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(1948)

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CHARLES SAWYER, SECRETARY
COAST AND GEODETIC SURVEY
LEO OTIS COLBERT, *Director*

MAY 15, 1948 SERIAL NO. 715

# UNITED STATES COAST PILOT

# Atlantic Coast Section D

## Cape Henry to Key West

## FIFTH (1948) EDITION

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# National Oceanic and Atmospheric Administration

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# 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 |

# Important

The courses and bearings are given in degrees (true), reading clockwise from 000° at north to 359°. In the case of lights all bearings are from seaward. When a course is given as "067°", it means that is the true course to be made good.

Distances are in nautical miles unless otherwise noted. Multiply nautical miles by 1.15 to obtain the approximate statute miles.

The directions of winds are the points from which they blow; of currents, the points toward which they set. These directions are true.

Depths are in feet or fathoms below mean low water. Heights are in feet above high water.

Currents are expressed in knots, which are nautical miles per hour.

Light and fog signal characteristics are not fully described, and light sectors are not always defined. The mariner should consult the Light Lists which are published at intervals of about a year.

When using this Coast Pilot, reference should be made to the latest supplement and also to each Notice to Mariners issued subsequently. Mariners are requested to notify the Director, United States Coast and Geodetic Survey, Washington 25, D. C., of any changes affecting this pilot.

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# Preface

THIS is the fifth edition of the United States Coast Pilot, Atlantic Coast, Section D, Cape Henry to Key West. It is based upon the work of the United States Coast and Geodetic Survey and includes the results of a special field examination made in 1947. Valuable information was furnished for inclusion by the United States Weather Bureau, Corps of Engineers, Coast Guard, and others.

The volume has been expanded beyond the limits of the previous edition to include a description of Chesapeake Bay Entrance, a complete description of the Intracoastal Waterway between Norfolk and Key West, and a continuation of the text beyond Key West to Dry Tortugas.

This edition is corrected to May 15, 1948, including Notice to Mariners No. 20. It cancels the previous edition, published in 1936, and the special booklet, Serial No. 670, Coast Pilot Information, Intracoastal Waterway, Norfolk, Va., to Key West, Fla., published in 1945.

Supplements to the Coast Pilots, containing corrections and additions from various sources, are issued 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 are requested to forward 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.

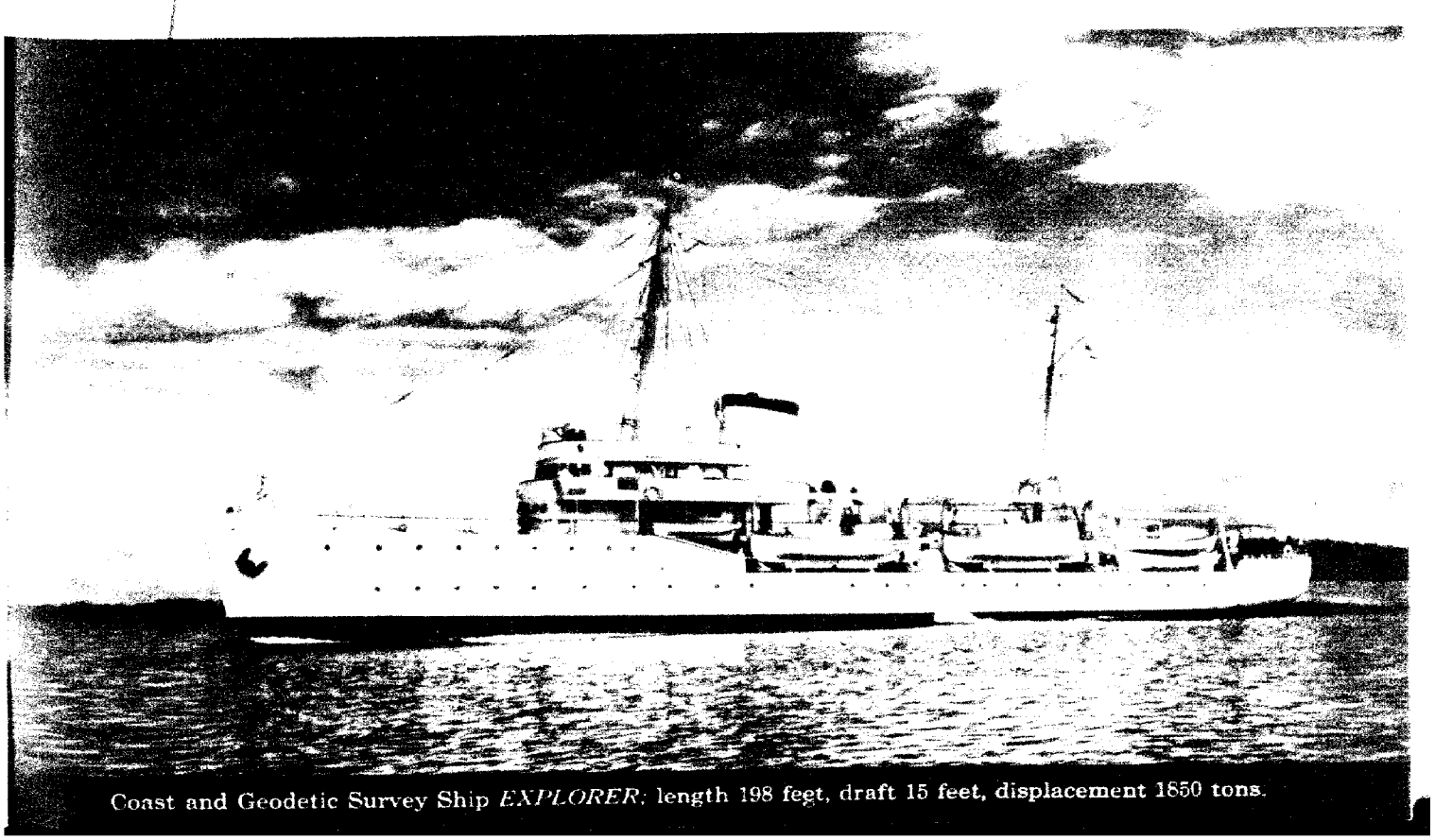
LEO OTIS COLBERT, *Director*.

MAY 15, 1948.

SERVICE FLAG
U. S. COAST AND GEODETIC SURVEY

# Index Maps

## U. S. Coast and Geodetic Survey Charts
## Cape Henry to Key West



Coast and Geodetic Survey Ship *EXPLORER*; length 198 feet, draft 15 feet, displacement 1850 tons.

# NUMERICAL LIST OF NAUTICAL CHARTS

May 15, 1948

| No. | Price | Scale |
|---|---|---|
| 50 | $0.75 | 1:210,100 |
| 70 | .75 | 1:675,000 |
| 77 | .75 | 1:197,250 |
| 78 | .75 | 1:200,000 |
| 400 | .75 | 1:20,000 |
| 409 | .25 | 1:30,000 |
| 419 | .75 | 1:40,000 |
| 420 | .75 | 1:40,000 |
| 424 | .50 | 1:40,000 |
| 425 | .50 | 1:40,000 |
| 440 | .75 | 1:40,000 |
| 447 | .25 | 1:40,000 |
| 448 | .50 | 1:40,000 |
| 450 | .50 | 1:20,000 |
| 452 | .75 | 1:20,000 |
| 453 | .50 | 1:20,000 |
| 470 | .75 | 1:20,000 |
| 473 | .50 | 1:40,000 |
| 474 | .25 | 1:40,000 |
| 481 | .75 | 1:20,000 |
| 491 | .50 | 1:20,000 |
| 492 | .75 | 1:20,000 |
| 494 | .75 | 1:40,000 |
| 495 | .75 | 1:40,000 |
| 504 | .75 | 1:40,000 |
| 529 | .75 | 1:40,000 |
| 530 | .50 | 1:40,000 |
| 531 | .75 | 1:20,000 |
| 534 | .75 | 1:40,000 |
| 535 | .75 | 1:40,000 |
| 536 | .75 | 1:20,000 |
| 537 | .75 | 1:40,000 |
| 538 | .75 | 1:40,000 |
| 539 | .75 | 1:40,000 |
| 545 | .75 | 1:15,000 |
| 546 | .75 | 1:5,000 |
| 547 | .75 | 1:10,000 |
| 548 | .75 | 1:40,000 |
| 549 | .75 | 1:40,000 |
| 550 | .75 | 1:40,000 |
| 553 | .75 | 1:40,000 |
| 556 | .25 | 1:20,000 |
| 557 | .75 | 1:40,000 |
| 558 | .75 | 1:40,000 |
| 559 | .75 | 1:40,000 |
| 560 | .75 | 1:40,000 |
| 566 | .75 | 1:25,000 |
| 567 | .75 | 1:20,000 |
| 570 | .50 | 1:20,000 |
| 571 | .75 | 1:40,000 |
| 572 | .75 | 1:40,000 |
| 573 | .75 | 1:40,000 |
| 574 | .75 | 1:40,000 |
| 575 | $0.25 | 1:40,000 |
| 576 | .75 | 1:10,000 |
| 577 | .75 | 1:40,000 |
| 582 | .25 | 1:10,000 |
| 584 | .75 | 1:30,000 |
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| 587 | .75 | 1:40,000 |
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| 687 | .50 | 1:40,000 |
| 688 | .50 | 1:40,000 |
| 777 | .75 | 1:40,000 |
| 787 | .50 | 1:40,000 |
| 792 | .75 | 1:40,000 |
| 793 | .75 | 1:40,000 |
| 794 | .25 | 1:40,000 |
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| 830 | .25 | 1:40,000 |
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| 838 | .25 | 1:40,000 |
| 839 | .25 | 1:40,000 |
| 840 | .25 | 1:40,000 |
| 841 | .25 | 1:40,000 |
| 842 | .25 | 1:40,000 |
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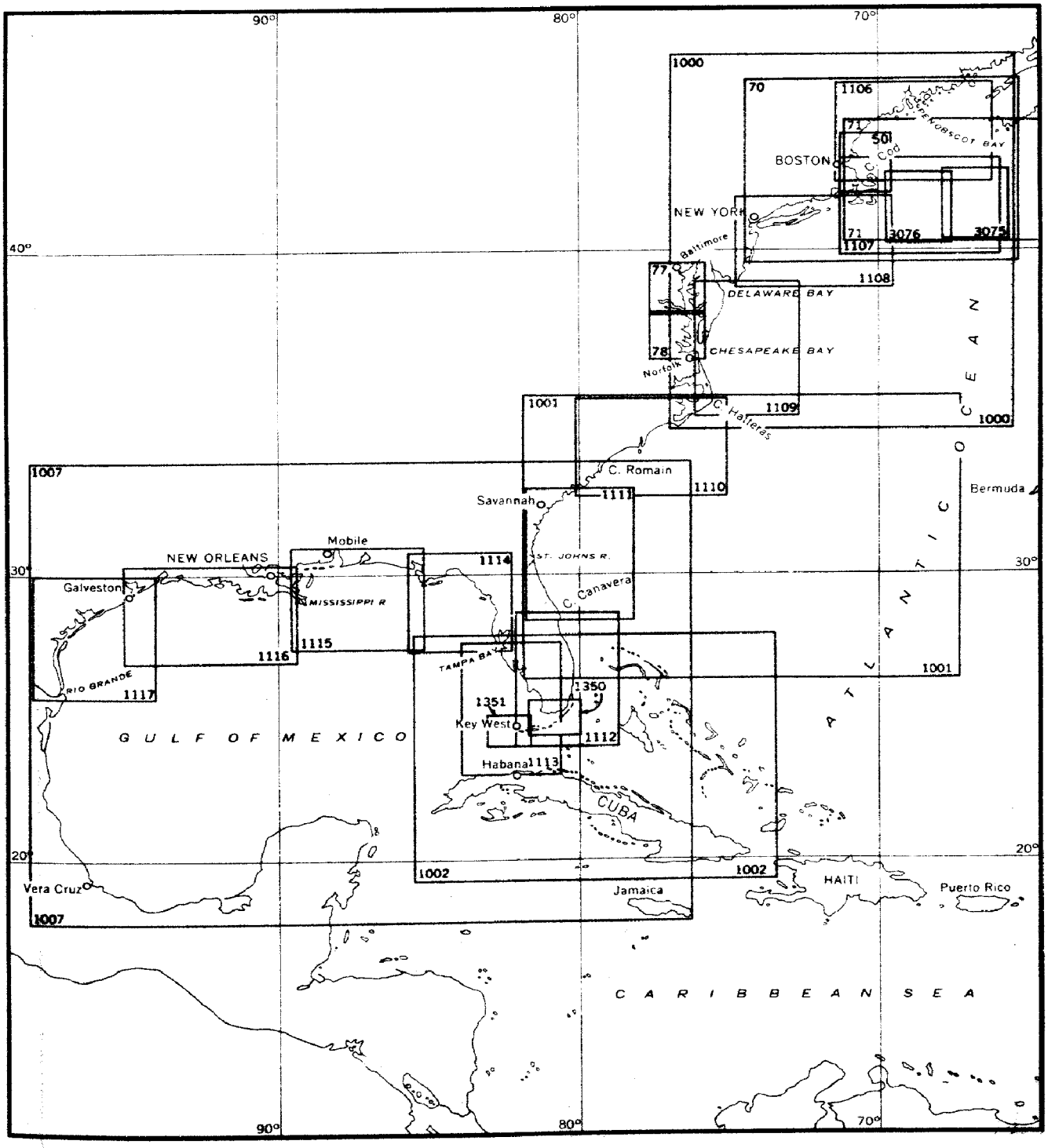
| 844 | .25 | 1:40,000 |
| 845 | .25 | 1:40,000 |
| 846 | .25 | 1:40,000 |
| 847 | .25 | 1:40,000 |
| 848 | .25 | 1:40,000 |
| 849 | .25 | 1:40,000 |
| 865 | .25 | 1:40,000 |
| 866 | .25 | 1:40,000 |
| 867 | .25 | 1:40,000 |
| 1000 | .75 | 1:1,200,000 |
| 1001 | .75 | 1:1,207,256 |
| 1002 | .75 | 1:1,210,765 |
| 1007 | .75 | 1:2,161,530 |
| 1106 | .75 | 1:378,838 |
| 1107 | .75 | 1:400,000 |
| 1108 | .75 | 1:400,000 |
| 1109 | .75 | 1:416,944 |
| 1110 | .75 | 1:432,700 |
| 1111 | .75 | 1:449,659 |
| 1112 | .75 | 1:466,940 |
| 1113 | .75 | 1:470,940 |
| 1114 | $0.75 | 1:456,394 |
| 1115 | .75 | 1:456,394 |
| 1116 | .75 | 1:458,596 |
| 1117 | .75 | 1:460,732 |
| 1220 | .75 | 1:80,000 |
| 1221 | .75 | 1:80,000 |
| 1222 | .75 | 1:80,000 |
| 1223 | .75 | 1:80,000 |
| 1224 | .75 | 1:80,000 |
| 1225 | .75 | 1:80,000 |
| 1226 | .75 | 1:80,000 |
| 1227 | .75 | 1:80,000 |
| 1228 | .75 | 1:80,000 |
| 1229 | .75 | 1:80,000 |
| 1231 | .75 | 1:80,000 |
| 1232 | .75 | 1:80,000 |
| 1233 | .75 | 1:80,000 |
| 1234 | .75 | 1:80,000 |
| 1235 | .75 | 1:80,000 |
| 1236 | .75 | 1:80,000 |
| 1237 | .75 | 1:80,000 |
| 1238 | .75 | 1:80,000 |
| 1239 | .75 | 1:80,000 |
| 1240 | .75 | 1:80,000 |
| 1241 | .75 | 1:80,000 |
| 1242 | .75 | 1:80,000 |
| 1243 | .75 | 1:80,000 |
| 1244 | .75 | 1:80,000 |
| 1245 | .75 | 1:80,000 |
| 1246 | .75 | 1:80,000 |
| 1247 | .75 | 1:80,000 |
| 1248 | .75 | 1:80,000 |
| 1249 | .75 | 1:80,000 |
| 1250 | .75 | 1:80,000 |
| 1251 | .75 | 1:80,000 |
| 1252 | .75 | 1:80,000 |
| 1253 | .75 | 1:80,000 |
| 1254 | .75 | 1:80,000 |
| 1255 | .75 | 1:80,000 |
| 1256 | .75 | 1:80,000 |
| 1257 | .75 | 1:80,000 |
| 1258 | .75 | 1:80,000 |
| 1259 | .75 | 1:80,000 |
| 1260 | .75 | 1:80,000 |
| 1261 | .75 | 1:80,000 |
| 1262 | .75 | 1:80,000 |
| 1263 | .75 | 1:80,000 |
| 1289 | .75 | 1:80,000 |
| 1350 | .75 | 1:180,000 |
| 1351 | .75 | 1:180,000 |
| 3075 | .75 | 1:220,000 |
| 3076 | .75 | 1:220,000 |
| 3261 | .25 | 1:40,000 |

## SAILING AND GENERAL CHARTS - ATLANTIC AND GULF COASTS

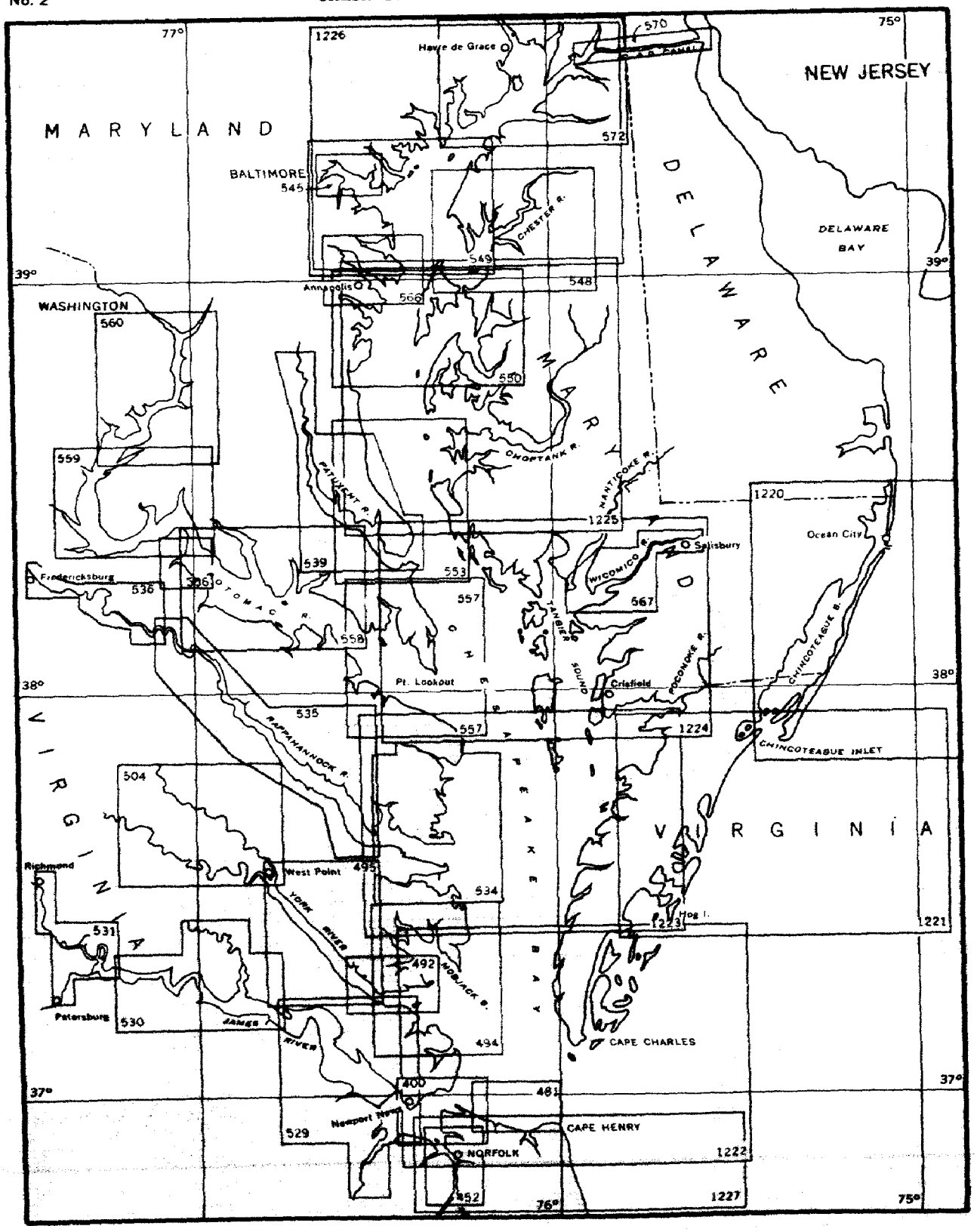
No. 1



COAST AND HARBOR CHARTS - ATLANTIC COAST

No. 2

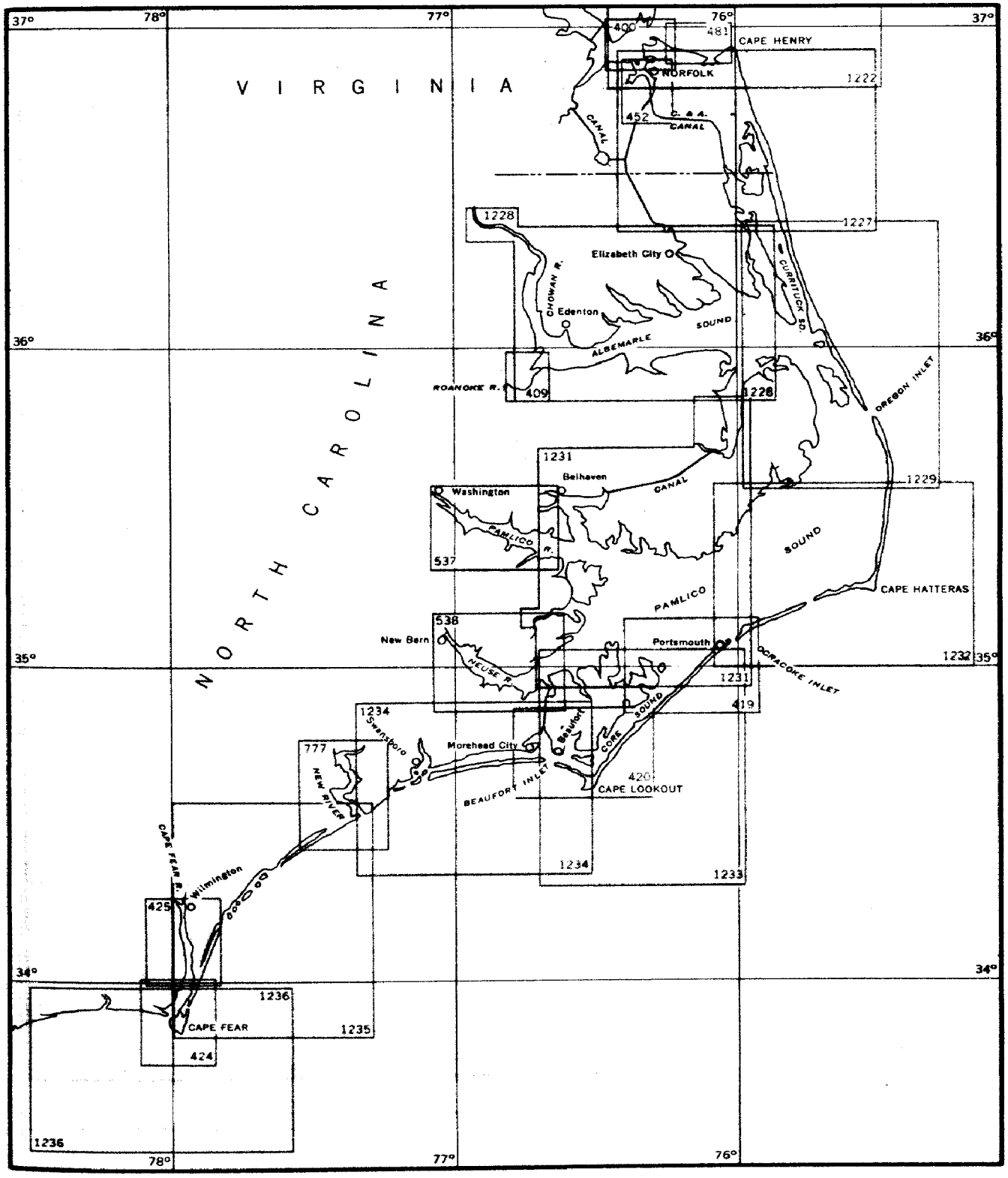
# CHESAPEAKE BAY AND TRIBUTARIES



COAST AND HARBOR CHARTS - ATLANTIC COAST

# CAPE HENRY, VA. TO CAPE FEAR, N.C.

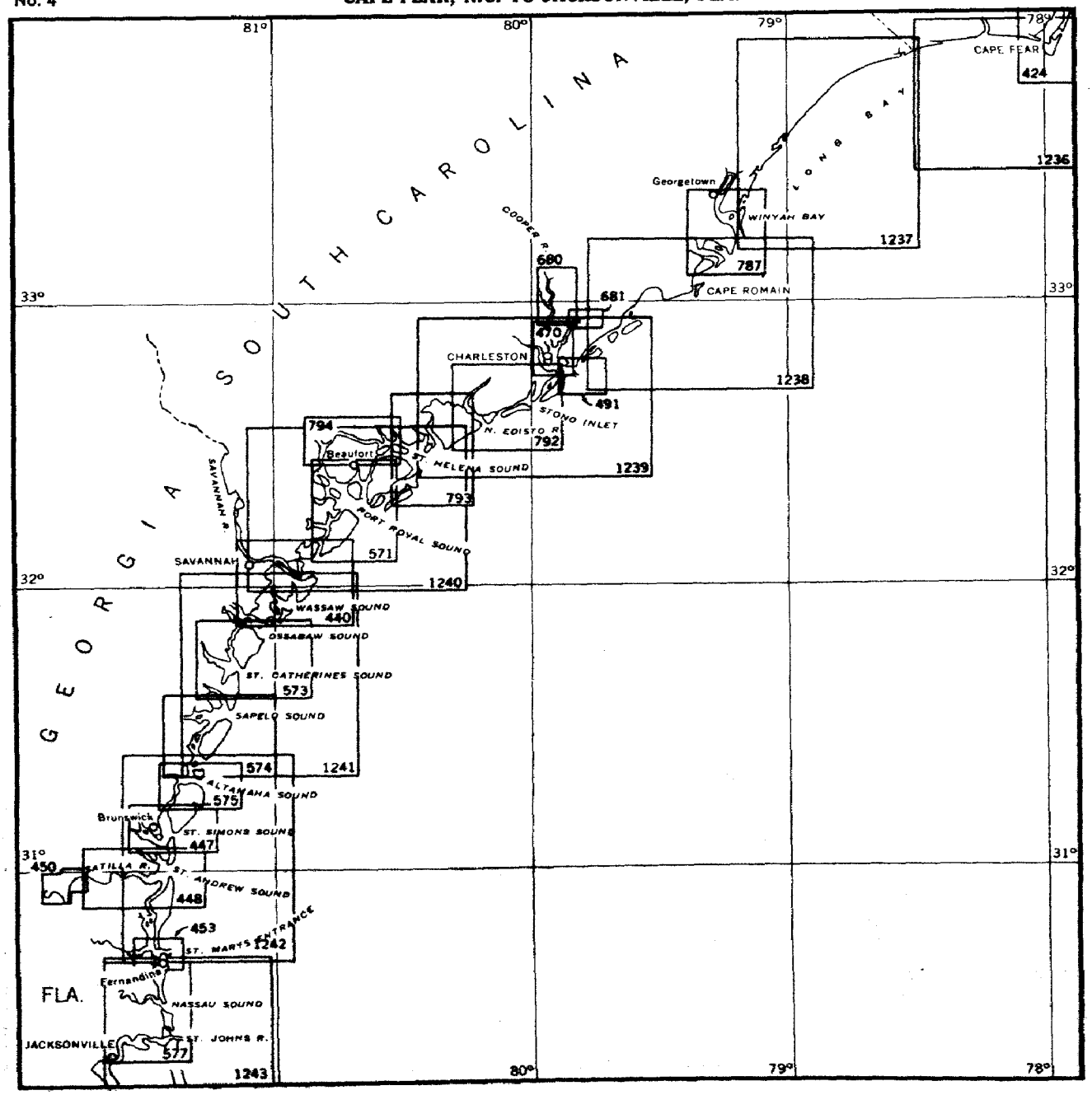
No. 3



COAST AND HARBOR CHARTS - ATLANTIC COAST

No. 4

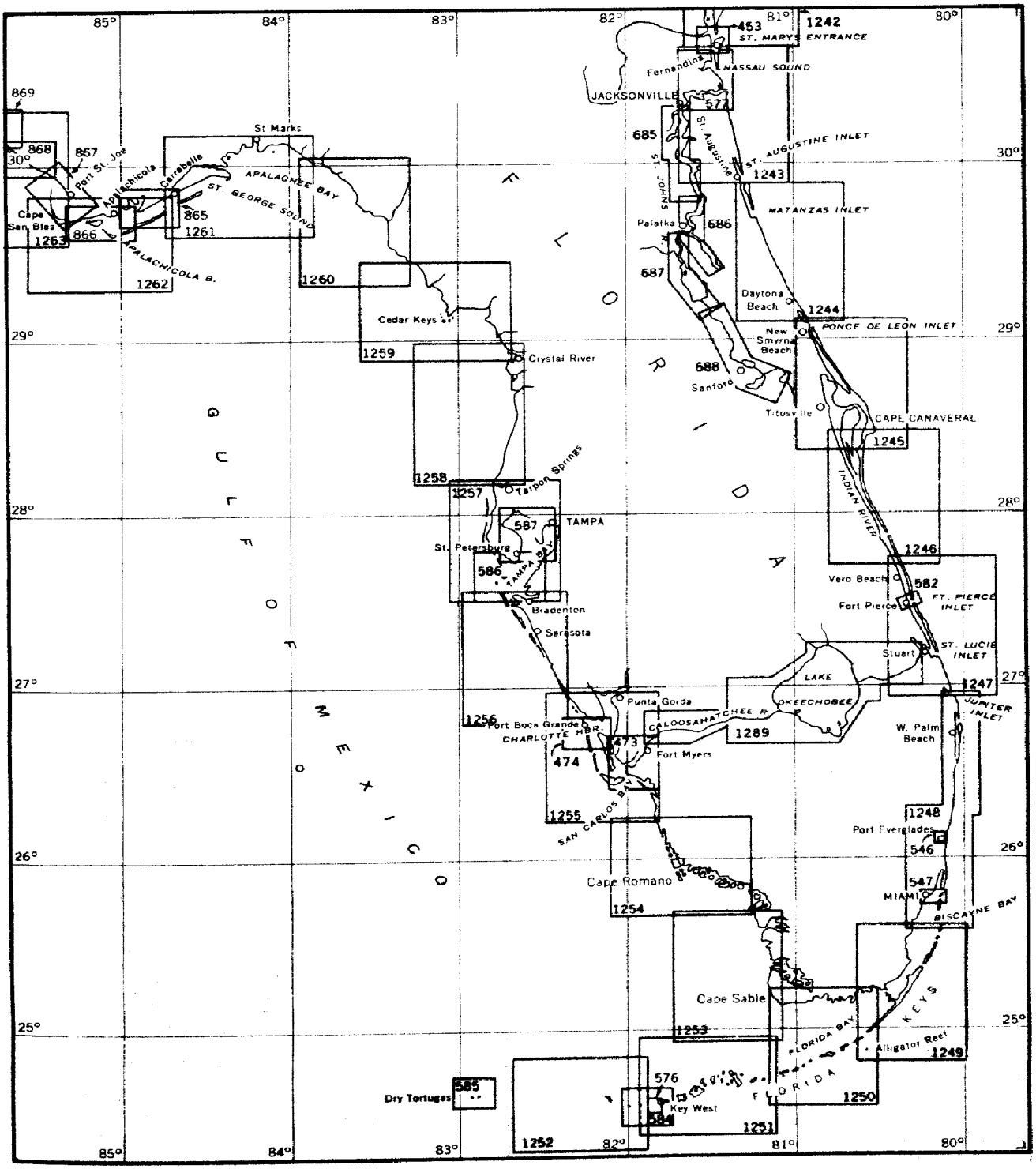
# CAPE FEAR, N.C. TO JACKSONVILLE, FLA.



COAST AND HARBOR CHARTS - ATLANTIC AND GULF COASTS

# JACKSONVILLE TO CAPE SAN BLAS, FLORIDA

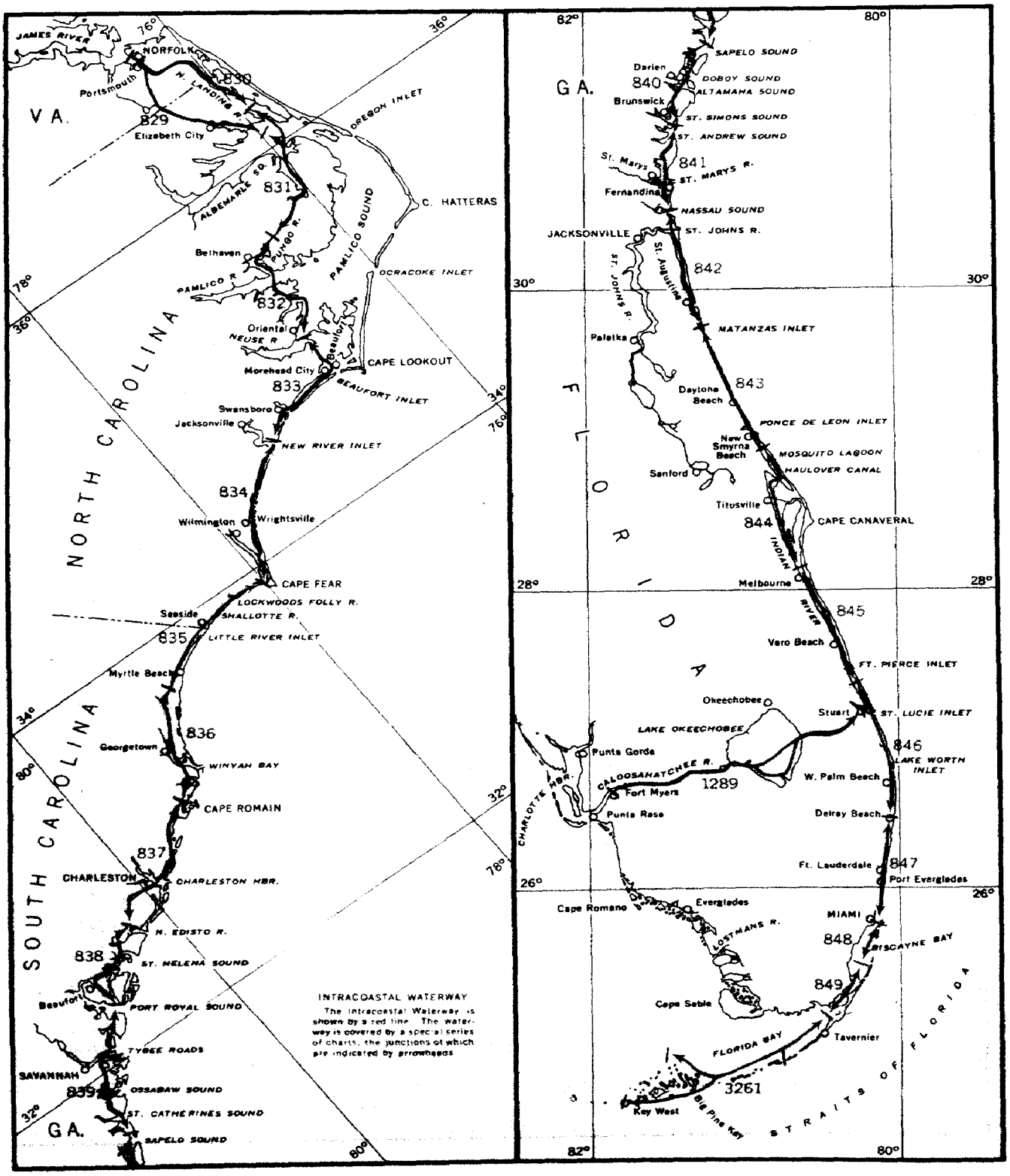
No. 5



CHARTS OF THE ATLANTIC INTRACOASTAL WATERWAY

No. 6

# NORFOLK TO KEY WEST



# SYMBOLS AND ABBREVIATIONS FOR NAUTICAL CHARTS

**The standard symbols and abbreviations which have been approved for use on nautical charts published by the Coast and Geodetic Survey are reproduced on the following pages.**

*Symbols and abbreviations are numbered in accordance with a standard form proposed by the International Hydrographic Bureau.*

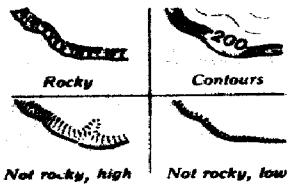
*Vertical figures indicate that the symbol or abbreviation is in accordance with the I. H. B. standard.*

*Symbols or abbreviations which differ from those of the I. H. B., or which do not appear on the standard are indicated by slant figures.*

*Figures in parentheses indicate that the symbol or abbreviation is in addition to those shown on the standard.*

## A. The Coastline

1 Shoreline unsurveyed

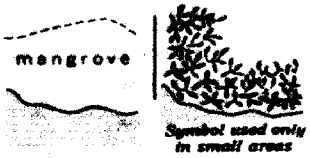



3 Cliffy coastline (Bluffs)

4 Sandhills or dunes

5 Stony or shingly shore

6 Sandy shore




7 Mangrove

8 Swamp or marsh

### 11 Foreshores

a Mud flats

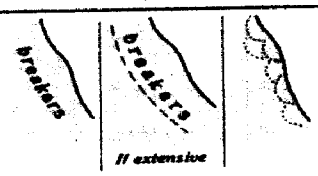
b Sand

c Stones or gravel

d Rock, uncovers at datum of soundings

f Sand and gravel

g Coral, uncovers at datum of soundings (See O-10)



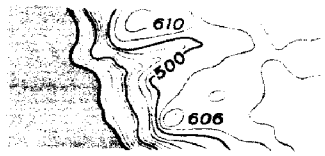

12 Breakers along a shore

13 Limiting danger line

## B. Coast Features

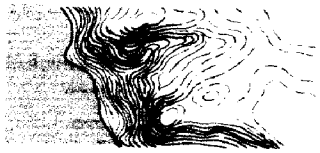
| | | |
|---|---|---|
| 1 | *G.* | Gulf |
| 2 | *B.* | Bay |
| (2a) | *B.* | Bayou |
| 3 | *Fd.* | Fjord |
| 4 | *L.* | Loch,Lough,Lake |
| 5 | *Cr.* | Creek |
| (5a) | *C.* | Cove |
| 6 | *In.* | Inlet |
| 7 | *Str.* | Strait |
| 8 | *Sd.* | Sound |
| 9 | *Pass.* | Passage, Pass |
| 10 | *Chan.* | Channel |
| 11 | *Entr.* | Entrance |
| 13 | *Mth.* | Mouth |
| 14 | *Rds.* | Roads, Roadsted |
| 15 | *Anch.* | Anchorage |
| 16 | *Hbr.* | Harbor |
| 17 | *P.* | Port |
| (17a) | *P.* | Pond |
| 18 | I. | Island |
| 19 | It. | Islet |
| 20 | Arch. | Archipelago |
| 21 | Pen. | Peninsula |
| 22 | C. | Cape |
| 23 | Prom. | Promontory |
| 24 | Hd. | Head |
| 25 | Pt. | Point |
| 26 | Mt. | Mountain Mount |
| 27 | Rge. | Range |
| 29 | Pk. | Peak |
| 30 | Vol. | Volcano |
| 32 | *Bld.* | Boulder |
| (33) | *Str.* | Stream |
| (34) | *R.* | River |
| (35) | *Slu.* | Slough |
| (36) | *Lag.* | Lagoon |
| (37) | *Thoro.* | Thorofare |

## C. The Land

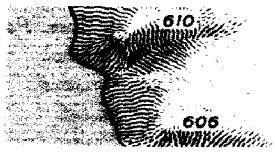



1 Contours

(a) Contours, approximate



(b) Form lines, no definite interval




2 Hachures

3 Glacier

TREE

A conspicuous clump or single tree of any kind useful as a landmark.

5 Isolated trees

wooded

9 Deciduous woodland

wooded

10 Coniferous woodland

*2560 T.T.

(11) Elevation of top of trees

## D. Control Points

| | | | |
|---|---|---|---|
| 1 | △ | | Triangulation point (station) |
| 2 | ⊙ | | Fixed point |
| 3 | *256 | | Summit of height (Peak) (when not a landmark) |
| (a) | 256 | | Peak, accentuated by contours |
| (b) | 256 | | Peak, accentuated by hachures |
| (c) | | | Peak, when elevation has not been determined |
| (d) | 256 | | Peak, when a landmark |
| 4 | ⊕ | Obs. Spot | Observation spot |
| 5 | | B.M. | Bench mark |
| 6 | ∘ | See View | View point |
| (9) | | Astro. | Astronomical |
| (10) | | Tri. | Triangulation |
| (11) | | C. of E. | Corps of Engineers |
| (12) | | | |
| (13) | | | |

## E. Units

| | | |
|---|---|---|
| 1 | hr. | hour |
| 2 | min. | minute |
| 3 | sec. | second |
| 4 | m. | meter |
| 5 | km. | kilometer |
| 6 | in. | inch |
| 7 | ft. | foot |
| 8 | yd. | yard |
| 9 | fm. | fathom |
| 11 | M. | nautical mile |
| 12 | kn. | knot |
| 13 | lat. | latitude |
| 14 | long. | longitude |
| 17 | cor. | correction |
| (18) | alt. | altitude |
| (19) | ht. | height |
| (20) | | |
| (21) | | |
| (22) | | |

## F. Adjectives

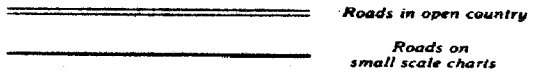
**and other abbreviations**

| | | |
|---|---|---|
| 1 | gt. | great |
| 3 | lrg. | large |
| 4 | sml. | small |
| 7 | mid. | middle |
| 9 | anc. | ancient |
| 12 | conspic. | conspicuous |
| 16 | dist. | distant |
| 17 | abt. | about |
| (19) | aband. | abandoned |
| (20) | extr. | extreme |
| (21) | concr. | concrete |
| (22) | bet. | between |
| (23) | estab. | established |
| (24) | exper. | experimental |
| (25) | discontd. | discontinued |
| (26) | fl. | flood |
| (27) | mod. | moderate |
| (28) | maintd. | maintained |
| (29) | elec. | electric |
| (30) | priv. | private, privately |
| (31) | prom. | prominent |
| (32) | std. | standard |
| (33) | subm. | submerged |
| (34) | approx. | approximate |
| (35) | cor. | corner |
| (36) | CL. | clearance |
| (37) | No. | number |
| (38) | Ave. | avenue |
| (39) | Hy. | highway |
| (40) | explos. | explosive |
| (41) | Blvd. | boulevard |
| (42) | | |
| (43) | | |
| (44) | | |
| (45) | | |
| (46) | | |

## G. Harbors

| | | | |
|---|---|---|---|
| 1 | | Anch. | Anchorage, large vessels (see No. P-12) |
| 2 | | Anch. | Anchorage, small vessels |
| 3 | | Hbr. | Harbor |
| 6 | | Bkw. | breakwater |
| 8 | | | jetty (partly below M H W) |
| (8a) | | | jetty (small scale) |
| 9 | | Pier | pier |
| 11 | | | groin (partly below M H W) |
| 12 | Anchorage prohibited | Anch. prohib. | Anchorage prohibited |
| 13 | spoil area | | spoil ground |
| 14 | Trap | | fish traps (actual shape charted) |
| (14a) | | Fsh. stk. | fishing stakes when dangerous |
| 16 | | Ldg. | landing place |
| 18 | | Whf. | wharf |
| 21 | | Dol. | dolphin |
| 26 | | Quar. | Quarantine |
| 29 | | Cus. Ho. | Customhouse |
| 33 | | B. Hbr. | Boat Harbor |
| 35 | | | dock |
| 36 | | | dry dock (actual shape shown on large scale charts) |
| 37 | | | floating dock (actual shape shown on large scale charts) |
| 39 | | | patent slip (marine railway) |
| (39a) | | Ramp | ramp |
| 40 | Lock | | lock (point upstream) |
| 45 | | Obsy. | Observatory |
| (46) | | | |
| (47) | | | |

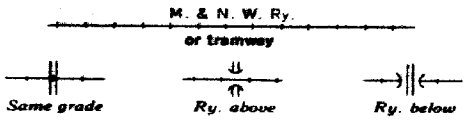
# H. Topography



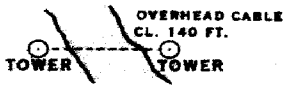

1 Roads (Rds.)



2 Track, footpath, or trail



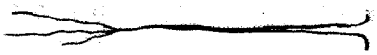

3 Railway (single or double track)
Railway (Ry.) Railroad (R.R.)



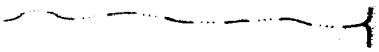

4 Overhead cable (OVHD. CAB.)



5 Power transmission line



8 River or Stream



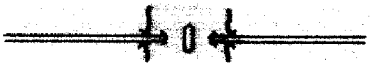
9 Intermittent stream

10 Lake (L.)

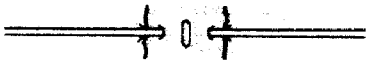
12 Marsh (See No. A-8)

13 Canal or ditch (point upstream)

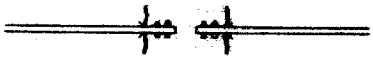
14 Bridge (fixed) (BR.)



