,** on the mainland back of St. Michael Island, and St. Michael, Stephens, and Stuart Mountains, on St. Michael and Stuart Islands, appear above the horizon and are excellent landmarks.

About 10 miles southward of Canal Point is the **Pikmiktalik River.** In the mouth of the right-hand stream is an anchorage for medium-sized steamers. The bar to this stream has only about 2½ feet on it at low tide. A shoal extends out from the south point at the entrance.

In moderate weather the ocean swell is not felt between the Apoon entrance and Stephens Pass; but in heavy weather and westerly weather, which is more likely to occur during the latter part of the season, a choppy sea develops and is heavier off Point Romanof than elsewhere. In general, this passage is safe for river steamers in the summer season. During the latter part of the season, however, high winds become more frequent, and the boats are obliged to watch their opportunities.

Anchorages.—River steamboats anchor on the flats or in the channel, wherever exigency demands. In the southern end of St. Michael Canal in the southern branch just above the junction, is a good and safe anchorage in all kinds of weather. The depth is only about 3 feet at low tide on the outside bar, and it has to be crossed at high tide.

Good protection is available from all but southwesterly weather in depths of 6 to 9 feet in the cove on the south side of Cape Stephens. **Stebbins** (*pop. 115 in 1950; P. O.*), a village on the shore of the cove, has an Alaska Native Service School and a nurse; radiotelephone and mail service are maintained the year around.

Stuart Island, northwest of St. Michael Island, is separated from the latter by **Stephens Pass,** which has a minimum width of about 0.6 mile. The island is divided into two approximately equal parts by a narrow north-south waterway which is used considerably by small launches and native craft. **Stuart Mountain,** 483 feet high, east of the center, is the highest point. The rest of the island is low and rolling, with some small, scattered peaks. The shore of the island is very irregular. From **North Point** to **Observation Point** and around through Stephens Pass is a line of conspicuous bluffs about 170 feet high; the rest of the coast is much lower. From Observation Point to the west point of the island the north shore is free from outlying dangers; 5 fathoms can be carried 1 mile from the beach. Off the west point, some detached rocks extend about 300 yards. On the east face of the island well toward the southeast point a shoal makes out about 3 miles. **Cape Stephens,** on the southeast side of Stephens Pass, is marked by a **light** (**lat. 63°32′.7 N., long. 162°18′.0 W.**), 200 feet above the water

and visible 8 miles, which is shown from a small white house; the light is maintained from August 1 to November 1.

Egg Island, 16 miles eastward of Stuart Island, has been used as a quarantine station. The water off the western shore is deep, 6 fathoms being found close inshore. The island is so small that it does not afford much protection in heavy weather, but it is the only lee to be had in northerly gales.

Egg Island Light (lat. 63°36′.0 N., long. 161°43′.2 W.), 90 feet above the water and visible 8 miles, is shown from a small white house on the highest part of the island; the light is maintained from August 1 to November 1.

St. Michael Island, which is separated from the mainland by St. Michael Canal, is mostly low but has two conspicuous rises: **St. Michael Mountain,** 472 feet high, near the center of the island, and sharp conical **Stephens Mountain,** 331 feet high, overlooking Cape Stephens and Stephens Pass.

St. Michael Canal is a narrow, crooked tidal slough which forks and comes together again. Distances through the canal are 18 miles by way of the north fork and 20 miles by way of the south fork. The southern fork is generally used because it is the wider. Depths in the canal are probably less than the 6 feet of the old improvement project but are sufficient for the traffic of the area; the depth over the bar at the southwestern entrance is about 3 feet. In 1952, the canal was reported safe for navigation. **Canal Point,** on the north side of the southwestern entrance, is marked by a light that is maintained from August 1 to November 1 of each year.

Chart 9375.—St. Michael Bay is the harbor on the east side of St. Michael Island **Orizaba Reef** extends 1.5 miles off **Rock Point,** which is 051° from St. Michael Mountain. It is marked by a bell buoy moored in 24 feet of water. The buoy is removed during the winter.

Whale Island, close off the east end of St. Michael Island, is about 0.5 mile long east and west, 118 feet high, and on approaching the harbor its east end is seen as a vertical bluff. **Whale Island Light (lat. 63°29′.5 N., long. 161°59′.3 W.),** shown from a white wooden house, is 45 feet above the water and visible 9 miles. It is maintained from August 1 to November 1. The passage between Whale and St. Michael Islands is blocked by rocks, bare at low water. Eastward and northward of the island the water deepens rapidly.

A boulder with 18 feet of water over it is 0.5 mile 064° from Whale Island Light.

Beulah Island, about 0.3 mile northwest from Whale Island, is about 50 feet high, small and rounded. It has bold water off its northeast side. Between this and Whale Island the water is shoal.

St. Michael (*pop. 157 in 1950; P. O.*), near the eastern end of St. Michael Island, shows little evidence of the days when it was of major importance in the Yukon River traffic. Gone are most of the buildings of the Army post and the warehouses of the trading companies, and the tall masts of the telegraph company; and the waterfront is littered with the rotting hulks of the once great river fleet.

The Northern Commercial Co. operates the only remaining trading post at St. Michael and maintains facilities for transfer of freight from ocean to river vessels. The village has a church and a school, but no hospital and no physicians; a traveling nurse from the Bureau of Indian Affairs calls at the school.

Limited amounts of diesel fuel and supplies can be obtained at the trading post.

Drinking water is usually hauled to the village by boat. A marine railway operated by the Northern Commercial Co. can handle vessels up to 100 tons in weight and 9 feet in draft, and has limited machine-shop facilities.

Radiotelephone and mail service and connections with an airline for transportation inland are maintained the year around. The Northern Commercial Co. operates an irregular freight-barge service over the reaches of the lower Yukon during the summer months; this service connects at Marshall, 153 miles above the Apoon mouth, with the one remaining Alaska Railroad river boat, which makes two or three trips down river from Nenana each season.

Anchorage.—The harbor and anchorage for seagoing vessels is an open roadstead exposed to winds from northwest through north to east. Larger vessels anchor in the offing between St. Michael Bay and Egg Island, and in heavy northerly gales shift their anchorage to get a lee under Egg Island or go to sea. Anchorage is found about 0.5 mile southeastward of Whale Island in 3½ to 4 fathoms, bottom dark-blue mud and good holding ground. Care should be taken to avoid the 18-foot boulder previously described.

Good anchorage in 5 fathoms is 3 miles off Whale Island Light on the following bearings: Egg Island 038°, Crater Mountain 205°, Whale Island Light 227°, North Point of Stuart Island 295°. Use 45 fathoms of chain.

Light-draft vessels and river steamers can find shelter from northerly and westerly winds by anchoring close in under the east side of the island, in 3 to 8 feet. The shores of St. Michael Bay are strewn with loose rocks, which are often frozen in the ice in winter and dropped as it goes out in the spring. Light-draft vessels, when anchoring in shoal water, should be careful not to anchor over any of these loose, scattered rocks.

Tides.—The tides of St. Michael are chiefly diurnal. Daily predictions are given in the *Tide Tables*. The range between mean higher high water and mean lower low water is about 4 feet.

Currents.—About 0.8 mile offshore in St. Michael Bay the tidal current averages about ¾ knot at times of strength. Like the tide itself, the tidal current is chiefly diurnal and sets southeastward on the flood and northward on the ebb. Strengths of flood and ebb occur about 3½ hours before higher high and lower low waters respectively at St. Michael.

Ice.—Weather Bureau records for St. Michael show an average ice breakup in early June and an average freezeup in early November. See *Appendix* for tabular detail.

St. Michael being the end of deep-water navigation, all the Yukon traffic beyond this point has to be conducted with vessels drawing 5 feet or less. The larger launches leaving St. Michael Bay go around the north side of St. Michael Island and through Stephens Pass, between St. Michael and Stuart Islands. They give the reef off Rock Point, on the north side of St. Michael Island, a wide berth, and after passing between the islands a straight course is made slightly westward of Point Romanof. When the summit of Point Romanof is abeam, distant about 1.5 miles, the direction is changed and a course is steered for Apoon Pass. The most dangerous part of the passage is the 14 miles around the north end of St. Michael Island, which is exposed to the deep-water swell from the north. This can be avoided by small craft by going through St. Michael Canal.

Directions, Isanotski Strait (False Pass) to St. Michael.—The following remarks are intended to apply only to small craft that are unable to make the direct passage.

After passing out of Isanotski Strait, clear of the outlying breakers, the course is shaped for the east side of Amak Island. Shelter can be found on the south, southeast, and east sides of the island.

Leaving Amak Island, the next course is laid for Cape Newenham. Shelter can be obtained on either side, according to the wind. From Cape Newenham the course is laid for Nunivak Island. If heavy northerly or northeasterly winds are encountered before the island is reached, shelter is sought in the depth of the bight on the south side. Weather conditions being good, it is only necessary to touch at this island if needing water. The anchorage on the north side, about 12 miles eastward of Cape Etolin, is considered the best; see Nunivak Island, earlier in this chapter.

From the northern end of Nunivak Island the customary course is to cross over diagonally to a little north of Hazen Bay, and then coast along just outside the shoals, in 3 to 5 fathoms of water until Cape Romanzof is reached. If the weather is unpropitious or water is required, an anchorage in Scammon Bay is made close inshore on the south side, in a bight where a stream empties.

After leaving Scammon Bay, by giving the spit on the north side of the entrance a good berth, the remaining distance to St. Michael is made by skirting along on the outer portion of the Yukon Flats, in 2 to 5 fathoms, where the courses are exclusively guided by sounding. On this crooked stretch, after the mountains of Cape Romanzof and the Kusilvak Mountains disappear, no land will be visible until the high peaks on the mainland south from Stuart Island are sighted; a little later the summits of Stuart and St. Michael Islands become visible. After Stuart and St. Michael Islands become defined, the course is shaped to go through the pass between them, and then skirt around the north side of St. Michael Island to St. Michael.

In the summer, northerly and easterly winds prevail a large portion of the time between Cape Newenham and Cape Romanzof. The tidal currents in Etolin Strait are strong and at times cause heavy tide rips.

Chart 9380.—The coast from St. Michael Bay to Cape Darby is generally low and rock strewn, and the depths when approaching it shoal gradually from 6 fathoms toward the beach; a depth of 3 fathoms can be taken as close as 0.8 mile except in a few places. There are no outlying dangers, but a reef makes off about 0.5 mile from the shore 2 miles southward of **Black Point,** the point about 26 miles eastward from St. Michael. **Tolstoi Point** and its vicinity are high and rocky, and from there to Unalakleet River the shore is low.

Anchorage with good protection from southerly winds can be found in **Kiliktarik (Kiktaguk) Bay,** which is about 15 miles eastward of St. Michael. There are several native camp sites along this coast but the only permanent settlement is Unalakleet.

Unalakleet (*pop. 469 in 1950; P. O.*), in **latitude 63°53′ N., longitude 160°47′ W.,** is the largest village on Norton Sound east of Nome. A United States commissioner and an Alaska Native Service nurse are stationed in the village, which also has a mission church, a school, and a store. Vessels can obtain supplies in limited amounts. The CAA radio and weather station broadcasts weather reports 15 minutes before and after the hour on 382 kcs. Radio and mail service are maintained the year around, and there is biweekly plane service to Anchorage.

A shoal extends about 1.5 miles offshore from the mouth of the **Unalakleet River.** The approach to the river is navigable only by shallow-draft boats. During the navigation season, lights on either side of the river mouth and privately maintained buoys mark the approach. The Unalakleet aviation radiobeacon, signal characteristic UNK, operating continuously on 382 kcs., has been found valuable as an aid to surface navigation. Vessels have anchored, with 60 fathoms of chain, about 2 miles offshore in depths of 5 fathoms with Besboro Island bearing 317° and the CAA towers bearing 117°. An alternate anchorage is about 6 miles north of Unalakleet.

In the winter, prevailing winds are strong from the east and velocities of 50 miles per hour are common. High and low waters at Unalakleet are about 1 hour later than at St. Michael.

Ice.—Weather Bureau records for Unalakleet River at Unalakleet show an average ice breakup about mid-May and an average freezeup in late October. See *Appendix* for tabular detail.

Besboro Island is 1,040 feet high and very prominent; on a clear day it can be seen from St. Michael. It affords a poor lee, as the wind draws all around the island. A shoal with depths of 4 to 4¾ fathoms makes off 2 miles in a northeasterly direction from the north end of the island. The western side of the island is bold-to, and the eastern side of the island can be approached as close as 0.5 mile, with a depth of over 5 fathoms.

Cape Denbigh is a moderately high rounded hill, joined to the mainland by a low narrow neck. The head of the bight, eastward of the cape, is shoal, but in approaching the water shoals gradually. A good anchorage in northeasterly winds can be had eastward of the cape in depths suitable to the draft of the vessel. The south end of the cape is bold-to, and its western side, 2.5 miles northward of the point, can be approached close-to in 4 fathoms of water. The water shoals rapidly inside a depth of four fathoms when approaching the shore.

Norton Bay is generally shoal. About midway between **Point Dexter** and **Bald Head** is a depth of about 6 fathoms, and from this depth the water shoals gradually as the shores are approached in any direction inside of Bald Head. In some places the 6-foot curve is 5 miles or more from the beach. The north shore of the bay for a distance of 15 miles westward of Bald Head is comparatively low, and the water is shoal for some distance from the shore. From a point 15 miles west of Bald Head to Cape Darby the land is high and wooded along the coast; a few native villages are located on this stretch. For a distance of 20 miles northeastward from Cape Darby, a depth of 4 fathoms can be taken 0.3 mile from the shore, and in some places much closer. The water shoals gradually on approaching the coast, but the south and east sides of Cape Darby have deep water close-to. During strong northerly winds the water is lowered considerably in Norton Bay.

At **Moses Point** (*P. O.*), on the northwestern side of Norton Bay, food and water can be obtained and medical facilities are available. The village has a CAA radio station and landing field. Biweekly plane service is maintained with Anchorage. The Moses Point aviation radiobeacon, signal characteristic MOS, operating continuously on 263 kcs., has been found valuable as an aid to surface navigation.

Anchorage with hard bottom, good holding ground, is off the native village of **Elim** (*pop. 154 in 1950; P. O.*) in 4½ fathoms located on the following bearings: Center of **Mt. Kwiniuk** 273°, white house at Elim 326°, CAA towers 000°, air beacon 026°, Bald Head 059°, Cape Denbigh 123°. Use 60 fathoms of chain. The landing area is at

Iron Creek, approximately 2 miles from anchorage. Protection from easterly winds is found in the lee of **Reindeer Hills.**

Ice.—Weather Bureau records for Kwiniuk River at Moses Point show an average ice breakup the latter part of May and an average freezeup the latter part of October. See *Appendix* for tabular detail.

During the season the entrance to the **Koyuk River** is marked by about 10 red or black buoys, spars or gasoline drums and tins; the outer buoy is about 9 miles off the mouth of the river.

Cape Darby is the southern extremity of **Kwiktalik Mountain.** The cape is high and rounded terminating at the water in steep rocky bluffs. A light is maintained on the southernmost part of the cape from August 1 to November 1.

Rocky Point is a high bold promontory with irregular rocky cliffs. On the point is a **light (lat. 64°24′.0 N., long. 163°09′.0 W.)**, 175 feet above the water and visible 8 miles; it is maintained from August 1 to November 1.

Chart 9382.—Golovnin Bay, on the north side of Norton Sound, has its entrance between Cape Darby and Rocky Point, with a width of 10 miles. It extends in a general northerly direction for 12 miles to the entrance to Golovnin Lagoon. The east shore is high and bold, with occasional sand and gravel beaches. **Carolyn Island,** low and rocky, is marked by a light and lies 0.2 mile off the east shore, about 8 miles north of Cape Darby. The west shore for about 3 miles north of Rocky Point is high and bold, but beyond this is a low sand beach, with a prominent point about 5 miles north of Rocky Point. The head of the bay on the west side of the entrance to Golovnin Lagoon lies between a sandspit projecting from the eastern shore and a low sand island extending northward from the west shore and connected with it at low water. Good water is generally available on the west side of the bay during the navigable season, and vessels can approach close enough to obtain it expeditiously. The stream is about 200 yards south of a conspicuous white post and white cross on the cliff. Boats may be filled by gravity flow from a chute and hose. In 1932 the Coast Guard cutter *Northland* made an intensive survey of the ship anchorage off this stream. According to this survey, the 24-foot depth curve is about 400 yards offshore, outside of which is a gentle sloping bottom to the charted depths one mile offshore. Another stream is on the east shore of Golovnin Bay.

The tidal current in Golovnin Bay is chiefly diurnal. Off Carolyn Island it floods northward and ebbs southward with an average velocity at strength of about ½ knot.

Deep water can be carried close under Cape Darby and Rocky Point. Eastward of Rocky Point is an extensive middle ground on which the least depth found was 19½ feet; on its east edge it rises abruptly from 36 to 42 feet. With the exception of this middle ground, the bay is free from dangers south of the low point on the west shore, the deepest water being on the east side, and ranging from 66 feet close under Cape Darby to 24 feet 0.5 mile northwest of Carolyn Island. In the south part of the bay the high land may be approached closely, but off the low land the 18-foot curve is in places nearly 1 mile offshore.

The Bureau of Indian Affairs ship *North Star* reported, in August 1952, striking a submerged object in latitude 64°20′ N., longitude 163°06′ W., about 4 miles south-southeast of Rocky Point; the vessel was drawing about 21 feet.

In the north part of the bay an extensive shoal, with 4 to 8 feet, makes out in a

northeast direction from the west shore to within 0.8 mile of the east shore, its extremity lying about 2 miles 093° from the north point of South Spit on the south side of the entrance to Golovnin Lagoon. The channel leading to the entrance to Golovnin Lagoon lies on the eastern side of the bay, passing around the east end of the shoal and following the eastern shore at a distance of 0.4 to 0.7 mile, with an average width of 800 yards. The least depth in the channel is 13 feet at low water, but 15 feet has been taken in at high water. The diurnal range of the **tide** is about 2 feet, but this is influenced by the prevailing winds which have a tendency to bank up the water in heavy southerly weather and to lower it with northerly and northeasterly winds.

Lights.—From about August 1 to November 1, a light is shown from a small white house on the northeasterly shore of the bay, 3.2 miles southeastward from Golovin, and another light on the north end of **South Spit,** about 1 mile south of Golovin. The light formerly in the village has been moved to the end of the spit westward of Golovin. Carolyn Island is marked by a light placed on the middle of the island.

Anchorage.—A little westward of South Spit, in the entrance to Golovnin Lagoon, anchorage may be had in 36 to 42 feet, with protection from all winds. For vessels whose size prevents the use of this anchorage, the best is off the point on the west side of the bay in about 24 feet. This is unsafe in southerly weather, but is the most convenient for communicating with the head of the bay. By shifting anchorage from one side to the other in Golovnin Bay good shelter is found from easterly or southwest or westerly winds.

An anchorage with good holding ground in 42 feet is located on the following bearings: Rocky Point Light 253°, Cape Darby Light 153°, Carolyn Island Light 040° 1.5 miles distant, Golovnin Bay Light 358°. Use 60 fathoms of chain. Keep at least 1 mile south of Carolyn Island.

Golovin (*pop. 94 in 1950; P. O.*) on the north spit at the entrance to Golovnin Lagoon, is a distributing point for the mining district of the Fish River country. The village has a school, roadhouse, cold-storage plant, two salteries, several stores, and an airport.

Golovnin Lagoon is very shallow and is navigable for small vessels of 3½ feet draft to the mouth of the **Fish River,** which empties into the head of the sound. The channel through the sound is narrow and tortuous. **White Mountain** (*pop. 129 in 1950; P. O.*), on Fish River, is a fishing village with a school and a store.

During the season of navigation about 14 buoys are maintained to mark the channel over the flats in the approach to Fish River.

Ice.—Weather Bureau records for White Mountain show an average ice breakup the latter part of May and an average freezeup about mid-October. Records for Golovin show about the same date of breakup but freezeup is about 2 weeks later. See *Appendix* for tabular detail.

Chart 9380.—For about 22 miles, from Rocky Point to Topkok Head, the land is high and bold, in many places rising abruptly. Beyond this to Cape Nome the coast is low, with high land farther back. Immediately behind this low land is a large shoal lagoon with two small entrances, the west one called Port Safety. Between Rocky Point and Cape Nome the water is deep, the bottom regular, and by giving the shore a berth of 1 mile a depth of 6 fathoms or more will be found.

Topkok Head is 22 miles westward of Rocky Point, and is the first high land close

to the coast eastward of Cape Nome. Its seaward face rises abruptly from the water 586 feet and is a well-known and conspicuous landmark.

A yellow bluff, 572 feet high, on the east side of **Bluff,** about 6 miles eastward of Topkok Head, is conspicuous, but not as much so as Topkok Head.

Solomon (*pop. 93 in 1950; P. O.*) is a mining village at the mouth of **Solomon River,** 11 miles westward of Topkok Head and 17 miles eastward of Cape Nome. A railroad has been built up Solomon River to **Council** (*pop. 41 in 1950; P. O.*). Solomon has a store and roadhouse. It is the coast terminus and shipping point for Council. From a survey made in 1902, the depth on the bar at the entrance and inside Solomon River was 3 feet, but local knowledge is necessary to keep in the best water. A fuel oil tank is a good landmark. No lights are visible on shore from the anchorage.

An anchorage approximately 2 miles offshore in 8½ fathoms, hard gravel and sand bottom, is located on the following bearings: Cape Nome 254°, largest house in village 358°, Topkok Head 079°. Use 45 fathoms of chain. The only protection against heavy winds is to stand out seaward.

Ice.—Weather Bureau records for Solomon and Council show an average ice breakup about the third week in May and an average freezeup in late October. See *Appendix* for tabular detail.

Chart 9381.—Port Safety is a small anchorage for vessels of less than 7 feet draft; it is about 8 miles eastward of Cape Nome. The channel is narrow and has a depth of 7 feet. Small vessels can anchor in the narrow sloughs which lead between the flats inside the entrance.

From about August 1 to November 1 of each year a lighted range is maintained to mark the entrance channel to the harbor. The front range light is shown from a white wooden house and the rear range light from a white skeleton tower. Buoys mark the entrance during the season of navigation.

Chart 9380.—Cape Nome is a bluff, about 300 feet high, apparently 1 mile broad, and rounded down to the water on either side, where the land at the shore is low, with higher land farther back. The water off this cape is quite deep. The diurnal range of tide at Cape Nome is about 2 feet.

From Cape Nome to Cape Rodney the coast, except abreast of Sledge Island, is a comparatively straight stretch of low sand beach, with no projecting points, and higher land some distance back. Abreast of Sledge Island for a distance of several miles the hills slope down to the beach, giving this part of the coast the appearance of a point. The stretch of beach is broken by a number of small rivers, where mining is in progress. The entrances to **Nome,** Snake, **Penny,** and **Sinuk Rivers** have shifting bars, but there is generally water enough in the channel over these bars to permit boats of 3-foot draft to enter. When approaching the coast between Cape Nome and Sledge Island, the water shoals regularly and gradually until a depth of 5 fathoms is reached; inside this depth the bottom is irregular, especially near the mouths of the rivers.

Chart 9383.—Nome (*pop. 1,876 in 1950; P. O.*) is on the beach at the mouth of the Snake River, about 11 miles westward of Cape Nome. The harbor is a shallow, open roadstead. Large vessels anchor and the passengers and cargo are taken ashore in lighters.

The Federal improvement project for the inner harbor provides for two parallel jetties at the mouth of the **Snake River;** and a channel 8 feet deep at mean lower low water from Norton Sound through Snake River; to the mouth of **Bourbon** and **Dry Creeks** in the city of Nome, ending in a basin of similar depth 250 feet wide and 600 feet long; and revetting the banks of the river. Rapid shoaling occurs at the entrance, and a dredge operates continuously during the open season attempting to maintain the project depth. The controlling depth was 8 feet in June 1953.

With heavy surf, boats crossing the bar before entering between the jetties will ground and are liable to overturn. The outer end of each jetty is marked by a light which is maintained from August 1 to November 15. The channel is also marked during that period by a lighted range.

The general anchorage for deep-draft vessels is in 7 to 8 fathoms about 1 mile from the beach abreast of the town. Vessels of less draft anchor in about 6 fathoms a little closer to the beach. In strong southerly winds vessels should anchor farther offshore.

Tides.—The diurnal range of the tide is 1.6 feet. The water levels are influenced more by wind than tide, an offshore wind sometimes causing a level of from 2 to 3 feet below mean lower low water for days at a time and a level of 14 feet above mean lower low water having been noted as a result of storms.

Currents.—About 2 miles offshore in Nome roadstead the tidal current averages about 1 knot at times of strength. It is chiefly diurnal. The flood sets eastward and the ebb northwestward. Strengths of flood occur approximately 5 hours before higher high water at St. Michael and strengths of ebb 2 hours before lower low water.

Weather.—Prevailing winds are from the southwest in the summer and from the northeast in the winter. Gales come from all quadrants. On the average, 5 days a month are foggy. The fogs are most frequent in June and July. An average of 200 days a year are cloudy.

Ice.—Weather Bureau records for Nome show an average ice breakup in late May and an average freezeup the second week in November; see *Appendix* for tabular detail. Navigation is difficult from early December to early June and is usually suspended from late December to mid-May.

Nome is a **Customs port of entry** at which marine documents are issued. The **United States Public Health Service** maintains an outpatient office at the hospital in Nome.

Nome is the headquarters of the **Second Judicial Division** and the metropolis of northwestern Alaska. The Federal Building houses the post office and many other Federal agencies.

Facilities—Traffic using the dredged channel is handled over the revetment, where transfer facilities that are open to public use have been installed by a lighterage company.

Supplies.—Fresh water and some provisions can be obtained. Diesel oil is not available in large quantities.

Communications.—Nome has radio and telegraphic communications with other parts of the Territory and the States. During the season of navigation, ships from Seattle bring in freight. Airplanes carry passengers, mail, and freight to and from Nome the year around. From Nome a tramway extends to Taylor, 100 miles distant.

The Nome aviation radiobeacon, signal characteristic MFK, operating continuously on 239 kcs., has been found useful as an aid to surface navigation.

Considerable hydraulic gold mining is carried on in the country back of Nome, but the placer mining for which the Nome beach was famous has largely been abandoned.

Chart 9380.—Sledge Island, about 31 miles west of Cape Nome and 4.5 miles offshore, is a rocky flat-topped island except near the southern extremity where the highest point, a 760-foot jagged summit, exists. Ruins of abandoned native habitations are located on the sandspit on the northern end of the island and along the beach about midway of the eastern side. These are probably ruins of the former village of **Aziak.** Except for the sandspit, the shores of the island are rocky and steep.

Sledge Island Light (lat. 64°30′.0 N., long. 166°11′.0 W.), 28 feet above the water and visible 8 miles, is shown from a small white house on the north point of the island. Obscured from 326° to 080°, the light is maintained from August 1 to November 1.

The island may be safely approached from any direction except the east, where the exposed wreck of a cargo ship is aground on a rock 1.1 miles east of the light. The area adjacent to the wreck is dangerous to approach because of submerged portions of the vessel which have been carried away by action of waves and ice. Small vessels seeking shelter close in on the north side are cautioned to stay clear of the submerged bar making off northwesterly from the spit. A depth of 6½ fathoms has been found about 3.7 miles offshore and about 7.5 miles eastward from Sledge Island. The passage between Sledge Island and the mainland has been surveyed. Although the bottom was found to be irregular, it is safe for navigation by vessels of normal draft. Tide rips have been observed in the passage and on the east side of the island during heavy weather.

With heavy southerly winds, vessels at anchor in the Nome roadstead usually seek shelter behind Sledge Island.

Currents.—Current observations were made in the passage between Sledge Island and the mainland for a period of 6 days in July 1950. The tidal current is diurnal with average velocity at strength of northwestward current of 1 knot and average velocity at strength of southeastward current of ½ knot. Maximum velocity observed during the period of the observations was about 1½ knots setting northwestward. For predicted currents, see the *Current Tables.* Vessels when in this vicinity should give special attention to the currents. Above Cape Rodney there is no perceptible current southward or eastward; the general set is northward and westward.

From **Cape Rodney** to **Cape Douglas** the shore is a low sand beach, and the high land is farther inland from the beach than eastward of Cape Rodney. This coast is seldom approached close-to; the water is comparatively shallow and dangerous shoals and ledges are found between Cape Douglas and Point Spencer.

Vessels are cautioned to exercise care when approaching the shore south of Cape Rodney and to give the shore off Cape Douglas a berth of at least 15 miles; an irregular bottom with depths of 6 fathoms has been found by reconnaissance lines off this cape with indications of lesser depths inshore. From a point about 8 miles north of Cape Douglas the area to the northward, covering the approaches to Port Clarence, has been surveyed. A shoal of 27 feet in surrounding depths of 6 fathoms was found at latitude 65°11′.8 N., longitude 167°08′.8 W. To the north-northeast approximately 1.2 miles a shoal of 25 feet was found in latitude 65°13′.1 N., longitude 167°07′.9 W. The adja-

cent area has shoals of slightly greater depth, and from this area to the north-northwest a long shoal with slightly less than 6 fathoms extends to latitude 65°18′.1 N., longitude 167°17′.0 W., thence sloping into deeper water to the northward. Farther inshore in latitude 65°09′.1 N., longitude 167°02′.0 W. is a 25-foot shoal. About 1.2 miles inshore to the eastward is a 10-foot shoal in a surrounding foul area.

Cape Rodney Light (lat. 64°39′.6 N., long. 166°24′.0 W.), 15 feet above the water and visible 8 miles, is shown from a white house on the point. The light is maintained from August 1 to November 1.

King Island, 1,196 feet high, is about 33 miles west of Cape Douglas. It is about 2 miles square, is rugged and rocky, and has nearly perpendicular cliffs, deep water, and generally rocky bottom on all sides. **Ukivok** is a native village on the south side, the houses being built in the sides of the cliffs some distance above the water. Off the village, but close inshore, vessels may anchor in about 15 fathoms, muddy bottom, with good protection from northwest winds. In clear weather the island is an excellent landfall for vessels coming from southward and bound to Port Clarence.

Cape York is a high rocky nearly vertical cliff, with numerous ravines and a range of high rugged mountains immediately back of it. The cliff is about 10 to 12 miles in extent. There is no distinct promontory and no exact point along the cliff that can be defined as the cape.

The area from Cape York to Port Clarence has been surveyed with no depth less than 6 fathoms being found at a distance of 1.5 miles from the shore. The general depths fall off to a submarine valley about 2 miles offshore, extending eastward, with depths of not less than 10 fathoms, to within 6 miles of the entrance to Port Clarence. A rock is reported about 0.8 mile from the shore southeastward of **York** village.

Between Cape York and the high land of Cape Prince of Wales is a bight, with comparatively low rolling land back of it, extending across the peninsula to the northern shore. The beach is low and the water shoals gradually when approaching the shore. The eastern part of the bight is slightly shoaler than the western part; about 6 fathoms will be found 1 mile offshore; in the western part of the bight 8 fathoms will be found at the same distance from the beach. The native village of **Pelazuk** is on the eastern shore of the bight. When standing westward alongshore, and when abreast of Cape Mountain, the water deepens suddenly to 20 fathoms.

Chart 9385.—Port Clarence, a large bay indenting the Seward Peninsula about 35 miles southeastward of Cape Prince of Wales, provides the only good harbor close to Bering Strait. The bay is formed by a low sandspit which extends from the mainland in a northerly direction for about 10 miles to Point Spencer. The highest elevation on the spit is a round knoll near the southern end, 24 feet above sea level. This knoll is inconspicuous except at close range. Near Point Spencer, at the broad portion of the spit, are numerous buildings of an abandoned air station, the most prominent of which is a control tower visible offshore for about 10 miles. Except for the light at **Point Spencer,** maintained from August 1 to November 1, there are no conspicuous landmarks other than these to aid the navigator in making the entrance into Port Clarence.

The channel between Point Spencer and **Point Jackson** on the north shore is 4 miles wide, free of dangers, and with depths of 42 to 48 feet. The northern half of the bay has a general depth of 42 feet as close as 1 mile from shore. There are no dangers, and depths shoal gradually to the beach. The southern half of the bay shoals gradually

to the bars and flats along the low shoreline at the south end. Along the western side of the bay the sandspit may be approached fairly close except for the shoal 2 miles south of Point Spencer which makes into the bay from the spit with depths of 15 feet 1 mile off. To the eastward the water shoals to the entrance to **Grantley Harbor,** which is connected with Port Clarence by a narrow channel marked by a light on the north side of the entrance and buoys during the season of navigation. These buoys are privately maintained and are shifted as conditions warrant. The controlling depth in the channel was not more than 10 feet in 1950. Small tide rips have been observed.

Anchorages.—Anchorage with good holding ground is available anywhere in Port Clarence. Shallow-draft vessels will find greater protection in Grantley Harbor.

Directions.—In approaching Port Clarence from the south in fog or misty weather, the low sand and shingle spit forming the west side of Port Clarence is not visible until close-to. The best procedure is to make a landfall on King Island from the eastward keeping in depths greater than 60 feet to avoid the foul ground northward from Cape Rodney. From King Island a course may be set a little eastward of Cape York to within 3 miles of the coast, thence on course **096°** through the entrance into Port Clarence, where good anchorage may be obtained.

Tides.—The mean range of the tide in Port Clarence is 2 feet. This condition, however, is subject to radical changes due to meteorological conditions. Moderate to strong southerly or southwesterly winds of several days' duration will raise the height of the tide in the area without appreciably increasing the range. This is actually a datum change and is appreciable along the entire south coast of the Seward Peninsula. It is reported that continued strong northerly winds produce a lowered datum but to a lesser extent.

Currents.—Along the outside coast west of Point Spencer and south of Cape York there is a general westerly set of 1 to 2 knots. This velocity is appreciably affected by direction, force, and duration of the wind.

Current observations in the entrance to Port Clarence indicate that the velocity seldom exceeds ½ knot 2 to 3 miles north of Point Spencer. One mile east of the point, velocities up to 1 knot were observed, the larger velocities generally setting westward or northward.

Weather.—The weather, in general, is better than in the Aleutian Island area, with less fog and fewer bad storms during the short summer navigation season. Fog and high winds are generally of short duration so that it is seldom that planes cannot land at Teller at least once a week. The winter weather is generally better than the summer for plane service, as there is little or no fog during cold weather.

The first surface fog appears after the spring break-up and is of an intermittent character, generally local, and forming and disappearing at intervals as short as one-half hour. As the season advances, the fog is more prevalent, of greater density and longer duration, but in general it offers no serious obstacle to surface navigation.

Ice.—Weather Bureau records for Grantley Harbor at Teller show an average ice breakup in early June and an average freezeup in early November. See *Appendix* for tabular detail.

Teller Mission (Teller Reindeer Station) (*pop. 109 in 1950*) is on the north shore of Point Clarence about 4 miles east of Point Johnson.

Teller (*Pop. 160 in 1950; P. O.*) is a small village about 4 miles northeast of **Cape Riley** and is located on the base of the southern spit at the entrance to Grantley Harbor.

There are a school and a mission, with two general merchandise stores and a suboffice and warehouse of the Loman Commercial Co. at Teller. An unsurfaced landing strip, about 1,000 feet long, lies in a north-south direction along the spit north of the town; a shorter, grass-covered strip lies across the base of the spit south of the town. The latter strip is used only when cross winds prevent landing on the main strip. All mail service is by air on a biweekly schedule, weather permitting.

Docking facilities.—Two ramp-type docks furnish facilities for unloading supplies from lighters and shallow-draft vessels on the Grantley Harbor side. Freighters must anchor well offshore in Port Clarence and lighter cargo to Teller.

Supplies.—Food supplies, coal, diesel oil, lubricating oil, and gasoline may be obtained in limited quantities from the two stores. Loading of oils and gasoline is by drum only. There is no connection for obtaining fresh water. That is available at **Fox Creek,** about 3 miles south of **Cape Riley;** shallow-draft vessels may safely approach the beach there closely enough to obtain water by pumping through hose from the creek mouth. Larger craft may anchor 0.7 mile offshore in 25 to 30 feet of water and boat fresh water from the beach.

Communications.—A commercial radiophone station is operated at the Teller Commercial Company store. Schedules with Nome and Wales are maintained. Call letters of the station, which operates on a frequency of 2474 kilocycles, are KANJ. Airway weather information is broadcast on schedule from this station.

Transportation.—Passenger and light freight service is principally by plane, but occasional freighters and tugs with lighters furnish transportation for heavier supplies during the short navigation season.

Chart 9380.—Imuruk Basin is a shallow body of water eastward of Grantley Harbor; the two are connected by narrow, difficult **Tuksuk Channel.**

Kuzitrin River rises in the Seward Peninsula and flows in a westerly direction about 75 miles to Imuruk Basin. The anchorage for oceangoing vessels is in Port Clarence; the head of navigation for powerboats and other vessels up to 12 feet in draft is the mouth of Kuzitrin River. Shallow-draft lighters can navigate the Kuzitrin for about 15 miles to **Shelton.** The river is open from June to October.

Cape Prince of Wales (lat. 65°38′ N., long. 168°07′ W.) is on the east side of **Bering Strait** and is the western extremity of **Seward Peninsula.** Immediately back of the steep rocky shores on the southwest side of the cape are mountains that rise to heights of about 2,300 feet. A low sandy beach extends northward about 4 miles from the mountains, then turns northeastward toward Shishmaref Inlet.

Wales (*pop. 141 in 1950; P. O.*), at the south end of the sand beach and close to the mountains, is a native village with about 60 small buildings, including a mission, a school, and a store. Small planes carrying mail and a few passengers land on the beach in front of the village about once a week. Radio communication is available through the CAA station in the village. A **light** is maintained from August 1 to November 1 on the beach 2 miles north of Wales.

Ice.—Weather Bureau records for Bering Strait at Wales show an average ice breakup in early June and an average freezeup about the first of December; see *Appendix* for tabular detail. Navigation is difficult from early December to early June and is usually suspended from late December through April.

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Approaching from southeastward and heading northward through Bering Strait, Cape Prince of Wales should be rounded at a distance of 3 miles. When 2 miles beyond the light, a 000° course will clear Prince of Wales Shoal.

§ 207.804 Bering Strait; Alaska; naval restricted area off Cape Prince of Wales—(a) *The area.* An area 2,000 feet wide extending from a point on Cape Prince of Wales marked by a triangular cable marker located approximately midway between the village of Wales and Cape Prince of Wales Light to a point 4 statute miles due west of the cable marker with the axis of the area passing through the two points.

(b) *The regulations.* (1) No vessel shall anchor in the restricted area described in paragraph (a) of this section.

(2) Dragging of anchors in or across the restricted area is prohibited and no object attached to a vessel shall be placed on or near the bottom.

(3) The regulations in this section shall be enforced by the Commandant, Seventeenth Naval District, Seattle, Washington, and such agencies as he may designate. *(FR–12/10/53)*

Tin City is a small abandoned mining community 5 miles southeastward of Wales. The bight off Tin City affords northerly-weather anchorage in depths of 10 fathoms 0.8 mile from the beach. West or southwesterly winds may necessitate shifting to Port Clarence for shelter.

Prince of Wales Shoal seems to be a ridge of sand which extends about 008° from the western extremity of the cape to a distance of about 35 miles. In 1925 the Coast Guard cutter *Bear* found that the shoal extended to about latitude 66°10′. The depth of water on the shoal is not definitely known, but numerous cases are reported of whaling vessels having struck on it at distances supposed to be 10 or 15 miles from the cape.

The vessel *Good Hope* was wrecked on Prince of Wales Shoal, about 10 miles northward of the cape, during a high wind storm.

The western face of the shoal is very steep, the depth decreasing rapidly from 20 fathoms. It is recommended that vessels give this shoal a wide berth, and not haul eastward when coming from southward until at a distance of 35 to 40 miles beyond the cape. Vessels bound southward through the strait should be careful not to fall too far eastward and be caught between the shoal and the northern shore of Seward Peninsula, especially sailing vessels with northerly or northeasterly winds. Southbound from Point Hope a course laid for Cape Dezhneva clears the shoals. As Cape Dezhneva is high land it gives a better landfall than the Diomedes, which are usually in fog.

No buoys have been established to mark Prince of Wales Shoal on account of its indefinite limits; moreover, the remoteness of the locality and ice conditions make it impracticable to do so. Navigators are obliged therefore to fix their position by aid of the distant land features.

A day of half-hourly **current** observations, in July, about 9 miles west of Cape Prince of Wales showed a northward current with a velocity that varied between 1 and 1½ knots. Five days of similar observations, in early September, 3.5 miles southwest of the cape showed velocities ranging from 0 to 3 knots; the average was 1¼ knots setting in a northwest by west direction. The observed current appeared to be entirely nontidal.

Vessels **anchoring** off the village of Wales should approach only from the southwestward. The depths decrease rapidly from 13 fathoms, and anchorage should not be attempted in less than 7 fathoms. Care should be taken to avoid being swept northward past the cape by the current and on to Prince of Wales Shoal. Recommended anchor-

age is in depths of 10 fathoms 0.6 mile westward of the north end of the sharp, rocky bluffs.

Fairway Rock (**lat. 65°37′.6 N., long. 168°44′.4 W.**), about 17 miles west of Cape Prince of Wales, is a square-headed, steep-sided rocky island 534 feet high. The bottom is steep-to on all sides, and there are no outlying dangers.