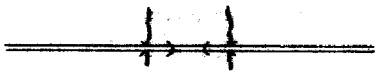
15 Drawbridge, in general



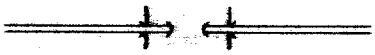
16 Swing bridge, that can be opened



17 Pontoon bridge, that can be opened



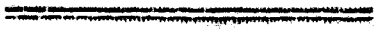
(17a) Lift bridge



(b) Bascule bridge, that can be opened

19 Ferry (Fy.)

21 Dam



(25) Levee

(26) Lava flow

(27) Log boom

(28) Submerged piling, piling, stumps, and snags

(29) Tunnel (railroad or road)

(30) Viaduct

# I. Buildings

*When the buildings are prominent, they may be shown by landmark symbol with descriptive note. (see L-63)*
*The landmark symbol is used to indicate positions of objects when accurately determined.*

| | | | |
|---|---|---|---|
| 1 | | | City or town (large scale) |
| (1a) | | | City or town (small scale) |
| 3 | | Vil. | Village |
| 4 | | Cas. | Castle |
| 5 | | Ho. | House |
| 8 | | Ch. | Church |
| 10 | | | Temple |
| 12 | | | Mosque |
| 13 | | | Minaret |
| 14 | | Pag. | Pagoda |
| 16 | | Mony. | Monastery |
| 18 | Cem. | Cem. | Cemetery |
| 19 | | Ft. | Fort (actual shape charted) |
| 23 | Airport | | Airplane landing field |
| 24 | | | Airport (large scale) |
| | | | Small scale |
| (24a) | | | Airport (military) |
| (24b) | | | Airport (civil) |
| 26 | First St. | | Street |
| 27 | | Tel. | Telegraph |
| 29 | | P.O. | Post Office |
| 30 | | Govt. | Government |
| 32 | | Hosp. | Hospital |
| 34 | | Magz. | Magazine |
| 35 | MON. | | Monument |
| 36 | CUP. | | Cupola |
| 37 | | elev. | elevation<br>elevator<br>elevated |
| 40 | Ruins | | Ruins |
| 41 | TR. | | Tower |
| 42 | | | Windmill |
| 44 | CHY | | Chimney |
| 46 | | | Oil tank |
| 47 | | Facty. | Factory |
| (56) | GAB. | | Gable |
| (57) | | Sch. | School |
| (58) | | H.S. | High School |
| (59) | | Univ. | University |
| (60) | | Inst. | Institute |
| (61) | | Co. | Company |
| (62) | | Corp. | Corporation |
| (63) | | Cap. | Capitol |
| (64) | | | Courthouse |
| (65) | | Cath. | Cathedral |
| (66) | | Bldg. | Building |
| (67) | | Pav. | Pavilion |
| (68) | | Ltd. | Limited |
| (69) | | Apt. | Apartment |
| (70) | | Tp. | Telephone |
| (71) | | | |
| (72) | | | |

## J. Miscellaneous Stations

| | | |
|---|---|---|
| 2 | Sta. | *Station* |
| 3 | C. G. | *Coast Guard (similar to LS.S.)* |
| (3a) | C. G. WALLIS SANDS | *When the building is a landmark* |
| 6 | LS.S. | *Lifesaving station (See J-3)* |
| 7 | Rkt. Sta. | *Rocket station* |
| 8 | PIL. STA | *Pilot station* |
| 9 | Sig. Sta. | *Signal station* |
| 10 | Sem. | *Semaphore* |
| 19 | FS. | *Flagstaff* |
| (20) | W. B. SIG. STA. | *Weather Bureau signal station* |
| (21) | FP. | *Flagpole* |
| (22) | F. TR. | *Flag tower* |
| (23) | LOOK. TR | *Lookout tower* |
| (24) | S'PIPE | *Standpipe* |
| (25) | BELL | *On land* |
| (26) | | |
| (27) | | |

## K. Lights

| | | |
|---|---|---|
| 1 | | *Position of light* |
| 2 | Lt. | *Light* |
| 3 | LH. | *Lighthouse* |
| 4 | AERO | *Aeronautical light* |
| 5 | | *Lighted beacon* |
| 6 | | *Lightship* |
| 7 | | *Lighted buoy* |
| 10 | REF | *Reflector* |
| (17) | Priv maintd | *Private light (maintained by private interests; to be used with caution)* |
| 21 | F | *Fixed* |
| 22 | Occ | *Occulting* |
| 23 | Fl | *Flashing* |
| 24 | Qk Fl | *Quick flashing* |
| (24a) | I Qk | *Interrupted quick* |
| 26 | Alt | *Alternating* |
| 27 | Gp Occ | *Group occulting* |
| 28 | Gp Fl | *Group flashing* |
| (28a) | S-L | *Short-long* |
| 29 | F Fl | *Fixed and flashing* |
| 30 | F Gp Fl | *Fixed and group flashing* |
| 31 | Rot. | *Rotating* |
| (39) | min. | *minutes* |
| (40) | sec. | *seconds* |
| 44 | | *visible* |
| 44a | M. | *nautical mile* |
| 47 | Gp. | *group* |
| 49 | SEC | *sector* |
| 61 | Vi. | *violet* |
| 63 | Bu. | *blue* |
| 64 | G. | *green* |
| 65 | Or. | *orange* |
| 66 | R. | *red* |
| 67 | W. | *white* |
| (67a) | Am. | *amber* |
| 68 | OBSC | *obscured* |
| 69 | (U) | *unwatched* |
| 70 | Occas. | *occasional* |
| 71 | Irreg. | *irregular* |
| 73 | Temp. | *temporary* |
| 80 | Vert. | *vertical* |
| 81 | Hor. | *horizontal* |
| (82) | D. | *destroyed* |
| (82a) | Exting. | *extinguished* |
| (83) | V. B. | *vertical beam* |
| (84) | Exper. | *experimental* |
| (85) | RGE | *range* |
| (86) | AERO | *aeronautical* |

# L. Buoys and Beacons

*On entering a channel from seaward, buoys on starboard side are red with even numbers, on port side black with odd numbers. **Lights on** buoys on starboard side of channel are red or white, on port side white or green. Mid-channel buoys **have** black and white vertical stripes. Obstruction buoys are green, or have red and black horizontal bands. This system does not always apply to foreign waters. The dot of the buoy symbol, and the small circle of the light vessel and mooring buoy symbols **and the center of the beacon symbol** indicate their positions.*

| | | |
|---|---|---|
| 1 | • | Position of buoy |
| 2 | | Lighted buoy |
| 3 | BELL | Bell buoy |
| (3a) | GONG | Gong buoy |
| 4 | WHIS | Whistle buoy |
| 5 | C | Can buoy |
| 6 | N | Nun buoy |
| 7 | SP | Spherical buoy |
| 8 | S | Spar buoy |
| (8a) | | Checkered buoy |
| 12 | | Lightship |
| 14 | BW | Fairway buoy (B. & W. V. S.) (Mid-Channel) |
| 18 | RB RB | Junction buoy (R. & B. H. B.) |
| 19 | RB RB | Isolated danger buoy (R. & B. H. B.) |
| 20 | RB G | Wreck or obstruction buoy (R. & B. H. B.) or (G.) |
| 22 | | Mooring buoy |
| 24 | Y Quar. | Quarantine buoy |
| (27) | BW | Fish trap buoy (W. & B. H. B.) |
| (28) | | Anchorage buoy |
| (29) | Priv. maintd. | Maintained by private interests; to be used with caution |
| 31 | H. B. | Horizontal bands |
| 32 | V. S. | Vertical stripes |
| 33 | Chec. | checkered |
| 41 | W. | white |
| 42 | B. | black |
| 43 | R. | red |
| 44 | Y. | yellow |
| 45 | G. | green |
| (46) | Br. | brown |
| (47) | Gy. | gray |
| (48) | T. B. | temporary buoy |
| 52 | △W Bn ▲R Bn ▲ Bn | Unlighted beacon (Daybeacon) |
| (52a) | MARKER | Private aid to navigation |
| 53 | Bn | Beacon (See L-52) |
| 63 | ⊙ | Landmark |
| (63a) | ∘ | Landmark, position approx |
| (64) | REF | Reflector |
| (65) | | |

Note: Buoy and beacon symbols with topmarks may be shown on charts of foreign waters.

# M. Radio and Radar Stations

| | | |
|---|---|---|
| 1 | R. Sta. | Radio station |
| 2 | R.T. | Radio telephone |
| 3 | R. Bn. | Radiobeacon |
| 7 | R. D. F. | Radio direction finder station |
| 9 | R. TR. | Radio tower |
| (9a) | R. MAST | Radio mast |
| (10) | R. TR. (WEAF) | Commercial broadcast |
| 11 | Ra. | Coast radar station |
| 12 | Racon | Radar responder beacon |
| (13) | Ra. Ref. | Radar reflector |
| (14) | Ra. (conspic.) | Radar conspicuous object |
| (15) | Ramk. | Ramark |

# N. Fog Signals

| | | |
|---|---|---|
| 1 | Fog Sig. | Fog signal station |
| 6 | SUB-BELL | Submarine fog bell (mechanical) |
| 7 | SUB-OSC. | Submarine oscillator |
| 8 | NAUTO. | Nautophone |
| 9 | DIA. | Diaphone |
| 11 | SIREN | Fog siren |
| 12 | HORN | Fog trumpet |
| 13 | HORN | Fog horn |
| 14 | BELL | Fog bell |
| 15 | WHIS. | Fog whistle |
| 16 | REED | Reed horn |
| 17 | GONG | Gong |
| (18) | D. F. S. | Distance finding station |
| (19) | GUN | Fog gun |
| (20) | | |

# O. Dangers

| | |
|---|---|
| 1 | Rocks which do not cover; with their elevations above M.H.W. |
| 2 | Rocks that cover and uncover, with heights in feet above datum of soundings |
| (3a) | When rock of 2 is considered a danger to navigation |
| (4a) | Sunken rock |
| (4b) | When rock of 4a is considered a danger to navigation |
| (4c) | Shoal sounding on isolated rock replaces symbol |
| 6a | Sunken danger with depth cleared by wire drag (Feet or fathoms) |
| 10 | Coral or rocky reef (below datum of soundings) See A-11g |
| 11 | Stranded wreck (any portion of hull above datum of soundings) |
| 12 | Sunken wreck with only masts visible |
| 14 | Dangerous sunken wreck with less than 10 fathoms of water over it (See 6a) |
| (14a) | A number of sunken wrecks |
| (14b) | Obstruction of any kind |
| 15 | Wreck of known depth |
| 16 | Sunken wreck, not dangerous to surface navigation or over which the depth exceeds 10 fathoms |
| 17 | Foul ground |
| 18 | Overfalls or tide rips |
| 19 | Eddies |
| 20 | Kelp, any kind |
| (20a) | |
| 21 | Bk. bank |
| 22 | Shl. shoal |
| 23 | Rf. reef |
| 24 | Le. ledge |
| 25 | breakers (see A-12) |
| 27 | Obstr. obstruction |
| 28 | Wk. wreck |
| (28a) | Wks. wreckage |
| 33 | cov. covers |
| 34 | uncov. uncovers |
| 35 | Rep. reported |
| (35a) | shoal reported |
| 36 | Discol. discolored |
| 41 | P.A. position approximate |
| 42 | P.D. position doubtful |
| 43 | E.D. existence doubtful |
| 44 | Pos. position |
| (46) | |
| (47) | |

## P. Various Limits

| | | |
|---|---|---|
| 1 | | Leading line (Range line) |
| 4 | | Limit of sector |
| 5 | | Channel or course recommended |
| (5a) | | Alternate course |
| 7 | Cable area | Submarine cable |
| 8 | Pipeline<br>Pipeline area | Submarine pipe line |
| 9 | | Maritime limits in general |
| 10 | | Limit of fishing zone (fish trap areas bounded by broken lines) |
| 11 | | Limit of dumping ground (see Nos. P-9 & G-13) |
| 12 | | Anchorage limit |
| 13 | Airport | Limit of airport |
| 16 | | International boundary (also State boundary) |
| 18 | | Ice limits |
| (21) | Bdy. | Boundary |
| (22) | Bdy. Mon. | Boundary monument |
| (23) | | Reservation line |

## T. Tides and Currents

| | | |
|---|---|---|
| 1 | H.W. | high water |
| (1a) | H.H.W. | higher high water |
| 2 | L.W. | low water |
| (2a) | L.L.W. | lower low water |
| 3 | M.T.L. | mean tide level |
| 4 | M.S.L. | mean sea level |
| 6 | Sp. | spring tide |
| 7 | Np. | neap tide |
| (8a) | M.H.W. | mean high water |
| (8b) | M.H.H.W. | mean higher high water |
| (9a) | M.L.W. | mean low water |
| (9b) | M.L.L.W. | mean lower low water |
| 10 | I.S.L.W. | Indian spring low water |
| 17 | Str. | stream |
| 18 | | current, general |
| 19 | 2 kn | flood stream |
| 20 | 2 kn | ebb stream |
| 23 | vel. | velocity |
| 24 | kn. | knots |
| (25) | | Current Diagram, with explanatory note |
| (26) | | |

## Q. Soundings

| | | |
|---|---|---|
| 2 | 27 | No bottom sounding |
| 5 | 30 FEET MAY 1939 | Dredged channels (controlling depth may be shown in separate note) |
| 9 | 17 | Swept areas (shown by green tint) (not yet covered by sufficient hydrographic surveys to show adequate soundings) |
| (9a) | 23<br>18 | Areas swept by wire drag to depth indicated |
| (12) | 19 | Soundings taken from older surveys or smaller scale charts |
| (16) | | Stream |
| (17) | 6 | See general remarks 13 |
| (18) | | |

## R. Depth Contours & Tints

| Feet | Fathoms |
|---|---|
| 0 | 0 |
| 6 | 1 |
| 12 | 2 |
| 18 | 3 |
| 24 | 4 |
| 30 | 5 |
| 36 | 6 |
| 60 | 10 |
| 120 | 20 |
| 180 | 30 |
| 240 | 40 |
| 300 | 50 |
| 600 | 100 |
| 1,200 | 200 |
| 1,800 | 300 |
| 2,400 | 400 |
| 3,000 | 500 |
| 6,000 | 1,000 |
| 12,000 | 2,000 |
| 18,000 | 3,000 |
| Or 10 fathoms and greater | |

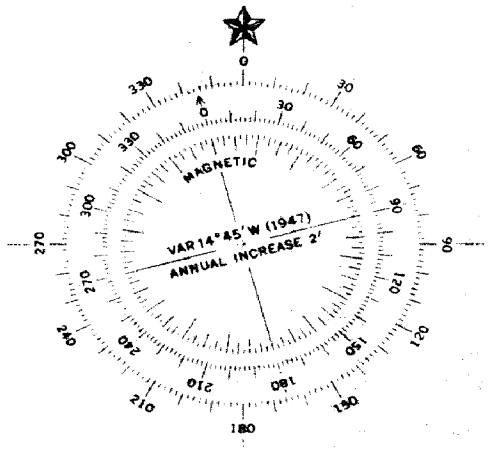
10

Or 100 (blue)

# S. Quality of the Bottom

| | | |
|---|---|---|
| 1 | Grd. | ground |
| 2 | S. | sand |
| 3 | M. | mud |
| 4 | Oz. | ooze |
| 5 | Ml. | marl |
| 6 | Cl. | clay |
| 7 | G. | gravel |
| 8 | Sn. | shingle |
| 9 | P. | pebbles |
| 10 | St. | stones |
| (10a) | Sp. | specks |
| 11 | Rk. | rock |
| (11a) | Bld. (s) | boulder (s) |
| 12 | Ck. | chalk |
| 13 | Qz. | quartz |
| 14 | Co. | coral |
| (14a) | Co. Hd. | coral head |
| 15 | Md. | madrepore |
| (16a) | Vol. Ash. | volcanic ash |
| 17 | La. | lava |
| 18 | Pm. | pumice |
| 19 | T. | tufa |
| 20 | Sc. | scorice |
| 21 | Cn. | cinders |
| 22 | Mn. | manganese |
| 23 | Sh. | shells |
| 24 | Oys. | oysters |
| 25 | Ms. | mussels |
| 26 | Spg. | sponge |
| 27 | Grs. | grass |
| 28 | Wd. | weeds |
| 32 | Fr. | foraminifera |
| 33 | Gl. | globigerina |
| 34 | Di. | diatom |
| 35 | Rd. | radiolaria |
| 36 | Pt. | pteropod |
| 37 | Po. | polyzoa |
| 39 | fne. | fine |
| 40 | crs. | coarse |
| 41 | sft. | soft |
| 42 | hrd. | hard |
| 43 | stf. | stiff |
| 44 | sml. | small |
| 45 | lrg. | large |
| 46 | stk. | sticky |
| 47 | brk. | broken |
| (47a) | rky. | rocky |
| 50 | spk. | speckled |
| 51 | gty. | gritty |
| 53 | fly. | flinty |
| 54 | glac. | glacial |
| 56 | wh. | white |
| 57 | bk. | black |
| 59 | bu. | blue |
| 60 | gn. | green |
| 61 | yl. | yellow |
| 63 | rd. | red |
| 64 | br. | brown |
| 66 | gy. | gray |
| 67 | lt. | light |
| 68 | dk. | dark |
| (69) | Ca. | calcareous |
| (70) | | |

# U. Compass

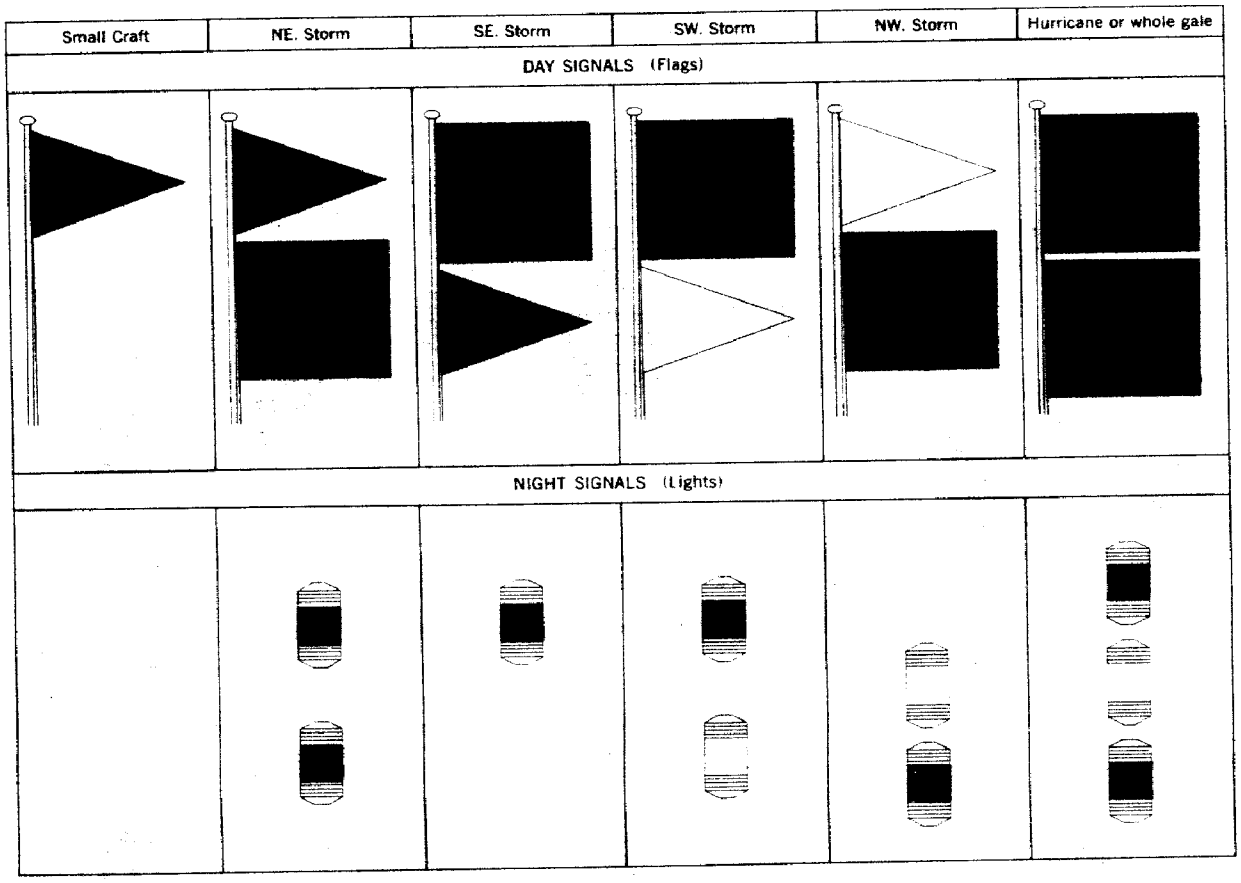



*Compass Rose*

*The outer circle is in degrees with zero at true north. The inner circles are in points and degrees with the arrow indicating magnetic north.*

| | | |
|---|---|---|
| 1 | N. | north |
| 2 | E. | east |
| 3 | S. | south |
| 4 | W. | west |
| 5 | NE. | northeast |
| 6 | SE. | southeast |
| 7 | SW. | southwest |
| 8 | NW. | northwest |
| 21 | brg. | bearing |
| 23 | mag. | magnetic |
| 24 | var. | variation |
| (27) | deg. | degrees |
| (28) | dev. | deviation |

## STORM WARNING SIGNALS




## EXPLANATION OF SMALL CRAFT, STORM, AND HURRICANE WARNINGS

*The small craft warning.*—A red pennant indicates that moderately strong winds that will interfere with the safe operation of small craft are expected. No night display of small craft warnings is made.

*The northeast storm warning.*—A red pennant *above* a square red flag with black center displayed by day, or two red lanterns, one above the other, displayed by night, indicates the approach of a storm of marked violence with winds beginning from the *northeast*.

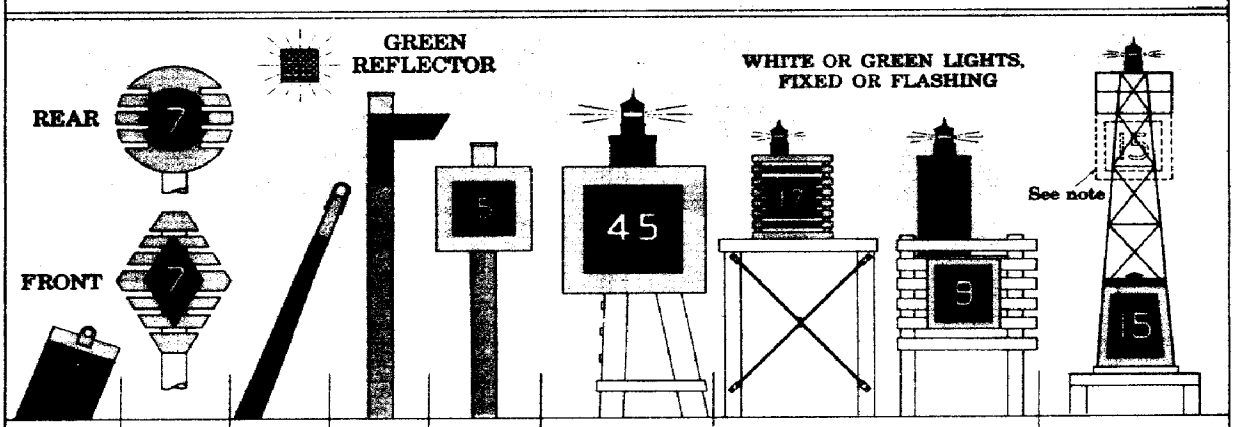
*The southeast storm warning.*—A red pennant *below* a square red flag with black center displayed by day, or one red lantern displayed by night, indicates the approach of a storm of marked violence with winds beginning from the *southeast*.

*The southwest storm warning.*—A white pennant *below* a square red flag with black center displayed by day, or a white lantern *below* a red lantern displayed by night, indicates the approach of a storm of marked violence with winds beginning from the *southwest*.

*The northwest storm warning.*—A white pennant *above* a square red flag with black center displayed by day, or a white lantern *above* a red lantern displayed by night, indicates the approach of a storm of marked violence with winds beginning from the *northwest*.

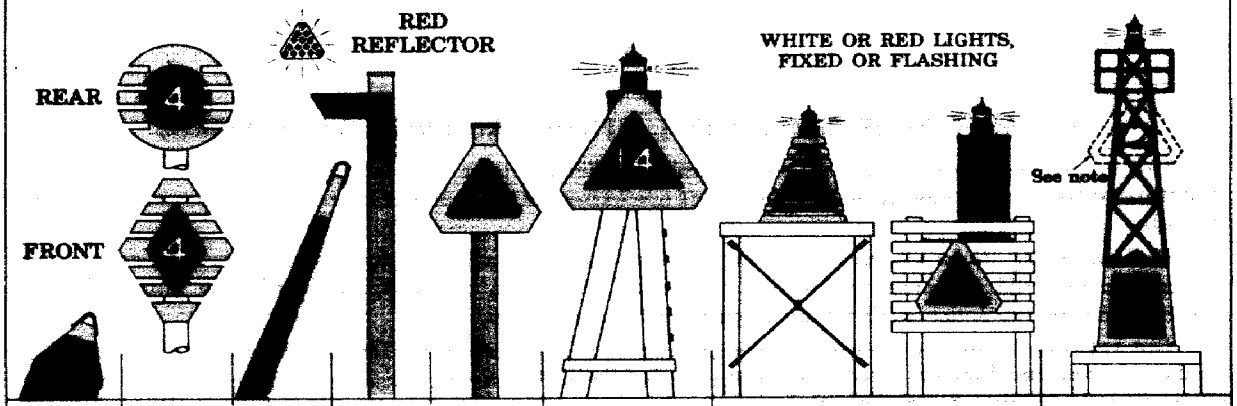
*Hurricane, or whole gale warning.*—Two square flags, red with black centers, one above the other, displayed by day, or two red lanterns, with a white lantern between, displayed by night, indicate the approach of a tropical hurricane or of one of the extremely severe and dangerous storms which occasionally move across the Great Lakes.

# TYPES OF AIDS TO NAVIGATION
# INTRACOASTAL WATERWAY



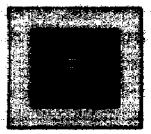

| SPECIAL (S) CAN BUOY | RANGES ROUND, OVAL OR DIAMOND | SPAR BUOY 2nd.-4th. Class | DAYBEACONS Pointer | DAYBEACONS Daymark | 3 PILE DOLPHIN | SLATTED, PILE STRUCTURES | | SKELETON STRUCTURES |
|---|---|---|---|---|---|---|---|---|
| | | | Supporting Structure may be painted White or Aluminum. | | | | | Note:- Daymark (shown dotted) added where needed. Border and number on Daymark where used. |
| C "3" | "7" | "7" | S "17" | "17" | "5" | Fl 2sec "45" | Fl G 5sec "17" | F "9" | F G "15" |

**PORT** Side of channel (Black with Odd Numbers) entering from north and east and traversed to south and west respectively.

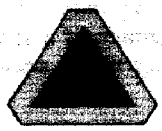



| SPECIAL (S) NUN BUOY | RANGES ROUND, OVAL OR DIAMOND | SPAR BUOY 2nd.-4th. Class | DAYBEACONS Pointer | DAYBEACONS Daymark | 3 PILE DOLPHIN | SLATTED, PILE STRUCTURES | | SKELETON STRUCTURES |
|---|---|---|---|---|---|---|---|---|
| | | | Supporting Structure may be painted White or Aluminum. | | | | | Note:- Daymark (shown dotted) added where needed. Border and number on Daymark where used. |
| R N "12" | R "4" | R "4" | R S "14" | R "14 A" | R "6" | Fl 2sec "14" | Fl R 5sec "12" | F "6" | F R "12" |

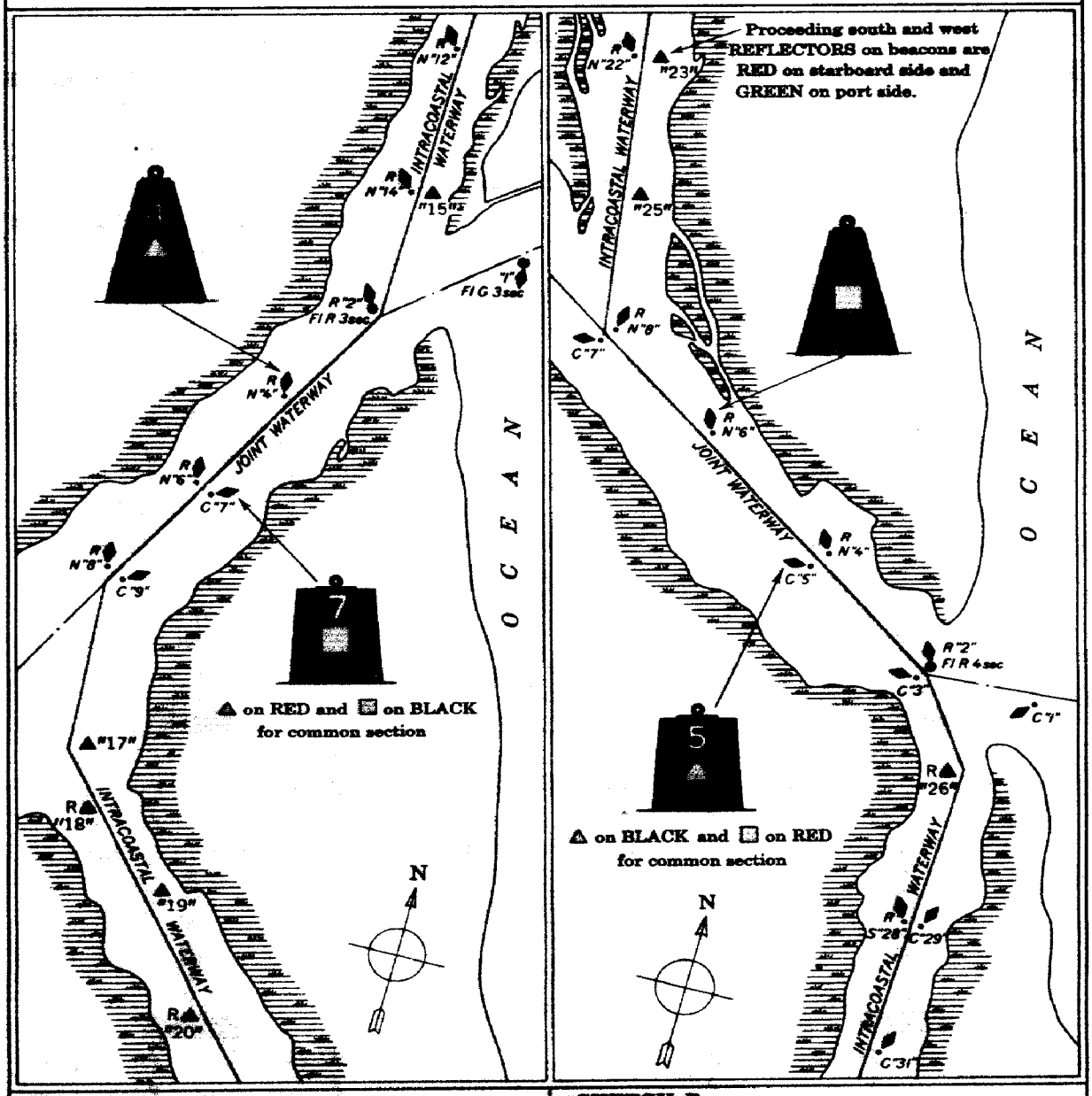
**STARBOARD** Side of channel (Red with Even Numbers) entering from north and east and traversed to south and west respectively.



**THE ICW AIDS ARE CHARACTERIZED BY THE YELLOW BORDER**



# ILLUSTRATING THE SYSTEM OF DUAL PURPOSE MARKING WHERE THE ICW AND OTHER WATERWAYS COINCIDE




**SKETCH A:**

ICW joins another waterway, which is numbered from seaward, at buoy No. 2 and is common with it to buoy No. 9. ICW numbers and yellow borders are omitted in this section but the ▲ or ■ is used on the regular aids to designate the ICW.

**SKETCH B:**

ICW joins another waterway at buoy No. 8 and is common with it to buoy No. 3. This section is numbered in the opposite direction to that of the ICW. The ICW numbers and yellow borders are omitted from the regular aids but a ▲ or ■ is shown to designate the ICW.

# Light Characteristics and Typical Lighted Buoys

## PORT SIDE
Entering from seaward (read up)
Color: BLACK Numbers: ODD

COLOR OF LIGHTS
Green or White

SLOW FLASHING
(at regular intervals)

OCCULTING
(at regular intervals)

QUICK FLASHING

Marking important turns, etc., where particular caution is required.

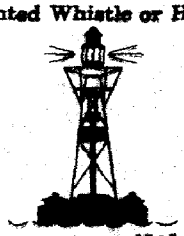
Lighted

"5" Fl G 3 sec
"5" Fl 3 sec
"5" Occ G 3 sec
"5" Occ 3 sec
"5" Qk Fl G
"5" Qk Fl

Lighted Bell or Gong

"5" Fl G 3 sec BELL
"5" Fl 3 sec BELL
"5" Occ G 3 sec BELL
"5" Occ 3 sec BELL
"5" Qk Fl G BELL
"5" Qk Fl BELL

Lighted Whistle or Horn



"5" Fl G 3 sec WHIS
"5" Fl 3 sec WHIS
"5" Occ G 3 sec WHIS
"5" Occ 3 sec WHIS
"5" Qk Fl G WHIS
"5" Qk Fl WHIS

## For JUNCTIONS or OBSTRUCTIONS
COLOR OF LIGHTS
White, Red or Green

INTERRUPTED QUICK FLASHING

## For MID-CHANNEL or FAIRWAY
COLOR OF LIGHTS
White only

SHORT-LONG FLASHING

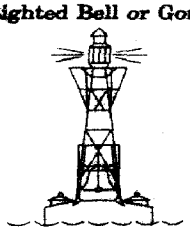
No special shapes

Buoy colors same as for unlighted buoys.

Lighted

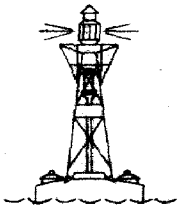
RB Iq Qk Fl
RB Iq Qk Fl R
RB Iq Qk Fl G
BW "CH" (Cape Hatteras) S-L Fl

Lighted Bell or Gong



RB Iq Qk Fl BELL
RB Iq Qk Fl R BELL
RB Iq Qk Fl G BELL
BW "CH" (Cape Hatteras) S-L Fl BELL

Lighted Whistle or Horn



RB Iq Qk Fl WHIS
RB Iq Qk Fl R WHIS
RB Iq Qk Fl G WHIS
BW "CH" (Cape Hatteras) S-L Fl WHIS

## STARBOARD SIDE
Entering from seaward (read up)
Color: RED Numbers: EVEN

COLOR OF LIGHTS
Red or White

SLOW FLASHING
(at regular intervals)

OCCULTING
(at regular intervals)

QUICK FLASHING

Marking important turns, etc., where particular caution is required.

Lighted

R "6" Fl R 4 sec
"6" Fl 4 sec
R "6" Occ R 3 sec
"6" Occ 3 sec
R "6" Qk Fl R
"6" Qk Fl

Lighted Bell or Gong

R "6" Fl R 3 sec BELL
"6" Fl 3 sec BELL
R "6" Occ R 3 sec BELL
"6" Occ 3 sec BELL
R "6" Qk Fl R BELL
"6" Qk Fl BELL

Lighted Whistle or Horn

R "6" Fl R 3 sec WHIS
"6" Fl 3 sec WHIS
R "6" Occ R 3 sec WHIS
"6" Occ 3 sec WHIS
R "6" Qk Fl R WHIS
"6" Qk Fl WHIS

Combination lighted buoys may contain both light and BELL, GONG, WHIS or HORN.
Lights on buoys are white unless otherwise indicated.
Reflectors (REF) may be indicated on all floating aids.

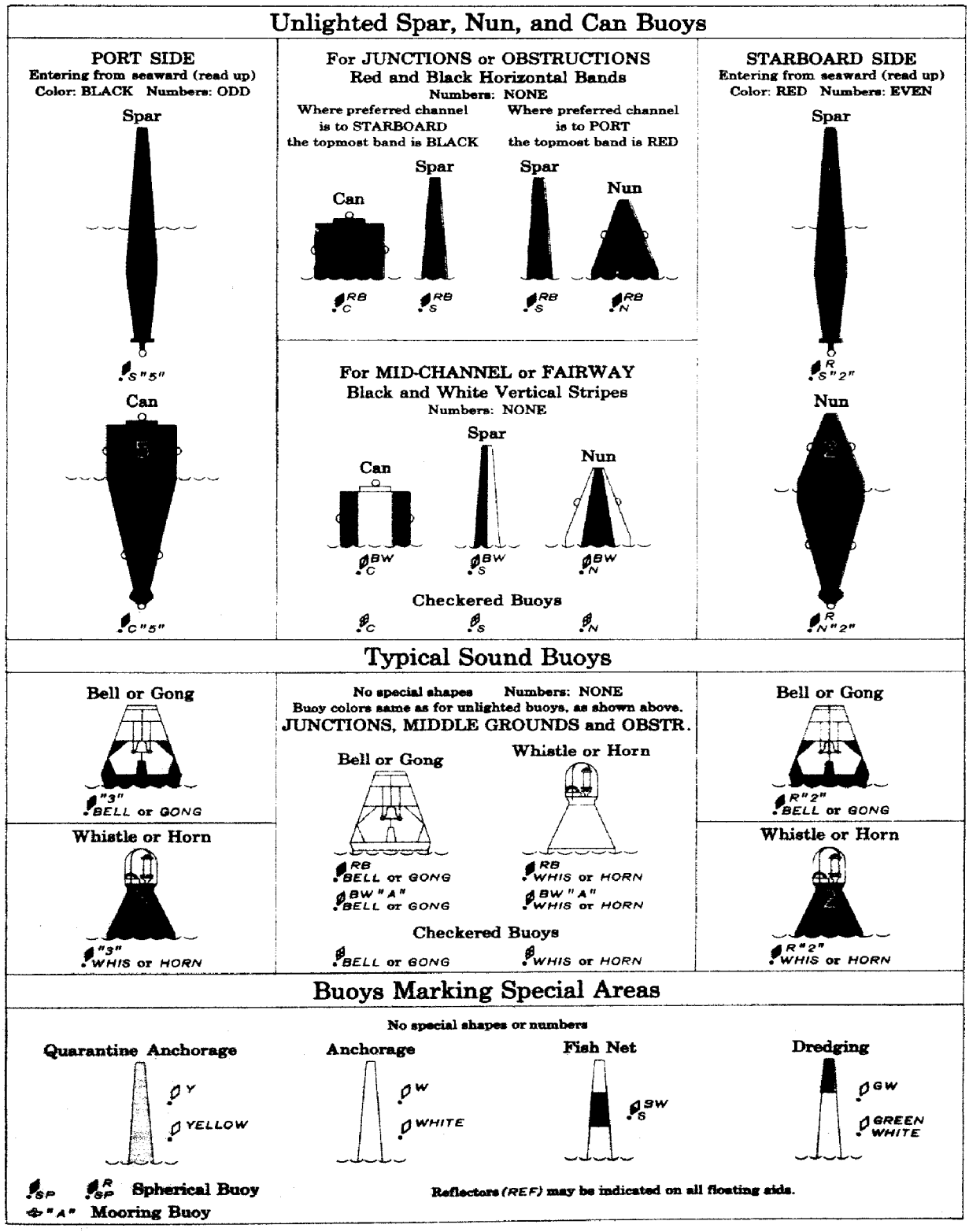
Lighted Mooring Buoy
Qk Fl "C"

Lightship
BRENTON REEF
Occ 4 sec 13 M DIA

F, Fl, Gp Fl, Qk Fl, Occ, Gp Occ — May be used as prefix to any color light

"A" Fl G 3 sec
R "2" Fl R 4 sec
W "20" Fl 2 sec

Lighted buoyage of the United States with explanation of their standard chart symbols and abbreviations.




Unlighted buoyage of the United States with explanation of their standard chart symbols and abbreviations.

CHAPTER 1

# General Navigational Information

## Coast and Geodetic Survey

**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, and tables of predicted tides and currents,** 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 located within the area covered by this Coast Pilot. The charts and publications can also be purchased from the Washington Office and from most of the District Offices. Orders mailed to Washington, D. C., should be accompanied by check or money order, made payable to the United States Coast and Geodetic Survey. Postage stamps or Superintendent of Documents coupons cannot be accepted. The catalog of nautical charts and related publications can be obtained free of charge from the Coast and Geodetic Survey or any of its agencies.



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**Important.**—Mariners and others using this Coast Pilot are urgently requested to forward to the Director, United States Coast and Geodetic Survey, Washington 25, D. C., directly or through a District Office, any information affecting it or the charts that may come to their attention, as well as any suggestions they may have for increasing the value of these publications. Reports of an urgent character should be sent by radio or telegraph.

**Special signals for surveying vessels.**—The following signals have been prescribed for vessels of the United States engaged in hydrographic surveying:

By day a surveying vessel of the Coast and Geodetic Survey, under way and employed in hydrographic surveying, may carry in a vertical line, one over the other not less than 6 feet apart where they can best be seen, three shapes not less than 2 feet in diameter of which the highest and lowest shall be globular in shape and green in color and the middle one diamond in shape and white.

Vessels of the Coast and Geodetic Survey shall carry the above-described marks while actually engaged in hydrographic surveying and under way, including drag work. Launches and other boats shall carry the prescribed marks when necessary.

By night a surveying vessel of the Coast and Geodetic Survey, under way and employed in hydrographic surveying, shall carry the regular lights prescribed by *The Rules of the Road.*

A vessel of the Coast and Geodetic Survey, when at anchor in a fairway on surveying operations, shall display from the mast during the daytime two black balls in a vertical line and 6 feet apart. At night two red lights shall be displayed in the same manner. In the case of a small vessel the distance between the balls and between the lights may be reduced to 3 feet if necessary.

Such vessels, when at anchor in a fairway on surveying operations, shall have at hand and show if necessary in order to attract attention a flare-up light in addition to the lights which are, by this regulation, required to be carried.

In addition to the signals described, vessels of the Coast and Geodetic Survey when engaged in survey work often hoist one of the following International Code signals:

**HD** signifying "I am engaged in submarine work, you should keep clear of me."
**HF** signifying "I have a sweep out, you should keep clear of it."
**ONA** having the same meaning as the two letter hoist "HD."

**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. Steamers 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 wire drag launches while the wire is being set out or taken in, unless it would endanger a vessel to do otherwise. In setting out or taking up the wire drag, the tension on the bottom wire is released and the floats at each 100-foot section may cause the wire to be held near the surface. At this time the launches are usually headed either directly toward or away from each other and the operation of taking up or setting out may usually be clearly seen.

## Charts

**Nautical charts** are published primarily for the use of the mariner, although they serve the public interest in many other ways. They are compiled principally from the basic field surveys of the Coast and Geodetic Survey, supplemented by data from other

Government organizations. They include all available information necessary for safe navigation.

**Projections.**—Nautical charts, with few exceptions, are constructed on the Mercator projection. On this projection meridians and parallels are straight lines intersecting 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.

**Notes, symbols, and abbreviations.**—Charts contain various types of notes placed in association with the title or in the proximity of the detail to which they refer. They may include such matters as scale, projection, date to which chart has been corrected, source of charted data, an explanation of the more important symbols and abbreviations, an index or notation of adjoining charts, controlling depths, caution notes, etc. These notes are essential for the complete interpretation of the chart and should be thoroughly understood by the chart user.

**Accuracy of charts.**—Each sounding represents an actual measure of depth and location at the time the survey was made. Shores and shoals where sand and mud prevail, and especially bar harbors and the entrances of bays and rivers exposed to strong tidal current and a heavy sea, are subject to continual change of a greater or less extent, and important ones may have taken place since the date of the last survey. In localities which are noted for frequent and radical changes, such as the entrances to a number of estuaries on the Atlantic, Gulf, and Pacific coasts, notes are printed on the charts calling attention to the fact.

It should also be remembered that in coral regions and where rocks and boulders abound it is always possible that a survey with lead and line, however detailed, may have failed to find every small obstruction. For these reasons, when navigating such waters, the customary sailing lines and channels should be followed and those areas avoided where the irregular and sudden changes in depth indicate conditions which are associated with pinnacle rocks, coral heads, or boulders.

**Dredged channels.**—These are generally shown upon the chart by two broken lines to represent the side limits of the improvement together with the depth and date. The depth is the controlling depth through the channel on the date charted and does not mean that this depth obtains over the full width of the channel, nor that the depth has not subsequently changed due to either shoaling or dredging. The Coast Pilot generally gives the project dimensions of an improved channel.

**Buoys.**—Too much reliance should not be placed on buoys always maintaining their exact station, especially when in exposed localities. It is safer, when possible, to navigate by bearings or angles referred to fixed objects on shore and by the use of soundings.

**Plane of reference for soundings on charts.**—For the Atlantic coast of the United States and Puerto Rico the plane of reference for soundings is the mean of all low waters; for the Pacific coast of the United States and Alaska, with the one exception noted below, and for the Hawaiian and Philippine Islands, it is the mean of the lower low waters. For the Atlantic coast of the Canal Zone, Panama, the plane of reference for soundings is mean low water, and for the Pacific coast of the same it is mean low

water springs. For foreign charts many different planes of reference are in use, but that most frequently adopted is mean low water springs.

**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 Notices to Mariners.

Nautical charts bear three dates, which are important to persons using them: (1) The **edition date** (month and year) of the publication note, *printed* on most charts, centrally in the lower margin; (2) the **print date** (year, month, and day), the latest date *printed* in the lower left-hand corner below the border, which is the date of correction to the printing plate; (3) the **date of issue,** *stamped* in the right lower margin and just to the left of the subtitle. Charts are hand-corrected to show all essential changes for lights, buoys, beacons, recently reported dangers, and other critical information as of 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.

**Scales of charts.**—The scales of nautical charts range from 1:2,500 to about 1:5,000,000. Graphic scales are generally shown on charts with scale 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. These 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.*—Scale 1:100,000 to 1:600,000. These are for coastwise navigation outside of outlying reefs and shoals.

*Coast charts.*—Scale 1:50,000 to 1:100,000. These are for inshore navigation for entering bays and harbors of considerable width; and for navigating large inland waterways.

*Harbor charts.*—Scales larger than 1:50,000. These are for harbors, anchorage areas, and the smaller waterways.

*Intracoastal Waterway (inside route) charts.*—Scale 1:40,000. This is a special series of charts embracing the inside route in New Jersey, the route from Norfolk, Va., to Key West, Fla., on the Atlantic coast, and from Key West, Fla., 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, whereas on a small scale the same amount of displacement means large fractions of a mile. For the same reason, bearings to near objects should be used in preference to objects farther off, although the latter may be more prominent, as a small error in bearing or in laying it down on the chart has greater effect in misplacing the position, the longer the line to be drawn.

**Depth curves.**—Since the installation of echo-sounding apparatus on most modern 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 and the more certain will be his position. Previously, the charts were distinguished by many soundings and few depth curves; the newer charts are characterized by many depth curves and fewer soundings.

**Compass roses on charts.**—The annual change in variation gradually introduces an error in magnetic compass roses on charts, and in some cases, the displacement of position from neglect of this change may be of importance. 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 certain of the sailing and general charts the magnetic variation is shown by isogonic lines in addition to the compass roses.

**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; they are never encountered over oceanic depths. Magnetic force diminishes so rapidly with distance that a magnetic center in the visible 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 is conveniently possible by soft iron and permanent magnets, suitably placed in or on the binnacle. See Special Publication No. 96 of the United States Coast and Geodetic Survey, entitled *Instructions for Compensation of the Magnetic Compass.*

**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 Lists 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 such instruments have a definite effect on magnetic compasses, so that when such instruments are within 6 feet of a compass an error of from 2° to 4° will result. Closer proximity increases this greatly. Other equipment, such as emergency lights and portable telephones, will have similar effect. So as not to affect magnetic compasses, such electric equipment should not be stowed within 10 feet of magnetic compasses and care should be taken to see that such instruments are not used in proximity of magnetic compasses for a time greater than necessary.

# Tides and Currents

**Tide Tables** for the Atlantic Ocean and for the Pacific Ocean are published in advance annually by the United States Coast and Geodetic Survey. The Atlantic Ocean Tide Tables supply complete tidal data for the east coast of North and South America, the west and north coasts of Africa, and all of Europe. The Pacific Ocean Tide Tables give data for the Pacific and Indian Oceans; see "Publications" at the end of this chapter.