The **Diomede Islands,** about midway between Cape Prince of Wales and the Russian coast, have nearly perpendicular sides and are without beaches; the tops of the islands are broken tablelands. The waters around the islands are deep, the bottom is mostly rocky, and anchorage is poor.

Big Diomede Island (**Russia**) rises to a height of 1,667 feet; close to shore on the west side are some bare rocks. **Little Diomede Island** (**United States**), 2.1 miles to the eastward, has an elevation of 1,309 feet.

Ignaluk (*pop. 103 in 1950*), the only village on Little Diomede Island, is just north of the sandspit midway along the western shore. A reef extends from the sandspit toward the south end of Big Diomede Island. A passage is reported between the islands but it should not be attempted by large vessels.

Vessels approaching Little Diomede Island from the south and east may run close along the south shore, keeping in depths greater than 14 fathoms until the village is sighted, and anchor south of the sandspit. Vessels also have anchored in depths of 17 fathoms north of the sandspit on bearings 171° to the spit, 082° to the left tangent of Little Diomede Island, and 338° to the right tangent of Big Diomede Island; the approach was made along the north shore of Little Diomede Island at distances decreasing from 1 mile to 0.4 mile.

Chart 9400.—Cape Dezheneva (**Russia**), 46 miles northwest by west from Cape Prince of Wales, is a bold, rugged headland, 2,638 feet high, steep on all sides, and with deep water close-to. When seen from a distance, the headland resembles an island because of the low, marshy land back of it. Anchorage, with good protection from offshore winds, can be found in depths of 8 fathoms both north and south of the meeting place of the lowlands and the headland. Anchorage is also possible in depths of 10 fathoms, muddy bottom, off the outermost face of the cape.

From Cape Prince of Wales to Shishmaref Inlet, the coast is a low sand beach, with lagoons and marshes back of it. On a clear day the mountains in the interior can be seen, **Ear Mountain** and **Potato Mountain** being distinguishable.

Shishmaref Inlet (**lat. 66°10′ N., long. 165°50′ W.**), a large inlet extending into the land, has been explored by prospectors. Across its mouth is **Sarichef Island,** narrow and about 7 miles long. A light has been established on Sarichef Island, southwest side of entrance to Shishmaref Inlet, about 0.5 mile from the northeast end of the island. The light, 56 feet above the water and visible 8 miles, is shown from the Trading Post Building and is one of the best landmarks along the beach. The light is maintained from August 1 to April 30. The village of **Shishmaref** (*pop. 194 in 1950; P. O.*) lies about midway the length of the island. It is the most important settlement along this section of the coast. The village has a school, mission, fox farm, and store; of these the schoolhouse is the most conspicuous. Anchorage in 5 fathoms can be obtained with the tower bearing 115°, distant about 1.3 miles. The navigable

inlet is around the northeast end of the island. A dangerous bar makes out about 0.5 mile westward of the north entrance point.

Ice.—Weather Bureau records for Shishmaref show an average ice breakup in the latter part of June and an average freezeup about the second week in November; see *Appendix* for tabular detail. Navigation is difficult from the first of December until late June and usually is suspended from late December until early June.

From Shishmaref Inlet to Cape Espenberg, the coast is higher than that westward of the inlet, and is a line of low bluffs and small sand dunes terminating at Cape Espenberg in a very low spit, which is made out with difficulty. A number of small native settlements are scattered along this coast from Cape Prince of Wales to Cape Espenberg.

Northwest Corner Light (lat. 66°35′ N., long. 164°25′ W.) is on the coast about 18 miles west of Cape Espenberg. The light is exhibited from a small white house and is 100 feet above the water; it is maintained from August 1 to November 1.

Cape Espenberg (lat. 66°33′ N., long. 163°36′ W.) is marked by a light, shown from a white wooden house, which is maintained from August 1 to November 1 of each year.

Kotzebue Sound, northward of Seward Peninsula, is about 30 miles wide at its entrance between Cape Espenberg and Cape Krusenstern, 22 miles from Cape Espenberg to the shoal water off the mouth of Hotham Inlet, and extends about 30 miles south of Cape Espenberg. Except for the shoal off the mouth of Hotham Inlet, the depths throughout the sound are very uniform, varying from 7 to 9 fathoms. From Cape Espenberg the west shore of the sound is shallow some distance from the land, and vessels should approach it with care. The land on this side of the sound is generally low. A small but conspicuous hill is about halfway between the cape and the southern shore. On the south side of the sound the land is higher, more rocky, and of a bolder character than the west shore. Under water, also, it is bold, and has soundings of 4 and 5 fathoms quite close to the promontories. It is recommended that constant use of the hand lead and fathometer be made in all areas in Kotzebue Sound in order to prevent standing in too close to shore.

Chamisso Island, near the head of Kotzebue Sound, is in the entrance to Eschscholtz Bay. The island, which is about 1 mile in length, is 2.5 miles south of Choris Peninsula, is tundra-covered and has an elevation of about 250 feet. Bluffs of earth and gray rock that rim the island vary in height from 80 feet at the northwest end to 15 feet at the south end. The shores are mostly broken boulders separated by numerous short stretches of sand beach; the high-water line is at the foot of the bluffs in the rocky part. Along the north and east sides of the island, shoals extend 0.3 to 0.5 mile from the shore.

Puffin Island, which lies 0.3 mile northwest of Chamisso Island, is small, has steep rocky shores, and the high-water line is at the base of the rocks. South of Puffin Island are two conspicuous rocks. The waters between Puffin Island and Chamisso Island are foul. The waters on the north and west sides of Puffin Island are deep.

Chamisso Anchorage, between Chamisso Island and Choris Peninsula, is the only place on the Arctic coast of Alaska that can be called a harbor. By shifting anchorage 0.5 mile, good shelter can be found from all winds. Off Choris Peninsula shoals extend toward Chamisso Island fully 1 mile. The deepest water is close to Puffin Island. In approaching the anchorage give **Point Garnet,** the southwest extremity of Choris Peninsula, a berth of 1 mile, and stand down well toward Puffin Island before hauling

in. Anchor with Puffin Island bearing 203° at a distance not greater than 0.8 mile, in 8 fathoms, muddy bottom.

Early in the season fresh water can be obtained on Chamisso Island and on the east side of Choris Peninsula.

Kiwalik Lagoon, on the south side of Kotzebue Sound opposite Chamisso Island, is shallow and has a mud bottom. A narrow, crooked channel extends through the lagoon to **Kiwalik River,** navigation of which requires local knowledge. Shallow-draft boats can operate in the lagoon during periods of high water, but the lagoon is almost dry when the water is lowered by adverse winds.

Kiwalik is a native settlement on the gravel spit on the west side of the entrance to the lagoon. The village has no stores. The landing strip at Kiwalik is composed of loose gravel and shingle, and will accommodate small planes only. The strip is covered with scattered grass and is very rough. There are no radio communications. The diurnal range of **tide** is 2¾ feet at Kiwalik.

Candle (*pop. 105 in 1950; P. O.*), which is about 8 miles upriver from Kiwalik, has stores and a school. A United States deputy marshal is stationed in the village. A privately owned radio station is operated in Candle. A good gravel landing strip is maintained by the gold-mining company that operates in the village. Supplies are boated up Kiwalik River to Candle.

Deering (*pop. 174 in 1950; P. O.*) is a town on the south side of Kotzebue Sound at the mouth of the **Inmachuk River,** about 22 miles westward from Kiwalik. Two stores and a school are here, and reindeer meat can be procured. There is telephone communication with Candle. A firm at Deering has a lighterage outfit and will discharge vessels at various points in the sound.

An anchorage in 5½ fathoms is located on the following true bearings: Deering 180°, **Cape Deceit** 270°.

Eschscholtz Bay, east of Chamisso Island and Choris Peninsula and north of **Spafarief Bay,** is generally shoal. The soundings decrease gradually from Chamisso Anchorage to 2½ fathoms at 2 miles off the point which lies 4 miles west of **Elephant Point.** East of this point the shoaling continues, and this part of the bay is only navigable for small boats. The shore at the head of the bay is difficult of access on account of long, muddy flats, which at low water are bare in some places 0.3 mile from the beach. It is probable that the whole bay is gradually filling up, and vessels going east of Chamisso Anchorage should proceed with caution. **Buckland River,** which empties into the head of Eschscholtz Bay, is large but shallow and has little, if any, water traffic. The native village of **Buckland** is near the mouth of the river.

Elephant Point (*pop. 108 in 1950*) is a native settlement on the spit of the same name. The village has permanent frame structures, a native school, and a store which is operated only during the summer months. The village also has a reindeer station.

Choris Peninsula extends southward for 7 miles from **Baldwin Peninsula** and restricts the entrance to Eschscholtz Bay. On Choris Peninsula are two hills with elevations of about 370 feet; the northern hill is joined to Baldwin Peninsula by a narrow neck of land about 20 feet in elevation. The southern end of Choris Peninsula is more than 2 miles in width and is the widest part of the entire feature; the bluffs are 50 to 95 feet high, and there are projecting rock ledges. Northward of Choris Peninsula, Baldwin Peninsula is low for some distance, and then rises to low bluffs which continue

to Hotham Inlet. These bluffs are composed of ice and frozen mud, which is gradually melting and sliding down, making deep furrows all along their face.

Cape Blossom (lat. 66°43′ N., long. 162°32′ W.) is a distinctly marked point in this line of bluffs, which are highest at the cape and slope to either side. A **light,** 200 feet above the water and shown from a small white house, has been established on Cape Blossom.

The bottom of this side of the sound is very even southward of Cape Blossom at a distance of about 5 miles from the land; but northward of the cape a shoal, with very little water on it, extends 8 to 10 miles off the land from the mouth of Hotham Inlet, and south to within 2 miles of the latitude of Cape Blossom. This shoal is very dangerous, as the soundings give short warnings of its proximity; the distance from the shore cannot be judged under ordinary conditions, and there are no good landmarks.

Kotzebue (*pop. 623 in 1950; P. O.*) is a town at the entrance to Hotham Inlet. Vessels of less than 6-foot draft can reach the town if they know the channel, which is shifting and hard to follow. During the season of navigation buoys are planted, but they are hard to pick up and cannot be relied upon. A pilot can be obtained at Kotzebue where there is an Army radio station.

Vessels of deep draft approach the town as closely as possible and lighter freight ashore in boats. A mail launch from Nome calls here during the summer months. During the winter, mail comes in overland by dog teams.

Kotzebue is the central distributing point for the gold-mining industry along the Kobuk River. There is a small wharf at the town, and small launches can obtain good shelter nearby. Kotzebue has a school, two missions, four stores, and three large fur farms. A deputy marshal is stationed here.

There are many herds of reindeer in this locality, and meat in any quantity can be obtained. The industry has suffered from lack of transportation to the States.

Besides the waterborne trade passing through Kotzebue, the settlement is also a center for air traffic. Scheduled flights and charter planes operate from runways near the village. Supplies ordinarily are quite short from early spring until the annual ship arrives about the middle of August. The Indian Service maintains a hospital at Kotzebue.

Ice.—Weather Bureau records for Kotzebue Sound at Kotzebue show an average ice breakup about the last of May and an average freezeup in the latter part of October; see *Appendix* for tabular detail. Navigation is difficult from late October to the latter part of June and usually is suspended from the second week in November to mid-June.

The general anchorage in this vicinity is off Cape Blossom, as it is the nearest point from which communication can be had with Hotham Inlet. In approaching the cape, it should not be brought to bear southward of 090° until in the vicinity of the anchorage. Anchor in 5 fathoms with the cape bearing between 090° and 102°, distant 3 miles. This anchorage is protected from northerly and easterly winds.

It is reported that boating at the anchorage is very unreliable as the wind will increase to 25 or 30 miles, causing a choppy sea in a few minutes. The trip by small boat from the anchorage to the town of Kotzebue is about 15 miles, and over many sand bars subject to the continuous shifting. Local knowledge should be obtained.

The coast from Cape Blossom to the mouth of Hotham Inlet is the place of rendezvous for the natives of the surrounding country for the purpose of fishing and trading. The coast natives from Cape Prince of Wales, including the Diomedes and

King Island, to Point Hope, assemble here about the last of July to meet those who come down the large rivers from the interior.

Current.—At the anchorage about 6 miles west of Cape Blossom the average velocity of the tidal current at strength is about ½ knot. The flood sets southeastward and the ebb northwestward. The strengths of the flood and ebb occur about 50 minutes later than the times of low water and high water, respectively, at Kiwalik. Observations at this location show a northwestward nontidal flow which at times has sufficient velocity to overcome the flood of the tidal current and produce a continuous northwestward current of varying velocity for days at a time. This northwestward flow attains maximum velocities of 1 to 2 knots at times of ebb strength of the tidal current.

Hotham Inlet, making in from the north side of Kotzebue Sound, is about 35 miles in length and 4 to 8 miles in width. Its general trend is southeast; its water is little influenced by tides, but a prolonged southeast wind causes a low stage. The entrance is obstructed by vast mud flats and sandbars, some of which are bare at low water. In the inlet proper the channel in 1884 had a depth of 3 to 7 fathoms for a distance of 20 miles. There are three large rivers emptying into the inlet. No landing can be made at many places in the inlet on account of extensive mud flats. The water of Hotham Inlet is fresh because of the near absence of any eastward current. The inlet is known locally as **Kobuk Lake.**

Noatak River, joining it at the north, has numerous rapids, and is not navigable for any distance for boats larger than native canoes. The natives portage from the headwaters of this river to Chipp River, and thus to the Arctic Ocean east of Point Barrow. The native village of **Noatak** (*pop. 326 in 1950; P. O.*) is on the lower part of Noatak River.

Kobuk River empties at the east side of the inlet by many mouths, off which shoals with 2 to 4 feet extend far out into the inlet. In crossing the bar, which is indicated by drift lodged on the shoals, it is difficult to find a channel, the one generally used being known as the **Middle Mouth.** The delta from the inlet is about 45 miles long and very difficult to navigate, but when fairly between the banks of the river there is comparatively deep water. In 1898 a large number of prospectors were attracted to the region of Hotham. Two stern-wheel steamers were used in transporting their supplies up Kobuk River, and it is said that these steamers ascended the river 200 miles. The current in the river was found very strong, running at some points with a velocity of 5 or 6 miles an hour. The current is dangerous for small boats; eight men lost their lives in 1898 while boating their provisions up the river. The natives portage from the headwaters of the Kobuk River to the Koyukuk River, a branch of the Yukon.

Selawik Lake is the prolongation of the head of Hotham Inlet eastward of **Attiunik Point;** it is about 50 miles long and 20 miles wide, and a depth of 2 fathoms can be taken around the lake by giving the shore a good berth. It has a large river, **Selawik River,** emptying into it at its head, the entrance of which is obstructed by mud flats extending 0.8 mile from the shore, through which a depth of 12 feet could be carried, in 1884, into the westernmost outlet of the river into the lake. The native village of **Selawik** (*pop. 273 in 1950; P. O.*), at the mouth of the river, has a school and a mission.

Noorvik (*pop. 248 in 1950; P. O.*), on Kobuk River, has a hospital for natives. **Kiana** (*pop. 181 in 1950; P. O.*), at the junction of the Kobuk River and **Squirrel River,** is a supply depot and transfer point for mining camps up the river. It has a school and three stores.

At the head of navigation on Kobuk River are **Kobuk** (*pop. 38 in 1950; P. O.*) and **Shungnak** (*pop. 141 in 1950; P. O.*). Shungnak has a school and a mission.

From Hotham Inlet to Cape Krusenstern the coast is a low beach. The shoal water from the mouth of the inlet extends nearly halfway to the cape; the edge of the shoal is steep, and should be approached carefully. From where the shoal joins the land to Cape Krusenstern there is good water close in, with regular soundings.

Back of **Cape Krusenstern (lat. 67°07′ N., long. 163°46′ W.)** is a high, prominent range of mountains, which can be seen at a long distance. On nearer approach the mountains are seen to fall away to the cape in a series of steps, and in shaping a course into the sound these cliffs, or steps, must not be mistaken for the cape, which is a low point extending about 3 miles westward of them. A shoal extends about 2 miles westward and northward off the point of the cape.

From Cape Krusenstern to Cape Seppings the coast is a low, shingle beach, back of which is a series of lagoons which discharge through small, shallow openings. The high land of Cape Krusenstern extends along this coast some distance inland, terminating in the **Mulgrave Hills,** about 30 miles northward. After passing Mulgrave Hills the land is an extensive plain until in the vicinity of **Cape Seppings,** which is about 62 miles northwest of Cape Krusenstern. At Cape Seppings the mountains are closer to the coast and slope down to the water. Cape Seppings is not a distinctive point, and it is difficult to determine the feature to which the name should be applied.

Along this coast are numerous Eskimo camp sites which are used only during the hunting and fishing season. Locations of these sites may vary as much as several miles from year to year and should not be relied upon for an accurate check of position.

Kivalina (*pop. 117 in 1950; P. O.*), a small native village about 42 miles north-northwest of Cape Krusenstern, is on the north side of the southerly entrance to **Kivalina Lagoon.** The village has a Native Service school, a radio, and a store. Food and fuel are available in small quantities after the arrival of the supply ship in late summer, but usually only enough supplies are freighted in for the needs of the village.

Good anchorage is available for small craft along the inner side of the village, where the channel bears in close to shore. On either side of the inlet are shoals that extend about 0.2 mile offshore and, as they change considerably, entrance should not be attempted without local information as to conditions. Two buildings in Kivalina that should be easily recognized from seaward are the schoolhouse about 200 yards north of the inlet and a two-story dwelling at the north end of the settlement.

Ice.—Weather Bureau records for Kivalina show an average ice breakup in the latter part of May and an average freezeup in the latter part of October. See *Appendix* for tabular detail.

At **Cape Thompson,** about 80 miles northwest of Cape Krusenstern, the mountains drop directly to the water in a series of steep bluffs and cliffs about 500 feet high that extend for a distance of 6 miles; the name is applied to the entire series. Thousands of sea birds nest along the bluffs, and the area is the main source of fresh eggs for the Eskimo in early summer.

The coast is without distinct promontories. About midway along the Cape Thompson cliffs is a rugged mountain face that has at its southern end a distinct series of strata in an irregular semicircle. In the ravine south of this point is a small stream from which fresh water can be easily obtained. Directly off the stream, anchorage can

be had in depths of 5 fathoms, sandy bottom. At other places along the cliffs the bottom is mostly rocky.

In the bight 1 mile north of Cape Thompson, the water is fairly deep close to shore and remains calm in the severest northerly and easterly storms. Good anchorage, with sand bottom, is available for small craft. A 69-ton vessel has been brought to within 75 yards of the shore without grounding. Good water can be obtained from any of several streams.

From Cape Thompson the mountains continue northward to Cape Lisburne, while the coast curves northwestward and westward to Point Hope.

Point Hope (lat. 68°21′ N., long. 166°50′ W.) is the western extremity of a low tongue of land which projects almost 16 miles from the general line of the coast mountain range. It has a steep shingle beach, and its surface is broken by a number of lagoons. The largest of these, **Marryatt Inlet,** has its entrance on the north side, close to where the coast trends northward, and a draft of 10 feet can be carried through the entrance. For a number of years small schooners have been using this inlet as a place to winter. Those not familiar should sound out the channel before entering. In the first of the season, when the ice breaks in the inlet, there is a strong current running out and the moving ice is more or less dangerous.

Shoal water extends westward from the point and the 6-fathom curve projects out about 1 mile from the point in a westerly direction.

The outer end of Point Hope is marked by a light, shown from a white slatted tripod, which is maintained from August 1 to May 1 of each year.

The village of **Point Hope** (*pop. 264 in 1950; P. O.*), the most important settlement along this part of the coast, has a Native Service school, an Episcopal Mission, a radio, and a store at which food and fuel can be obtained. Ruins of the old village of **Tigara** (native for *forefinger*) are just east of the mission buildings.

Ice.—Weather Bureau records for the Arctic Ocean at Point Hope show an average ice breakup the latter part of June and an average freezeup about the second week in November; see *Appendix* for tabular detail. Navigation is difficult from the latter part of November until mid-July and usually is suspended from early December until the latter part of June.

The anchorage most convenient to the village and mission is on the north side of the point, but a better landing can sometimes be made south of the point. The northern anchorage is in 6 fathoms about 0.5 mile offshore, with the mission church bearing 175°. A south anchorage in 10 fathoms is 2 miles offshore, with the church bearing 325°. Another anchorage can be found south of Point Hope in 11 fathoms, mud bottom, about 1.5 miles from shore. The bearings are as follows: light, 324°; two-story house, 331½°; Mission flagpole, 005°. When the wind is from the southwest it causes a heavy swell and the landing of cargo may be impossible due to heavy seas and currents.

Because of the shoal off this point, vessels must either round the point close-to or make a wide sweep to the westward and round it many miles off. To pass close-to, haul gradually around the point, keeping about 0.5 mile offshore; keep the lead going constantly and hold in not less than 6 fathoms.

Communication is by boat in the summer and by dog team in the winter, or by airplane.

In the bight just west of the high land of Cape Thompson the water is somewhat shoaler than farther west, though the soundings are regular. Seven miles east of Point

Hope is a 3-fathom shoal nearly 1 mile offshore. As the point is approached the water deepens, and toward its end 8 fathoms can be carried to within 0.3 mile of the beach. The tip of the point is very bold, there being 13 fathoms a few ship's lengths from shore; but on rounding the point to the north side the soundings decrease rapidly to 5 fathoms 0.5 miles from shore, and, in general, the water in the bight on the north side of the point is shoaler than on the south side. At the mouth of Marryatt Inlet shoals extend off some distance.

A narrow shoal, with a depth of 4 fathoms at its southern end, is about 2.2 miles northwest from Point Hope. This shoal extends in a general northwest direction for a distance of 3 miles from the 4-fathom spot, and has depths of 5 to 7 fathoms over it.

It is reported that a 10-fathom channel lies inside the broken shoals off Point Hope and quite close to the point. This channel was used by a Coast Guard cutter in 1921, but it has not been examined.

Appendix

COAST AND GEODETIC SURVEY.—Coast Pilots.—
U. S. C. P. 1, Atlantic Coast, St. Croix River to Cape Cod, 1950.
U. S. C. P. 2, Atlantic Coast, Cape Cod to Sandy Hook, 1950.
U. S. C. P. 3, Atlantic Coast, Sandy Hook to Cape Henry, 1953.
U. S. C. P. 4, Atlantic Coast, Cape Henry to Key West, 1948.
U. S. C. P. 5, Gulf Coast, Key West to Rio Grande, 1949.
U. S. C. P. 6, West Indies, Puerto Rico and Virgin Islands, 1949.
U. S. C. P. 7, Pacific Coast, California, Oregon, and Washington, 1951.
U. S. C. P. 8, Southeast Alaska, Dixon Entrance to Yakutat Bay, 1952.
U. S. C. P. 9, Alaska, Cape Spencer to Arctic Ocean, 1954.
U. S. C. P. 10, Hawaiian Islands, 1950.
Distances Between United States Ports, 1938.

District Office: Northwestern District: 705 Federal Office Building, Seattle 4, Wash.

CHART AGENCIES.—Agents marked with an (*) asterisk also handle certain United States Hydrographic Office publications.

Agents marked with a (†) dagger also handle United States Coast Guard publications.

Anchorage: Miller-Dalton Co.
Cordova: Cordova Drug Co.
Craig: J. L. Lucier.
Hoonah: P. S. Ganty Co.
Juneau: † The Northern Commercial Co.; J. B. Burford.
Ketchikan: *† Ryus Drug Co. *†Ketchikan Instrument Co., 416 Water St.
Kodiak: †Donnelly and Acheson.
Pelican: Pelican Cold Storage Co.
Petersburg: The Trading Union, Inc.
Seldovia: H. S. Young Mercantile Co.
Seward: J. Vic Brown and Sons, Alaska Shop.
Sitka: †Sitka Arts and Crafts.
Tenakee Springs: Snyder Mercantile Co.
Valdez: Valdez Drug Co., Inc.
Wrangell: Campbell Brothers.

Monthly Mean Surface Water Temperatures

Place	Years of record	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Mean
		° F.	° F.	° F.	° F.	° F.	° F.	° F.	° F.	° F.	° F.	° F.	° F.	° F.
Yakutat	11	39. 9	39. 0	39. 6	42. 1	46. 8	51. 8	55. 4	55. 7	52. 5	48. 3	44. 5	40. 9	46. 4
Cordova	3	36. 6	35. 7	35. 0	36. 8	41. 3	45. 5	50. 1	52. 5	50. 1	44. 6	40. 0	39. 3	42. 3
Seward	20	38. 4	37. 9	38. 1	40. 4	45. 2	51. 3	53. 9	53. 8	50. 8	46. 1	42. 2	40. 4	44. 9
Kodiak, Kodiak Island	3	38. 3	37. 7	37. 7	38. 2	43. 2	46. 8	49. 2	50. 8	49. 6	45. 5	42. 0	38. 3	43. 1
Womens Bay, Kodiak Island	2	31. 6	32. 8	34. 2	38. 2	44. 2	46. 8	54. 0	55. 2	50. 2	44. 8	37. 8	34. 1	42. 0
Dutch Harbor, Unalaska Island	5	36. 5	36. 3	36. 8	39. 4	41. 4	44. 7	48. 7	50. 0	46. 5	43. 0	40. 2	38. 1	41. 8
Sweeper Cove, Adak Island	8	36. 3	36. 9	37. 5	38. 8	41. 3	44. 0	46. 2	46. 8	46. 3	43. 1	40. 2	38. 3	41. 3
Constantine Harbor Amchitka Island	5	37. 5	37. 0	37. 6	40. 1	-------	41. 9	43. 4	44. 6	44. 5	42. 5	40. 5	38. 6	-------
Massacre Bay, Attu Island	5	37. 0	36. 5	36. 3	38. 2	40. 9	44. 7	46. 4	49. 0	48. 2	44. 1	40. 2	37. 1	41. 6
Port Moller	2	(ice)	(ice)	31. 8	33. 6	40. 6	50. 7	53. 2	55. 4	52. 4	44. 2	38. 0	(ice)	-------

For temperature data in greater detail, see U. S. Coast and Geodetic Survey publication, *Surface Water Temperatures, Pacific Ocean.*

Monthly Mean Sea Water Densities

Reduced to 15° C. (59° F.)

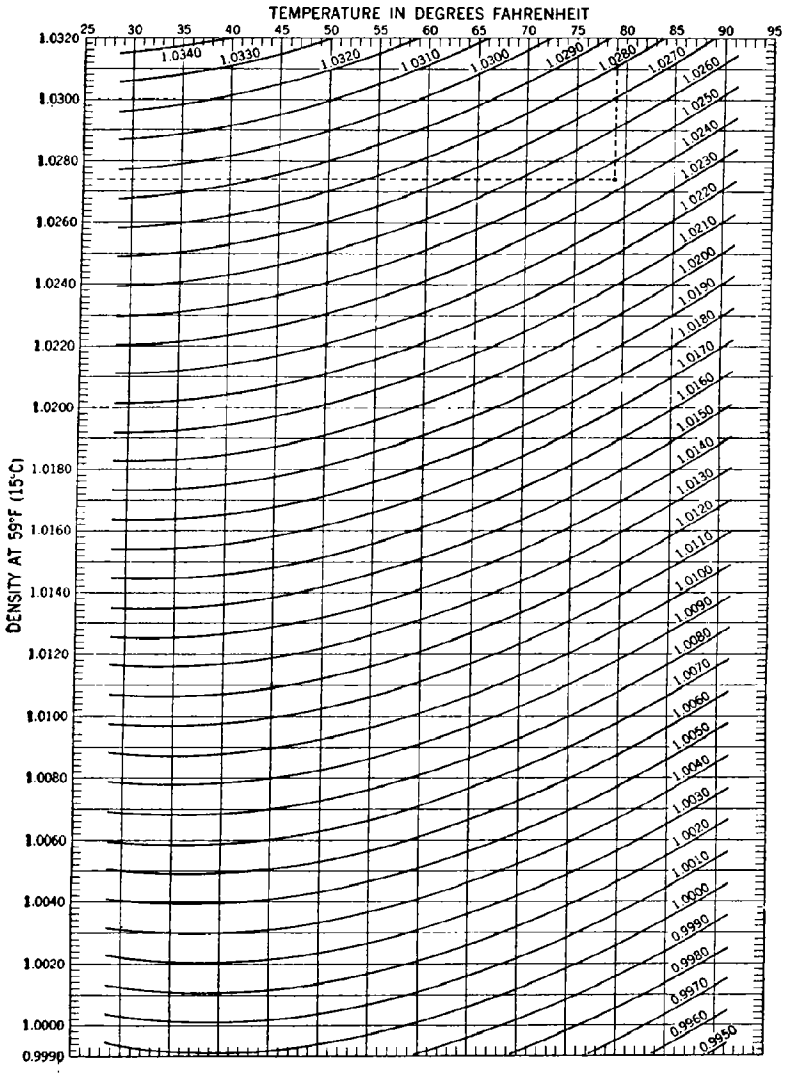
Place	Years of record	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Mean
Yakutat	11	1. 0222	1. 0225	1. 0222	1. 0220	1. 0208	1. 0194	1. 0176	1. 0175	1. 0188	1. 0205	1. 0218	1. 0223	1. 0206
Cordova	3	1. 0228	1. 0229	1. 0229	1. 0230	1. 0224	1. 0214	1. 0202	1. 0185	1. 0179	1. 0198	1. 0219	1. 0225	1. 0214
Seward	20	1. 0219	1. 0217	1. 0216	1. 0212	1. 0168	1. 0095	1. 0065	1. 0082	1. 0121	1. 0164	1. 0193	1. 0212	1. 0164
Kodiak, Kodiak Island	1	1. 0227	1. 0232	1. 0237	1. 0241	1. 0223	1. 0228	1. 0232	1. 0238	1. 0226	1. 0228	1. 0231	1. 0231	1. 0231
Womens Bay, Kodiak Island	2	1. 0229	1. 0224	1. 0231	1. 0222	1. 0178	1. 0113	1. 0134	1. 0168	1. 0138	1. 0202	1. 0220	1. 0229	1. 0191
Dutch Harbor, Unalaska Island	5	1. 0237	1. 0237	1. 0238	1. 0236	1. 0237	1. 0231	1. 0235	1. 0239	1. 0237	1. 0238	1. 0239.	1. 0239	1. 0237
Sweeper Cove, Adak Island	8	1. 0214	1. 0213	1. 0201	1. 0178	1. 0183	1. 0212	1. 0214	1. 0217	1. 0213	1. 0208	1. 0210	1. 0215	1. 0206
Constantine Harbor, Amchitka Island	5	1. 0244	1. 0250	1. 0248	1. 0245	-------	1. 0247	1. 0246	1. 0246	1. 0243	1. 0245	1. 0243	1. 0242	-------
Massacre Bay, Attu Island	5	1. 0241	1. 0244	1. 0246	1. 0243	1. 0240	1. 0234	1. 0238	1. 0241	1. 0242	1. 0243	1. 0242	1. 0243	1. 0241
Port Moller	2	(ice)	(ice)	1. 0223	1. 0225	1. 0227	1. 0227	1. 0230	1. 0228	1. 0226	1. 0220	1. 0220	(ice)	-------

For density data in greater detail, see U. S. Coast and Geodetic Survey publication, *Density of Sea Water, Pacific Ocean.*

Sea Water Density at Various Temperatures

The purpose of this graph is to provide the density of sea water at any temperature apt to be encountered when the density at the standard temperature of 59° F. (15° C.) is known. The densities are referred to the density of fresh water at 39°2 F. (4° C.) as unity.

To convert a density at 59° F. to density at another temperature, enter the graph horizontally from the left with the known density and downward from the top with the desired temperature; the position of the point of intersection with respect to the curves gives the density at the desired temperature. Interpolate between curves when necessary.



Example: If certain water has a density of 1.0274 at 59° F., what would its density be at a temperature of 79° F.? Entering the graph from the side and top as shown by the dashed lines, it is found that the point of intersection lies about $\frac{4}{10}$ of the way between curves 1.0240 and 1.0250, so that the density at 79° is 1.0244.

Distance Table

DISTANCES ARE GIVEN IN NATURAL MILES

From: \ To:	Cape Chacon 64°40′.6 N., 131°68′.7 W.	Cape Decision 55°69′.4 N., 134°08′.1 W.	Cape Spencer 58°10′.0 N., 136°38′.3 W.	Yakutat 59°32′.9 N., 139°43′.9 W.	Cordova 60°33′.4 N., 146°45′.3 W.	Valdez 61°06′.7 N., 146°16′.3 W.	Whittier 60°46′.8 N., 148°39′.6 W.	Latouche 60°03′.3 N., 147°54′.1 W.	Seward 60°06′.0 N., 149°26′.3 W.	Seldovia 59°26′.5 N., 151°43′.0 W.	Anchorage 61°14′.2 N., 149°53′.3 W.	Kodiak 57°47′.1 N., 152°25′.1 W.	Uyak 57°38′.6 N., 154°00′.0 W.	Chignik 56°17′.8 N., 158°24′.0 W.	Unga 55°10′.6 N., 160°29′.8 W.	False Pass 54°51′.4 N., 163°24′.0 W.	Unimak Pass 54°20′.5 N., 164°44′.5 W.	Dutch Harbor 53°32′.7 N., 166°31′.8 W.	Kuluk Bay 51°51′.6 N., 176°37′.6 W.	Constantine Harbor 51°24′.0 N., 179°18′.1 E.	Kiska 51°58′.3 N., 177°34′.5 E.	Alcan Harbor 52°43′.8 N., 174°04′.1 E.	Massacre Bay 52°43′.9 N., 173°15′.6 E.	St. Paul Island 57°07′.6 N., 170°17′.9 W.	St. Michael 63°32′.4 N., 161°54′.8 W.	Golovnin Bay 64°22′.3 N., 163°06′.7 W.	Nome 64°29′.0 N., 165°26′.0 W.	Port Clarence 65°17′.1 N., 166°24′.5 W.	Point Hope 68°20′.0 N., 166°48′.4 W.
Cape Chacon	----	162	349	490	649	662	669	651	670	748	875	712	793	914	1,005	1,113	1,147	1,222	1,610	1,761	1,819	1,952	1,980	1,402	1,858	1,834	1,794	1,857	2,023
Cape Decision	162	----	193	334	526	539	546	528	552	636	763	610	691	817	909	1,063	1,064	1,139	1,527	1,678	1,736	1,869	1,897	1,319	1,775	1,750	1,711	1,774	1,940
Cape Spencer	349	193	----	141	387	400	407	388	422	514	642	534	571	727	819	957	987	1,062	1,450	1,601	1,659	1,792	1,820	1,242	1,698	1,674	1,634	1,697	1,863
Yakutat	490	334	141	----	268	281	288	270	316	411	538	418	478	646	737	896	918	993	1,382	1,533	1,591	1,724	1,752	1,173	1,629	1,605	1,565	1,629	1,794
Cordova	649	526	387	268	----	77	100	86	147	260	387	294	346	506	597	712	764	839	1,228	1,379	1,437	1,570	1,597	1,019	1,475	1,451	1,411	1,475	1,640
Valdez	662	539	400	281	77	----	92	84	145	257	385	292	344	504	596	711	762	836	1,225	1,376	1,434	1,567	1,595	1,017	1,473	1,448	1,409	1,472	1,637
Whittier	669	546	407	288	100	92	----	64	125	237	364	271	323	484	575	690	742	817	1,205	1,356	1,415	1,547	1,575	997	1,453	1,429	1,389	1,452	1,618
Latouche	651	528	388	270	86	84	64	----	64	176	304	210	263	423	514	630	680	755	1,144	1,295	1,353	1,486	1,514	935	1,391	1,367	1,327	1,391	1,556
Seward	670	552	422	316	147	145	125	64	----	147	274	175	229	394	485	600	652	727	1,115	1,266	1,325	1,457	1,485	907	1,363	1,339	1,299	1,362	1,528
Seldovia	748	636	514	411	260	257	237	176	147	----	139	116	139	304	395	510	562	637	1,025	1,176	1,234	1,367	1,395	817	1,273	1,249	1,209	1,272	1,438
Anchorage	875	763	642	538	387	385	364	304	274	139	----	244	265	430	521	636	688	763	1,152	1,303	1,361	1,494	1,521	943	1,399	1,375	1,335	1,399	1,564
Kodiak	712	610	534	418	294	292	271	210	175	116	244	----	81	247	339	454	506	580	969	1,120	1,178	1,311	1,339	760	1,217	1,192	1,153	1,216	1,381
Uyak	793	691	571	478	346	344	323	263	229	139	265	81	----	181	273	388	440	514	903	1,054	1,112	1,245	1,273	694	1,151	1,126	1,087	1,150	1,315
Chignik	914	817	727	646	506	504	484	423	394	304	430	247	181	----	126	241	292	367	756	907	965	1,098	1,126	547	1,004	979	940	1,003	1,168
Unga	1,005	909	819	737	597	596	575	514	485	395	521	339	273	126	----	135	187	258	651	802	860	993	1,020	442	888	874	834	898	1,063
False Pass	1,113	1,063	957	886	712	711	690	630	600	510	636	454	388	241	135	----	86	160	549	700	758	891	919	340	798	772	732	796	961
Unimak Pass	1,147	1,064	987	918	764	762	742	680	652	562	688	506	440	292	187	86	----	75	463	699	672	805	833	255	711	687	647	710	876
Dutch Harbor	1,222	1,139	1,062	993	839	836	817	755	727	637	763	580	514	367	258	160	75	----	406	557	615	748	773	239	723	698	659	722	888
Kuluk Bay	1,610	1,527	1,450	1,382	1,228	1,225	1,205	1,144	1,115	1,025	1,152	969	903	756	651	549	463	406	----	175	234	367	395	387	917	893	853	916	1,082
Constantine Harbor	1,761	1,678	1,601	1,533	1,379	1,376	1,356	1,295	1,268	1,176	1,303	1,120	1,054	907	802	700	699	557	175	----	80	222	249	468	1,016	992	952	1,016	1,181
Kiska	1,819	1,736	1,659	1,591	1,437	1,434	1,415	1,353	1,325	1,234	1,361	1,178	1,112	965	860	758	672	615	234	80	----	157	185	526	986	959	921	984	1,149
Alcan Harbor	1,952	1,869	1,792	1,724	1,570	1,567	1,547	1,486	1,457	1,367	1,494	1,311	1,245	1,098	993	891	805	748	367	222	157	----	34	604	1,018	993	953	1,016	1,182
Massacre Bay	1,980	1,897	1,820	1,752	1,597	1,595	1,575	1,574	1,485	1,395	1,521	1,339	1,273	1,126	1,020	919	833	773	395	249	185	34	----	632	1,037	1,012	972	1,035	1,201
St. Paul Island	1,402	1,319	1,242	1,173	1,019	1,017	997	935	907	817	943	760	694	547	442	340	255	239	387	468	526	604	632	----	548	524	484	548	713
St. Michael	1,858	1,775	1,698	1,629	1,475	1,473	1,453	1,391	1,363	1,273	1,399	1,217	1,151	1,004	888	796	711	723	917	1,016	986	1,018	1,037	548	----	59	109	227	393
Golovnin Bay	1,834	1,750	1,674	1,605	1,451	1,448	1,429	1,367	1,339	1,249	1,375	1,192	1,126	979	874	772	687	698	893	992	959	993	1,012	524	59	----	62	182	345
Nome	1,794	1,711	1,634	1,565	1,411	1,409	1,389	1,327	1,299	1,209	1,335	1,153	1,087	940	834	732	647	659	853	952	921	953	972	484	109	62	----	119	284
Port Clarence	1,857	1,774	1,697	1,629	1,475	1,472	1,452	1,391	1,362	1,272	1,399	1,216	1,150	1,003	898	796	710	722	916	1,016	984	1,016	1,035	548	227	182	119	----	233
Point Hope	2,023	1,940	1,863	1,794	1,640	1,637	1,618	1,556	1,528	1,438	1,564	1,381	1,315	1,168	1,063	461	876	888	1,082	1,181	1,149	1,182	1,201	713	393	345	284	233	----
Seattle (inside)	652	789	796	1,117	1,363	1,376	1,383	1,365	1,398	1,491	1,618	1,510	1,547	1,704	1,795	1,933	1,963	2,038	2,426	2,577	2,636	2,768	2,796	2,218	2,674	2,650	2,610	2,673	2,839
Swiftsure Bank L. S.	573	591	739	870	1,087	1,099	1,107	1,088	1,100	1,168	1,295	1,123	1,203	1,311	1,402	1,477	1,510	1,585	1,973	2,124	2,182	2,315	2,343	1,765	2,221	2,196	2,157	2,220	2,386
Columbia River L. S.	663	717	865	1,000	1,213	1,225	1,233	1,214	1,224	1,291	1,418	1,242	1,321	1,423	1,514	1,576	1,608	1,683	2,072	2,222	2,281	2,414	2,441	1,863	2,319	2,295	2,255	2,318	2,484
San Francisco L. S.	1,148	1,201	1,349	1,480	1,683	1,696	1,704	1,685	1,686	1,742	1,869	1,676	1,755	1,840	1,931	1,944	1,974	2,049	2,437	2,588	2,646	2,779	2,807	2,229	2,685	2,660	2,621	2,684	2,850

NOTE.—Distances to Seattle are via inside route to Cape Spencer.