They contain tables of full daily predictions of the times and heights of high and low waters for certain reference stations along the coasts, with full explanations for the use of this table. The use of Table 2 of the Tide Tables should be known to every navigator. By means of this table the predictions given for the reference ports are extended so as to enable one to obtain the predictions for each day for a large number of other stations. Table 3 enables the height of tide at any time to be computed.

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 water may also rise above mean high water due to similar causes.

**Caution.**—In using the Tide Tables, slack water should not be confounded with high or low water. For ocean stations there is usually but little difference between the time of high or low water and the beginning of ebb or flood current; 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 stand. 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 either to figures given for various places in this volume of the Coast Pilot or to the Current Tables.

**Current Tables** for the Atlantic Coast and for the Pacific Coast of the United States are published in advance annually by the United States Coast and Geodetic Survey. Each volume includes the daily predicted times of slack water and the times and velocities of strength of flood and ebb for certain reference stations and a table of current differences and constants by means of which corresponding daily predictions may be readily obtained for numerous other places. Tables for the velocity of current at any time, duration of slack, and rotary tidal currents at certain offshore locations, together with data on the Gulf Stream and wind currents are included. There are also current diagrams for a number of sounds, bays, and harbors, which show in a graphical form the velocities of the flood and ebb currents and the times of slack and strength over a considerable stretch of the channel of these waterways. See "Publications" at the end of this chapter.

**Tidal Current Charts** are published by the United States Coast and Geodetic Survey for various localities; see "Publications" at the end of this chapter. These current charts are good for any year and show the direction and velocity of the tidal current for each hour of the current. They present a comprehensive view of the tidal current movement of the area as a whole and also supply a means of readily determining the direction and velocity of the current at various localities throughout the area.

# Destructive and Other Waves

**Destructive waves.**—Unusual sudden changes in height of water level can be caused by seismic sea waves or violent storms. Seismic sea waves sometimes spread out in all directions from places at which severe seismic disturbances occur. They travel long distances and can cause tremendous damage by wrecking ships and inundating coastal regions. Violent storms can produce extreme heights of tide which reflect the piling up of water to high levels or the withdrawal of water with consequent low levels. 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.

Seiche and surge are short-period vertical and horizontal oscillations of water which are particularly dangerous to ships in certain areas.

**Seismic sea waves.**—The destructive effect of great seismic sea waves which occur from time to time should not be minimized. The loss of life and property can be lessened if shipmasters and others acquaint themselves with the behavior of these waves so that intelligent action can be taken when they become imminent.

Tide gage records of the waves of April 1, 1946, in the Pacific and of many that have occurred in the past show that the recession of the water is usually, though not always, preceded by a smaller but distinct rise of water level. The waves are so long that they are not visually recognizable as such, but manifest themselves as a rapid rising and falling of the water surface.

At Honolulu, which is reasonably well protected from the direct onslaught of the waves, there was on April 1, 1946, an initial rise of about ½ foot in 6 minutes followed by a fall of 2¼ feet in the next 7½ minutes. In the three succeeding 7½-minute periods there was first a rise of 2¾ feet, a fall of about 3½ feet, and then a rise of 4 feet to the third and highest crest of the series. The oscillations continued for many hours. The tide gages which have recorded heights of seismic sea waves have usually been located in comparatively sheltered areas. The wave of April 1, 1946, was reported to have reached levels 40 feet or more above sea level in some parts of the Hawaiian Islands. Except for the possible grounding of floating equipment, the rise following the first fall is the first destructive part of the series of waves.

In some harbors there is normally a seiche whose period is determined by the size and depth of the harbor. If the seismic sea waves, even though small, should have a period about equal to that of the seiche, a resonance may be set up which would considerably magnify the usual oscillation and make it difficult to hold a ship to her moorings.

Waves travel outward from the epicenter at speeds which depend on depth. Though their speed may exceed 400 knots in the open ocean, they are relatively low and extremely long, hence will pass a ship unnoticed. They become dangerous on either nearby or distant shores where depths and shape of coastline conspire to augment them. When a seismic sea wave moves into shallow waters, its speed is diminished, its height is increased, and its front becomes more steep.

Submarine earthquakes produce waves that proceed at the velocity of sound waves. On reaching the surface, these oscillations may be felt on board a ship as a shock that violently rocks the vessel. The shock may be so severe that the sailors believe their ship has struck a reef. A ship receiving such a shock is not necessarily directly over the

location of the seismic disturbance as some such reports have been received from ships at considerable distances from epicenters located by seismological methods.

Improvements have been and are being made in the quick determination and reporting of earthquake epicenters, but no method has as yet been perfected for determining whether a sea wave will result from a given earthquake.

After the receipt of a seaquake warning, safety requires that ships put to sea and that people on shore retreat to high ground away from the water front. If lack of time or other reason makes it necessary for a ship to remain in a harbor, the following account of the experience of a United States naval vessel while lying in the port of Kahului, Maui, on April 1, 1946, may be helpful.

"At or about 0650 this date, the water in this harbor was observed to be receding seaward and the level dropped from 10 to 12 feet in a matter of 15 to 20 minutes. Later the tide surged back into the entrance of the harbor through the jetties with waves washing over the breakwater and, shortly thereafter, over the docks and land on the northeast side. There were officially recorded on the log 20 separate waves from 0650 until 0920. These waves started with great magnitude from 10 to 15 feet in height and lessened as time progressed. Due to the suddenness of the first tidal wave approaching it was impossible to get the vessel safely underway. Later the terrific currents around the harbor entrance made navigation extremely hazardous. In view of these facts, a decision was made to remain alongside the dock and maintain the safety of the ship by the use of mooring lines and wire.

"The vessel was moored starboard side to dock No. 2 and the strong currents within the harbor moved virtually in all directions, causing the ship to alternately move forward, aft, away from the dock, and then toward the dock. During this emergency, the manila lines and two 1⅝ towing hawsers were parted but were replaced immediately. Approximately 30 lines were parted, and all hands were made available at all times to cope with the situation. During the time our lines were being rapidly depleted through breakage, new ones were furnished by the Navy Supply Office and the Marine Corps. In the meantime, the harbor began filling with debris to such an extent that the main generators were shut down, due to the congestion of the sea chest. As a result, the handling of all lines was accomplished by hand, as all our winches and windlasses are operated electrically. It was feared at one time that in low water the vessel might rest on the bottom with a possibility of capsizing. . . . The damage caused is not sufficiently severe to prevent continued operation of the vessel."

**Extreme tides.**—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-lying regions, particularly at high stages of tide. Extreme low tides can result in depths which are considerably less than those shown on nautical charts. This storm type of "tidal wave" occurs expecially in coastal regions bordering on shallow waters which are subject to tropical storms. The destructive rise at Galveston on September 8, 1900, was of this type, raising the water level about 10 feet above mean high water.

**Seiche and surge.**—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 an external force such as strong winds, changes in barometric pressure, swells or seismic sea waves disturbing the equilibrium of the water surface. It

is found both in enclosed bodies of water and superimposed upon the tidal waves of the open ocean. When these external forces cause a short-period horizontal oscillation of 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 the eye to be completely undisturbed; heavy mooring lines have repeatedly been parted under such conditions. Pilots advise taut lines to reduce the effect of the surge.

An intensive study of wave and surge at the Naval Operating Base, Terminal Island, Calif., was completed in 1945. It indicated that in this particular area, oscillations with periods of from 1 to 3 minutes and with amplitudes as small as 0.2 foot induced ship motion capable of appreciable damage. Very little, if any, damage occurred to ships and piers during times of abnormally high waves which had periods of about 15 seconds. Since the investigations, a breakwater has been built to minimize the seiche and surge oscillations at Terminal Island.

**Swell.**—When a severe storm has raised a heavy sea, large wind waves emerge from the storm area. 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. This swell may be all but hidden by short irregular wind waves until it enters shallow water where it is often responsible for determining the character of the surf.

Offshore the swell is almost uniform in character, but it may be deflected by outlying islands so that a number of systems of swell approach shore.

The most striking transformation takes place, however, during the last few minutes, from the time when the wave "feels bottom" until it breaks on the beaches. Where the swell approaches a shoreline at an angle it tends to turn parallel to the shore. It bends into bays and around outlying points. As the wave is about to break, the crest rises sharply from the water surface, and the accumulated energy is thrown into the breaking wave. Transformations occur everywhere, and therefore the character of the surf varies considerably on adjacent beaches although caused by a uniform swell offshore.

# Corps of Engineers

The improvement of the rivers and harbors of the United States and miscellaneous civil works are under the charge of the **Corps of Engineers, United States Army.**

The miscellaneous civil works under the Corps of Engineers 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, the granting of permits for structures or operations in navigable waters, etc.

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 some places are defined and limited by the Corps of Engineers. They also publish regulations controlling the use of these areas.

These are enforced by the United States Coast Guard. 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 **Port Series,** publications of the Corps of Engineers and the United States Maritime Commission, are complete reports covering the principal seaports of the United States. They are primarily of interest to commercial and industrial concerns. The volumes of the series are wide in their scope and treat the subjects of particular interest to the shipping world, such as the physical features of each port (includes list of piers, wharves, and docks, with data), its organization and practices, regulations regarding the movement of ships and goods, port dues and charges, water and rail connections, and character and commerce of the hinterland.

The information in all these reports is generally prepared along similar lines; the general subjects covered include the following:

Port and harbor conditions.
Port customs and regulations.
Port services and charges.
Fuel and supplies.
Port and harbor facilities.
Communications.
The freight-rate situation.
Commerce reports.

The publication, **Port and Terminal Charges at United States Ports,** Miscellaneous Series, No. 1, prepared by the Corps of Engineers and sold by the Superintendent of Documents, gives detailed information regarding all port services and charges (including dockage, wharfage, storage, handling charges, etc.) at practically all ports of the United States. This publication includes the more important governmental regulations affecting the movement of vessels, freight, and passengers. This information includes a digest of the more important regulations of the United States Public Health Service (quarantine and hospital services), the Customs Service, and the Immigration and Naturalization Service; it also includes a list of Federal documents which vessels are required to have.

**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 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 the 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 menace to navigation, or dangerous to persons or property engaged in commerce on such waters, and for the loading, handling, and unloading of oil.

# Hydrographic Office

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 mercantile 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.

The Publications of the Hydrographic Office issued for the use of the mariners are: Charts of the high seas and all foreign waters, Sailing Directions for the same areas, Light Lists, Table of Distances between Ports, Radio Navigational Aids, Radio Weather Aids to Navigation, International Code of Signals, American Practical Navigator (Bowditch), and a number of books of navigational tables that are described in the American Practical Navigator and in the General Catalog of Hydrographic Office Publications. Periodic publications of the Hydrographic Office are: The Notice to Mariners (weekly), the Hydrographic Bulletin (weekly), the Daily Memorandum, and the Pilot Charts for various oceans (monthly or quarterly); see "Publications" at the end of this chapter.

# Weather Bureau

The **Weather Bureau** has charge of weather forecasting, including the issuance and display of weather forecasts, and storm, hurricane, cold-wave, frost, forest fire, and flood warnings. It collects and transmits marine meteorological information for the benefit of commerce and navigation, records and reports rainfall and temperature conditions, etc. Meteorological tables issued by this Bureau for various ports in this Coast Pilot are in the Appendix.

## Storm Signals

**Storm signals** are displayed by the United States Weather Bureau at numerous places on the coast of the United States and the Great Lakes. No visual displays of storm warnings are made at coastal stations in Alaska since distribution of the messages is effected by local radio broadcasts, as a rule.

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.

DAY SIGNALS:

Two pennants, red and white, and one flag, square, red, with black center, used either alone or in combination have the following meanings:

*Red pennant.*—Small craft warning indicates that moderately strong winds that will interfere with the safe operation of small craft are expected.

*Red pennant over flag.*—Northeast storm.

*White pennant over flag.*—Northwest storm.

*Flag over red pennant.*—Southeast storm.

*Flag over white pennant.*—Southwest storm.

*Two flags.*—Hurricane or whole gale.

NIGHT SIGNALS:

Red and white lanterns having the following meanings are used at night:

*Red lantern.*—Southeast storm.

*Red lantern over white lantern.*—Southwest storm.

*Two red lanterns.*—Northeast storm.

*Two red lanterns with white lantern between.*—Hurricane or whole gale.

*White lantern over red lantern.*—Northwest storm.

For additional information regarding weather broadcasts see Radio Services.

# Coast Guard

The **Coast Guard** has among its duties the following:

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.

Enforcement of navigation laws.

Enforcement of neutrality laws and regulations.

Enforcement of rules and regulations in relation to anchorage grounds.

Enforcement of the Oil Pollution Act.

Inspection of all vessels to insure safety to passengers and crews.

Aid to distressed mariners and saving of life and property from shipwreck.

Issuance of marine licenses and certificates.

Investigation of circumstances connected with shipwreck or collision at sea.

Destruction of derelicts.

Construction, operation, maintenance, and inspection of aids to navigation.

Publication of Light Lists and Radiobeacon Charts.

**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 Superintendent 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, visibility, etc., of lights, as well as descriptions of light structures and daymarks, buoys, fog signals, etc. 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; the mariner should keep his Light Lists as well as his charts corrected from changes announced in the weekly *Notice to Mariners*.

## Aids to Navigation

**Lights.**—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, due to 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 Visibility Table in the *Light Lists*. In the case of 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 (a) the vessel is at the limit of the geographic range and (b) the light is of considerable luminous power. If, under the same circumstances, the light cannot be made to dip, it is evident that (a) the vessel is well within the geographic range and may, in fact, be very close to the light, and (b) 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" table.

**Buoys.**—For the system of buoyage of the United States—color, shape, numbering, light characteristics, etc.—the mariner is referred to the preface of the *Light Lists*.

Buoys are liable to be carried away, shifted, capsized, etc.; lighted buoys may be extinguished; or whistling buoys may not sound as the result of storm, ice conditions, collision, or other accidents. The navigator should, if possible, check his position by bearings on fixed objects on shore and by soundings.

**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 force of the sound and must not assume that a signal is not sounding because they do not hear it.

All these considerations point to the necessity for the utmost caution when running near the land in a fog. Audible signals are useful, but the navigator's principal reliance should be on the lead or the echo-sounding apparatus, and in bearings of radio or submarine signals, if such are available.

**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 type is specially constructed so that the echo will be heard at a specified distance off. The second type is a flat surface which will reflect any sound striking it. Refer to the *Light Lists* 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 radiobeacons are given in the *Light List* and *H. O. Publication No. 205, Radio Navigational Aids.*

A vessel steering a course for a radiobeacon should observe the same precautions that apply 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, direction-finder observations may be unreliable. See page 26.

## Search and Rescue

**Search and rescue operations** of surface vessels and aircraft in distress or overdue are coordinated by the Coast Guard.

**Air-Sea Rescue planes** have special markings of chrome yellow on the wing tips and wing-tip floats. The cooperation of vessel operators with the Air-Sea Rescue planes may mean the difference between life and death of some seaman or aviator.

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 non-metallic 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 water line as possible. The largest metallic object available should be used.

## Instructions to Mariners in Case of Shipwreck

**General information.**—Coast Guard (lifesaving) stations and houses of refuge are located on the Atlantic and Pacific seaboards of the United States, the Gulf of Mexico, and the Lake coasts.

The stations are manned throughout the year by crews of experienced surfmen.

All lifesaving stations, except inactive stations, are fully supplied with boats, wreck guns, beach apparatus, and restoratives.

The lifesaving stations are provided with the International Code of Signals, and other means of visual signaling, and vessels can, by opening communication, be reported; or obtain the latitude or longitude of the station, where determined; or information as to the weather probabilities in most cases; or where facilities for the transmission of messages by telephone or telegraph are available, request for a tug or Coast Guard cutter will be received and promptly forwarded.

All services are performed by the lifesaving crews without other compensation than their pay from the Government.

Destitute seafarers are provided with food and lodging at the nearest station by the Government as long as necessarily detained by the circumstances of shipwreck.

The station crews patrol the beach from 2 to 4 miles each side of their stations between sunset and sunrise, and if the weather is foggy the patrol is continued through the day. A continuous lookout is also maintained at every station night and day.

Each patrolman carries warning signals. Upon discovering a vessel standing into danger he ignites one of these, which emits a brilliant red flame of about 2 minutes' duration, to warn her off, or, should the vessel be ashore, to let her crew know that they are discovered and assistance is at hand.

If the vessel is not discovered by the patrol immediately after striking, rockets, flare-up lights, or other recognized signals of distress should be used. If the weather be foggy, some recognized sound signal should be made to attract attention, as the patrolman may be some distance away at the other end of his beat.

Masters are particularly cautioned, if they should be driven ashore anywhere in the neighborhood of the stations, to remain on board until assistance arrives and under no circumstances should they attempt to land through the surf in their own boats until the last hope of assistance from shore has vanished. Often when comparatively smooth at sea a dangerous surf is running which is not perceptible 400 yards offshore, and the surf when viewed from a vessel never appears as dangerous as it is. Many lives have been lost unnecessarily by the crews of stranded vessels being thus deceived and attempting to land in the ship's boats.

The difficulties of rescue by operations from the shore are greatly increased in cases where the anchors are let go after entering the breakers, as is frequently done, and the chances of saving life correspondingly lessened.

**Rescue with the lifeboat or surfboat.**—The patrolman after discovering your vessel ashore and burning a warning signal, hastens to his station or the telephone for assistance. If the use of a boat is practicable, either the large lifeboat is launched from its ways in the station and proceeds to the wreck by water, or the lighter surfboat is hauled overland to a point opposite the wreck and launched, as circumstances may require.

Upon the boat reaching your vessel the directions and orders of the officer in charge (who always commands and steers the boat) should be implicitly obeyed. Any headlong rushing and crowding should be prevented, and the captain of the vessel should remain on board, to preserve order, until every other person has left.

Women, children, helpless persons, and passengers should be passed into the boat first.

Goods and baggage will positively not be taken into the boat until all are landed. If any be passed in against the remonstrance of the officer in charge, he is fully authorized to throw same overboard.

**Rescue with the breeches buoy or life car.**—Should it be inexpedient to use either the lifeboat or surfboat, recourse will be had to the wreck gun and beach apparatus for the rescue by the breeches buoy or the life car.

A shot with a small line attached will be fired across your vessel. Get hold of the line as soon as possible and haul on board until you get a tailblock with a whip or endless line rove through it. The tailblock should be hauled on board as quickly as possible to prevent the whip drifting off with the set or fouling with wreckage, etc. Therefore if you have been driven into the rigging, where but one or two men can work to advantage, cut the shot line, and run it through some available block, such as the throat or peak-halyards block, or any block which will afford a clear lead, or even between the ratlines, that as many as possible may assist in hauling.

Attached to the tailblock will be a tally board with the following directions in English on one side and French on the other:

"Make the tail of the block fast to the lower mast, well up. If the masts are gone, then to the best place you can find. *Cast off shot line, see that the rope in the block runs free*, and show signal to the shore."

As soon as your signal is seen, a 3-inch hawser will be bent onto the whip and hauled off to your ship by the lifesaving crew.

If circumstances permit, you can assist the lifesaving crew by manning that part of the whip to which the hawser is bent and hauling with them.

When the end of the hawser is got on board, a tally board will be found attached, bearing the following directions in English on one side and French on the other:

"Make this hawser fast about 2 feet above the tailblock, see all clear and that the rope in the block runs free and show signal to the shore."

*Take particular care that there are no turns of the whip line around the hawser. To prevent this, take the end of the hawser up between the parts of the whip before making it fast.*

When the hawser is made fast, the whip cast off from the hawser, and your signal seen by the lifesaving crew, they will haul the hawser taut and by means of the whip will haul off to your vessel a breeches buoy suspended from a traveler block, or a life car, from rings running on the hawser.

If the breeches buoy be sent, let one man immediately get into it, thrusting his legs through the breeches. If the life car, remove the hatch, place as many persons therein as it will hold (four to six) and secure the hatch on the outside by the hatch bar and hook, signal as before, and the buoy or car will be hauled ashore. This will be repeated until all are landed. On the last trip of the life car the hatch must be secured by the inside hatch bar.

In many instances two men can be landed in the breeches buoy at the same time by each putting a leg through a leg of the breeches and holding onto the lifts of the buoy.

Children when brought ashore by the buoy should be in the arms of older persons or securely lashed to the buoy. Women and children should be landed first.

In signaling as directed in the foregoing instruction, if in the daytime, let one man separate himself from the rest and swing his hat, a handkerchief, or his hand; if at night, the showing of a light and concealing it once or twice will be understood; and like signals will be made from the shore. (See also Wreck signals, below.)

Circumstances may arise, owing to the strength of the current or set or the danger of the wreck breaking up immediately, when it would be impossible to send off the hawser. In such a case a breeches buoy or life car will be hauled off instead by the whip or sent off to you by the shot line, and you will be hauled ashore through the surf.

If your vessel is stranded during the night and discovered by the patrolman—which you will know by his burning a brilliant red light—keep a sharp lookout for signs of the arrival of the lifesaving crew abreast of your vessel.

Some time may intervene between the burning of the light and their arrival, as the patrolman may have to return to his station, perhaps 3 or 4 miles distant, and the lifesaving crew draw the apparatus or surfboat through the sand or over bad roads to where your vessel is stranded.

Lights on the beach will indicate their arrival, and the sound of cannon firing from the shore may be taken as evidence that a line has been fired across your vessel. Therefore upon hearing the cannon make strict search aloft, fore, and aft, for the shot line, for it is almost certain to be there. Though the movement of the lifesaving crew may not be perceptible to you, owing to the darkness, your vessel will be a good mark for the men experienced in the use of the wreck gun, and the first shot seldom fails.

**Important.**—Remain by the wreck until assistance arrives from the shore, or as long as possible; if driven aloft, the inshore mast is the safest.

If not discovered immediately by the patrol, burn rockets, flare-up, or other lights, or if the weather be foggy, fire guns or make other sound signals.

Make the shot line fast on the deck or to the rigging to prevent its being washed into the sea and possibly fouling the gear.

Take particular care that there are no turns of the whip line around the hawser before making the hawser fast.

Send the women, children, helpless persons, and passengers ashore first.

Make yourself thoroughly familiar with these instructions, and remember that on your coolness and strict attention to them will greatly depend the chances of success in bringing you and your people safely to land.

**Wreck signals.**—The following signals have been adopted by the Coast Guard and will be used and recognized by the officers and employees as occasion may require:

Upon the discovery of a wreck by night, the lifesaving force will burn a red pyrotechnic light or a red rocket to signify, "You are seen; assistance will be given as soon as possible."

A red flag waved on shore by day, or a red light, red rocket, or red roman candle displayed by night, will signify, "Haul away."

A white flag waved on shore by day, or a white light slowly swung back and forth, or a white rocket, or white roman candle fired by night, will signify, "Slack away."

Two flags, a white and red, waved at the same time on shore by day, or two lights, a white and a red, slowly swung at the same time, or a blue pyrotechnic light burned by night, will signify, "Do not attempt to land in your own boats; it is impossible."

A man on shore beckoning by day, or two torches burning near together by night, will signify, "This is the best place to land."

Any of these signals may be answered from the vessel as follows: In the daytime, by waving a flag, a handkerchief, a hat, or even the hand; at night, by firing a rocket, a blue light, or a gun, or by showing a light over the ship's gunwale for a short time, and then concealing it.

## Distress Signals Used by Submarines and Aircraft

**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.

**Aircraft distress signals.**—The attention of all navigators of surface vessels is called to the procedure which will be used by United States aircraft in attracting the attention of surface vessels when their assistance is required in any case of distress at sea:

The aircraft will establish identification if necessary. It will then circle the ship at least once, fly across the bow of the ship at low altitude, opening and closing the throttle, and will head in the direction of distress scene, rocking the wings. This procedure will be repeated until the ship has acknowledged by following the aircraft. If possible, the aircraft will maintain visual contact with the ship until the latter sights the plane or ship in distress or the survivors thereof.

## Reports of Accidents

The licensed officer in command of any vessel shall report in writing and in person to the Coast Guard officer nearest the port of first arrival any accident to said vessel involving loss of life, or damage to property, and shall also report in like manner any casualty or loss of life from whatever cause of any person on board such vessel and any stranding or grounding, whether or not any damage has been sustained by the vessel.

## Use of Oil for Modifying the Effects of 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.

# Customs Service

The functions of the **Bureau of Customs** include the following: Enter and clear vessels; supervise the discharge of cargo; ascertain the quantities of imported merchandise, appraise and classify such merchandise, and assess and collect the duties thereon; control the custom warehousing of imported merchandise; enforce 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 volume are tabulated in the Appendix.

# Quarantine and Health

The **United States Public Health Service** is the governmental guardian of the public health, working to prevent the spread of human contagious and infectious diseases.

In addition to its other duties, this bureau administers hospitalization and outpatient treatment at marine hospitals and many other relief stations to legal beneficiaries of the Government; it administers the foreign and domestic quarantine laws, supervising the medical examination of immigrants and enforcing interstate quarantine laws.

American merchant seamen are entitled to medical relief obtainable through the Public Health Service at its established relief stations.

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An American 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 engaged in such care, preservation, or navigation.

**Relief stations** 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. 205, *Radio Navigational Aids*.

Quarantine regulations are given in the text under the names of the ports.

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 American consulates, and will be furnished to vessels upon application, either by officers of the service or by the bureau in Washington, D. C.

# Radio

**Radio supervision.**—The radio communications in the United States and its possessions, except the Panama Canal Zone, are controlled by the **Federal Communications Commission,** Washington, 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, D. C., or from its suboffices. For further details concerning the above rules and regulations consult the following publications:

Ship Radiotelegraph Safety Rules.
The Communications Act of 1934, with amendments.
Radio Navigational Aids. H. O. 205.

## Weather Broadcasts

The **major weather bulletins** issued four times daily by United States naval radio stations NSS, Washington, D. C., NPG., San Francisco, Calif., NBA, Balboa, C. Z., NPM, Honolulu, T. H., and the Civil Aeronautics Administration radio station WEK, New Orleans, La., include observations from ships at sea; weather reports from selected land stations; forecasts, storm advisories, and weather analyses for specific ocean areas. The information contained in these bulletins is suitable for preparing weather maps at sea.

The areas covered by the forecasts and storm advisories are as follows:

NSS, Washington, D. C.: Forecasts—North Atlantic north of 30° N. latitude and west of 30° W. longitude. Warnings—North Atlantic, Gulf of Mexico, and Caribbean Sea.

NPG, San Francisco, Calif.: Equator to 60° N. latitude and eastward of 150° W. longitude.

NBA, Balboa, C. Z.: North Atlantic, south of 25° N. latitude and west of 60° W. longitude; North Pacific south of 20° N. and east of 115° W.

NPM, Honolulu, T. H.: North Pacific, south of 45° N. and from 140° W. to 165° E. longitude.

WEK, New Orleans, La.: North Atlantic, Gulf of Mexico, and Caribbean Sea within the area between 35° N. and 10° N. latitude and west of 35° W. longitude.

**Local weather bulletins** containing forecasts, storm warnings when issued, and the weather summaries for specified areas are broadcast on schedule every day by certain Government and commercial radio stations.

**Storm warnings,** whenever they are issued by the United States Weather Bureau, are the subject of special broadcast by various Government and commercial radio stations of the mobile service.

**Emergency broadcasts by Naval Radio Stations.**—Storm warnings and notices concerning the safety of navigation at sea of an urgent nature are broadcast by United States Naval Radio Stations (those whose call letters begin with N) in accordance with the urgency, as follows:

A. Notices of an urgent nature, such as 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 above 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.

Transmission procedure:

A. Urgent messages as defined in A above:

The urgent signal (XXX) is transmitted on 500 kc., followed by QSW—kc. (Directing a shift to the frequency specified) and an appropriate phrase such as "tidal wave." After shifting, the message is transmitted on the wave specified.

B. Less urgent messages as defined in B above:

The safety signal (TTT) is transmitted on 500 kc, followed by QSW—kc., and an appropriate phrase such as "storm warning." After shifting, the message is transmitted on the frequency specified.

**Emergency broadcasts by Coast Guard Radio Stations.**—Storm and hurricane warnings, advisories, and other urgent marine information are broadcast by United States Coast Guard Radio Stations as follows:

A. By radiotelegraph:

1. One transmission immediately on receipt.
2. One transmission during each of the next two ensuing single-operator periods for merchant ships.

B. By radiotelephone:

1. One transmission on receipt.
2. Transmission at 2-hourly intervals thereafter for a period of 6 hours unless the information is canceled or superseded.

Transmission Procedure:

A. Radiotelegraph transmission will follow the same procedure as outlined above for naval radio stations.

B. Radiotelephone transmissions will be preceded by a preliminary announcement on 2670 kc., containing the appropriate radiotelephone equivalents ("PAN" and/or "SECURITY") of the urgent and/or safety signals together with instructions to shift to certain designated frequencies. After shifting, the message is transmitted on the frequency specified.

Storm warnings are broadcast in plain language and on the frequencies assigned to the service (maritime or aeronautical) for which they are intended.

Scheduled radiotelegraphic broadcasts of weather information affecting the coasts of the United States, Canada, and Alaska, are also made by Mexican and Canadian radio stations. Most Canadian coastal stations of the mobile service supply weather information on request only and without charge.

**Radiotelephonic 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. These broadcasts are followed immediately by reports of dangers, obstructions, and changes in aids to navigation.

This service gives to yachts, fishing vessels, tugboats, and any vessels within range,

equipped with an ordinary radio receiving set, having a band covering the frequency range of 2 to 3 megacycles, direct official weather information from the Weather Bureau, in plain language, and on regular schedules, such as is available to ships equipped with radiotelegraph apparatus and operator. This service should also prove of value to dock terminals, pilots, yacht clubs, etc.

These radiophone broadcasts are made twice daily at definite times and consist of the transmission of weather bulletins issued by the Weather Bureau. The bulletins contain forecasts (and storm warnings whenever they are issued) for specified regions and adjacent coastal waters.

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

North of the United States, radiophone weather as well as navigational information, is furnished on request and on schedule, without charge, by certain Canadian radio stations.

**West Indies.**—Radiotelephonic broadcasts of storm and hurricane warnings are made by various stations in the West Indies.

**Alaska.**—Weather broadcasts are made by Navy and Coast Guard radiotelegraph and radiophone stations at Adak, Anchorage, Ketchikan and Kodiak. For times and schedules of broadcasts, see *Radio Navigational Aids, H. O. 205.*

Circulars giving complete details relative to the broadcasting of weather information are published by the Weather Bureau.

These circulars, together with a card descriptive of storm warnings, may be obtained upon application to the Chief, United States Weather Bureau, Washington 25, D. C. Similar information is also given in *Radio Weather Aids to Navigation, H. O. 206.* These publications give the schedules with times and frequencies of weather broadcasts, together with tables for decoding as needed.

At Coast Guard stations, storm warnings are also broadcast on receipt and three times thereafter at 2-hour intervals, whenever they are issued by the Weather Bureau. The first of these special broadcasts begins on receipt of the message at the radio station and the broadcast is repeated on each odd or even hour thereafter for a period of 6 hours. If the warnings are superseded by another message from the Weather Bureau before the completion of three broadcasts, the later information is used and broadcast three times unless superseded again.

## 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 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, preceded by the ship's name, unsigned, and checked prepaid, United States Government.

If a copy of the international meteorological code is not on shipboard, the code will be found in *Radio Weather Aids to Navigation, H. O. 206*, or a copy may be obtained on application to the Uuited States Weather Bureau, Washington 25, D. C. If the code is unavailable, the message may be sent in plain language.

During the West Indies hurricane season, June 1 to November 30, ships in the Gulf of Mexico, Caribbean Sea, and southern North Atlantic Ocean are urged to cooperate with the Weather Bureau in order that more complete information may be supplied to ships and for the purpose of warning the inhabitants of coastal areas.

## 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 twenty-ninth 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 twenty-ninth second, as explained above. The dash on the beginning of the hour (shown as 59 minutes 60 seconds above) 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.

Repetitions: 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.

**Standard Frequency Broadcast Service of National Bureau of Standards.**—The technical radio services broadcast continuously by the National Bureau of Standards, Central Radio Propagation Laboratory, from its radio station WWV near Washington, D. C., include a total of eight radio frequencies, 2.5, 5, 10, 15, 20, 25, 30, and 35 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 are: (1) Standard radio frequencies, (2) time announcements, (3) stand-

ard time intervals, (4) standard audio frequencies, (5) standard musical pitch, 440 cycles per second, corresponding to A above middle C, (6) radio propagation disturbance warning notices.

| Megacycles | Power, kw. | Modulation | Audio frequencies cycles per second |
|---|---|---|---|
| 2. 5 | 0. 7 | 1 | 440 |
| 5 | 8. 0 | 1 | 440 |
| 10 | 9. 0 | 1 | 440 and 4000 |
| 15 | 9. 0 | 1 | 440 and 4000 |
| 20 | *8. 5 | 1 | 440 and 4000 |
| 25 | 0. 1 | 1 | 440 and 4000 |
| 30 | 0. 1 | 1 | 440 |
| 35 | 0. 1 | 1 | |

*0.1 kw., for first 4 work days after first Sunday of each month.

*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 time service of the United States Naval Observatory so that they mark accurately the hour and successive 5-minute periods.

Eastern standard time is announced in telegraphic code each 5 minutes. This provides a quick reference to correct time where a timepiece may be in error by a few minutes. The 0- to 24-hour system is used starting with 0000 at midnight. The first two figures give the hour and the last two figures the number of minutes past the hour when the tone returns. For example, at 4:55 p. m. or 1655 e. s. t., four figures (1, 6, 5, and 5) are broadcast in code. The code used, International Morse, is given below. The time announcement refers to the end of the announcement interval, i. e., when the audio frequencies are resumed. At the hour and half-hour the telegraph code is followed by the station announcement in voice.

*Numerals in International Morse Code*

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 0 | — — — — — | 2 | . . — — — | 4 | . . . . — | 6 | — . . . . | 8 | — — — . . |
| 1 | . — — — — | 3 | . . . — — | 5 | . . . . . | 7 | — — . . . | 9 | — — — — . |

*Standard time intervals.*—On each carrier frequency is a pulse of 0.005-second duration which occurs at intervals of precisely 1 second. The pulse consists of five cycles, each of 0.001-second duration, and is heard as a faint tick when listening to the broadcast. It may be used as an accurate time signal. On the fifty-ninth second of every minute the pulse is omitted. The 1-minute, 4-minute, and 5-minute intervals, synchronized with the seconds pulses, are marked by the beginning or ending of the periods when the audio frequencies are off.

*Radio propagation disturbance warning notice.*—A warning of radio propagation conditions is broadcast in code on each of the standard radio carrier frequencies at 19 and 49 minutes past the hour. If a warning is in effect, a series of "W's" (in the telegraphic code . — —) follow the time announcement; if no warning is in effect, a series of "N's" (in the telegraphic code — .) follow the time announcement.

A warning (W) means that radio propagation disturbance of the ionosphere storms

type is anticipated within 12 hours, or is in progress, with its most severe effects on radio transmission paths crossing the North Atlantic; i. e., those paths for which the control points of transmission lie in or near the northern auroral zone. Owing to increased auroral-zone absorption during the disturbance, however, it may be impossible to have usable transmission on any high frequency. Also, *during a period of radio propagation disturbance, direction-finder observations may be unreliable.* Sudden ionosphere disturbances characterized by simultaneous fade-outs in the entire high frequency spectrum, on paths in the daylight side of the world, are not covered by this warning.

If no warning (N) is in effect, satisfactory transmission should be possible on the normal frequencies for the different times of day.

*Distance range of reception.*—Of the radio frequencies of WWV, the lowest provides service to short distances, and the highest to great distances. Reliable reception is in general possible at all times throughout the United States and the North Atlantic Ocean, and reception at times throughout the world. One should select the frequency that gives the best reception at any particular place and time. This can usually be done by two methods:

A. By tuning to the different frequencies and selecting the one most suitable at that time. For nighttime conditions over the propagation path, lower frequencies than those used during the day are usually necessary because of the skip. Received intensities on usable frequencies are much greater for nighttime than for daytime conditions.

B. By making use of techniques of prediction of usuable frequencies.

Additional information on how to receive and utilize the service is given in the Bureau's Letter Circular, LC886, *Technical Radio Broadcast Services, Radio Station WWV,* obtainable on request. The Bureau welcomes reports on reception, methods of use, or special applications of the service. Correspondence should be addressed to Central Radio Propagation Laboratory, National Bureau of Standards, Washington 25, D. C.

## Navigational Warnings

Radiotelegraphic navigational warnings affecting the waters of the United States and possessions are compiled by the United States Hydrographic Office; the United States Coast Guard; and the North Atlantic International Ice Patrol, United States Coast Guard vessel. These warnings contain information of importance to the safety of navigation, such as the position of ice, derelicts; also defects and changes in aids to navigation, mine fields, etc., which are later published in the *Notice to Mariners.* Navigational warnings are also available via radiotelephone.

**Radiotelephone.**—Transmission by voice of radio navigational warnings is made immediately after the regular "radiotelephonic broadcast of weather information" by the same stations, following the same schedule and method of procedure.

These radiophone warnings contain the latest reports of local changes in aids to navigation such as are later published in the *Notice to Mariners* and the late and more important reports of obstructions to navigation in nearby waters as received from the Hydrographic Office and local sources.

Complete details relative to radio telephonic or telegraphic navigational warnings are given in *Radio Navigational Aids H. O. 205.*

## Ships in Distress

Radio-equipped vessels requiring assistance 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.

If the following information is included in the original request for assistance it will place the responsible Coast Guard officer in a position to determine immediately the types and number of vessels required to render adequate aid; thus greatly facilitating the work of the Coast Guard and avoiding any unnecessary delay in the dispatching of assistance.

1. Name, type, and nationality of vessel.
2. Position, course, and speed (including drift).
3. Nature of trouble and condition of vessel, sea, and wind.
4. Number of persons on board.
5. State whether or not Coast Guard assistance is required.

**Small craft in distress.**—Under the provision of the international regulations, which permit the use of any means available to a vessel or aircraft in distress to draw attention and obtain help, small commercial and private craft equipped with radiotelegraph or radiotelephone apparatus that cannot be operated on the international distress frequency of 500 kc. (600 m.) may usually obtain United States Coast Guard assistance by transmitting the distress signal or call and the message on the 2670 kc. (112 m.) frequency. Practically all Coast Guard units maintain a continuous watch on 2670 kc. and will answer emergency calls thereon, if heard.

**Medical advice by radio.**—Arrangements are made in various countries whereby mariners of all nationalities may obtain medical advice by radio. In the United States and its possessions free medical advice is obtainable through Government and commercial radio stations of its mobile service. The advice is given in language intelligible to the layman. For further details see *Radio Navigational Aids H. O. 205*.

## Loran and Radar

**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 to 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.

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 is experimenting with printing Loran lines of positions on various sailing and inshore navigational charts.

**Radar** (Radio Detection and Ranging) is among the most important of recent developments affecting the techniques of navigation. It promises to fill a long standing need of the merchant marine for 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, and the mariner's dream has only partly come true. Radar is merely a supplement and a highly valuable adjunct to existing equipment and navigational methods. Therefore, the mariner cannot forsake other piloting 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, of 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.*—For navigational purposes, radar has several advantages over other navigational aids, namely:

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.*—As a navigational aid, radar is subject to certain limitations and disadvantages, as follows:

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 obstruction 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 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" (see inside back cover) 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. Interpretation of the information presented on the scope is not always easy, even after considerable training.

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

5. Radar may be unreliable or unavailable during certain atmospheric conditions.

6. Radar requires transmission from the ship.

7. Charts do not always give information necessary for identification of radar echoes.

8. Small boats, buoys, etc., may not be detected, especially if a light sea is running, if they are near the shore or lack sufficient elevation to produce an echo. Most icebergs can be detected at distances equal to that at which a similar land mass could be seen, but *radar is not wholly reliable in the detection of growlers and floe ice large enough to damage or sink ships.*

9. Radar cannot distinguish the *nature* of small targets. One small object capable of returning an echo looks to radar just about the same as another.

*The limitations of each radar set should be thoroughly understood by those who are depending upon the information it presents.*

# 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 of the publications of that Bureau.

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.

The Catalog of the United States Coast and Geodetic Survey Nautical Charts, Coast Pilots, Tide Tables, Current Tables, and Tidal Current Charts is distributed free by the United States Coast and Geodetic Survey and its agents.

## Nautical Charts

Coasts of the United States, Territories, Possessions, and Philippine Islands:
Issued by the United States Coast and Geodetic Survey.
For sale by the Coast and Geodetic Survey, and its sales agents.

Mississippi River from the Head of Passes to Cairo:
Issued and for sale by the Mississippi River Commission, Vicksburg, Miss.

Illinois Waterway System:
Issued and for sale by the United States Corps of Engineers, Chicago, Ill.

Ohio River:
Issued and for sale by the United States Corps of Engineers, Cincinnati, Ohio.
Great Lakes, Lake Champlain, New York State Canals, and the St. Lawrence River, St. Regis to Cornwall, Canada:
Issued and for sale by the United States Lake Survey, Detroit, Mich. 5
New York State Canal System:
Issued and for sale by the Superintendent of Public Works, Albany, N. Y.
Foreign countries:
Issued by the United States Hydrographic Office.
For sale by the Hydrographic Office and its sales agents. 10

## Coast Pilots

Coasts of the United States, Territories, Possessions, and Philippine Islands:
Published by the United States Coast and Geodetic Survey.
For sale by the Coast and Geodetic Survey, and its sales agents.
Foreign countries: 15
Published by the United States Hydrographic Office.
For sale by the Hydrographic Office and its sales agents.

## Tide Tables

Atlantic Ocean, and Pacific and Indian Oceans—Two volumes:
Published by the United States Coast and Geodetic Survey. 20
For sale by the Coast and Geodetic Survey and its sales agents.

## Current Tables

Atlantic Coast, North America, and Pacific Coast, North America, and Philippine Islands—Two volumes:
Published by the United States Coast and Geodetic Survey. 25
For sale by the Coast and Geodetic Survey and its sales agents.

## Tidal Current Charts

Boston Harbor, Narragansett Bay to Nantucket Sound, Long Island and Block Island Sounds, New York Harbor, San Francisco Bay, Puget Sound Northern Part, Puget Sound Southern Part—Seven volumes: 30
Published by the United States Coast and Geodetic Survey.
For sale by the Coast and Geodetic Survey and its sales agents.

## Water Temperatures and Densities

Surface Water Temperatures, Atlantic and Gulf Coasts (TW 1).
Surface Water Temperatures, Pacific Coast (TW 2). 35
Density of Sea Water, Atlantic and Gulf Coasts (DW 1).
Density of Sea Water, Pacific Ocean (DW 2).
Published by and free on application to the United States Coast and Geodetic Survey.

## Notice to Mariners

Notices to Mariners are published weekly and may be secured free of charge from the United States Hydrographic Office.

## Light Lists

North Atlantic Coast, South Atlantic Coast, Intracoastal Waterway, Pacific Coast:
Published by the United States Coast Guard.
For sale by the Superintendent of Documents and his sales agents.
Foreign countries:
Published by the United States Hydrographic Office.
For sale by the Hydrographic Office and its sales agents.

## Radio

Charts of Radiobeacon System, Atlantic and Gulf Coasts, Pacific Coast, and Great Lakes:
Free on application to the United States Coast Guard.
Radio Circulars giving schedules, frequencies, and data included in weather broadcasts.
Free on application to the Chief, United States Weather Bureau.
Radio Navigational Aids (H. O. Pub. No. 205).
Radio Weather Aids to Navigation (H. O. Pub. No. 206).
Published by the United States Hydrographic Office.
For sale by the Hydrographic Office, and its sales agents.
List of radiobeacons:
See Light Lists published by the United States Coast Guard.
Hydrographic Bulletin:
Issued weekly by the United States Hydrographic Office.
International Code of Signals [American Edition] Vol. II—Radio (H. O. Pub. No. 88):
Published by the United States Hydrographic Office.
For sale by the Hydrographic Office and its sales agents.
International Convention for the Safety of Life at Sea, London, 1929 (affecting radio), Extracts From:
May be obtained from United States Federal Communications Commission.
Communications Act of 1934:
For sale by Superintendent of Documents.
Ship Radio Telegraph Safety Rules:
From the United States 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 United States Federal Communications Commission.

## Weather

Instructions to Marine Meteorological Observers. (W. B. Circular M.): 5
Published by the United States Weather Bureau.

Preparation and Use of Weather Maps at Sea. (W. B. Circular R.):
Published by the United States Weather Bureau.

Codes for Cloud Forms and States of the Sky. (W. B. Circular S.):
Published by the United States Weather Bureau. 10
For sale by Superintendent of Documents. These publications will also be furnished free of charge on request to ships' officers cooperating with the Weather Bureau.

## Miscellaneous

American Practical Navigator [Bowditch] (H. O. Pub. No. 9):
Published by the United States Hydrographic Office. 15
For sale by the Hydrographic Office, the Superintendent of Documents, and their agents.

The American Ephemeris and Nautical Almanac:
Published by the United States Naval Observatory.
For sale by the Superintendent of Documents and his sales agents.

International Code of Signals [American Edition] Vol. I—Visual (H. O. Pub. No. 87): 20
Published by the United States Hydrographic Office.
For sale by the Hydrographic Office and its sales agents.

Pilot Rules for Certain Inland Waters of Atlantic and Pacific Coasts and Coast of Gulf of Mexico:
Published by and free on application to the United States Coast Guard.

Pilot Rules for Rivers whose Waters Flow into the Gulf of Mexico and Their Tributaries and Red River of the North: 25
Published by and free on application to the United States Coast Guard.

Pilot Rules for Great Lakes and Their Connecting and Tributary Waters:
Published by and free on application to the United States Coast Guard.

Navigation Laws of the United States: 30
Published by the United States Coast Guard.
For sale by the Superintendent of Documents.

Rules and Regulations relating to the Navigable Waters of the United States:
Published by the United States Corps of Engineers.
For sale by the Superintendent of Documents. 35

General Rules and Regulations Prescribed by the Board of Supervising Inspectors—four volumes:
Published by and issued free on application to the United States Coast Guard.

Laws Governing Steamboat Inspection:
Published by and issued free on application to the United States Coast Guard.

Annual Report of the Chief of the United States Corps of Engineers: 40
Part 1.—Report upon river and harbor improvement work, including flood-control operations.
Part 2.—Commercial Statistics, Water-borne Commerce of the United States.
These volumes may be consulted at the libraries which are public depositories.

Port Series—of the United States:

Prepared by the Board of Engineers for Rivers and Harbors, United States Department of the Army, in cooperation with the United States Maritime Commission.

For sale by the Superintendent of Documents.

Port and Terminal Charges at United States Ports:

Prepared by the Board of Engineers for Rivers and Harbors, United States Department of the Army, in cooperation with the United States Maritime Commission.

For sale by the Superintendent of Documents.

Shipping Charges at United States and Foreign Ports; Consular Services and Charges:

Prepared by the Board of Engineers for Rivers and Harbors, United States Department of the Army in cooperation with the United States Maritime Commission.

For sale by the Superintendent of Documents.

CHAPTER 2

# Local General Information

## Description

FROM Chesapeake Bay to Cape Florida the general character of the coast is low and sandy, backed by woods. Southward of Cape Henry the highest land near the coast is Mount Cornelia, 63 feet high, just northward of the entrance to St. Johns River. From Cape Florida to Loggerhead Key the coast may be considered as being formed by a long chain of small islands known as Florida Keys; off and extending nearly parallel to the keys are the Florida Reefs.

The coastline of Virginia from Cape Henry southward to the boundary of North Carolina is firm land for 13 miles; then it becomes a barrier beach, covered with sand dunes, for 11 miles. The boundary between Virginia and North Carolina is the only marked boundary on this section of the coast. The easternmost boundary monument is a granite shaft 6 feet high about 0.5 mile west of the beach.

The coast line of North Carolina is a long barrier beach. The islands are known as *banks*. The banks are constantly shifting sand dunes varying in height. Three capes, with their offshore shoals, project from the islands, namely: Hatteras, Lookout, and Fear. Behind the barrier beach a chain of sounds including Currituck, Roanoke, Albemarle, Pamlico, Core, and Bogue, stretch along the State's entire 300 miles of coastline.

Bordering the sounds on the mainland is a belt from 30 to 80 miles wide, where the land is level and sometimes swampy. On the north a portion of the Great Dismal Swamp spreads across the border of Virginia into North Carolina. Between Albemarle Sound and Pamlico River the swamplands are locally known as *dismals* and *pocosins*. They occur on the divides or watersheds between the rivers and sounds. In the southeast section of the State are the *savannas*, treeless prairie lands with a thick growth of grass and wild flowers; they have been formed by a lack of drainage and a close impervious soil.

Between Little River Inlet, the boundary between the States of North and South Carolina, and Winyah Bay, the coast is practically an unbroken beach. Cape Romain,

just south of Winyah Bay, and its off-making shoal form the southern point of the cusp-like indentation which had its northern point at Cape Fear.

From Winyah Bay to Savannah River, the boundary between the States of South Carolina and Georgia, the coastline is a border of sandy barrier islands. The large sounds so characteristic of the North Carolina coast are missing.

South Carolina has several large rivers which are or were navigable for a considerable distance back from the coastline.

The coastline of Georgia between Savannah River on the north and St. Marys River on the south is partly submerged at flood tide, and is broken by tidal rivers and marshes covered with dense grasses and sedges. Of the fringe of sandy islands off the coast of Georgia, the most important are Tybee, Wassaw, Ossabaw, St. Catherines, Sapelo, St. Simons, Jekyll, and Cumberland.

On the islands along the coast of Georgia many of the old structures are made of material called *tabby*. This building material, used by the Spanish and English for walls of buildings, is made by grinding burned oyster shells with sand, shells, and water.

The coastline of Florida is a long, low, barrier sand beach, from the border of Georgia south to Cape Florida. Many of the leading tourist towns have been built on this beach, while the business districts are often on the mainland.

Under the sand and the lagoons is a limestone called *coquina*, which is soft while in its native state, but becomes a hard building stone when exposed to the air.

Below Cape Florida the coast is formed by a chain of small islands, known as the Florida Keys, off and nearly parallel to which are the Florida Reefs. These keys and reefs are of sand, shell, and coral formation. The low, mangrove-covered keys extend for about 134 miles in a southwesterly curve to Sand Key Light, and about 58 miles in a westerly direction to Loggerhead Key.

## Coastwise Navigation

This section describes those factors which relate to the navigation of vessels along the outer coast.

**Depths.**—Between Chesapeake Entrance and Jupiter Inlet, frequent use of the sounding apparatus will give the mariner timely warning of his approach to the land from seaward.

Northward of Hatteras the 20-fathom curve is from 13 to 45 miles offshore, but inside of 15 fathoms the depths are irregular and many holes of limited extent lie inside the general limits of corresponding depths; 10 and 14 fathoms are found in places only 1.5 miles from shore. This irregularity of depth is apt to confuse the mariner and lead him into danger in thick weather; the greatest caution should therefore be used inside of a depth of 20 fathoms. By keeping over 5 miles from the beach all dangers will be avoided, but the strong currents which sometimes set along the shore must be considered, especially after a gale.

Southeastward of Cape Hatteras, and off the end of Hatteras Shoals which extend seaward about 8 miles, the 20-fathom curve is from 12 to 15 miles offshore, and the 30-fathom curve is but a short distance farther. In thick weather, soundings of 20 fathoms or less should warn the mariner to keep offshore.

From Cape Hatteras to Jupiter Inlet, the 20-fathom curve is fairly regular and for a greater part of the distance is from 40 to 50 miles offshore. Northward of St. Johns River, the water shoals uniformly to the 10-fathom curve, which, excepting in the two great bights between Cape Hatteras and Cape Fear, is from 10 to 20 miles offshore. Vessels bound for any of the harbors between Cape Fear and St. Johns River should approach the land with caution when in 10 fathoms of water; inside the 10-fathom curve depths are irregular and spots of 5 fathoms or less will be found from 6 to 12 miles offshore. In thick weather vessels standing along the coast should keep a general depth of 10 fathoms between Cape Fear and St. Johns River.

In a heavy sea, depths of less than 6 fathoms show discolored water; deep-draft vessels should be cautious about passing over such spots.

Southward of St. Johns River, the 20-fathom curve draws inshore gradually and at Jupiter Inlet is only 4 miles from the beach, and the 100-fathom curve a little over 8 miles. Southward of Jupiter Inlet, both curves draw closer inshore, and along the Florida Reefs the 20-fathom curve is close in to the reefs, while the 100-fathom curve is at an average distance of about 7 miles outside the reefs. The 10-fathom curve between St. Johns River and Jupiter Inlet is irregular and of no use in determining distance from shore. Approaching Florida Reefs southward of Jupiter Inlet, soundings are of little use unless taken frequently as the water shoals rapidly from seaward.

When approaching the Bahama Banks along the Straits of Florida, the discolored water is the best indication the mariner has to warn him of shoal water; the 100-fathom curve at some points is only 1 or 2 miles from the shoal water of the banks.

The Straits of Florida extend from about latitude 27°25′ N., between Little Bahama Bank and the east coast of Florida, southward and westward to Dry Tortugas, a distance of about 300 miles. They are between the Florida coast and its outlying keys and reefs on the west and north, and the Bahama Banks, Salt Key Bank, and the coast of Cuba on the east and south. Their width is variable, the following being the narrower portions: Jupiter Inlet to Little Bahama Bank, 48 miles, greatest depth about 500 fathoms; Fowey Rocks to Great Bahama Bank, 41 miles, greatest depth about 480 fathoms; Tennessee Reef to Salt Key Bank, 47 miles, greatest depth about 500 fathoms. Westward of Salt Key Bank the straits have a nearly uniform width of about 80 miles, and a depth of about 1,000 fathoms.

The great velocity of the Gulf Stream and the closeness to which it at times approaches the reefs and banks render the navigation of the straits by sailing vessels bound south and west both tedious and dangerous. The difficulties are enhanced by the lack of convenient anchorages and by the abrupt rise of the banks and reefs from deep water. This combination of unfavorable conditions influences sailing vessels bound south and west to avoid the straits as far as possible by entering through the Providence Channels, and if of sufficiently light draft, crossing the Great Bahama Bank. Bound northward, the strong current is greatly in their favor and more than counterbalances the difficulties of navigation. By the aid of the lights and daybeacons, steamers, or sailing vessels if they have a leading wind, bound southward, may skirt the reefs in safety sufficiently close to partly avoid the adverse current, and sometimes find a favorable eddy after passing Alligator Reef. Steamers drawing less than 10 feet, when abreast Cape Florida, may pass inside the reefs and follow Hawk Channel to Key West, avoiding the adverse current of the Gulf Stream, and finding comparatively smooth water with all winds.

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The Straits of Florida lie within the region of the northeast trades, but these winds do not blow over the Straits with the same regularity as over the open ocean. The prevailing winds are from the eastward, however, during the entire year—from southward of east in summer, and from northward of east in winter. The straits are in or near the track of West Indian hurricanes. In the winter heavy northers are encountered. They blow generally from northwest to north, hauling, as a rule, northward and eastward, and rarely backing. Their approach is nearly always heralded by a heavy bank of clouds in the northwest, preceded by light airs from the contrary direction, and accompanied by a falling barometer; they commence with a violent squall, gradually settling to a fresh gale. Vessels caught in the narrower parts of the Straits in these gales are subject to a most trying sea. Southeast gales occur at intervals also during the winter. They usually commence to blow at about east-northeast, freshening rapidly with a falling barometer and a rising thermometer, and, hauling southward and eastward, obtain their greatest force at about southeast.

**Anchorages and inlets.**—Southward of Cape Henry the more important harbors, either commercially or as places of refuge, are Lookout Bight, Beaufort Inlet, Cape Fear River, Winyah Bay, Charleston Harbor, Port Royal Sound, Savannah River, Sapelo Sound, St. Simons Sound, Cumberland Sound, St. Johns River and Jacksonville, Port of Fort Pierce—Fort Pierce Inlet, Port of Palm Beach—Lake Worth Inlet, Port Everglades, Miami, and Key West.

**Harbor entrances.**—The entrance to every harbor on this stretch of the coast is more or less obstructed by a shifting sand bar over which the channel depth is changeable. The entrance channels of the larger and more important harbors have been improved by dredging; in some cases jetties have been built from both sides of the entrance.

The buoys on many of the bars are not charted because they are moved from time to time to indicate the changing channel. They are liable to be dragged out of position and cannot always be replaced immediately, so a stranger must use the greatest caution. If possible, a stranger should enter a harbor or inlet on a rising tide.

The tidal currents have considerable velocity in all of the entrances, and their direction is affected by the force and direction of the wind; sailing vessels entering the harbors and sounds require a fair working breeze during the ebb.

In easterly gales the sea breaks on most of the bars, and no stranger should then attempt to enter such harbors without the assistance of a pilot.

**Aids to navigation.**—Lightships are off Chesapeake Bay, Diamond Shoals, Frying Pan Shoals, Savannah River, and St. Johns River. Lights are on the dangerous capes, at the entrances of the harbors, and along the Florida Reefs. The numerous aviation lights along this coast should not be confused with the marine navigation lights. For a complete description of all lighted aids, buoys, and daybeacons see the *Light List, Atlantic and Gulf Coasts of the United States.*

All lightships and many light stations are equipped with radiobeacons, particularly in the vicinity of the entrances to the larger ports and on the capes.

All medium-frequency radio direction-finder stations have been discontinued along this coast. A system of high-frequency radio direction-finder stations has been established for use of vessels in distress and in conjunction with search and rescue operations.

This section of the coast is well covered by Loran. Vessels equipped to use this aid should not neglect it when making landfalls.

**Rules of the Road.**—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, apply to the "inland waters" of the Atlantic coast of the United States as defined by the "General Rule" except at the entrances to Chesapeake Bay; Charleston Harbor; Savannah River; St. Simons Sound, St. Andrews Sound, and Cumberland Sound; St. Johns River, Florida; Florida Reefs and Keys from Miami to Marquesas Keys, where specific boundary lines for the high seas have been described and are given in the descriptions of those places.

**General rule for inland waters.**—At all buoyed entrances from seaward to bays, sounds, rivers, or other estuaries for which specific lines are not described, the waters inshore of a line approximately parallel with the general trend of the shore, drawn through the outermost buoy or other aid to navigation of any system of aids, are inland waters, and upon them the Inland Rules and pilot rules made in pursuance thereof apply.

**Danger signal information.**—During the war it came to the attention of the Coast Guard that many American masters and officers, when on the high seas and danger of collision appeared imminent, used the danger signal of four or more short blasts of the whistle as provided by Article 18, Rule 3 of the Inland Pilot Rules. The International Rules for the Prevention of Collision provide no danger signal, and the use of four or more short blasts of the whistle is neither appropriate nor applicable. 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.

**Coastwise traffic.**—This section of the coast has considerable traffic in all types of vessels. When bound southward the vessels attempt to avoid the full northerly set of the Gulf Stream and therefore either run eastward or westward of the current. When northbound the current of the Gulf Stream is utilized. The routes generally followed are given in Chapter 3.

**Wrecks.**—Many vessels have been wrecked along this coast as the result of collision, foundering, torpedoing, fire, and other causes. Prior to 1941, most of the offshore wrecks had been located and wire-dragged to determine the least depth over their highest projecting part. Since 1945, work on the location and dragging of the vessels lost during the war has been resumed and is expected to be continued until completed. Dangerous wrecks for the most part are marked by buoys of various colors and shapes and often showing a quick flashing or an interrupted quick flashing light.

**Fish weirs.**—Regulations limiting the areas within which fish weirs may be established are prescribed by the Secretary of the Army, and the supervision of those structures is controlled by the Chief of Engineers, Corps of Engineers. The areas within which fish weirs are permitted are shown on the 1200 series charts and where no 1200 chart covers the area, they are shown on the next larger scale chart. The exact location of the weirs within the designated areas is not shown on the charts.

Along the outer coasts the limits of the areas are not marked. 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:

The lights shall be displayed between sunset and sunrise. They shall be placed at each end of the structure excepting where the inner end terminates in such a situation that there is no practicable navigation between it and the high-water line of the adjacent coast, in which case no inner light shall be displayed. The outer light shall be white and the inner light shall be red. The size, capacity, and manner of maintenance of the lights shall 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 in line with no navigable passage between them, they will be considered, for lighting purposes, as one structure.

**Crawfish traps.**—The inshore waters described in this Pilot contain numerous crawfish traps or pots. Painted wooden buoys, secured by small lines, float on the surface. These buoys extend from the shore out to, and in some cases across, the alongshore sailing routes. Small yachts and motorboats are cautioned against fouling, which is liable to result in a fouled wheel or sprung shaft or propeller.

**Tropical waters.**—The most remarkable feature is the exceeding clearness of the sea water, enabling the bottom to be seen from aloft at considerable depths and at some distance. The navigation of the banks is consequently conducted almost entirely by the eye, but care must be taken not to run with the sun ahead of the vessel as that prevents the banks from being seen.

The charts indicate clearly the positions of the many shoal heads; but considerable experience is required in identifying the patches by the color of the water. Small clouds, moving slowly and known to the pilots as *flyers*, are apt to deceive the inexperienced, their reflection on the surface of the sea over the clear white sandy bottom having every appearance of rocky shoals. It is prudent to avoid a dark spot.

**Bank Blink** is a phenomenon in tropical waters described as a bright reflected light hanging over the clear white sandbanks, serving to point them out from a considerable distance. From lengthy experience, it has been found to be untrustworthy, however, and should not be depended on in place of a lookout aloft. Soundings, the reckoning, and especially the latitude, should be unremittingly checked.

**Hurricane seamanship.**—This item is based on Instructions to the Pacific Fleet by Admiral Nimitz, February 13, 1945. The West Indian hurricane, the counterpart of the Western Pacific typhoon, may well be encountered anywhere in the Caribbean, Gulf of Mexico, and in much of the Western Atlantic. The same principles of seamanship are applicable to the more frequent and extensive, though less violent, North Atlantic extra-tropical storms.

Many fine ships, crews, and cargoes have been needlessly lost as the result of taking too little heed of unmistakable weather symptoms in sufficient time to enable the master to take evasive or preventive action.

A hundred years ago, a ship's survival depended almost solely on the competence of her master and on his constant alertness to every hint of change in the weather. To be taken aback or caught with full sail on by even a passing squall might mean the loss of spars or canvas; and to come close to the center of a genuine hurricane or typhoon was synonymous with disaster. While to be taken by surprise was thus serious, the facilities for avoiding it were meager. Each master was dependent wholly on himself for detecting the first symptoms of bad weather, for predicting its seriousness and movement, and for taking the appropriate measures to evade it if possible and to battle through it if it passed near to him. There was no radio by which weather data could be

collected from all over the oceans and the resulting forecasts by expert meteorologists broadcasted to him while afloat on the high seas. There was no one to tell him that the time had now come to strike his light sails and spars, and snug her down under close reefs or storm trysails. His own barometer, the force and direction of the wind, and the appearance of sea and sky were all that he had for information. Ceaseless vigilance in watching and interpreting signs, plus a philosophy of taking no risk in which there was little to gain and much to be lost, was what enabled him to survive.

Seamen of the present day should be better at forecasting weather at sea, independently of the radio, than were their predecessors. The general laws of storms and the weather expectancy for all months of the year in all parts of the world are now more thoroughly understood, more completely cataloged, and more readily available in various publications. Weather and hurricanes are described later in this chapter. The Pilot Charts, available to all ships, give excellent information as to the probable incidence and movements of cyclonic storms.

A navigator is held culpable if he neglects "log, lead, and lookout" through placing blind faith in radio fixes. Likewise, a seaman is culpable if he regards personal weather estimates as obsolete and assumes that if no radio storm warning has been received then all is well, and no local weather signs need cause him concern.

Mariners are reminded to give full consideration to the adverse weather likely to be encountered in the West Indian hurricane area during this season. In this connection, masters should refresh themselves as to ship-handling in heavy weather. In order to know what outside weather reports are broadcast and what he should be getting, the mariner should be familiar with *Radio Weather Aids to Navigation* (H. O. 206).

Masters should be fully aware of the stability characteristics of their ships, particularly the effect of free-liquid surfaces upon stability.

Any, and possibly all, of the following conditions can be expected if the vessel is so poorly handled that she finds herself within the destructive area of a severe cyclonic storm.

1. Visibility reduced to 1,000 yards or less and sea becoming mountainous and nearly indescribable.

2. Ship not merely rolling, but heeled far over continually by the force of the wind, thus leaving very little margin for further rolling to leeward.

3. Ingress of water through ventilators and other topside openings.

4. Switchboards and electrical machinery shorted and drowned out and possible fires resulting from short circuits.

5. Free water over engineroom or fireroom floor plates and probably in other spaces.

6. Loss of steering control, failure of power and lighting, and stoppage of main engines. Loss of means of radio communication.

7. High winds and seas carrying away masts, funnels, boats, davits, and deck structures, and generally making it impossible for crew to secure gear adrift or to jettison deck cargo or top-side weights.

8. The storm "taking charge" and making impossible various evasive and security measures which might have been effective at an earlier stage.

An experienced and prudent seaman, analyzing the foregoing, will readily appreciate that a vessel so situated is indeed in dire circumstances. He will also realize that it is now too late to prevent serious damage or actual foundering. At the same time, he

will fail to understand why the vessel was allowed to continue until such dangerous conditions became unavoidable and the vessel placed in jeopardy.

It is emphasized that in bad weather, as in other situations, safety and fatal hazard are not separated by any sharp boundary line but shade gradually from one into the other. There is no "little red light" which is going to flash on and inform the master that from now on there is extreme danger from the weather and that measures for the ship's safety must now take precedence over further efforts to continue the voyage without delay or deviation. This time of decision will always be a matter of personal judgment. Naturally, no master is going to cut thin the margin between staying afloat and foundering, but he may nevertheless unwittingly pass the danger point even though his ship is not yet *in extremis*. A ship that keeps going as long as the severity of wind and sea has not yet come close to capsizing her or breaking her in two may nevertheless become helpless to avoid catastrophe later if things get worse. By then she may be unable to steer any heading but in the trough of the sea, or may have her steering gear, lighting, and main engines disabled, or may be helpless to secure or jettison deck cargo. The time for taking measures for a ship's safety is while still able to do so. Nothing is more dangerous than for a seaman to be grudging in taking precautions lest they turn out to have been unnecessary. Safety at sea for a thousand years has depended on exactly the opposite philosophy.

## Coastal Currents

It appears that, except during northerly and northeasterly winds, a current of about ½ knot average velocity, setting northeastward with the trend of the coast, may be expected outside the 10-fathom curve between Cape Canaveral and Cape Hatteras. Farther off shore the velocity of the northeastward flow increases as the axis of the Gulf Stream is approached. Current observations taken at lightships off Cape Fear, Cape Lookout, and Cape Hatteras show that at those locations the northeastward current is much stronger in summer than in winter.

Strong currents are produced by the wind along the coast during northeasterly and southerly gales, reversing or greatly increasing the normal current. Their velocity and direction depend upon the direction, strength, and duration of the wind. Details of the velocities and directions of currents caused by winds for a number of locations along the Atlantic coast are given in the *Atlantic Coast Current Tables*.

The following is a more detailed statement of the currents along the coast. The largest current velocities likely to occur during storms at a number of offshore locations are given as follows: Tail of the Horseshoe lighted whistle buoy TH, 3 knots; Chesapeake Lightship, 1½ knots; Diamond Shoal Lighship, 4½ knots; Ocracoke Inlet, 3½ miles south-southeast of, 2 knots; Cape Lookout Shoals lighted whistle buoy, off Cape Lookout, 3 knots; Frying Pan Shoals lighted whistle buoy 2A FP, off Cape Fear, 2½ knots; Frying Pan Shoals Lightship, off Cape Fear, 3 knots; Charleston lighted whistle buoy 2C, off Charleston Harbor Entrance, 1½ knots; Martins Industry, 5 miles east of, off Port Royal Sound, 2 knots; Savannah Lightship, off Savannah River Entrance, 1½ knots; Brunswick lighted whistle buoy 2B, off St. Simons Sound, 1½ knots; and St. Johns Lightship, off St. Johns River Entrance, 2 knots.

Additional detailed information including data from which current predictions may

be readily obtained for most of the above-named locations are given in Tables 2 and 5 of the *Atlantic Coast Current Tables.*

Detailed results of analyses of extensive current observations taken at about 50 lightship stations (many of which have been discontinued) along the Atlantic coast of the United States are given in Coast and Geodetic Survey Special Publication No. 230, *Coastal Currents Along the Atlantic Coast of the United States.* This publication is sold only by the Superintendent of Documents, Washington 25, D. C., price 75 cents.

Detailed results of current surveys of the St. Johns River, the Savannah River, and the entrances and inside waterways between these rivers, including tidal current charts showing for these areas the hourly current velocities and directions referred to times of high and low waters, are contained in Coast and Geodetic Survey Special Publication No. 211, *Currents in St. Johns River, Savannah River, and Intervening Waterways.* The price of this publication is 60 cents per copy. It is sold only by the Superintendent of Documents, Washington 25, D. C.

The **Gulf Stream** is the most famous of the principal ocean currents. The name was first used by Banjamin Franklin in 1769. In general, as the swift current of the Gulf Stream issues into the sea through the Straits of Florida, its waters are characterized by a deep blue color, high salinity, great clearness, high temperature in the upper stratum, and absence of phosphorescence. The eye can penetrate it to considerable depths. At its junction with ordinary sea water the edges may frequently be recognized in moderate weather by the ripples which occur as well as by the difference in color. Northward, in the cooler regions, the evaporation from its surface, when the temperature of the air is lower than that of the water, is apparent to the eye. In addition, in the lower latitudes, the stream carries with it a quantity of *gulf weed*, which is olive brown, branched seaweed with berrylike air vessels. Surface debris such as logs and other material with small depth tend to drift toward the eastern edge of the stream but not toward the western edge.

The region where the Gulf of Mexico narrows to form the channel between Florida Keys and Cuba may be regarded as the head of the Gulf Stream. From this region the stream sets eastward and northward through the Straits of Florida, and after passing Little Bahama Bank it continues northward and then northeastward, following the general direction of the 100-fathom curve as far as Cape Hatteras. The flow in the Straits is frequently referred to as the **Florida Current.**

Shortly after emerging from the Straits of Florida, the stream is joined by the **Antilles Current,** which flows northwesterly along the open ocean side of the West Indies before uniting with the water which has passed through the straits. The Antilles Current, like the Gulf Stream, carries warm, highly saline water of clear indigo blue. The union of the two currents gives rise to a broad current possessing about the same characteristics as the Gulf Stream within the Straits except that the velocity is much reduced. Beyond Cape Hatteras the combined current turns more and more eastward under the combined effects of the deflecting force of the earth's rotation and the eastwardly trending coastline, until the region of the Grand Banks of Newfoundland is reached.

Eastward of the Grand Banks the whole surface is slowly driven eastward and northeastward by the prevailing westerly winds to the coastal waters of northwestern Europe. For distinction, this broad and variable wind-driven surface movement is sometimes referred to as the **North Atlantic Drift** or **Gulf Stream Drift.**

On its western or inner side, the Gulf Stream is separated from the coastal waters by a zone of rapidly falling temperature, to which the term *cold wall* has been applied. The abrupt change in the temperature of the waters separated by the cold wall is frequently very striking and is a definite indication of the edge of the stream. It is most clearly marked north of Cape Hatteras but extends, more or less defined, from the Straits to the Grand Banks. In the vicinity of the Banks of Newfoundland the cold wall represents the dividing line between the warm current of the Gulf Stream and the cold waters of the **Labrador Current** which, according to observations, turns sharply, between parallels 42 and 43 and meridians 51 and 52, and flows easterly, parallel to the Gulf Stream.

Off Cape Hatteras the wide-spreading current separates into numerous bands which are indicated by the juxtaposition of warm and cold bands of water of varying widths. This feature, though not so marked, is also noticed below Cape Hatteras.

Throughout the whole stretch of 400 miles in the Straits of Florida, the stream flows with considerable velocity. Abreast of Habana, the average surface velocity in the axis of the stream is about 2½ knots. As the cross-sectional area of the stream decreases, the velocity increases gradually, until abreast of Cape Florida, it becomes about 3½ knots. From this point within the narrows of the straits, the velocity along the axis gradually decreases to about 2 knots off St. Augustine, and 1 knot off Cape Hatteras. These values are for the axis of the stream where the current is a maximum, the velocity of the stream decreasing gradually from the axis as the edges of the stream are approached. The velocity of the stream, furthermore, is subject to fluctuations brought about by variations in winds and barometric pressure.

The following tables give the mean sufrace velocity of the Gulf Stream in two cross sections in the Straits of Florida:

*Between Rebecca Shoal and Cuba*

| Distance south of Rebecca Shoal | Mean surface velocity observed |
|---|---|
| *Nautical miles* | *Knots* |
| 20 | 0. 3 |
| 35 | 0. 7 |
| 50 | 2. 2 |
| 68 | 2. 2 |
| 86 | 0. 8 |

*Between Fowey Rocks and Gun Cay*

| Distance east of Fowey Rocks | Mean surface velocity observed |
|---|---|
| *Nautical miles* | *Knots* |
| 8 | 2. 7 |
| 11½ | 3. 5 |
| 15 | 3. 2 |
| 22 | 2. 7 |
| 29 | 2. 1 |
| 36 | 1. 7 |

Crossing the Gulf Stream at Jupiter or Fowey Rocks, an average allowance of 2½ knots in a northerly direction should be made for the current.

Crossing the stream from Habana, a fair allowance for the average current between 100-fathom curves is 1.1 knots in an east-northeasterly direction.

A vessel bound from Cape Hatteras to Habana, or the Gulf ports, crosses the stream off Cape Hatteras. A fair allowance to make in crossing the stream is 1 to 1½ knots in a northeasterly direction for a distance of 40 miles from the 100-fathom curve.

From within the straits, the axis of the Gulf Stream runs approximately parallel to the 100-fathom curve as far as Cape Hatteras. Since this stretch of coastline sweeps northward, then eastward, in a sharper bend than does the 100-fathom curve, the stream lies at varying distances from the shore.

Earlier systematic observations on the Gulf Stream dealt with the temperature of the water rather than its motion and the axis was taken to be along the line of highest temperature obtained. Later the axis was taken to mark the line of greatest velocity. Ordinarily it is assumed that the two axes coincide but this is by no means certain. The thermometer, although it indicates the limits of the stream in a general way, is therefore only an approximate guide to the velocity of the current, nor is it to be assumed that the northerly set will be lost when the thermometer shows a region of cold sea water.

The lateral boundaries of the current within the straits are fairly well fixed, but when the stream flows into the sea the eastern boundary becomes somewhat vague. On the western side, the limits can be defined approximately since the waters of the stream differ in color, temperature, salinity, and flow from the inshore coastal waters. On the east, however, the Antilles Current combines with the Gulf Stream, so that its waters here merge gradually with the waters of the open Atlantic. Observations of the Coast and Geodetic Survey indicate that, in general, the average position of the inner edge of the Gulf Stream as far as Cape Hatteras lies inside the 50-fathom curve. The Gulf Stream, however, shifts somewhat with the seasons, and is considerably influenced by the winds which cause fluctuations in its position, direction, and velocity; consequently, any limits which are assigned refer to mean or average positions. A further cause of fluctuation is found in the variations of the currents which feed it or which, like the Labrador Current, come in conflict with it. Variations due to tidal currents are now considered as only minor in character.

The approximate mean positions of the inner edge and axis, point where greatest velocity may be found, are indicated in the following table:

*Approximate mean position of the Gulf Stream*

| Locality | Inner edge | Axis |
|---|---|---|
| | *Nautical miles* | *Nautical miles* |
| North of Habana | --------- | 25 |
| Southeast of Key West | --------- | 45 |
| East of Fowey Rocks | --------- | 10 |
| East of Miami Beach | --------- | 15 |
| East of Palm Beach | --------- | 15 |
| East of Jupiter Inlet | --------- | 20 |
| East of Cape Canaveral | 10 | 45 |
| East of Daytona Beach | 25 | 75 |
| East of Ormond Beach | 25 | 75 |
| East of St. Augustine, coastline | 40 | 85 |
| East of Jacksonville, coastline | 55 | 90 |
| Southeast of Savannah, coastline | 65 | 95 |
| Southeast of Charleston, coastline | 55 | 90 |
| Southeast of Myrtle Beach | 60 | 100 |
| Southeast of Cape Fear Light | 35 | 75 |
| Southeast of Cape Lookout Light | 20 | 50 |
| Southeast of Cape Hatteras | 10 | 35 |
| Southeast of Virginia Beach | 85 | 115 |
| Southeast of Atlantic City | 120 | --------- |
| Southeast of Sandy Hook | 150 | --------- |

At the western end of the Straits of Florida the limits of the Gulf Stream are not well defined, and for this reason the location of the inner edge has been omitted for

Habana and Key West in the above table. Between Fowey Rocks and Jupiter Inlet the inner edge is deflected westward and lies very close to the shoreline.

Along the Florida Reefs between Alligator Reef and Dry Tortugas the distance of the northerly edge of the Gulf Stream from the edge of the reefs gradually increases toward the westward. Off Alligator Reef it is quite close inshore, while off Rebecca Shoal and Dry Tortugas it is possibly 15 to 20 miles south of the 100-fathom curve. Between the reefs and the northern edge of the Gulf Stream the currents are ordinarily tidal and are subject at all times to considerable modification by local winds and barometric conditions. This neutral zone varies in both length and breadth; it may extend along the reefs a greater or less distance than stated, and its width varies as the northern edge of the Gulf Stream approaches or recedes from the reefs.

The approximate position of the axis of the Gulf Stream for various regions is shown on the following Coast and Geodetic Survey charts: No. 1002, Straits of Florida; No. 1007, South Carolina to Cuba; No. 1112, Cape Canaveral to Key West; No. 1113, Alligator Reef to Habana. Chart No. 1001 shows the axis and the position of the inner edge of the Gulf Stream from Chesapeake Bay to Straits of Florida.

Water temperature curves are shown on the maps in the section on Weather in this chapter.

**Wind currents** are very complicated. Their velocities and directions depend upon a number of factors such as the velocity, direction, and duration of the wind, the proximity of the coast and the direction of the coastline. Generally in the Northern Hemisphere the wind-driven current sets somewhat to the right of the wind but in coastal waters there are many exceptions to this general rule, the current often setting to the left of the wind, due to the tendency of the current to follow the direction of the coastline or to other local conditions.

The velocity of the wind current relative to that of the wind also varies with the locality. It follows, therefore, that local wind-current information is desirable. Such information based upon extensive current and wind observations at a number of lightship stations is given in the *Atlantic Coast Current Tables* under the heading "Wind-driven Currents."

The largest velocities that may be expected to occur during storms at a number of offshore locations are given in the first part of the section.

## Weather

See Appendix for the meteorological tables for 10 land stations arranged alphabetically, and 4 ocean areas.

The climate of the southeastern seaboard region extending from Cape Henry, Va., to Key West, Fla., varies from temperate and semimarine in southern Virginia to humid and subtropical in southern Florida. The major climatic controls include latitude, altitude, land and sea, mountains, prevailing winds, and ocean currents. The climate of any particular place may be described as the result of the reaction between the physiographic features and the general circulation. The discussion following presents in brief a description of the most significant surface features affecting the climate along the coast, the general circulation, and the principal climatic elements.

**Surface features.**—A general description of the immediate coastal area is presented elsewhere in this book. The low, flat, near sea-level coastal region extends inland from 50 to 150 miles sloping slightly seaward and forming an almost featureless coastal plain the entire length of the area. In that portion of the area north of the Florida Peninsula there is an abrupt rise beyond this coastal plain which continues in an irregular terraced pattern to the westward, culminating in the Blue Ridge Mountains, the Great Smokies, and other ranges of the Appalachian chain. Southern Georgia and Florida are flat and much of the area is swampy. The highest point in Florida is only 325 feet above sea level, and no point in the State is more than 60 miles from salt water.

The mountainous area, though at a considerable distance from the ocean, is meteorologically very important because it forms a partial barrier to the cold waves that move southeastward from the interior of the country, and also because its presence has a material effect upon the general circulation.

The exposure to the ocean is from the east from Cape Hatteras, N. C., to Cape Henry, Va., from the southeast from Cape Hatteras to Savannah, Ga., from the east and east-northeast from Savannah to Jupiter Inlet, Fla.; from the east and southeast from Jupiter Inlet to the southern tip of the Florida mainland; and from the southerly directions in the Florida Keys, which are also exposed to the Gulf of Mexico. The entire shoreline is marked by innumerable indentations and irregularities, many of which cause important local climatic variations.

**General circulation.**—A complete discussion of the physical aspects of the atmospheric processes in the general circulation is beyond the scope of this book. The following brief discussion of the most conspicuous elements is intended only to satisfy the mariner's cursory interest in the "why" of the weather and to give the reader a simple but useful tool for interpreting climatic data and his own observations.

The northern part of the area, extending from 30° N. to 37° N. latitude, is located in the belt on the globe known as the band of the *westerlies*, and the southern part, from 25° N. to 30° N., in the *northeast trade* belt. These terms refer, in general, to the smooth idealized wind pattern set up as the earth enveloped in its atmosphere is heated by the sun.

This general circulation pattern may be observed with few irregularities at some distance above the earth. At the surface, however, it is modified in several ways. The intensity and inclination of solar radiation at any given time varies from place to place, and over the year, from season to season. Furthermore, different types of surfaces react differently to equal radiations. The break-down at the surface results in the formation of a number of smaller circulations with more specific characteristics.

To the east of the southeastern seaboard region lies a region of high pressure. The circulation center, referred to in this section as the Bermuda HIGH, migrates during the year a limited distance to the north or south and to the east or west and varies considerably in size and intensity. It is constantly fed from its source region, located in the southern part of the North Atlantic, and is persistent. Continental pressure systems, far from their own source regions, the Aleutian low, polar high, or Pacific high, usually take their courses around the outer edges of the Bermuda HIGH. The circulation over the eastern seaboard at any time is therefore controlled largely by the proximity of the Bermuda HIGH.

During the winter months when the mean position of the Bermuda HIGH is far out to sea, a continental high pressure ridge generally exists over the Southern States.

Major frontal systems developing over the interior of the country and the Gulf of Mexico sweep unimpeded over the Middle Atlantic States. The mountain ranges to the westward obstruct their progress to some degree, permitting considerable modification along the way. Only the strongest polar outbreaks are able to penetrate to the southernmost points in the area. The rapidly changing air masses in the northern part of the area may be observed in variable temperatures from day to day and in the brief but stormy periods followed by crisp, clear days. The contrast between polar air masses of continental and maritime origin and tropical maritime air is greatest at this time. Consequently winter storms are generally severe, accompanied by strong, gusty winds. In the south where the general circulation is least disturbed, throughout the year the weather is warm and humid. Northers, when they do occur, cause rough seas in the Straits of Florida.

During the spring months the Bermuda HIGH begins to move westward and northward. Its influence is felt along the southern Atlantic coast where the frequency of passing cyclonic storms decreases and the weather becomes more uniformly warm and humid. The northern part of the area, still at the outer edge of the circulation, is subject to frontal activity and changing air masses. Warm spring rainy spells usually alternate with mild, balmy weather. It is not uncommon, however, for the Bermuda HIGH to dominate the entire area in this season, bringing summer heat and enervating humidities prematurely.

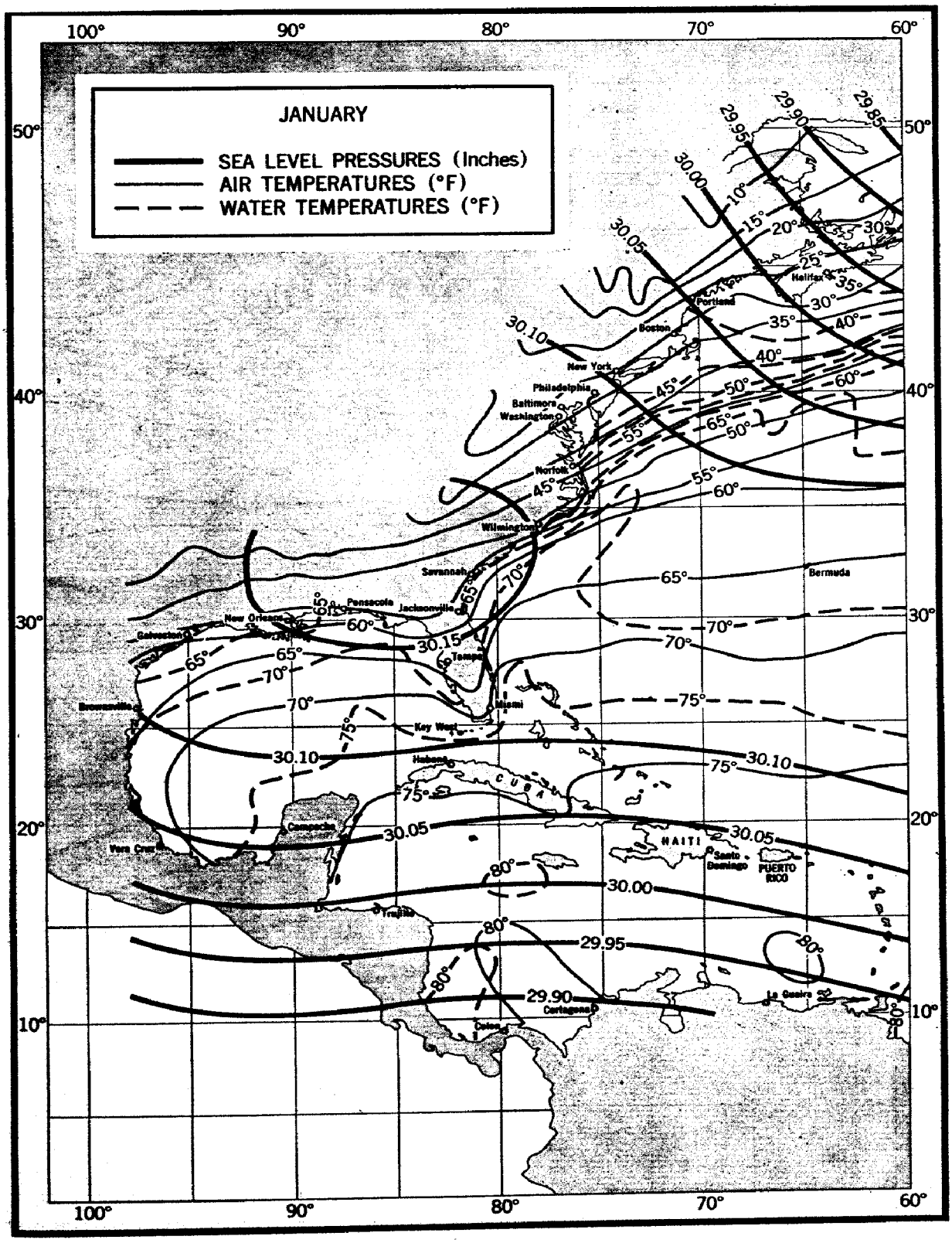
In summer the center of the Bermuda HIGH circulation has moved to its northern limit and extends over the entire eastern seaboard region. The intensity is moderate but persistent, blocking the eastward movement of the continental pressure systems. For weeks at a time the synoptic situation on the coast may not change significantly. The weather during this season is characterized by frequent instability showers and thunderstorms, high temperatures and humidities, and relatively low wind velocities most of the time. The summer months also mark the beginning of the hurricane season which reaches its peak in late summer and early fall. All of the Coastal States are subject to these tropical disturbances.

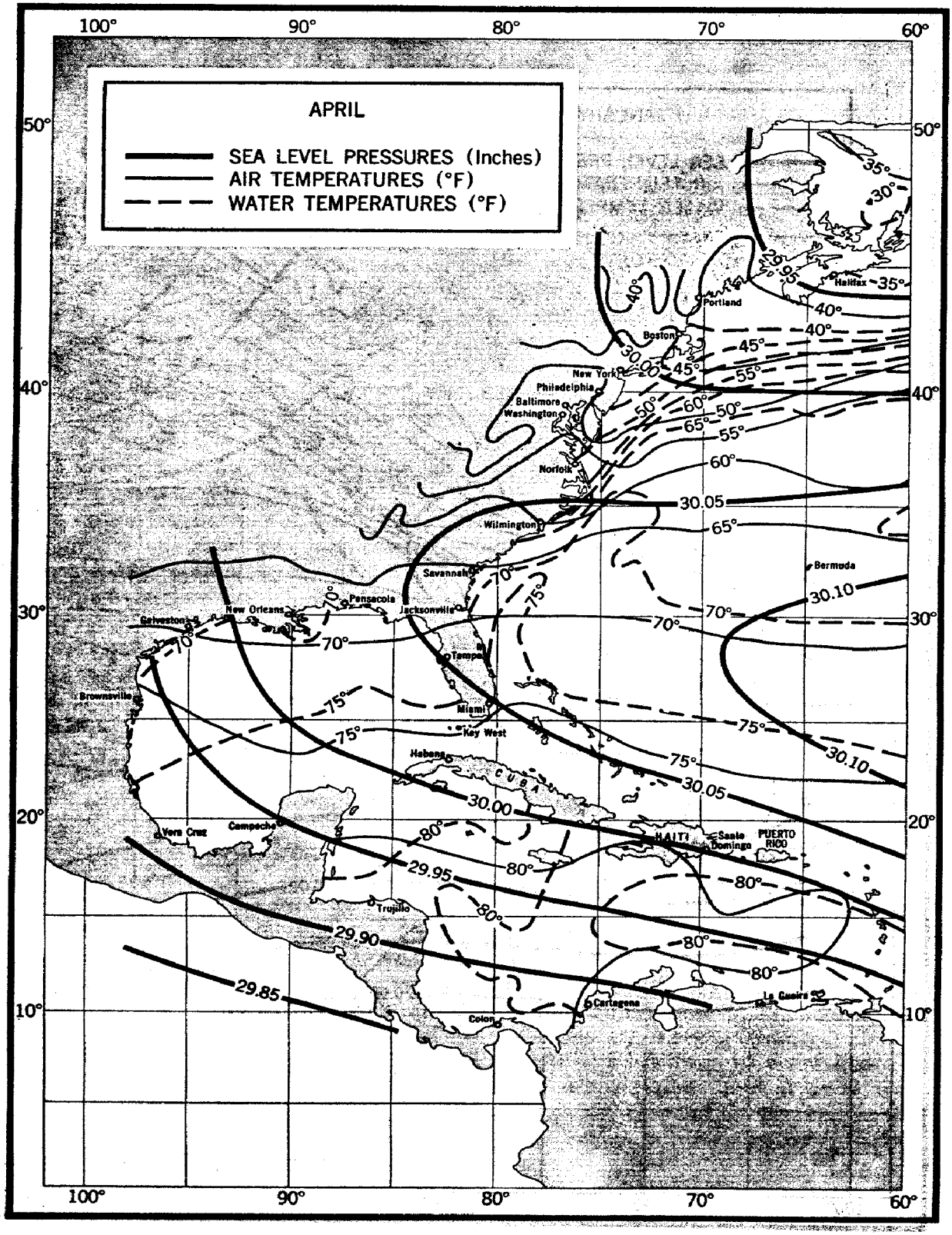
During the fall months the Bermuda HIGH retreats southward and eastward, leaving the Atlantic coast in a weak continental high pressure zone. The weakening of the pressure system indicates the gradual transition to the winter synoptic pattern accompanied by increased frontal activity, particularly in the northern part of the area. The weather is usually cool and fine, interrupted by brief rainy periods associated with the passage of fronts.

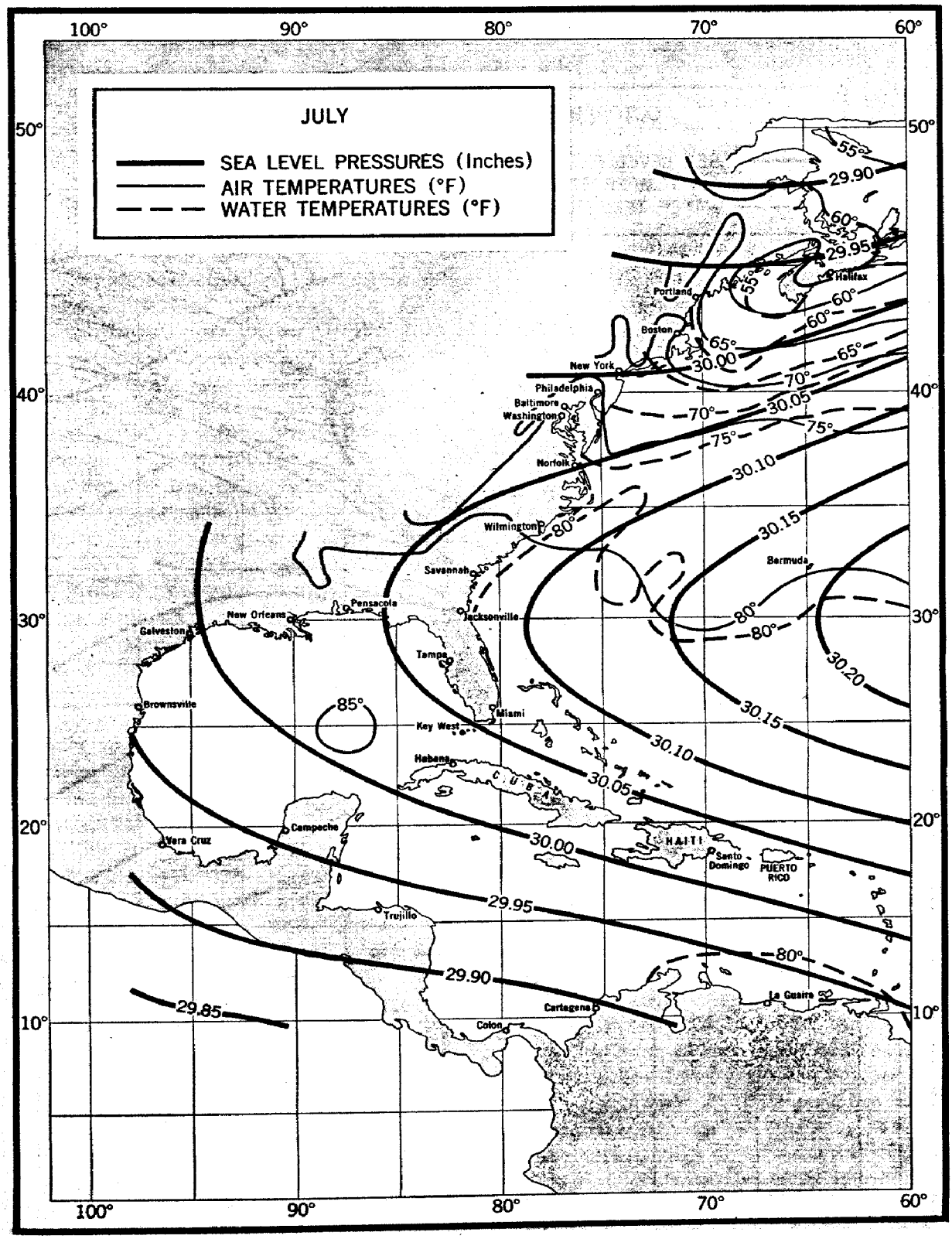
**Pressure.**—Mean sea-level pressure over the southern Atlantic coast ranges from an annual average of 30.02 inches at Key West, Fla., to 30.07 inches at Norfolk, Va., and Charleston, S. C. The pressure pattern, as may be observed from the accompanying weather maps, changes considerably over the area from season to season. At individual stations, however, the seasonal variation in mean pressure is only 0.12 inch to 0.17 inch throughout the year. Extremes vary considerably more than this.