Radio Bearing Conversion Table

Table of corrections, in minutes

[DIFFERENCE OF LONGITUDE IN DEGREES]

Mid. L.	½°	1°	1½°	2°	2½°	3°	3½°	4°	4½°	5°	5½°	6°	6½°	7°	7½°	8°	8½°	9°	9½°	10°
15°	4	8	12	16	19	23	27	31	35	40	43	47	50	54	58	62	66	70	74	78
16°	4	8	12	17	21	25	29	33	37	41	45	50	54	58	62	66	70	74	79	83
17°	4	9	13	18	22	26	31	35	39	44	48	53	57	61	66	70	75	79	83	88
18°	5	9	13	19	23	28	32	37	42	46	51	56	60	65	70	74	79	83	88	93
19°	5	10	15	20	24	29	34	39	44	49	54	59	63	68	73	78	83	88	93	98
20°	5	10	15	21	26	31	36	41	46	51	56	62	67	72	77	82	87	92	98	103
21°	5	11	16	21	27	32	38	43	48	54	59	64	70	75	81	86	91	97	102	108
22°	6	11	17	22	28	34	39	45	51	56	62	67	73	79	84	90	96	101	107	112
23°	6	12	18	23	29	35	41	47	53	59	64	70	76	82	88	94	100	105	111	117
24°	6	12	18	24	31	37	43	49	55	61	67	73	79	85	92	98	104	110	116	122
25°	6	13	19	25	32	38	44	51	57	63	70	76	82	89	95	101	108	114	120	127
26°	7	13	20	26	33	39	46	53	59	66	72	79	85	92	99	105	112	118	125	131
27°	7	14	20	27	34	41	48	54	61	68	75	82	89	95	102	109	116	123	129	136
28°	7	14	21	28	35	42	49	56	63	70	77	84	92	99	106	113	120	127	134	141
29°	7	15	21	29	36	44	51	58	65	73	80	87	95	102	109	116	124	131	138	145
30°	7	15	22	30	38	45	53	60	68	75	83	90	98	105	113	120	127	135	143	150
31°	8	15	23	31	39	46	54	62	70	77	85	93	100	108	116	124	131	139	146	155
32°	8	16	24	32	40	48	56	64	72	79	87	95	103	111	119	127	135	143	151	159
33°	8	16	25	33	41	49	57	65	74	82	90	98	106	114	123	131	139	147	155	163
34°	8	17	25	34	42	50	59	67	75	84	92	101	109	117	126	134	143	151	159	168
35°	9	17	26	34	43	52	60	69	77	86	95	103	112	120	129	138	146	155	163	172
36°	9	18	26	35	44	53	62	71	79	88	97	106	115	123	132	141	150	159	168	176
37°	9	18	27	36	45	54	63	72	81	90	99	108	117	126	135	144	153	163	172	181
38°	9	18	28	37	46	55	65	74	83	92	102	111	120	129	139	148	157	166	175	185
39°	9	19	28	38	47	57	66	76	85	94	104	113	123	132	142	151	160	170	179	189
40°	10	19	29	39	48	58	68	77	87	96	106	116	125	135	145	154	164	174	183	193
41°	10	20	30	39	49	59	69	79	89	98	108	118	128	138	148	158	167	177	187	197
42°	10	20	30	40	50	60	70	80	90	100	110	120	130	140	151	161	171	181	191	201
43°	10	20	31	41	51	61	72	82	92	102	113	123	133	143	153	164	174	184	194	205
44°	10	21	31	42	52	63	73	83	94	104	115	125	135	146	156	167	177	188	198	208
45°	11	21	32	42	53	64	74	85	95	106	117	127	138	149	159	170	180	191	201	212
46°	11	22	32	43	54	65	76	86	97	108	119	129	140	151	162	173	183	194	205	216
47°	11	22	33	44	55	66	77	88	99	110	121	132	143	154	165	176	186	197	208	219
48°	11	22	33	45	56	67	78	89	100	111	123	134	145	156	167	178	190	201	212	223
49°	11	23	34	45	57	68	79	91	102	113	125	136	147	158	170	181	192	204	215	226
50°	11	23	34	46	57	69	80	92	103	115	126	138	149	161	172	184	195	207	218	230
51°	12	23	35	47	58	70	82	93	105	117	128	140	152	163	175	186	198	210	221	233
52°	12	24	35	47	59	71	83	95	106	118	130	142	154	165	177	189	201	213	225	236
53°	12	24	36	48	60	72	84	96	108	120	132	144	156	168	180	192	204	216	228	240
54°	12	24	36	49	61	73	85	97	109	121	133	146	158	170	182	194	206	218	231	243
55°	12	25	37	49	61	74	86	98	111	123	135	147	160	172	184	197	209	221	233	246
56°	12	25	37	50	62	75	87	100	112	124	137	149	162	174	187	199	211	224	236	249
57°	13	25	38	50	63	75	88	101	113	126	138	151	164	176	189	201	214	226	239	252
58°	13	25	38	51	64	76	89	102	115	127	140	153	165	178	191	204	216	229	242	254
59°	13	26	39	51	64	77	90	103	116	129	141	154	167	180	193	206	219	231	244	257
60°	13	26	39	52	65	78	91	104	117	130	143	156	169	182	195	208	221	234	247	260

Example. A ship in latitude 39°51′. N., longitude 67°35′ W., by dead reckoning, obtains a radio bearing of 299° true on the radiobeacon located in latitude 40°37′. N., longitude 69°37′ W.

Radiobeacon station	Latitude	40°37′ N.
Dead-reckoning position of ship	Latitude	39°51′
Middle latitude		40°14′
Radiobeacon station	Longitude	69°37′ W.
Dead reckoning position of ship	Longitude	67°35′
Longitude difference		2°02′

Entering the table with difference of longitude equals 2°, which is the nearest tabulated value, and opposite 40° middle latitude, the correction of 39′ is read.

As the ship is east of the radiobeacon, a minus correction is applied. The Mercator bearing then will be 299°−000°39′=298°21′. To facilitate plotting, subtract 180° and plot from the position of the radiobeacon the bearing 298°21′−180°, or 118°21′ (Mercator bearing reckoned clockwise from true north).

CORPS OF ENGINEERS DISTRICT.—Anchorage, T. A. This district consists of the Territory of Alaska.

BRANCH HYDROGRAPHIC OFFICE.—453 Federal Office Bldg., Seattle, Wash.

COAST GUARD DISTRICT.—17th Coast Guard District, Box 2991, Community Bldg., Juneau, T. A. The district comprises the Territory of Alaska.
Marine Inspection Office: Juneau.

COLLECTOR OF CUSTOMS.—The 31st Customs District consists of the Territory of Alaska. Juneau is the district headquarters. Marine documents are issued. Other ports of entry are: (an asterisk indicates that marine documents are issued)
Cordova, Craig, *Eagle, Hyder, *Ketchikan, Pelican, Petersburg, Sand Point—during the halibut fishing season, *Sitka, *Skagway, and *Wrangell.

PUBLIC HEALTH SERVICE

Quarantine Stations:
Anchorage, Cordova, Nome, Seward, Whittier, Juneau, Ketchikan, Petersburg, and Wrangell.

Public Health Service Hospital:
Seattle, Wash.: Judkins and 14th Avenues South; outpatient office, Federal Office Building.

Outpatient Offices:
Cordova: Community Hospital; Juneau, Ketchikan, Nome, Petersburg, Wrangell.

NATIONAL PARK SERVICE

Headquarters: McKinley Park.
National Monuments.—Katmai.

FOREST SERVICE

Research Center, Sub Port: Juneau.

IMMIGRATION AND NATURALIZATION

Ports of Entry: Haines, Juneau, Ketchikan (including Sitka and Wrangell), Skagway, Pelican.

PLANT QUARANTINE BRANCH OF THE AGRICULTURAL RESEARCH SERVICE

Ports at which inspectors are located:
Anchorage, 136 Federal Bldg.
Fairbanks, 403 Federal Bldg.

FOREIGN CONSULS

France: Anchorage.
Norway: Juneau.

FEDERAL COMMUNICATIONS COMMISSION

Regional Office: Anchorage, Room 52, U. S. Courthouse.
District Office: Juneau, Engineer in charge: Chattuck Bldg.

FISH AND WILDLIFE SERVICE

Enforcement agent: P. O. Box 2021, Juneau.
National Wildlife Refuges: Aleutian Islands, Bering Sea (St. Matthew and Hall Islands), Bogoslof, Chamisso, Hazen Bay, Kenai National Moose Range, Kodiak, Nunivak Island, Pribilof Reservation, Semidi, and Tuxedni.

WEATHER BUREAU.—Offices: Barometers may be compared with standards at these offices:

Anchorage: International Airport.
Barrow: Weather Bureau Bldg., Airport.
Bethel: Weather Bureau—CAA Bldg., Airport.
Cordova: CAA Building, Airport.
Kotzebue: Weather Bureau—CAA Bldg., Airport.
Nome: Marks Field.
St. Paul Island: Airport.
Yakutat: Airport.

STORM WARNING DISPLAY STATIONS.—No storm warning display stations are now being maintained in this area by the Weather Bureau; storm warnings are being disseminated by other methods, principally by radio.

Radiotelephone Broadcasts of Weather Information.—Regular broadcasts including weather forecasts, small craft and storm warnings, and other marine information are made by the following radiotelephone stations in plain language.

Station		*Frequency (kcs.)*	*Local time*
ALB	Anchorage	2970	0800, 1900.
ALC 33	Barrow	2970	On call.
ALB 66	Cold Bay	2970	1000 during navigation season; on call otherwise.
ALB 44	Cordova	2970	0900, 1100, 1300, 1500, 1700, 1900.
NMJ	Ketchikan	2678	0900, 2100.
ALB 99	Kodiak	2970	Every odd hour on the half hour.
ALC 44	Kotzebue	2604	On call.
ALB 77	Naknek	2970	0900, 1100, 1300, 1500, 1700.
ALC 22	Nome	2970	0830 during navigation season; on call otherwise.
ALD 33	Unalaska	2970	0800, 1500.
ALB 22	Whittier	2970	0800, 1000, 1200, 1400, 1600, 1800, 2000.

Weather Broadcasts by Standard Broadcast Band Radio Stations.—The following table lists alphabetically the radio stations that have installed microphones in nearby Weather Bureau Offices. From these offices forecasts and weather summaries including coastal and offshore information are broadcast by Weather Bureau personnel:

Station	Call sign	Frequency (kcs.)	Power (watts)	Weekdays	Saturdays (local time)	Sundays
Anchorage	KENI	550	5,000	0740 2135	0740 2135	2110
Anchorage	KFQD	600	10,000	0700	0700	1215
Juneau	KINY	1460	5,000	0825 1855	0825 1855	1000 1855
Seward	KIBH	1340	250	1815	1815	1815

Climatological Tables

COMPILED BY CLIMATOLOGICAL SERVICES DIVISION, U. S. WEATHER BUREAU

Adak Island, Davis AFB, Latitude 51°53′ N., Longitude 176°38′ W.

ELEVATION: 14 FEET. YEARS OF RECORD: 3–5

Weather elements	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
Visibility (percent of all observations)													
All cases less than 3 miles	10	14	10	7	3	7	10	13	6	1	6	7	8
0700 LST (percent of all observations)	10	14	8	7	5	12	15	17	7	1	5	8	9
Less than ½ mile	0	2	2	1	0	4	2	2	2	0	0	1	1
½ to 3 miles	10	12	6	6	5	8	13	15	5	1	5	7	8
1300 LST (percent of all observations)	9	15	10	9	2	3	7	10	4	1	8	8	7
Less than ½ mile	1	2	0	2	0	0	0	1	0	0	0	1	1
½ to 3 miles	8	13	10	7	2	3	7	9	4	1	8	7	6
1900 LST (percent of all observations)	11	14	11	6	3	7	9	13	7	2	6	6	8
Less than ½ mile	1	3	1	1	0	1	0	1	1	0	0	(*)	1
½ to 3 miles	10	11	10	5	3	6	9	12	6	2	6	6	7
Precipitation													
Mean amount, inches	6.79	5.22	4.96	3.57	3.38	2.05	3.27	5.07	5.17	6.72	8.36	9.14	63.70
Least amount, inches	2.18	2.97	1.52	1.93	0.61	0.42	1.77	2.89	2.17	5.64	2.25	4.79	0.42
Greatest amount, inches	10.76	6.87	7.42	5.00	4.68	2.54	3.34	5.86	7.07	7.46	11.34	9.40	11.34
Maximum amount in 24 hours, inches	1.08	2.85	1.69	1.23	0.88	1.28	1.14	1.61	2.27	1.79	1.45	1.97	2.85
Mean number of days, 0.01 inch or more	28	22	20	20	11	14	11	12	15	22	14	19	208
Snow (1 year)													
Mean amount, inches	2.0	4.0	2.7	0.5	T	0	0	0	0	0	0	T	9.2
Air temperature													
Mean, ° F	31	32	33	37	40	44	49	51	48	42	37	33	40
Minimum:													
Extreme, ° F	16	12	18	26	28	32	36	36	34	28	22	14	12
32° or less, mean number of days	25	22	21	8	2	(†)	0	0	0	4	11	22	115
Maximum:													
Extreme, ° F	53	43	49	53	51	61	69	67	75	61	73	53	75
32° or less, mean number of days	8	6	4	1	0	0	0	0	0	(†)	1	4	24

	Winter	Spring	Summer	Autumn	Year
Wind (percent of all observations)					
N.:					
1–16 knots	7	12	10	9	10
17–27 knots	5	5	1	5	4
28 knots or over	1	(*)	0	(*)	(*)
NE.:					
1–16 knots	8	10	11	7	9
17–27 knots	8	4	1	(*)	3
28 knots or over	2	(*)	0	(*)	(*)
E.					
1–16 knots	7	7	6	4	6
17–27 knots	5	1	1	(*)	2
28 knots or over	(*)	(*)	(*)	(*)	(*)
SE.:					
1–16 knots	5	7	8	3	6
17–27 knots	3	2	1	1	2
28 knots or over	(*)	1	(*)	(*)	(*)
S.:					
1–16 knots	5	6	7	5	6
17–27 knots	(*)	2	2	2	2
28 knots or over	(*)	1	(*)	(*)	(*)
SW.:					
1–16 knots	8	8	13	11	10
17–27 knots	5	4	7	9	6
28 knots or over	3	3	1	5	3
W.:					
1–16 knots	8	9	15	13	11
17–27 knots	5	6	7	8	7
28 knots or over	2	2	1	2	2
NW.:					
1–16 knots	3	4	3	6	4
17–27 knots	(*)	2	(*)	3	1
28 knots or over	(*)	(*)	0	1	(*)
Calm	10	4	5	6	6
Maximum velocity, knots	56 SW.	43 W.	52 SW.	52 SW.	56 SW.

*Less than 0.5 percent.
† Average less than ½ day.
T = Trace.

Amchitka Island, Latitude 51°23′ N., Longitude 179°15′ W.

ELEVATION: 50 FEET. YEARS OF RECORD: 4–6

Weather elements	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
Visibility (percent of all observations)													
All cases less than 3 miles	15	18	15	18	14	35	63	64	31	11	10	14	26
0700 LST (percent of all observations)	12	16	16	15	13	44	74	73	34	12	9	12	28
Less than ½ mile	3	5	5	6	4	33	59	62	23	5	3	3	18
½ to 3 miles	9	11	11	9	9	11	15	11	11	7	6	9	10
1300 LST (percent of all observations)	18	18	13	19	15	29	52	57	29	10	10	16	24
Less than ½ mile	5	4	3	5	4	19	33	37	20	4	2	8	12
½ to 3 miles	13	14	10	14	11	10	19	20	9	6	8	8	12
1900 LST (percent of all observations)	15	19	16	20	14	31	63	62	29	11	10	15	25
Less than ½ mile	5	4	4	3	1	23	45	46	16	5	5	4	13
½ to 3 miles	10	15	12	17	13	8	18	16	13	6	5	11	12
Precipitation													
Mean amount, inches	2.76	1.67	1.53	1.95	1.30	0.97	3.56	4.36	3.04	3.47	3.22	4.50	32.33
Least amount, inches	1.27	1.52	0.14	1.25	0.60	0.33	2.32	3.37	1.51	1.80	0.93	0.89	0.14
Greatest amount, inches	4.26	2.99	3.87	3.83	2.61	1.83	5.40	5.86	4.02	4.67	4.82	9.56	9.56
Maximum amount in 24 hours, inches	0.85	0.83	0.97	1.98	0.60	0.43	1.54	1.09	1.65	1.24	1.10	1.30	1.98
Mean number of days, 0.01 inch or more	21	19	15	14	12	11	16	20	16	21	18	19	202
Air temperature													
Mean, ° F	31	32	34	36	39	42	46	48	46	41	37	33	39
Minimum:													
Extreme, ° F	16	14	20	20	30	32	36	38	36	28	22	22	14
32° or less, mean number of days	28	24	22	13	3	(†)	0	0	0	1	10	22	123
Maximum:													
Extreme, ° F	45	43	49	47	49	57	65	59	57	51	51	45	65
32° or less, mean number of days	9	6	4	1	0	0	0	0	0	0	1	5	26

	Winter	Spring	Summer	Autumn	Year
Wind (percent of all observations)					
N.:					
1–16 knots	5	5	10	5	6
17–27 knots	5	4	4	4	4
28 knots or over	1	1	(*)	3	1
NE.:					
1–16 knots	2	9	6	4	5
17–27 knots	4	6	3	2	4
28 knots or over	3	2	(*)	(*)	1
E.:					
1–16 knots	6	5	3	2	4
17–27 knots	6	3	1	4	4
28 knots or over	9	4	(*)	3	4
SE.:					
1–16 knots	4	5	5	2	4
17–27 knots	1	5	4	2	3
28 knots or over	5	4	1	(*)	2
S.:					
1–16 knots	3	2	9	5	5
17–27 knots	3	4	6	4	4
28 knots or over	3	3	1	4	3
SW.:					
1–16 knots	5	5	10	8	7
17–27 knots	5	6	8	5	6
28 knots or over	1	3	2	2	2
W.:					
1–16 knots	5	8	12	11	9
17–27 knots	4	3	5	8	5
28 knots or over	4	1	(*)	3	2
NW.:					
1–16 knots	7	6	8	10	8
17–27 knots	6	5	2	6	5
28 knots or over	2	(*)	0	2	1
Calm	1	1	(*)	1	1
Maximum velocity, knots	71 E.	61 SW.	58 SE.	69 E.	71 E.

†Average less than ½ day.
*Less than 0.5 percent.

Anchorage, Elmendorf Field, Latitude 61°14′ N., Longitude 149°52′ W.

ELEVATION: 192 FEET. YEARS OF RECORD: 9

Weather elements	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
Visibility (percent of all observations)													
All cases less than 3 miles	12	9	7	3	1	(*)	2	2	5	4	10	13	6
0700 LST (percent of all observations)	13	10	7	4	1	0	4	4	8	6	10	14	7
Less than ½ mile	3	2	2	1	0	(*)	(*)	1	3	2	3	5	2
½ to 3 miles	10	8	5	3	1	0	4	3	5	4	7	9	5
1300 LST (percent of all observations)	11	9	5	2	1	(*)	2	(*)	1	3	8	14	5
Less than ½ mile	2	1	(*)	0	0	0	0	0	0	0	2	2	1
½ to 3 miles	9	8	5	2	1	(*)	2	(*)	1	3	6	12	4
1900 LST (percent of all observations)	11	7	8	2	1	(*)	(*)	1	5	4	11	12	5
Less than ½ mile	3	2	1	1	0	0	0	0	2	1	1	2	1
½ to 3 miles	8	5	7	1	1	(*)	(*)	1	3	3	10	10	4
Precipitation [1]													
Mean amount, inches	0.98	0.58	0.59	0.30	0.53	1.39	1.79	2.49	2.86	1.12	0.81	0.99	14.43
Least amount, inches	0.36	T	0.29	0.04	0.03	0.30	0.97	0.92	1.07	0.47	0.26	0.13	T
Greatest amount, inches	2.13	1.22	1.23	0.82	1.27	2.94	3.28	4.01	5.16	2.32	1.39	1.71	5.16
Maximum amount in 24 hours, inches	0.58	0.43	0.65	0.31	0.62	0.79	1.06	1.33	1.79	0.75	0.61	0.58	1.79
Mean number of days, 0.01 inch or more	11	6	7	5	6	11	12	16	15	11	8	10	118
Snow (10 years)													
Mean amount, inches	16.1	8.6	9.2	2.7	1.5	T	0	0	T	4.6	8.3	16.2	67.2
Air temperature [1]													
Mean, ° F	12	16	23	34	45	53	57	55	47	36	20	13	34
Minimum:													
Extreme, ° F	−35	−38	−20	−21	1	31	38	31	20	1	−20	−33	−38
32° or less, mean number of days	31	28	31	27	7	(†)	0	(†)	4	23	29	31	211
Maximum:													
Extreme, ° F	48	57	52	59	62	84	82	80	72	57	53	48	84
32° or less, mean number of days	27	20	12	3	(†)	0	0	0	0	2	18	27	109

	Winter	Spring	Summer	Autumn	Year
Wind (percent of all observations)					
N.:					
1–16 knots	26	25	14	25	23
17–27 knots	2	2	0	2	1
28 knots or over	(*)	(*)	0	(*)	(*)
NE.:					
1–16 knots	16	9	4	13	11
17–27 knots	(*)	0	0	0	(*)
28 knots or over	0	0	0	0	0
E.:					
1–16 knots	16	7	6	13	10
17–27 knots	(*)	0	0	0	(*)
28 knots or over	0	0	0	0	0
SE.:					
1–16 knots	7	4	5	6	5
17–27 knots	(*)	(*)	(*)	(*)	(*)
28 knots or over	0	0	0	0	0
S.:					
1–16 knots	5	7	9	7	7
17–27 knots	(*)	(*)	1	(*)	(*)
28 knots or over	(*)	0	0	0	(*)
SW.:					
1–16 knots	3	7	11	3	6
17–27 knots	(*)	0	(*)	(*)	(*)
28 knots or over	(*)	0	0	0	(*)
W.:					
1–16 knots	3	16	25	5	12
17–27 knots	(*)	0	(*)	0	(*)
28 knots or over	0	0	0	0	0
NW.:					
1–16 knots	8	13	15	10	12
17–27 knots	8	(*)	0	(*)	(*)
28 knots or over	(*)	(*)	0	0	(*)
Calm	14	10	10	16	13
Maximum velocity, knots [1]	54 S.	57 N.	39 S.	57 NE.	57 N.

*Less than 0.5 percent.
†Average less than ½ day.
[1] Data from Merrill Field, Lat. 61°13′ N., Long. 149°50′ W. Elevation 134 feet.
T = Trace

Atka Island, Latitude 52°13′ N., Longitude 174°12′ W.

ELEVATION: 36 FEET. YEARS OF RECORD: 2–3

Weather elements	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
Visibility (percent of all observations)													
All cases less than 3 miles	8	9	11	10	4	9	18	22	10	5	8	8	10
0700 LST (percent of all observations)	7	9	11	9	3	11	22	24	12	6	7	8	11
Less than ½ mile	2	0	0	0	0	1	2	4	2	0	0	1	1
½ to 3 miles	5	9	11	9	3	10	20	20	10	6	7	7	10
1300 LST (percent of all observations)	13	9	13	10	7	9	13	21	7	3	9	5	10
Less than ½ mile	2	2	2	1	0	0	2	1	0	0	1	2	1
½ to 3 miles	11	7	11	9	7	9	11	20	7	3	8	3	9
1900 LST (percent of all observations)	3	9	10	11	3	7	20	21	12	7	8	12	10
Less than ½ mile	1	0	2	0	0	0	6	5	1	0	0	7	2
½ to 3 miles	2	9	8	11	3	7	14	16	11	7	8	5	8
Precipitation													
Mean amount, inches	2.76	2.33	5.35	2.54	2.60	2.13	3.33	5.43	4.83	7.28	8.23	6.17	52.98
Least amount, inches	2.21	1.61	3.83	1.82	2.05	0.47	2.54	4.82	2.36	6.15	5.01	3.84	0.47
Greatest amount, inches	3.31	3.04	6.87	3.81	3.01	3.74	4.03	6.20	8.38	8.41	11.19	7.84	11.19
Maximum amount in 24 hours, inches	0.43	0.61	1.00	0.74	0.50	1.08	0.89	1.26	1.09	2.34	1.08	0.95	2.34
Mean number of days, 0.01 inch or more	22	18	27	19	17	7	15	21	16	21	26	29	238
Snow (4–9 years)													
Mean amounts (inches)	7.0	10.3	8.6	4.0	T	0	0	0	0	1.2	4.6	13.1	48.8
Air temperature													
Mean, ° F	32	32	32	38	40	45	49	51	48	38	38	33	41
Minimum:													
Extreme, ° F	16	18	18	24	28	34	40	40	36	28	22	16	16
32° or less, mean number of days	25	18	26	9	4	0	0	0	0	3	9	23	117
Maximum:													
Extreme, ° F	43	43	43	53	51	61	63	65	61	55	49	45	65
32° or less, mean number of days	3	3	5	0	0	0	0	0	0	0	0	7	18

Wind (percent of all observations)	Winter	Spring	Summer	Autumn	Year
N.:					
1–16 knots	3	5	5	5	5
17–27 knots	1	3	(*)	1	1
28 knots or over	(*)	(*)	0	(*)	(*)
NE.:					
1–16 knots	2	2	1	1	1
17–27 knots	1	(*)	(*)	(*)	(*)
28 knots or over	(*)	(*)	0	(*)	(*)
E.:					
1–16 knots	7	8	12	9	9
17–27 knots	10	7	(*)	5	6
28 knots or over	2	1	0	1	1
SE.:					
1–16 knots	6	12	17	8	11
17–27 knots	5	5	3	3	4
28 knots or over	2	(*)	(*)	(*)	(*)
S.:					
1–16 knots	2	5	9	4	5
17–27 knots	3	2	(*)	2	2
28 knots or over	(*)	(*)	(*)	(*)	(*)
SW.:					
1–16 knots	7	8	7	8	8
17–27 knots	1	(*)	(*)	(*)	(*)
28 knots or over	(*)	(*)	0	0	(*)
W.:					
1–16 knots	13	9	10	13	11
17–27 knots	3	1	3	3	3
28 knots or over	0	(*)	(*)	1	(*)
NW.:					
1–16 knots	17	21	21	20	20
17–27 knots	5	6	6	8	6
28 knots or over	1	2	1	1	1
Calm	9	3	5	7	6
Maximum velocity, knots	52 NW.	35 NW.	33 NW.	40 W.	52 NW.

*Less than 0.5 percent.
T=trace.

Bethel, Latitude 60°47′ N., Longitude 161°41′ W.

ELEVATION: 21 FEET. YEARS OF RECORD: 28

Weather elements	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
Visibility (percent of all observations)[1]													
All cases less than 3 miles	10	8	13	9	7	2	6	11	10	11	11	8	9
0600 LST (percent of all observations)	6	5	13	11	14	5	13	19	20	12	10	6	11
Less than ½ mile	1	1	2	2	5	2	4	5	5	1	1	1	2
½ to 3 miles	5	4	11	9	9	3	9	14	15	11	9	5	9
1200 LST (percent of all observations)	10	9	11	9	6	0	3	8	6	13	13	10	8
Less than ½ mile	2	2	1	2	0	0	0	1	1	3	3	1	1
½ to 3 miles	8	7	10	7	6	0	3	7	5	10	10	9	7
1800 LST (percent of all observations)	14	11	14	6	2	1	1	6	4	8	10	7	7
Less than ½ mile	1	1	1	1	1	0	0	0	0	0	1	1	1
½ to 3 miles	13	10	13	5	1	1	1	6	4	8	9	6	6
Precipitation													
Mean amount, inches	0.90	0.92	0.99	0.56	0.94	1.23	2.30	4.32	2.97	1.79	1.02	1.06	19.00
Least amount, inches	0.03	T	0.10	0.02	0.06	0.11	0.17	0.32	0.28	0.08	0.08	T	T
Greatest amount, inches	5.65	3.94	3.09	1.24	2.50	2.48	6.14	12.37	7.44	3.70	2.41	6.17	12.37
Maximum amount in 24 hours, inches	1.42	0.96	1.31	0.43	0.92	0.82	0.97	2.40	1.67	1.88	1.48	1.14	2.40
Mean number of days, 0.01 inch or more	10	18	9	8	10	11	16	21	17	12	11	11	154
Snow (29 years)													
Mean amount, inches	8.9	7.3	9.8	3.8	0.7	T	0	0	T	3.4	6.2	9.6	49.7
Air temperature													
Mean, ° F	7	9	11	27	40	53	54	53	45	32	17	7	30
Minimum:													
Extreme, ° F	−52	−45	−34	−25	−5	28	30	30	18	−5	−31	−44	−52
32° or less, mean number of days	31	28	31	28	20	1	(†)	(†)	6	24	29	31	229
Maximum:													
Extreme, ° F	49	51	53	59	76	90	86	84	76	62	60	49	90
32° or less, mean number of days	25	21	25	11	2	0	0	0	0	7	21	24	136

	Winter	Spring	Summer	Autumn	Year
Wind (percent of all observations)[1]					
N.:					
1–16 knots	21	19	11	18	17
17–27 knots	4	3	(*)	3	3
28 knots or over	1	0	0	(*)	(*)
NE.:					
1–16 knots	27	15	8	18	17
17–27 knots	7	2	(*)	3	3
28 knots or over	1	(*)	0	(*)	(*)
E.:					
1–16 knots	6	7	6	7	7
17–27 knots	(*)	(*)	0	(*)	(*)
28 knots or over	0	0	0	0	0
SE.:					
1–16 knots	6	8	9	9	8
17–27 knots	1	1	(*)	(*)	1
28 knots or over	(*)	0	0	(*)	(*)
S.:					
1–16 knots	9	11	18	10	12
17–27 knots	3	4	3	3	3
28 knots or over	(*)	(*)	0	1	(*)
SW.:					
1–16 knots	3	8	17	8	9
17–27 knots	(*)	1	2	(*)	1
28 knots or over	0	0	0	(*)	(*)
W.:					
1–16 knots	1	6	11	5	6
17–27 knots	(*)	(*)	(*)	(*)	(*)
28 knots or over	0	0	0	0	0
NW.:					
1–16 knots	8	13	14	14	12
17–27 knots	(*)	1	(*)	(*)	(*)
28 knots or over	0	0	0	0	0
Calm	2	1	1	1	1
Maximum velocity, knots	42 S.	42 NW.	30 SW.	35 S.	42 S.

[1] 11–12 years of record.
†Average less than ½ day.
T=Trace.
*Less than 0.5 percent.

Cape Spencer, Latitude 58°12′ N., Longitude 136°38′ W.

ELEVATION: 81 FEET. YEARS OF RECORD: 8–9

Weather elements	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
Visibility (percent of all observations)													
All cases less than 3 miles	6	4	4	1	4	7	7	8	7	1	4	6	5
0700 LST (percent of all observations)	7	4	3	2	7	11	9	14	9	1	3	5	6
Less than ½ mile	1	1	1	1	5	6	6	8	3	0	1	2	3
½ to 3 miles	6	3	2	1	2	5	3	6	6	1	2	3	3
1300 LST (percent of all observations)	4	4	6	(1)	2	4	6	5	7	2	4	5	4
Less than ½ mile	1	1	1	0	1	2	4	2	3	0	0	1	1
½ to 3 miles	3	3	5	(1)	1	2	2	3	4	2	4	4	3
1900 LST (percent of all observations)	7	4	4	1	4	7	5	6	4	1	4	8	5
Less than ½ mile	2	0	1	0	3	4	1	2	1	0	0	4	2
½ to 3 miles	5	4	3	1	1	3	4	4	3	1	4	4	3
Precipitation													
Mean amount, inch	8.08	5.20	7.71	3.88	5.91	4.36	7.73	11.93	13.22	17.68	12.19	10.87	108.76
Least amount, inch	2.45	1.76	3.65	0.35	2.70	0.39	0.15	0.97	0.97	0.34	0.39	0.75	0.07
Greatest amount, inch	14.80	10.95	12.30	5.29	10.36	8.20	11.90	17.93	24.34	25.90	22.23	24.96	25.90
Maximum amount in 24 hours, inch	3.65	3.47	3.71	1.30	2.30	1.75	2.34	2.45	7.20	4.77	5.93	3.65	7.20
Mean number of days, 0.01 inch or more	18	15	20	15	15	14	21	21	20	26	19	22	225
Snow (3–5 years)													
Mean amount, in	6.6	12.8	7.3	T	0	0	0	0	0	T	T	6.9	33.6
Air temperature													
Mean, °F	34	33	31	40	46	50	52	52	50	49	36	34	42
Minimum:													
Extreme, °F	10	4	22	6	26	32	32	33	30	24	12	6	4
32° or less, mean number of days	18	16	18	5	1	1	1	0	1	1	14	16	92
Maximum:													
Extreme, °F	49	55	53	61	69	75	67	67	69	61	59	51	75
32° or less, mean number of days	4	5	2	1	0	0	0	0	0	0	3	6	21

	Winter	Spring	Summer	Autumn	Year
Wind (percent of all observations)					
N.:					
1–16 knots	(1)	(1)	(1)	(1)	(1)
17–27 knots	(1)	(1)	(1)	(1)	(1)
28 knots or over	(1)	(1)	0	(1)	(1)
NE.:					
1–16 knots	18	19	18	22	19
17–27 knots	19	12	5	16	13
28 knots or over	14	3	1	7	6
E.:					
1–16 knots	7	12	13	12	11
17–27 knots	9	8	2	8	7
28 knots or over	6	2	(1)	3	3
SE.:					
1–16 knots	2	1	(1)	3	1
17–27 knots	1	1	(1)	1	1
28 knots or over	(1)	0	0	(1)	(1)
S.:					
1–16 knot	(1)	4	5	2	3
17–27 knots	2	2	1	2	2
28 knots or over	1	(1)	0	1	(1)
SW.:					
1–16 knots	4	5	11	5	6
17–27 knots	2	3	2	4	3
28 knots or over	2	1	(1)	1	1
W.:					
1–16 knots	3	9	19	4	9
17–27 knots	3	4	5	3	4
28 knots or over	2	1	(1)	1	1
NW.:					
1–16 knots	3	6	9	2	5
17–27 knots	1	3	3	1	2
28 knots or over	(1)	1	(1)	(1)	(1)
Calm	1	3	6	2	3
Maximum velocity, knots	56 NE.	52 NW.	40 NW.	74 NE.	74 NE.

[1] Less than 0.5 percent.
T = Trace.

Chignik, Latitude 56°17′ N., Longitude 158°22′ W.

ELEVATION: 10 FEET. YEARS OF RECORD: 4

Month	Air temperature in degrees F.					Precipitation			Average number of days with—		Prevailing direction of wind
	Mean			Extremes		Average rainfall (inches)	Maximum rainfall in 24 hours	Average snowfall (inches)	Rainfall 0.01 in. or more	Fog	
	For month	Mean maximum	Mean minimum	Highest	Lowest						
January	32.4	36.6	27.3	46	9	19.19	7.15	9.3	19.0	1.3	SE.
February	24.6	30.7	20.3	46	−5	15.51	5.80	15.7	15.0	.3	NW.
March	24.9	31.7	18.1	48	−6	5.55	3.79	6.9	7.6	.3	NW.
April	31.9	39.0	25.6	51	5	4.20	2.55	3.7	6.6	.3	NW.
May	39.2	45.9	32.4	64	19	17.07	7.33	.6	14.0	.0	SE.
June	45.7	53.2	38.3	66	30	13.35	3.42	.0	14.2	1.3	SE.
July	50.0	57.2	42.8	68	33	5.82	3.68	.0	16.2	.0	SW.
August	50.9	57.8	44.1	71	33	7.78	7.15	.0	13.0	.3	SW./W.
September	46.8	53.4	40.4	75	27	18.76	7.12	.0	19.5	1.7	W.
October	38.6	44.5	32.8	55	20	15.35	6.52	4.0	15.2	.3	W.
November	31.6	37.4	25.8	50	−3	17.11	4.82	5.4	16.2	.7	NW.
December	28.8	34.3	23.4	48	2	11.74	4.40	14.2	14.8	.3	W.
Mean	37.1	43.5	30.9								SE.
Total						151.43		59.8	171.3	6.8	
Extreme				75	−6		7.33				

Cold Bay, Thornbrough AFB, Latitude 55°12′ N., Longitude 162°43′ W.

ELEVATION: 99 FEET. YEARS OF RECORD: 4–7

Weather elements	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
Visibility (percent of all observations)													
All cases less than 3 miles	17	20	19	12	7	9	13	18	8	4	12	15	13
0700 LST (percent of all observations)	16	18	19	13	11	14	20	22	9	2	11	10	14
Less than ½ mile	3	5	5	2	2	1	3	4	1	0	4	2	3
½ to 3 miles	13	13	14	11	9	13	17	18	8	2	7	8	11
1300 LST (percent of all observations)	20	21	15	11	3	4	8	13	6	5	13	19	12
Less than ½ mile	4	5	5	2	0	1	0	1	1	1	5	3	2
½ to 3 miles	16	16	10	9	3	3	8	12	5	4	8	16	9
1900 LST (percent of all observations)	14	22	22	11	6	8	12	18	9	5	13	16	13
Less than ½ mile	3	5	3	2	0	2	1	2	2	0	2	4	2
½ to 3 miles	11	17	19	9	6	6	11	16	7	5	11	12	11
Precipitation													
Mean amount, inches	2.93	2.92	1.40	1.15	2.12	2.21	1.85	2.89	3.44	4.47	4.59	2.87	32.75
Least amount, inches	0.20	1.50	0.45	0.02	1.37	0.88	0.43	1.41	2.60	2.69	2.55	0.24	2.69
Greatest amount, inches	8.47	7.87	3.61	2.42	2.85	4.54	2.81	4.45	4.21	6.63	7.72	5.31	8.47
Maximum amount in 24 hours, inches	2.49	1.81	0.95	1.14	1.13	1.24	1.17	1.29	1.26	1.53	1.68	1.08	2.49
Mean number of days, 0.01 inch or more	18	18	16	13	14	13	13	19	20	25	18	17	204
Snow (7 years)													
Mean amount, inches	16.1	10.6	13.9	4.8	0.9	T	0	T	T	0.8	6.4	12.9	66.4
Air temperature													
Mean, ° F	27	28	27	33	39	45	49	52	46	40	33	27	37
Minimum:													
Extreme, ° F	−5	−9	−3	4	20	30	36	32	30	28	8	−1	−9
32° or less, mean number of days	27	24	27	25	9	(†)	0	(†)	(†)	6	21	26	165
Maximum:													
Extreme, ° F	49	47	51	61	57	63	69	71	61	55	51	47	71
32° or less, mean number of days	12	11	15	5	(†)	0	0	0	0	(†)	4	15	62

	Winter	Spring	Summer	Autumn	Year
Wind (percent of all observations)					
N.:					
1–16 knots	8	8	6	7	7
17–27 knots	8	5	1	4	5
28 knots or over	2	1	0	2	1
NE.:					
1–16 knots	2	4	2	3	3
17–27 knots	1	2	(*)	(*)	1
28 knots or over	1	(*)	0	(*)	(*)
E.:					
1–16 knots	2	2	5	3	3
17–27 knots	2	3	3	1	2
28 knots or over	1	1	1	(*)	1
SE.:					
1–16 knots	9	10	11	8	9
17–27 knots	9	10	12	6	9
28 knots or over	7	5	6	3	5
S.:					
1–16 knots	5	4	4	6	5
17–27 knots	3	2	3	3	3
28 knots or over	1	1	1	1	1
SW.:					
1–16 knots	4	4	3	5	4
17–27 knots	2	(*)	2	2	2
28 knots or over	1	1	(*)	(*)	1
W.:					
1–16 knots	7	9	16	12	11
17–27 knots	3	5	6	7	5
28 knots or over	1	1	1	2	1
NW.:					
1–16 knots	11	12	12	11	11
17–27 knots	6	7	3	8	6
28 knots or over	1	1	(*)	3	1
Calm	3	2	2	3	3
Maximum velocity, knots	69 SE.	58 SE.	52 SE.	49 NW.	69 SE.

†Average less than ½ day.
*Less than 0.5 percent.
T=trace.

Cordova, Latitude 60°29′ N., Longitude 145°30′ W.

ELEVATION: 40 FEET. YEARS OF RECORD: 6–9

Weather elements	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
Visibility (percent of all observations)													
All cases less than 3 miles	17	14	8	4	4	5	8	12	11	3	6	25	10
0700 LST (percent of all observations)	12	6	7	8	7	6	14	19	11	2	3	49	12
Less than ½ mile	0	0	1	0	1	1	2	4	3	0	1	1	1
½ to 3 miles	12	6	6	8	6	5	12	15	8	2	2	48	11
1300 LST (percent of all observations)	26	26	8	2	2	3	3	11	9	4	8	12	10
Less than ½ mile	4	1	2	0	0	0	0	0	0	0	1	3	1
½ to 3 miles	22	25	6	2	2	3	3	11	9	4	7	9	9
1900 LST (percent of all observations)	13	11	10	3	3	5	7	7	13	3	7	13	8
Less than ½ mile	2	2	0	0	1	0	0	0	2	0	2	3	1
½ to 3 miles	11	9	10	3	2	5	8	8	11	3	5	10	7
Precipitation													
Mean amount, inches	8.07	4.26	4.91	4.06	7.00	4.96	5.41	8.03	18.06	12.55	9.28	7.57	94.16
Least amount, inches	0.72	1.07	1.03	0.08	4.14	1.51	3.02	4.29	5.03	5.82	1.75	2.19	0.08
Greatest amount, inches	14.21	9.16	10.57	7.72	10.04	9.47	9.69	20.25	27.72	24.07	16.82	20.78	27.72
Maximum amount in 24 hours, inches	2.66	2.17	3.56	1.60	2.38	2.79	2.56	3.40	7.92	3.14	4.48	2.45	7.92
Mean number of days, 0.01 inch or more	19	14	18	15	21	19	17	16	20	22	18	19	218
Snow (10 years)													
Mean amount, inches	31.3	20.2	21.3	5.9	1.1	0	0	0	0	2.2	8.5	24.6	115.1
Air temperature													
Mean, °F	24	24	29	35	43	50	53	52	48	39	29	24	38
Minimum:													
Extreme, °F	−27	−33	−15	−9	20	31	35	30	22	11	−17	−19	−33
32° or less, mean number of days	29	26	28	25	11	1	0	(†)	5	16	24	29	194
Maximum:													
Extreme, °F	47	49	49	56	77	77	84	75	70	60	55	46	84
32° or less, mean number of days	15	12	4	0	0	0	0	0	0	0	10	13	54

	Winter	Spring	Summer	Autumn	Year
Wind (percent of all observations)					
N.:					
1–16 knots	4	5	4	5	5
17–27 knots	(*)	0	0	0	(*)
28 knots or over	0	0	0	0	0
NE.:					
1–16 knots	8	9	13	14	11
17–27 knots	(*)	(*)	0	(*)	(*)
28 knots or over	0	0	0	0	0
E.:					
1–16 knots	24	21	22	27	24
17–27 knots	4	1	(*)	3	2
28 knots or over	(*)	0	0	(*)	(*)
SE.:					
1–16 knots	13	15	13	12	13
17–27 knots	3	2	1	1	2
28 knots or over	(*)	0	0	(*)	(*)
S.:					
1–16 knots	(*)	5	6	2	3
17–27 knots	(*)	(*)	0	(*)	(*)
28 knots or over	0	0	0	0	0
SW.:					
1–16 knots	3	10	12	4	7
17–27 knots	(*)	0	0	0	(*)
28 knots or over	0	0	0	0	0
W.:					
1–16 knots	2	5	7	2	4
17–27 knots	(*)	0	0	0	(*)
28 knots or over	0	0	0	0	0
NW.:					
1–16 knots	3	4	3	3	3
17–27 knots	(*)	0	0	0	(*)
28 knots or over	0	0	0	0	0
Calm	36	23	19	27	26
Maximun velocity, knots	29 E.	24 E.	17 SE.	43 SE.	43 SE.

†Average less than ½ day.
*Less than 0.5 percent.

BILLINGS 7304

Dutch Harbor, Latitude 53°53′ N., Longitude 166°32′ W.

ELEVATION: 13 FEET. YEARS OF RECORD: 28–40

Weather elements	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
Visibility (percent of all observations) All cases less than 3 miles													
LST (percent of all observations)													
Less than ½ mile													
½ to 3 miles													
LST (percent of all observations)													
Less than ½ mile													
½ to 3 miles													
LST (percent of all observations)													
Less than ½ mile													
½ to 3 miles													
Precipitation													
Mean amount, inches	5.85	5.63	4.88	3.91	4.24	2.74	1.91	2.43	5.32	7.30	5.66	7.01	56.88
Least amount, inches													
Greatest amount, inches													
Maximum amount in 24 hours, inches [1]	2.62	3.75	2.47	3.46	2.74	3.00	1.60	2.08	2.53	3.21	3.22	2.12	3.75
Mean number of days, 0.01 inch or more [1]	22	18	20	19	19	13	13	12	18	23	21	21	219
Snow (9–23 years)													
Mean amount, inches	15.6	19.7	10.5	6.7	0.1	T	0	0	T	0.5	5.8	10.8	69.7
Air temperature													
Mean, ° F	32	32	34	36	41	46	51	53	48	42	36	33	40
Minimum:													
Extreme, ° F	5	6	5	13	20	30	36	28	28	24	14	10	5
32° or less, mean number of days													
Maximum:													
Extreme, ° F	56	60	69	61	66	73	80	80	80	65	58	56	80
32° or less, mean number of days													

	Winter	Spring	Summer	Autumn	Year
Wind (percent of all observations) [2]					
N.:					
1–16 knots	14	11	6	10	10
17–27 knots					
28 knots or over	1	(*)	(*)	1	1
NE.:					
1–16 knots	8	8	13	6	9
17–27 knots					
28 knots or over	1	(*)	(*)	(*)	(*)
E.:					
1–16 knots	7	8	13	5	8
17–27 knots					
28 knots or over	1	(*)	(*)	(*)	(*)
SE.:					
1–16 knots	13	12	13	9	12
17–27 knots					
28 knots or over	2	1	(*)	1	1
S.:					
1–16 knots	14	14	12	13	13
17–27 knots					
28 knots or over	(*)	(*)	(*)	(*)	(*)
SW.:					
1–16 knots	12	13	17	15	15
17–27 knots					
28 knots or over	(*)	(*)	(*)	(*)	(*)
W.:					
1–16 knots	7	9	6	11	8
17–27 knots					
28 knots or over	(*)	(*)	(*)	(*)	(*)
NW.:					
1–16 knots	13	20	13	21	17
17–27 knots					
28 knots or over	1	1	(*)	2	1
Calm	6	3	7	5	5
Maximum velocity, knots					

T = Trace.
[1] 15–16 years of record.
[2] 6–7 years of record.
*Less than 0.5 percent

Gambell, Latitude 63°51′ N., Longitude 171°36′ W.

ELEVATION: 25 FEET. YEARS OF RECORD: 9

Weather elements	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
Visibility (percent of all observations)													
All cases less than 3 miles	27	28	22	21	20	25	24	23	9	13	22	25	22
0600 LST (percent of all observations)	24	32	27	26	25	32	33	27	9	12	19	25	24
Less than ½ mile	4	8	3	6	5	11	10	8	3	2	1	4	5
½ to 3 miles	20	24	24	20	29	21	23	19	6	10	18	21	19
1200 LST (percent of all observations)	26	26	19	18	19	19	19	21	9	13	21	23	20
Less than ½ mile	9	5	6	6	2	2	2	3	1	2	3	5	4
½ to 3 miles	17	21	13	12	17	17	17	18	8	11	18	18	16
1800 LST (percent of all observations)	32	26	19	19	15	25	21	21	9	14	25	26	21
Less than ½ mile	6	7	5	2	4	3	2	3	2	2	3	4	4
½ to 3 miles	26	19	14	17	11	22	19	18	7	12	22	22	17
Precipitation													
Mean amount, inches	0.89	1.23	1.20	1.25	0.70	0.55	1.85	2.69	1.54	1.42	1.14	1.23	15.69
Least amount, inches	0.42	0.21	0.06	0.10	0.02	0.16	0.38	1.61	0.58	0.30	0.33	0.38	0.02
Greatest amount, inches	3.28	4.86	4.85	5.86	1.87	1.12	3.20	4.86	3.72	2.21	2.62	3.13	5.86
Maximum amount in 24 hours, inches	1.10	1.29	1.10	1.41	0.57	0.31	1.82	1.55	1.37	1.03	0.67	1.17	1.82
Mean number of days, 0.01 inch or more	10	11	11	12	10	9	14	16	13	15	12	14	147
Snow (10 years)													
Mean amount, inches	9.2	12.1	11.8	11.3	3.9	0.2	T	T	0.1	6.6	10.8	13.7	79.7
Air temperature													
Mean, ° F	5	3	5	17	29	37	44	45	38	32	23	11	24
Minimum:													
Extreme, ° F	−23	−30	−26	−20	2	25	34	33	27	11	−5	−20	−30
32° or less, mean number of days	31	28	31	30	30	10	0	0	3	22	30	31	236
Minimum:													
Extreme, ° F	32	36	34	37	50	57	51	58	50	46	38	35	61
32° or less, mean number of days	31	27	30	27	14	0	0	0	0	10	23	30	192

	Winter	Spring	Summer	Autumn	Year
Wind (percent of all observations)					
N.:					
1–16 knots	10	15	7	10	10
17–27 knots	19	11	4	15	12
28 knots or over	8	2	1	6	4
NE.:					
1–16 knots	18	19	16	10	16
17–27 knots	18	11	2	10	10
28 knots or over	6	2	(*)	5	3
E.:					
1–16 knots	2	4	5	4	4
17–27 knots	3	2	2	3	3
28 knots or over	2	(*)	(*)	2	1
SE.:					
1–16 knots	1	3	5	4	3
17–27 knots	(*)	3	4	3	3
28 knots or over	(*)	(*)	(*)	1	(*)
S.:					
1–16 knots	5	6	15	6	8
17–27 knots	2	1	2	1	2
28 knots or over	(*)	(*)	(*)	(*)	(*)
SW.:					
1–16 knots	3	8	24	7	10
17–27 knots	(*)	3	4	1	2
28 knots or over	(*)	(*)	0	(*)	(*)
W.:					
1–16 knots	1	7	7	4	5
17–27 knots	1	(*)	(*)	3	1
28 knots or over	(*)	0	0	(*)	(*)
NW:					
1–16 knots	(*)	1	1	2	1
17–27 knots	(*)	(*)	(*)	2	1
28 knots or over	(*)	0	(*)	1	(*)
Calm	1	2	1	(*)	1
Maximum velocity, knots	49 S.	43 S.	36 N.	57 N.	57 N.

T=Trace.
*Less than 0.5 percent.

Homer, Latitude 59°38′ N., Longitude 151°31′ W.

ELEVATION: 65 FEET. YEARS OF RECORD: 8–10

Weather elements	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
Visibility (percent of all observations)													
All cases less than 3 miles	7	5	6	1	(*)	1	1	1	1	1	3	5	3
0900 LST (percent of all observations)	6	3	3	1	(*)	2	2	(*)	2	1	3	4	2
Less than ½ mile	1	0	(*)	1	0	1	1	(*)	0	0	0	0	(*)
½ to 3 miles	5	3	3	(*)	(*)	1	1	(*)	2	1	3	4	2
1300 LST (percent of all observations)	8	5	6	(*)	1	1	1	1	1	1	2	6	3
Less than ½ mile	0	0	1	0	0	1	0	0	0	0	1	(*)	(*)
½ to 3 miles	8	5	5	(*)	1	(*)	1	1	1	1	1	6	3
1800 LST (percent of all observations)	6	6	8	1	0	0	1	2	1	0	4	5	3
Less than ½ mile	1	1	1	0	0	0	0	0	1	0	0	1	(*)
½ to 3 miles	5	5	7	1	0	0	1	2	0	0	4	4	3
Precipitation													
Mean amount, inches	2.61	1.99	1.96	1.42	1.05	1.02	1.76	3.16	3.15	5.17	2.56	3.14	28.99
Least amount, inches	0.94	0.18	0.46	0.19	0.42	0.24	1.12	1.45	1.62	1.44	0.22	0.92	0.18
Greatest amount, inches	4.85	5.25	3.87	3.04	1.88	3.42	2.99	5.76	4.58	11.41	7.25	7.71	11.41
Maximum amount in 24 hours, inches	1.74	1.68	1.06	1.40	0.81	0.98	0.64	1.55	1.20	8.90	1.63	1.70	8.90
Mean number of days, 0.01 inch or more	15	11	11	8	10	9	13	16	16	16	12	15	152
Snow (8–11 years)													
Mean amount, inches	18.3	17.6	10.6	6.6	T	0	0	0	T	2.0	12.6	14.4	82.1
Air temperature													
Mean, ° F	24	29	28	36	43	50	53	52	47	38	28	24	38
Minimum:													
Extreme, ° F	−17	−19	−7	−9	14	28	34	33	22	14	−3	−15	−19
32° or less, mean number of days	28	24	29	22	11	2	0	0	5	16	27	27	191
Maximum:													
Extreme, ° F	49	51	51	61	69	71	71	79	69	59	49	49	79
32° or less, mean number of days	14	7	9	1	(†)	0	0	0	0	1	11	16	59

	Winter	Spring	Summer	Autumn	Year
Wind (percent of all observations)					
N.:					
1–16 knots	15	4	1	11	8
17–27 knots	(*)	1	0	(*)	(*)
28 knots or over	0	0	0	0	0
NE.:					
1–16 knots	36	17	6	29	22
17–27 knots	1	1	0	1	1
28 knots or over	0	0	0	0	0
E.:					
1–16 knots	16	16	11	17	15
17–27 knots	2	(*)	(*)	1	1
28 knots or over	0	0	0	0	0
SE.:					
1–16 knots	6	8	8	6	7
17–27 knots	1	(*)	(*)	1	1
28 knots or over	0	0	0	0	0
S.:					
1–16 knots	4	10	11	4	7
17–27 knots	(*)	(*)	0	(*)	(*)
28 knots or over	0	0	0	0	0
SW.:					
1–16 knots	6	19	29	11	16
17–27 knots	2	1	1	1	1
28 knots or over	(*)	(*)	0	0	(*)
W.:					
1–16 knots	5	16	29	9	15
17–27 knots	(*)	1	1	1	1
28 knots or over	(*)	(*)	0	0	(*)
NW.:					
1–16 knots	3	3	2	5	3
17–27 knots	(*)	(*)	(*)	(*)	(*)
28 knots or over	(*)	0	0	0	(*)
Calm	3	3	1	3	2
Maximum velocity, knots	36 SW.	35 SW.	22 W.	30 NE.	36 SW.

*Less than 0.5 percent.
†Average less than ½ day.
T = Trace.

Hooper Bay, Latitude 61°30′ N., Longitude 165°45′ W.

ELEVATION: 275 FEET. YEARS OF RECORD: 2–7

Month	Air temperature in degrees F.					Precipitation			Average number of days with—		Prevailing direction of wind
	Mean			Extremes		Average rainfall (inches)	Maximum rainfall in 24 hours	Average snowfall (inches)	Rainfall 0.01 in. or more	Fog	
	For month	Mean maximum	Mean minimum	Highest	Lowest						
January	11.0	17.7	3.7	39	−27	1.88	1.43	5.5	9.2	0.5	NE.
February	8.5	16.5	0.6	36	−35	.74	0.55	5.3	7.8	.0	NE.
March	11.7	20.0	3.5	38	−26	.24	.23	2.8	3.6	.0	E./NE.
April	26.4	32.9	19.9	56	−1	.47	.50	1.5	3.0	.0	NE.
May	36.5	43.7	29.3	59	4	.66	.25	T	6.5	.0	N.
June	49.5	57.0	42.0	80	31	.94	.33	.0	8.0	.0	NE.
July	52.7	58.8	46.7	77	36	2.30	.66	.0	13.5	.0	SE.
August	51.0	55.9	46.2	68	39	3.62	.98	.0	16.0	.0	SW.
September	47.3	53.3	41.4	70	25	3.20	.95	.0	16.0	.0	NE.
October	34.0	39.9	28.7	58	7	1.19	.55	3.4	9.6	.0	N.
November	24.1	29.8	18.4	59	−19	1.16	1.19	3.5	11.6	.5	NE.
December	12.1	20.4	5.6	50	−28	.74	.45	7.8	9.3	1.5	NE.
Mean	30.4	37.2	23.8								NE.
Total						17.14		29.8	114.1	2.5	
Extreme				80	−35		1.43				

T=Trace.

Kodiak, Latitude 57°45′ N., Longitude 152°31′ W.

ELEVATION: 21 FEET. YEARS OF RECORD: 6–9

Weather elements	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
Visibility (percent of all observations)													
All cases less than 3 miles	16	15	11	9	10	10	12	9	10	7	9	10	11
0600 LST (percent of all observations)	15	14	10	10	10	11	16	11	9	5	6	9	11
Less than ½ mile	2	1	3	1	2	1	3	4	0	1	0	1	2
½ to 3 miles	13	13	7	9	8	10	13	7	9	4	6	8	9
1200 LST (percent of all observations)	19	16	10	9	11	9	10	8	10	7	7	11	11
Less than ½ mile	2	1	2	0	2	(*)	2	2	1	1	0	1	1
½ to 3 miles	17	15	8	9	9	9	8	6	9	6	7	10	10
1800 LST (percent of all observations)	15	16	12	7	9	9	10	8	11	9	15	11	11
Less than ½ mile	1	2	1	1	3	(*)	1	1	2	(*)	9	1	2
½ to 3 miles	14	14	11	6	6	9	9	7	9	9	6	10	9
Precipitation													
Mean amount, inches	6.71	9.52	3.39	6.27	5.28	4.95	3.24	3.38	5.82	7.13	5.64	5.92	67.25
Least amount, inches	2.57	2.48	0.85	0.01	2.77	1.89	1.73	1.46	1.95	4.03	1.66	1.83	0.01
Greatest amount, inches	12.75	30.71	7.04	11.55	9.87	8.93	4.71	8.80	13.23	9.66	12.19	9.65	30.71
Maximum amount in 24 hours, inches	2.16	20.21	1.47	1.74	1.52	2.22	1.91	2.56	4.48	2.37	2.32	1.65	20.21
Mean number of days, 0.01 inch or more	20	19	14	18	20	17	16	15	17	19	16	17	208
Snow (33–38 years)													
Mean amount, inches	9.5	10.6	8.2	5.4	0.3	T	0	0	T	1.1	3.4	8.4	46.9
Air temperature													
Mean, ° F	31	34	33	38	44	48	54	56	50	42	34	30	41
Minimum:													
Extreme, ° F	−2	−1	−2	0	31	35	41	41	32	25	11	9	−2
32° or less, mean number of days	20	17	24	13	2	0	0	0	(†)	7	17	23	123
Maximum:													
Extreme, ° F	53	53	53	59	77	79	75	85	77	61	51	45	85
32° or less, mean number of days	7	3	6	1	0	0	0	0	0	0	4	9	30

	Winter	Spring	Summer	Autumn	Year
Wind (percent of all observations)					
N.:					
1–16 knots	4	5	6	4	5
17–27 knots	(*)	(*)	(*)	(*)	(*)
28 knots or over	(*)	0	0	(*)	(*)
NE.:					
1–16 knots	8	12	15	6	10
17–27 knots	1	1	1	1	1
28 knots or over	0	(*)	0	(*)	(*)
E.:					
1–6 knots	5	13	24	7	12
17–27 knots	2	1	(*)	3	2
28 knots or over	1	0	0	1	1
SE.:					
1–16 knots	10	15	15	9	12
17–27 knots	4	1	1	1	2
28 knots or over	1	0	0	(*)	(*)
S.:					
1–16 knots	9	7	8	11	9
17–27 knots	1	(*)	(*)	(*)	(*)
28 knots or over	(*)	0	0	(*)	(*)
SW.:					
1–16 knots	10	8	6	9	8
17–27 knots	(*)	1	(*)	(*)	(*)
28 knots or over	(*)	0	0	0	(*)
W.:					
1–16 knots	8	5	4	11	7
17–27 knots	1	1	(*)	(*)	1
28 knots or over	(*)	0	0	(*)	(*)
NW.:					
1–16 knots	24	20	16	26	21
17–27 knots	7	6	1	7	5
28 knots or over	1	1	0	1	1
Calm	3	3	3	3	3
Maximum velocity, knots	45 NW.	35 SE.	26 NW.	47 W.	47 W.

*Less than 0.5 percent.
†Average less than ½ day.
T=Trace.

Kotzebue, Latitude 66°52′ N., Longitude 162°38′ W.

ELEVATION: 10 FEET. YEARS OF RECORD: 8–9

Weather elements	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
Visibility (percent of all observations)													
All cases less than 3 miles	11	19	21	12	9	9	4	3	5	7	10	10	10
0800 LST (percent of all observations)	11	19	20	16	11	11	4	3	6	6	11	13	11
Less than ½ mile	3	9	8	4	1	6	1	(*)	1	1	2	3	13
½ to 3 miles	8	10	12	12	10	5	3	3	5	5	9	10	8
1100 LST (percent of all observations)	12	17	21	10	8	10	6	3	4	9	12	11	10
Less than ½ mile	3	6	8	4	4	5	1	0	2	2	4	4	3
½ to 3 miles	9	11	13	6	4	5	5	3	2	7	8	7	7
2000 LST (percent of all observations)	10	22	23	9	7	7	2	2	4	6	6	7	9
Less than ½ mile	3	6	7	2	3	3	2	0	0	2	2	2	3
½ to 3 miles	7	16	16	7	4	4	(*)	2	4	4	4	5	6
Precipitation													
Mean amount, inches	0.30	0.37	0.36	0.34	0.39	0.58	1.70	2.67	1.28	0.63	0.56	0.44	9.62
Least amount, inches	0.05	0.01	0.14	T	0.15	0.10	0.65	1.76	0.37	0.13	0.13	0.17	T
Greatest amount, inches	0.53	1.13	0.77	1.34	0.80	1.12	2.86	5.18	2.34	1.22	0.98	0.76	5.18
Maximum amount in 24 hours, inches	0.24	0.68	0.21	0.21	0.47	0.30	1.80	1.36	0.72	0.46	0.26	0.40	1.80
Mean number of days, 0.01 inch or more	8	7	9	9	7	8	12	13	13	10	11	12	124
Snow (9 years)													
Mean amount, inches	3.8	3.8	4.4	4.2	1.6	0.1	0	T	0.1	4.9	7.1	5.3	35.3
Air temperature													
Mean, ° F	−6	−3	−2	12	30	43	54	49	41	26	9	−3	21
Minimum:													
Extreme, ° F	−43	−48	−43	−44	−18	20	36	31	18	−3	−36	−42	−48
32° or less, mean number of days	31	28	31	30	27	7	0	(†)	8	29	30	31	252
Maximum:													
Extreme, ° F	36	35	34	42	74	81	82	75	61	51	38	34	82
32° or less, mean number of days	31	28	31	25	7	0	0	0	0	19	28	30	199

	Winter	Spring	Summer	Autumn	Year
Wind (percent of all observations)					
N.:					
1–16 knots	10	9	6	13	9
17–27 knots	1	(*)	(*)	3	1
28 knots or over	0	0	0	0	0
NE.:					
1–16 knots	16	11	1	16	11
17–27 knots	1	(*)	0	(*)	(*)
28 knots or over	0	(*)	0	0	(*)
E.:					
1–16 knots	19	16	8	23	16
17–27 knots	9	5	2	7	6
28 knots or over	3	2	0	1	2
SE.:					
1–16 knots	8	8	7	11	9
17–27 knots	5	4	2	3	4
28 knots or over	2	(*)	(*)	1	1
S.:					
1–16 knots	2	4	11	3	5
17–27 knots	(*)	(*)	(*)	(*)	(*)
28 knots or over	(*)	0	(*)	(*)	(*)
SW.:					
1–16 knots	3	7	12	2	6
17–27 knots	(*)	(*)	1	(*)	(*)
28 knots or over	(*)	(*)	0	(*)	(*)
W.:					
1–16 knots	6	16	30	5	14
17–27 knots	2	4	6	2	4
28 knots or over	(*)	1	(*)	(*)	(*)
NW.:					
1–16 knots	5	5	10	5	6
17–27 knots	1	3	3	2	2
28 knots or over	(*)	(*)	(*)	(*)	(*)
Calm	7	5	1	3	4
Maximum velocity, knots	48 SE.	57 SE.	36 N.	49 SE.	57 SE.

*Less than 0.5 percent.
†Average less than ½ day.
T=Trace.

Naknek, Latitude 58°41′ N., Longitude 156°44′ W.

ELEVATION: 67 FEET. YEARS OF RECORD: 4–6

Weather elements	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
Visibility (percent of all observations)													
All cases less than 3 miles	10	6	11	6	5	5	9	14	5	8	8	8	8
0700 LST (percent of all observations)	10	7	12	10	12	12	21	24	11	8	9	8	12
Less than ½ mile	2	1	4	3	3	4	5	7	5	3	2	2	3
½ to 3 miles	8	6	8	7	9	8	16	17	6	5	7	6	9
1300 LST (percent of all observations)	12	6	12	3	2	2	3	7	2	10	7	10	6
Less than ½ mile	3	2	1	(*)	0	1	0	0	0	1	1	2	1
½ to 3 miles	9	4	11	3	2	1	3	7	2	9	6	8	5
1900 LST (percent of all observations)	8	5	9	6	2	2	4	10	1	6	8	6	6
Less than ½ mile	3	1	1	1	0	0	0	0	0	0	1	1	1
½ to 3 miles	5	4	8	5	2	2	4	10	1	6	7	5	5
Precipitation													
Mean amount, inches	0.76	1.05	1.07	0.48	0.68	1.25	2.42	3.50	2.92	3.02	1.64	1.08	19.87
Least amount, inches	0.38	0.56	0.30	T	0.11	0.91	1.41	2.81	1.87	1.25	1.13	0.52	T
Greatest amount, inches	1.54	2.30	1.72	0.86	1.37	1.92	4.28	4.19	4.91	6.51	2.66	1.72	6.51
Maximum amount in 24 hours, inches	0.31	0.82	0.53	0.68	0.45	0.41	0.70	0.81	0.98	0.90	0.90	0.72	0.98
Mean number of days, 0.01 inch or more	10	12	9	7	9	9	13	19	15	21	12	11	147
Snow (12–17 years)													
Mean amount, inches	9.0	10.5	4.8	1.1	T	0	0	0	0	0.6	4.7	6.8	37.5
Air temperature													
Mean, ° F	14	20	18	32	42	51	54	53	46	36	20	15	34
Minimum:													
Extreme, ° F	−39	−33	−35	−5	4	30	14	32	20	6	−19	−33	−39
32° or less, mean number of days	28	25	29	25	9	(†)	1	(†)	7	20	26	30	200
Maximum:													
Extreme, ° F	47	51	57	55	71	79	83	81	69	57	49	45	83
32° or less, mean number of days	18	12	19	4	(†)	0	0	0	0	4	17	19	93

	Winter	Spring	Summer	Autumn	Year
Wind (percent of all observations)					
N.:					
1–16 knots	20	15	4	20	15
17–27 knots	6	4	(*)	6	4
28 knots or over	1	1	0	(*)	1
NE.:					
1–16 knots	11	9	6	11	9
17–27 knots	1	1	(*)	1	1
28 knots or over	(*)	(*)	0	(*)	(*)
E.:					
1–16 knots	9	10	6	7	8
17–27	6	4	2	2	4
28 knots or over	2	1	(*)	1	1
SE.:					
1–16 knots	9	8	12	10	10
17–27 knots	3	2	2	2	2
28 knots or over	(*)	(*)	(*)	1	(*)
S.:					
1–16 knots	7	10	20	10	12
17–27 knots	2	3	3	1	2
28 knots or over	(*)	(*)	(*)	(*)	(*)
SW.:					
1–16 knots	5	8	21	7	10
17–27 knots	1	1	1	1	1
28 knots or over	(*)	(*)	0	(*)	(*)
W.:					
1–16 knots	2	8	13	7	7
17–27 knots	(*)	1	(*)	(*)	(*)
28 knots or over	(*)	0	0	(*)	(*)
NW.:					
1–16	7	7	6	8	7
17–27 knots	(*)	1	0	(*)	(*)
28 knots or over	(*)	(*)	0	0	(*)
Calm	8	6	4	5	6
Maximum velocity, knots	48 E.	45 E.	35 SE.	39 SE.	48 E.

*Less than 0.5 percent.
†Average less than ½ day.
T = Trace.

Nome, Latitude 64°30′ N., Longitude 165°26′ W.

ELEVATION: 13 FEET. YEARS OF RECORD: 45

Weather elements	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
Visibility (percent of all observations) [1]													
All cases less than 3 miles	15	26	19	19	14	13	15	17	6	10	16	17	16
0600 LST (percent of all observations)	11	31	19	22	16	18	20	20	5	8	16	19	17
Less than ½ mile	3	7	3	3	4	4	3	1	1	0	2	4	3
½ to 3 miles	8	24	16	19	12	14	17	19	4	8	14	15	14
1200 LST (percent of all observations)	13	21	18	19	12	9	11	15	6	9	16	14	14
Less than ½ mile	3	4	5	3	1	3	(*)	1	0	0	3	2	2
½ to 3 miles	10	17	13	16	11	6	11	14	6	9	13	12	12
1800 LST (percent of all observations)	21	25	19	17	14	12	13	15	6	12	17	17	16
Less than ½ mile	0	4	5	2	2	2	2	1	0	3	2	1	2
½ to 3 miles	21	21	14	15	12	10	11	14	6	9	15	16	14
Precipitation													
Mean amount, inches	1.11	0.97	0.90	0.73	0.71	1.13	2.64	3.61	2.69	1.65	1.11	1.13	18.38
Least amount, inches	0.00	0.06	T	T	T	T	0.48	0.90	0.39	0.16	0.03	T	0.00
Greatest amount, inches	4.47	4.44	3.37	2.00	2.52	4.41	8.43	7.82	7.10	7.37	3.92	3.84	8.43
Maximum amount in 24 hours, inches	1.16	1.64	0.87	0.91	0.85	2.30	1.68	2.10	2.12	1.52	1.40	1.21	2.30
Mean number of days, 0.01 inch or more	10	8	12	12	6	10	18	16	12	10	11	14	139
Snow (36 years)													
Mean amount, inches	10.4	9.9	10.2	6.2	1.9	0.2	0	T	0.5	4.9	9.3	10.6	64.1
Air temperature													
Mean, ° F	4	6	8	20	34	46	50	49	42	30	16	7	26
Minimum:													
Extreme, ° F	−47	−42	−38	−30	−6	20	30	24	16	−4	−39	−42	−47
32° or less, mean number of days	31	28	31	30	22	6	1	4	13	28	30	31	255
Maximum:													
Extreme, ° F	46	45	44	60	66	80	84	80	66	58	49	40	84
32° or less, mean number of days	29	27	28	20	6	0	0	0	0	13	28	30	181

	Winter	Spring	Summer	Autumn	Year
Wind (percent of all observations) [1]					
N.:					
1–16 knots	20	13	8	19	15
17–27 knots	1	1	(*)	1	1
28 knots or over	(*)	0	0	(*)	(*)
NE.:					
1–16 knots	25	16	6	23	17
17–27 knots	7	4	1	4	4
28 knots or over	1	(*)	0	(*)	(*)
E.:					
1–16 knots	14	16	6	12	12
17–27 knots	5	4	(*)	1	2
28 knots or over	1	1	0	(*)	1
SE.:					
1–16 knots	4	8	12	6	7
17–27 knots	1	(*)	2	4	2
28 knots or over	(*)	(*)	0	1	(*)
S.:					
1–16 knots	3	7	13	2	6
17–27 knots	1	1	2	2	2
28 knots or over	1	(*)	(*)	1	1
SW.:					
1–16 knots	2	9	20	5	9
17–27 knots	(*)	1	2	1	1
28 knots or over	(*)	(*)	0	(*)	(*)
W.:					
1–16 knots	2	9	20	3	8
17–27 knots	(*)	(*)	2	1	1
28 knots or over	0	(*)	0	(*)	(*)
NW.:					
1–16 knots	7	7	5	12	8
17–27 knots	(*)	(*)	(*)	1	(*)
28 knots or over	0	0	0	0	0
Calm	5	3	1	1	3
Maximum velocity, knots	65 E.	63 E.	39 S.	63 SW.	65 E.

[1] 11–12 years of record.
*Less than 0.5 percent.
T=Trace.

Platinum, Latitude 59°01′ N., Longitude 161°47′ W.

ELEVATION: 21 FEET. YEARS OF RECORD: 2–3

Weather elements	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
Visibility (percent of all observations)													
All cases less than 3 miles	13	12	14	5	6	4	7	8	8	5	7	14	9
0700 LST (percent of all observations)	13	12	15	8	12	7	13	7	7	4	9	16	10
Less than ½ mile	4	4	8	3	2	6	7	0	1	0	1	1	3
½ to 3 miles	9	8	7	5	10	1	6	7	6	4	8	15	7
1300 LST (percent of all observations)	15	10	15	1	3	2	7	12	6	7	9	12	8
Less than ½ mile	8	3	6	1	0	1	1	1	0	0	1	2	2
½ to 3 miles	7	7	9	0	3	1	6	11	6	7	8	10	6
1900 LST (percent of all observations)	10	14	11	7	4	3	2	5	10	3	3	15	8
Less than ½ mile	6	7	7	2	1	0	0	0	1	0	0	7	3
½ to 3 miles	4	7	4	5	3	3	2	5	9	3	3	9	5
Precipitation													
Mean amount, inches	0.31	0.97	0.21	0.23	0.44	0.30	0.50	1.68	0.78	0.44	0.51	0.36	6.73
Least amount, inches	0.12	0.51	0.07	0.07	0.19	0.22	0.41	1.02	0.75	0.32	0.40	0.16	0.07
Greatest amount, inches	0.63	1.83	0.40	0.49	0.57	0.45	0.63	2.19	0.81	0.56	0.62	0.55	2.19
Maximum amount in 24 hours, inches	0.11	0.89	0.16	0.20	0.22	0.20	0.20	0.47	0.22	0.13	0.16	0.15	0.89
Mean number of days, 0.01 inch or more	11	14	10	7	12	8	13	21	11	17	15	12	151
Air temperature													
Mean, ° F	16	22	17	27	38	49	52	52	45	35	24	10	32
Minimum:													
Extreme, ° F	−33	−19	−17	−3	10	32	42	38	28	12	−17	−25	−33
32° or less, mean number of days	29	26	28	27	14	(†)	0	0	2	19	27	30	202
Maximum:													
Extreme, ° F	41	41	43	49	65	71	73	69	57	53	43	43	73
32° or less, mean number of days	20	14	22	11	1	0	0	0	0	6	19	24	117

Wind (percent of all observations)	Winter	Spring	Summer	Autumn	Year
N.:					
1–16 knots	16	12	4	15	12
17–27 knots	6	8	1	7	5
28 knots or over	2	1	0	2	1
NE.:					
1–16 knots	15	7	5	11	9
17–27 knots	5	2	(*)	2	2
28 knots or over	1	(*)	(*)	1	1
E.:					
1–16 knots	10	10	10	11	10
17–27 knots	6	5	2	5	5
28 knots or over	4	2	1	(*)	2
SE.:					
1–16	5	6	6	5	5
17–27 knots	4	3	1	1	2
28 knots or over	3	1	(*)	(*)	1
S.:					
1–16 knots	5	5	11	5	6
17–27 knots	3	2	(*)	(*)	1
28 knots or over	(*)	(*)	0	(*)	(*)
SW.:					
1–16 knots	1	8	18	5	8
17–27 knots	(*)	1	2	3	2
28 knots or over	(*)	0	(*)	0	(*)
W.:					
1–16 knots	1	4	20	6	8
17–27 knots	1	(*)	1	(*)	1
28 knots or over	(*)	0	(*)	0	(*)
NW.:					
1–16 knots	8	15	14	14	13
17–27 knots	3	6	3	4	4
28 knots or over	(*)	(*)	0	1	(*)
Calm	1	2	1	2	2
Maximum velocity, knots	53 E.	45 SE.	32 E.	43 NE.	53 E.

†Average less than ½ day.
*Less than 0.5 percent.

Point Hope, Latitude 68°21′ N., Longitude 166°47′ W.

ELEVATION: 19 FEET. YEARS OF RECORD: 1–2

Weather elements	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
Visibility (percent of all observations)													
All cases less than 3 miles	16	28	25	16	13	29	29	9	11	15	16	11	18
0700 LST (percent of all observations)	13	32	26	28	19	33	40	10	12	18	14	13	22
Less than ½ mile	0	4	6	7	3	10	10	0	3	3	0	5	4
½ to 3 miles	13	28	20	21	16	23	30	10	9	15	14	8	18
1300 LST (percent of all observations)	16	21	21	8	13	25	21	6	8	13	18	11	15
Less than ½ mile	3	5	6	2	2	2	0	0	3	2	0	3	2
½ to 3 miles	13	16	15	6	11	23	21	6	5	11	18	8	13
1900 LST (percent of all observations)	18	32	29	13	8	29	26	10	12	13	15	8	18
Less than ½ mile	0	9	8	2	2	10	3	0	2	0	0	2	3
½ to 3 miles	18	23	21	11	6	19	23	10	10	13	15	6	15
Precipitation													
Mean amount, inches	0.11	0.09	0.16	0.08	0.10	0.07	0.34	0.35	0.38	0.53	0.03	0.40	2.64
Least amount, inches	0.11	0.09	0.16	0.08	0.00	0.04	0.13	0.28	0.21	0.53	0.03	0.40	0.00
Greatest amount, inches	0.11	0.09	0.16	0.08	0.20	0.10	0.54	0.41	0.55	0.53	0.03	0.40	0.55
Maximum amount in 24 hours, inches	0.04	0.05	0.05	0.01	0.05	0.04	0.18	0.14	0.07	0.22	0.01	0.20	0.22
Mean number of days, 0.01 inche or more	6	5	5	9	6	4	9	9	14	17	4	6	94
Air temperature													
Mean, ° F	−1	−7	−11	13	24	35	42	42	38	27	8	1	23
Minimum:													
Extreme, ° F	−25	−38	−31	−17	−5	22	28	30	28	2	−11	−29	−38
32° or less, mean number of days	31	28	31	30	30	21	1	1	9	29	30	31	272
Maximum:													
Extreme, ° F	31	32	21	35	45	59	57	55	53	43	27	32	59
32° or less, mean number of days	31	28	31	29	16	2	0	0	0	16	30	31	214

Wind (percent of all observations)	Winter	Spring	Summer	Autumn	Year
N.:					
1–16 knots	18	24	16	9	17
17–27 knots	18	11	8	11	12
28 knots or over	5	3	1	6	4
NE.:					
1–16 knots	8	2	3	7	5
17–27 knots	2	1	(*)	6	2
28 knots or over	3	(*)	(*)	4	2
E.:					
1–16 knots	12	6	1	22	10
17–27 knots	3	(*)	(*)	2	1
28 knots or over	1	(*)	0	(*)	(*)
SE.:					
1–16 knots	3	12	15	4	8
17–27 knots	2	4	3	5	3
28 knots or over	1	1	0	2	1
S.:					
1–16 knots	3	8	18	5	8
17–27 knots	1	2	6	1	3
28 knots or over	1	(*)	0	1	1
SW.:					
1–16 knots	(*)	2	5	3	3
17–27 knots	(*)	(*)	(*)	2	1
28 knots or over	(*)	(*)			
W.:			0	0	(*)
1–16 knots	4	3	7	4	4
17–27 knots	(*)	(*)	1	1	1
28 knots or over	0	(*)	0	(*)	(*)
NW.:					
1–16 knots	10	17	14	3	11
17–27 knots	4	4	2	2	3
28 knots or over	(*)	(*)	0	(*)	(*)
Calm	1	(*)	(*)	(*)	(*)
Maximum velocity, knots	49 N.	44 N.	34 N.	49 SE.	49 N.

*Less than 0.5 percent.

Port Heiden, Ft. Morrow, Latitude 56°57′ N., Longitude 158°39′ W.

ELEVATION: 84 FEET. YEARS OF RECORD: 1–3

Weather elements	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
Visibility (percent of all observations)													
All cases less than 3 miles	20	12	19	9	6	8	13	19	5	4	9	14	12
0700 LST (percent of all observations)	25	12	24	10	10	17	18	24	5	1	9	11	14
Less than ½ mile	8	6	11	2	3	7	2	4	2	0	3	3	4
½ to 3 miles	17	6	13	8	7	10	16	20	3	1	6	8	10
1300 LST (percent of all observations)	17	10	16	10	3	1	8	18	5	5	13	13	10
Less than ½ mile	5	4	3	1	0	0	1	0	0	2	2	1	2
½ to 3 miles	12	6	13	9	3	1	7	18	5	3	11	12	8
1900 LST (percent of all observations)	19	14	16	6	6	6	14	14	6	7	6	19	11
Less than ½ mile	11	6	8	0	2	0	2	1	1	1	2	13	4
½ to 3 miles	8	8	8	6	4	6	12	13	5	6	4	6	7
Precipitation													
Mean amount, inches	0.49	0.28	0.20	0.20	0.25	0.63	0.58	1.22	0.91	1.49	0.65	0.62	7.52
Least amount, inches	0.29	0.07	0.07	0.06	0.07	0.38	0.46	1.04	0.68	1.28	0.65	0.47	0.06
Greatest amount, inches	0.68	0.48	0.38	0.31	0.52	0.88	0.69	1.45	1.13	1.70	0.65	0.77	1.70
Maximum amount in 24 hours, inches	0.14	0.19	0.11	0.13	0.14	0.27	0.27	0.45	0.15	0.31	0.09	0.18	0.45
Mean number of days, 0.01 inches or more	18	8	11	8	10	12	16	21	20	25	18	19	186
Air Temperature													
Mean, ° F	29	29	24	31	40	45	52	53	47	40	31	27	38
Minimum:													
Extreme, ° F	−13	−13	−11	−5	14	30	38	38	30	20	4	−3	−13
32° or less, mean number of days	21	22	27	26	14	1	0	0	(†)	8	22	24	165
Maximum:													
Extreme, ° F	45	49	55	51	65	71	73	83	67	55	47	45	83
32° or less, mean number of days	9	8	16	7	1	0	0	0	0	1	6	13	61

Wind (percent of all observations)	Winter	Spring	Summer	Autumn	Year
N.:					
1–16 knots	4	12	10	5	8
17–27 knots	2	3	(*)	2	2
28 knots or over	(*)	(*)	0	(*)	(*)
NE.:					
1–16 knots	16	9	4	10	10
17–27 knots	5	3	(*)	3	3
28 knots or over	1	0	0	(*)	(*)
E.:					
1–16 knots	8	6	3	7	6
17–27 knots	2	(*)	1	2	1
28 knots or over	(*)	(*)	(*)	(*)	(*)
SE.:					
1–16 knots	10	7	8	9	8
17–27 knots	9	8	7	4	7
28 knots or over	5	2	1	2	3
S.:					
1–16 knots	5	5	7	8	6
17–27 knots	3	2	3	(*)	2
28 knots or over	2	1	(*)	(*)	1
SW.:					
1–16 knots	6	4	10	9	7
17–27 knots	2	1	2	3	2
28 knots or over	1	0	(*)	(*)	(*)
W.:					
1–16 knots	3	13	20	10	11
17–27 knots	3	5	7	5	5
28 knots or over	1	1	2	1	1
NW.:					
1–16 knots	3	8	9	7	7
17–27 knots	4	5	(*)	6	4
28 knots or over	(*)	1	0	2	1
Calm	5	4	6	5	5
Maximum velocity, knots	48 SE.	47 SE.	38 SE.	42 SE.	48 SE.