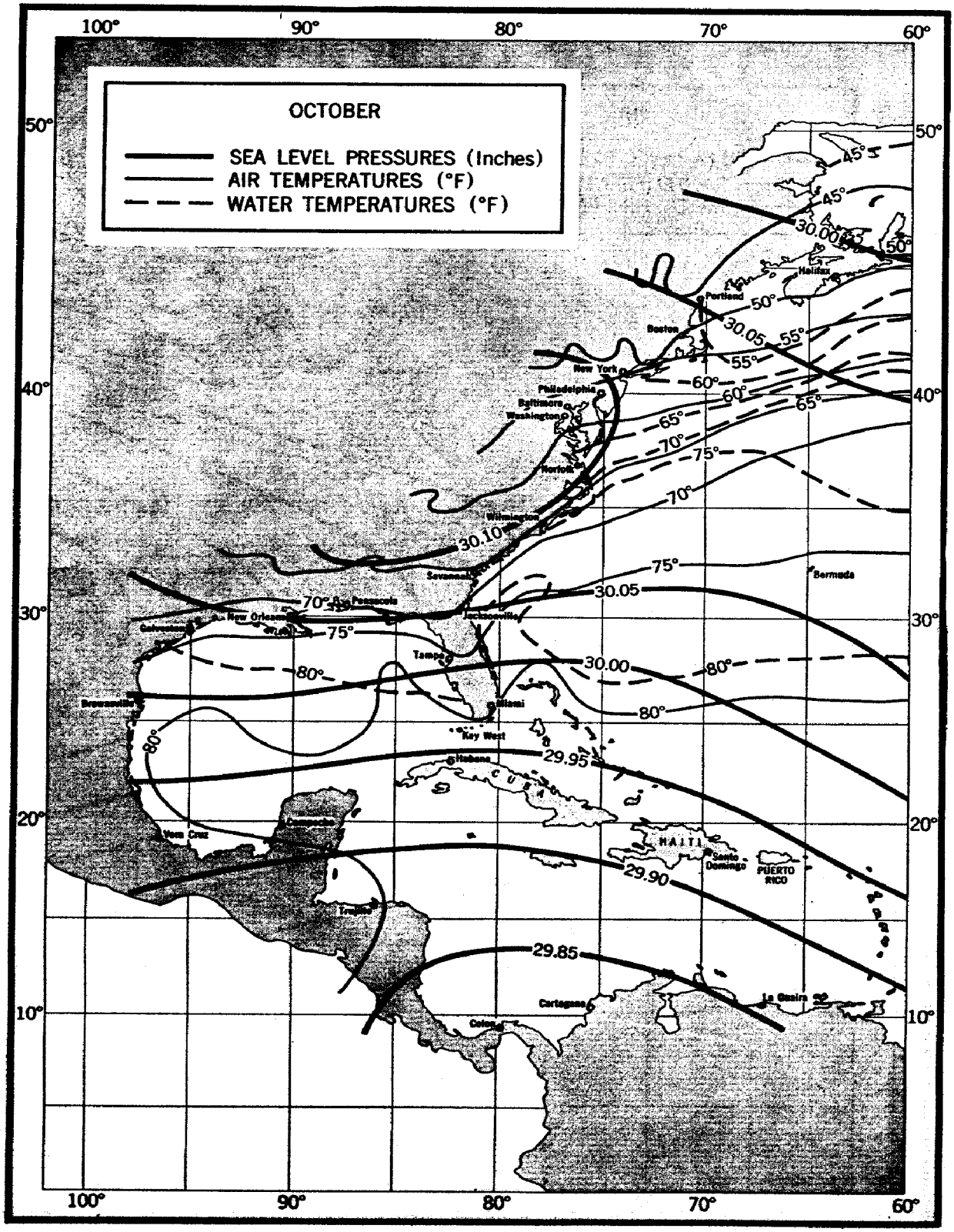
Over the northern part of the area, mean sea-level pressure is at a maximum in January (30.12 inches to 30.14 inches). Pressure drops rapidly and steadily from the January maximum to a minimum of 29.98 inches in May and June. During the summer months pressure remains low and steady and begins to rise again in September, continuing to rise through the remainder of the year.

Over the middle part of the area, which lies in the continental high-pressure ridge


JANUARY
SEA LEVEL PRESSURES (Inches)
AIR TEMPERATURES (°F)
WATER TEMPERATURES (°F)
100°
90°
80°
70°
60°
50°
40°
30°
20°
10°
29.85
29.90
29.95
30.00
30.05
30.10
30.15
10°
15°
20°
25°
30°
35°
40°
45°
50°
55°
60°
65°
70°
75°
80°
Halifax
Portland
Boston
New York
Philadelphia
Baltimore
Washington
Norfolk
Wilmington
Savannah
Jacksonville
Pensacola
New Orleans
Galveston
Tampa
Miami
Key West
Brownsville
Havana
CUBA
HAITI
Santo Domingo
PUERTO RICO
Campeche
Vera Cruz
Trujillo
Colon
Cartagena
La Guaira
Bermuda


APRIL
SEA LEVEL PRESSURES (Inches)
AIR TEMPERATURES (°F)
WATER TEMPERATURES (°F)
100°
90°
80°
70°
60°
50°
40°
30°
20°
10°
Halifax
Portland
Boston
New York
Philadelphia
Baltimore
Washington
Norfolk
Wilmington
Savannah
Jacksonville
Pensacola
New Orleans
Galveston
Brownsville
Tampa
Miami
Key West
Habana
CUBA
HAITI
Santo Domingo
PUERTO RICO
Vera Cruz
Campeche
Trujillo
Cartagena
Colon
Bermuda
30.10
30.05
30.00
29.95
29.90
29.85
35°
40°
45°
50°
55°
60°
65°
70°
75°
80°


JULY
SEA LEVEL PRESSURES (Inches)
AIR TEMPERATURES (°F)
WATER TEMPERATURES (°F)
100°
90°
80°
70°
60°
50°
40°
30°
20°
10°
29.90
29.95
30.00
30.05
30.10
30.15
30.20
29.85
55°
60°
65°
70°
75°
80°
85°
Halifax
Portland
Boston
New York
Philadelphia
Baltimore
Washington
Norfolk
Wilmington
Savannah
Jacksonville
Pensacola
New Orleans
Galveston
Tampa
Miami
Key West
Brownsville
Havana
CUBA
HAITI
Santo Domingo
PUERTO RICO
Vera Cruz
Campeche
Trujillo
Cartagena
Colon
La Guaira
Bermuda


OCTOBER
SEA LEVEL PRESSURES (Inches)
AIR TEMPERATURES (°F)
WATER TEMPERATURES (°F)
100°
90°
80°
70°
60°
50°
40°
30°
20°
10°
30.00
30.05
30.10
29.95
29.90
29.85
45°
50°
55°
60°
65°
70°
75°
80°
Halifax
Portland
Boston
New York
Philadelphia
Baltimore
Washington
Norfolk
Wilmington
Savannah
Jacksonville
Pensacola
New Orleans
Galveston
Tampa
Miami
Key West
Havana
CUBA
HAITI
Santo Domingo
PUERTO RICO
Bermuda
Veracruz
Tampico
Cartagena
Colon
La Guaira

present over the Southern States in winter, the highest mean pressure, 30.16 inches, occurs in January. Pressure falls gradually from the January maximum to a minimum of 29.98 inches in May, remaining low through the summer and beginning to rise around the first of October.

In the southern section pressure is generally lower throughout the year than in the other parts of the area. Here the mean maximum of 30.10 inches to 30.12 inches also occurs in January. The pressure then falls to a minimum of 29.97 inches to 30.00 inches in May, rises during the next 2 months 0.05 or 0.06 inch, and falls to the areal and monthly minimum of 29.94 inches to 29.97 inches in September and October. Generally rising pressure is observed during the last 2 months of the year.

The mean pressure pattern is an average of daily pressures which are almost always either higher or lower than the mean depending upon the intensity and location of the currently dominant pressure system. Monthly highest pressures show a smaller range than lowest pressures. The extreme highest pressures which have occurred during the winter months (30.48 inches to 30.96 inches) taper off to 30.28 inches to 30.38 inches in middle and late summer in the north and 30.15 inches to 30.17 inches in the south. Extreme lowest pressures, associated with severe storminess or hurricanes, occurred most frequently in spring (28.32 inches to 28.78 inches) in the north and in late summer and early fall (28.47 inches to 29.18 inches) in the south. The seasonal range from extreme highest to extreme lowest is great during winter and smaller during summer, which serves to illustrate the fact that the Bermuda HIGH is usually not so intense as the migratory continental highs but is much more persistent.

Another pressure variation of interest to the mariner is the normal regular change during the day. Peaks of pressure occur along the east coast around 10 a. m. and 10 p. m., and low points are observed at about 4 a. m. and 4 p. m. Of these, the greatest diurnal pressure is usually observed around 10 a. m. and the lowest around 4 p. m.

**Winds.**—The generalized wind pattern of the eastern seaboard region was described briefly in the section on the General Circulation. It was pointed out that near the surface of the earth the general circulation was much disturbed from place to place and at different times of year. The effects of these changes may be seen in all the weather elements but are, perhaps, most clearly shown by the winds.

The relationship between wind and pressure systems is quite easy to understand. Since a high-pressure system represents an accumulation or congestion of air in a particular area in comparison with the surrounding air, winds blow outward from the center. They are deflected to the right thus blowing in a clockwise direction around a high. Around a low, winds blow inward and in a counterclockwise direction for the same reason.

The seasonal changing pressure pattern causes the major changes in the prevailing winds along the southeastern coast. In winter over the northern part of the area winds from the northerly quadrant predominate, blowing about 40 to 60 percent of the time. Westerly winds, recorded in 30 to 45 percent of the observations, are also common. Winter storms over the entire area are modified by the presence of the Appalachian Mountain ranges. The extreme southern portion is especially sheltered and only the severest storms penetrate so far south, bringing northwesterly winds to that area. Southern Florida experiences prevailing winds from the easterly quadrant throughout the year (40 to 70 percent of the time).

# Wind Force and State of Sea Surface With Specifications and Equivalents

| Beaufort No. | Description of wind | Sea area: State of sea surface | Sea area: Description of sea | Sea area: Scale | Land area | Nautical miles per hour | Terms used in U. S. Weather Bureau forecasts |
|---|---|---|---|---|---|---|---|
| 0 | Calm | Sea like a mirror—smooth | Glassy-calm | 0 | Calm; smoke rises vertically | Less than 1 | Light. |
| 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 | |
| 2 | Light breeze | Small wavelets, still short but more pronounced. Crests have a glassy appearance and do not break. | Smooth | 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. | | | 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 | 3 | Raises 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 | 4 | Small trees in leaf begin to sway; crested wavlets 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 | 5 | Large branches in motion; whistling heard in telegraph wires; umbrellas used with difficulty. | 22 to 27 | Strong. |
| 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 | 6 | Whole trees in motion; inconvenience felt in walking against the wind. | 28 to 33 | |
| 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. | High | 7 | Breaks twigs off trees; generally impedes progress. | 34 to 40 | Gale. |
| 9 | Strong gale | High waves. Dense streaks of foam along the direction of the wind. Sea begins to "roll." Spray may affect visibility. | | | Slight structural damage occurs. | 41 to 47 | |
| 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 | 8 | 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] | 9 | 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. | | | | Above 65 | Hurricane. |

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

In spring and summer southerly winds predominate over the northern coastline, occurring about 30 to 50 percent of the time in spring and 40 to 60 percent of the time in summer. The persistence and dominance of the Bermuda HIGH is shown in the increasing frequency of southwesterlies as the summer progresses. Its recession in fall, accompanied by changing pressure systems along the coast results in a sharp increase in the frequency of northerly winds which are recorded 35 to 55 percent of the time.

Along the coast a daily shift in wind direction is observed. During the warmest part of the day winds blow from the ocean toward shore, and during the coolest, from the land toward the sea.

Offshore winds, unless they are exceptionally strong, are generally considered favorable for coastal navigation. Onshore winds have a more pronounced effect upon the sea surface particularly when they have been blowing from the same direction for a long period of time. Strong onshore winds cause heavy or choppy seas and swell and frequently make navigation difficult for small vessels.

Wind velocities along the southeastern coast are generally moderately light, averaging 8 to 12 knots over the year. Monthly averages vary from 6 to 10 knots in summer to 8 to 15 knots in winter. Wide departures from these averages should be expected in all seasons. In the immediate coastal area the windward side of the promontories may be lashed by gales and heavy seas, while the lee side is relatively protected. Averages do not show these variations. The area from Cape Hatteras to Cape Henry, exposed as it is to the ocean, is subject to severe northeasterly storms as well as moving continental pressure systems. Winds greater than 27 knots are reported on more than 40 days per year at exposed points. Cape Hatteras, as most seamen understand, is particularly exposed to the winds, with open sea in all directions from north through east to southwest. To the south of Cape Hatteras gale winds are much less frequent, occurring generally on less than 15 days per year. In the Straits of Florida where most of the waters of the Gulf current pass, a channeling effect may be observed. Choppy seas are common with winds of less than gale force, particularly with easterly winds. The swift current presents its own problem to navigation. The frequency of calms is less than 1 percent of the time in the north and from 15 to 20 percent of the time during the year at most places in the middle and south.

Extreme wind velocities are a hazard to the seaman in any month. Though winds greater than 32 knots are comparatively infrequent, they have been recorded at all stations and at almost any time of year. A wind of 106.8 knots occurred in the month of September at Miami and is the strongest wind on record during the period covered by the meteorological tables in the Appendix. Stronger winds have been observed during recent hurricanes. Measurement of extreme winds is difficult due to the fact that instruments are frequently damaged or completely destroyed during storms. Gale winds are usually associated with sharply defined frontal systems, severe cyclonic storms, hurricanes, or occasionally with severe local thunderstorms.

The seasonal variation in wind velocity is slightly greater in the north than in the south. An idea of the magnitude of the difference may be seen from a glance at the monthly averages. At Cape Henry, for example, the mean velocity range is from 8.8 knots to 12.7 knots. At Miami the range is from 7.2 knots to 9.6 knots. Highest mean velocities occur during the month of March in the north and in October and November in the extreme south; lowest, during July and August over the entire area. Over

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the ocean, winds are slightly stronger than at most land stations during the winter months and about the same during the summer.

**Temperature and humidity.**—The temperature regime of the southern Atlantic coast may be described as varying from temperate in the northern part of the area to subtropical in the southern part. The gradation from north to south, known as the latitudinal variation, is regular, decreasing with increasing latitude, and is perhaps the most important single temperature variation. Another interesting variation is the general modification process of the ocean and coastal temperatures by each other. Land surfaces absorb heat to slight depths and give it up freely, while water absorbs heat to great depths and tends to conserve it. The result of these physical properties is that along the coast the sheltered land stations have warmer summers and cooler winters than exposed points and open water areas.

Temperatures along the southeastern seaboard region favor a comparatively long period for small craft operation. The southern Atlantic coast annual mean air temperatures range from 58.9° F. at Cape Henry, Virginia, to 76.8° F. at Key West, Florida. January is the coldest month at most stations; July the warmest. The extreme range in mean monthly air temperature over the area is from 41.2° F. at Cape Henry in January to 83.5° F. at Key West in July and August.

Over the water area the coldest month is February and the warmest is August. Exposed coastal stations experience mean air temperatures more similar to those observed over water than land, and also have annual extremes in February and August.

The daily range in temperature from highest to lowest averages from 10° to 17° at coastal stations throughout the year, and is likely to be less over the water. The greatest diurnal variation occurs at most stations during the winter and early spring months and the lowest during late summer and fall. The daily range from month to month at individual stations is small, however, averaging only 2° to 5° F.

In contrast with air temperatures, which are controlled by air mass movements and continental effects over the area as well as the normal daily variation from maximum to minimum, sea surface temperatures are much more constant, following closely the ocean currents whose paths remain stationary over short periods of time. Considering the year as a whole, mean sea surface temperatures in the area are slightly higher than air temperatures. On a month-to-month basis, however, sea surface temperatures are higher through the year in the southern part of the area only where the greatest difference (3.5° F. to 8.6° F.) occurs from May through August. In the northern part, on the other hand, sea surface temperatures are higher than air temperatures from October through March (1.5° F. to 5.5° F.) and nearly equal or lower (1.1° F. warmer to 2.0° F. cooler) during the remainder of the year.

Very little data on extreme temperatures for the ocean areas are available. At coastal stations temperatures above 100° F., while not common, have been recorded. The highest during the period of record considered was 105° F. at Norfolk, Va., and Savannah, Ga. Mean minimum temperatures have been above the freezing point at all stations throughout the year. The lowest recorded temperature was 2° F. at Norfolk, Va., in February.

Mean relative humidity throughout the year is high, ranging from 73 to 82 percent at coastal stations and varying seasonally only 4 to 12 percent at individual places. Monthly averages in mean relative humidity range from 69 percent at Wilmington,

N. C., and Charleston, S. C., in April to 86 percent at Savannah, Ga., in September. Highest humidities occur in general from July through September and lowest, in April and May. Data are not available for water areas, but the relative humidities are known to be uniformly high. The presence of minute particles of salt in the air over the ocean, together with the high moisture content in the air, results in a very corrosive effect upon equipment and supplies both on the water and at nearby shore points.

**Cloudiness and precipitation.**—Mean cloudiness over the area is moderate to moderately high throughout the year, averaging from 35 to 65 percent sky cover. The seasonal variation is not distinct over the entire area, and the annual range at individual stations or areas varies only from 10 to 20 percent from greatest to least average cloud cover. In general, however, the cloudiest month is January in the northern section and over most of the water areas, and may be any month from June through September in the southern section. Over the coastal area the least average cloudiness occurs in October at most stations in the north and February or March in the extreme south. Over the water the month of least average cloud cover is different in each ocean square.

Since the air is usually quite moist, only a small drop in temperature may cause condensation and cloud formation. Sharp contrasts, at the boundary of waters of the warm northerly moving Gulf current and the cool southerly moving counter-Gulf current close to the shore from Jacksonville, Fla., to Cape Hatteras, N. C., result in the formation of heavy stratus clouds which may appear very much as a cold front. These clouds may persist for days at a time if the wind is light and may be carried inland by northeasterly winds. Such cloudiness is common during the spring months when the gradient between shore water and gulf current temperatures is steepest.

The fact that maximum cloudiness for the year occurs at northern coastal stations during the winter months may be explained by the maximum frequency of cyclonic storms passing northward or northeastward from the central or south-central section of the country during that season. These rarely affect the extreme southern part of the area.

Much of the cloudiness over the entire area is of the cumulus type, resulting from either the instability conditions that accompany cyclonic activity in all seasons or the general instability associated with the dominance of the Bermuda HIGH during the summer months. Such clouds frequently form over the coastal mountains during the day and drift seaward during the night.

To the small craft mariner who operates to a great extent during the daylight hours the amount of sunshine is particularly important. Of the possible hours of sunshine the coastal area experiences monthly averages of from 50 to 78 percent during the year. In the north the largest percentage of possible sunshine occurs in spring and fall and the smallest percentage in winter. The average annual range at individual stations, however, was 12 to 20 percent. In the over-all picture, the extreme south and a narrow belt in the north-central part of the area show a greater percentage of possible sunshine than the northern and south-central sections.

Precipitation over the southeastern seaboard region is moderately heavy, totaling on the average about 35 to 60 inches per year. Monthly departures may be large in any individual year, but over a long period of record, 50 to 75 years, a fairly uniform pattern appears. Since the area under consideration lies within both temperate and subtropical regions, the precipitation pattern shows differences in both type and amount

from north to south. Irregularities from station to station in the idealized pattern are due to differences in the exposure of the observing station. Year-to-year variation is caused by over-all changes in the general circulation.

In the northern part of the area the heaviest precipitation occurs normally during the months of July and August and least in November. In the southern section, however, the heaviest precipitation falls in September or October and the least in February. Average monthly totals at most stations range from 2 to 6 inches throughout the year. During the hurricane season, particularly in the months of greatest hurricane frequency, excessive rains of 9 to 15 inches in a 24-hour period have been recorded. These may occur at any point along the coast but are most common in the southern part of the area.

The distribution of precipitation with respect to time varies considerably. Precipitation amount of 0.01 inch or more falls on an average of 110 to 130 days per year. In the northern part of the area monthly averages range from about 6 to 9 days per month in the fall to 10 to 12 days per month in the summer and winter months. In the central part of the area the greatest number of rainy days occurs in summer, 11 to 16 days per month, and the least in spring and fall, 6 to 9 days per month. The maximum number of rainy days along the Florida coast generally occurs in late summer and early fall, 14 to 18 days per month, and the minimum from February through April, 5 to 8 days per month.

Much of the precipitation, like cloudiness, is associated with cyclonic activity throughout the year. During the winter season when frontal systems sweep over the area from the west and northwest, precipitation is generally of a showery type. Frontal systems originating or developing in the Gulf region are the result of the interaction of a moist tropical air mass with colder continental masses. These move east or northeastward and bring extensive precipitation to the seaboard region. During the summer months, when the area is dominated by the Bermuda HIGH and cumulus type clouds predominate, precipitation is localized and is showery in nature.

The intensity of ordinary cyclonic storms and showers is usually greater over land than over water. Heaviest precipitation occurs over land and near coastal waters in the afternoon; over open water, during the night.

Thunderstorms along the coast occur on an average of from 30 days per year in the north to 80 days per year in the south. Maximum occurrence is from June through August, and an average of 7 to 18 thunderstorms per month occur during this season. During the winter, spring, and fall, thunderstorms are generally associated with frontal passages. In summer cumulus clouds frequently develop into thunderstorms over the mountains to the west of the coastal area and drift seaward late in the afternoon.

Snow falls during the months from December through March in the northern part of the area on 1 or 2 days per month. Snow conditions so far as coastal operations are concerned are not significant since most of the area is entirely free from snow the year round.

**Fog and visibility.**—Because of the nature of the southeastern seaboard region with its irregular coastline, its capes, inlets, and shoals, and because of the volume of traffic in the area, restrictions to visibility are important to the coastal mariner.

Visibility is generally good throughout the year over the entire area, and visibilities of ⅛ mile or less are observed on the average of less than 10 days per year at most stations.

Fog is the principal restriction to visibility. The occurrence of fog reducing visibility to 550 yards or less is very irregular, ranging from practically no days per year at

some stations to 24 days per year at others. Differences in exposure account for the considerable variation between locations. In general, however, fog decreases from north to south, and the worst fog conditions occur during the winter months when air masses change frequently. The presence of the warm Gulf current is responsible for much of the fogginess in all seasons. Visibility is usually poorest during the night and early morning hours.

Along the coast radiation fog is frequent, forming shortly after sunset. These fogs do not generally extend to any great distance seaward, but may seriously restrict harbor activities. Sea fogs sometimes drift onshore on hot summer days, persisting for many hours in a shallow layer along the coast. Over the land surface dispersal usually begins at the surface giving the effect of lifting. Over the water fog generally persists at the surface and restricts visibility until the last vestige of the cloud formation disappears.

In addition to fog, precipitation is occasionally a restriction to visibility over both land and water, and haze and smoke sometimes restrict visibility over land.

## Hurricanes

Tropical cyclones of the North Atlantic Ocean are usually designated as **West Indian hurricanes,** though many of these storms originate, move, and die out far from the mainland and hundreds of miles from the West Indies. The fully developed tropical cyclone passing over hundreds of square miles is perhaps the most destructive of all storms.

Tropical cyclones occur over all the tropical oceans except the South Atlantic and originate in the region near the Equator. In the North Atlantic, hurricanes form over a wide range of the ocean from Cape Verde and the Windward Islands to the coast of Mexico and Central America. The entire Caribbean area, the Gulf of Mexico, the coastal regions bordering these bodies of water, and the Atlantic coast are in danger of disturbances during the hurricane season. The most common path is parabolic, characterized by a generally westward movement of the young storm followed by subsequent curvature first to the northwestward and then to the northeastward. A considerable number of hurricanes, however, remain in low latitudes and do not turn appreciably to the northward. Freak movements are not uncommon, and there have been storms describing loops, hairpin-curved paths, and other irregular patterns. Progressive movement toward the southeast is rare in the West Indian region, and when it does occur it is of very short duration.

There is a fairly well marked seasonal variation in hurricane movement. The season generally extends from June through November, with the greatest frequency of tropical disturbances occurring in the 3 months of August, September, and October. The June hurricanes originating in the West Indian region usually move in a direction between west and north while they are south of 25° N. latitude. In late September, October, and November, hurricanes of this region are more likely to move in a direction between north and east, passing through the Yucatan Channel, or over Cuba, Florida, or the Bahamas. Of the hurricanes that come from the Atlantic into the West Indies, the majority occur in August and September and move on a west-northwesterly course in low latitudes reaching the coast before curving toward the north and northeast.

Late in the season, October or November, the movement of hurricanes that originate east of the West Indies is often toward the north in the open Atlantic.

The following table shows the number of tropical storms that have been recorded in North Atlantic waters during the 11-year period 1937–47, according to records of the United States Weather Bureau.

*Occurrence of North Atlantic tropical storms for the 11-year period, 1937–47*

| | May | June | July | August | September | October | November | Total |
|---|---|---|---|---|---|---|---|---|
| 1937 | 0 | 0 | 1 | 2 | 6 | 0 | 0 | 9 |
| 1938 | 0 | 0 | 0 | 3 | 1 | 3 | 1 | 8 |
| 1939 | 0 | 1 | 0 | 1 | 1 | 2 | 0 | 5 |
| 1940 | 1 | 0 | 0 | 3 | 2 | 2 | 0 | 8 |
| 1941 | 0 | 0 | 0 | 0 | 4 | 2 | 0 | 6 |
| 1942 | 0 | 0 | 0 | 3 | 1 | 3 | 1 | 8 |
| 1943 | 0 | 0 | 1 | 2 | 4 | 3 | 0 | 10 |
| 1944 | 0 | 0 | 3 | 2 | 3 | 2 | 0 | 10 |
| 1945 | 0 | 1 | 1 | 4 | 3 | 1 | 0 | 10 |
| 1946 | 0 | 1 | 1 | 1 | 1 | 2 | 0 | 6 |
| 1947 | 0 | 0 | 1 | 3 | 3 | 3 | 0 | 10 |
| Total | 1 | 3 | 8 | 24 | 29 | 23 | 2 | 90 |
| Percentage frequency | 1. 1 | 3. 3 | 8. 9 | 26. 7 | 32. 2 | 25. 6 | 2. 2 | 100 |

The average speed of movement is about 10 to 13 knots. This speed, however, varies considerably according to the development of the storm, the location, and surrounding meteorological conditions. The highest rates of progression usually occur when the storm is moving northward or northeastward in the middle or high latitudes. During all the months of the season, the storm intensity will be sufficiently great to warrant the mariner's keeping a careful watch of the weather elements while in these waters. Hurricanes are likely to be most severe during August and the early half of September.

Tracks of selected hurricanes are shown on the *Pilot Charts of the North Atlantic Ocean* and *Central American Waters*, published monthly by the United States Hydrographic Office.

Winds of the West Indian hurricane blow in a counter-clockwise direction around and slightly toward the center of the storm. The storm area varies from about 100 miles to 500 or more miles in width, with a comparatively calm center or *eye* some 10 to 20 miles in diameter. The wind velocity at the outer edge is light to moderate and gusty and increases toward the center to incredible speeds. In some respects the *eye* is the most dangerous part of the hurricane and is therefore a region especially to be avoided; for although the air movement within it, if any, is usually light and fitful, the seas are in most cases very heavy and confused, rendered so by the shifting violent winds surrounding it. The sudden subsiding of violent winds is misleading and the passage of the *eye* is marked by the onset of equally violent winds from the opposite direction.

The winds on the right side of the center (looking forward along the hurricane's path) are blowing in the same direction as the hurricane is moving, and are felt with greater force at a point over which the hurricane moves than are the winds in other parts of the hurricane. These winds drive the water forward, produce large waves, and flood the coast in advance of the hurricane. The highest tides occur to the right of the point where the hurricane center crosses the coast. These high tides or storm waves are one

of the greatest dangers from the hurricane. A hurricane of large diameter generally creates higher tides on the coast than one of smaller diameter, and a slow-moving hurricane produces higher tides than one of rapid progress. In each case the higher water is due to the greater duration of the drive of the wind in the same direction.

At the outer limits of the hurricane, rainfall is usually in the form of showers. As the center approaches, the characteristic squalls of the hurricane begin, that is, the showers increase in frequency and intensity. Nearer the center the rain is heavy to excessive and continuous.

**Information regarding tropical cyclones by radio.**—Modern developments in radio communication have made it possible for organized meterological services to collect daily weather reports from island stations and from ships at sea, and thus to locate tropical cyclones when they develop and to issue warnings to shipping as to their intensities and probable movements. As a further aid, the mariner may secure weather reports direct by radio from other ships in the vicinity of the tropical cyclone. Although these radio weather reports and warnings have made it unnecessary in many instances for the navigator to depend entirely upon his own observations and knowledge in avoiding dangerous positions with respect to the storm center, it is still an essential of good seamanship that he understand the rules for ascertaining from his own observations the existence of a tropical cyclone and for locating its center. *Attention is directed to the heading Hurricane seamanship under Coastwise Navigation in this chapter.*

**Rules for establishing the existence of a storm and locating its center.**—During the season of tropical storms any interruption in the regularity of the diurnal oscillation of the barometer should be considered an indication of a change of weather. The barometer is by no means an infallible guide for warnings much in advance, but after the beginning of a storm it will more or less accurately indicate the rapidity of approach and distance from the center, and its indications should in no case be disregarded.

One of the earliest indications of the approach of a tropical storm is the appearance of the sky and general clearness of the atmosphere. These storms are almost invariably preceded by a day of unusual clearness, when distant objects not ordinarily visible stand out with great distinctness. The atmosphere at such times is more than usually oppressive.

These conditions are frequently accompanied by an usually high barometer. Later it may be followed by a restless oscillating or pumping of the mercury caused by the disturbed condition of the atmosphere. Then the sky becomes overcast and remains so, at first with a delicate tufted cirrus, *mares' tails*, which shows no disposition to clear away at sunset, but which later becomes gradually more and more dense until the dark mass of the true hurricane cloud appears upon the horizon. From the main body of this cloud portions are detached from time to time and drift across the sky, their progress marked by squalls of rain and wind of increasing force. Rain, indeed, forms one of the most prominent features of the storm. In the outer portions it is fine and mistlike, with occasional showers, these later increasing in frequency and in copiousness. In the neighborhood of the center it falls in torrents. The rain area extends farther in advance of the storm than in the rear.

A long swell from the direction of the storm frequently sets in before any other indication becomes marked.

When the sky first becomes overcast with the characteristic veil of cirrus, the storm center will most probably lie in the direction of the greatest density of the cloud.

When the hurricane cloud appears over the horizon it will be densest at the storm center.

By this time the barometer will usually be showing unmistakable evidence of a fall, and one may confidently look for a storm and begin observations to determine the location of its center and the direction in which it is moving.

Surrounding the actual storm area is a territory of large extent throughout which the barometer reads a tenth of an inch or more below the average, the pressure diminishing toward the central area, but with no such rapidity as is noted within the area itself. Throughout the outer ring unsettled weather prevails. The sky is ordinarily covered with a light haze, which increases in density as the center of the storm approaches. Showers are frequent. Throughout the northern semicircle of this area (in the Northern Hemisphere), the wind rises to force 6 or 8—the *reinforced trades*—and is accompanied by squalls; throughout the other semicircle unsettled winds, generally from a southeasterly direction, prevail.

**Position of center.**—It is very important to determine as early as possible the location and direction of travel of the center.

While this cannot be done with absolute accuracy with one set of observations, a sufficiently close approximation can be arrived at to enable the vessel to maneuver to the best advantage.

Facing the wind, the storm center will be 8 to 12 points to the right; when the storm is distant it will be from 10 to 12 points, and when the barometer has fallen five- or six-tenths it will be about 8 points.

The following old table from Piddington's *Horn Book* may serve as a guide, but it can give only an imperfect estimate of the distance and too much reliance must not be placed upon it.

| Average fall of barometer per hour | Distance in miles from center |
|---|---|
| From 0.02 to 0.06 inch | From 250 to 150. |
| From 0.06 to 0.08 inch | From 150 to 100. |
| From 0.08 to 0.12 inch | From 100 to 80. |
| From 0.12 to 0.15 inch | From 80 to 50. |

**Handling the ship within the storm area.**—If, from the weather indications given above and such others as his experience has taught him, the navigator is led to believe in the approach of a storm, he should at once—

First. Determine the bearing of the center.

Second. Estimate its distance.

Third. Plot its apparent path.

The first two of the above determinations will locate the approximate position of the center, which should be marked on the chart. The relation between the position of the ship and the position and prospective track of the center will indicate the proper course to pursue (*a*) to enable the vessel to keep out of or escape from the dangerous semicircle and to avoid the center of the storm; (*b*) to enable the vessel to ride out the storm in safety if unable to escape from it.

Should the ship be to the westward of the storm center in low latitude it may be assumed that the latter will draw nearer more or less directly. It then becomes of the

utmost importance to determine its path and so learn whether the vessel is in the right or left semicircle of the storm area.

The right and left semicircles lie on the right and left hands, respectively, of an observer standing on the storm track and facing in the direction the center is moving. *Prior to curving*, the winds in that semicircle of the storm which is more remote from the Equator (the right-hand semicircle in the Northern Hemisphere, the left-hand semicircle in the Southern Hemisphere) are liable to be more severe than those of the opposite semicircle. A vessel hove-to in the semicircle adjacent to the Equator has also the advantage of improbability of becoming involved in the actual center itself, inasmuch as there is a distinct tendency for storms to move away from the Equator and to curve. For these reasons the more remote semicircle (the right hand in the Northern Hemisphere, the left hand in the Southern Hemisphere) has been called the *dangerous*, while that semicircle adjacent to the Equator (the left hand in the Northern Hemisphere, the right hand in the Southern Hemisphere) is called the *navigable*.

In order to determine the path of the storm, and consequently in which semicircle the ship finds herself, it is necessary to wait until the wind shifts. When this occurs, plot a new position of the center 10 points to the right of the new direction of the wind as before, and the line joining these two positions will be the *probable* path of the storm. If the ship has not been stationary during the time between the two sets of observations (as will never be the case unless at anchor), allowance must be made for the course and distance she has traveled in the interim.

Two bearings of the center with an interval between of from 2 to 3 hours will, in general, be sufficient to determine the course of the storm, provided an accurate account is kept of the ship's way, but if the storm be moving slowly a longer interval will be necessary.

Should the wind not shift, but continue to blow steadily with increasing force, and with a falling barometer, it may be assumed that the vessel is on or near the storm track. Owing to the slow advance of storms in the Tropics, a vessel might come within the disturbed area by overtaking the center. In such a case a slight decrease in speed would probably be all that would be necessary, but it should be borne in mind that the storm path is by no means constant either in speed or direction, and that it is particularly liable to curve away from the Equator.

A vessel hove-to in advance of a tropical cyclonic storm will experience a long heavy swell, a falling barometer with torrents of rain, and winds of steadily increasing force. The shifts of wind will depend upon the position of the vessel with respect to the track followed by the storm center. Immediately upon the track, the wind will hold steady in direction until the passage of the central calm, the *eye of the storm*, after which the gale will renew itself, but from a direction opposite to that which it previously had. To the right of the track, or in the *right-hand semicircle* of the storm (the observer being supposed to face along the track), the winds, as the center advances and passes the vessel, will constantly shift to the right, the rate at which the successive shifts follow each other increasing with the proximity to the center; in this semicircle, then, in order that the wind shall draw aft with each shift, and the vessel not be taken aback a sailing vessel must be hove-to on the starboard tack; similarly, in the left-hand semicircle, the wind will constantly shift to the left, and here a sailing vessel must be hove-to on the port tack so as not to be taken aback. These rules hold alike for both hemispheres and for *cyclonic* storms in all latitudes.

Since the wind circulates counterclockwise in the Northern Hemisphere, the rule in that hemisphere is to face the wind and the storm center will be on the right hand. In the Southern Hemisphere, under the same circumstances, the center is to the left. If the wind traveled in exact circles, the center would be 8 points to the right when looking directly in the wind's eye. We have seen, however, that the wind follows more or less a spiral path inward, which brings the center from 8 to 12 points to the right of the direction of the wind.

The number of points to the right may vary during the same storm, and as the wind usually shifts in squalls its direction should be taken just after a squall.

The center will bear more nearly 8 points from the direction of the lower clouds than from that of the surface wind.

Ten points to the right (left in south latitude) when facing the wind is a good average allowance to make if in front of the storm, but a larger allowance should be made when in the rear. If very near the center the allowance should be reduced to 8 or 9 points in the front quadrants.

The approximate direction of the storm center can be determined with fair accuracy if the vessel is definitely within the wind system of the cyclone. The direction of movement of the storm may be determined roughly by the change in the barometer and the shifts of wind. It is helpful, in judging the probable course of West Indian hurricanes, to study the recorded paths of storms in different months as shown on the various *Pilot Charts* since the places of origin and the area traversed vary with the season. For example, tropical storms originating in the western Caribbean Sea in June nearly always move northwestward into the Gulf of Mexico; in November storms originating in the same region usually move northeastward into the Atlantic.

With storms of varying area and different intensities the lines of equal barometric pressure (isobars) must lie much closer together in some cases than in others, so that it is quite impossible to more than guess at the distance of the center by the height of the mercury or its rate of fall.

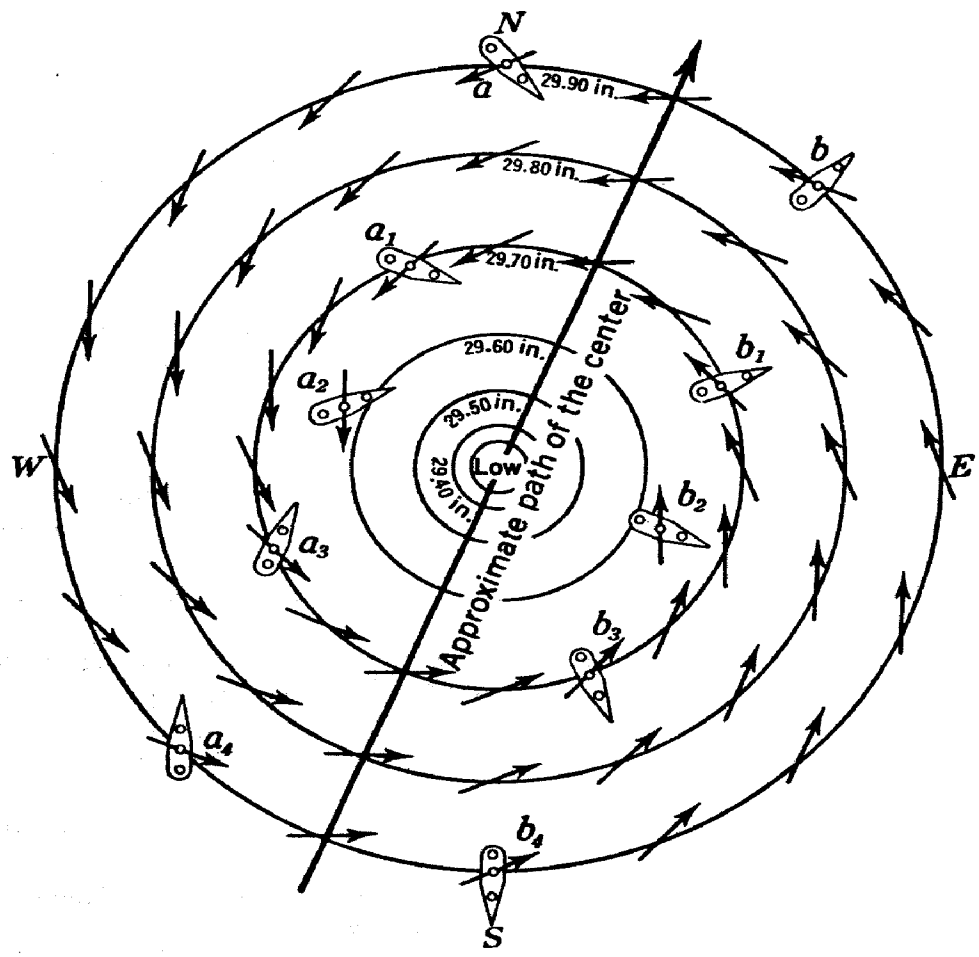
At the same time storms travel at varying rates of progression. In the Tropics this ranges from 5 to 20 miles per hour, generally decreasing as the storm track turns northward and curves, increasing again as it reaches the North Atlantic, where it may amount to as much as 50 miles per hour. Within the Tropics the storm area is usually small, the region of violent winds seldom extending more than 150 miles from the center. The barometer, however, falls rapidly as one progresses from the circumference toward the center, a difference of more than 3 inches having been observed in this distance.

The winds accordingly blow with greater violence and are more symmetrically disposed around the center than is the case in higher latitudes. After the storm has curved it gradually widens out and becomes less severe, and its velocity of translation increases as its rotational energy grows more moderate. Its center is no longer a well-defined area of small size marked by a patch of clear sky and near which the winds blow with the greatest violence. Out of the Tropics the strongest winds are often found at some distance from the center.

The central area of calm and blue sky, characteristic of tropical cyclones, is not found in well-developed storms of extratropical origin. Sometimes there is found near the center of areas of low barometer where the cyclonic circulation is but imperfectly developed a region of relative calm and clear sky lying between the easterly winds on the front of the depression and the westerly winds in the rear. The phenomenon is not,

however, analogous to the *eye* of the tropical cyclone. The latter appears to be due to intensity of rotation and disappears when this has sufficiently diminished. Occasionally a cyclone which originated in the Tropics will maintain its organization, including the calm center, until it reaches middle latitudes.

It must not be forgotten that the shifts of wind will only occur in the above order when the vessel is stationary. When the course and speed are such as to maintain a constant relative bearing between the ship and storm center, there will be no shift of wind. Should the vessel be outrunning the storm, the wind will indeed shift in the opposite direction to that given, and a navigator in the right semicircle, for instance, and judging only by the shifts of wind without taking into account his own run, might imagine himself on the opposite side. In such a case the barometer must be the guide. If it falls, one is approaching the center; if it rises, one is receding.




An examination of the diagram shows how this is. A vessel hove-to at the position marked *b*, and being passed by the storm center, will occupy successive positions in regard to the center from *b* to $b_4$, and will experience shifts of wind, as shown by the arrows, from east through south to southwest. On the other hand, if the storm center be stationary or moving slowly and a vessel be overtaking it along the line from $b_4$ to *b*,

the wind will back from southwest to east, and is likely to convey an entirely wrong impression as to the location and movement of the center.

Hence it is recommended that a vessel suspecting the approach or proximity of a cyclonic storm should stop (if a sailing ship heave-to on the starboard tack) for a while until the path of the center is located by observing the shifts of the wind and the behavior of the barometer.

If the wind remains steady in direction and increases in force in heavy squalls while the barometer falls rapidly, say, at a greater rate than 0.03 of an inch per hour, the vessel is probably on or near the track of the storm and in advance of the center.

In this position, with plenty of sea room, the proper course is to run with the wind well on the starboard quarter, if north of the Equator, and on the port quarter if south. The vessel will thus be in the navigable semicircle and be constantly increasing her distance from the center. The wind will draw more forward as she recedes from the center but the compass course first set should be adhered to until well clear.

The procedure is the same if the observations place the ship anywhere within the navigable semicircle.

The most critical situation is that of a vessel finding herself in the forward quadrant of the dangerous semicircle, particularly if at some distance from the center, where the wind shifts but slowly and the barometer indications are undecided, both causes combining to render the bearing of the center uncertain.

The general object, however, of putting as much distance as possible between oneself and the storm center should be kept in view.

With steamers this may not be difficult, although, should the storm be curving, the course first set may have to be subsequently altered in order to continue to draw away.

A *sailing vessel* will be set by the wind directly toward the path of the storm and may become involved with the center without being able to avoid it. If so caught in the dangerous semicircle, a *sailing vessel* should haul by the wind on the starboard tack when in north latitude (on the port tack in south latitude), keep coming up as the wind draws aft, and carry sail as long as the weather permits. If obliged to heave-to, do so on the starboard tack in north latitude and on the port tack in south latitude.

This maneuver, while it may not carry a vessel clear of the storm track, will make the best of a bad situation.

A vessel so hove-to will find the shifts of wind drawing aft, enabling her to come up to them instead of being headed off, as would be the case on the other tack.

Moreover, since the sea changes its direction less rapidly than the wind, the vessel will come up more nearly head-on to the old sea, instead of having it more abeam as on the opposite tack.

A general rule for *sailing vessels* is always heave-to on whichever tack permits the shifts of wind to draw aft.

The diagram representing a cyclonic storm in the Northern Hemisphere after curving illustrates graphically these rules for *sailing vessels*.

For simplicity the area of low barometer is made perfectly circular and the center is assumed to be 10 points to the right of the direction of the wind at all points within the disturbed area. Let us assume that the center is advancing about north-northeast, in the direction of the long arrow, shown in heavy full line. The ship *a* has the wind at east-northeast; she is to the left of the track, or technically in the navigable semicircle.

The ship *b* has the wind at east-southeast and is in the dangerous semicircle. As the storm advances these ships, if lying-to, *a* upon the port tack, *b* upon the starboard tack, as shown, take with regard to the storm center the successive positions *a a*, etc., *b b*, etc., the wind of ship *a* shifting to the left, of ship *b* to the right, or in both cases drawing aft, and thus diminishing the probability of either ship being struck aback, with possible serious damage to spars and rigging, a danger to which a vessel lying-to on the opposite tack (i. e., the starboard tack in the left-hand semicircle or the port tack in the right-hand semicircle) is constantly exposed, the wind in the latter case tending constantly to draw forward. The ship *b* is continually beaten by the wind and sea toward the storm track. The ship *a* is drifted away from the track and should she be able to carry sail would soon find better weather by running off to the westward.