†Average less than ½ day.
*Less than 0.5 percent.

St. Paul Island, Latitude 57°09′ N., Longitude 170°13′ W.

ELEVATION: 22 FEET. YEARS OF RECORD: 31–33

Weather elements	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
Visibility (percent of all observations)[1]													
All cases less than 3 miles	15	18	20	17	20	27	41	33	14	5	3	14	19
0700 LST (percent of all observations)	15	18	22	22	24	35	46	45	11	3	12	15	22
Less than ½ mile	0	9	6	6	10	22	32	32	3	1	2	2	10
½ to 3 miles	15	9	16	16	14	13	14	13	8	2	10	13	12
1300 LST (percent of all observations)	16	18	19	17	18	23	40	24	12	7	12	12	18
Less than ½ mile	2	3	5	7	6	10	16	11	2	1	1	3	6
½ to 3 miles	14	15	14	10	12	13	24	13	10	6	11	9	12
1900 LST (percent of all observations)	14	19	20	12	19	23	36	31	18	4	13	14	18
Less than ½ mile	1	5	7	2	5	10	22	16	8	0	1	1	6
½ to 3 miles	13	14	13	10	14	13	14	15	10	4	12	13	12
Precipitation													
Mean amount, inches	1.74	1.17	1.23	1.03	1.19	1.25	2.43	3.16	3.47	2.89	2.50	1.93	23.99
Least amount, inches	0.25	0.33	0.20	0.16	0.21	0.24	0.32	1.34	1.22	1.03	0.67	0.08	0.08
Greatest amount, inches	4.06	3.61	2.97	2.16	3.11	2.80	5.85	6.17	6.02	5.18	5.31	4.18	6.17
Maximum amount in 24 hours, inches	1.16	1.51	1.04	0.72	1.27	1.48	1.92	1.36	1.58	1.93	1.76	1.15	1.93
Mean number of days, 0.01 inch or more	18	14	15	14	13	12	16	18	20	22	19	19	200
Snow (28 years)													
Mean amount, inches	13.7	9.7	8.0	5.2	1.8	0.1	0	0	0.1	2.1	5.2	9.9	55.8
Air Temperature													
Mean, °F	25	23	25	29	35	41	46	48	45	39	33	29	35
Minimum:													
Extreme, ° F	−26	−13	−17	−1	14	26	29	34	27	23	9	−5	−26
32° or less, mean number of days	27	27	29	28	20	2	(†)	0	(†)	8	18	25	184
Maximum:													
Extreme, ° F	48	44	44	41	56	62	62	64	59	54	50	52	64
32° or less, mean number of days	15	17	16	9	2	0	0	0	0	(†)	6	13	78

	Winter	Spring	Summer	Autumn	Year
Wind (percent of all observations)[1]					
N.:					
1–16 knots	10	10	6	9	9
17–27 knots	8	5	3	4	5
28 knots or over	1	(*)	(*)	(*)	(*)
NE.:					
1–16 knots	10	13	14	9	11
17–27 knots	12	9	4	5	7
28 knots or over	4	1	0	1	2
E.:					
1–16 knots	7	8	9	4	7
17–27 knots	7	3	1	2	3
28 knots or over	2	1	0	2	1
SE.:					
1–16 knots	4	6	11	5	7
17–27 knots	2	2	1	3	2
28 knots or over	(*)	(*)	0	1	(*)
S.:					
1–16 knots	5	6	6	5	6
17–27 knots	3	2	2	4	3
28 knots or over	1	(*)	0	(*)	(*)
SW.:					
1–16 knots	5	7	16	9	9
17–27 knots	4	4	3	6	4
28 knots or more	3	1	0	1	1
W.:					
1–16 knots	3	6	12	8	7
17–27 knots	1	1	1	4	2
28 knots or over	(*)	(*)	0	(*)	(*)
NW.:					
1–16 knots	4	9	9	11	8
17–27 knots	3	5	1	5	4
28 knots or over	(*)	1	(*)	1	1
Calm	1	(*)	1	1	1
Maximum velocity, knots	43 S.	49 SW.	30 N.	39 SW.	49 SW.

[1] 7 years of record.
*Less than 0.5 percent.
†Average less than ½ day.

Scotch Cap, Latitude 54°25′ N., Longitude 164°44′ W.

ELEVATION: 20 FEET. YEARS OF RECORD: 1–6

Month	Air temperature in degrees F.					Precipitation			Average number of days with rainfall 0.01 in. or more	Percentage of observation with—			Prevailing direction of wind
	Mean			Extremes		Average rainfall (inches)	Maximum rainfall in 24 hours	Average snowfall (inches)		Fog (dense)	Thunder	Visibility 1 mile or less	
	For month	Mean maximum	Mean minimum	Highest	Lowest								
January	33.8	37.9	29.6	49	10	3.82	1.30	7.0	13	0.0	0.0	0.6	SE.
February	33.8	37.7	29.9	45	9	3.55	1.56	2.5	13	.0	.0	.7	NW.
March	32.2	37.4	27.2	49	9	2.46	1.40	4.4	13	.6	.0	2.9	NW.
April	36.8	41.3	32.5	52	21	2.72	0.86	.4	13	.6	.0	2.3	W.
May	40.0	45.8	35.2	65	27	4.20	1.98	T	14	.0	.0	2.6	W.
June	46.0	50.7	41.4	64	33	2.80	1.14	.0	14	.0	.0	7.2	SE.
July	49.2	53.6	44.9	74	39	4.48	1.50	.0	18	12.9	.0	14.5	W.
August	51.6	56.0	47.4	72	38	6.84	2.05	.0	19	2.6	.0	9.1	W.
September	48.2	52.6	43.8	67	35	6.22	1.85	.0	22	6.2	.0	10.8	W.
October	43.2	48.2	38.2	60	27	5.55	1.94	1.7	21	.0	.0	10.7	NW.
November	36.9	41.4	32.4	55	15	4.37	1.82	5.6	16	.0	.0	.0	NW.
December	33.0	37.4	28.6	49	13	3.80	1.22	8.7	16	.0	.0	1.2	SE.
Mean	40.4	44.8	35.9							1.9	.0	5.2	W.
Total						50.81		28.0	192				
Extreme				74	9		2.05						

T=Trace.

Seward, Latitude 60°06′ N., Longitude 149°27′ W.

ELEVATION: 60 FEET. YEARS OF RECORD: 9–28

Month	Air temperature in degrees F.					Precipitation			Average number of days with—			Percentage of observations with visibility 1 mile or less	Prevailing direction of wind
	Mean			Extremes									
	For month	Mean maximum	Mean minimum	Highest	Lowest	Average rainfall (inches)	Maximum rainfall in 24 hours	Average snowfall (inches)	Rainfall 0.01 in. or more	Fog (dense)	Thunder		
January	21.5	31.3	18.1	48	−20	4.46	3.64	17.4	12	0.0	0.2	19.8	N.
February	27.1	31.9	20.6	55	−14	4.91	2.95	19.1	11	.0	.0	15.1	N.
March	30.7	37.2	22.9	52	−7	3.42	4.02	9.9	11	.0	.0	10.9	N.
April	37.2	44.4	31.6	72	9	4.32	2.28	8.2	14	.3	.0	10.2	S.
May	44.5	50.5	37.0	77	22	3.33	2.59	T	15	.0	.0	7.3	S.
June	51.1	58.1	43.4	84	32	2.38	1.56	.0	9	.1	.0	4.0	S.
July	55.4	61.4	54.7	88	37	2.88	3.20	.0	12	.9	.0	7.8	S.
August	54.1	60.8	54.2	85	33	6.12	3.50	.0	17	.5	.0	4.8	S.
September	48.6	55.4	48.5	84	27	9.49	3.05	T	15	.2	.1	3.1	N.
October	39.8	46.3	40.2	65	9	10.99	6.75	1.5	16	.0	.1	6.0	N.
November	31.2	37.7	31.8	58	3	7.31	3.12	5.4	15	.0	.3	3.3	N.
December	24.7	31.2	25.6	53	−12	6.82	9.17	16.2	12	.0	.2	6.9	N.
Mean	38.8	45.5	39.0									8.8	N.
Total						66.43		77.7	159	2.0	.9		
Extreme				88	−20		9.17						

T=Trace.

Shemya Island, Latitude 52°43′ N., Longitude 174°06′ W.

ELEVATION: 36 FEET. YEARS OF RECORD: 2–5

Weather elements	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
Visibility (Percent of all observations)													
All cases less than 3 miles	14	16	18	20	12	19	46	40	19	8	9	11	19
0700 LST (Percent of all observations)	10	14	14	22	12	21	53	47	19	6	6	6	19
Less than ½ mile	1	3	1	4	3	7	28	19	7	0	1	1	6
½ to 3 miles	9	11	13	18	9	14	25	28	12	6	5	5	13
1300 LST (Percent of all observations)	17	15	20	20	8	19	39	37	21	8	7	14	19
Less than ½ mile	1	4	2	3	2	6	16	13	5	1	0	0	4
½ to 3 miles	16	11	18	17	6	13	23	24	16	7	7	14	15
1900 LST (Percent of all observations)	14	20	19	19	16	18	47	35	18	11	13	12	20
Less than ½ mile	3	2	3	3	3	4	15	16	6	2	1	1	5
½ to 3 miles	11	18	16	16	13	14	32	19	12	9	12	11	15
Precipitation													
Mean amount, in.	2.02	1.70	2.15	1.06	0.88	0.90	2.17	2.84	2.08	2.96	3.02	2.04	23.82
Least amount, in.	1.43	0.72	0.72	0.70	0.14	0.44	1.53	1.50	1.23	1.85	1.26	0.78	0.14
Greatest amount, in.	3.12	4.67	5.73	1.36	1.65	1.71	2.90	5.25	4.45	4.41	4.46	3.70	5.73
Maximum amount in 24 hours, in.	1.32	2.12	3.01	0.37	0.28	0.52	0.81	1.29	1.00	1.13	1.08	0.74	3.01
Mean number of days, 0.01 in. or more	21	19	20	11	13	13	14	14	12	25	20	17	199
Snow													
Mean amount, in.	14.1	10.0	8.9	2.1	0.2	0	0	0	0	0.5	6.0	9.0	50.8
Air Temperature													
Mean, ° F	30	30	32	36	38	42	46	49	48	42	37	33	39
Minimum:													
Extreme, ° F	18	18	18	20	30	30	38	40	38	28	24	18	18
32° or less, mean number of days	27	26	26	12	2	(†)	0	0	0	2	11	21	127
Maximum:													
Extreme, ° F	43	41	41	45	47	55	63	61	57	55	49	43	63
32° or less, mean number of days	12	12	8	1	0	0	0	0	0	0	1	5	39

	Winter	Spring	Summer	Autumn	Year
Wind (Percent of all observations)					
N.:					
1–16 knots	5	9	6	7	7
17–27 knots	4	4	1	3	3
28 knots or over	1	(*)	(*)	1	1
NE.:					
1–16 knots	6	6	6	4	5
17–27 knots	8	5	1	2	4
28 knots or over	1	2	(*)	(*)	1
E.:					
1–16 knots	9	5	4	4	5
17–27 knots	8	3	(*)	3	4
28 knots or over	4	1	(*)	1	2
SE.:					
1–16 knots	5	5	8	4	5
17–27 knots	6	5	3	4	4
28 knots or over	3	3	(*)	1	2
S.:					
1–16 knots	2	4	9	5	5
17–27 knots	2	3	4	4	3
28 knots or over	1	1	(*)	3	1
SW.:					
1–16 knots	2	7	12	5	6
17–27 knots	2	5	5	5	4
28 knots or over	(*)	1	0	1	1
W.:					
1–16 knots	7	9	17	11	11
17–27 knots	6	5	4	0	6
28 knots or over	3	1	1	3	2
NW.:					
1–16 knots	7	10	13	10	10
17–27 knots	5	4	4	7	5
28 knots or over	2	(*)	(*)	(*) 2	1
Calm	1	2	2	1	2
Maximum velocity, knots	63 E.	46 NW.	35 W.	55 SE.	63 E.

† Average less than ½ day.
*Less than 0.5 percent.

Umnak Island, Cape AFB, Latitude 53°23′ N., Longitude 167°54′ W.

ELEVATION: 131 FEET. YEARS OF RECORD: 4–6

Weather elements	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
Visibility (Percent of all observations)													
All cases less than 3 miles	14	20	20	13	8	12	25	33	11	5	8	12	15
0700 LST (Percent of all observations)	13	14	15	13	9	14	31	39	13	4	7	10	15
Less than ½ mile	2	4	3	2	2	6	15	23	5	1	2	3	6
½ to 3 miles	11	10	12	11	7	8	16	16	8	3	5	7	9
1300 LST (Percent of all observations)	16	22	23	13	7	11	20	29	8	7	10	12	15
Less than ½ mile	3	5	5	2	2	4	10	15	3	(*)	2	2	4
½ to 3 miles	13	17	18	11	5	7	10	14	5	7	8	10	11
1900 LST (Percent of all observations)	13	24	21	13	9	11	25	32	13	5	7	15	16
Less than ½ mile	3	5	5	1	2	1	13	23	5	1	2	4	5
½ to 3 miles	10	19	16	12	7	10	12	9	8	4	5	11	11
Precipitation													
Mean amount, in.	2.74	4.29	2.79	2.52	3.35	3.15	3.70	6.25	3.62	3.84	5.11	4.78	46.14
Least amount, in.	0.52	2.13	0.71	1.27	1.44	1.13	1.84	3.23	2.42	0.40	2.47	0.45	0.40
Greatest amount, in.	3.77	6.74	5.77	5.59	6.21	5.16	5.93	9.48	5.18	7.18	8.65	7.08	9.48
Maximum amount in 24 hours, in.	1.01	1.55	1.80	1.06	0.93	1.87	1.38	3.04	1.41	1.14	2.99	2.51	3.04
Mean number of days, 0.01 in. or more	18	19	18	17	19	15	17	19	18	24	20	22	226
Air Temperature													
Mean, ° F.	30	32	32	36	39	45	48	50	46	40	35	32	39
Minimum:													
Extreme, ° F.	10	10	8	16	26	32	38	36	33	26	22	16	8
32° or less, mean number of days	25	22	23	18	7	(†)	0	0	0	4	15	23	137
Maximum:													
Extreme, ° F.	45	49	47	51	53	89	69	67	65	61	55	45	89
32° or less, mean number of days	9	7	8	1	0	0	0	0	0	0	1	9	35

	Winter	Spring	Summer	Autumn	Year
Wind (Percent of all observations)					
N.:					
1–16 knots	10	11	11	10	10
17–27 knots	9	9	4	7	7
28 knots or over	5	3	1	3	3
NE.:					
1–16 knots	5	6	10	3	6
17–27 knots	4	3	(*)	2	2
28 knots or over	1	1	(*)	(*)	1
E.:					
1–16 knots	5	5	8	4	5
17–27 knots	2	2	(*)	2	2
28 knots or over	(*)	(*)	(*)	(*)	(*)
SE.:					
1–16 knots	3	6	5	3	4
17–27 knots	3	(*)	(*)	(*)	1
28 knots or over	(*)	(*)	(*)	(*)	(*)
S.:					
1–16 knots	5	10	17	8	10
17–27 knots	5	3	4	4	4
28 knots or over	3	(*)	(*)	1	1
SW.:					
1–16 knots	9	14	22	12	14
17–27 knots	5	5	5	5	5
28 knots or over	2	2	1	2	2
W.:					
1–16 knots	5	5	3	6	5
17–27 knots	2	1	(*)	4	2
28 knots or over	(*)	(*)	(*)	(*)	(*)
NW.:					
1–16 knots	7	6	3	10	6
17–27 knots	5	4	2	6	4
28 knots or over	(*)	2	(*)	4	2
Calm	5	2	4	4	4
Maximum velocity, knots	69 N.	61 NW.	35 E.	74 NW.	74 NW.

†Average less than ½ day.
*Less than 0.5 percent.

Unalakleet, Latitude 63°54′ N., Longitude 160°47′ W.

ELEVATION: 22 FEET. YEARS OF RECORD: 1–2

Weather elements	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
Visibility (percent of all observations)													
All cases less than 3 miles	5	9	17	9	5	10	3	8	5	5	2	6	7
0700 LST (percent of all observations)	7	4	15	18	5	15	4	8	8	3	2	3	8
Less than ½ mile	2	2	2	7	3	6	0	0	3	0	0	0	2
½ to 3 miles	5	2	13	11	2	9	4	8	5	3	2	3	6
1300 LST (percent of all observations)	2	12	21	3	2	7	4	7	4	8	3	8	7
Less than ½ mile	0	2	5	2	2	2	0	0	2	0	0	2	1
½ to 3 miles	2	10	16	1	0	5	4	7	2	8	3	6	6
1900 LST (percent of all observations)	7	12	15	7	8	9	2	8	2	3	0	8	7
Less than ½ mile	0	5	5	0	2	7	0	0	1	0	0	2	2
½ to 3 miles	7	7	10	7	6	2	2	8	1	3	0	6	5
Precipitation													
Mean amount, inches	0.07	0.14	0.21	0.09	0.51	0.33	0.89	1.99	1.41	0.75	0.03	0.07	6.49
Least amount, inches	0.07	0.09	0.03	0.05	0.44	0.18	0.47	1.92	1.30	0.75	0.03	0.07	0.03
Greatest amount, inches	0.07	0.18	0.39	0.12	0.58	0.47	1.32	2.06	1.51	0.75	0.03	0.07	2.06
Maximum amount in 24 hours, inches	0.07	0.08	0.06	0.09	0.20	0.18	0.30	0.31	0.31	0.23	0.01	0.03	0.31
Mean number of days, 0.01 inch or more	7	8	11	6	11	10	13	22	21	12	3	6	130
Air Temperature													
Mean, ° F	9	11	6	19	34	45	55	51	42	31	16	8	30
Minimum:													
Extreme, ° F	−33	−35	−37	−21	−11	26	36	32	20	−7	−17	−37	−37
32° or less, mean number of days	31	28	31	30	22	6	0	1	8	23	29	31	240
Maximum:													
Extreme, ° F	41	41	37	43	61	81	79	67	65	51	41	41	81
32° or less, mean number of days	28	22	28	17	5	0	0	0	0	8	27	28	163

	Winter	Spring	Summer	Autumn	Year
Wind (percent of all observations)					
N.:					
1–16 knots	4	6	5	6	5
17–27 knots	(*)	1	(*)	1	1
28 knots or over	0	(*)	0	0	(*)
NE.:					
1–16 knots	10	7	5	14	9
17–27 knots	11	3	0	3	4
28 knots or over	3	1	0	1	1
E.:					
1–16 knots	21	14	12	29	19
17–27 knots	19	6	(*)	11	9
28 knots or over	5	1	0	2	2
SE.:					
1–16 knots	4	5	6	5	5
17–27 knots	(*)	(*)	(*)	(*)	(*)
28 knots or over	(*)	(*)	0	(*)	(*)
S.:					
1–16 knots	3	3	4	2	3
17–27 knots	2	(*)	(*)	(*)	(*)
28 knots or over	(*)	(*)	0	0	(*)
SW.:					
1–16 knots	5	13	16	5	10
17–27 knots	2	2	3	3	2
28 knots or over	(*)	(*)	(*)	(*)	(*)
W.:					
1–16 knots	3	8	25	4	10
17–27 knots	(*)	(*)	2	(*)	1
28 knots or over	(*)	(*)	(*)	0	(*)
NW.:					
1–16 knots	5	22	17	8	13
17–27 knots	(*)	2	2	3	2
28 knots or over	0	(*)	0	0	(*)
Calm	3	6	3	3	4
Maximum velocity, knots	46 E.	36 E.	30 W.	41 E.	46 E.

*Less than 0.5 percent.

Valdez, Latitude 61°07′ N., Longitude 146°16′ W., Altitude 400 feet

Month	Pressure reduced to sea level	Air temperature in degrees F.					Precipitation			Average number of days with rainfall 0.01 in. or more	Percentage of observations with—			Wind							
	Mean	Mean			Extremes		Average rainfall (inches)	Maximum rainfall in 24 hours	Average snowfall (inches)		Fog (dense)	Thunder	Visibility 1 mile or less	Percentage of observations from—							
	For month	For month	Mean maximum	Mean minimum	Highest	Lowest								N.	NE.	E.	SE.	S.	SW.	W.	NW.	Calm
January	29.78	19.2	26.1	12.5	50	−20	4.59	2.03	64.2	12	0.0	0.0	7.3	32	53	0	0	1	6	0	0	8
February	29.82	21.6	28.9	13.9	59	−24	4.84	4.00	57.7	11	.3	.0	11.6	36	47	0	0	0	4	0	0	13
March	29.83	25.7	33.6	17.1	52	−11	4.40	4.63	44.9	10	.0	.0	10.7	31	46	0	0	2	7	0	0	14
April	29.88	34.4	42.9	28.4	63	4	3.21	2.36	19.6	11	.0	.0	5.5	32	39	0	0	3	15	0	0	11
May	29.94	42.6	50.6	34.1	78	18	2.85	1.80	1.5	14	.0	.0	1.0	15	14	0	0	6	57	0	0	8
June	29.98	50.0	58.1	41.5	83	30	2.24	1.66	.0	13	.0	.0	.0	1	0	0	0	9	83	0	0	7
July	30.01	53.3	60.2	45.4	84	36	3.72	2.41	.0	16	.0	.0	3.5	6	7	0	0	13	53	0	0	21
August	29.94	52.0	59.7	44.2	84	29	6.26	2.97	.0	20	.0	.0	4.3	15	16	0	0	8	33	0	0	28
September	29.80	46.1	53.4	38.7	82	23	8.86	3.53	.2	19	.0	.0	3.0	31	32	0	0	5	15	0	0	17
October	29.68	37.7	43.7	31.9	69	5	8.11	2.63	9.1	19	.2	.0	4.9	22	57	0	0	2	10	0	0	9
November	29.62	26.6	33.0	21.1	59	−9	5.86	2.55	38.7	14	.0	.0	9.6	32	47	2	0	2	12	0	0	5
December	29.66	21.1	27.5	14.4	48	−18	5.56	3.55	56.3	12	.0	.0	5.2	26	33	18	3	4	9	0	0	7
Mean	29.83	35.9	43.1	28.6							.1	.0	5.6	23	33	2	(*)	5	25	0	0	12
Total							60.50		292.2	171												
Extreme					84	−24		4.63														
Number years record		26-31	22-28	21-28	23-30	26	26-31	25-31	17	22-29	7-8	7-8	7-8	2	2	2	2	2	2	2	2	2

*Less than 0.5 percent.

Wales, Latitude 65°37′ N., Longitude 168°03′ W.

ELEVATION: 9 FEET. YEARS OF RECORD: 7–8

Weather elements	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
Visibility (percent of all observations)													
All cases less than 3 miles	42	50	34	24	13	20	23	12	6	7	12	16	22
0700 LST (percent of all observations)	39	46	29	28	10	28	35	16	6	11	7	19	23
Less than ½ mile	16	12	10	7	3	5	8	4	0	3	7	0	6
½ to 3 miles	23	34	19	21	7	23	27	12	6	8	0	19	17
1300 LST (percent of all observations)	48	47	37	25	13	13	15	8	4	3	17	19	21
Less than ½ mile	18	20	23	5	2	0	4	2	0	0	3	6	7
½ to 3 miles	30	27	14	20	11	13	11	6	4	3	14	13	14
1900 LST (percent of all observations)	39	56	37	18	16	18	18	11	9	6	13	10	21
Less than ½ mile	15	28	16	2	2	7	4	1	0	0	10	0	7
½ to 3 miles	24	28	21	16	14	11	14	10	9	6	3	10	14
Precipitation													
Mean amount, inches	0.28	0.39	0.21	0.22	0.32	0.49	1.37	2.65	1.57	1.10	0.58	0.34	9.52
Least amount, inches	0.04	0.15	T	T	0.04	0.19	0.45	1.70	0.26	0.24	0.05	0.01	T
Greatest amount, inches	0.64	0.76	0.51	0.79	0.66	1.07	2.09	4.84	2.69	2.32	1.13	0.67	4.84
Maximum amount in 24 hours, inches	0.18	0.22	0.14	0.27	0.33	0.40	0.80	1.57	0.82	0.48	0.30	0.27	1.57
Mean number of days, 0.01 inch or more	7	8	7	6	8	9	12	16	13	15	15	10	126
Snow (7 years)													
Mean amount, inches	5.0	3.4	3.5	2.3	2.8	0.4	0	T	0.3	7.2	7.5	4.7	37.1
Air Temperature													
Mean, ° F	−1	−2	−3	13	27	38	46	45	40	30	19	4	21
Minimum:													
Extreme, ° F	−33	−41	−40	−26	−11	23	27	32	25	8	−19	−31	−41
32° or less, mean number of days	31	28	31	30	30	17	(†)	(†)	5	25	30	31	258
Maximum:													
Extreme, ° F	33	44	39	45	57	66	70	71	56	48	45	38	71
32° or less, mean number of days [1]	31	25	30	27	14	1	0	0	0	12	30	24	194

	Winter	Spring	Summer	Autumn	Year
Wind (percent of all observations)					
N.:					
1–16 knots	2	7	11	11	8
17–27 knots	5	6	4	9	6
28 knots or over	3	1	(*)	2	2
NE.:					
1–16 knots	15	20	18	11	16
17–27 knots	16	10	4	5	9
28 knots or over	9	3	(*)	4	4
E.:					
1–16 knots	14	7	4	17	10
17–27 knots	14	10	(*)	7	8
28 knots or over	3	1	0	1	1
SE.:					
1–16 knots	2	1	1	2	2
17–27 knots	1	2	1	1	1
28 knots or over	1	(*)	(*)	(*)	(*)
S.:					
1–16 knots	3	7	8	5	6
17–27 knots	3	7	14	7	8
28 knots or over	2	3	5	2	3
SW.:					
1–16 knots	1	8	14	3	6
17–27 knots	1	3	8	2	3
28 knots or over	1	1	1	(*)	1
W.:					
1–16 knots	1	1	4	4	2
17–27 knots	1	(*)	1	2	1
28 knots or over	0	(*)	0	(*)	(*)
NW.:					
1–16 knots	(*)	1	1	2	1
17–27 knots	1	(*)	(*)	1	1
28 knots or over	0	0	0	(*)	(*)
Calm	1	1	1	2	1
Maximum velocity, knots	45 S.	47 S.	38 S.	50 S.	50 S.

[1] 2 years of record.
†Average less than ½ day.
*Less than 0.5 percent.
T=Trace.

Whittier, Latitude 60°47′ N., Longitude 148°41′ W.

ELEVATION: 55 FEET. YEARS OF RECORD: 7–8

Weather elements	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Year
Visibility (percent of all observations)													
All cases less than 3 miles													
LST (percent of all observations)													
Less than ½ mile													
½ to 3 miles													
LST (percent of all observations)													
Less than ½ mile													
½ to 3 miles													
LST (percent of all observations)													
Less than ½ mile													
½ to 3 miles													
Precipitation													
Mean amount, inches	18.47	9.51	7.15	7.73	13.22	11.84	12.95	15.01	18.56	23.23	17.22	18.84	173.73
Least amount, inches	4.37	4.90	5.51	0.03	6.24	4.94	2.94	5.60	8.28	7.22	0.82	3.32	0.03
Greatest amount, inches	32.36	14.16	9.73	15.26	35.84	18.12	17.92	24.88	28.09	51.81	40.32	34.65	51.81
Maximum amount in 24 hours, inches	4.75	2.81	2.35	2.55	3.92	2.88	3.90	4.12	4.14	7.48	5.59	4.80	7.48
Mean number of days, 0.01 inch or more	18	15	12	12	15	14	17	19	22	21	16	19	200
Snow (7 years)													
Mean amount, inches	75.0	44.9	39.7	9.5	0.7	0.0	0.0	T	0.0	3.9	20.4	65.5	259.6
Air Temperature													
Mean, °F	24.5	27.5	28.2	35.0	44.1	52.0	56.9	55.5	49.3	39.3	29.8	25.5	39.0
Minimum:													
Extreme, °F	−11	−15	−10	−2	15	30	40	34	30	19	−4	−29	−29
32° or less, mean number of days	28	26	29	22	6	0	0	0	1	12	23	28	175
Maximum:													
Extreme, °F	45	53	48	63	76	82	84	84	71	60	50	46	84
32° or less, mean number of days	15	11	9	2	0	0	0	0	0	0	9	14	60

	Winter	Spring	Summer	Autumn	Year
Wind (percent of all observations)					
N.:					
1–16 knots					
17–27 knots					
28 knots or over					
NE.:					
1–16 knots					
17–27 knots					
28 knots or over					
E.:					
1–16 knots					
17–27 knots					
28 knots or over					
SE.:					
1–16 knots					
17–27 knots					
28 knots or over					
S.:					
1–16 knots					
17–27 knots					
28 knots or over					
SW.:					
1–16 knots					
17–27 knots					
28 knots or over					
W.:					
1–16 knots					
17–27 knots					
28 knots or over					
NW.:					
1–16 knots					
17–27 knots					
28 knots or over					
Calm					
Maximum velocity, knots					

T=Trace.

Yakutat, Latitude 59°31′ N., Longitude 139°40′ W.

ELEVATION: 31 FEET. YEARS OF RECORD: 6–8

Weather elements	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
Visibility (percent of all observations)													
All cases less than 3 miles	17	20	21	9	8	10	16	23	17	10	9	22	15
0700 LST (percent of all observations)	17	16	21	10	12	18	21	32	15	9	5	16	16
Less than ½ mile	1	3	2	1	3	4	1	6	5	0	0	1	2
½ to 3 miles	16	13	19	9	9	14	20	26	10	9	5	15	14
1300 LST (percent of all observations)	13	21	20	8	5	7	14	17	16	8	14	25	14
Less than ½ mile	1	4	4	1	0	1	0	1	1	1	1	2	1
½ to 3 miles	12	17	16	7	5	6	14	16	15	7	13	23	13
1900 LST (percent of all observations)	22	24	23	8	6	6	13	19	19	14	9	24	16
Less than ½ mile	1	5	2	1	0	0	1	0	2	0	0	1	1
½ to 3 miles	21	19	21	7	6	6	12	19	17	14	9	23	15
Precipitation													
Mean amount, inches [1]	11.56	8.67	9.48	7.78	7.68	4.82	8.21	11.17	15.83	19.31	15.11	12.36	131.98
Least amount, inches [1]	0.60	3.31	3.15	0.75	3.30	0.52	1.25	3.73	4.92	6.68	4.36	3.51	0.52
Greatest amount, inches [1]	29.45	15.67	19.83	16.94	17.11	13.11	17.66	26.81	27.10	36.45	29.43	28.54	36.45
Maximum amount in 24 hours, inches	5.10	2.66	3.07	2.69	2.77	2.50	2.33	3.49	3.16	3.90	5.32	2.01	5.32
Mean number of days, 0.01 inch or more	23	17	22	21	14	13	15	13	15	24	23	22	222
Snow (8 years)													
Mean amount, inches	41.6	31.6	38.8	9.8	0.7	0	0	0	0	2.0	16.7	38.2	179.4
Air Temperature													
Mean, ° F. [1]	28	30	32	37	44	50	53	53	49	42	34	30	40
Minimum:													
Extreme, ° F	−23	−19	−7	2	8	32	36	30	27	18	−10	−15	−23
32° or less, mean number of days	24	23	28	21	8	1	0	0	1	9	19	25	159
Maximum:													
Extreme, ° F	49	51	50	65	79	78	78	81	71	63	59	51	81
32° or less, mean number of days	9	7	4	1	0	0	0	0	0	0	6	11	38

	Winter	Spring	Summer	Autumn	Year
Wind (percent of all observations)					
N.:					
1–16 knots	2	2	3	3	2
17–27 knots	0	0	0	0	0
28 knots or over	0	0	0	0	0
NE.:					
1–16 knots	17	9	4	15	11
17–27 knots	1	1	*	1	1
28 knots or over	*	0	0	*	*
E.:					
1–16 knots	36	26	20	36	30
17–27 knots	4	5	2	4	4
28 knots or over	1	*	*	1	1
SE.:					
1–16 knots	9	13	15	11	12
17–27 knots	3	3	2	2	2
28 knots or over	1	1	*	1	1
S.:					
1–16 knots	3	4	8	4	5
17–27 knots	1	*	*	1	*
28 knots or over	*	*	0	*	*
SW.:					
1–16 knots	2	8	11	5	6
17–27 knots	1	1	*	1	1
28 knots or over	0	0	0	*	*
W.:					
1–16 knots	1	6	17	3	7
17–27 knots	1	*	*	*	*
28 knots or over	*	0	0	*	*
NW.:					
1–16 knots	2	8	11	3	6
17–27 knots	0	*	*	*	*
28 knots or over	0	0	0	0	0
Calm	15	13	7	9	11
Maximum velocity, knots	50 SE.	42 SE.	40 SE.	43 SE.	50 SE.

[1] 30 years of record.
*Less than 0.5 percent.

Ocean Area No. 40120. Position: Lat. 40°–45° N., Long. 120°–125° W. 17,000 Greenwich Noon Observations—Years of Record: 53

Month	Wind																		Weather									
	Mean velocity (knots)	Percentages of observations from—																	Percentages of observations recording							Mean cloud amount (0-10)	Average air temperature	Average sea surface temperature
		N.		NE.		E.		SE.		S.		SW.		W.		NW.		Calm	Fog, mist, haze	Rain, drizzle	Snow	Showers	Squalls	Gales (force 8 or over)	Exceptional visibility			
		Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over												
January	15	13	(*)	7	0	6	(*)	27	2	13	1	8	1	7	(*)	10	1	4	15	17	0	4	5	3	-----	6	48	51
February	15	13	1	7	0	8	0	19	3	18	1	7	1	5	(*)	11	1	5	14	18	1	3	6	3	-----	6	49	50
March	13	16	1	4	0	6	(*)	19	1	13	(*)	10	1	6	(*)	18	1	4	13	13	(*)	4	8	2	-----	6	49	50
April	12	15	1	4	(*)	4	0	13	2	11	1	9	(*)	10	(*)	24	2	4	9	13	(*)	4	6	2	-----	6	50	50
May	10	20	1	2	0	3	0	9	1	10	(*)	8	0	8	0	29	2	7	20	10	0	4	4	1	-----	6	52	52
June	10	20	1	3	0	3	0	9	0	7	(*)	5	(*)	4	0	35	4	9	23	6	0	1	1	2	-----	6	54	53
July	9	29	1	1	0	2	0	8	(*)	5	(*)	4	0	4	(*)	35	4	7	32	2	0	1	(*)	1	-----	6	55	54
August	9	22	1	3	0	2	0	8	(*)	5	0	4	(*)	4	0	39	2	10	43	3	(*)	1	0	1	-----	6	56	54
September	9	27	1	3	0	1	0	12	(*)	12	(*)	2	0	3	0	28	1	10	35	3	0	1	1	1	-----	5	56	55
October	11	21	(*)	5	(*)	6	0	18	1	15	1	4	(*)	2	0	19	(*)	8	31	6	1	2	2	1	-----	5	54	54
November	15	14	1	5	(*)	5	0	21	2	17	4	7	1	5	(*)	12	0	6	18	13	(*)	3	6	5	-----	6	52	53
December	16	9	(*)	7	0	12	0	25	4	11	4	7	1	6	(*)	9	1	4	10	14	1	5	8	5	-----	7	50	51
Means	12	18	1	4	(*)	5	(*)	16	1	12	1	6	(*)	5	(*)	22	2	7	22	10	(*)	3	4	2	-----	6	52	52

*Less than 0.5 percent.

Ocean Area No. 40125. Position: Lat. 40°–45° N., Long. 125°–130° W. 9,000
Greenwich Noon Observations—Years of Record: 56

Month	Wind																				Weather												Mean cloud amount (0–10)	Average air temperature	Average sea surface temperature
	Mean velocity (Knots)	Percentages of observations from—																			Percentages of observations recording														
		N.		NE.		E.		SE.		S.		SW.		W.		NW.		Calm			Fog, mist, haze		Rain, drizzle		Snow		Showers		Squalls		Gales (force 8 or over)		Exceptional visibility				
		Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over																				
January	15	12	1	5	(*)	5	(*)	11	3	17	2	14	2	10	1	13	2	2			15		13		(*)		6		13		7			6	50	50
February	15	10	1	5	0	5	(*)	12	2	15	3	16	3	10	1	16	1	2			18		16		1		4		11		9			6	50	50
March	13	14	1	7	(*)	4	0	11	2	11	2	10	2	13	(*)	17	2	3			12		12		1		3		13		5			6	50	50
April	13	17	1	3	(*)	2	(*)	9	2	13	2	12	1	13	(*)	21	1	4			10		9		(*)		4		8		3			6	51	51
May	10	15	1	3	(*)	3	0	7	1	9	1	15	1	15	(*)	26	1	3			16		12		(*)		3		5		2			6	53	53
June	10	23	1	3	(*)	1	0	6	1	7	1	11	1	11	(*)	33	1	4			14		9		0		1		8		1			6	56	56
July	13	33	2	2	(*)	2	0	4	0	3	0	6	0	7	0	38	2	3			14		9		0		1		3		1			6	59	59
August	10	33	1	3	(*)	2	0	4	1	9	(*)	8	(*)	10	1	37	1	3			18		3		0		2		3		2			6	61	60
September	11	30	1	3	(*)	2	0	4	1	9	1	8	2	10	1	26	1	3			14		5		(*)		3		3		2			6	61	60
October	11	20	1	4	(*)	4	(*)	11	1	14	1	9	2	10	1	18	1	3			14		10		1		3		5		2			5	59	58
November	10	11	1	4	(*)	4	0	13	4	18	5	12	3	8	2	9	2	3			12		19		0		5		8		5			6	55	56
December	15	10	(*)	4	1	4	1	12	4	18	5	13	3	8	2	10	1	4			13		13		(*)		4		13		10			6	52	53
Means	12	19	1	4	(*)	3	(*)	9	1	11	2	11	2	10	1	22	1	3			14		10		(*)		3		8		5			6	55	55

*Less than 0.5 percent.

Ocean Area No. 45120. Position: Lat. 45°–50° N., Long. 120°–125° W. 8,000
Greenwich Noon Observations—Years of Record: 54

Month	Wind																	Weather							Mean cloud amount (0–10)	Average air temperature	Average sea surface temperature
	Mean velocity (knots)	Percentages of observations from—																Percentages of observations recording									
		N.		NE.		E.		SE.		S.		SW.		W.		NW.											
		Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Calm	Fog, mist, haze	Rain, drizzle	Snow	Showers	Squalls	Gales (force 8 or over)	Exceptional visibility			
January	11	6	(*)	12	(*)	15	0	18	3	12	1	10	1	10	(*)	6	(*)	6	9	20	3	3	7	5	-----	6	44	47
February	12	8	(*)	10	(*)	13	1	16	4	10	2	10	3	10	1	7	(*)	5	11	17	1	5	9	8	-----	6	45	46
March	10	8	1	8	1	12	(*)	12	2	8	1	12	1	15	1	10	1	7	10	15	1	3	8	4	-----	6	45	47
April	9	6	(*)	6	(*)	7	(*)	14	3	12	1	11	(*)	16	1	14	1	8	7	15	(*)	2	7	3	-----	5	48	48
May	7	8	0	4	0	5	(*)	11	1	9	(*)	13	1	19	(*)	20	(*)	9	17	11	(*)	3	6	1	-----	6	50	50
June	6	8	0	1	0	4	0	11	1	10	0	12	(*)	19	0	20	1	13	18	8	(*)	3	2	(*)	-----	6	54	53
July	5	7	0	2	0	3	0	10	0	10	0	9	0	20	(*)	22	(*)	17	26	6	(*)	2	1	(*)	-----	6	56	55
August	5	10	(*)	3	0	4	0	11	0	10	(*)	9	0	17	(*)	18	(*)	18	34	5	0	1	1	(*)	-----	6	57	56
September	5	12	0	5	0	5	(*)	13	2	8	(*)	9	(*)	14	(*)	16	0	16	33	7	0	1	2	1	-----	5	56	54
October	8	8	0	7	(*)	11	1	18	3	7	2	9	(*)	9	1	11	0	13	21	10	(*)	3	3	3	-----	5	53	53
November	11	5	0	11	(*)	13	1	22	4	8	3	11	1	7	1	8	0	5	12	20	2	3	9	5	-----	6	50	50
December	12	4	0	10	(*)	13	2	19	5	10	3	10	2	9	1	5	1	6	9	16	1	4	6	7	-----	6	46	49
Means	8	8	(*)	6	(*)	9	(*)	15	2	10	1	10	1	14	1	13	(*)	10	17	13	1	2	5	3	-----	6	50	51

*Less than 0.5 percent.