Should *steamers* find it necessary to heave-to the method of doing so must depend upon the position within the storm area.

A steamer is concerned more with the damage resulting from heavy seas than from wind; furthermore a steamer is not dependent for her course upon the direction of the wind, but is free to maneuver to keep away from the storm center, where the heaviest and most confused seas are found, unless other circumstances, such as proximity to the land, prevent.

If unable to escape from the storm, and this can be done only in low latitudes when the storm covers a comparatively limited area, the principal object of a steamer is to avoid the center of the storm.

Referring to the diagram, it is obvious that in the Northern Hemisphere if a steamer finding herself in the left-hand (*navigable*) semicircle at *a* or $a_1$ should obey the rule for sailing vessels and heave-to on the port tack, her head will lie toward the storm track and the greatest danger. On the other hand, under the same circumstances, if the steamer heaves-to on the starboard tack, her head will lie away from the storm track and such headway as is made over the ground will all be in the direction of safety.

Following the same reasoning, a steamer in the Northern Hemisphere caught in the right-hand (*dangerous*) semicircle at *b*, $b_1$ in the diagram and obliged to heave-to should do so head to sea, because in this case both the wind and sea are constantly beating her toward the storm track, and when lying-to, head to sea, less leeway will be made than in any other position.

Many steamers behave better when hove-to with the sea astern, or on the quarter, but the adoption of this method must depend upon the position of the vessel within the storm area. Referring again to the diagram, it will be clearly seen that, in the Northern Hemisphere if in the forward quadrant of the left-hand semicircle at position *a*, $a_1$, a steamer may safely heave-to with the sea astern or on the starboard quarter. This course, however, should never be attempted when in the forward quadrant of the right-hand semicircle (position *b*, $b_1$) for the reason that any headway made over the ground would be, in all probability, toward the storm center where the high and confused seas would be likely to inflict damage.

If, in spite of all endeavors, the storm center should pass directly over a vessel she will experience a short period of calm, but the seas will be high, confused, and dangerous, being swept in from all directions. After a short interval the wind will burst with hurricane force from a point directly opposite to that from which it was blowing before, and the vessel must be prepared to meet it and to avoid being caught aback.

**Rules for maneuvering.**—The rules for maneuvering in the Northern Hemisphere so far as they may be generalized, are:

*Right or dangerous semicircle.*—Steamers: Bring the wind on the starboard bow, make as much way as possible, and if obliged to heave-to, do so head to sea. Sailing vessels: Keep close-hauled on the starboard tack, make as much way as possible, and if obliged to heave-to, do so on the starboard tack.

*Left or navigable semicircle.*—Steam and sailing vessels: Bring the wind on the starboard quarter, note the course and hold it. If obliged to heave-to, steamers may do so stern to sea; sailing vessels on the port tack.

*On the storm track in front of center.*—Steam and sailing vessels: Bring the wind 2 points on the starboard quarter, note the course and hold it, and run for the left semicircle, and when in that semicircle maneuver as above.

*On the storm track in rear of center.*—Avoid the center by the best practicable route, having due regard to the tendency of cyclones to curve to the northward and eastward.

## Inside Navigation

This section describes those factors which relate to the navigation of vessels along the Intracoastal Waterway and adjacent channels. Attention is called to paragraphs on Tropical Waters and Bank Blink in the section on Coastwise Navigation.

**Speed.**—The speed small vessels built in recent years are able to maintain has greatly increased the size of the wake and the damage caused by it. Any damage caused by the wake of a vessel to a moored or anchored vessel or a structure can be held against the vessel.

The general Federal regulation is given in this chapter under Navigation and Bridge Regulations. In areas where special Federal or local regulations have been issued see the description of the area in the text.

**Bends or curves.**—In the Intracoastal and adjoining waterways are many sharp bends which are dangerous to meeting and passing vessels. Speed should be reduced sufficiently so that the vessel may be stopped within half the distance an approaching vessel can be observed.

Under no circumstances should a vessel attempt to overtake and pass another vessel at a bend. Even with a sufficient view of the channel ahead of the overtaken vessel and after the proper exchange and understanding of whistle signals the currents may cause the overtaken vessel to sheer. This action is more noticeable with larger vessels and tows.

**Cross currents.**—Where two streams cross, the current will have a greater velocity in the deeper channel. This is noticeable along the Intracoastal Waterway where it follows a dredged canal cutting across a winding stream. Cross currents will also be noticed where either an inlet from the ocean or a drainage canal enters the waterway. Locations at which cross currents are particularly hazardous are described in the text.

**Bridges.**—Many of the bridges are hand-operated and move very slowly. Some have been noticed to open in the direction toward a vessel using the right-hand opening; however, this is no reason for using the left opening. Also many of the swing spans, even when the clearances are the same, do not make a complete turn but close in the

opposite direction to that of opening. Vessels equipped with whistles of the same or nearly the same tone as an automobile horn may have difficulty in making themselves heard or understood at bridges which have considerable highway traffic.

**Spoil banks.**—Nature quickly covers its scars. This statement is true of the spoil banks made by dredging. In the northern areas when awash these banks are often covered by grass, while in the southern areas they are covered by bushes and sometimes fairly large trees.

**Water hyacinth** is a floating fresh-water plant which infests numerous streams tributary to the South Atlantic and Gulf coasts. It has bright green leaves and a purple flower. It propagates from seeds and suckers, spreads quickly in most localities, and may cause entire suspension of navigation if not removed. The hyacinths form in mats or jams and float around driven by the wind or current. In open water these mats often resemble small islands. At times some of the bays and tributaries may be deceiving in appearance due to the presence of hyacinth jams. Where the water is apt to be brackish, an attempt can be made to force a boat through the mat. In doing so, however, care should be taken that any logs that might be floating in the weeds are not struck with force enough to damage the hull. Snakes may also be found on the hyacinth mats. The work of removing this growth is undertaken by the various Corps of Engineers districts by the processes of spraying, cutting, and the use of booms.

**Mangrove.**—Three distinct types of mangrove are found in the southern section of this area. *Yellow mangrove* grows to a height of about 4 feet and is found principally on the sand flats in front of the fast land. *Red mangrove* grows to a height of 10 to 15 feet and is rooted in water most of the time. *Black mangrove* grows on sand ridges and higher ground which cover only at very high water or storm tides. The black mangrove sometimes grows to a height of 50 to 60 feet.

**Stumps and sunken logs.**—Reports are frequently made that vessels have struck shoals or rocks in rivers which have later proved to be stumps or sunken logs. Mariners are warned against carrying their vessels too close to the banks of streams where submerged stumps are known or may be expected to exist.

**Dockage** is usually charged at the various piers and yacht basins. The rates vary from place to place and generally increase from north to south. Where moorings have been placed in an area dockage at a reduced rate will probably be charged. While a short free period is sometimes allowed, vessels should expect to be charged dockage at either privately or municipally owned piers or basins.

The term **marina** in its original conception was to be a sheltered harbor for recreational craft of all sizes, wherein the owner of a boat might buy his fuel, provisions, accessories, and the like, as well as spend the night or a longer period. The type of ownership may be municipal, club, or private. In this publication the term is used to indicate a sheltered harbor for the docking or mooring of recreational craft. The facilities and services available are generally listed in the description of the place.

**Hurricane moorings.**—In view of the equalization of the insurance rates more small boats will be going to southern waters at an earlier time than formerly. On receiving advisory notice of a tropical disturbance small boats should seek shelter in a small winding stream whose banks are lined with trees, preferably either cedar or mangrove. Moor with bow and stern lines fastened to the lower branches of a cedar or a mangrove; if possible snug up with good chafing gear. The knees of the trees will act as fenders and the branches having more give than the trunks will ease the shocks of the heavy gusts.

If the banks are lined only with small trees or large shrubs use clumps of them within each hawser loop. Keep clear of any tall pines as they generally have shallow roots and are more apt to be blown down.

## Navigation and Bridge Regulations

In this section are the general regulations prescribed by the Secretary of the Army (successor to the Secretary of War) for navigation, attended bridges, and unattended bridges for all the waterways tributary to the Atlantic Ocean within the area covered by this volume. All special regulations will be found in the text under the description of the area.

**Use, administration, and navigation** *of all waterways tributary to the Atlantic Ocean south of Chesapeake Bay and all waterways tributary to the Gulf of Mexico east and south of St. Marks, Fla.* These regulations apply to the following:

**Waterways.**—All navigable waters of the United States, natural or artificial, including bays, lakes, sounds, rivers, creeks, intracoastal waterways, as well as canals and channels of all types, which are tributary to or connected by other waterways with the Atlantic Ocean south of Chesapeake Bay or with the Gulf of Mexico east and south of St. Marks, Fla.

**Locks.**—All Government owned or operated locks and hurricane gate chambers and appurtenant structures in any of the above-described waterways.

**United States property.**—All river and harbor lands owned by the United States in or along the above-described waterways, including lock sites and all structures thereon, other sites for Government structures and for the accommodation and use of employees of the United States, and rights-of-way and spoil disposal areas to the extent of Federal interest therein.

**Vessels and rafts.**—The term "vessel" as used herein includes all floating things moved over these waterways other than rafts.

**(a) Authority of district engineers.**—The use, administration, and navigation of these waterways, Federal locks and hurricane gate chambers shall be under the direction of the officers of the Corps of Engineers, United States Army, detailed in charge of the respective sections, and their authorized assistants. The cities in which the United States district engineers are located are as follows:

United States District Engineer, Norfolk, Va.
United States District Engineer, Wilmington, N. C.
United States District Engineer, Charleston, S. C.
United States District Engineer, Savannah, Ga.
United States District Engineer, Jacksonville, Fla.

**(b) Commercial statistics.**—(1) As required by section 11 of the River and Harbor Act of September 22, 1922 (42 Stat. 1043; 33 U. S. C. 555), owners, agents, masters, and clerks of vessels plying upon the above-described waterways shall submit a report of such activities for statistical purposes which must contain the following information:

Name of vessel.
Name and address of owner or operator.
Type of vessel—steam, motor, sail, barge, or other type.
Net registered tonnage—if not registered, approximate net tonnage.
Maximum draft at time of passage.
Number of passengers.
Cargo—by commodities, expressed in short tons, or other units by which such commodities are customarily measured, giving origin and destination.

(2) All persons rafting and towing logs shall submit a report of their activities containing such information as may be called for by the district engineer concerned.

(3) The report should be presented to the lockmaster of the federally operated locks for each trip made. Where no federally operated lock is passed, they shall be mailed promptly to the district engineer. On written request, persons or corporations making frequent use of these waterways may

be granted permission to submit monthly statements in lieu of reports by trips. Reports may be submitted on forms furnished free of charge by the district engineer.

**(c) Bridges—(1) General.**—As required by law, and general regulations to govern the operation of drawbridges crossing all navigable waterways of the United States discharging their waters into the Atlantic Ocean south of and including Chesapeake Bay and the Gulf of Mexico, excepting the Mississippi River and its tributaries, prescribed by the Secretary of the Army, successor to the Secretary of War, all corporations or persons owning, operating, and tending drawbridges shall provide the same with the necessary tenders and the proper mechanical appliances for the safe, prompt, and efficient opening of the draw for the passage of vessels and other watercraft. The owner shall keep the operating machinery of the draw in serviceable condition, and shall have the draw opened and closed at intervals frequent enough to make certain that the machinery is kept in proper condition for satisfactory operation. Bridges and fender systems shall be constructed and maintained so as to afford at all times reasonably free, easy, and unobstructed navigation of the draw opening or the drawspan. Any accident or damage to the bridge, the fenders or the operating mechanism, shall be promptly reported to the district engineer, giving the cause and the probable period required for repairs. All bridges will be lighted in accordance with the rules and regulations of the Treasury Department, Coast Guard, successor to the Department of Commerce, Bureau of Lighthouses. (See 33 CFR, ch. IV.)

**(2) Signals for drawbridges.**—The signals for vessels desiring to pass bridges shall be those prescribed in the general regulations.

**(3) Passage through drawbridges.**—Trains, wagons, and other vehicles shall be not stopped on a drawbridge for the purpose of delaying its opening, nor shall watercraft or vessels be so manipulated as to hinder or delay the operation of a drawspan, but all passage over, through, or under a drawbridge shall be prompt, to prevent unnecessary delay to either land or water traffic.

**(d) Locks—(1) Authority.**—The locking of all vessels and rafts and their movements while in a lock, or in the approaches thereto, shall be under the direction of the lockmaster. The term "lockmaster" as used in these regulations, shall mean the lock official present who is in charge of the operation of the lock.

**(2) Signals.**—Vessels desiring lockage in either direction shall give notice to the lockmaster at not more than three-quarters of a mile nor less than one-quarter of a mile from the lock, by two long and two short blasts of a whistle. When the lock is available, a green light, semaphore, or flag will be displayed; when not available, a red light, semaphore, or flag will be displayed. No vessels or rafts shall approach within 300 feet of any lock entrance unless signaled to do so by the lockmaster.

**(3) Precedence at locks.**—Ordinarily vessels or rafts arriving at the lock shall take precedence in order of their arrival, but in all cases, vessels belonging to the United States or employed on public work shall have precedence over all others; passenger vessels shall have precedence over freight vessels, individual vessels over tows or rafts. Small vessels will not be granted separate lockage when larger vessels are awaiting lockage, and they will be required to lock through with other vessels. When two vessels approach the lock from opposite directions at approximately the same time, preference will ordinarily be given to the one for which the lock is prepared. In all cases, the order of the actual entry shall be determined by the lockmaster.

**(4) Entrance to and exit from locks.**—No vessel or raft shall enter or leave the locks before being signaled to do so. While waiting their turns vessels or rafts must not obstruct traffic and must remain at a safe distance from the lock. They shall take position in rear of any vessels or rafts that may precede them, and there arrange the tow for locking in sections if necessary. Masters and pilots of vessels or in charge of rafts shall cause no undue delay in entering or leaving the lock, and will be held to a strict accountability that the approaches are not at any time unnecessarily obstructed by parts of a tow awaiting lockage or already passed through. They shall provide sufficient men to move through the lock promptly without damage to the structures. Vessels or tows that fail to enter the locks with reasonable promptness after being signaled to do so will lose their turn.

**(5) Lockage of vessels.**—Vessels must enter and leave the locks carefully at slow speed, must be provided with suitable lines and fenders, must always use fenders to protect the walls and gates, and when locking at night must be provided with suitable lights and use them as directed.

The lockmaster may refuse to lock vessels which, in his judgment, fail to comply with these rules.

**(6) Lockage of rafts.**—Rafts shall be locked through in sections as directed by the lockmaster. No raft will be locked that is not constructed in accordance with the requirements stated in paragraph

(f). The party in charge of a raft desiring lockage shall register with the lockmaster immediately upon arriving at the lock and receive instructions for locking.

**(7) Number of lockages.**—Tows or rafts locking in sections will generally be allowed only two consecutive lockages if one or more single vessels are waiting for lockage, but may be allowed more in special cases. If tows or rafts are waiting above and below a lock for lockage, sections will be locked both ways alternately whenever practicable. When there are two or more tows or rafts awaiting lockage in the same direction, no part of one shall pass the lock until the whole of the one preceding it shall have passed.

Vessels which do not draw at least 6 inches less than the depth on miter sills or breast walls, or which have projections or sharp corners liable to damage gates or walls, shall not enter a lock or approaches.

No vessel having chains or lines either hanging over the sides or end, or dragging on the bottom for steering or other purposes, will be permitted to pass a lock or dam.

Power vessels must accompany tows through the locks when so directed by the lockmaster.

No vessel whose cargo projects beyond its sides will be admitted to lockage.

Vessels in a sinking condition shall not enter a lock or approaches.

The passing of coal from flats or barges to steamers while in locks is prohibited.

Where special regulations for safeguarding human life and property are desirable for special situations, the same may be indicated by printed signs, and in such cases such signs will have the same force as other parts of these regulations.

**(8) Mooring.**—Vessels and rafts when in the lock shall be moored where directed by the lockmaster by bow, stern and spring lines to the snubbing posts or hooks provided for that purpose, and lines shall not be let go until signal is given for vessel or raft to leave. Tying boats to the lock ladders is prohibited.

The mooring of vessels or rafts near the approaches to locks except while waiting for lockage, or at other places in the pools where such mooring interferes with general navigation of the waterway is prohibited.

**(9) Maneuvering locks.**—The lock gates, valves, and accessories will be moved only under the direction of the lockmaster; but if required, all vessels and rafts using the locks must furnish ample help on the lock walls for handling lines and maneuvering the various parts of the lock under the direction of the lockmaster.

**(e) Waterways—(1) Fairway.**—A clear channel shall at all times be left open to permit free and unobstructed navigation by all types of vessels and rafts that normally use the various waterways or sections thereof. The district engineer may specify the width of the fairway required in the various waterways under his charge.

**(2) Stoppage in waterway, anchorage, or mooring.**—No vessels or rafts shall anchor or moor, in any of the land cuts or other narrow parts of the waterway, except in case of an emergency. Whenever it becomes necessary for a vessel or raft to stop in any such portions of the waterway it shall be securely fastened to one bank and as close to the bank as possible. This shall be done only at such a place and under such conditions as will not obstruct or prevent the passage of other vessels or craft. Stoppages shall be only for such periods as may be necessary.

No vessel or raft will be allowed to use any portion of the fairway as a mooring place except temporarily as authorized above without the written permission from the district engineer.

When tied up, all vessels must be moored by bow and stern lines. Rafts and tows shall be secured at sufficiently close intervals to insure their not being drawn away from the bank by winds, currents, or the suction of passing vessels. Tow lines shall be shortened so that the different parts of the tow shall be as close together as possible. In narrow sections, no vessel or raft shall be tied abreast of another.

Lights shall be displayed in accordance with provisions of the Federal Pilot Rules.

No vessel, even if fastened to the bank as above prescribed, shall be left without a sufficient crew to care for it properly.

Vessels will not be permitted to load or unload in any of the land cuts except at a regular established landing or wharf without written permission secured in advance from the district engineer.

No vessel, regardless of size, shall anchor in a dredged channel or narrow portion of a waterway for the purpose of fishing, if navigation is obstructed thereby.

Except in cases of emergency the dropping of anchors, weights, or other ground tackle, within

areas occupied by submarine cable or pipe crossings, is prohibited. Such crossing will ordinarily be marked by signboards on each bank of the shore or indicated on coast charts.

**(3) Speed.**—Vessels shall proceed at a speed which will not endanger other vessels or structures and will not interfere with any work in progress incident to maintaining, improving, surveying, or marking the channels.

Official signs indicating limiting speeds through critical portions of the waterways shall be strictly obeyed.

Vessels approaching and passing through a bridge shall so govern their speed as to insure passage through the bridge without damage to the bridge or its fenders.

A vessel being overtaken by another shall slacken speed sufficiently to permit the passage to be effected with safety to both vessels.

**(4) Assembly and handling of tows.**—All vessels drawing tows not equipped with rudders shall use two tow lines or a bridle and shorten them to the greatest possible extent so as to have full control at all times. The various parts of a tow shall be securely assembled with the individual units connected by lines as short as practicable. If necessary, as in the case of lengthy or cumbersome tows or tows in restricted channels, the district engineer may require that tows be broken up and may require the installation of a rudder, drag, or other approved steering device on the tow in order to avoid obstructing navigation or damaging the property of others, including aids to navigation maintained by the United States or under its authorization, by collision or otherwise.

**(5) Projections from vessels.**—No vessel carrying a deck load which overhangs or projects over the side of said vessel, or whose rigging projects over the side of the vessel so as to endanger passing vessels, wharves, or other property, will enter or pass through any of the narrow parts of the waterway.

**(6) Meeting and passing.**—Vessels on meeting or overtaking, shall give the proper signals and pass in accordance with Federal Pilot Rules. Rafts shall give to vessels the side demanded by proper signal. All vessels approaching dredges, or other plant engaged on improvements to a waterway, shall give the signal for passing and slow down sufficiently to stop if so ordered or if no answering signal is received. On receiving the answering signal, they shall then proceed to pass at a speed sufficiently slow to insure safe navigation.

**(f) Rafts, logging.**—Rafts will be permitted to navigate a waterway only if properly and securely assembled. The passage of "bag" or "sack" rafts, "dog" rafts, or of loose logs over any portion of a waterway, is prohibited. Each section of a raft will be secured within itself in such a manner as to prevent the sinking of any log, and so fastened or tied with chains or wire rope that it cannot be separated or bag out so as to materially change its shape. All dogs, chains, and other means used in assembling rafts shall be in good condition and of ample size and strength to accomplish their purposes.

No section of a raft will be permitted to be towed over any portion of a waterway unless the logs float sufficiently high in the water to make it evident that the section will not sink en route.

Frequent inspections will be made by the person in charge of each raft to insure that all fastenings remain secure, and when any one is found to have loosened, it shall be repaired at once. Should any log or section be lost from a raft, the fact must be promptly reported to the district engineer, giving as definitely as possible the exact point at which the loss occurred. In all cases the owner of the log or section will take steps immediately to remove the same from the waterway.

The length and width of rafts shall not exceed such maximum dimensions as may be prescribed by the district engineer.

All rafts shall carry sufficient men to enable them to be managed properly, and to keep them from being an obstruction to other craft using the waterway. To permit safe passage in a narrow channel, rafts will, if necessary, stop and tie up alongside the bank. Care must be exercised both in towing and mooring rafts to avoid the possibility of damage to aids to navigation maintained by the United States or under its authorization.

When rafts are left for any reason with no one in attendance, they must be securely tied at each end and at as many intermediate points as may be necessary to keep the timbers from bagging into the stream, and must be moored so as to conform to the shape of the bank. Rafts moored to the bank shall have lights at 500-foot intervals along their entire length. Rafts must not be moored at prominent projections of the bank, or at critical sections.

Logs may be stored in certain tributary streams provided a clear channel at least one-half the width of the channel be left clear for navigation along the tributary. Such storage spaces must be protected by booms and, if necessary to maintain an open channel, piling should also be used.

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Authority for placing these booms and piling must be obtained by written permit from the district engineer.

The building, assembling, or breaking up of a raft in a waterway will be permitted only upon special authority obtained from the district engineer, and under such conditions as he may prescribe.

**(g) Dumping of refuse or oil in waterway, obstructions.**—Attention is invited to the provisions of sections 13 and 20 of the River and Harbor Act of March 3, 1899 (30 Stat. 1152, 1154; 33 U. S. C. 407, 415), and of sections 2, 3, and 4 of the Oil Pollution Act of June 7, 1924 (43 Stat. 604, 605; 33 U. S. C. 432–434), which prohibit the depositing of any refuse matter in these waterways or along their banks where liable to be washed into the waters; authorize the immediate removal or destruction of any sunken vessel, craft, raft, or other similar obstruction, which stops or endangers navigation; and prohibit the discharge of oil from vessels into the coastal navigable waters of the United States.

**(h) Damage.**—Masters and owners of vessels using the waterways are responsible for any damage caused by their operations to canal revetments, lock piers and walls, bridges, hurricane gate, chambers, spillways, or approaches thereto, or other Government structures, and for displacing or damaging of buoys, stakes, spars, range lights or other aids to navigation. Should any part of a revetment, lock, bridge, hurricane gate, chamber, spillway or approach thereto, be damaged, they shall report the fact, and furnish a clear statement of how the damage occurred, to the nearest Government lockmaster or bridge tender, and by mail to the District Engineer, United States Engineer Office, in local charge of the waterway in which the damage occurred. Should any aid to navigation be damaged, they shall report that fact immediately to the nearest District Coast Guard office.

**(i) Trespass on property of the United States.**—Trespass on waterway property or injury to the banks, locks, bridges, piers, fences, trees, houses, shops, or any other property of the United States pertaining to the waterway, is strictly prohibited. No business, trading or landing of freight or baggage will be allowed on or over Government piers, bridges, or lock walls.

**(j) Copies of regulations.**—Copies of these rules and regulations will be furnished free of charge upon application to the nearest district engineer.

**(k) Effective date.**—These regulations shall take effect and be in force on and after June 5, 1938.

**Attended bridges** over *all navigable waters discharging into the Atlantic Ocean south of and including Chesapeake Bay and the Gulf of Mexico, except the Mississippi River, its tributaries and outlets:*

(*a*) Corporations or persons owning or controlling a drawbridge shall provide the same with the necessary tenders and the proper mechanical appliances for the safe, prompt, and efficient opening of the draw for the passage of vessels.

(*b*) If the weather conditions are good and sound signals can be heard when a vessel approaches a drawbridge and desires to pass through the draw, three distinct blasts of a whistle or horn shall be sounded or three calls through a megaphone shall be made from the vessel when within reasonable hearing distance of the bridge.

(1) When the draw of the bridge can be opened immediately, the drawtender shall reply by three distinct blasts of a whistle or horn, by three calls through a megaphone, or by three loud and distinct strokes of a bell.

(2) When the draw of the bridge cannot be opened immediately or when the bridge is open and is to be closed immediately, the drawtender shall reply by four or more short, distinct blasts of a whistle or horn, by four or more calls through a megaphone, or by four or more loud and distinct strokes of a bell (danger signal).

(*c*) When weather conditions prevent hearing the sound signals when a vessel approaches a drawbridge and desires to pass through the draw, signals shall be made from the vessel by swinging in circles at arm's length a lighted lantern at night and a flag by day.

(1) When the draw of the bridge can be opened immediately, the drawtender shall reply by raising and lowering in vertical plane a number of times a lighted lantern at night and a flag by day.

(2) When the draw of the bridge cannot be opened immediately or when the bridge is open and is to be closed immediately, the drawtender shall reply by swinging to and fro horizontally a number of times a lighted lantern at night and a flag by day.

(*d*) When a vessel wishes to pass two or more bridges close together or crossing a section of the waterway less than 500 feet in length, signals as prescribed above shall be given from the vessel for opening the first bridge, followed at an interval of about 5 seconds by the same signals for the second bridge, and so on, thus giving, at intervals of about 5 seconds, separate signals for each bridge the vessel desires to pass.

(*e*) When two or more vessels are approaching a bridge at nearly the same time from the same or opposite directions with the draw opened or closed, each of these vessels shall signal independently for the opening of the draw, and the drawtender shall reply as prescribed and in turn to the signal of each vessel.

(*f*) Where bridges are less than 500 feet apart, the signals to govern the movements of the approaching vessel shall be given from the bridge nearest the vessel. If the bridge can be opened immediately, the bridgetender shall await the reply signals from the other bridges and then give the signal circumstances require. If the nearest bridge cannot be opened immediately, the prescribed signal shall be given the approaching vessel at once to be followed as soon as possible by the signal from that bridge that the draws are about to open.

(*g*) The draw shall be opened with the least possible delay upon receiving the prescribed signal: Provided, that the drawspan shall not be opened when a train is approaching so closely that it cannot safely be stopped before reaching the bridge, or when a passenger or mail train is approaching within sight or hearing of the operator of the drawspan.

(*h*) When a bridgetender is about to close a draw, he shall sound four or more short, distinct blasts of a whistle or horn, four or more calls through a megaphone, or four or more loud and distinct strokes of a bell (danger signal).

(*i*) Trains, wagons, and other vehicles shall not be stopped on a drawbridge for the purpose of delaying its opening, nor shall watercraft be so manipulated as to hinder or delay the operation of a drawspan, but all passage over, through, or under a drawbridge shall be prompt, to prevent delay to either land or water traffic.

**Unattended bridges** over *all navigable waterways of the United States discharging their waters into the Atlantic Ocean south of and including Chesapeake Bay and the Gulf of Mexico, excepting the Mississippi River and its tributaries; bridges where constant attendance of drawtenders is not required.*

A. The owners of or agencies controlling the bridges listed below [see note under par. F] will not be required to keep drawtenders in constant attendance.

B. Whenever a vessel, unable to pass under a closed bridge, desires to pass through the draw, advance notice, as specified, of the time the opening is required shall be given to the authorized representative of the owner of or agency controlling the bridge.

C. Upon receipt of such advance notice, the authorized representative of the owner or agency controlling the bridge, in compliance therewith, shall arrange for the prompt opening of the draw at the time specified in the notice for the passage of the vessel.

D. The owners of or agencies controlling the bridges shall keep conspicuously posted on both the upstream and downstream sides thereof, in such manner that it can easily be read at any time, a copy of these regulations together with a notice stating exactly how the representative specified in paragraph B of this section may be reached.

E. The operating machinery of the draws shall be maintained in a serviceable condition, and the draws shall be opened and closed at intervals frequent enough to make certain that the machinery is in proper order for satisfactory operation.

F. The bridges to which these regulations apply, and the advance notice required in each case, are as follows: [NOTE.—The information contained in this paragraph has been entered in the description of the bridges affected and a reference made to this regulation.]

# Local Services

**Pilotage** is compulsory for certain vessels entering from sea, but is not compulsory for the interior waters inside the inlets. Pilots cruise off Chesapeake Bay, Charleston Harbor, and Savannah River entrances. At other ports pilots will come out upon previous notice by radio or otherwise, or, in most cases, to vessels making signals for the pilot by International Code. Pilot stations and rates of pilotage are given in the information concerning the various ports.

Local boatmen competent to act as pilots for parts of the Intracoastal Waterway and interior waters can usually be found at the larger cities and towns along the route or near the entrances to various tributaries; the charge for piloting in these cases is by special arrangement with the pilot.

**Quarantine** for all ports within the limits of this volume is enforced in accordance with the regulations of the United States Public Health Service.

National quarantine regulations will be found at the stations of the service and at United States consulates, or will be furnished to vessels upon application, either by officers of the service or by the United States Public Health Service, Washington 25, D. C. All vessels visiting foreign ports should be provided with the quarantine regulations.

The location of the quarantine stations within the limits of this volume are in the Appendix.

**Harbor masters** are appointed for the principal ports, and they have charge of the anchorage and berthing of vessels in their respective harbors. For harbor masters' fees, see information concerning the various ports.

**Dockmaster** is the title generally given to the person in charge of a municipal wharf or dock used by small craft, especially along the Intracoastal Waterway. The dockmaster assigns berths, collects dockage fees, and exercises police control over the property.

**Towboats** are stationed at Norfolk, Cape Fear River, Winyah Bay, Charleston Harbor, Savannah River, St. Simons Sound (Brunswick), St. Johns River, Miami, and Key West. Arrangements for towboats should be made by radio or telegraph.

**Repairs.**—Newport News, Norfolk, Charleston, Savannah, and Jacksonville are the principal places at which extensive repairs to the hulls and machinery of large vessels can be made. Elizabeth City, Washington, N. C., New Bern, Wilmington, Georgetown, and Miami have limited facilities for repairs. Minor repairs can be made and small craft can be hauled out at several other places.

**Salvage equipment** consisting of tugs, lighters, pumps, derricks, diving apparatus, and the like is available at Norfolk, Wilmington, Charleston, Savannah, Jacksonville, Miami, and Key West. The more extensive equipment is available at Norfolk and Jacksonville.

**Supplies.**—Coal, fuel oil, Diesel oil, gasoline, fresh water, and supplies of all kinds can be obtained at Norfolk, Newport News, Wilmington, Charleston, Savannah, Jacksonville, and Miami. Gasoline, provisions, water, and usually Diesel oil are obtainable at practically all of the cities and towns.

**Standard time.**—The standard time of the meridian 75°, west, eastern, 5 hours slow of Greenwich time is used within the limits of this volume.

**Daylight saving time.**—In some localities clocks are advanced 1 hour between 2 a. m. on the last Sunday in April and 2 a. m. on the last Sunday in September. Norfolk, Newport News, and Miami keep daylight saving or summer time within the limits of this volume.

**Legal holidays.**—The following are the legal holidays in the States of Virginia, North Carolina, South Carolina, Georgia, and Florida:

January 1, New Year's Day.—All.
January 19, Lee's Birthday.—All.
February 22, Washington's Birthday.—All.
Good Friday.—South Carolina, Florida.

Easter Monday.—North Carolina.
April 12, Halifax Independence Resolutions.—North Carolina.
April 13, Thomas Jefferson's Birthday.—Virginia.
April 26, Confederate Memorial Day.—Georgia, Florida.
May 10, Confederate Memorial Day.—North Carolina, South Carolina.
May 20, Mecklenburg Declaration of Independence.—North Carolina.
June 3, Confederate Memorial Day.—Virginia.
June 3, Jefferson Davis' Birthday.—All except Virginia.
July 4, Independence Day.—All.
Labor Day.—All.
October 12, Columbus Day.—Virginia, Georgia, Florida.
October, Thursday of State Fair Week.—South Carolina.
Election Day.—All except Georgia.
November 11, Armistice Day.—All.
Thanksgiving Day.—All.
December 25, Christmas Day.—All.

**Miscellaneous.**—For information of any particular kind about a definite locality refer to the locality in the text.

For general information of a local character, including the addresses of the offices maintained by the different bureaus of the Government, meteorological tables, and the like, refer to the Appendix.

# Inland Waterways

The following data concerning the Intracoastal Waterway from Boston to the Rio Grande, the New York Canal System, the Lakes to Gulf Waterway, and the other river channels tributary to the Mississippi River are included for ready reference.

The **Intracoastal Waterway** affords a protected route, with the exception of various sections, for vessels between Boston, Mass., and the Rio Grande; a distance of approximately 2,900 miles. No toll is charged for passage as the waterway is under Federal jurisdiction. Navigation is restricted, however, by the limiting depths, and horizontal and vertical clearances in the various sections of the waterway.

*Boston to New York Harbor.*—Between Boston and Long Island Sound it is necessary to pass through comparatively exposed waters and no inland route exists except for the passage through the Cape Cod Canal and its approaches. The canal extends from Cape Cod Bay to Buzzards Bay and with its approach channels affords a sea-level waterway 12.6 miles in length. The project depth is 32 feet over a width of 450 to 500 feet. The minimum vertical clearance is 135 feet at high water. Cape Cod Bay and the canal are fully described in *United States Coast Pilot, Atlantic Coast, Section A.* Buzzards Bay to New York is described in *United States Coast Pilot, Atlantic Coast, Section B.*

*New York Harbor to Norfolk.*—Between New York and Manasquan Inlet the route follows the outside coast. From Manasquan Inlet to Delaware Bay the inside route follows the New Jersey Inland Waterway. The State-maintained channels have a project depth of 6 feet. The Corps of Engineers have been authorized to maintain a waterway with a project depth of 12 feet over a width of generally 100 feet. The minimum horizontal clearance is 30 feet. Up to 1948 no work had been done on this project by the Corps of Engineers. The route then follows Delaware Bay and River to the

Chesapeake & Delaware Canal, through the canal to Chesapeake Bay. The canal has a project depth of 27 feet over a width of 250 to 400 feet. The minimum vertical clearance is 135 feet at high water. *United States Coast Pilot, Atlantic Coast, Section C,* fully describes the route between New York and Norfolk.

*Norfolk to Key West.*—This waterway, which is described in the text of this volume, consists of dredged channels and land cuts roughly parallel to the coast. The project depth is 12 feet from Norfolk to St. Johns River with minimum clearances of 47 feet horizontal and 80 feet vertical. From St. Johns River to Miami the project depth is 8 feet with minimum clearances of 52 feet horizontal and 79½ feet vertical. From Miami to Cross Bank the project depth is 7 feet with a minimum horizontal clearance of 40 feet. Between Cross Bank and Key West the waterway follows a natural channel 5 feet deep.

*Key West to Apalachicola.*—This waterway along the outer coast is described in *United States Coast Pilot, Gulf Coast.*

*Apalachicola to Corpus Christi.*—This waterway consists of dredged channels and land cuts roughly parallel to the coast. The project depth is 12 feet over a width of 125 to 150 feet. The minimum clearances are 75 feet horizontal and 70 feet vertical. This waterway is described in *United States Coast Pilot, Gulf Coast.*

*Corpus Christi to the Rio Grande.*—In 1948, this section of the waterway was being dredged through Laguna Madre. The project depth is 12 feet over a width of 125 feet.

**New York State Canal System.**—The New York canals, built by the State of New York, afford free waterway communication between Lakes Erie and Ontario on the west and the Hudson River and Lake Champlain on the east. The system comprises the following lines or branches: Erie Canal, from Troy Lock in Hudson River to Tonawanda on Niagara River; Champlain Canal, from Waterford on Hudson River to Whitehall on Lake Champlain; Oswego Canal, from Three Rivers Point at head of Oswego River to Oswego on Lake Ontario; Cayuga and Seneca Canals, from Erie line at the confluence of Seneca and Clyde Rivers to Ithaca on Cayuga Lake and Montour Falls on Seneca Lake.

*Troy to Lake Ontario.*—The Erie Canal is followed to Three Rivers where the canalized Oswego River is entered and followed to Oswego on Lake Ontario. This section is being improved by the Federal Government to provide a channel 14 feet deep between the locks and a vertical clearance of 20 feet at maximum navigable stage at bridges and overhead structures. The 29 locks have usable dimensions of 43.5 feet wide, 300 feet long, and 12 feet over the sills. The locks are to be deepened to 13 feet.

*Troy to Niagara River.*—The Erie Canal is followed the entire distance. West of Three Rivers Point the depth is 12 feet in the canal and over the sills of the locks. The usable length of the locks is 300 feet and the width 43.5 feet. The least vertical clearance is 15 feet.

*Troy to St. Lawrence River.*—The Champlain Canal, Lake Champlain, and the Richelieu River, including the Chambly Canal, afford an all-water route from Troy to the St. Lawrence River. The size of vessels using this route is limited by the locks in the Chambly Canal, Canada, which have usable dimensions of 111½ feet in length, 22 feet in width, and 6½ feet of water over the sills. The locks of the Champlain Canal have the same dimensions as those in the Erie Canal west of Three Rivers Point. The distance from Albany to Montreal via this route is 309 statute miles.

The Canadian Government requires cruising permits or let-passes from pleasure boats entering Canadian waterways, which may be obtained at their canal statistical offices at St. Johns and Prescot. American vessels when leaving Canada must report at the customs office.

*Charts.*—Charts of the Erie Canal, Champlain Canal, Lake Champlain, and Great Lakes are published by the United States Lake Survey Office, Detroit, Mich., and sections of the New York State canals by the Superintendent of Public Works, Albany, N. Y. Charts of the Richelieu River and Chambly Canal are published by the Hydrographic and Map Service, Department of Mines and Resources, Ottawa, Canada.

*Ice.*—Navigation in the upper Hudson River and the New York State Canal System is usually obstructed by ice from the middle of December to the middle of April.

The **Lakes to Gulf Waterway** via the Illinois Waterway and the Mississippi River affords passage of vessels from Chicago on Lake Michigan to the Gulf of Mexico, a distance of 1,630 statute miles.

The **Mississippi River,** *Gulf of Mexico to Baton Rouge.*—This section of the river is a deep-water channel and is described in the *United States Coast Pilot, Gulf Coast.* Navigation is safe and easy at all seasons. The bridge 2 miles above New Orleans has a vertical clearance of 135 feet above ordinary high water.

*Baton Rouge to Cairo.*—The project depth of the channel is 12 feet over a width of 300 feet. This dimension is greatly exceeded during medium and high stages. The minimum clearances are 600 feet horizontal and 59½ feet vertical at extreme high stage.

*Cairo to the mouth of the Missouri River.*—The project provides for a channel 9 feet deep at low water over a width of 300 feet to the northern boundary of the city of St. Louis; thence 200 feet wide to the mouth of the Missouri River. The minimum clearances are 500 feet horizontal and 59 feet vertical at extreme high stage. Navigation is continuous throughout the year except when the river is blocked by running ice or gorges.

*Mouth of the Missouri River to St. Paul and Minneapolis.*—The project provides for a channel 9 feet deep. Below Hastings, Minn., the locks have uniform dimensions of 110 feet wide and 600 feet long. Above Hastings the widths are 56 feet and the lengths 400 feet. The minimum vertical clearance is 53 feet at normal pool level. Above Grafton, Ill., the navigation season is usually from April to December.

The **Illinois Waterway,** consisting of canals and improved waterways, connects the Mississippi River at Grafton, Ill., with outlets to Lake Michigan at Chicago and Calumet Harbors. The project depth is 9 feet over a width of 300 feet to Lockport, thence 160 feet to the head of deep-draft navigation at Lake Michigan harbors. The locks are all 600 feet long and 110 feet wide. A butterfly dam has a horizontal clearance of 80 feet when open. The minimum clearances are 50 feet horizontal and 17 feet vertical.

The *Illinois and Mississippi (Hennepin) Canal* connects the Mississippi River at the mouth of Rock River with the Illinois River near Bureau Junction, on the Illinois Waterway. The project depth is 7 feet. The locks are 143 feet long and 35 feet wide. The minimum vertical clearance is 16½ feet at normal pool stage.

The **Red River** enters the Mississippi River 300.8 statute miles above the Head of the Passes. This river is navigable to Fulton, Ark., a distance of 463 statute miles. The minimum clearances are 100 feet horizontal and 37 feet vertical at high water.

The *Black River* enters the Red River 35.5 statute miles above the mouth. Above Jonesville, La., the Black River is joined by the Tensas and Little Rivers and the

name of the river changes to the *Ouachita River*. The project provides for a navigable depth of 6½ feet at low water from the mouth of the Black River to Camden, Ark., a distance of 351 statute miles. The locks are all 55 feet wide and 268 feet long. The minimum vertical clearance is 57¼ feet at normal pool level. Between Camden and Arkadelphia, 67 statute miles, the river is used by vessels of 5½-foot draft. The project on the *Tensas River* provides for snag removal and a channel through the bars 4 feet deep from the mouth at Jonesville to Tendal, La., a distance of 137.8 statute miles. The minimum clearances on the Tensas River are 55 feet horizontal, 22¼ feet vertical at low water, and 8 feet vertical at high water. *Bayou Macon* enters the Tensas River 42.7 statute miles above the mouth. It is snagged between Floyd, La., and the mouth, a distance of 111.6 statute miles. The minimum clearances on Bayou Macon are 58 feet horizontal, 30 feet vertical at low water, and 1 foot vertical at high water. The *Boeuf River* enters the Ouachita River at Sicily Island Gorge, about 81 statute miles above the mouth. It is snagged between Wallace Landing and the mouth, a distance of 166 statute miles. The minimum clearances are 58 feet horizontal, 28½ feet vertical at low water, and 8½ feet vertical at high water.

The **Yazoo River** enters the Mississippi River at Vicksburg, Miss., 431.7 statute miles above the Head of the Passes. The project provides for a channel with a minimum depth of 4 feet over a width of 200 feet from the mouth to the junction of the Tallahatchie and Yalobusha Rivers, a distance of about 189 statute miles. The minimum clearances are 83¼ feet horizontal and 50 feet vertical at high water.

The *Big Sunflower River* enters the Yazoo River about 44 statute miles above the mouth. The project channel is 4½ feet deep over a width of 100 feet from the mouth to the mouth of the Hushpuckena River, a distance of 171.4 statute miles. The lock, 36 feet wide and 160 feet long, is no longer maintained. The minimum clearances are 60 feet horizontal, 31 feet vertical at low water, and 12 feet vertical at high water.

The **Arkansas River** enters the Mississippi River 575 statute miles above the Head of the Passes. It is navigable to the mouth of the Grand (Neosho) River, a distance of 459.3 statute miles. The channel is kept clear of snags. For about 4 months in the year the depth is 3 feet or more and for 8 months the depth is less than 3 feet. The minimum clearances are 130 feet horizontal and 42½ feet vertical at low water.

The *Fourche La Fave River* enters the Arkansas River 192.2 statute miles above the mouth. It is navigable to Perryville, Ark., a distance of 22.2 statute miles.

The *Petit Jean River* enters the Arkansas River 234.9 statute miles above the mouth. It is navigable to Rocky Crossing, Ark., a distance of 28.2 statute miles.

The *Poteau River* enters the Arkansas River 362 statute miles above the month. It is navigable to Braden, Okla., a distance of 8.6 statute miles.

The **White River** enters the Mississippi River 583.5 statute miles above the Head of the Passes. The project provides for channel maintenance to Batesville, 302 statute miles above the mouth, and for locks and dams to provide slack water navigation for 4-foot draft from Batesville to Guion, 33 statute miles upstream. During 8 months of the year the depth is more than 4½ feet to Peach Orchard Bluff, 169 statute miles; thence 4 feet to Black River, 96 statute miles; thence 2½ feet to Batesville, 37 statute miles. The locks above Batesville have a width of 36 feet and a length of 147 feet. The minimum clearances are 118 feet horizontal, 79 feet vertical at low water, and 47 feet vertical at high water.

The *Black River* enters the White River at Jacksonport, Ark., 264.8 statute miles above the mouth. The project provides for channel maintenance to Poplar Bluff, Mo., 211 statute miles above the mouth. The minimum clearances are 32 feet horizontal, 26¼ feet vertical at low water, and 18½ feet vertical at high water.

The **St. Francis River** enters the Mississippi River 669.7 statute miles above the Head of the Passes. The project provides for channel maintenance to Marked Tree, Ark., a distance of 148.2 statute miles above the mouth. Navigation can be carried to St. Francis, Ark., a distance of 255.6 statute miles above the mouth. During 5 months of the year a depth of 6 feet or more can be carried to about 45 statute miles above Marked Tree and for 7 months a depth of 1 foot or more. The minimum clearances below Marked Tree are 81 feet horizontal, 47½ feet vertical at low water, and 7 feet vertical at high water.

The *L'Anguille River* enters the St. Francis River 11.8 statute miles above the mouth. The project provides for channel maintenance to Marianna, Ark., a distance of 8.3 statute miles above the mouth. For 5 months depths of more than 3 feet are available and for 7 months less than 3 feet.

*Blackfish Bayou* enters the St. Francis River 38.3 statute miles above the mouth. The project provides for channel maintenance to Fifteen Mile Bayou, 6 statute miles above the mouth. Depths of more than 3 feet are available for 5 months and less than 3 feet for 7 months.

The **Ohio River** enters the Mississippi River 964 statute miles above the Head of the Passes and 2 miles below Cairo, Ill. The project provides for the construction of dams and locks to provide a channel 9 feet deep from the mouth to Pittsburgh, Pa., a distance of 981 statute miles. The locks have usable dimensions of 110 feet in width and 600 feet in length. The minimum clearances are 110 feet horizontal and 63 feet vertical at normal pool level. Running ice and ice gorges may occur during the months of December, January, or February, but seldom later. The ice gorges are at times extremely dangerous to navigation. Charts, regulations, and navigation condition reports should be obtained from The Division Engineer, Corps of Engineers Office, P. O. Box 1799, 243 North High Street, Columbus 16, Ohio.