Ocean Area No. 45125. Position: Lat. 45°–50° N., Long. 125°–130° W. 17,000
Greenwich Noon Observations—Years of Record: 50

Month	Wind																		Weather									
	Mean velocity (knots)	Percentages of observations from—																	Percentages of observations recording							Mean cloud amount (0-10)	Average air temperature	Average sea surface temperature
		N.		NE.		E.		SE.		S.		SW.		W.		NW.												
		Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Calm	Fog, mist, haze	Rain, drizzle	Snow	Showers	Squalls	Gales (force 8 or over)	Exceptional visibility			
January	15	6	(*)	6	1	8	2	14	7	14	5	11	3	9	2	9	2	1	11	19	2	5	8	9	-----	7	45	47
February	15	6	1	5	1	10	2	13	7	15	3	10	3	9	2	9	2	2	14	20	1	3	8	7	-----	7	46	46
March	13	7	(*)	7	(*)	6	1	13	4	11	3	11	2	14	2	13	3	3	10	14	1	4	10	5	-----	6	46	46
April	12	6	0	3	0	7	1	15	3	12	2	12	1	16	1	17	2	2	11	14	1	3	9	3	-----	6	47	47
May	10	6	0	3	0	4	(*)	14	1	11	1	12	1	20	(*)	24	1	3	13	11	(*)	4	4	2	-----	6	50	50
June	10	5	(*)	2	(*)	3	0	11	1	9	(*)	11	1	21	2	29	1	4	15	9	(*)	4	2	1	-----	6	53	53
July	9	7	0	2	(*)	2	0	7	(*)	8	(*)	10	(*)	25	(*)	34	1	4	19	7	(*)	3	2	1	-----	7	57	56
August	9	10	(*)	2	0	4	0	7	(*)	7	(*)	8	0	21	1	32	2	6	23	7	(*)	2	2	1	-----	6	59	58
September	9	11	(*)	5	(*)	6	(*)	8	1	9	1	8	1	14	1	28	2	5	19	7	(*)	2	6	2	-----	6	57	57
October	11	7	(*)	5	0	9	1	17	5	11	2	10	2	13	1	12	1	4	20	14	(*)	4	8	4	-----	6	55	55
November	15	5	1	5	(*)	8	2	14	8	13	5	8	5	10	3	8	2	3	11	21	4	4	13	9	-----	7	51	52
December	16	4	(*)	4	1	9	2	16	6	13	6	11	4	9	4	6	3	2	9	21	1	4	13	10	-----	7	48	49
Means	12	7	(*)	4	(*)	6	1	13	4	11	2	10	2	15	2	18	2	3	15	14	1	4	7	4	-----	6	51	51

*Less than 0.5 percent.

Ocean Area No. 45130. Position: Lat. 45°–50° N., Long. 130°–135° W. 7,000
Greenwich Noon Observations—Years of Record: 55

Month	Wind																Weather												Mean cloud amount (0–10)	Average air temperature	Average sea surface temperature
	Mean velocity (knots)	Percentages of observations from—															Percentages of observations recording														
		N.		NE.		E.		SE.		S.		SW.		W.		NW.		Calm	Fog, mist, haze	Rain, drizzle	Snow	Showers	Squalls	Gales (force 8 or over)	Exceptional visibility			
		Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over														
January	15	7	1	4	0	6	1	12	2	15	3	17	1	13	2	25	2	1	11	19	2	6	4	----	7	44	46
February	15	8	1	6	(*)	8	1	13	2	13	4	15	2	12	1	25	1	2	10	20	1	5	6	----	7	44	45
March	13	8	(*)	3	(*)	7	(*)	10	1	17	1	13	1	17	1	16	1	3	13	14	2	9	4	----	7	44	45
April	13	5	1	4	(*)	4	1	12	1	11	1	17	(*)	16	2	14	3	2	10	14	(*)	4	3	----	7	45	46
May	12	7	0	2	0	5	0	11	1	15	1	18	1	18	1	15	1	2	12	11	0	4	3	----	7	48	48
June	10	6	0	4	0	5	0	5	1	13	1	15	1	20	0	25	1	3	18	9	(*)	2	2	----	7	51	53
July	10	10	0	2	(*)	4	0	6	1	14	(*)	14	(*)	20	(*)	25	(*)	1	19	7	(*)	3	3	----	8	56	55
August	11	13	(*)	1	0	3	0	6	(*)	10	1	13	1	20	1	30	1	1	23	8	0	4	3	1	7	59	58
September	13	15	1	4	0	3	(*)	8	(*)	13	1	12	2	14	1	23	2	1	13	14	0	3	7	4	6	57	58
October	14	10	1	4	(*)	6	(*)	11	3	17	3	13	2	14	2	10	2	2	14	21	(*)	3	9	5	7	55	55
November	15	4	1	3	(*)	5	2	12	4	15	4	17	3	14	2	11	2	1	11	21	(*)	5	8	7	7	50	51
December	18	7	1	5	(*)	4	1	10	4	16	6	6	3	11	4	10	1	1	9	21	3	4	14	11	8	47	48
Means	13	8	1	3	(*)	5	1	10	2	15	2	15	1	16	2	17	1	2	14	14	1	14	7	4	7	50	51

*Less than 0.5 percent.

Ocean Area No. 45135. Position: Lat. 45°–50° N., Long. 135°–140° W. 4,000
Greenwich Noon Observations—Years of Record: 55

Month	Wind																	Weather									
	Mean velocity (knots)	Percentages of observations from—																Percentages of observations recording							Mean cloud amount (0–10)	Average air temperature	Average sea surface temperature
		N.		NE.		E.		SE.		S.		SW.		W.		NW.											
		Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Calm	Fog, mist, haze	Rain, drizzle	Snow	Showers	Squalls	Gales (force 8 or over)	Exceptional visibility			
January	16	6	2	2	1	6	2	9	1	8	1	17	4	15	4	9	3	(*)	15	11	3	3	9	7	----	3	43	45
February	15	5	2	7	(*)	8	4	15	2	18	4	15	1	9	2	10	1	1	15	15	2	2	10	5	----	7	43	44
March	15	7	1	5	0	3	1	9	1	15	1	10	3	18	3	2	12	0	9	16	6	4	9	5	----	7	42	44
April	15	7	0	5	0	5	0	10	2	17	2	12	2	12	3	11	5	2	9	15	3	4	14	6	----	7	44	44
May	12	5	0	2	0	7	(*)	13	1	17	1	17	1	18	2	13	1	2	12	12	0	5	7	1	----	8	46	46
June	11	7	0	4	0	8	0	12	1	16	(*)	12	1	19	(*)	20	0	1	21	13	0	2	1	1	----	8	50	49
July	9	12	0	5	0	4	0	12	0	11	(*)	14	1	19	1	16	(*)	5	28	12	0	1	3	1	----	8	54	54
August	10	9	0	4	0	6	(*)	8	0	12	1	17	(*)	20	0	21	(*)	2	26	13	0	5	4	1	----	8	58	57
September	11	10	0	5	(*)	4	0	8	1	14	1	14	1	18	2	18	2	4	15	7	(*)	4	7	3	----	7	57	57
October	15	6	0	4	0	3	1	11	2	19	3	14	2	21	2	10	1	1	12	17	(*)	4	11	5	----	7	54	54
November	17	7	2	3	0	5	1	11	3	15	3	16	3	15	3	11	1	1	7	14	0	5	11	10	----	7	48	49
December	18	10	(*)	3	0	6	1	5	2	19	4	16	5	16	4	8	1	0	11	14	2	4	10	8	----	7	45	46
Means	14	7	1	4	(*)	5	1	10	1	16	2	15	2	17	2	14	1	2	15	13	1	4	8	4	----	7	49	49

*Less than 0.5 percent.

Ocean Area No. 45140. Position: Lat. 45°–50° N., Long. 140°–145° W. 3,000
Greenwich Noon Observations—Years of Record: 55

Month	Wind																	Weather									
	Mean velocity (knots)	Percentages of observations from—																Percentages of observations recording							Mean cloud amount (0–10)	Average air temperature	Average sea surface temperature
		N.		NE.		E.		SE.		S.		SW.		W.		NW.		Calm	Fog, mist, haze	Rain, drizzle	Snow	Showers	Squalls	Gales (force 8 or over)	Exceptional visibility			
		Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over											
January	15	7	1	7	0	6	1	8	3	15	1	10	2	21	4	10	3	1	18	18	1	1	7	6	----	7	43	44
Febuary	15	6	2	5	1	8	2	11	4	19	2	12	3	12	2	5	4	2	18	18	1	3	8	7	----	7	42	44
March	16	8	1	3	1	3	1	10	3	15	2	11	3	16	3	16	3	1	16	12	4	2	9	9	----	7	42	43
April	14	8	1	5	0	7	(*)	9	(*)	17	2	11	3	14	5	14	2	2	14	13	3	3	10	7	----	7	43	44
May	14	6	1	2	1	8	0	7	(*)	17	2	19	2	19	2	19	1	3	17	16	0	4	10	7	----	8	46	45
June	11	8	0	4	0	7	(*)	10	(*)	19	1	19	(*)	18	1	19	1	3	25	12	0	4	3	1	----	9	49	49
July	8	9	0	5	0	4	1	11	0	14	0	18	0	20	0	14	(*)	4	32	11	0	2	2	1	----	8	54	53
August	10	8	(*)	5	0	5	0	11	(*)	16	0	21	1	17	1	12	(*)	3	30	10	0	1	2	1	----	8	57	57
September	13	9	0	7	(*)	7	1	9	1	16	2	13	2	15	4	11	2	1	19	11	(*)	5	5	5	----	7	57	57
October	16	4	1	1	0	6	1	11	1	18	3	23	3	14	3	9	1	1	10	14	0	6	10	5	----	7	52	53
November	16	8	1	4	1	4	1	7	1	13	3	19	6	17	7	5	2	1	11	14	(*)	4	15	10	----	6	47	49
December	18	6	3	2	2	4	1	6	5	14	4	11	7	14	4	13	3	1	11	14	(*)	4	11	14	----	7	44	46
Means	14	7	1	4	1	6	1	9	1	16	2	15	3	16	3	11	2	2	18	14	1	3	8	6	----	7	48	49

*Less than 0.5 percent.

Ocean Area No. 45145. Position: Lat. 45°–50° N., Long. 145°–150° W. 3,000
Greenwich Noon Observations—Years of Record: 55

Month	Wind																	Weather									
	Mean velocity (knots)	Percentages of observations from—																Percentages of observations recording							Mean cloud amount (0-10)	Average air temperature	Average sea surface temperature
		N.		NE.		E.		SE.		S.		SW.		W.		NW.		Calm	Fog, mist, haze	Rain, drizzle	Snow	Showers	Squalls	Gales (force 8 or over)	Exceptional visibility			
		Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over											
January	16	9	2	5	1	7	1	11	2	15	3	12	3	11	6	8	3	1	14	15	5	2	8	9	.....	7	42	43
February	17	9	0	4	0	6	2	10	1	18	3	13	3	19	3	6	3	0	11	13	4	3	8	5	.....	7	41	43
March	17	9	1	7	1	4	0	10	1	10	3	11	3	21	4	11	4	0	14	14	2	4	8	8	.....	7	41	43
April	14	8	(*)	5	0	5	0	8	1	12	2	14	4	20	3	13	2	3	13	13	5	4	9	6	.....	5	42	42
May	14	3	1	5	(*)	4	1	9	1	20	2	16	2	16	3	14	1	2	13	16	(*)	4	10	4	.....	8	45	44
June	11	6	0	6	0	10	0	12	1	20	0	18	(*)	15	1	9	0	2	25	14	0	4	0	(*)	.....	8	48	48
July	10	8	0	4	0	7	0	8	0	18	0	20	(*)	17	1	4	0	4	34	12	0	2	2	(*)	.....	8	53	52
August	11	7	0	3	0	7	0	12	1	18	(*)	22	2	16	1	9	(*)	2	25	14	0	1	2	1	.....	9	57	56
September	14	6	(*)	3	1	9	(*)	14	1	15	3	16	2	14	3	11	1	1	18	12	(*)	3	5	5	.....	7	57	56
October	17	6	(*)	4	(*)	3	0	10	2	19	5	14	4	15	6	10	2	0	15	19	0	6	13	8	.....	7	51	52
November	17	4	1	6	1	8	1	12	1	16	1	13	5	16	4	9	1	1	7	16	3	5	10	10	.....	7	47	48
December	18	4	3	2	1	8	1	4	3	17	3	19	6	14	6	9	1	1	10	16	1	3	9	10	.....	7	44	45
Means	15	6	1	4	1	6	1	10	1	17	2	16	3	16	3	10	2	1	17	15	2	3	7	6	.....	7	47	48

*Less than 0.5 percent.

Ocean Area No. 45150. Position: Lat. 45°–50° N., Long. 150°–155° W. 3,000
Greenwich Noon Observations—Years of Record: 55

Month	Wind																	Weather									
		Percentages of observations from—																Percentages of observations recording									
		N.		NE.		E.		SE.		S.		SW.		W.		NW.												
	Mean velocity (knots)	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Calm	Fog, mist, haze	Rain, drizzle	Snow	Showers	Squalls	Gales (force 8 or over)	Exceptional visibility	Mean cloud amount (0–10)	Average air temperature	Average sea surface temperature
January	17	1	1	4	2	8	2	9	1	16	1	18	6	12	5	7	6	1	12	17	2	3	7	11	-----	7	41	42
February	16	6	1	3	1	11	2	10	3	17	2	9	2	15	4	11	2	1	15	13	4	2	6	6	-----	7	41	42
March	16	6	(*)	4	1	7	(*)	7	2	18	1	15	3	14	2	18	2	0	14	12	6	1	11	6	-----	7	41	42
April	13	8	1	5	0	7	(*)	6	2	12	(*)	18	(*)	20	3	14	2	2	14	15	3	5	7	3	-----	7	41	42
May	14	3	2	7	(*)	7	0	7	(*)	16	1	20	3	17	3	11	2	1	21	15	1	4	9	4	-----	8	44	44
June	11	5	0	4	0	7	(*)	14	(*)	14	(*)	21	1	19	2	10	(*)	3	25	16	0	3	1	1	-----	9	47	47
July	10	9	(*)	3	0	7	(*)	11	0	16	0	19	0	20	(*)	12	0	3	35	17	0	1	1	1	-----	7	52	51
August	12	7	0	3	0	6	0	10	1	18	1	20	2	18	(*)	12	0	2	32	19	(*)	3	2	1	-----	8	56	55
September	15	3	2	3	(*)	5	(*)	10	2	19	4	18	1	15	2	12	2	2	21	12	(*)	4	8	7	-----	7	56	55
October	18	5	1	2	1	5	1	7	4	12	3	15	5	20	6	8	5	0	10	13	0	6	11	11	-----	7	50	51
November	17	5	1	3	0	8	1	6	2	14	3	11	5	19	3	16	3	(*)	8	14	2	5	9	11	-----	7	45	47
December	17	10	1	4	1	7	1	12	1	11	4	16	4	13	3	7	4	1	12	14	3	3	13	12	-----	7	43	44
Means	15	6	1	3	1	7	1	9	2	15	2	17	2	17	3	11	2	1	18	5	2	3	7	6	-----	7	46	47

*Less than 0.5 percent.

Ocean Area No. 45155. Position: Lat. 45°–50° N., Long. 155°–160° W. 3,000
Greenwich Noon Observations—Years of Record: 52

Month	Wind																	Weather							Mean cloud amount (0–10)	Average air temperature	Average sea surface temperature
	Mean velocity (knots)	Percentages of observations from—																Percentages of observations recording									
		N.		NE.		E.		SE.		S.		SW.		W.		NW.											
		Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Calm	Fog, mist, haze	Rain, drizzle	Snow	Showers	Squalls	Gales (force 8 or over)	Exceptional visibility			
January	16	4	1	5	1	13	1	11	4	12	3	16	2	12	2	11	2	0	11	16	3	2	8	7	----	7	41	44
February	16	5	2	5	2	8	2	8	1	13	4	10	4	22	1	11	2	(*)	13	10	5	1	9	8	----	7	39	41
March	16	6	1	5	1	8	0	7	2	17	3	16	1	15	4	13	1	(*)	16	13	7	2	9	6	----	8	40	40
April	15	8	2	5	0	6	0	8	0	9	1	15	2	21	5	14	3	1	14	11	5	4	6	4	----	7	40	41
May	14	7	0	6	0	5	1	10	1	11	1	15	1	18	3	17	3	1	18	19	1	5	8	4	----	7	43	42
June	12	6	(*)	3	0	6	0	12	1	16	1	17	1	21	1	14	0	1	28	11	0	4	2	1	----	9	46	45
July	10	6	0	4	0	4	0	10	(*)	21	1	19	1	18	(*)	13	0	3	30	14	0	1	(*)	(*)	----	8	51	50
August	11	5	0	4	0	6	(*)	11	(*)	19	2	18	1	16	1	15	0	2	33	15	0	3	1	(*)	----	9	54	54
September	16	7	(*)	2	1	4	1	12	2	20	3	16	2	15	3	8	2	2	18	15	(*)	2	6	9	----	8	55	54
October	18	4	1	4	(*)	6	3	7	2	9	2	17	3	21	5	12	3	1	9	16	0	8	12	8	----	7	49	50
November	18	7	1	8	(*)	6	1	8	2	11	2	16	5	14	5	11	2	1	8	14	1	4	7	11	----	7	44	46
December	18	5	3	4	1	9	2	8	2	11	6	13	3	11	8	9	4	1	9	14	6	2	12	10	----	7	41	43
Means	15	6	1	4	1	7	1	9	2	14	2	16	2	17	3	12	2	1	17	14	2	3	6	6	----	8	45	46

*Less than 0.5 percent.

Ocean Area No. 45160. Position: Lat. 45°–50° N., Long. 160°–165° W. 3,000
Greenwich Noon Observations—Years of Record: 55

Month	Wind																	Weather									
	Mean velocity (knots)	Percentages of observations from—																Percentages of observations recording							Mean cloud amount (0–10)	Average air temperature	Average sea surface temperature
		N.		NE.		E.		SE.		S.		SW.		W.		NW.		Calm									
		Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over		Fog, mist, haze	Rain, drizzle	Snow	Showers	Squalls	Gales (force 8 or over)	Exceptional visibility			
January	18	4	2	5	1	11	2	8	4	12	3	11	2	15	4	13	3	(*)	12	14	4	3	10	11	.....	7	39	40
February	17	7	4	6	2	6	1	10	2	12	1	13	5	10	3	14	3	1	8	15	0	3	7	9	.....	5	38	40
March	16	12	1	3	1	5	1	9	1	17	2	14	1	16	4	11	1	1	14	12	4	2	7	4	.....	7	39	40
April	15	9	1	7	(*)	4	1	8	1	12	1	12	2	18	2	19	3	(*)	11	14	5	2	9	7	.....	7	40	40
May	13	7	0	4	(*)	6	(*)	9	1	14	2	14	2	23	2	14	1	1	18	19	1	2	5	2	.....	8	42	42
June	12	6	(*)	4	1	8	1	15	(*)	12	1	14	2	22	(*)	11	0	3	23	15	0	3	4	2	.....	8	46	45
July	10	7	0	4	0	7	0	9	1	17	(*)	24	0	20	(*)	9	(*)	2	37	12	0	2	1	(*)	.....	9	50	49
August	10	9	0	3	0	6	0	10	1	23	1	15	(*)	15	1	14	(*)	2	32	17	0	1	1	1	.....	7	54	53
September	14	7	1	5	(*)	3	1	9	1	18	2	18	2	15	3	11	2	2	20	13	(*)	3	5	7	.....	8	53	53
October	17	6	1	3	0	5	1	6	1	10	3	16	3	22	5	14	3	1	6	14	(*)	6	13	11	.....	7	49	49
November	18	6	1	6	1	4	4	5	(*)	12	2	13	3	21	6	14	2	(*)	7	16	2	6	12	10	.....	7	44	45
December	17	6	1	6	3	7	1	6	1	12	4	14	2	17	3	14	2	1	8	13	5	2	10	11	.....	7	40	42
Means	15	7	1	4	1	6	1	9	1	14	2	15	2	18	3	13	2	1	17	16	2	3	7	6	.....	7	44	45

*Less than 0.5 percent.

Ocean Area No. 45165. Position: Lat. 45°–50° N., Long. 165°–170° W. 4,000 Greenwich Noon Observations—Years of Record: 52

Month	Wind																	Weather							Mean cloud amount (0–10)	Average air temperature	Average sea surface temperature
	Mean velocity (knots)	Percentages of observations from—																Percentages of observations recording									
		N.		NE.		E.		SE.		S.		SW.		W.		NW.												
		Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Calm	Fog, mist, haze	Rain, drizzle	Snow	Showers	Squalls	Gales (force 8 or over)	Exceptional visibility			
January	17	6	1	9	2	9	4	8	2	15	2	12	2	13	2	9	3	1	8	15	6	2	9	10	----	7	38	40
February	17	8	2	8	1	10	1	6	5	8	2	14	2	16	4	10	2	1	12	13	8	2	11	9	----	7	37	39
March	16	12	(*)	5	0	7	2	8	2	15	3	14	2	13	5	10	1	1	9	12	6	2	8	7	----	7	38	39
April	15	8	(*)	5	2	8	0	6	1	14	2	16	1	15	2	17	2	1	13	12	6	3	8	4	----	7	39	39
May	13	9	0	3	0	5	(*)	8	1	12	2	17	3	20	2	14	1	3	18	11	2	2	6	3	----	8	41	41
June	10	8	(*)	5	0	10	(*)	11	1	14	1	17	1	17	1	11	(*)	3	27	14	0	3	1	2	----	9	45	44
July	11	7	(*)	4	(*)	7	0	11	(*)	15	1	24	1	17	(*)	10	(*)	3	40	17	(*)	1	1	1	----	9	50	48
August	10	7	0	6	0	5	1	8	1	18	1	16	1	18	2	11	1	3	41	13	0	1	1	2	----	8	53	53
September	14	8	2	7	1	3	1	8	1	19	2	12	1	18	2	12	2	1	14	15	0	4	3	6	----	----	52	52
October	18	7	4	4	2	4	1	7	1	11	3	11	2	22	2	17	2	(*)	6	14	1	4	9	12	----	7	47	48
November	18	3	2	4	0	5	1	6	1	13	3	11	7	16	7	17	4	0	7	13	2	3	15	11	----	7	43	44
December	18	6	3	4	3	7	2	9	2	12	4	12	2	17	2	11	4	0	6	11	6	3	8	11	----	7	40	42
Means	15	8	1	5	1	7	1	8	1	14	2	15	2	17	3	12	2	1	18	13	3	2	6	6	----	8	44	44

*Less than 0.5 percent.

Ocean Area No. 45170. Position: Lat. 45°–50° N., Long. 170°–175° W. 4,000
Greenwich Noon Observations—Years of Record: 55

Month	Wind																Weather								Mean cloud amount (0–10)	Average air temperature	Average sea surface temperature
	Mean velocity (knots)	Percentages of observations from—															Percentages of observations recording										
		N.		NE.		E.		SE.		S.		SW.		W.		NW.		Calm	Fog, mist, haze	Rain, drizzle	Snow	Showers	Squalls	Gales (force 8 or over)	Exceptional visibility			
		Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over											
January	17	10	1	7	1	9	2	10	2	12	2	13	4	12	2	11	1	1	11	14	5	1	8	11	----	7	39
February	17	9	2	6	2	13	2	9	4	11	2	9	4	9	4	12	1	1	9	11	9	2	9	7	----	7	38
March	16	12	(*)	6	2	7	1	10	3	13	3	13	2	16	2	8	2	(*)	13	9	5	3	9	7	----	8	38
April	15	10	2	5	0	6	1	9	(*)	13	1	13	2	15	3	15	2	1	11	11	5	3	7	5	----	8	39
May	13	9	2	5	0	7	1	11	1	8	2	11	1	20	2	16	2	3	17	15	4	2	6	2	----	8	40
June	11	6	1	6	0	10	1	12	1	15	1	14	1	14	2	13	1	4	29	13	0	1	(*)	0	----	9	44
July	9	5	0	3	0	8	0	10	1	22	2	18	2	16	(*)	10	0	2	40	8	1	1	1	1	----	9	48
August	12	9	0	7	(*)	6	0	11	1	22	2	15	2	12	(*)	11	0	1	40	13	1	1	1	1	----	9	52
September	15	9	1	8	1	7	1	7	2	12	2	11	3	14	3	17	2	1	14	15	0	3	8	6	----	8	52
October	17	6	1	5	1	6	1	5	1	10	2	9	4	20	4	20	4	1	7	14	1	5	12	8	----	7	47
November	17	5	1	6	1	7	1	5	1	9	2	7	3	23	5	21	4	0	7	12	3	5	14	8	----	7	43
December	18	9	1	8	3	6	2	9	2	6	4	11	3	16	5	13	2	(*)	5	14	7	3	11	12	----	7	41
Means	15	8	1	6	1	8	1	8	2	13	2	12	2	15	3	14	2	2	18	13	3	3	7	6	----	8	43

*Less than 0.5 percent.

Ocean Area No. 45175. Position: Lat. 45°–50° N., Long. 175°–180° W. 5,000
Greenwich Noon Observations—Years of Record: 55

Month	Wind																	Weather							Mean cloud amount (0-10)	Average air temperature	Average sea surface temperature
	Mean velocity (knots)	Percentages of observations from—																Percentages of observations recording									
		N.		NE.		E.		SE.		S.		SW.		W.		NW.												
		Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Calm	Fog, mist, haze	Rain, drizzle	Snow	Showers	Squalls	Gales (force 8 or over)	Exceptional visibility			
January	18	6	2	8	1	10	2	8	4	8	3	15	4	12	3	11	2	1	12	10	12	1	11	12	----	7	37	39
February	17	10	3	8	3	9	2	7	4	7	2	16	1	13	2	12	1	1	8	9	10	1	10	10	----	7	36	38
March	18	8	(*)	7	1	7	2	7	4	13	4	11	5	15	4	11	1	(*)	13	10	11	1	10	10	----	7	37	38
April	16	10	3	8	0	9	1	9	1	10	2	11	3	15	3	14	2	0	10	12	6	2	7	5	----	8	38	38
May	14	7	(*)	7	1	9	1	8	1	10	(*)	12	1	20	3	18	1	1	17	13	3	3	5	4	----	8	40	40
June	11	6	1	8	(*)	11	0	15	1	11	0	13	2	17	1	11	(*)	3	38	15	0	1	1	1	----	9	44	43
July	10	4	0	7	0	10	0	14	(*)	20	0	23	0	13	0	8	0	1	46	12	0	1	(*)	(*)	----	7	49	48
August	11	7	1	8	(*)	6	1	12	1	17	1	19	(*)	14	1	11	(*)	1	39	13	0	2	1	2	----	8	53	52
September	14	12	1	6	1	8	(*)	9	2	14	1	10	1	15	1	16	2	1	13	14	0	3	6	4	----	7	51	51
October	16	8	2	4	0	5	1	7	2	11	(*)	13	2	17	4	19	5	(*)	7	14	1	4	9	9	----	6	46	47
November	18	8	2	6	1	5	2	6	2	7	3	7	3	16	6	20	5	1	5	11	4	3	12	11	----	7	42	43
December	16	8	2	7	2	9	2	5	5	8	2	9	2	21	5	12	0	1	5	10	7	2	16	10	----	6	38	40
Means	15	8	1	7	1	8	1	9	2	11	2	13	2	16	3	13	2	1	19	12	4	2	7	6	----	7	43	43

*Less than 0.5 percent.

Ocean Area No. 45175E. Position: Lat. 45°–50° N., Long. 175°–180° E. 6,000
Greenwich Noon Observations—Years of Record: 52

Month	Wind																	Weather									
		Percentages of observations from—																Percentages of observations recording									
		N.		NE.		E.		SE.		S.		SW.		W.		NW.												
	Mean velocity (knots)	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Calm	Fog, mist, haze	Rain, drizzle	Snow	Showers	Squalls	Gales (force 8 or over)	Exceptional visibility	Mean cloud amount (0–10)	Average air temperature	Average sea surface temperature
January	18	5	1	8	1	9	2	9	2	15	3	12	3	13	3	12	2	(*)	9	6	13	2	14	11	-----	6	36	38
February	18	10	2	10	2	10	2	10	2	7	2	11	3	13	3	11	2	(*)	7	7	12	1	14	10	-----	6	35	37
March	18	7	2	5	1	5	3	12	4	11	3	12	5	15	4	9	1	1	9	9	13	1	11	12	-----	6	36	37
April	16	9	(*)	8	(*)	9	1	9	2	10	3	11	3	16	4	12	3	(*)	15	11	9	1	9	8	-----	6	38	38
May	14	8	1	6	1	8	1	8	1	10	1	14	2	16	4	16	2	1	15	11	3	3	6	5	-----	7	40	39
June	12	7	1	9	1	11	2	13	1	11	(*)	11	1	14	1	16	(*)	1	32	15	0	2	1	2	-----	8	43	42
July	10	4	(*)	7	0	6	0	19	(*)	18	1	20	(*)	13	(*)	9	1	2	54	12	0	2	(*)	(*)	-----	9	48	47
August	11	9	1	11	(*)	6	1	8	1	13	1	18	(*)	17	1	10	1	2	42	13	0	1	3	2	-----	9	52	52
September	14	9	2	6	(*)	6	1	9	1	9	1	14	2	16	2	19	2	1	13	12	0	3	5	4	-----	8	51	51
October	17	9	(*)	6	1	3	1	7	1	7	1	12	2	22	5	19	4	0	8	13	1	4	10	8	-----	7	46	47
November	19	6	2	5	2	6	2	5	2	10	2	11	4	17	7	14	4	1	9	12	4	5	16	13	-----	7	41	43
December	19	7	2	6	2	8	1	7	4	8	3	12	4	15	6	12	3	0	6	10	11	6	13	13	-----	7	38	40
Means	15	8	1	7	1	8	1	9	2	10	2	14	2	16	3	13	2	1	18	11	6	3	8	7	-----	7	42	43

*Less than 0.5 percent.

Ocean Area No. 45170E. Position: Lat. 45°–50° N., Long. 170°–175° E. 8,000
Greenwich Noon Observations—Years of Record: 52

Month	Wind																		Weather									
		Percentages of observations from—																	Percentages of observations recording									
		N.		NE.		E.		SE.		S.		SW.		W.		NW.													
	Mean velocity (knots)	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Calm	Fog, mist, haze	Rain, drizzle	Snow	Showers	Squalls	Gales (force 8 or over)	Exceptional visibility	Mean cloud amount (0–10)	Average air temperature	Average sea surface temperature
January	19	7	1	7	1	7	1	6	2	9	2	13	4	21	5	12	2	(*)	5	6	20	1	28	13	.....	7	34	38
February	18	13	1	8	1	8	3	8	2	6	1	11	5	15	4	11	3	(*)	5	6	14	1	15	9	.....	6	34	36
March	18	8	2	5	2	5	3	8	4	8	4	9	5	17	6	11	2	1	8	8	15	2	13	12	.....	8	35	36
April	16	6	2	6	1	5	1	8	3	10	2	15	4	17	6	11	2	1	12	10	8	1	10	7	.....	8	37	37
May	13	10	(*)	9	(*)	6	1	11	1	9	1	14	1	17	1	17	1	1	23	14	2	3	4	5	.....	8	39	39
June	11	10	(*)	9	(*)	11	1	12	1	11	(*)	12	1	15	1	13	1	2	36	8	0	2	2	2	.....	9	42	42
July	10	6	(*)	9	(*)	8	(*)	16	1	16	1	18	2	13	(*)	7	(*)	3	47	15	0	1	1	2	.....	9	48	47
August	10	9	(*)	8	(*)	6	(*)	11	(*)	15	(*)	22	1	15	1	11	(*)	1	41	11	0	1	1	1	.....	9	53	52
September	14	8	2	9	1	6	1	8	1	10	1	12	3	15	4	17	1	1	15	14	0	3	6	5	.....	8	51	51
October	17	9	1	6	1	4	1	7	1	7	2	13	2	20	4	19	3	0	7	14	(*)	4	10	8	.....	7	47	48
November	19	7	(*)	3	1	4	1	7	2	9	2	12	3	20	6	20	3	0	5	14	5	4	17	13	.....	7	41	43
December	19	6	2	5	1	6	1	10	4	5	4	11	3	14	10	12	6	(*)	5	12	15	2	19	12	.....	7	37	40
Means	15	8	1	7	1	7	1	9	2	9	2	13	3	17	4	13	2	1	18	11	7	2	10	7	.....	8	42	42

*Less than 0.5 percent.

Ocean Area No. 50130. Position: Lat. 50°–55° N., Long. 130°–135° W. 4,000
Greenwich Noon Observations—Years of Record: 50

Month	Wind																	Weather									
	Mean velocity (knots)	Percentages of observations from—																Percentages of observations recording							Mean cloud amount (0–10)	Average air temperature	Average sea surface temperature
		N.		NE.		E.		SE.		S.		SW.		W.		NW.		Calm	Fog, mist, haze	Rain, drizzle	Snow	Showers	Squalls	Gales (force 8 or over)	Exceptional visibility			
		Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over											
January	16	8	1	8	(*)	7	(*)	16	1	16	2	7	2	14	2	12	3	1	9	16	2	4	12	6	-----	7	43	45
February	15	6	0	6	(*)	5	0	17	4	15	3	10	3	13	2	12	1	3	13	21	5	3	9	4	-----	7	42	44
March	15	7	0	4	(*)	4	1	12	2	16	1	16	1	17	3	13	1	2	9	15	5	3	13	3	-----	7	42	44
April	13	4	1	5	0	4	1	10	1	19	0	15	1	13	1	13	1	2	10	16	2	6	10	1	-----	7	44	45
May	11	5	0	3	0	6	1	11	1	14	1	14	(*)	23	1	17	(*)	3	14	14	0	4	5	2	-----	7	46	47
June	10	5	0	2	0	6	0	13	(*)	11	(*)	15	(*)	20	(*)	22	1	5	15	12	0	5	2	1	-----	8	50	50
July	10	4	0	3	0	5	0	12	(*)	11	(*)	14	0	23	(*)	22	2	4	20	14	0	3	3	1	-----	8	54	54
August	10	4	0	3	0	3	(*)	9	1	11	(*)	14	(*)	25	0	29	(*)	2	17	14	0	4	2	1	-----	7	57	57
September	13	8	0	3	(*)	3	(*)	8	2	11	1	14	1	18	3	25	1	2	15	10	0	4	6	2	-----	6	56	56
October	14	6	0	4	0	4	1	12	4	17	2	14	5	16	1	12	(*)	2	10	18	(*)	5	13	4	-----	7	52	53
November	15	5	1	4	0	6	(*)	13	3	14	4	15	2	18	2	10	(*)	3	6	19	1	8	10	7	-----	7	47	50
December	18	7	(*)	4	(*)	5	1	8	4	18	4	14	4	14	6	9	2	0	9	22	2	5	10	9	-----	7	45	46
Means	13	6	0	4	0	5	0	12	2	14	2	13	2	18	2	16	1	3	12	16	1	5	8	3	-----	7	48	49

*Less than 0.5 percent.

Ocean Area No. 50135. Position: Lat. 50°–55° N., Long. 135°–140° W. 5,000
Greenwich Noon Observations—Years of Record: 50

Month	Wind																	Weather									
		Percentages of observations from—																Percentages of observations recording									
		N.		NE.		E.		SE.		S.		SW.		W.		NW.												
	Mean velocity (knots)	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Calm	Fog, mist, haze	Rain, drizzle	Snow	Showers	Squalls	Gales (force 8 or over)	Exceptional visibility	Mean cloud amount (0–10)	Average air temperature	Average sea surface temperature
January	17	10	1	5	(*)	4	1	11	2	11	5	11	2	16	6	10	3	2	11	13	3	3	10	9	-----	7	42	44
February	16	8	(*)	3	0	5	1	9	2	20	3	15	2	18	3	8	3	0	10	14	3	3	7	6	-----	7	41	43
March	17	7	1	3	0	5	(*)	8	1	18	2	18	1	17	4	12	2	1	14	17	3	4	12	6	-----	8	41	43
April	15	5	0	3	0	8	(*)	11	2	20	1	14	2	19	4	10	1	0	12	17	2	4	9	4	-----	7	42	43
May	13	7	0	2	(*)	6	1	14	(*)	18	(*)	20	2	16	1	12	1	0	16	16	(*)	5	5	2	-----	8	45	45
June	10	9	(*)	4	(*)	7	0	10	0	14	(*)	17	(*)	20	(*)	17	(*)	2	22	15	(*)	3	2	1	-----	8	49	49
July	10	7	0	3	0	4	(*)	6	0	15	0	22	1	22	0	17	(*)	3	23	12	0	4	2	(*)	-----	8	53	53
August	12	7	0	3	0	2	0	6	(*)	18	1	20	1	26	1	14	(*)	1	25	13	0	2	3	1	-----	8	56	56
September	14	8	(*)	1	0	2	(*)	5	2	13	1	15	2	30	2	17	1	1	13	13	(*)	3	5	4	-----	7	55	55
October	17	6	(*)	2	0	5	(*)	10	2	16	5	18	4	17	5	21	1	1	6	13	0	4	9	7	-----	7	51	52
November	17	3	1	6	(*)	4	(*)	12	3	18	3	17	3	13	4	5	1	1	8	17	(*)	6	14	5	-----	7	47	48
December	19	8	1	4	(*)	5	1	7	3	15	6	17	5	15	8	8	2	0	7	14	2	2	10	9	-----	7	44	46
Means	15	7	(*)	3	(*)	5	(*)	9	2	16	3	17	2	19	4	12	1	1	14	15	1	4	7	4	-----	7	47	48

*Less than 0.5 percent.

263068°—53——40

Ocean Area No. 50140. Position: Lat. 50°–55° N., Long. 140°–145° W. 6,000
Greenwich Noon Observations—Years of Record: 50

Month	Wind																	Weather									
	Mean velocity (knots)	Percentages of observations from—																Percentages of observations recording							Mean cloud amount (0–10)	Average air temperature	Average sea surface temperature
		N.		NE.		E.		SE.		S.		SW.		W.		NW.		Calm	Fog, mist, haze	Rain, drizzle	Snow	Showers	Squalls	Gales (force 8 or over)	Exceptional visibility			
		Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over											
January	17	7	1	4	1	10	(*)	10	2	17	3	14	2	14	4	9	1	1	15	19	4	3	9	8	-----	7	41	42
February	16	6	2	5	0	8	2	11	3	16	2	14	2	16	5	6	1	1	12	15	5	3	5	8	-----	7	40	42
March	17	6	1	5	0	3	1	10	1	14	2	17	2	18	5	12	2	1	12	13	6	3	12	6	-----	7	40	41
April	15	6	1	6	(*)	4	1	8	1	16	2	17	2	19	4	11	1	1	12	16	4	4	12	6	-----	7	40	41
May	13	4	1	3	(*)	6	1	10	1	21	1	19	1	18	1	11	1	1	18	17	(*)	4	6	2	-----	8	43	44
June	10	7	0	6	0	7	0	10	1	16	1	18	1	19	(*)	12	(*)	2	23	15	0	2	2	1	-----	8	47	47
July	10	5	0	3	0	5	0	9	(*)	16	(*)	22	(*)	25	1	12	0	2	29	15	(*)	1	2	(*)	-----	9	52	51
August	11	5	(*)	2	0	6	0	9	1	19	1	18	1	25	1	10	(*)	2	28	15	(*)	2	5	1	-----	8	55	55
September	14	4	(*)	4	(*)	3	1	8	2	17	3	16	3	23	2	10	2	2	17	15	0	3	6	5	-----	7	54	54
October	18	3	1	4	(*)	4	1	11	2	15	4	15	3	20	8	6	3	0	8	15	(*)	5	12	8	-----	7	49	51
November	19	6	1	4	1	5	1	9	3	14	5	18	5	13	6	7	2	0	8	19	1	4	17	12	-----	7	45	46
December	19	7	1	3	1	6	1	10	2	15	3	17	3	18	5	6	2	0	10	16	3	2	12	11	-----	7	42	44
Means	15	5	1	4	(*)	5	1	9	2	17	2	17	2	19	4	10	1	1	16	16	2	3	8	6	-----	7	46	47

*Less than 0.5 percent.