The *Tennessee River* enters the Ohio River 48.2 statute miles above the mouth. The project provides for a channel 9 feet deep by the construction of high dams and locks to the junction of French Broad and Holston Rivers, 4.4 statute miles above Knoxville, Tenn., a distance of 652.1 statute miles above the mouth. The locks have usable dimensions of 110 feet wide and 600 feet long below Florence, Ala., 256.4 statute miles above the mouth and 60 feet wide and 265 feet long above Florence. The minimum clearances are governed by the widths of the locks horizontally and 56.4 feet vertical at normal pool level below Knoxville and 50 feet vertical at normal pool level above Knoxville. The *Hiwassee River* enters the Tennessee River 499.4 statute miles above the mouth. It is navigable to Charleston, Tenn., 18.8 statute miles above the mouth. The minimum vertical clearance is 27 feet. The *Clinch River* enters the Tennessee River 567.7 statute miles above the mouth. It has a channel 9 feet deep for 18.8 statute miles above its mouth. *Little River* enters the Tennessee River 635.6 statute miles above the mouth. It has a channel 9 feet deep at minimum pool level to Singleton, Tenn., 1.2 statute miles above the mouth. The *French Broad River* is navigable to the Douglas Dam, 24.1 statute miles above the mouth. The river is used by vessels of 3 feet and less draft.

The *Cumberland River* enters the Ohio River 60.5 statute miles above the mouth. The project provides for a channel 6 feet deep to Waitsboro Shoals, 324.6 statute miles above the mouth, thence 4 feet for a distance of 3 statute miles to Burnside, Ky. All of the locks on this river are 52 feet wide and 280 feet long. The minimum vertical clearances are 74½ feet at pool level and 34 feet at extreme high water in the section below Nashville, Tenn., 191 statute miles above the mouth, and 88½ feet at pool level and 40 feet at extreme high water in the section above Nashville. Information about the depths available at any given point at any specific time should be obtained from the District Engineer, 306 United States Courthouse, Nashville, Tenn.

The *Tradewater River* enters the Ohio River 107 statute miles above the mouth. The project depth is 9 feet at pool stage for a distance of 3 statute miles above the mouth.

The *Green River* enters the Ohio River 196.9 statute miles above the mouth. The project depth is 5½ feet to Mammoth Cave, Ky., a distance of 197.8 statute miles. The minimum dimensions of the locks are 35½ feet wide and 137½ feet long. The minimum vertical clearances are 64½ feet at normal pool level and 26 feet at extreme high water. The *Rough River* enters the Green River 71 statute miles above the mouth. Slack-water navigation for 4-foot draft is available to Hartford, Ky., a distance of 29.3 statute miles. The Rough River lock is 27 feet wide and 123 feet long. The minimum clearances are 120 feet horizontal, 60 feet vertical at normal pool level, and 24½ feet at extreme high water. The *Barren River* enters the Green River 149.5 statute miles above the mouth. The project depth is 5½ feet to Bowling Green, Ky., a distance of 30.1 statute miles. The lock is larger than those on the Green River and all bridges are above the head of navigation. *Bear Creek* enters the Green River 168.4 statute miles above the mouth. The project depth is 5½ feet for 8 statute miles above its mouth. *Nolin River* enters Green River 183.5 statute miles above the mouth. The project depth is 5½ feet to Meredith Ferry, Ky., a distance of 7.8 statute miles.

The *Kentucky River* enters the Ohio River 435.2 statute miles above the mouth. The project depth is 6 feet at slack water for a distance of 258.6 statute miles, which is a short distance above Beattyville, Ky. The minimum dimensions of the locks are 38 feet wide and 145 feet long. The minimum clearances are 174 feet horizontal, 45 feet vertical at normal pool level, and 2 feet vertical at extreme high water.

The *Big Sandy River* enters the Ohio River 664 statute miles above the mouth. The project slack-water depth is 6 feet to the junction of the Levisa and Tug Forks at Louisa, Ky., 27.2 statute miles above the mouth. The locks are 51.9 feet wide and 158 feet long. The minimum clearances are 165 feet horizontal, 46½ feet vertical at normal pool level, and 7¾ feet vertical at extreme high water. *Levisa Fork* has a project slack-water depth of 6 feet to Cox Branch, 17.5 statute miles above the junction. The locks have a length of 160 feet and a width of 55 feet. The minimum clearances are 165 feet horizontal, 46½ feet vertical at normal pool level, and 15 feet at extreme high water. *Tug Fork* has a project slack-water depth of 6 feet to Bear Branch 12.5 statute miles above the junction. The locks have the same dimensions as on Levisa Fork. The minimum clearances are 175 feet horizontal, 46½ feet vertical at normal pool level, and 14¾ feet vertical at extreme high water.

The *Kanawha River* enters the Ohio River 715.4 statute miles above the mouth. The project slack-water depth is 9 feet to Deepwater, W. Va., 90.6 statute miles above

the mouth. The usable dimensions of the locks are 56 feet wide and 360 feet long. The minimum clearances are 400 feet horizontal, 54¼ feet vertical at normal pool level, and 27¼ feet vertical at extreme high water.

The *Little Kanawha River* enters the Ohio River 796.4 statute miles above the mouth. The project slack-water depth is 4 feet to Creston, W. Va. The usable dimensions of the locks are 23 feet wide and 125 feet long. The minimum clearances are 285 feet horizontal and 50½ feet vertical at normal pool level.

The *Muskingum River* enters the Ohio River 808.2 statute miles above the mouth. The project slack-water depth is 4½ feet to Dresden, Ohio, 92.9 statute miles above the mouth. The minimum dimensions of the locks are 156.5 feet long and 35.2 feet wide. The minimum clearances are 36 feet horizontal and 15¾ feet vertical at normal pool level.

The *Beaver River* enters the Ohio River 955.6 statute miles above the mouth. A project to provide a depth of 12 feet from the mouth of Beaver River to and up the *Mahoning River* to Struthers, Ohio, has been approved but no work has been done.

The *Allegheny River* at the head of the Ohio River has a slack-water project depth of 9 feet to 2 miles above East Brady, Pa., 72 statute miles above the mouth. The locks are 360 feet long and 56 feet wide. The minimum clearances are 180 feet horizontal, 40 feet vertical at normal pool level below East Brady, and 28¼ feet at normal pool level above East Brady.

The *Monongahela River* at the head of the Ohio River has a slack-water project depth of 9 feet for 100.3 statute miles above the mouth, thence 8 feet for 0.6 statute mile, thence 7 feet to Fairmont, W. Va., 128 statute miles above the mouth. The locks are all 56 feet wide, the length at Point Marion, Pa., 90.6 statute miles above the mouth, is 360 feet, and the length above Point Marion is 182 feet. The minimum clearances are 344 feet horizontal and 42½ feet vertical at normal pool level. The *Youghiogheny River* enters the Monongahela River 14.5 statute miles above the mouth. The slack-water project depth is 9 feet to West Newton, Pa., 19.3 statute miles above the mouth. No work had been done on this river to 1946.

The **Missouri River** enters the Mississippi River 1,159.5 statute miles above the Head of the Passes. The project depth is 9 feet to Sioux City, Iowa, 761.5 statute miles above the mouth. The minimum clearances are 120 feet horizontal and 71½ feet vertical below Kansas City, 386.2 statute miles above the mouth, and 160 feet horizontal and 63¼ feet vertical between Kansas City and Sioux City. The vertical clearance is above the zero of the Weather Bureau gages. The river stage reading on these gages is published daily. The navigation season below Kansas City usually extends from March 15 to November 30. Above Kansas City the season is usually from April 1 to November 15.

The *Osage River* enters the Missouri River 129.1 statute miles above the mouth. The slack-water project depth is 3 feet to Bagnell Dam 75.4 statute miles above the mouth. The lock is 42 feet wide and 220 feet long. The minimum clearances are 96 feet horizontal and 32 feet vertical at extreme high water. The navigation season is usually from March 1 to November 30.

The **St. Croix River** enters the Mississippi River 1,777.3 statute miles above the Head of the Passes. The project depth is 9 feet to Stillwater, Minn., 23.4 statute miles above the mouth, thence 3 feet to Taylors Falls, Minn., 51.8 statute miles above the mouth. The minimum vertical clearance is 57 feet at normal pool level.

The **Minnesota River** enters the Mississippi River 1,810 statute miles above the Head of the Passes. The project depth is 4 feet to Shakapee, Minn., 25.6 statute miles above the mouth. The minimum clearances are 85 feet horizontal, 35¾ feet vertical at low water, and 7¾ feet vertical at extreme high water.

## CHAPTER 3

# Routes and Sailing Directions

FOR the convenience of the navigator, the courses and distances for the coastwise routes and for entering the principal ports are given in tabular form. The courses given will be found dependable if used judiciously in connection with the latest charts.

These are slack-water courses and due allowance must be made for currents and wind. The courses as tabulated should be used in conjunction with the general information given concerning the currents, depths, and cautions.

All bearings and directions are true. The geographical positions given are those of the turning points and not the reference objects. Where the course on a range is given in degrees and minutes the azimuth has been determined with sufficient accuracy for compass error determination.

Sailing directions for bays, harbors, channels, and the like not shown in the tables will be found under the headings of the various features.

### Table 1.—New York (Sandy Hook) to Cape Hatteras

CHARTS 1215, 1216, 1217, 1109, 1232

| Positions (Reverse directions in *italics*—read upward) | True course | Distance |
|---|---|---|
| 1. **Gedney Channel lighted whistle buoy** bearing 117°, distant 0.4 mile; 40°29′.0 N., 73°54′.1 W.; Chart 1215. | | |
| International Rules apply outside of the line between Ambrose Channel Lightship and Navesink Light, south tower. | | |
| Pass Scotland Lightship distant 0.8 mile, Shrewsbury Rocks lighted bell buoy 1 distant 1.1 miles and Sea Girt Light distant 5.8 miles: | *Degrees* | *Nautical miles* |
| Direct | 180 | 43.3 |
| Change to Chart 1216 (*1215*) when east of Sea Girt Light: | | |
| *Reverse* | *000* | *43.3* |

## Table 1.—New York (Sandy Hook) to Cape Hatteras—Continued

CHARTS 1215, 1216, 1217, 1109, 1232

| Positions (Reverse directions in *italics*—read upward) | True course | Distance |
|---|---|---|
| **2. Barnegat Lightship** bearing 280°, distant 1.5 miles; 39°45′.6 N., 73°54′.1 W.: | | |
| Direct | *Degrees* 193 | *Nautical miles* 285. 1 |
| Change to Chart 1217 (*1216*) in 39°30′.0 N., 73°58′.7 W., Chart 1109 (*1217*) in 39°00′.0 N., 74°07′.6 W., and to Chart 1232 (*1109*) in 35°20′.0 N., 75°11′.0 W.: | | |
| *Reverse* | *013* | *285. 1* |
| **3. Diamond Shoal Lightship** bearing 240°, distant 5 miles; 35°07′.8 N., 75°14′.5 W.; Chart 1232. | | |
| Continue southward by Tables 6 or 7. | | |

Currents up to 1½ knots at Chesapeake Lightship and 4½ knots at Diamond Shoal Lightship have been observed. High current velocities usually occur during heavy or long continued gales. Currents produced by onshore winds are likely to set toward the shore. See *Atlantic Coast Current Tables* for details of wind-driven currents.

# Directions, New York to Chesapeake Bay Entrance

From Sandy Hook southward to Brigantine Shoal, a distance of about 70 miles, the coast is comparatively free from off-lying shoals, but southward of this point it is fronted with extensive areas of broken ground, depths of 10 fathoms and less being found at distances of nearly 20 miles offshore in places. A number of wrecks exist this distance offshore.

Owing to the numerous out-lying shoals and wrecks this coast is dangerous for deep-draft vessels, and unless sure of the vessel's position soundings should be taken to give warning of too close an approach to shore. The 15-fathom curve extends from 9 to 30 miles offshore but in general is about 18 miles offshore. The curve is nearest to the shore at the northern part. In thick weather vessels should keep outside this depth curve.

The water shoals uniformly from 30 fathoms to 15 fathoms, but inshore of the latter depth the soundings are irregular, and shoals rise abruptly in many places from about 10 fathoms.

**Caution.**—In case one of the lights or lightships is not made when in a depth of 15 fathoms, it is advisable to stand alongshore until one is sighted.

**Wrecks.**—Many vessels have been wrecked along this coast as the result of collision, foundering, torpedoing, fire, and other causes. Dangerous wrecks for the most part are marked by buoys of various colors and shapes and often showing a quick-flashing or an interrupted quick-flashing light.

Standing along the coast, vessels of the deepest draft usually pass outside of the lightships and out of sight of land, except between Cape May and New York. At night, if on this track, some of the lights or lightships will be sighted, so that the vessel's

position can be readily determined. Radiobeacons will also assist in determining the vessel's position.

The large number of steamers and tows passing up and down this coast makes it necessary to keep a sharp lookout to prevent collisions.

The routes followed along this part of the coast vary greatly, according to the vessel's draft and the condition of wind and weather. Complete directions to meet all conditions cannot be given, but the following suggestions may be of some assistance to strangers.

## Directions for Vessels of the Deepest Draft

Vessels of the deepest draft should in all cases keep outside of the lightships and should, wherever possible, avoid crossing areas of a less charted depth than about 9 fathoms. The courses given below lead in a least depth of about 9 fathoms except in approaching the entrances to Delaware and Chesapeake Bays. They lead across a least depth of 6½ fathoms in Delaware Bay entrance and in 7 fathoms in Chesapeake Bay entrance.

From Ambrose Channel Lightship bearing 005°, distant 1 mile, steer **185°** for 40.7 miles to Barnegat Lightship bearing 280°, distant 1.5 miles.

International Rules apply seaward of Ambrose Channel Lightship.

Then steer **206½°** for 66.3 miles to Five Fathom Bank Lightship bearing 300°, distant 2.2 miles.

Continuing southward along the coast from Five Fathom Bank Lightship, steer **199°** for 54.3 miles to Winter Quarter Shoal Lightship bearing 295°, distant 1.5 miles, and pass 3.3 miles off Fenwick Shoal lighted whistle buoy 2.

Continuing southward from the position off Winter Quarter Shoal Lightship, steer **213°** for 68 miles to Chesapeake Lightship, bearing 315°, distant 1.2 miles. Two wrecks are on this course.

Then steer **230°** for 10 miles to Chesapeake Bay Entrance lighted whistle buoy 2CB, bearing 315°, distant 0.3 mile and round the buoy southward until it bears 045°. For courses entering the bay see Table 3.

**Alternate course.**—Many large vessels entering Chesapeake Bay from the northward run from Winter Quarter Shoal Lightship following the courses laid down in Table 2. For entering Delaware Bay use Table 2.

## Directions for Vessels of 17 to 24 Feet Draft

Table 2 represents approximately the mean of the courses followed by coasting vessels of 17 to 24 feet draft and the largest tows. They are varied but little on account of weather conditions except northward of Five Fathom Bank, where courses leading farther offshore are sometimes followed during easterly weather and closer inshore during westerly weather. These courses depend entirely on making the aids, and soundings are of little value to insure safety; in thick weather it is safer to keep farther offshore between Five Fathom Bank and Sandy Hook and exercise care to keep outside of Barnegat Lightship.

# Table 2.—New York (Sandy Hook) to Chesapeake Bay Entrance

CHARTS 1215, 1216, 1217, 1219, 1109, 1220, 1221, 1222

| Positions (Reverse directions in *italics*—read upward) | True course | Distance |
|---|---|---|
| **1. Gedney Channel lighted whistle buoy** bearing 117°, distant 0.4 mile; 40°29′.0 N., 73°54′.1 W.; Chart 1215. | | |
| International Rules apply outside of the line between Ambrose Channel Lightship and Navesink Light, south tower. | | |
| Pass Scotland Lightship distant 0.8 mile, Shrewsbury Rocks lighted bell buoy 1 distant 1.1 miles and Sea Girt Light distant 5.8 miles: | *Degrees* | *Nautical miles* |
| Direct | 180 | 43.3 |
| Change to Chart 1216 (*1215*) when east of Sea Girt Light: | | |
| *Reverse* | *000* | *43.3* |
| **2. Barnegat Lightship** bearing 280°, distant 1.5 miles; 39°45′.6 N., 73°54′.1 W. | | |
| Pass Brigantine Shoal lighted whistle buoy 2BS distant 4.5 miles and Five Fathom Bank North lighted whistle buoy 2FB distant 4.9 miles: | | |
| Direct | 206½ | 66.3 |
| Change to Chart 1217 (*1216*) in 39°30′.0 N., 74°04′.2 W. and to Chart 1219 (*1217*) in 39°00′.0 N., 74°23′.3 W.: | | |
| *Reverse* | *026½* | *66.3* |
| **3. Five Fathom Bank Lightship** bearing 300°, distant 2.2 miles; 38°46′.2 N., 74°32′.2 W.; Chart 1219. | | |
| To Delaware Bay Entrance | | |
| **3. Five Fathom Bank Lightship** bearing 300°, distant 2.2 miles; 38°46′.2 N., 74°32′.2 W.; Chart 1219: | | |
| Direct | 274 | 23.0 |
| *Reverse* | *094* | *23.0* |
| **3A. Overfalls Lightship** bearing 045°, distant 0.2 mile; 38°47′.8 N., 75°01′.6 W. | | |
| International Rules apply seaward of Overfalls Lightship. For directions in Delaware Bay and River see *U. S. Coast Pilot, Section C, Sandy Hook to Cape Henry.* | | |
| Delaware Bay Entrance to Chesapeake Bay Entrance | | |
| **3A. Overfalls Lightship** bearing 045°, distant 0.2 mile; 38°47′.8 N., 75°01′.6 W.; Chart 1219: | | |
| Direct | 144 | 27.3 |
| Change to Chart 1109 (*1219*) in 38°27′.0 N., 74°42′.2 W.: | | |
| *Reverse* | *324* | *27.3* |
| **4. Fenwick Shoal lighted whistle buoy 2** bearing 260°, distant 3.9 miles; 38°25′.9 N., 74°41′.0 W.; Chart 1109. | | |
| Continuing southward | | |
| **3. Five Fathom Bank Lightship** bearing 300°, distant 2.2 miles; 38°46′.2 N., 74°32′.2 W.; Chart 1219: | | |
| Direct | 199 | 21.5 |
| Change to Chart 1109 (*1219*) in 38°27′.0 N., 74°40′.6 W.: | | |
| *Reverse* | *019* | *21.5* |
| **4. Fenwick Shoal lighted whistle buoy 2** bearing 260°, distant 3.9 miles; 38°25′.9 N., 74°41′.0 W.: | | |
| Direct | 199 | 32.8 |
| Change to Chart 1220 (*1109*) in 38°20′.0 N., 74°43′.5 W.: | | |
| *Reverse* | *019* | *32.8* |

## Table 2.—New York (Sandy Hook) to Chesapeake Bay Entrance—Con.

CHARTS 1215, 1216, 1217, 1219, 1109, 1220, 1221, 1222

| Positions (Reverse directions in *italics*—read upward) | True course | Distance |
|---|---|---|
| Continuing southward | | |
| 5. **Winter Quarter Shoal Lightship** bearing 295°, distant 1.5 miles; 37°54′.8 N., 74°54′.6 W. | | |
| Pass 3.5 miles southeastward of Hog Island lighted bell buoy 12, 1.5 miles southeastward of Cape Charles lighted whistle buoy 14, and 3 miles northwestward of Chesapeake Lightship: | *Degrees* | *Nautical miles* |
| Direct | 216½ | 71. 5 |
| Change to Chart 1221 (*1220*) in 37°50′.0 N., 74°59′.2 W., to Chart 1109 (*1221*) in 37°23′.0 N., 75°24′.5 W., and to Chart 1222 (*1109*) in 37°16′.8 N., 75°30′.0 W.: | | |
| *Reverse* | *036½* | *71. 5* |
| 6. **Cape Henry Approach lighted whistle buoy 2** bearing 306°, distant 0.6 mile; 36°57′.6 N., 75°47′.8 W. | | |
| Pass close to southward of Cape Henry Junction lighted whistle buoy: | | |
| Direct | 259 | 8. 0 |
| *Reverse* | *079* | *8. 0* |
| 7. **Cape Henry Light** bearing 257°, distant 2.3 miles; 36°56′.0 N., 75°57′.7 W.; Chart 1222. | | |
| To continue to Chesapeake Bay Ports see Table 3. | | |

## Table 3.—Chesapeake Bay Entrance to Norfolk and Newport News

CHARTS 1222, 481, 400, 452

| | | |
|---|---|---|
| 1. **Chesapeake Lightship** bearing 000°, distant 0.2 mile; 36°58′.5 N., 75°42′.2 W.; Chart 1222. | | |
| Pass 0.5 mile south of Cape Henry Approach lighted whistle buoy 2, and close-to on either side of Cape Henry Junction lighted whistle buoy: | | |
| Direct | 259 | 12. 6 |
| *Reverse* | *079* | *12. 6* |
| **Or, Chesapeake Bay Entrance lighted whistle buoy 2CB** bearing 045°, distant 0.3 mile; 36°51′.5 N., 75°51′.2 W.; to position 2—Steer 312° for 6.8 miles. | | |
| 2. **Cape Henry Light** bearing 257°, distant 2.3 miles; 36°56′.0 N., 75°57′.7 W. | | |
| Pass through Thimble Shoal Dredged Channel. See text for restricted use of this channel. Vessels with drafts within the restrictions should parallel this course just outside the lighted aids. Change to Chart 481: | | |
| Direct | 288 | 14. 5 |
| *Reverse* | *108* | *14. 5* |
| 3. **Thimble Shoal Light** bearing 045°, distant 0.45 mile; 37°00′.5 N., 76°14′.8 W.; Chart 400: | | |
| Direct | 259 | 1. 1 |
| *Reverse* | *079* | *1. 1* |
| 4. **Old Point Comfort Light** bearing 263°, distant 1.8 miles; 37°00′.3 N., 76°16′.2 W.; Thimble Shoal Light astern: | | |
| Direct | 249 | 1. 9 |
| *Reverse* | *069* | *1. 9* |

## Table 3.—Chesapeake Bay Entrance to Norfolk and Newport News—Con.

CHARTS 1222, 481, 400, 452

| Positions (Reverse directions in *italics*—read upward) | True course | Distance |
|---|---|---|
| **5. Old Point Comfort Light** bearing 000°, distant 0.5 mile; 36°59′.6 N., 76°18′.4 W.; Anchorage A west of Old Point Comfort is for Quarantine. Caution: Course leads along Quarantine and Naval Anchorage limits. | *Degrees* | *Nautical miles* |
| Direct | 229½ | 1. 9 |
| *Reverse* | *049½* | *1. 9* |
| **6. Elizabeth River lighted gong buoy 1** bearing 139°, distant 150 yards; 36°58′.4 N., 76°20′.2 W. Entrance to dredged channel leading to Norfolk. Anchorage can be made in Hampton Roads as desired. | | |
| To Newport News | | |
| **6. Elizabeth River lighted gong buoy 1** bearing 139°, distant 150 yards; 36°58′.4 N., 76°20′.2 W.; Chart 400: | | |
| Direct | 229½ | 1. 4 |
| *Reverse* | *049½* | *1. 4* |
| **7A. Newport News North Channel lighted buoy 2** bearing 319°, distant 100 yards; 36°57′.5 N., 76°21′.5 W.; through Newport News dredged channel: | | |
| Direct | 264 | 2. 7 |
| *Reverse* | *084* | *2. 7* |
| **8A. Newport News North Channel lighted bell buoy 8** bearing 066°, distant 0.2 mile; 36°57′.2 N., 76°24′.9 W. Thence be guided by the chart: | | |
| Direct | 307 | 1. 1 |
| *Reverse* | *127* | *1. 1* |
| **9A. Newport News, Chesapeake and Ohio Railway Pier** bearing 070°, distant 250 yards; 36°57′.9 N., 76°26′.0 W. Fog bell on outer end of pier. For James River courses see *U. S. Coast Pilot, Section C, Sandy Hook to Cape Henry.* | | |
| To Norfolk | | |
| **6. Elizabeth River lighted gong buoy 1** bearing 139°, distant 150 yards; 36°58′.4 N., 76°20′.2 W., through dredged channel; Chart 400: | | |
| Direct | 184 | 3. 4 |
| *Reverse* | *004* | *3. 4* |
| **7. Elizabeth River lighted buoy 12** bearing 274°, distant 150 yards; 36°55′.1 N., 76°20′.4 W.; off Pier 2. Pass 200 yards eastward of Craney Island Light with fog bell. Change to Chart 452: | | |
| Direct | 172½ | 2. 8 |
| *Reverse* | *352½* | *2. 8* |
| **8. Elizabeth River lighted buoy 23** bearing 111°, distant 380 yards; 36°52′.3 N., 76°20′.0 W.; off Lambert Point Piers, heading for Town Point: | | |
| Direct | 131 | 2. 2 |
| *Reverse* | *311* | *2. 2* |
| **9. Elizabeth River buoy 30** bearing 233°, distant 150 yards; 36°50′.9 N., 76°17′.9 W. Thence be guided by the chart to the Norfolk Piers or into Eastern Branch. | | |
| Direct | 155 | 0. 5 |
| *Reverse* | *335* | *0. 5* |
| **10. Railway wharves, north end Portsmouth water front** bearing 270°, distant 180 yards; 36°50′.4 N., 76°17′.7 W. Thence be guided by the chart to the Portsmouth or Berkley wharves. | | |

## Table 4.—Delaware Bay Entrance to Cape Hatteras

CHARTS 1219, 1109, 1220, 1232

| Position (Reverse directions in *italics*—read upward) | True course | Distance |
|---|---|---|
| | *Degrees* | *Nautical miles* |
| 1. **Overfalls Lightship** bearing 045°, distant 0.2 mile; 38°47′.8 N., 75°01′.6 W.; Chart 1219: | | |
| Direct | 144 | 27. 3 |
| Change to Chart 1109 (*1219*) in 38°27′.0 N., 74°42′.2 W.: | | |
| *Reverse* | *324* | *27. 3* |
| 2. **Fenwick Shoal Lighted whistle buoy 2** bearing 260°, distant 3.9 miles; 38°25′.9 N., 74°41′.0 W.: | | |
| Direct | 199 | 32. 8 |
| Change to Chart 1220 (*1109*) in 38°20′.0 N., 74°43′.5 W.: | | |
| *Reverse* | *019* | *32. 8* |
| 3. **Winter Quarter Shoal Lightship** bearing 295°, distant 1.5 miles; 37°54′.8 N., 74°54′.6 W.: | | |
| Direct | 185½ | 167. 8 |
| Change to Chart 1109 (*1220*) in 37°50′.0 N., 74°55′.2 W. and to Chart 1232 (*1109*) in 35°30′.0 N., 75°11′.7 W.: | | |
| *Reverse* | *005½* | *167. 8* |
| 4. **Diamond Shoal Lightship** bearing 240°, distant 5 miles; 35°07′.8 N., 75°14′.5 W.; Chart 1232. | | |
| Continue southward by Tables 6 or 7. | | |

## Table 5.—Chesapeake Bay Entrance to Cape Hatteras

CHARTS 1222, 1227, 1229, 1232

| | | |
|---|---|---|
| 1. **Cape Henry Light** bearing 257°, distant 2.3 miles; 36°56′.0 N., 75°57′.7 W.; Chart 1222: | | |
| Direct | 132 | 6. 8 |
| *Reverse* | *312* | *6. 8* |
| 2. **Chesapeake Bay Entrance lighted whistle buoy 2CB** bearing 045°, distant 0.3 mile; 36°51′.5 N., 75°51′.2 W. Change to Chart 1227 (*1222*). Pass 0.5 mile eastward of False Cape lighted whistle buoy 4A, 1.7 miles eastward of Currituck lighted bell buoy 6 and 3.1 miles eastward of Bodie Island lighted bell buoy 8: | | |
| Direct | 158 | 70. 8 |
| Change to Chart 1229 (*1227*) when east of Currituck Beach Light. | | |
| *Reverse* | *338* | *70. 8* |
| 3. **Bodie Island Light** bearing 285°, distant 13.0 miles; 35°45′.8 N., 75°18′.5 W. Pass 1.5 miles eastward of Wimble Shoals lighted whistle buoy 10: | | |
| Direct | 175 | 38. 1 |
| Change to Chart 1232 (*1229*) in 35°34′.0 N., 75°17′.3 W.: | | |
| *Reverse* | *355* | *38. 1* |
| 4. **Diamond Shoal Lightship** bearing 240°, distant 5.0 miles; 35°07′.8 N., 75°14′.5 W.; Chart 1232. | | |
| Continue southward by Tables 6 or 7. | | |

# Cape Hatteras to Jupiter Inlet Light

From Diamond Shoal Lightship to Jupiter Inlet Light vessels use either of two routes in attempting to avoid the full northerly set of the Gulf Stream. Most of the regular lines bound for the Straits of Florida use the route outside the stream. All vessels bound to any port as far south as St. Johns River follow the coast inside the stream. 5

789003°—48——7

## Table 6.—Cape Hatteras to Jupiter Inlet Light (Outer Route)

CHARTS 1232, 1110, 1001, 1112, 1247

| Positions | True course | Distance |
|---|---|---|
| **1. Diamond Shoal Lightship** bearing 240°, distant 5.0 miles; 35°07′.8 N., 75°14′.5. W.; Chart 1232: | *Degrees* | *Nautical miles* |
| Direct | 188 | 129. 0 |
| Change to Chart 1110 in 35°00′.0 N., 75°15′.8 W. | | |
| **2. Latitude 33°00′.0 N., longitude 75°36′.0 W.**; change to Chart 1001: | | |
| Direct | 210½ | 348. 5 |
| **3. Latitude 28°00′.0 N., longitude 79°01′.0 W.**; change to Chart 1112: | | |
| Direct | 219 | 81. 2 |
| Change to Chart 1247 in 27°09′.4 N., 79°47′.0 W. | | |
| **4. Jupiter Inlet Light** bearing 270°, distant 6.0 miles; 26°56′.9 N., 79°58′.3 W. | | |
| Continue southward by Table 8. | | |

*Positions 1 to 2.*—This course crosses the Gulf Stream. Under ordinary conditions an average allowance should be made for a 1-knot current setting 045° for the entire run; with northeasterly winds there may be practically no current, while southerly, and especially southwesterly winds, may increase it considerably. Observations should be obtained as often as possible.

*Positions 2 to 3.*—There is uncertainty as to the currents that may be expected on this run. It is probable that a Gulf Stream set of ½ knot or more against the vessel and, as the Bahama Bank is approached, possibly some easterly drift will also be experienced. With northeasterly winds it is stated that a southwesterly set of ½ knot has been experienced. This and the easterly set mentioned are the dangerous ones to guard against in order not to overrun and get too close to Matanilla Shoal. Observations should be obtained as often as possible. The establishment of radiobeacons on the Florida coast has greatly facilitated the fixing of position, and their use should not be neglected by vessels in this area. In case of doubt from about latitude 28° N., vessels can stand westward and watch the lead carefully to pick up the edge of the bank on the Florida coast northward of Jupiter.

*Positions 3 to 4.*—This course leads across the Gulf Stream for Jupiter Inlet Lighthouse. **Matanilla Shoal,** marked by Matanilla Shoal lighted whistle buoy MS, should be given a wide berth. This buoy is often difficult to find owing to atmospheric conditions. The bank in the vicinity of the shoal is extremely dangerous, as the bottom is rocky and covered with dark seaweed, the water is not discolored, and the sea does not break. The current for some distance northward of the shoal is very uncertain and near the edge of the bank sets strongly toward it. On this course an allowance should be made for a northerly current, averaging about 2¼ knots for the entire run of about 80 miles. It will, therefore, be necessary to shape the course for a position some 8 or 10 miles southeastward of Jupiter Inlet Light to allow for the northerly set. When fixing the position by bearings on the light, keep in mind that while outside the 100-fathom curve the vessel is probably in the full strength of the Gulf Stream, where the northerly current may average a velocity of 4 knots. If the light is on the starboard bow, the vessel will be much closer to it than indicated by the distance run between the successive bearings on it.

## Table 7.—Cape Hatteras to Jupiter Inlet Light (Inner Route)

CHARTS 1232, 1110, 1111, 1112, 1247

| Positions | True course | Distance |
|---|---|---|
| 1. **Diamond Shoal Lightship** bearing 240°, distant 5.0 miles; 35°07′.8 N., 75°14′.5 W.; Chart 1232. Change to Chart 1110 in 35°00′.0 N., 75°25′.2 W. | | |
| Pass 1.4 miles southeastward of Cape Lookout Shoals lighted whistle buoy 14: | *Degrees* | *Nautical miles* |
| Direct | 228½ | 152. 8 |
| 2. **Frying-Pan Shoals Lightship** bearing 320°, distant 1.8 miles; 33°26′.6 N., 77°32′.5 W.: | | |
| Direct | 235½ | 152. 6 |
| Change to Chart 1111 in 32°30′.0 N., 79°10′.0 W. | | |
| 3. **Latitude 32°00′.0 N., longitude 80°01′.0 W.:** | | |
| Direct | 202½ | 64. 9 |
| 4. **Latitude 31°00′.0 N., longitude 80°30′.0 W.:** | | |
| Direct | 180 | 90. 0 |
| 5. **Latitude 29°30′.0 N., longitude 80°30′.0 W.:** | | |
| Direct | 167 | 52. 5 |
| 6. **Hetzel Shoal lighted whistle buoy 8** bearing 260°, distant 4.0 miles; 28°38′.8 N., 80°16′.6 W. Change to Chart 1112. | | |
| Pass 3.5 miles eastward of Bethel Shoal lighted whistle buoy and change to Chart 1247; pass close to eastward of wreck lighted buoy 12A: | | |
| Direct | 171 | 103. 2 |
| 7. **Jupiter Inlet Light** bearing 270°, distant 6.0 miles; 26°56′.9 N., 79°58′.3 W. | | |
| Continue southward by Table 8 | | |

The courses southward to position 6 off Hetzel Shoal lighted whistle buoy 8 lead in depths of 17 to 20 fathoms. In approaching and passing the shoals off Cape Canaveral care must be exercised: the depth should not be shoaled to less than 13 fathoms.

The current of the Gulf Stream may be expected under ordinary conditions to set against the vessel for the entire run with a velocity of about ½ to ¾ knot, the direction of the current following the curve of the coast. It must be remembered, however, that the effect of winds is almost immediately felt on the currents, and that with northerly, and especially northeasterly winds, a current of possibly 1 knot will set southward along the coast. Southerly, and especially southwesterly winds, increase the velocity of the Gulf Stream.

On the course between positions 6 and 7 the 15-fathom curve is a good guide. The current of the Gulf Stream may be expected under ordinary conditions to have a velocity of about ¾ knot off Cape Canaveral, increasing to 1½ or 2 knots off Jupiter Inlet Light.

# Straits of Florida and the Florida Reefs

**Caution as to currents.**—The attention of navigators is called to the fact that most of the wrecks on Florida Reefs have occured in the case of vessels bound southward, especially at night. They generally occurred on reefs lying about halfway between the lights; and the region of maximum frequency of wrecks was between Carysfort Reef and Alligator Reef, and to a less extent between Fowey Rocks and Carysfort Reef and

between Alligator Reef and Sombrero Key. The establishment of intermediate lights has greatly facilitated navigation in this area.

From a consideration of the data it can be stated that nearly all casualties are due to one cause—an underestimate of the strength of the Gulf Stream against the vessel. This leads to two errors in navigation: First, the distance made good over the bottom is less than assumed or indicated by the log, and when skirting the reefs the course is changed too soon for the next light and before sighting it; second, the vessel underrunning her log is closer to the reefs than indicated by the four-point bearing, and this error is greater for slow vessels than for fast ones.

At night, when bound southward and navigating at a safe distance from the reefs between Fowey Rocks and Sombrero Key, it is on the side of safety to assume that the vessel is steaming against a 3- or 4-knot current and from one light to hold a course that will insure clearing the reefs until the next light is sighted. It is also well to remember that near the reefs there is a tidal current, possibly as much as ½ knot in places directly on and off the reefs on the rising and falling tides respectively.

On the other hand, when bound northward and following Florida Reefs between Sombrero Key and Fowey Rocks, it is on the side of safety to underestimate the velocity of the Gulf Stream with the vessel; the courses should be laid well clear of the reefs, which is the usual practice. Vessels are rarely lost on Florida Reefs when bound northward, except when crossing the stream from Habana and making the reefs in misty or rainy weather.

The following are extracts from a report of a stranding:

> Rounded Great Isaac Light at a distance of 2¼ miles, steered by compass and log 227° true for 20 miles, and then steered 224° true. By bow and beam bearing Fowey Rocks Light was 12 miles distant when abeam, but on account of the northerly current it was probably about 7 miles. The vessel stranded on the north end of Long Reef, having had a northerly set of 17 miles, or an average of about 2¼ knots for the crossing from Great Isaac Light to Florida Reefs.

Along the keys is a slight tidal drift of not more than ½ knot setting on and off the the reefs. This current will probably not be noticeable at a greater distance from the reefs than 1 mile.

The courses given in Table 8—Jupiter Inlet Light to Dry Tortugas—are those recommended for both day and night navigation, and the distances at which they are laid from the reefs should be regarded as a minimum to insure safety.

## Table 8.—Jupiter Inlet Light to Dry Tortugas

CHARTS 1248, 1249, 1250, 1251, 1252, 1351

| Positions | True course | Distance |
|---|---|---|
| 1. **Jupiter Inlet Light** bearing 270°, distant 6.0 miles; 26°56′.9 N., 79°58′.3 W.; Chart 1248. | | |
| Pass about 3.5 miles eastward of Hillsboro Inlet Light. Keep in white sector of Fowey Rocks Light: | *Degrees* | *Nautical miles* |
| Direct | 183½ | 81.7 |
| 2. **Fowey Rocks Light** bearing 275°, distant 2.0 miles; 25°35′.3 N., 80°03′.6 W.; change to Chart 1249. | | |
| Keep in white sector of Fowey Rocks Light: | | |
| Direct | 186 | 10.5 |

## Table 8.—Jupiter Inlet Light to Dry Tortugas—Continued

CHARTS 1248, 1249, 1250, 1251, 1252, 1351

| Positions | True course | Distance |
|---|---|---|
| 3. **Pacific Reef Light** bearing 232°, distant 4.1 miles; 25°24′.8 N., 80°04′.9 W. This position is in the white sector of Carysfort Reef Light. Keep in white sector: | *Degrees* | *Nautical miles* |
| Direct | 203 | 13. 4 |
| 4. **Carysfort Reef Light** bearing, 293° distant 2.0 miles; 25°12′.5 N., 80°10′.7 W. The latter half of this course is in the red sector of Carysfort Reef Light: | | |
| Direct | 214 | 15. 9 |
| 5. **Molasses Reef Light** bearing 304°, distant 2.4 miles; 24°59′.3N., 80°20′.5 W. The first half of this course is in the red sector of Alligator Reef Light: | | |
| Direct | 234 | 17. 2 |
| 6. **Alligator Reef Light** bearing 324°, distant 2.3 miles; 24°49′.2 N., 80°35′.7 W.; change to Chart 1250: | | |
| Direct | 234 | 16. 6 |
| 7. **Intersection of edges of red sectors of Alligator Reef and Sombrero Key Lights;** 24°39′.5 N., 80°50′.4 W. Keep in white sector of Sombrero Key Light on this course: | | |
| Direct | 255 | 14. 8 |
| 8. **Sombrero Key Light** bearing 345°, distant 2.1 miles; 24°35′.6 N., 81°06′.1 W.; change to Chart 1251: | | |
| Direct | 254 | 23. 2 |
| 9. **American Shoal Light** bearing 344°, distant 2.3 miles; 24°29′.3 N., 81°30′.5 W. | | |
| Direct | 259 | 20. 4 |
| 10. **Sand Key Light** bearing 349°, distant 2.0 miles; 24°25′.3 N., 81°52′.3 W.; change to Chart 1252: | | |
| Direct | 265 | 42. 1 |
| 11. **Rebecca Shoal Light** bearing 010°, distant 13.3 miles; 24°21′.6 N., 82°37′.6 W.; change to Chart 1351: | | |
| Direct | 289 | 25. 6 |
| 12. **Dry Tortugas Light** bearing 045°, distant 11.4 miles; 24°30′.0 N., 83°04′.0 W. To continue westward, *see U. S. Coast Pilot, Gulf Coast, Key West to the Rio Grande.* | | |

**Jupiter to Fowey Rocks.**—Vessels follow the coast as close as safety permits—in the daytime at a distance of 1 to 1½ miles to Hillsboro Inlet Light, then 1½ to 2 miles off—and pass 1 mile eastward of Miami lighted whistle buoy 2 and Fowey Rocks Light. Close attention should be given to the lead, and courses not depended upon entirely and checked frequently. Between Jupiter and Lake Worth Inlets the depth should not be shoaled to less than 13 fathoms and then keep in over 15 fathoms. Southward of Lake Worth Inlet the depths increase so rapidly offshore that the hand lead cannot be depended upon to insure safety for deep-draft vessels.

A narrow ridge, on which least depths of 7 to 12 fathoms were found and with somewhat deeper water inside it, lies from 1 to 1½ miles from this coast. This ridge has not been closely developed and should be avoided by deep-draft vessels. A vessel with a draft of 23 feet reports striking at a point 1½ miles from shore and 6 miles southward of Jupiter Inlet Light and another with a draft of 19 feet at a point 1¾ miles from shore and 18½ miles northward of Fowey Rocks Light. It is suspected that the reported grounding of several steamers on ridges south of Port Everglades is in a measure attributable to the indistinct shoreline for which the line of trees along the west edge of the marsh is mistaken, which would place a vessel 1 to 1½ miles inshore of her intended position.

The northward current may be expected to have a velocity near the coast of about 1½ knots from well northward of Jupiter Inlet to southward of Palm Beach, then 1 knot to Hillsboro Inlet, and then ¾ knot to Fowey Rocks. The velocity usually increases rapidly toward the axis of the Gulf Stream.

That velocities much larger than those mentioned above sometimes occur near the coast is evidenced by observations taken April 18, 1945. On that date with normal weather conditions a northward current of 5 knots was measured off Lake Worth about 2 miles east of the shoreline, latitude 26°36′ N., longitude 80°00′ W.

**Fowey Rocks to Sand Key.**—Vessels follow the Florida Reefs from 1 to 2 miles off in the daytime, and 2 to 4 miles off at night. The position should be checked on the aids as passed and on the lights and sectors at night. Care must be taken not to get inside of the line of reefs, daybeacons, buoys, or lights, especially when passing parts of the reef that lie well back of the edge and do not break or show near the surface. The color of the water does not always mark the edge of the reefs.

Except in the vicinity of Fowey Rocks, where the 100-fathom curve is only about 2 miles outside the reef, the 50-fathom curve lies from 2 to 3 miles from Florida Reefs, and this is about the least depth that can be depended upon to insure safety in skirting them. The hand lead is practically of no value as an aid and should not be depended on, but vessels equipped with echo-sounding apparatus should find this equipment of great value in navigating this region.

The reefs are fringed in places with broken ground, which, as a measure of safety, should be avoided by deep-draft vessels where the depths are less than 10 or 12 fathoms.

A number of vessels have been lost on the reefs between The Elbow and Molasses Reef, and extra caution should be observed in this locality. The extremely variable current against the vessel should be carefully considered in determining the position off Carysfort Reef Light from which to shape the course to lead well clear of The Elbow.

Any crossing of the Gulf Stream should be regarded as difficult, on account of the strong current of variable velocity, for which it may not be possible to make a proper allowance, and the abrupt shoaling inside the 100-fathom curve. The axis of the Gulf Stream is nearest the reefs from about 10 miles northward of Carysfort Reef Light to Molasses Reef Light.

Vessels bound for Habana generally shape the course for that port when abreast of Alligator Reef Light.

**Sand Key to Dry Tortugas.**—On the south edge of Florida Reefs between Sand Key and Dry Tortugas is broken ground with rocky, very uneven bottom, which, like other parts of Florida Reefs, rises abruptly from the deep water of the Straits of Florida. As a measure of safety this broken ground, including the areas with depths less than 10 or 12 fathoms lying southward and westward of Rebecca Shoal and Dry Tortugas, should be avoided by vessels of the deepest draft. The 50-fathom curve is about the least depth than can be depended upon to insure clearing this broken ground when skirting it, except southwestward and westward of Dry Tortugas.

A vessel is reported to have struck an obstruction with about 18 feet over it lying 11 miles 147° off Rebecca Shoal Light; the least depth found in this locality by a careful examination is 5½ fathoms. A vessel is also reported to have struck an obstruction 2 miles 285° off Rebecca Shoal Light. The area in the vicinity of this shoal was examined with the wire drag, no obstruction being found with the drag set to a depth of 33 feet.

The currents near the edge of the bank in this locality are variable, being influenced

by the winds, by differences in barometric pressure in the Gulf and outside, and by the tides. The strong tidal currents set through the passage westward of Rebecca Shoal; a velocity of 1.5 knots has been observed in the passage and 1 knot (north and south) on the edge of the bank southward of the passage. The tidal current on and off the edge of the reef should also be considered.

## Entering Straits of Florida through Providence Channels

The greater number of sailing vessels bound to the Gulf of Mexico from ports in Europe, British North America, or the northern Atlantic ports of the United States, and a large number of steamers from European ports, enter the Straits of Florida from eastward through the Providence Channels, which have a least width of 22 miles between Great and Little Bahama Banks.

The point for which a course is shaped, and the first land sighted, is Hole in the Wall, the south point of Great Abaco Island. Vessels coming from northward, if at all doubtful of their reckoning, should make latitude 26°30′ N., well eastward of the eastern end of Great Abaco Island, so that in case the wind falls light or the weather becomes thick they will not be picked up by Elbow (Little Guana) Cay. At night, in a sailing vessel, if the wind is from southward when in this locality, and the light is not sighted or the reckoning is doubtful, the vessel's head should be kept eastward, as the lead will be of little use to give warning of danger. Near the northeastern end of Great Abaco Island the currents are strong and variable and have caused many wrecks in the vicinity of Elbow Cay.

**Caution.**—A branch of the North Equatorial Current runs strongly on the eastern side of Bahama Islands, and several vessels have stranded between Hole in the Wall and Elbow Cay. The current generally sets north-northwestward; its velocity is about 1½ knots, increased during southeast winds, but it sometimes sets in an opposite direction.

In the Northeast Providence Channel the currents are variable and the reefs and cays should not be approached too closely in light winds. In the Northwest Providence Channel, between Great Stirrup Cay and Great Isaac, the flood sets southward on the Great Bahama Bank and the ebb northward off the bank. In the middle of the channel the current is generally weak, except after northerly winds, when it frequently sets eastward with a velocity of about 1 knot. The tidal current has a velocity of about 1 knot on the banks, setting directly on and off on the rising and falling tide, respectively.

Steamers bound to ports in the Gulf of Mexico, after passing Great Isaac, will find it to their advantage to stand across the Straits of Florida for Fowey Rocks Light and follow the Florida Reefs into the Gulf. The reefs are so well marked in the daytime, and at night by the red sectors in the lights, that no uncertainty as to the position of a vessel is possible with ordinary care. This route is also shorter than the one along the western edge of Great Bahama Bank and across Cay Sal Bank.

Sailing vessels after passing Great Isaac stand along the western edge of Great Bahama Bank for a distance of about 75 to 80 miles and then stand for the northwest end of Cay Sal Bank; or, if not over 18-foot draft, they can cross Cay Sal Bank, passing either side of Dog Rocks, 30 feet high, and south of Double Headed Shot Cays, thus avoiding the strength of the Gulf Stream, which is weaker here than on its western

side. From Cay Sal Bank the wind generally governs whether the vessel bound into the Gulf of Mexico crosses the Straits of Florida so as to make Sand Key Light, or follows the north shore of Cuba and crosses the straits so as to pass westward of Dry Tortugas.