Ocean Area No. 50145. Position: Lat. 50°–55° N., Long. 145°–150° W. 7,000
Greenwich Noon Observations—Years of Record: 52

Month	Wind																	Weather									
	Mean velocity (knots)	Percentages of observations from—																Percentages of observations recording							Mean cloud amount (0-10)	Average air temperature	Average sea surface temperature
		N.		NE.		E.		SE.		S.		SW.		W.		NW.											
		Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Calm	Fog, mist, haze	Rain, drizzle	Snow	Showers	Squalls	Gales (force 8 or over)	Exceptional visibility			
January	16	7	1	6	1	6	1	13	1	12	3	15	2	17	3	9	3	0	13	15	5	2	8	7	----	7	40	41
February	17	7	(*)	4	1	7	2	14	2	19	2	11	2	15	2	7	4	1	15	15	4	3	6	8	----	7	38	40
March	17	5	1	5	(*)	7	(*)	10	1	12	2	13	2	24	4	10	4	0	13	13	6	2	11	6	----	7	38	40
April	15	5	1	4	1	6	1	9	1	17	2	17	2	19	2	10	1	2	12	16	6	2	8	5	----	7	39	40
May	13	5	1	3	1	6	1	9	1	18	1	19	2	19	3	10	(*)	1	18	17	(*)	4	6	3	----	8	42	42
June	10	10	0	3	(*)	7	0	13	(*)	16	1	20	1	17	(*)	10	0	2	25	17	0	1	2	1	----	9	46	46
July	10	5	(*)	3	0	4	0	7	(*)	16	(*)	24	(*)	28	1	10	0	2	33	15	0	2	3	(*)	----	9	50	50
August	12	5	(*)	2	0	6	(*)	10	1	17	3	21	2	20	2	10	(*)	1	25	18	0	2	3	1	----	8	54	53
September	16	3	1	3	(*)	2	1	8	2	15	5	21	3	24	3	6	2	1	16	14	(*)	3	7	7	----	8	52	53
October	18	5	1	3	(*)	4	1	8	2	15	4	17	6	16	8	5	4	1	7	16	1	5	15	10	----	7	48	49
November	18	7	1	3	1	5	1	6	2	14	4	18	4	16	7	6	4	1	8	16	1	5	15	11	----	7	43	45
December	19	5	1	5	1	8	1	11	2	12	4	12	4	13	7	9	4	1	10	11	4	3	12	14	----	7	41	42
Means	15	5	1	3	1	5	1	10	1	15	3	17	3	19	4	9	2	1	16	16	2	3	8	6	----	8	44	45

*Less than 0.5 percent.

Ocean Area No. 50150. Position: Lat. 50°–55° N., Long. 150°–155° W. 6,000
Greenwich Noon Observations—Years of Record: 50

Month	Wind																	Weather									
		Percentages of observations from—																Percentages of observations recording									
	Mean velocity (knots)	N.		NE.		E.		SE.		S.		SW.		W.		NW.		Calm	Fog, mist, haze	Rain, drizzle	Snow	Showers	Squalls	Gales (force 8 or over)	Exceptional visibility	Mean cloud amount (0–10)	Average air temperature	Average sea surface temperature
		Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over											
January	17	8	1	5	1	8	1	9	1	16	3	13	2	16	3	9	3	1	15	8	5	2	8	9	----	8	38	40
February	17	8	(*)	4	1	8	2	15	2	16	2	10	2	16	2	7	4	1	14	14	5	2	8	8	----	7	37	39
March	17	6	1	3	(*)	7	(*)	12	1	13	2	13	2	21	4	10	4	1	14	13	6	3	8	8	----	8	37	39
April	16	6	1	4	1	5	1	9	1	15	2	18	2	19	2	12	1	1	8	14	5	2	10	6	----	7	38	39
May	13	5	1	6	1	8	1	12	1	14	1	14	2	19	3	11	(*)	1	14	15	1	3	6	3	----	8	41	41
June	10	7	0	6	(*)	7	0	11	(*)	13	1	16	1	21	(*)	12	0	5	25	16	(*)	2	2	1	----	8	45	45
July	10	4	(*)	3	0	4	0	11	(*)	17	(*)	26	(*)	25	1	8	0	1	35	16	0	2	2	1	----	9	50	49
August	13	4	(*)	2	0	4	(*)	9	1	17	3	26	2	20	2	8	(*)	2	29	16	0	2	3	2	----	8	53	52
September	16	2	1	4	(*)	4	1	10	2	16	5	18	3	19	3	9	2	1	19	16	0	4	7	7	----	8	52	52
October	19	4	1	3	(*)	6	1	7	2	11	4	17	6	18	8	8	4	0	11	16	2	5	15	11	----	7	47	48
November	19	4	1	2	1	7	1	9	2	9	4	14	4	21	7	10	4	0	7	13	4	4	16	12	----	7	42	44
December	19	10	1	3	1	6	1	12	2	10	4	12	4	13	7	9	4	1	11	13	4	3	13	14	----	7	39	41
Means	16	5	1	3	1	6	1	11	1	14	2	16	3	19	4	10	2	1	17	14	3	3	8	7	----	8	43	44

*Less than 0.5 percent.

Ocean Area No. 50155. Position: Lat. 50°–55° N., Long. 155°–160° W. 7,000
Greenwich Noon Observations—Years of Record: 50

Month	Wind																	Weather									
	Mean velocity (knots)	Percentages of observations from—																Percentages of observations recording							Mean cloud amount (0–10)	Average air temperature	Average sea surface temperature
		N.		NE.		E.		SE.		S.		SW.		W.		NW.											
		Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Calm	Fog, mist, haze	Rain, drizzle	Snow	Showers	Squalls	Gales (force 8 or over)	Exceptional visibility			
January	17	9	2	6	1	11	1	10	2	14	2	11	3	14	3	8	2	1	14	14	6	1	9	9	-----	7	38	39
February	17	7	1	4	1	9	2	15	3	18	3	11	2	11	2	8	2	1	16	17	5	3	9	9	-----	7	37	38
March	17	8	1	5	(*)	7	(*)	10	1	17	3	11	3	16	3	11	0	1	16	12	6	1	10	7	-----	7	36	38
April	16	6	1	4	1	7	0	7	2	12	1	18	2	21	4	11	3	(*)	13	13	5	1	11	7	-----	7	37	38
May	13	7	1	7	0	6	1	11	2	12	1	14	2	20	1	11	2	2	16	14	1	3	4	3	-----	8	41	40
June	11	5	0	8	0	9	(*)	9	1	18	1	16	1	19	(*)	11	0	2	28	13	0	1	1	1	-----	8	45	44
July	11	4	0	3	0	4	0	7	1	16	2	21	1	29	(*)	10	(*)	2	35	15	(*)	2	2	1	-----	8	49	48
August	12	3	1	5	(*)	6	0	8	1	22	2	18	2	20	1	8	1	2	26	16	0	4	3	3	-----	8	52	52
September	15	4	1	3	1	4	2	9	1	6	1	19	3	21	3	10	2	(*)	14	13	(*)	3	4	5	-----	8	51	51
October	19	4	2	5	1	5	2	4	3	9	3	14	6	16	7	12	6	1	7	14	(*)	5	13	12	-----	7	46	47
November	17	9	1	3	1	7	(*)	9	1	9	1	15	4	20	5	11	4	(*)	7	14	2	4	16	8	-----	7	41	43
December	18	7	2	5	2	6	2	8	2	10	3	13	3	14	4	14	4	1	12	13	8	3	10	8	-----	8	38	40
Means	15	6	1	5	1	7	1	9	2	14	2	15	3	18	3	10	2	1	17	14	3	3	8	6	-----	8	43	43

*Less than 0.5 percent.

Ocean Area No. 50160. Position: Lat. 50°–55° N., Long. 160°–165° W. 7,000
Greenwich Noon Observations—Years of Record: 50

Month	Wind																		Weather									
	Mean velocity (knots)	Percentages of observations from—																	Percentages of observations recording							Mean cloud amount (0–10)	Average air temperature	Average sea surface temperature
		N.		NE.		E.		SE.		S.		SW.		W.		NW.												
		Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Calm	Fog, mist, haze	Rain, drizzle	Snow	Showers	Squalls	Gales (force 8 or over)	Exceptional visibility			
January	17	9	2	8	(*)	9	1	15	3	11	3	10	2	11	2	11	2	1	15	11	11	1	11	9	-----	7	37	39
February	17	7	2	7	1	8	1	13	2	13	2	13	2	14	2	9	3	1	11	11	9	1	9	7	-----	7	36	38
March	16	9	2	5	1	8	1	11	2	11	3	14	3	11	3	12	3	1	11	12	9	3	11	9	-----	7	36	38
April	16	6	1	5	(*)	5	1	9	1	13	1	17	4	17	3	15	2	(*)	12	14	6	2	10	7	-----	7	37	38
May	13	7	1	8	(*)	5	1	12	1	11	(*)	12	1	18	1	17	2	3	17	12	2	2	5	5	-----	7	40	40
June	10	7	0	5	(*)	9	(*)	13	(*)	15	1	14	1	17	1	13	1	3	26	15	1	2	2	2	-----	8	44	43
July	10	4	0	4	0	5	(*)	8	(*)	14	1	24	(*)	23	1	12	0	4	32	15	0	1	1	(*)	-----	8	48	48
August	12	7	(*)	5	(*)	4	(*)	9	1	17	1	21	1	19	1	10	1	3	27	15	0	2	3	3	-----	9	51	51
September	14	6	1	4	(*)	5	(*)	11	1	14	1	19	2	21	1	12	1	1	16	13	0	2	5	4	-----	7	50	50
October	18	5	2	5	1	5	2	6	2	9	1	12	3	19	7	13	8	(*)	8	14	2	3	13	12	-----	7	45	46
November	18	8	1	4	2	8	1	7	2	6	2	13	3	20	5	12	5	1	7	14	4	4	15	10	-----	7	41	42
December	17	8	3	7	1	8	1	9	2	11	2	13	2	14	2	14	3	(*)	10	11	7	2	12	9	-----	7	38	40
Means	15	7	1	5	1	6	1	11	1	12	2	15	2	17	2	12	3	2	17	13	4	2	8	6	-----	7	42	43

*Less than 0.5 percent.

Ocean Area No. 50165. Position: Lat. 50°–55° N., Long. 165°–170° W. 6,000
Greenwich Noon Observations—Years of Record: 50

Month	Wind																	Weather									
		Percentages of observations from—																Percentages of observations recording									
		N.		NE.		E.		SE.		S.		SW.		W.		NW.												
	Mean velocity (knots)	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Calm	Fog, mist, haze	Rain, drizzle	Snow	Showers	Squalls	Gales (force 8 or over)	Exceptional visibility	Mean cloud amount (0–10)	Average air temperature	Average sea surface temperature
January	18	10	3	10	2	8	2	11	2	12	4	10	2	11	2	7	3	0	13	9	10	3	10	13	----	7	37	39
February	18	10	1	7	1	9	2	8	2	11	4	11	3	16	2	10	2	1	10	9	10	1	9	9	----	7	35	37
March	17	9	2	7	1	8	2	10	1	11	2	13	4	16	2	10	2	(*)	12	8	9	3	12	8	----	7	36	37
April	16	7	2	7	(*)	6	(*)	7	2	10	(*)	14	4	19	4	15	2	1	10	10	12	3	10	8	----	8	36	38
May	12	9	1	6	2	8	(*)	10	1	10	2	12	2	14	1	17	1	4	14	16	1	3	5	4	----	7	40	40
June	11	5	1	7	0	10	1	10	1	14	1	15	1	13	1	15	1	4	25	16	0	1	3	2	----	7	44	43
July	10	7	(*)	4	0	4	(*)	9	(*)	18	1	23	1	19	1	9	(*)	4	36	14	0	1	2	(*)	----	8	48	47
August	11	6	(*)	3	(*)	4	(*)	10	1	16	1	20	1	19	1	13	1	4	26	13	(*)	2	2	3	----	8	50	50
September	14	6	1	4	2	5	2	9	2	15	2	16	3	17	2	9	3	2	14	16	(*)	3	7	6	----	8	49	49
October	18	7	3	5	1	5	(*)	5	2	9	1	12	4	18	5	17	7	1	7	14	2	4	15	13	----	7	44	46
November	19	8	2	6	1	7	1	6	2	6	2	6	4	9	6	17	5	1	6	10	5	4	15	15	----	7	40	42
December	18	8	2	5	3	8	2	7	2	11	2	15	3	12	3	14	2	1	8	11	11	2	15	12	----	7	37	40
Means	15	7	2	6	1	7	1	8	2	12	2	14	3	15	3	13	2	2	16	12	5	2	8	8	----	7	41	42

*Less than 0.5 percent.

Ocean Area No. 50170. Position: Lat. 50°–55° N., Long. 170°–175° W. 5,000
Greenwich Noon Observations—Years of Record: 50

Month	Wind																		Weather														Mean cloud amount (0–10)	Average air temperature	Average sea surface temperature
	Mean velocity (knots)	Percentages of observations from—																	Percentages of observations recording																
		N.		NE.		E.		SE.		S.		SW.		W.		NW.		Calm	Fog, mist, haze	Rain, drizzle	Snow	Showers	Squalls	Gales (force 8 or over)	Exceptional visibility									
		Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over																			
January	17	9	2	7	2	9	1	13	3	10	4	15	2	10	1	9	2	1	6	6	12	2	11	9	----	7	36	38
February	18	9	1	7	2	9	1	8	5	9	3	10	4	14	5	9	3	1	9	6	9	2	9	11	----	7	35	37
March	18	8	1	6	1	7	2	9	6	10	3	18	4	18	1	9	2	1	10	13	11	2	12	10	----	7	36	37
April	17	10	2	3	1	4	0	6	1	14	2	13	2	18	4	13	1	1	9	10	10	1	12	6	----	8	36	38
May	14	10	1	5	(*)	7	1	8	1	9	1	16	1	19	2	17	1	2	23	13	2	3	7	4	----	8	39	40
June	12	9	(*)	5	(*)	9	(*)	8	1	9	1	22	1	20	1	15	1	2	10	14	0	2	3	3	----	9	43	43
July	11	8	(*)	5	0	5	(*)	9	0	17	1	21	3	22	3	16	1	3	22	14	0	(*)	2	1	----	8	46	47
August	13	5	(*)	3	(*)	5	0	7	(*)	16	1	20	3	20	3	10	1	1	29	15	0	1	4	4	----	8	50	50
September	15	7	2	5	1	5	1	7	2	11	2	15	1	19	3	16	2	1	14	15	1	2	6	8	----	8	50	49
October	18	7	3	3	1	4	1	5	1	6	2	11	1	19	5	18	6	1	5	11	1	3	12	11	----	7	44	45
November	20	6	3	5	2	6	1	6	3	5	4	10	6	16	7	14	5	1	5	12	6	4	15	12	----	7	40	42
December	18	8	1	5	1	5	3	8	3	8	3	14	6	12	5	13	3	2	6	14	9	1	13	10	----	6	37	40
Means	16	8	1	5	1	6	1	8	2	11	2	15	3	17	3	13	2	2	14	2	5	2	8	7	----	8	41	42

*Less than 0.5 percent.

Ocean Area No. 50175. Position: Lat. 50°–55° N., Long. 175°–180° W. 4,000
Greenwich Noon Observations—Years of Record: 49

Month	Wind																	Weather									
	Mean velocity (knots)	Percentages of observations from—																Percentages of observations recording							Mean cloud amount (0–10)	Average air temperature	Average sea surface temperature
		N.		NE.		E.		SE.		S.		SW.		W.		NW.												
		Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Calm	Fog, mist, haze	Rain, drizzle	Snow	Showers	Squalls	Gales (force 8 or over)	Exceptional visibility			
January	18	10	0	7	1	8	2	10	4	9	4	15	3	13	4	10	(*)	(*)	8	6	17	1	14	10	.....	7	35	38
February	17	10	1	10	1	9	2	13	3	7	3	10	3	11	3	11	1	2	7	9	12	3	10	11	.....	6	34	37
March	17	9	2	7	1	5	2	11	5	11	3	13	3	13	3	11	(*)	1	10	9	12	2	11	6	.....	8	36	37
April	18	7	1	5	0	4	1	8	(*)	7	2	16	5	17	10	12	4	1	10	15	12	1	15	11	.....	7	36	38
May	15	13	1	8	1	4	1	6	1	8	0	12	4	18	2	17	3	1	11	16	4	3	6	5	.....	8	39	39
June	12	8	1	6	(*)	7	2	9	1	14	2	14	(*)	18	2	14	0	2	20	13	0	3	4	3	.....	8	43	42
July	10	8	0	4	0	6	0	10	1	11	1	23	(*)	20	2	11	(*)	3	44	15	0	1	2	1	.....	9	46	46
August	12	6	1	6	0	5	(*)	7	(*)	15	1	24	1	19	2	12	(*)	1	34	17	0	2	4	0	.....	9	50	49
September	15	10	1	6	2	4	2	8	2	7	3	16	3	18	4	10	3	1	12	14	1	3	8	7	.....	8	49	48
October	17	12	3	6	1	4	1	5	1	5	2	9	3	18	8	17	4	1	6	10	1	3	9	11	.....	6	44	45
November	20	10	3	5	1	5	1	7	2	4	3	10	3	21	8	13	4	(*)	5	13	7	3	14	14	.....	7	40	42
December	18	7	1	7	(*)	10	1	7	2	8	4	12	5	17	5	11	3	(*)	6	6	13	2	14	13	.....	7	36	40
Means	16	10	1	6	1	6	1	8	2	9	2	14	3	18	4	12	2	1	15	12	7	2	9	8	.....	7	41	42

*Less than 0.5 percent.

Ocean Area No. 50175E. Position: Lat. 50°–55° N., Long. 175°–180° E. 3,000
Greenwich Noon Observations—Years of Record: 49

Month	Wind																	Weather									
	Mean velocity (knots)	Percentages of observations from—																Percentages of observations recording							Mean cloud amount (0–10)	Average air temperature	Average sea surface temperature
		N.		NE.		E.		SE.		S.		SW.		W.		NW.		Calm	Fog, mist, haze	Rain, drizzle	Snow	Showers	Squalls	Gales (force 8 or over)	Exceptional visibility			
		Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over											
January	19	9	1	9	2	7	2	10	6	5	3	12	6	8	6	11	2	1	3	10	13	1	17	12	-----	8	35	38
February	18	9	2	6	1	11	5	8	3	5	3	15	4	13	2	10	2	1	3	7	19	2	16	11	-----	7	34	36
March	19	7	0	6	2	10	3	9	5	8	4	11	9	12	3	9	1	1	6	7	19	3	18	13	-----	8	35	37
April	16	13	0	4	(*)	3	1	10	3	9	2	15	2	20	4	10	2	2	11	8	17	2	13	8	-----	8	36	37
May	14	11	1	8	1	9	(*)	7	(*)	7	1	13	2	22	2	14	1	1	13	11	4	3	8	4	-----	8	39	39
June	12	10	0	6	(*)	10	(*)	9	0	8	1	16	1	18	1	16	1	3	21	17	0	3	2	2	-----	9	42	42
July	11	5	0	3	0	4	0	11	(*)	18	1	26	2	19	(*)	8	0	3	42	14	(*)	(*)	1	1	-----	9	47	46
August	12	6	0	4	1	6	0	12	2	7	1	24	1	22	0	8	1	5	32	14	0	1	2	3	-----	9	50	49
September	14	8	2	9	1	5	0	6	1	10	0	16	2	21	3	13	2	1	10	15	0	2	5	8	-----	8	49	49
October	18	12	2	4	2	2	2	6	2	7	0	9	5	21	7	11	7	1	6	10	(*)	1	11	10	-----	7	44	45
November	18	9	2	7	2	6	2	4	2	9	2	11	4	15	10	11	3	1	2	8	5	4	19	13	-----	7	39	42
December	19	7	2	4	2	7	3	7	3	9	2	12	4	17	6	12	2	1	5	6	14	2	20	15	-----	7	36	39
Means	16	9	1	6	1	6	2	8	2	8	2	15	4	17	4	11	2	1	14	11	8	2	11	8	-----	8	40	42

*Less than 0.5 percent.

Ocean Area No. 50170E. Position: Lat. 50°–55° N., Long. 170°–175° E. 1,000 Greenwich Noon Observations—Years of Record: 52

Month	Wind																	Weather							Mean cloud amount (0–10)	Average air temperature	Average sea surface temperature
	Mean velocity (knots)	Percentages of observations from—																Percentages of observations recording									
		N.		NE.		E.		SE.		S.		SW.		W.		NW.		Calm	Fog, mist, haze	Rain, drizzle	Snow	Showers	Squalls	Gales (force 8 or over)	Exceptional visibility			
		Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over											
January	17	5	0	18	4	11	2	8	2	4	4	12	2	18	2	0	0	2	4	6	18	2	21	11	-----	8	33	37
February	17	12	2	13	0	12	2	1	3	4	0	13	3	17	0	16	2	0	0	8	9	3	6	8	-----	6	33	36
March	16	12	3	10	3	7	0	9	2	7	1	11	3	15	2	13	0	2	14	4	17	2	16	9	-----	8	35	36
April	16	11	1	5	1	8	1	12	1	5	1	10	7	16	4	13	4	0	8	7	12	1	8	13	-----	8	36	37
May	15	10	1	3	1	7	1	8	0	8	3	9	3	20	1	21	3	1	16	14	2	1	12	6	-----	8	38	39
June	12	7	1	6	2	7	0	11	0	6	0	18	0	21	0	18	1	3	36	10	0	0	2	2	-----	9	42	42
July	11	5	0	0	0	4	1	6	0	17	2	21	6	23	1	12	0	2	48	13	0	1	2	5	-----	9	46	46
August	13	5	0	8	0	7	0	8	1	17	4	22	2	15	2	7	1	1	26	12	0	0	4	7	-----	8	50	50
September	15	10	2	2	4	4	0	6	4	14	1	11	4	18	2	17	1	0	8	15	0	2	6	8	-----	8	49	49
October	17	7	1	4	0	10	2	1	(*)	5	1	13	7	19	5	24	1	0	6	14	0	5	7	11	-----	7	44	45
November	18	4	2	3	0	10	2	7	0	5	0	11	7	23	8	14	2	2	3	11	6	3	16	12	-----	7	39	42
December	19	5	0	7	0	5	2	11	3	5	5	10	3	19	8	13	2	2	0	2	12	3	20	14	-----	7	35	38
Means	15	7	2	7	1	8	1	8	1	8	2	13	4	19	3	14	1	1	10	10	6	2	10	9	-----	8	40	41

*Less than 0.5 percent.

Ocean Area No. 55135. Position: Lat. 55°–60° N., Long. 135°–140° W. 2,000
Greenwich Noon Observations—Years of Record: 49

Month	Wind														Weather									Mean cloud amount (0–10)	Average air temperature	Average sea surface temperature
	Mean velocity (knots)	Percentages of observations from—													Percentages of observations recording											
		N.		NE.		E.		SE.		S.		SW.		W.		NW.		Calm	Fog, mist, haze	Rain, drizzle	Snow	Showers	Squalls	Gales (force 8 or over)	Exceptional visibility			
		Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over										
January	12	6	2	14	3	17	5	16	2	10	0	5	0	6	0	10	2	2	4	13	10	4	12	11	----	5	36	41
February	13	9	2	19	0	6	0	15	5	4	0	13	0	7	0	14	0	1	10	12	18	7	11	7	----	5	35	39
March	11	13	1	19	1	20	3	14	1	6	2	8	1	1	1	5	0	4	7	16	14	3	10	4	----	6	37	39
April	10	7	0	5	1	14	3	21	2	11	1	10	0	7	0	13	0	5	4	24	8	2	11	4	----	6	40	42
May	7	6	0	7	1	14	2	20	2	9	(*)	9	0	7	0	10	0	12	9	19	0	4	4	1	----	6	45	45
June	4	9	0	9	0	9	0	11	0	8	0	7	0	15	0	12	0	20	16	12	0	4	2	0	----	3	49	49
July	5	3	0	11	0	10	0	15	0	8	0	12	0	14	0	9	0	14	17	16	0	4	4	1	----	7	53	53
August	4	5	0	6	0	11	1	15	1	9	0	12	0	7	0	9	0	24	25	25	0	8	4	(*)	----	8	54	54
September	6	7	0	6	1	9	3	18	3	6	0	4	0	10	0	12	0	22	18	26	0	8	6	4	----	6	51	50
October	10	6	0	12	2	17	2	15	3	7	0	10	2	8	0	8	0	8	4	31	1	8	11	2	----	7	46	47
November	12	9	0	5	1	12	1	20	5	14	2	8	0	5	0	9	1	8	5	18	3	3	3	6	----	6	41	45
December	12	11	0	12	0	3	0	21	1	9	3	11	4	6	3	12	0	4	4	17	13	10	8	6	----	7	37	42
Means	9	8	(*)	10	1	12	2	17	2	8	1	9	1	7	1	11	(*)	10	10	19	6	5	7	4	----	6	44	46

*Less than 0.5 percent.

Ocean Area No. 55140. Position: Lat. 55°–60° N., Long. 140°–145° W. 1,000
Greenwich Noon Observations—Years of Record: 48

Month	Wind																		Weather									
	Mean velocity (knots)	Percentages of observations from—																	Percentages of observations recording							Mean cloud amount (0–10)	Average air temperature	Average sea surface temperature
		N.		NE.		E.		SE.		S.		SW.		W.		NW.		Calm	Fog, mist, haze	Rain, drizzle	Snow	Showers	Squalls	Gales (force 8 or over)	Exceptional visibility			
		Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over												
January	13	6	0	24	2	21	3	12	2	2	0	12	2	6	3	4	0	1	3	7	4	0	6	5	----	4	36	40
February	12	6	0	11	0	21	1	15	5	8	0	11	0	11	0	9	0	2	8	12	8	7	18	5	----	6	37	41
March	12	5	0	11	2	25	3	13	3	5	0	8	0	9	0	14	0	2	8	10	15	3	7	2	----	3	36	38
April	12	2	0	12	4	23	5	12	2	5	0	4	0	17	0	7	1	6	4	19	9	2	13	1	----	7	40	41
May	9	4	0	9	0	19	3	16	1	9	0	11	0	11	2	9	0	6	17	20	1	5	6	3	----	6	43	44
June	7	5	0	15	0	18	0	8	1	7	0	21	1	14	0	5	0	5	29	16	0	3	7	0	----	7	48	47
July	7	6	0	8	0	13	3	12	0	7	0	17	0	20	0	4	0	10	18	8	0	5	2	1	----	5	53	52
August	7	8	0	11	0	10	0	19	0	7	0	13	0	18	0	7	0	7	11	15	0	4	6	0	----	7	54	54
September	11	2	0	14	1	18	2	20	1	4	0	18	2	12	2	2	0	2	8	27	1	11	9	7	----	6	51	51
October	13	6	0	9	3	25	6	17	4	6	3	10	0	7	0	1	0	3	4	15	0	4	9	7	----	9	47	48
November	11	6	0	15	2	9	4	15	2	17	0	9	4	0	2	13	0	2	2	11	5	0	9	6	----	5	41	46
December	14	2	0	13	5	18	5	10	5	2	0	16	3	8	0	10	0	3	8	12	5	5	11	12	----	6	39	42
Means	11	5	0	12	2	18	3	14	2	7	(*)	13	1	11	1	7	(*)	4	10	14	4	4	9	5	----	6	44	45

*Less than 0.5 percent.

Ocean Area No. 55160. Position: Lat. 55°–60° N., Long. 160°–165° W. 700
Greenwich Noon Observations—Years of Record: 50

Month	Wind																			Weather								Mean cloud amount (0–10)	Average air temperature	Average sea surface temperature
	Mean velocity (knots)	Percentages of observations from—																		Percentages of observations recording										
		N.		NE.		E.		SE.		S.		SW.		W.		NW.		Calm		Fog, mist, haze	Rain, drizzle	Snow	Showers	Squalls	Gales (force 8 or over)	Exceptional visibility				
		Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over														
January																														
February																														
March																														
April																														
May	10	12	1	13	1	11	1	6	2	4	1	8	1	6	1	19	4	9		25	5	12	2	3	3		6			
June	8	8	1	14	2	12	0	8	1	9	1	16	0	8	0	11	1	8		30	9	0	0	1	0		7	43	41	
July	7	4	0	1	0	6	0	9	1	15	1	25	0	8	0	11	3	16		19	16	0	0	2	0		7	49	47	
August	9	6	1	5	0	5	1	13	1	15	1	16	0	14	2	10	2	8		30	20	0	1	3	4		6	50	49	
September	8	2	0	4	0	8	0	14	0	21	0	12	0	19	2	16	0	2		15	16	0	7	13	0		7	49	49	
October																														
November																														
December																														
Means																														

Ocean Area No. 55165. Position: Lat. 55°–60° N., Long. 165°–170° W. 2,000
Greenwich Noon Observations—Years of Record: 50

Month	Wind																		Weather							Mean cloud amount (0–10)	Average air temperature	Average sea surface temperature
	Mean velocity (knots)	Percentages of observations from—																	Percentages of observations recording									
		N.		NE.		E.		SE.		S.		SW.		W.		NW.		Calm	Fog, mist, haze	Rain, drizzle	Snow	Showers	Squalls	Gales (force 8 or over)	Exceptional visibility			
		Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over												
January																												
February																												
March																												
April																												
May	12	22	1	23	1	9	0	4	1	2	0	1	1	11	0	21	3	1	13	6	8	0	3	2	----	6	34	34
June	8	11	0	15	(*)	6	1	15	0	6	0	11	(*)	8	0	19	(*)	8	44	8	1	(*)	0	(*)	----	8	40	39
July	8	6	0	7	0	9	(*)	12	(*)	16	1	18	1	12	0	13	0	5	55	10	0	2	2	1	----	8	46	45
August	10	5	1	7	0	6	(*)	14	1	14	1	18	1	12	(*)	15	(*)	5	38	16	(*)	1	3	2	----	8	48	47
September	14	10	1	9	1	12	1	11	3	10	2	9	2	9	2	12	2	4	19	15	1	5	12	8	----	7	46	45
October	17	13	5	12	2	10	2	9	1	4	0	4	1	10	1	21	4	1	5	22	9	1	20	7	----	7	39	41
November																												
December																												
Means																												

*Less than 0.5 percent.

Ocean Area No. 55170. Position: Lat. 55°–60° N., Long. 170°–175° W. 700
Greenwich Noon Observations—Years of Record: 50

Month	Wind																		Weather									
	Mean velocity (knots)	Percentages of observations from—																	Percentages of observations recording							Mean cloud amount (0–10)	Average air temperature	Average sea surface temperature
		N.		NE.		E.		SE.		S.		SW.		W.		NW.												
		Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Calm	Fog, mist, haze	Rain, drizzle	Snow	Showers	Squalls	Gales (force 8 or over)	Exceptional visibility			
January																												
February																												
March																												
April																												
May																												
June																												
July	9	5	0	3	1	3	0	3	2	23	0	19	1	13	0	5	1	6	51	10	0	0	5	4		9		
August	11	10	(*)	5	1	5	0	11	2	9	2	17	4	14	1	12	1	6	32	17	0	1	8	5		9	48	46
September	17	8	0	8	5	7	2	8	4	10	4	11	5	15	3	8	2	0	14	15	2	3	13	13		8	47	46
October																												
November																												
December																												
Means																												

*Less than 0.5 percent.

Ocean Area No. 60160. Position: Lat. 60°–65° N., Long. 160°–165° W. 500
Greenwich Noon Observations—Years of Record: 46

Month	Wind																		Weather														Mean cloud amount (0–10)	Average air temperature	Average sea surface temperature
	Mean velocity (knots)	Percentages of observations from—																	Percentages of observations recording																
		N.		NE.		E.		SE.		S.		SW.		W.		NW.		Calm	Fog, mist, haze	Rain, drizzle	Snow	Showers	Squalls	Gales (force 8 or over)	Exceptional visibility								
		Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over																		
January	6	13	0	11	0	7	1	9	1	11	1	11	0	11	0	13	0	11	12	7	1	0	0	1	6	46	41								
February	7	8	0	9	0	9	0	13	1	16	0	17	1	12	0	8	0	6	16	16	2	7	1	0	6	53	52								
March	7	8	0	12	0	8	0	13	0	16	0	16	1	12	0	8	0	2	11	17	0	3	2	0	6	50	52								
April	9	21	0	21	0	11	0	6	1	8	0	8	0	9	0	12	0	2	10	19	1	2	4	0	5	46	48								
May	16	18	3	13	4	11	4	5	0	9	7	7	3	6	0	4	3	3	2	1	4	1	6	11	5	35	40								
June																																			
July																																			
August																																			
September																																			
October																																			
November																																			
December																																			
Means																																			

Ocean Area No. 60165. Position: Lat. 60°–65° N., Long. 165°–170° W. 2,000
Greenwich Noon Observations—Years of Record: 60

Month	Wind																		Weather									
	Mean velocity (knots)	Percentages of observations from—																	Percentages of observations recording							Mean cloud amount (0–10)	Average air temperature	Average sea surface temperature
		N.		NE.		E.		SE.		S.		SW.		W.		NW.		Calm	Fog, mist, haze	Rain, drizzle	Snow	Showers	Squalls	Gales (force 8 or over)	Exceptional visibility			
		Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over												
January																												
February																												
March																												
April																												
May	9	32	2	8	2	12	0	14	0	4	0	4	0	8	0	6	0	8	47	6	9	0	0	0	----	4	35	31
June	7	15	(*)	9	(*)	8	1	6	1	11	(*)	15	(*)	8	0	17	(*)	9	37	3	2	1	1	1	----	6	39	36
July	7	6	0	7	0	12	0	11	0	14	(*)	10	1	16	0	17	(*)	6	44	11	1	2	4	(*)	----	7	46	45
August	9	8	(*)	9	0	6	1	14	1	15	(*)	13	1	11	1	11	1	8	24	20	1	3	4	2	----	7	48	48
September	12	17	3	14	2	10	1	6	3	5	2	8	3	10	1	10	1	4	16	19	1	4	8	4	----	7	43	44
October	14	17	2	16	2	7	2	8	1	5	0	6	1	8	2	18	3	2	4	11	10	1	13	5	----	6	----	----
November																												
December																												
Means																												

*Less than 0.5 percent.

Ocean Area No. 60170. Position: Lat. 60°–65° N., Long. 170°–175° W. 200
Greenwich Noon Observations—Years of Record: 50

Month	Wind																		Weather									
		Percentages of observations from—																	Percentages of observations recording									
		N.		NE.		E.		SE.		S.		SW.		W.		NW.													
	Mean velocity (knots)	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Calm	Fog, mist, haze	Rain, drizzle	Snow	Showers	Squalls	Gales (force 8 or over)	Exceptional visibility	Mean cloud amount (0–10)	Average air temperature	Average sea surface temperature
January																												
February																												
March																												
April																												
May																												
June	10	25	0	15	0	7	2	0	0	8	0	14	2	4	0	12	0	11	48	8	0	0	4	0	----	8	37	33
July	8	6	2	10	0	12	0	14	0	12	0	13	0	14	0	6	0	11	35	9	0	0	2	2	----	8	41	38
August	8	14	0	17	0	5	0	10	0	13	5	9	0	0	0	14	0	13	37	18	0	5	5	5	----	9	45	44
September	14	15	0	7	8	8	0	7	3	17	0	11	5	6	0	2	3	8	20	16	8	0	5	3	----	8	42	42
October																												
November																												
December																												
Means																												

Ocean Area No. 65165. Position: Lat. 65°–70° N., Long. 165°–170° W. 400
Greenwich Noon Observations—Years of Record: 49

Month	Wind																		Weather							Mean cloud amount (0–10)	Average air temperature	Average sea surface temperature
	Mean velocity (knots)	Percentages of observations from—																	Percentages of observations recording									
		N.		NE.		E.		SE.		S.		SW.		W.		NW.												
		Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Force 1–6	Force 7 or over	Calm	Fog, mist, haze	Rain, drizzle	Snow	Showers	Squalls	Gales (force 8 or over)	Exceptional visibility			
January																												
February																												
March																												
April																												
May																												
June	8	19	0	4	0	6	0	11	0	22	0	7	0	14	0	9	1	7	38	6	0	0	3	1	-----	4	37	34
July	9	6	1	7	1	4	0	17	5	12	1	11	0	7	0	12	2	14	45	6	1	1	3	4	-----	6	43	42
August	9	12	1	8	2	11	0	16	0	14	2	13	0	3	0	13	2	4	24	8	1	1	2	2	-----	8	46	46
September	12	14	0	13	6	10	0	10	3	6	0	9	0	6	3	20	0	0	18	23	10	3	3	6	-----	7	41	42
October	15	13	6	3	3	17	0	3	3	3	3	6	0	6	0	16	9	9	3	3	23	6	15	17	-----	6	-----	-----
November																												
December																												
Means																												

Dates of Ice Breakups and Freezeups

Place	Waters	Ice breakup			Ice freezeup			Average years record	Period
		Average	Earliest	Latest	Average	Earliest	Latest		
Gulf of Alaska									
Susitna	Susitna River	May 1	4/12/41	5/10/46	Nov. 1	10/19/33	11/14/36	12	1933–1946
Talkeetna	do	May 8	4/12/41	5/25/52	Dec. 2	11/12/39	12/23/47	12	1919–1952
Kasilof	Kasilof River	Apr. 13	3/27/41	4/29/46	Dec. 3	11/13/45	12/24/48	10	1937–1947
Kenai	Kenai River	Apr. 2	3/18/52	4/14/51	Dec. 10	11/23/51	12/26/37	6	1937–1952
Anchorage	Ship Creek	Mar. 29	2/16/44	4/17/42	Nov. 24	11/10/35	12/10/36	21	1915–1953
Bering Sea									
Egegik	Egegik River	Apr. 14	3/16/41	5/ 1/39	Dec. 12	11/12/42	1/11/39	10	1937–1952
Naknek	Naknek River	Apr. 9	3/19/41	4/25/49	Nov. 17	10/17/39	12/15/17	7	1916–1951
Koggiung	Kvichak River	May 4	4/26/38	5/13/40	Dec. 22	11/23/39	1/30/41	3	1937–1940
Dillingham	Nushagak Bay	May 9	4/25/26	5/27/52	Nov. 7	10/16/32	12/22/40	19	1919–1952
Kanakanak	do	May 2	4/17/40	5/22/39	Nov. 20	10/14/42	12/21/38	4	1937–1943
Platinum	Goodnews Bay	May 1	4/ 8/42	5/25/52	Nov. 19	10/23/30	12/12/47	12	1928–1952
Kwinhagak	Kuskokwim Bay	May 1	4/10/45	5/17/46	Nov. 15	10/20/29	12/20/38	10	1929–1952
Bethel	Kuskokwim River	May 15	4/24/40	5/28/52	Oct. 29	10/ 8/28	11/24/51	27	1923–1952
Crooked Creek	do	May 7	4/22/40	5/23/52	Nov. 18	11/ 3/39	12/ 2/52	12	1937–1952
McGrath	do	May 10	4/24/40	5/24/52	Nov. 5	10/23/41	11/15/52	12	1939–1952
Mekoryuk, Nunivak Island	Mekoryuk River	May 12	4/18/50	5/30/46	Nov. 27	11/20/52	12/13/47	5	1943–1951
Gambell, St. Lawrence Island.		May 26	5/ 1/43	7/ 1/50	Nov. 21	10/15/49	12/14/40	10	1940–1952
Savoonga, St. Lawrence Island.		May 26	4/25/48	6/17/45	Nov. 19	9/30/30	12/13/40	10	1929–1949
Hooper Bay	Hooper Bay	May 26	5/15/42	6/ 4/45	Nov. 12	10/19/26	11/20/41	4	1926–1945
Yukon River, *See* text.									
St. Michael	Norton Sound	June 9	5/19/12	7/ 3/01	Nov. 10	10/10/84	12/ 7/81	53	1874–1952
Unalakleet	Unalakleet River	May 17	4/28/40	5/30/52	Oct. 25	10/ 8/39	11/19/37	14	1937–1952
Moses Point	Kwiniuk River	May 24	5/ 2/51	6/11/49	Oct. 20	10/ 1/51	11/ 2/52	6	1943–1952
Golovin	Golovnin Bay	May 23	5/13/40	6/14/39	Nov. 2	10/ 8/42	11/19/37	6	1937–1943
White Mountain	Fish River	May 21	5/ 5/40	6/ 2/37	Oct. 14	9/27/31	11/ 9/25	24	1923–1951
Solomon	Solomon River	May 20	5/ 1/42	5/30/45	Oct. 29	10/10/40	11/29/48	10	1940–1952
Council	Niukluk River	May 17	4/27/40	5/31/52	Oct. 30	10/13/20	11/ 9/40	12	1920–1952
Nome	Norton Sound	May 29	4/28/42	6/28/48	Nov. 12	10/13/18	12/13/47	50	1900–1952
Teller	Grantley Harbor	June 7	5/12/36	6/18/39	Nov. 10	10/13/42	12/26/50	16	1936–1952

Dates of Ice Breakups and Freezeups—Continued

Place	Waters	Ice breakup			Ice freezeup			Average years record	Period
		Average	Earliest	Latest	Average	Earliest	Latest		
	Arctic Ocean								
Wales	Bering Strait	June 8	5/15/47	6/30/49	Dec. 3	10/ 8/48	1/ 8/51	16	1927–1952
Shishmaref	Arctic Ocean	June 22	5/30/36	7/ 8/33	Nov. 10	10/ 6/39	12/18/34	18	1921–1952
Candle	Kiwalik River	May 18	5/ 5/43	5/27/27	Oct. 17	10/10/42	10/23/43	8	1922–1950
Deering	Inmachuk River	June 4	5/11/43	6/30/41	Oct. 23	10/ 3/46	11/ 4/41	4	1937–1948
Kotzebue	Kotzebue Sound	May 31	5/17/40	6/ 8/45	Oct. 23	10/ 2/39	11/ 5/38	14	1929–1952
Selawik	Selawik River	May 28	5/13/40	6/ 7/45	Oct. 17	10/ 3/46	10/30/38	12	1927–1952
Noorvik	Kobuk River	May 29	5/18/25	6/11/22	Oct. 11	9/26/48	10/25/22	17	1918–1952
Kiana	do	May 18	5/ 7/40	5/29/39	Oct. 18	10/10/39	11/ 4/38	6	1938–1944
Kobuk	do	May 19	5/11/43	5/29/45	Oct. 21	10/ 9/39	11/ 2/38	12	1937–1952
Shungnak	do	May 21	5/12/41	5/29/45	Oct. 16	10/ 7/19	10/25/40	8	1919–1950
Kivalina	Kivalina River	May 22	5/15/43	5/27/49	Oct. 25	10/15/48	11/ 1/46	6	1948–1952
Point Hope	Arctic Ocean	June 20	5/30/27	7/ 8/46	Nov. 11	10/ 6/42	12/19/47	8	1927–1951

Ice terminology, glossary.—The purpose of this glossary is twofold: (1) To standardize ice terminology and its usage; (2) to provide a convenient means for describing observed ice features and related characteristics.

In the glossary, an attempt has been made to eliminate ambiguous terms, and to restrict meanings to the best accepted usage. The essential and preferred terms are indicated by *italics*.

In compiling this glossary all major sources of English terminology have been consulted and foreign terms have been held to a minimum.

Ablation.—The removal of an ice or snow surface by evaporation.

Anchor ice.—Bottom ice.

Arctic pack.—Polar ice.

Avalanche.—A large mass of snow and ice, or of earth, rock, etc., in swift motion down a mountainside, or over a precipice.

Barbers.—Frost smoke.

Barranca.—A ravine in piedmont ice, or in shelf ice.

Barrier.—The cliffed edge of shelf ice.

Barrier Berg.—A mass of ice calved from shelf ice, having a flat upper surface with at least the upper portion formed from stratified snow or névé.

Bay.—(1) An inlet of the sea, usually smaller than a gulf, but of the same general character. The name is used for large tracts of water, around which the land forms a curve, or any recess or inlet between capes or headlands.

(2) An inward bend of the ice edge or the ice limit, and can, in the same way as a tongue, be formed either by wind or by current.

Bay ice.—(See classification section following glossary in order to describe Bay Ice more completely.)

Belt.—A relatively narrow band of ice or any variety.

Bending.—The first stage of pressure ice caused by the action of current, wind, tide, or changes in air temperature. Bending is more characteristic of thin plastic ice.

Berg.—An abbreviation for Iceberg. A mass of land ice which has broken away from its parent formation on the coast, and either floats in the sea or is grounded on a shoal. The most common types are (1) tabular, derived from shelf ice; and (2) irregular, derived from glacier ice.

Bergshrund.—The crevasse or series of crevasses, deep and often broad, occurring frequently at the source of a mountain glacier between the glacier ice and the mountain itself.

Bergy bit.—A medium-sized piece of glacier ice, or heavy floe, or hummocky pack ice, washed clear of snow, and floating in the sea. A typical bergy bit is about the size of a small house.

Beset.—Hemmed in, surrounded, besieged, and/or harassed by ice from all quarters so that the control of the movements of a vessel is lost. Beset does not imply the presence of ice under pressure.

Big clearing.—Polynya.

Bight.—An inward bend of an ice edge or an ice limit.

Bit.—A single piece of brash.

Black and white berg.—A berg having a dark, opaque portion of ice containing sand and stones, and separated from the white portion by a definite line of demarcation. The dark portions are generally smoothly rounded.

Black ice.—Ice crust which is dark in color.

Blind lead.—A lead with only one outlet, as a blind alley.

Blink.—A whitish glare on the underside of extensive cloud areas created by light reflected from snow- or ice-covered surfaces. In contrast to snow blink and ice blink, the sky is dark above bare land or open-water surfaces.

Block.—A piece of sea ice ranging in size from 6 to 30 feet across.

Blocky iceberg.—A berg with steep, precipitous sides, and with either a horizontal or nearly horizontal upper surface.

Blue ice.—The oldest and hardest form of glacier ice. It is distinguished by a slightly bluish or greenish color.

Boring.—Forcing a vessel under power through ice by breaking a lead.

Bottom ice.—Ice formed on the bed of a river, lake, or very shallow sea where there is a strong current. When water is well mixed and at the freezing temperature, any radiation of heat from the bottom of the shallow-water area will cause the bottom temperature to fall below freezing, and ice will form on and attach to the bottom.

Brash.—Small ice fragments less than 6 feet across; the wreckage of other forms of ice.

Broken belt.—The transition zone between open water and the consolidated pack.

Broken ice.—Ice that covers from five- to eight-tenths of the sea surface.

Bucking.—Repeatedly charging the ice with a ship under full power in an attempt to break through the ice.

Cake—A term of general meaning used in reference to individual chunks of ice. The dimensions of a cake are not fixed, and the term is used when no specific size is intended.

Cake ice.—An area of ice cakes.

Calved ice.—A piece of floating glacier ice ranging in size from a berg to a growler.

Calving.—The breaking away of ice from its parent berg, glacier, or shelf ice formation.

Candle ice.—Vertical fingers or needles of ice existing in rotten or disintegrating sea ice after the more saline portions of the ice have melted. The needles may be in length equal to the thickness of the cake prior to the establishment of the disintegrating process.

Capsize.—To turn over. When bergs calve and when their balance is changed sufficiently, they turn over, or capsize.

Channel.—Lead.

Cirque.—A large, steep-walled rock recess in a mountain area that acts as a basin for the generation of a glacier.

Clearing.—Polynya.

Close ice.—Ice so closely packed that virtually all of the sea water openings are obscured.

Close pack.—Close ice.

Coast ice.—Fast ice.

Coastal ice.—Fast ice.

Collar ice.—Icefoot.

Compact ice.—Conglomerated ice.

Compound pancake ice.—Pancakes which have frozen together.

Concrete.—Snow compacted by heavy objects. The concrete becomes most evident when the lighter snow has blown away, leaving the compacted snow in elevated peaks or ridges.

Concussion crack.—A crack produced by the impact of one ice cake upon another.

Confluent ice.—Piedmont ice.

Conglomerated ice.—All forms of floating ice compacted into one mass.

Consolidated ice.—An ice area entirely devoid of water spaces, and containing the heaviest forms of ice.

Continental glacier.—That part of a land-formed ice cap that covers the coastal slopes, where the movement of the ice is relatively rapid.

Continental ice.—Ice cap.

Cornice.—Snow or ice overhanging the lee edge of a vertical cliff.

Corrasion.—The scouring action of wind-borne snow crystals, salt crystals, sand particles, etc.

Crack.—A small, unnavigable, narrow break in sea ice that may reveal the sea water surface. Cracks are caused by tidal change, temperature change, current, and/or wind.

Cream ice.—Sludge.

Crevasse.—A fissure or rift in glacier shelf, or other land ice formations, due either to temperature changes or to motion of the ice over underlying obstacles.

Cul-de-sac.—Blind lead.

Cwm ice.—Ice formed in a bare, steep-walled rock recess in a mountainous area.

Debacle.—The breakup of ice in a stream, or the rush of water or ice that follows.

Debris ice.—Ice which contains mud, stones, shells, etc.

Depth ice.—Bottom ice.

Disturbed ice.—Any land ice which is broken by pressure into a chaotic pattern of elevations and depressions.

Donga.—A small ravine in piedmont ice or shelf ice, with steep sides.

Drift.—(1) Wind-driven snow. (2) Snow lodged in the lee of surface irregularities. (3) The motion of sea ice or vessels resulting from current.

Drift ice.—(1) Floating ice. (2) Any ice that has drifted from its place of origin. (3) Pack ice other than Polar pack.

Drift icefoot.—An accumulation of snow drifts connecting shore cliffs with sea ice.

Drifting ice.—Floating ice.

Erosion.—The destruction of ice by the action of waves and weather.

Erratic.—A mass of rock or gravel transported by ice from its original resting place.

Esker.—A narrow ridge or mound of gravel or sand deposited by a subglacial stream.

Expanded foot glacier.—A glacier with an expanded front outside the walls of a rock valley, and generally on a plain at or near the shore.

Fast ice.—A stretch of ice, broken or unbroken, either stranded in shoal water or attached to the shore.

Fast ice belt.—Icefoot.

Field.—The largest of ice areas. A field is so called because of its size only (greater than 5 miles across). The effects of pressure, erosion, or age are of no consideration.

Field ice.—Obsolete. Field ice is NOT to be confused with *ice field*.

Firn.—Névé.

Fjord ice.—(See classification section in order to completely describe Fjord Ice).

Flat ice.—Ice with a flat or level surface.

Flaw.—(1) The seaward edge of landfast ice. (2) The shore lead just outside the landfast ice.

Floating ice.—A general term applied to all types of ice other than those aground or attached to shore.

Floe.—One of the terms used to classify sea ice according to size. A small floe is approximately 30 feet to 600 feet across. A medium floe is approximately 600 feet to 3,000 feet across. A giant floe is approximately 3,000 feet to 5 miles across. A floe may consist of a single unbroken piece of ice, or many large consolidated pieces.

Floe belt.—A belt consisting of floes.

Floeberg.—A mass of thick, heavily hummocked sea ice, usually detached from its parent floe. A floeberg may be from several feet to more than 100 feet high.

Flower ice.—Ice flower.

Fossil ice.—Ice formed by the freezing of underground water.

Frazil.—Cinderlike ice crystals formed in turbulent water.

Fresh ice.—(1) Newly formed ice. (2) Ice formed from fresh water. (3) Ice that has been salty but now is fresh.

Frost smoke.—A thick fog or mist rising from the sea surface when the relatively warmer water is exposed to an air temperature much below freezing. Frost smoke may appear over newly formed leads, or over open water.

Giant floe.—A piece of sea ice ranging in size from 3,000 feet to about 5 miles across.

Glaciation.—The erosive action caused by the movement of a field or stream of land-formed ice.

Glacier.—A field or body of land-formed ice moving slowly down a mountainside or valley.

Glacier ice.—Ice which is formed in glaciers.

Glacier iceberg.—A berg usually bluish or greenish in color, with little or no snow covering, and often containing many crevasses. Such bergs are smaller than tabular bergs. Glacier bergs are derived from glaciers, piedmont ice, confluent ice, or ice tongues from the land areas.

Glacier tongue.—The extension of a glacier

into the sea prior to calving. A glacier tongue is generally afloat.

Glaçon.—A piece of sea ice ranging in size from brash to a medium floe.

Glade.—Polynya.

Glass ice.—Ice crust.

Glimmer ice.—Ice newly formed within the cracks or holes of old ice, or on the puddles on old ice.

Grease ice.—A kind of slush formed from the congelation of ice crystals in the early stages of freezing. It has a greasy appearance.

Grounded ice.—Fast ice.

Ground ice.—(1) Bottom ice, when referring to ice formed on the bed of a river, lake, or shallow sea area. (2) Fossil ice, when referring to ice associated with permafrost.

Growler.—A small piece of glacier ice, usually greenish in color and barely showing above the water.

Growler ice.—An accumulation of growlers.

Gulf ice.—(See classification section following glossary in order to describe more completely Gulf Ice.)

Haycock.—An isolated ice cone rising above the surface of land or shelf ice as a result of pressure or ice movement.

Heavy ice.—Any sea ice more than 10 feet thick.

Heeling.—Causing a vessel to roll by mechanical means so as to enable the vessel to gain headway when working an ice pack.

Highland ice.—Ice cap.

Hinge.—A crack in sea ice running parallel and adjacent to a pressure ridge. The weight of the pressure ridge is the primary cause for the existence of the hinge.

Hole.—(1) An opening through the ice or, (2) An open space between ice cakes.

Hummock.—A type of pressure ice in the form of a short ridge or hillock.

Hummocked ice.—Ice piled haphazardly into a short ridge or hillock.

Hummocky field.—A large area of hummocked ice.

Hummocky floe.—A floe of hummocked ice.

Hummocky ice.—Hummocked ice.

Hummocky polar ice.—Polar ice that has been hummocked.

Hummocky winter ice.—Ice less than 1 year old that has been hummocked.

Ice barrier.—The cliffed edge of shelf ice.

Iceberg.—Berg. A mass of land ice which has broken away from its parent formation on the coast, and either floats in the sea or is stranded on a shoal. The most common types are: (1) tabular, derived from shelf ice; (2) irregular, derived from glacier ice.

Ice blink.—A yellowish-white glare on the underside of extensive cloud areas created by light reflected from ice-covered surfaces. Snow blink is brighter than ice blink. In contrast to blink, the sky is dark above bare land or open water surfaces.

Ice cake.—A term of general meaning used in reference to individual chunks of ice. The dimensions of a cake are not fixed, and the term is used when no specific size is intended.

Ice cap.—An ice sheet of vast extent covering the topographic features of a continental land mass.

Ice cliff.—The clifflike front of a glacier, or of shelf ice where it meets the sea.

Ice crust.—A general term for thin, hard ice. Ice crust has varying degrees of whiteness depending upon age, thickness, and/or the rapidity of formation.

Ice crystal.—A pointed, thin plate a few centimeters long consisting of pure ice without salt which is the very first stage of ice formation.

Ice edge.—The part of an ice field that borders the open sea.

Ice fall.—An interruption in the surface of a glacier, caused by an abrupt change in the slope of its bed, resulting in disturbed ice usually in the form of a steep or precipitous ice cascades.

Ice fat.—Grease Ice.

Ice field.—The largest of ice areas. An ice field is so called because of its size only (more than 5 miles across). The effects of pressure, erosion, or age are of no consideration.

Ice flowers.—Frost crystals formed on salt nuclei which have developed on the surface of sea ice as a result of rapid freezing of the sea water.

Icefoot.—A type of fast ice. A wall or belt of sea ice formed along a shore.

Ice fringe.—A belt of ice extending a short distance offshore.

Ice gruel.—A type of slush formed by the irregular freezing together of ice crystals.

Ice island.—(1) An island completely buried under snow or ice, showing no exposed rock surfaces. (2) A tabular berg whose dimensions are measured in miles.

Ice jam.—An accumulation of broken river ice caught in a narrow part of the channel.

Ice lens.—Fossil ice.

Ice limit.—The greatest extent of ice at any given time.

Ice rind.—Ice crust.

Ice sheet.—A general term signifying any large area of continuous ice overlying a land surface.

Ice tongue.—A narrow projection or peninsula of shelf ice.

Landfast ice.—Fast ice.

Land sky.—Dark streaks, patches, or a grayness on the underside of extensive cloud areas due to the absence of reflected light from bare ground. Land sky is not as dark as water sky. In contrast to land sky and water sky, the clouds are white or yellowish white above snow- or ice-covered surfaces.

Lane.—Lead.

Lard ice.—Grease ice.

Lead.—A long, narrow, but navigable water passage in pack ice. The lead may be covered by thin ice.

Level ice.—Flat ice.

Light ice.—Winter ice of medium thickness (less than 2 feet).

Loose ice.—Broken ice.

Loose pack ice.—Broken ice.

Marginal crushing.—The destruction of the outer edges of ice cakes due to collision of the cakes.

Medium floe.—A piece of sea ice ranging in size from 600 to 3,000 feet across.

Melting.—The destruction of ice by a change in phase from ice to water by the application of heat.

Moraine.—A mound or ridge of unstratified rock material deposited by a glacier.

Mountain glacier.—A stream of ice originating in and fed by upland ice, and moving in a definite valley or fjord toward sea level.

Moutonnée.—A description applied to an ice surface which is weathered and well-rounded.

Muddy ice.—Debris ice.

Mush.—Brash.

Needle ice.—Candle ice.

Névé.—Compacted snow in transition from soft snow to glacier ice. Compaction is caused by wind and temperature variations.

Névé berg.—A berg similar in appearance and color to a tabular berg but composed of névé or compacted snow.

Newly frozen ice.—A general classification for ice in the first stage of formation and development.

Nipped.—Caught and held tightly by ice under pressure. This is applied to ships caught fast in the ice.

Nipping.—The forcible closing of ice around a ship so that the ship is held fast by ice under pressure.

Nunatak.—An isolated hill or mountain of bare rock rising above the surrounding ice sheet

Old ice.—(1) Any ice over 1 year old. (2) Paleocrystic ice.

Open ice.—Broken ice.

Open lead.—A lead that is not covered with newly frozen ice.

Open pack ice.—Broken ice.

Open water.—Water that is less than one-tenth covered with floating ice.

Pack.—(1) Any large area of floating ice driven closely together. (2) The entire area of Polar sea ice.

Packed ice.—Close ice.

Paleocrystic ice.—Old pressure ice that has been irregularly heaped and tumbled, and is well weathered.

Pan.—Cake.

Pancake ice.—Pieces of newly formed ice about 1 to 6 feet in diameter. The raised rims and the circular appearance are a result of the almost constant bumping of each cake against the other.

Patch.—An irregular cluster of floating ice.

Permafrost.—Permanently frozen ground. A thickness of soil or other superficial deposit, or even of bedrock, at a variable depth below the surface of the earth in which a temperature below freezing has existed continually for a long time (from two to tens of thousands of years). Permanently frozen ground is defined exclusively on the basis of temperature.

Permanent icefoot.—An icefoot that does not melt completely during the summer months.

Piedmont ice.—A broad area of low coastal ice usually fed by one or more valley glaciers. Piedmont ice may rest on a coastal plain, or may be wholly or partially afloat.

Plate ice.—Pancake ice.

Pocket.—A blind lead.

Polar cap ice.—Polar ice.

Polar ice.—The thickest and heaviest form of pack ice more than one year old.

Polynya.—Any sizable sea-water area, other than a lead, encompassed by ice.

Pool.—(1) Polynya. (2) A depression on sea ice filled with water.

Pressure ice.—A general term for ice displaced vertically by pressure. Such pressure is caused by the action of the wind, current, tide, and/or temperature change. Examples of pressure ice are: hummocked ice, rafted ice and tented ice.

Pressure icefoot.—An icefoot formed along a shoreline by the freezing together of stranded pressure ice.

Pressure ridge.—Pressure ice in the form of a ridge.

Puddle.—A depression on sea ice filled with melt-water.

Pyramidy berg.—A berg that is irregular in appearance as contrasted to a blocky or tabular berg.

Rafted ice.—A type of pressure ice formed by one cake overriding another.

Rafting.—The process of creating rafted ice.

Ram.—A horizontal extension of ice below its waterline.

Ramming.—Charging ice with a ship under full power. Repeated ramming is called *bucking.*

Regional clearing.—Polynya.

River ice.—Any ice formed in or carried by rivers.

Ropak.—A pinnacle of sea ice formed by excessive pressure causing an ice cake to stand on edge.

Rotten ice.—Old ice which has become honeycombed in the course of melting, and which is in an advanced stage of disintegration.

Rough ice.—Pressure ice.

Rubber ice.—A type of sludge with an elastic quality, and not strong enough to bear the weight of a man.

Sailing ice.—Scattered ice.

Sallying.—Rolling a vessel by means of the crew running from side to side in unison, in order to loosen ice adhering to the vessel so that she may gain headway.

Sastrugi.—Wavelike ridges of hard snow formed on a level surface by the action of the wind, with the axes of the ridges at right angles to the direction of the wind.

Scattered ice.—Ice that covers less than one-half of the sea surface.

Screw ice.—Ice fragments in heaps or ridges produced by crushing together of ice cakes.

Screwing pack.—Ice cakes in rotary motion due to the influence of wind and current.

Sea-ice shelf.—Sea ice floating in the area of its formation and separated from fast ice, of which it may have been a part, by a tide crack, or a family of such cracks.

Seracs.—Sharp pinnacles or ridges of ice among the crevasses of a glacier.

Shear crack.—A crack in glacier or sea ice caused by two different but simultaneous forces acting on the ice.

Sheet ice.—Ice sheet.

Shelf ice.—A thick, glacial ice formation extending from the land but attached thereto. It may be afloat or aground.

Shock crack.—A crack in ice produced by the impact of one ice cake upon another.

Shore clearing.—Shore lead.

Shore ice.—Fast ice.

Shore ice belt.—Icefoot.

Shore lead.—A lead between floating ice and the shore, or between floating ice and fast ice.

Sikussak.—Very old ice trapped in fjords. Sikussak resembles glacier ice since it is formed somewhat from snowfall and snowdrifts.

Skin.—The first film or crust of newly formed ice. Skin has some degree of hardness.

Sky map.—A pattern on the underside of extensive cloud areas created by the varying amounts of light reflected from the earth's surface. Snow surfaces produce a white glare in the sky (snow blink), and ice surfaces produce a yellowish-white glare (ice blink). Bare land and open water reflect little or no light, and for this reason the clouds above these surfaces appear relatively dark (land sky; water sky).

Slack ice.—Broken ice.

Slewing.—Forcing a ship through the ice by separating adjacent cakes.

Slob.—Sludge formed from snow.

Sludge.—An accumulation of small pieces of soft ice mixed with slush. Sludge has a slight degree of hardness, and is, therefore, a type of ice crust.

Sludge cake.—Sludge hardened into a cake strong enough to bear the weight of a man.

Sludge floe.—Sludge hardened into a floe strong enough to bear the weight of a man.

Sludge lump.—An irrigular mass of sludge formed as a result of strong winds.

Slush.—A general term for an accumulation of ice crystals which are either slightly frozen together or not at all. Slush has no degree of hardness.

Small floe.—A piece of sea ice ranging in size from 30 feet in diameter to 600 feet in diameter.

Snow blink.—A white glare on the underside of extensive cloud areas created by light reflected from snow-covered surfaces. Snow blink is brighter than the yellowish-white glare of ice blink. In contrast to blink, the sky is dark above bare land or open water surfaces.

Snow drift.—(1) Wind-driven snow. (2) Snow lodged in the lee of surface irregularities, or heaped by the peculiarities of the wind itself.

Snow ice.—Ice crust which has been formed in a considerable part from falling or drifting snow.

Snow sludge.—Sludge formed from snow.

Snow slush.—Slush formed from snow that has fallen into water at a temperature that is below that of the snow.

Spring sludge.—Rotten ice.

Stagnant glacier.—An inactive glacier.

Stamukhi.—A single piece of ice stranded on a shoal or a shore.

Storis.—A regional term applied to the largest chunks of Polar ice moving along the coast of Greenland from the Arctic Ocean.

Storm icefoot.—An icefoot created by freezing spray.

Strain crack.—A crack in ice caused by stretching the ice beyond its elastic limit.

Stranded floe icefoot.—Stranded icefoot.

Stranded ice.—Fast ice.

Stranded icefoot.—An icefoot formed by floes or small bergs stranded along a shoreline. It may be built upward by breakers and wind-driven spray.

Sugar berg.—A berg composed of the most porous type of glacier ice. Such ice is formed at very low temperatures; it is loosely constructed and falls apart easily.

Tabular iceberg.—A mass of ice calved from shelf ice, with a flat upper surface, and with at least the upper portion formed from stratified snow or névé.

Tarn.—A small mountain lake or pool.

Telescoped ice.—Rafted ice.

Tented ice.—A type of pressure ice created when ice is displaced vertically upward forming a flat-sided arch, and thus causing a cavity to exist between the tented ice and the sea-water surface.

Tidal platform icefoot.—An icefoot produced between high and low water levels by the rise and fall of the tide.

Tide crack.—A crack in sea ice, usually parallel to the shore, caused by the rising and falling tide. It thus separates the moving ice from the icefoot. Several such cracks frequently occur as a family.

Tongue.—A projection of ice caused by wind and current. It may be several miles long.

Torsion crack.—A crack produced in sea ice by two different but simultaneous forces stretching the ice beyond its elastic limit.

Tracking.—Following the edge of an ice pack.

Turret ice.—Ropak.

Unconformity iceberg.—A berg in the transition stage, composed of blue ice, and névé or compacted snow. An unconformity berg contains may crevasses and silt bands.

Valley glacier.—A mountain glacier.

Wall-sided glacier.—A stream of ice originating and fed by upland ice. It is not confined by any marked valley wall. It has overridden debris rather than carved out a valley, and is usually stagnant.

Water sky.—Dark streaks, patches, or a grayness on the underside of extensive cloud areas due to the absence of reflected light from open water areas. Water sky is darker than land sky. In contrast to water sky and land sky, the clouds are white or yellowish white above snow or ice-covered surfaces.

Weathered.—A process of erosion caused by the action of the weather.

Weathered iceberg.—A berg whose irregularity is due to the advanced stage of destruction, having been overturned or well weathered by warm rain, wind, and current.

Winter ice.—Ice which is created and developed in one winter or season, and is therefore less than one year old, and usually less than 12 feet thick.

Working.—Negotiating a pack of ice by boring and slewing.

Young ice.—Newly formed ice in the transitional stage of development from ice crust to winter ice.

A guide to the description of ice conditions.—The primary purpose for this section is to help the ice observer describe accurately what he sees. Heretofore the responsibility for selecting appropriate terms to describe ice phenomena has rested primarily upon the individual observer. As a result, ice terminology has developed ambiguities, has lacked uniformity, and has been incomplete.

By the use of this guide an observer will be able to describe completely what he sees in appropriate terms. Assume, for example, that ice has been encountered, and a description of it is to be made. The first element observed is the quantity or *amount* of ice covering the water area. After estimating that the area is about 70 percent covered by ice, a reference to the guide shows that the term to describe this quantity is "broken ice." The next feature observed is the *size* of the ice pieces. After estimating that the majority of the ice cakes are about 100 feet across and the remainder are from 10 to 25 feet, a reference to the guide will indicate that the preferred term for the larger cakes is "small floe." For the smaller cakes, the term is "block." After determining the amount and sizes, the observer should be concerned next with the *age* of the ice and the *surface features*. By reference to the terms in the guide, the observer finds that the term "Polar" best describes its age, and the term "hummocked" best describes the character of the surface. The choice of these terms can be verified by comparing their definitions with those of the alternative terms listed in the glossary. For example, "hummocked ice" is ice that has been heaped and then weathered, but "rafted ice" is ice that has overridden other ice, and the sharp edges remain. (It should be pointed out here that meltwater "puddles" are also a *surface feature*, and they should be reported when present.) The observer should now turn his attention to *fast ice*, if present, and such *related features* as "sea water spaces" and "special terms." Through the judicious use of the guide and the glossary, complete descriptions of ice conditions can be made, and a standardized terminology will evolve.

To be complete, a description of ice must be all-inclusive. Surface features show whether the ice has been subjected to pressure, and whether the pressure has recently occurred. The thickness of the ice tells much about its age, and the quantity of puddles that may be on the ice surface indicates the stage of disintegration. Although some characteristics of the ice may appear to be of minor importance, they should be described because they give indirect information about the ice, its age, its origin, its movement, and whether it is forming or disintegrating. The presence of sea water spaces—their type, quantity, and orientation—also tell much of the history of the ice. Descriptions should be as complete as possible.

From such descriptions of the ice one should be able to estimate operational limits imposed by the ice on aircraft, ships, shore parties, submarines, and other groups. From such descriptions one should be able to predict future ice conditions, after considering also the locality, the time of the year, and the impending climatic or meteorological regime. A thorough and accurate description of the ice coupled with this information will help solve many mysteries of Polar ice. A good observational program is the first of many steps in this direction.

When describing ice conditions, the observer should always keep in mind three general features:

1. The character and amount of floating ice, including icebergs and river ice as well as the ice formed in the sea

2. The character and amount of fast ice; that is, ice aground or attached to the shoreline

3. Certain features related to ice, as water areas and miscellaneous terms associated with special weather phenomena and ice navigation.

When floating ice or fast ice is present, the following characteristics should be observed and described in appropriate terms:

(*a*) The amount of ice covering the water area or shore

(*b*) The size or sizes of the ice pieces

(*c*) The age of the ice—whether thin ice crust, thick Polar ice, etc.

To complete the description, the observer should also indicate the character of the ice surface. A key list of terms is given below.

Although existing ice terminology relates primarily to floating ice, those descriptive terms applicable may also be used to describe fast ice. Such descriptions should indicate positively that they are related to fast ice.

Various types of sea water spaces within ice areas indicate important stages of the life cycle of Polar ice. When they are observed, the quantity, type, and the dimensions of the cracks, leads, or polynyas should be reported.

Special terms concerning weather and navigation as associated with ice give indirect information about the ice itself. The presence of blink or sky, for example, indicates the distribution of ice beyond the line of sight of the observer; also when heeling or ramming is necessary in order to navigate a vessel, something of the quantity and hardness of the ice may be inferred. A few of the special terms are presented below, but complete definitions are contained in the glossary, and reference should be made to it when using such terms.

The guide to the description of sea ice follows:

A. Floating ice.—Classify according to:

(*a*) *Amount covering water area*—

(1) Open water (less than $\frac{1}{10}$ ice)
(2) Scattered ice ($\frac{1}{10}$ to $\frac{5}{10}$ ice)
(3) Broken ice ($\frac{5}{10}$ to $\frac{9}{10}$ ice)
(4) Close ice ($\frac{9}{10}$ to $\frac{10}{10}$ with water)
(5) Consolidated ice ($\frac{10}{10}$ ice with no water)
(6) Transitional—
  (a) Belt (narrow band of ice)
  (b) Patch (cluster of ice)

(*b*) *Size*—

(1) Brash (less than 6 feet across)
(2) Block (6 feet to 30 feet across)
(3) Small floe (30 feet to 600 feet across)
(4) Medium floe (600 feet to 3,000 feet across)
(5) Giant floe (3,000 feet to 5 miles across)
(6) Field (5 miles and greater)
(7) Cake (no specific size)

A. Floating ice—Continued

(*c*) *Age*—

(1) Slush (newly formed, but soft)
(2) Crust (newly formed, some hardness)
(3) Young (newly formed, hard)
(4) Winter (seasonal, usually less than 12 feet thick)
(5) Polar (old)
(6) Rotten (disintegrating)

(*d*) *Surface features*—

(1) Topography—

(a) Flat (flat and level surface)
(b) Pressure ridge (ridged by pressure)
(c) Hummocked (heaped then weathered)
(d) Weathered (erosion due to weather)
(e) Rafted (overriding of cakes)
(f) Ropak (turret or pinnacle formation)
(g) Tented (flat-arched)

(2) Other—

(a) Puddles (melt-water on ice surface)

B. Fast ice.—Classify according to:

(*a*) *Type*—

(1) Icefoot (a wall or belt attached to shore)
(2) Stamukhi (a piece stranded on a shoal)
(3) Bottom ice (ice attached to bottom of shoal)

(*b*) *Amount obstructing shoreline*
(*c*) *Size (including thickness)*
(*d*) *Surface features*

C. Related features.—Classify according to:

(*a*) *Sea water spaced in ice area*—

(1) Crack (unnavigable break, may reveal water)
(2) Lead (long navigable water passage)
(3) Polynya (any large ice-free area other than lead)
(4) Bay (inward bend of ice edge)

(*b*) *Special terms*—

(1) Blink (reflection on clouds)
(2) Sky (dark patches on clouds)
(3) Heeling (rolling the vessel)
(4) Beset (surrounded by ice)
(5) Nipped (held fast by the ice)
(6) Others

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Distance of Visibility of Objects at Sea

The following table gives the approximate geographic range of visibility for an object which may be seen by an observer whose eye is at sea level; in practice, therefore, it is necessary to add to these a distance of visibility corresponding to the height of the observer's eye above sea level.

Height, feet	Nautical miles	Height, feet	Nautical miles	Height, feet	Nautical miles	Height, feet	Nautical miles	Height, feet	Nautical miles
6	2.8	48	7.9	220	17.0	660	29.4	2,000	51.2
8	3.1	50	8.1	240	17.7	680	29.9	2,200	53.8
10	3.6	55	8.5	260	18.5	700	30.3	2,400	56.2
12	4.0	60	8.9	280	19.2	720	30.7	2,600	58.5
14	4.3	65	9.2	300	19.9	740	31.1	2,800	60.6
15	4.4	70	9.6	320	20.5	760	31.6	3,000	62.8
16	4.6	75	9.9	340	21.1	780	32.0	3,200	64.9
18	4.9	80	10.3	360	21.7	800	32.4	3,400	66.9
20	5.1	85	10.6	380	22.3	820	32.8	3,600	68.6
22	5.4	90	10.9	400	22.9	840	33.2	3,800	70.7
24	5.6	95	11.2	420	23.5	860	33.6	4,000	72.5
26	5.8	100	11.5	440	24.1	880	34.0	4,200	74.3
28	6.1	110	12.0	460	24.6	900	34.4	4,400	76.1
30	6.3	120	12.6	480	25.1	920	34.7	4,600	77.7
32	6.5	130	13.1	500	25.6	940	35.2	4,800	79.4
34	6.7	140	13.6	520	26.1	960	35.5	5,000	81.0
36	6.9	150	14.1	540	26.7	980	35.9	6,000	88.8
38	7.0	160	14.5	560	27.1	1,000	36.2	7,000	96.0
40	7.2	170	14.9	580	27.6	1,200	39.6	8,000	102.6
42	7.4	180	15.4	600	28.0	1,400	42.9	9,000	108.7
44	7.6	190	15.8	620	28.6	1,600	45.8	10,000	114.6
46	7.8	200	16.2	640	29.0	1,800	48.6		

Conversion Table, Degrees to Points and Vice Versa

° ′	Points	° ′	Points	° ′	Points	° ′	Points
0 00	N	90 00	E	180 00	S	270 00	W
2 49		92 49		182 49		272 49	
5 38	N ½ E	95 38	E ½ S	185 38	S ½ W	275 38	W ½ N
8 26		98 26		188 26		278 26	
11 15	N x E	101 15	E x S	191 15	S x W	281 15	W x N
14 04		104 04		194 04		284 04	
16 53	N x E ½ E	106 53	ESE ½ E	196 53	S x W ½ W	286 53	WNW ½ W
19 41		109 41		199 41		289 41	
22 30	NNE	112 30	ESE	202 30	SSW	292 30	WNW
25 19		115 19		205 19		295 19	
28 08	NNE ½ E	118 08	SE x E ½ E	208 08	SSW ½ W	298 08	NW x W ½ W
30 56		120 56		210 56		300 56	
33 45	NE x N	123 45	SE x E	213 45	SW x S	303 45	NW x W
36 34		126 34		216 34		306 34	
39 23	NE ½ N	129 23	SE ½ E	219 23	SW ½ S	309 23	NW ½ W
42 11		132 11		222 11		312 11	
45 00	NE	135 00	SE	225 00	SW	315 00	NW
47 49		137 49		227 49		317 49	
50 38	NE ½ E	140 38	SE ½ S	230 38	SW ½ W	320 38	NW ½ N
53 26		143 26		233 26		323 26	
56 15	NE x E	146 15	SE x S	236 15	SW x W	326 15	NW x N
59 04		149 04		239 04		329 04	
61 53	NE x E ½ E	151 53	SSE ½ E	241 53	SW x W ½ W	331 53	NNW ½ W
64 41		154 41		244 41		334 41	
67 30	ENE	157 30	SSE	247 30	WSW	337 30	NNW
70 19		160 19		250 19		340 19	
73 08	ENE ½ E	163 08	S x E ½ E	253 08	WSW ½ W	343 08	N x W ½ W
75 56		165 56		255 56		345 56	
78 45	E x N	168 45	S x E	258 45	W x S	348 45	N x W
81 34		171 34		261 34		351 34	
84 23	E ½ N	174 23	S ½ E	264 23	W ½ S	354 23	N ½ W
87 11		177 11		267 11		357 11	

Conversion Tables

FEET TO METERS

Feet	0	1	2	3	4	5	6	7	8	9
0	0. 00	0. 30	0. 61	0. 91	1. 22	1. 52	1. 83	2. 13	2. 44	2. 74
10	3. 05	3. 35	3. 66	3. 96	4. 27	4. 57	4. 88	5. 18	5. 49	5. 79
20	6. 10	6. 40	6. 71	7. 01	7. 32	7. 62	7. 92	8. 23	8. 53	8. 84
30	9. 14	9. 45	9. 75	10. 06	10. 36	10. 67	10. 97	11. 28	11. 58	11. 89
40	12. 19	12. 50	12. 80	13. 11	13. 41	13. 72	14. 02	14. 33	14. 63	14. 93
50	15. 24	15. 54	15. 85	16. 15	16. 46	16. 76	17. 07	17. 37	17. 68	17. 98
60	18. 29	18. 59	18. 90	19. 20	19. 51	19. 81	20. 12	20. 42	20. 73	21. 03
70	21. 34	21. 64	21. 95	22. 25	22. 55	22. 86	23. 16	23. 47	23. 77	24. 08
80	24. 38	24. 69	24. 99	25. 30	25. 60	25. 91	26. 21	26. 52	26. 82	27. 13
90	27. 43	27. 74	28. 04	28. 35	28. 65	28. 96	29. 26	29. 57	29. 87	30. 17

FATHOMS TO METERS

Fathoms	0	1	2	3	4	5	6	7	8	9
0	0. 00	1. 83	3. 66	5. 49	7. 32	9. 14	10. 97	12. 80	14. 63	16. 46
10	18. 29	20. 12	21. 95	23. 77	25. 60	27. 43	29. 26	31. 09	32. 92	34. 75
20	36. 58	38. 40	40. 23	42. 06	43. 89	45. 72	47. 55	49. 38	51. 21	53. 03
30	54. 86	56. 69	59. 52	60. 35	62. 18	64. 01	65. 84	67. 67	69. 49	71. 32
40	73. 15	74. 98	76. 81	78. 64	80. 47	82. 30	84. 12	85. 95	87. 78	89. 61
50	91. 44	93. 27	95. 10	96. 93	98. 75	100. 58	102. 41	104. 24	106. 07	107. 90
60	109. 73	111. 56	113. 39	115. 21	117. 04	118. 87	120. 70	122. 53	124. 36	126. 19
70	128. 02	129. 85	131. 67	133. 50	135. 33	137. 16	138. 99	140. 82	142. 65	144. 47
80	146. 30	148. 13	149. 96	151. 79	153. 62	155. 45	157. 28	159. 11	160. 93	162. 76
90	164. 59	166. 42	168. 25	170. 08	171. 91	173. 74	175. 56	177. 39	179. 22	181. 05

NAUTICAL MILES TO STATUTE MILES

1 nautical mile = 6,080.20 feet. 1 statute mile = 5,280 feet.

Nautical miles	0	1	2	3	4	5	6	7	8	9
0	0. 000	1. 152	2. 303	3. 455	4. 606	5. 758	6. 909	8. 061	9. 212	10. 364
10	11. 515	12. 667	13. 819	14. 970	16. 122	17. 273	18. 425	19. 576	20. 728	21. 880
20	23. 031	24. 183	25. 334	26. 486	27. 637	28. 789	29. 940	31. 092	32. 243	33. 395
30	34. 547	35. 698	36. 850	38. 001	39. 153	40. 304	41. 456	42. 607	43. 759	44. 911
40	46. 062	47. 214	48. 365	49. 517	50. 668	51. 820	52. 971	54. 123	55. 275	56. 426
50	57. 578	58. 729	59. 881	61. 032	62. 184	63. 335	64. 487	65. 639	66. 790	67. 942
60	69. 093	70. 245	71. 396	72. 548	73. 699	74. 851	76. 003	77. 154	78. 306	79. 457
70	80. 609	81. 760	82. 912	84. 063	85. 215	86. 366	87. 518	88. 670	89. 821	90. 973
80	92. 124	93. 276	94. 427	95. 579	96. 730	97. 882	99. 034	100. 185	101. 337	102. 488
90	103. 640	104. 791	105. 942	107. 094	108. 246	109. 397	110. 549	111. 701	112. 852	114. 004

STATUTE MILES TO NAUTICAL MILES

Statute miles	0	1	2	3	4	5	6	7	8	9
0	0. 000	0. 868	1. 737	2. 605	3. 474	4. 342	5. 210	6. 079	6. 947	7. 816
10	8. 684	9. 552	10. 421	11. 289	12. 158	13. 026	13. 894	14. 763	15. 631	16. 500
20	17. 368	18. 236	19. 105	19. 973	20. 842	21. 710	22. 578	23. 447	24. 315	25. 184
30	26. 052	26. 920	27. 789	28. 657	29. 526	30. 394	31. 262	32. 131	32. 999	33. 868
40	34. 736	35. 604	36. 473	37. 341	38. 210	39. 078	39. 946	40. 815	41. 683	42. 552
50	43. 420	44. 288	45. 157	46. 025	46. 894	47. 762	48. 630	49. 499	50. 367	51. 236
60	52. 104	52. 972	53. 841	54. 709	55. 578	56. 446	57. 314	58. 183	59. 051	59. 920
70	60. 787	61. 655	62. 524	63. 392	64. 261	65. 129	65. 997	66. 866	67. 734	68. 603
80	69. 471	70. 339	71. 208	72. 076	72. 945	73. 813	74. 681	75. 550	76. 418	77. 287
90	78. 155	79. 023	79. 892	80. 760	81. 629	82. 497	83. 365	84. 234	85. 102	85. 971