Vessels of less than 12-foot draft can stand across the northwest end of Great Bahama Bank after entering the Northwest Providence Channel, but this should not be attempted unless in the daytime when the rocky patches can be seen so as to be avoided. A vessel using this route will leave the western edge of Great Bahama Bank about 78 miles southward of Great Isaac Light, and southward of Orange Cay.

**Through Providence Channels to Great Isaac and Fowey Rocks.**—When Hole in the Wall Light is made, shape the course to pass from 3 to 5 miles southward of it; a narrow bank of soundings with depths of 9 to 12 fathoms extends 5 miles between the bearings southeastward and east-southeastward from Hole in the Wall. Then make good a **281½°** course for 100 miles, passing 5 miles northward of Great Stirrup Cay Light and to a position near the edge of the bank with Great Isaac Light bearing 231°, distant 7 miles. Then round Great Isaac Light at a distance of about 4 miles in a depth of about 12 or 13 fathoms.

The principal dangers are the Gingerbread Ground and the rocks and reefs lying between it and Great Isaac Light, which have a total length of about 30 miles; and the greatest caution and attention to soundings should be observed in approaching this dangerous locality, as the flood current sets directly on the reefs, and in places parts of it are only about 1½ miles from the edge of the bank. From westward of Stirrup Cays to eastward of the Gingerbread Ground the northern edge of the bank is clear and the lead a safe guide, and vessels sometimes anchor here during light winds.

From northward of Great Isaac Light steamers shape the course across the Gulf Stream for Fowey Rocks Light. On this course an allowance should be made for a northerly current, averaging about 2¼ knots for the entire run. It will therefore be necessary to shape the course for a position some 8 or 10 miles southeastward of Fowey Rocks Light to allow for the northerly set. When fixing the position by bearings on the light, keep in mind that while outside the 100-fathom curve the vessel is probably in the full strength of the Gulf Stream, where the northerly current may average a velocity of 4 knots; if the light is on the starboard bow, the vessel will be much closer to it than indicated by the distance run between the successive bearings on it. On account of the strong current and the abrupt shoaling inside the 100-fathom curve, the greatest caution should be observed in approaching Fowey Rocks and in fixing the position from which to shape the course southward. See the caution as to currents in the Straits of Florida on page 93.

**To stand along the western edge of Great Bahama Bank.**—If possible, daylight should be selected for the run.

Having rounded Great Isaac Light at a least distance of 3 miles, steer **223°** for 10 miles to pass outside Eldorado Shoal, depth 10 feet, taking care in the night not to come within the depth of 10 fathoms, or to bring the light to bear northward of 051° until the shoal is passed, or, from aloft, Gun Cay Light is opened westward of Bimini Islands. The course may then be altered more southward to follow the edge of the bank in not less than 10 fathoms and pass outside Moselle Bank.

After passing North Bimini the cays must be closely hugged in order to avoid the Gulf Stream, which sometimes comes close to the rocks. A short calm within a mile of

the edge of this part of the bank might drift a sailing vessel so far northward as to oblige her to run around Little Bahama Bank and to enter again from eastward. Therefore, instead of attempting to beat along with a light wind it is more prudent to anchor under North Bimini and await a slant of wind to get around the elbow.

In the winter when near Great Isaac, if the weather indications give warning of a northwester, it is advisable for a sailing vessel to remain in the Northwest Providence Channel and be guided by bearings on Great Isaac until the wind draws northward, which it usually does in 24 to 48 hours.

Vessels proceeding westward from Great Bahama Bank should endeavor to strike soundings on the northwest end of Cay Sal Bank. Should the wind be scant from westward, they may run in on the bank on either side of Dog Rocks and pass off southward of the Double Headed Shot Cays; or, should the wind be light and tending to calm, they may anchor on the bank to avoid being set northward. At night vessels had better run down westward of the bank, paying great attention to the lead.

It is advisable for sailing vessels not to stand over for Cay Sal Bank until after reaching Orange Cay. In the summer months when light southeasterly winds prevail, a strong northwest current frequently runs into Straits of Florida from Santaren Channel, and vessels meeting with a calm or light airs at this period are sometimes drifted through the straits, even in sight of the keys along the edge of the bank.

Having passed North Elbow Cay abandoned lighthouse tower and being clear of Cay Sal Bank, the course should be about **233°** until close over to the coast of Cuba, to avoid the strength of the current. This course should lead toward the peak of Matanzas and about 12 miles northwest of Cayo Piedras Light, but this will depend upon where the vessel leaves the bank and the set of the current, which is very uncertain and sometimes strong into the Nicholas Channel. If bound to ports of the United States on the Gulf of Mexico, keep along the coast of Cuba as far west as Mariel, about 22 miles westward of Habana, and then shape a course to pass westward of Dry Tortugas.

Should the Cuban coast be left in the daytime, an occasional bearing of the high land will possibly enable the mariner to estimate the strength of the current, and to regulate his course accordingly. He may depend on finding the current all the way across and probably with increasing strength as he advances northward.

Vessels with a fair wind may shorten the passage by crossing over from Cay Sal Bank to Sand Key Light; a Gulf Stream current with a velocity of about 2 knots in a northeasterly direction will be experienced.

**To cross Great Bahama Bank.**—Vessels of less than 12-foot draft can stand across the northwest part of Great Bahama Bank from Northwest Providence Channel, but this should not be attempted unless in the daytime, when the rocky patches can be seen so as to be avoided. The distance with a depth less than 4 fathoms is 70 miles. About half of this distance carries a depth of a little more than 2 fathoms; 15 miles of this is known as the flats or Middle Ground, which has narrow sand ridges and small black heads, between which the vessel must be guided by eye.

Passing 1½ miles northward of Great Stirrup Cay Light, bring the light to bear 112°, distant 4 miles. Then steer **238°** for 33 miles to the edge of the flats or Middle Ground, which extends across the bank and is about 15 miles wide; allowance must be made for the tidal current. Thence a **217°** course for 50 miles will lead to a position 5 or 6 miles southeastward and in sight of Orange Cay, and the course continued will lead to the edge of the bank about 12 miles southward of it.

In crossing the flats the eye must be the guide between the numerous white sand ridges and the small black heads, which are easily seen, even in the nighttime, if the weather is clear. Should a vessel enter upon the bank with the first of the flood, she should steer a little more westward, and more southward if she enters on the first of the ebb. Although the water is shoal and clear the lead should be kept going constantly, the lead line being marked to feet. If eastward of the track and approaching what is known as Long Bank, the little heads of sponge and dark fans will become more numerous. In the winter months, should the wind haul southward, a sure indication of a northwester, it is advisable to anchor and await the change instead of beating about among the shoals.

**Current.**—The current has a velocity of ½ to 1 knot to within a short distance of the north side of the Middle Ground. On the Middle Ground there is little current.

## Table 9.—Straits of Florida to Cape Hatteras via Gulf Stream

CHARTS 1351, 1350, 1112, 1001, 1110, 1232

| Positions | True course | Distance |
|---|---|---|
| | *Degrees* | *Nautical miles* |
| **1. Dry Tortugas Light** bearing 045°, distant 11.4 miles; 24°30′.0 N., 83°04′.0 W.; Chart 1351: | | |
| Direct | 109 | 25. 6 |
| **2. Rebecca Shoal Light** bearing 010°, distant 13.3 miles; 24°21′.6 N., 82°37′.6 W.: | | |
| Direct | 095 | 40. 6 |
| **3. Sand Key Light** bearing 005°, distant 9.2 miles; 24°18′.1 N., 81°53′.5 W.: | | |
| Direct | 076 | 46. 5 |
| Change to Chart 1350 when abeam of American Shoal Light. | | |
| **4. Sombrero Key Light** bearing 346°, distant 8.6 miles; 24°29′.4 N., 81°04′.4 W.: | | |
| Direct | 065 | 31. 8 |
| **5. Alligator Reef Light** bearing 335°, distant 9.3 miles; 24°42′.6 N., 80°32′.8 W.: | | |
| Direct | 046 | 34. 5 |
| **6. Carysfort Reef Light** bearing 316°, distant 9.3 miles; 25°06′.6 N., 80°05′.6 W.; change to Chart 1112: | | |
| Direct | 023 | 27. 1 |
| **7. Fowey Rocks Light** bearing 290°, distant 11.4 miles; 25°31′.6 N., 79°54′.1 W.: | | |
| Direct | 003½ | 85. 5 |
| **8. Jupiter Inlet Light** bearing 270°, distant 15.0 miles; 26°56′.9 N., 79°48′.3 W.: | | |
| Direct | 002 | 208. 2 |
| Change to Chart 1001 in 28°30′.0 N., 79°44′.6 W. | | |
| **9. Latitude 30°25′.0 N., longitude 79°40′.0 W.:** | | |
| Direct | 025 | 50. 8 |
| **10. Latitude 31°11′.0 N., longitude 79°15′.0 W.:** | | |
| Direct | 046 | 242. 8 |
| **11. Latitude 34°00′.0 N., longitude 75°49′.0 W.;** change to Chart 1110: | | |
| Direct | 023 | 73. 6 |
| Change to Chart 1232 in 35°00′.0 N., 75°18′.5 W. | | |
| **12. Diamond Shoal Lightship** bearing 240°, distant 5.0 miles; 35°07′.8 N., 75°14′.5 W. | | |
| Continue northward by Tables 1, 4, or 5. | | |

On the eastern side of the Gulf of Mexico, for a distance of possibly 100 miles outside the 100-fathom curve, southeasterly currents prevail and velocities as high as 2½ knots have been reported. The Gulf Stream investigations indicated that the strongest

current into the Straits of Florida is found near the 1,000-fathom curve westward of Dry Tortugas, and that velocities of 1½ to 2 knots are frequent in that locality. Approaching Dry Tortugas from the Gulf should, therefore, be regarded as a difficult run, as a vessel will overrun her log, and observations are the principal guide; currents may be expected at all times, but variations occur both in direction and velocity, due to the season of the year and the winds. Approaching the passage westward of Rebecca Shoal from northward, a number of vessels have stranded on New Ground, indicating an easterly set.

From Straits of Florida to Cape Hatteras vessels follow the Gulf Stream, pass about 12 miles southwestward of Dry Tortugas Light, about 14 miles southward of Rebecca Shoal Light, then follow Florida Reefs about 8 miles off and pass Fowey Rocks at a distance of 10 to 12 miles and Jupiter Inlet Light 15 miles. The velocity of the current varies greatly in different localities and is also subject to sudden changes, due to wind, differences in barometric pressure, and the like, so that no fixed hourly rate can be given. Frequently high velocities will be carried between certain points and suddenly dropping off between others. The position should, therefore, be checked whenever possible by bearings. The ship speed plus supposed rate of current should not be assumed to fix the position. The greatest velocity will be found between Carysfort Reef and Jupiter Inlet, ranging from 2 to 4½ knots.

The course between positions 8 and 9 should lead from 6 to 30 miles outside the 100-fathom curve. Northward currents of 1½ to 3½ knots may be expected.

It is stated that between latitude 30°30′ and 32°30′ N. heavy tide rips will be experienced, indicating a change in the direction of the stream and not an increase in the velocity, and creating in stormy weather a very uncomfortable sea.

When approaching Diamond Shoal great care must be taken to have a correct location for the vessel. The currents are subject to wide variations, as indicated by the observations on the lightships. At times during both summer and winter the Gulf Stream has great velocity; at other times none will be found, or a southerly set may be experienced with northerly winds. The general direction of the stream is northeast with a velocity of 1 to 2 knots, but on nearing Diamond Shoal Lightship the current is said to set well to the east-northeast and at other times nearly north. Overallowance and this northerly set have been fatal to many vessels. If a northerly gale is encountered between Jupiter Inlet and Cape Hatteras, some navigators keep closer inshore to get on soundings before reaching Diamond Shoal.

## Table 10.—Cape Fear River Entrance to Wilmington

CHARTS 424, 425

| Positions (Reverse directions in *italics*—read upward) | True course | Distance |
|---|---|---|
| **1. Cape Fear River Entrance lighted whistle buoy 2CF** bearing 135°, distant 100 yards; 33°50′.3 N., 78°02′.8 W.; Chart 424: | *Degrees* | *Nautical miles* |
| Direct (Bald Head Shoal Channel Range ahead) | 043°27′ | 2.8 |
| *Reverse (Bald Head Shoal Channel Range astern)* | *223°27′* | *2.8* |
| **2. Junction of Bald Head Shoal Channel and Smith Island Ranges**; Bald Head Radiobeacon tower bearing 086°, distant 0.4 mile; 33°52′.4 N., 78°00′.5 W.: | | |
| Direct (Smith Island Range ahead) | 008°13′ | 0.8 |
| *Reverse (Smith Island Range astern)* | *188°13′* | *0.8* |

## Table 10.—Cape Fear River Entrance to Wilmington—Continued

CHARTS 424, 425

| Positions (Reverse directions in *italics*—read upward) | True course | Distance |
|---|---|---|
| | *Degrees* | *Nautical miles* |
| **3. Shoal lighted buoy 13** bearing 315°, distant 350 yards; 33°53′.2 N., 78°00′.4 W.: | | |
| Direct (Southwest end of Battery Island ahead) | 340 | 0.4 |
| *Reverse (Southwest end of Battery Island astern)* | *160* | *0.4* |
| **4. Smith Island Range Front Light** bearing 070°, distant 400 yards; 33°53′.6 N., 78°00′.5 W.: | | |
| Direct | 322 | 0.9 |
| *Reverse* | *142* | *0.9* |
| **5. Battery Island Light 14** bearing 045°, distant 350 yards; 33°54′.3 N., 78°01′.2 W. Round Battery Island Light 14 at a distance of about 300 yards until the light bears 090°, and continue to swing gradually to the Lower Swash Channel Range: | | |
| Direct | Various | 0.5 |
| *Reverse* | *Various* | *0.5* |
| **6. Southport Light 1** bearing 315°, distant 400 yards; 33°54′.7 N., 78°01′.1 W: | | |
| Direct (Lower Swash Channel Range ahead) | 055°45′ | 1.4 |
| *Reverse (Lower Swash Channel Range astern)* | *235°45′* | *1.4* |
| **7. Snow Marsh Channel lower buoy 16** abeam, close aboard; 33°55′.5 N., 77°59′.7 W.: | | |
| Direct (Snow Marsh Channel Range ahead) | 045°58′ | 2.6 |
| *Reverse (Snow Marsh Channel Range astern)* | *225°58′* | *2.6* |
| **8. Snow Marsh Channel Upper Light 21** bearing 280°, distant 150 yards; 33°57′.4 N., 76°57′.4 W.: | | |
| Direct (Horseshoe Shoal Channel Range astern) | 023°45′ | 1.1 |
| *Reverse (Horseshoe Shoal Channel Range ahead)* | *203°45′* | *1.1* |
| **9. Reaves Point Channel Entrance buoy 23** bearing 225°, distant 100 yards; 33°58′.3 N., 77°56′.9 W.: | | |
| Direct (Reaves Point Channel Range astern) | 005°25′ | 1.0 |
| *Reverse (Reaves Point Channel Range ahead)* | *185°25′* | *1.0* |
| **10. Reaves Point Channel buoy 24** abeam, close aboard; 33°59′.3 N., 77°56′.8 W.: | | |
| Direct (Lower Midnight Channel Range ahead) | 014°31′ | 1.4 |
| Change to Chart 425 (*424*) when abeam of buoy 25. | | |
| *Reverse (Lower Midnight Channel Range astern)* | *194°31′* | *1.4* |
| **11. Midnight Channel Light 27** abeam, close aboard; 34°00′.7 N., 77°56′.4 W.: | | |
| Direct (Upper Midnight Channel Range astern) | 359°29′ | 2.3 |
| *Reverse (Upper Midnight Channel Range ahead)* | *179°29′* | *2.3* |
| **12. Orton Point Light 34** abeam, close aboard; 34°03′.0 N., 77°56′.4 W.: | | |
| Direct (Lower Liliput Channel Range ahead) | 012°29′ | 1.7 |
| *Reverse (Lower Liliput Channel Range astern)* | *192°29′* | *1.7* |
| **13. Liliput Middle Light 37** bearing 315°, distant 150 yards; 34°04′.7 N., 77°56′.0 W.: | | |
| Direct (Upper Liliput Channel Range astern) | 353°02′ | 1.7 |
| *Reverse (Upper Liliput Channel Range ahead)* | *173°02′* | *1.7* |
| **14. Keg Island Cut lower buoy 40** abeam, close aboard; 34°06′.4 N., 77°56′.2 W.: | | |
| Direct (Keg Island Channel Range ahead) | 003°19′ | 1.1 |
| *Reverse (Keg Island Channel Range astern)* | *183°19′* | *1.1* |
| **15. Midway between Campbell Island Light 43 and Big Island Channel Daybeacon 44;** 34°07′.5 N., 77°56′.1 W.: | | |
| Direct (Big Island Channel Lower Range astern) | 331°32′ | 0.7 |
| *Reverse (Big Island Channel Lower Range ahead)* | *151°32′* | *0.7* |
| **16. Midway between Big Island Channel Light 45 and Big Island Channel Turn Daybeacon 46;** 34°08′.1 N., 77°56′.5 W.: | | |
| Direct (Big Island Channel Upper Range astern) | 307°56′ | 0.4 |
| *Reverse (Big Island Channel Upper Range ahead)* | *127°56′* | *0.4* |
| **17. First Western Jetty Light 47** abeam, close aboard; 34°08′.4 N., 77°56′.9 W.: | | |
| Direct (Lower Brunswick Channel Range ahead) | 333°17′ | 1.4 |
| *Reverse (Lower Brunswick Channel Range astern)* | *153°17′* | *1.4* |

## Table 10.—Cape Fear River Entrance to Wilmington—Continued

CHARTS 424, 425

| Positions (Reverse directions in *italics*—read upward) | True course | Distance |
|---|---|---|
| | *Degrees* | *Nautical miles* |
| **18. Brunswick Channel lower buoy 52** abeam, close aboard; 34°09′.7 N., 77°57′.7 W.: | | |
| Direct (Upper Brunswick Channel Range ahead) | 011°24′ | 0.9 |
| *Reverse (Upper Brunswick Channel Range astern)* | *191°24′* | *0.9* |
| **19. Brunswick Channel middle buoy 53** abeam, close aboard; 34°10′.6 N., 77°57′.5 W.: | | |
| Direct (Fourth Eastern Jetty Range astern) | 004°06′ | 1.0 |
| *Reverse (Fourth Eastern Jetty Range ahead)* | *184°06′* | *1.0* |
| **20. Clark Island Light 55** bearing 274°, distant 100 yards; 34°11′.6 N., 77°57′.4 W.: | | |
| Direct (Bring Upper Brunswick Channel Range Rear Light slightly on starboard quarter) | 343 | 0.4 |
| *Reverse (Bring Upper Brunswick Channel Range Rear Light slightly on port bow)* | *163* | *0.4* |
| **21. Dram Tree Point buoy 55A** bearing 270°, close aboard; 34°11′.9 N., 77°57′.5 W.: | | |
| Direct (Clark Island Range astern) | 002°44′ | 0.7 |
| *Reverse (Clark Island Range ahead)* | *182°44′* | *0.7* |
| **22. Alligator Creek Cut middle buoy 60** abeam; close aboard; 34°12′.7 N., 77°57′.5 W.: | | |
| Direct (Bring Eagle Island Light 59 astern) | 018 | 1.3 |
| *Reverse (Bring Eagle Island Light 59 ahead)* | *198* | *1.3* |
| **23. Wharves at Wilmington;** Chart 425. | | |

## Table 11.—Winyah Bay Entrance to Georgetown

CHART 787

| | | |
|---|---|---|
| **1. Winyah Bay lighted whistle buoy 2WB** bearing 000°, distant 100 yards; 33°11′.7 N., 79°05′.2 W.; Chart 787: | | |
| Direct | 264 | 2.0 |
| *Reverse* | *084* | *2.0* |
| **2. Winyah Bay bell buoy 4** bearing 000°, close aboard; 33°11′.5 N., 79°07′.6 W.: | | |
| Direct (South Jetty Channel Range ahead) | 269°52′ | 1.3 |
| *Reverse (South Jetty Channel Range astern)* | *089°52′* | *1.3* |
| **3. Winyah Bay buoy 8** bearing 045°, distant 250 yards; 33°11′.5 N., 79°09′.1 W.: | | |
| Direct (Middle Ground Channel Range ahead) | 284°55′ | 1.0 |
| *Reverse (Middle Ground Channel Range astern)* | *104°55′* | *1.0* |
| **4. Winyah Bay buoy 12** bearing 000°, distant 100 yards; 33°11′.8 N., 79°10′.3 W.: | | |
| Direct | 310 | 0.5 |
| *Reverse* | *130* | *0.5* |
| **5. Winyah Bay buoy 14** bearing 040°, distant 250 yards; 33°12′.2 N., 79°10′.8 W.: | | |
| Direct (Main Channel Range astern) | 337°56′ | 1.4 |
| *Reverse (Main Channel Range ahead)* | *157°56′* | *1.4* |
| **6. Georgetown Light** bearing 115°, distant 0.3 mile; 33°13′.5 N., 79°11′.5 W.: | | |
| Direct (Eastern Channel Approach Range ahead) | 327 | 1.7 |
| *Reverse (Eastern Channel Approach Range astern)* | *147* | *1.7* |
| **7. Wynyah Bay buoy 19** bearing 270°, distant 200 yards; 33°14′.9 N., 79°12′.5 W.: | | |
| Direct (Eastern Channel Lower Range astern and Upper Range ahead) | 310½ | 4.9 |
| *Reverse (Eastern Channel Upper Range astern and Lower Range ahead)* | *130½* | *4.9* |

## Table 11—Winyah Bay Entranc Georgetown—Continued

CHART 787

| Positions (Reverse directions in *italics*—read upward) | True course | Distance |
|---|---|---|
| **8. Eastern Channel Light 24** bearing 110°, distant 300 yards; 33°18′.1 N., 79°16′.9 W.: | *Degrees* | *Nautical miles* |
| Direct | 330 | 0.4 |
| *Reverse* | *150* | *0.4* |
| **9. Eastern Channel Upper Range Front Light 25** bearing 225°, distant 300 yards; 33°18′.4 N., 79°17′.1 W.: | | |
| Direct | 358 | 0.7 |
| *Reverse* | *178* | *0.7* |
| **10. Western Channel Light 27** bearing 270°, distant 175 yards; 33°19′.1 N., 79°17′.2 W.: | | |
| Direct | 010 | 1.1 |
| *Reverse* | *190* | *1.1* |
| **11. Rabbit Island Light 28** bearing 100°, distant 175 yards; 33°20′.2 N., 79°16′.9 W.: | | |
| Direct | 022 | 0.7 |
| *Reverse* | *202* | *0.7* |
| **12. Sampit River Light 29** bearing 290°, distant 100 yards; 33°20′.8 N., 79°16′.7 W.: | | |
| Direct | 335 | 0.5 |
| *Reverse* | *155* | *0.5* |
| **13. Sampit River Jetty Turn Light 32** bearing 090°, distant 100 yards; 33°21′.3 N., 79°16′.9 W.: | | |
| Direct | Various | 0.5 |
| *Reverse* | *Various* | *0.5* |
| **14. Georgetown Harbor.** | | |

## Table 12.—Charleston Harbor Entrance to Charleston

CHARTS 491, 470

| | | |
|---|---|---|
| **1. Charleston lighted whistle buoy 2C** bearing 000°, distant 150 yards; 32°40′.6 N., 79°42′.9 W.; Chart 491: | | |
| Direct (Fort Sumter Range ahead) | 299°20′ | 7.6 |
| St. Philips Church spire in Charleston is in line with Fort Sumter Range: | | |
| *Reverse (Fort Sumter Range astern)* | *119°20′* | *7.6* |
| **2. Junction of Fort Sumter and Mount Pleasant Ranges; Charleston Channel lighted bell buoy 20** bearing 040°, distant 175 yards; 32°44′.4 N., 79°50′.7 W. Change to Chart 470 (*491*): | | |
| Direct (Mount Pleasant Range ahead) | 317°41′ | 1.6 |
| *Reverse (Mount Pleasant Range astern)* | *137°41′* | *1.6* |
| **3. Junction of Mount Pleasant and South Channel Ranges; Fort Sumter Range Rear Light** bearing 231°, distant 1,100 yards; 32°45′.5 N., 79°52′.0 W.: | | |
| Direct (South Channel Range ahead; daybeacon and tank on Sullivans Island on range astern) | 270°08′ | 2.2 |
| *Reverse (Daybeacon and tank on Sullivans Island on range ahead. South Channel Range astern)* | *090°08′* | *2.2* |
| **4. Castle Pinckney Pierhead Light** bearing 355°, distant 0.8 mile; 32°45′.5 N., 79°54′.6 W.: | | |
| Direct (Prominent white spire of St. Michaels Church ahead; southernmost elevated tank of Fort Johnson Quarantine Station astern) | 314 | 0.6 |
| *Reverse (Southernmost elevated tank of Fort Johnson Quarantine Station ahead; prominent white spire of St. Michaels Church astern)* | *134* | *0.6* |

## Table 12.—Charleston Harbor Entrance to Charleston—Continued

CHARTS 491, 470

| Positions (Reverse directions in *italics*—read upward) | True course | Distance |
|---|---|---|
| | *Degrees* | *Nautical miles* |
| 5. **South Channel Range Front Light** bearing 231°, distant 0.6 mile; 32°45′.9 N., 79°55′.1 W.: | | |
| Direct (Town Creek Light 2 ahead) | 350 | 1.0 |
| *Reverse (Town Creek Light 2 astern)* | *170* | *1.0* |
| 6. **Cooper River Light 38** bearing 080°, distant 525 yards; 32°46′.9 N., 79°55′.3 W.: | | |
| Direct (Middle of main span of Cooper River Bridge ahead until passed) | 012 | 1.7 |
| *Reverse (Middle of main span of Cooper River Bridge ahead until passed)* | *192* | *1.7* |
| 7. **Drum Island Channel Range Front Light** bearing 090°, distant 500 yards; 32°48′.6 N., 79°54′.8 W.: | | |
| Direct (Haul northwestward to get on Drum Island Channel Range astern) | Various | 0.2 |
| *Reverse (Haul southeastward to bring main span of Cooper River Bridge ahead)* | *Various* | *0.2* |
| 8. **Cooper River lighted buoy 41** bearing 240°, distant 175 yards; 32°48′.8N., 79°55′.0 W.: | | |
| Direct (Drum Island Channel Range astern) | 298°30′ | 0.7 |
| *Reverse (Drum Island Channel Range ahead)* | *118°30′* | *0.7* |
| 9. **Town Creek Light 8** bearing 167°, distant 250 yards; 32°49′.2 N., 79°55′.7 W.: | | |
| Direct (Town Creek Light 8 astern; outer end of long pier north of Shipyard Creek ahead) | 347 | 0.5 |
| *Reverse (Town Creek Light 8 ahead; outer end of long pier north of Shipyard Creek astern)* | *167* | *0.5* |
| 10. **Cooper River Light 46** bearing 068°, distant 200 yards; 32°49′.7 N., 79°55′.8 W.: | | |
| Direct (Cooper River Lower Range ahead) | 006 | 0.8 |
| *Reverse (Cooper River Lower Range astern)* | *186* | *0.8* |
| 11. **Cooper River lighted buoy 49** bearing 321°, distant 400 yards; 32°50′.4 N., 79°55′.7 W.: | | |
| Direct | 331 | 0.7 |
| *Reverse* | *151* | *0.7* |
| 12. **Cooper River Upper Range Front Light** bearing 112°, distant 0.4 mile; 32°51′.0 N., 79°56′.1 W.: | | |
| Direct (Cooper River Upper Range astern) | 292 | 1.0 |
| *Reverse (Cooper River Upper Range ahead)* | *112* | *1.0* |
| 13. **South Pier of Navy Yard** bearing 270°, distant 200 yards 32°51′.4 N., 79°57′.2 W.: | | |
| Direct (Outer end of northernmost pier of Navy Yard ahead) | 318 | 0.6 |
| *Reverse (Outer end of northernmost pier of Navy Yard astern)* | *138* | *0.6* |
| 14. **North Radio Tower** bearing 225°, distant 300 yards; 32°51′.9 N., 79°57′.7 W.: | | |
| Direct | 342 | 0.9 |
| *Reverse* | *162* | *0.9* |
| 15. **Cooper River lighted buoy 56** bearing 090°, distant 75 yards; 32°52′.7 N., 79°58′.0 W.: | | |
| Direct | 002 | 0.5 |
| *Reverse* | *182* | *0.5* |
| 16. **Cooper River lighted buoy 58A** bearing 090°, distant 100 yards; 32°53′.2 N., 79°58′.0 W.: | | |
| Direct (Stack at Port Terminal ahead) | 015 | 0.8 |
| *Reverse (Stack at Port Terminal astern)* | *195* | *0.8* |
| 17. **Charleston Port Terminal.** | | |

# Table 13.—Savannah Lightship to Savannah

CHARTS 1241, 440

| Positions (Reverse directions in *italics*—read upward) | True course | Distance |
|---|---|---|
| | *Degrees* | *Nautical miles* |
| 1. **Savannah Lightship** bearing 113°, distant 1.0 mile; 31°57′.0 N., 80°40′.9 W.; Chart 1241: | | |
| Direct (Tybee Range ahead) | 298 | 5.9 |
| Pass 100 yards northward (*southward*) of Tybee lighted whistle buoy T and change to Chart 440 (*1241*). | | |
| *Reverse (Tybee Range astern)* | *118* | *5.9* |
| 2. **Junction of Tybee and Bloody Point Ranges;** Bloody Point lighted bell buoy 4 bearing 045°, distant 100 yards; 31°59′.6 N., 80°47′.0 W.: | | |
| Direct (Bloody Point Range ahead) | 321° 27′ | 2.9 |
| *Reverse (Bloody Point Range astern)* | *141° 27′* | *2.9* |
| 3. **Junction of Bloody Point and Jones Island Ranges;** Bloody Point lighted bell buoy 11 bearing 225°, distant 125 yards; 32°01′.9 N., 80°49′.1 W.: | | |
| Direct (Jones Island Range ahead) | 289 | 1.2 |
| *Reverse (Jones Island Range astern)* | *109* | *1.2* |
| 4. **Junction of Jones Island and Tybee Knoll Cut Ranges;** Jones Island lighted buoy 17 bearing 240°, distant 400 yards; 32°02′.3 N., 80°50′.4 W.: | | |
| Direct (Tybee Knoll Cut Range ahead) | 263 | 2.4 |
| *Reverse (Tybee Knoll Cut Range astern)* | *083* | *2.4* |
| 5. **Tybee Knoll Cut lighted buoy 24** bearing 000°, distant 200 yards; 32°02′.0 N., 80°53′.2 W.: | | |
| Direct | 270 | 0.4 |
| *Reverse* | *090* | *0.4* |
| 6. **Tybee Knoll Cut lighted buoy 25** bearing 180°, distant 125 yards; 32°02′.0 N., 80°53′.7 W.: | | |
| Direct (New Channel Range ahead) | 279 | 1.3 |
| *Reverse (New Channel Range astern)* | *099* | *1.3* |
| 7. **Long Island Crossing Range Front Light** bearing 180°, distant 300 yards; 32°02′.3 N., 80°55′.2 W.: | | |
| Direct | Various | 0.3 |
| Haul gradually northwestward until on Long Island Crossing Range astern, passing south and west of Horseshoe lighted buoy 28: | | |
| *Reverse* | *Various* | *0.3* |
| *Haul gradually eastward until on New Channel Range astern, passing south and west of Horseshoe lighted buoy 28.* | | |
| 8. **New Channel Range Front Light** bearing 225°, distant 350 yards; 32°02′.4 N., 80°55′.5 W.: | | |
| Direct (Long Island Crossing Range astern) | 319° 00′ | 2.3 |
| *Reverse (Long Island Crossing Range ahead)* | *139° 00′* | *2.3* |
| 9. **Lower Flats Range Front Light** bearing 000°, distant 200 yards; 32°04′.2 N., 80°57′.3 W.: | | |
| Direct | Various | 0.3 |
| Haul gradually westward until on Lower Flats Range astern, passing about 100 yards northeast of Pumpkin Shoal lighted buoy 35. | | |
| *Reverse* | *Various* | *0.3* |
| *Haul gradually southward until on Long Island Crossing Range ahead, passing about 100 yards northeast of Pumpkin Shoal lighted buoy 35* | | |
| 10. **Lower Flats Range Front Light** bearing 100°, distant 500 yards; 32°04′.3 N., 80°57′.6 W.: | | |
| Direct (Lower Flats Range astern) | 280 | 0.7 |
| *Reverse (Lower Flats Range ahead)* | *100* | *0.7* |
| 11. **Elba Island Light 37** bearing 270°, distant 300 yards; 32°04′.4 N., 80°58′.3 W.: | | |
| Direct | 296 | 0.5 |
| *Reverse* | *116* | *0.5* |
| 12. **Elba Island Upper Light 39** bearing 180°, distant 150 yards; 32°04′.6 N., 80°58′.9 W.: | | |
| Direct | Various | 0.5 |
| Haul gradually northward until on Upper Flats Range astern, passing about 100 yards east of Upper Flats Range Front Light 41. | | |
| *Reverse* | *Various* | *0.5* |
| *Haul gradually eastward passing about 100 yards east of Upper Flats Range Front Light 41.* | | |

## Table 13.—Savannah Lightship to Savannah—Continued

CHARTS 1241, 440

| Positions (Reverse directions in *italics*—read upward) | True course | Distance |
|---|---|---|
| | *Degrees* | *Nautical miles* |
| **13. Upper Flats Range Front Light** bearing 162°, distant 500 yards; 32°05′.1 N., 80°59′.3 W.: | | |
| Direct (Upper Flats Range astern) | 342°27′ | 0. 5 |
| *Reverse (Upper Flats Range ahead)* | *162°27′* | *0. 5* |
| **14. North Elba Island Training Wall Light 42** bearing 090°, distant 125 yards; 32°05′.5 N., 80°59′.5 W.: | | |
| Direct | Various | 1. 2 |
| Haul gradually westward, keeping 100 yards off Barnwell Place (Oglethorpe Range Rear) Light and the same distance from the bank until nearing Proctor Place Light 46. | | |
| *Reverse* | *Various* | *1. 2* |
| *Haul gradually to eastward, then southeastward passing 100 yards off Barnwell Place (Oglethorpe Range Rear) Light.* | | |
| **15. Proctor Place Light 46** bearing 000°, distant 125 yards; 32°06′.1 N., 81°00′.7 W.: | | |
| Direct | 234 | 0. 3 |
| *Reverse* | *054* | *0. 3* |
| **16. Proctor Place Light 46** bearing 045°, distant 650 yards; 32°05′.9 N., 81°00′.9 W.: | | |
| Direct (Fort Jackson Range ahead) | 210 | 0. 6 |
| *Reverse (Fort Jackson Range astern)* | *030* | *0. 6* |
| **17. Barnwell Island Flats lighted buoy 48** bearing 270°, distant 125 yards, 32°05′.4 N., 81°01′.3 W.: | | |
| Direct (Oglethorpe Range astern) | 245 | 1. 1 |
| *Reverse (Oglethorpe Range ahead)* | *065* | *1. 1* |
| **18. Fig Island Jetty Light 50** bearing 270°, distant 700 yards; 32°04′.9 N., 81°02′.5 W.: | | |
| Direct | Various | 4. 4 |
| Steer mid-channel courses until up to the wharves on the south bank, then follow the wharves at a distance of 80 to 100 yards. | | |
| *Reverse* | *Various* | *4. 4* |
| *Follow the wharves at a distance of 80 to 100 yards, the steer mid-channel courses.* | | |
| **19. Seaboard Air Line Ry. drawbridge.** Chart 440. | | |

## Table 14.—St. Simons Sound Entrance to Brunswick

CHART 447

| | | |
|---|---|---|
| **1. St. Simons lighted whistle buoy St.S.** bearing 213°, close aboard; 31°04′.0 N., 81°16′.5 W.; Chart 447: | | |
| Direct (St. Simons Light ahead) | 303 | 6. 1 |
| Pass midway between the buoys marking the dredged channel. | | |
| *Reverse (St. Simons Light astern)* | *123* | *6. 1* |
| **2. St. Simons lighted bell buoy 15** bearing 180°, distant 150 yards; 31°07′.4 N., 81°22′.4 W.: | | |
| Direct (Plantation Creek Range ahead) | 285°07′ | 1. 5 |
| Pass 125 yards north of St. Simons bell buoy 17. | | |
| *Reverse (Plantation Creek Range astern)* | *105°07′* | *1. 5* |
| **3. St. Simons Light** bearing 060°, distant 0.5 mile; 31°07′.8 N., 81°24′.1 W.: | | |
| Direct (St. Simons Light astern) | 240 | 0. 8 |
| Pass 125 yards northwestward of St. Simons Sound buoy 19. | | |
| *Reverse (St. Simons Light ahead)* | *060* | *0. 8* |
| **4. St. Simons Sound lighted buoy 20** bearing 035°, distant 575 yards; 31°07′.4 N., 81°25′.0 W.: | | |
| Direct (Jekyll Island Range ahead) | 217°09′ | 1. 0 |
| *Reverse (Jekyl Island Range astern)* | *037°09′* | *1. 0* |

## Table 14.—St. Simons Sound Entrance to Brunswick—Continued

CHART 447

| Positions (Reverse directions in *italics*—read upward) | True course | Distance |
|---|---|---|
| **5. Junction of Jekyll Island and Cedar Hammock Ranges;** St. Simons Sound lighted buoy 22 bearing 310°, distant 225 yards; 31°06′.5 N., 81°25′.7 W.: | *Degrees* | *Nautical miles* |
| Direct (Cedar Hammock Range ahead) | 255°17′ | 1.2 |
| *Reverse (Cedar Hammock Range astern)* | *075°17′* | *1.2* |
| **6. Junction of Cedar Hammock and Brunswick Point Cut Ranges;** St. Simons Sound lighted buoy 24 bearing 000°, distant 125 yards; 31°06′.2 N., 81°27′.1 W.: | | |
| Direct (Brunswick Point Cut Range astern) | 293½ | 2.1 |
| *Reverse (Brunswick Point Cut Range ahead)* | *113½* | *2.1* |
| **7. Junction of Brunswick Point Cut and Brunswick Harbor Ranges;** Brunswick Channel Light 26 bearing 352°, distant 0.4 mile; 31°07′.0 N., 81°29′.4 W.: | | |
| Direct (Brunswick Harbor Range ahead) | 343°47′ | 2.0 |
| *Reverse (Brunswick Harbor Range astern)* | *163°47′* | *2.0* |
| **8. Brunswick Harbor Docks;** 31°08′.9 N., 81°29′.9 W.: | | |
| Direct | 000 | 0.3 |
| *Reverse* | *180* | *0.3* |
| Follow closely along wharves on east side. | | |
| **9. Academy Creek Docks.** | | |
| Turtle River | | |
| **7. Junction of Brunswick Point Cut and Brunswick Harbor Ranges;** Brunswick Channel Light 26 bearing 352°, distant 0.4 mile; 31°07′.0 N., 81°29′.4 W.: | | |
| Direct (Turtle River Lower Range ahead) | 292°53′ | 1.7 |
| *Reverse (Turtle River Lower Range astern)* | *112°53′* | *1.7* |
| **8A. Junction of Turtle River Lower and Blythe Island Ranges;** Turtle River buoy 4 bearing 007°, distant 400 yards; 31°07′.7 N., 81°31′.2 W.: | | |
| Direct (Blythe Island Range ahead) | 337°41′ | 1.3 |
| *Reverse (Blythe Island Range astern)* | *157°41′* | *1.3* |
| **9A. Junction of Blythe Island and Turtle River Upper Ranges;** Turtle River buoy 6 bearing 090°, distant 100 yards; 31°08′.9 N., 81°31′.8 W.: | | |
| Direct (Turtle River Upper Range astern) | 010°02′ | 1.7 |
| Pass 75 yards west of Turtle River buoy 8 and 125 yards east of Turtle River Light 9. | | |
| *Reverse (Turtle River Upper Range ahead)* | *190°02′* | *1.7* |
| *Pass 125 yards east of Turtle River Light 9 and 75 yards west of Turtle River buoy 8.* | | |
| **10A. Ruins of Southern Ry. Wharves;** 31°10′.6 N., 81°31′.4 W.: | | |
| Direct | 338 | 0.5 |
| *Reverse* | *158* | *0.5* |
| **11A. Atlantic Refining Co. Wharf.** | | |

## Table 15.—St. Johns River Entrance to Jacksonville

CHART 577

| | | |
|---|---|---|
| **1. St. Johns lighted whistle buoy 2St.J.** bearing 000°, distant 175 yards; 30°23′.7 N., 81°20′.3 W.; Chart 577: | | |
| Direct (St. Johns Bar Cut Range ahead) | 276°40′ | 4.3 |
| *Reverse (St. Johns Bar Cut Range astern)* | *096°40′* | *4.3* |
| **2. Junction of St. Johns Bar Cut and Pilot Town Cut Ranges;** St. Johns River lighted bell buoy 11 bearing 125°, distant 300 yards; 30°24′.2 N., 81°25′.2 W.: | | |
| Direct (Pilot Town Cut Range astern) | 246 | 0.6 |
| *Reverse (Pilot Town Cut Range ahead)* | *066* | *0.6* |

## Table 15.—St. Johns River Entrance to Jacksonville—Continued

CHART 577

| Positions (Reverse directions in *italics*—read upward) | True course | Distance |
|---|---|---|
| **3. Junction of Pilot Town Cut and Mayport Cut Ranges;** Mayport Cut Range Front Light 16 bearing 023°, distant 300 yards; 30°24′.0 N., 81°25′.8 W.: | *Degrees* | *Nautical miles* |
| Direct (Mayport Cut Range astern) | 203°14′ | 0. 7 |
| *Reverse (Mayport Cut Range ahead)* | *023°14′* | *0. 7* |
| **4. Junction of Mayport Cut and Sherman Cut Ranges;** stack at Mayport Porgy Plant bearing 190°, distant 550 yards; 30°23′.3 N., 81°26′.1 W.: | | |
| Direct (Sherman Cut Range ahead) | 221°35′ | 0. 5 |
| *Reverse (Sherman Cut Range astern)* | *041°35′* | *0. 5* |
| **5. Junction of Sherman Cut and Mile Point Lower Ranges; Sherman Cut lighted buoy 20** bearing 320°, distant 150 yards; 30°23′.0 N., 81°26′.5 W.: | | |
| Direct (Mile Point Lower Range ahead) | 241°30′ | 0. 4 |
| *Reverse (Mile Point Lower Range astern)* | *061°30′* | *0. 4* |
| **6. Mile Point lighted buoy 22** bearing 000°, distant 150 yards; 30°22′.8 N., 81°26′.9 W.: | | |
| Direct | 287 | 0. 5 |
| Pass about 100 yards south of Mile Point lighted buoy 24. | | |
| *Reverse* | *107* | *0. 5* |
| **7. East Coast Canal Light 1** bearing 180°, distant 200 yards; 30°22′.9 N., 81°27′.5 W.: | | |
| Direct (Mile Point Upper Range astern) | 309°21′ | 0. 6 |
| *Reverse (Mile Point Upper Range ahead)* | *129°21′* | *0. 6* |
| **8. Drawbridge at mouth of Sister Creek** bearing 080°, distant 600 yards; 30°23′.3 N., 81°28′.1 W.: | | |
| Direct (Training Wall Range ahead) | 306°29′ | 0. 5 |
| *Reverse (Training Wall Range astern)* | *126°29′* | *0. 5* |
| **9. Junction of Training Wall and Short Cut Ranges;** Short Cut Range Front Light 26 bearing 091°, distant 360 yards; 30°23′.6 N., 81°28′.5 W.: | | |
| Direct (Short Cut Range astern) | 271°00′ | 0. 4 |
| *Reverse (Short Cut Range ahead)* | *091°00′* | *0. 4* |
| **10. Junction of Short Cut and White Shells Cut Ranges;** White Shells Cut Range Front Light bearing 057°, distant 500 yards; 30°23′.6 N., 81°29′.0 W.: | | |
| Direct (White Shells Cut Range astern) | 236°39′ | 0. 6 |
| *Reverse (White Shells Cut Range ahead)* | *056°39′* | *0. 6* |
| **11. St. Johns Bluff Light 29** bearing 090°, distant 250 yards; 30°23′.3 N., 81°29′.6 W.: | | |
| Direct | Various | 0. 7 |
| Haul slowly to the eastward and northeastward, passing 150 yards off St. Johns Bluff Light 31 and Fulton Light 33. | | |
| *Reverse* | *Various* | *0. 7* |
| *Haul slowly to the eastward and northeastward, passing 150 yards off St. Johns Bluff Light 31 and Fulton Light 33.* | | |
| **12. Fulton Light 33** bearing 170°, distant 250 yards; 30°23′.4 N., 81°30′.3 W.: | | |
| Direct (Fulton Cut Range ahead) | 341°17′ | 0. 7 |
| *Reverse (Fulton Cut Range astern)* | *161°17′* | *0. 7* |
| **13. Fulton Cut Range Front Light 36** bearing 341°, distant 500 yards; 30°24′.1 N., 81°30′.6 W.: | | |
| Direct | 323 | 0. 3 |
| *Reverse* | *143* | *0. 3* |
| **14. Fulton Cut Range Front Light 36** bearing 090°, distant 200 yards; 30°24′.4 N., 81°30′.8 W.: | | |
| Direct (Browns Creek Cut Range ahead) | 300½ | 1. 0 |
| *Reverse (Browns Creek Cut Range astern)* | *120½* | *1. 0* |
| **15. Vicks Island Light 39** bearing 225°, distant 250 yards; 30°24′.9 N., 81°31′.8 W.: | | |
| Direct | Various | 0. 7 |
| Haul slowly to the westward and southwestward, keeping about 200 yards south of the shoreline. | | |
| *Reverse* | *Various* | *0. 7* |
| *Haul slowly to the northeastward and eastward, keeping about 200 yards south of the shoreline.* | | |

789003°—48——8

## Table 15.—St. Johns River Entrance to Jacksonville—Continued

CHART 577

| Positions (Reverse directions in *italics*—read upward) | True course | Distance |
|---|---|---|
| | *Degrees* | *Nautical miles* |
| **16. Vicks Island Light 43** bearing 090°, distant 250 yards; 30°24′.7 N., 81°32′.5 W.: | | |
| Direct (San Carlos Creek Cut Range astern) | 207½ | 0. 4 |
| *Reverse (San Carlos Creek Cut Range ahead)* | *027½* | *0. 4* |
| **17. Vicks Island Light 43** bearing 043°, distant 950 yards; 30°24′.4 N., 81°32′.7 W.: | | |
| Direct (Quarantine Island Lower Range ahead) | 201 | 1. 2 |
| *Reverse (Quarantine Island Lower Range astern)* | *021* | *1. 2* |
| **18. Dame Point Light 46** bearing 270°, distant 250 yards; 30°23′.3 N., 81°33′.3 W.: | | |
| Direct | Various | 0. 6 |
| Haul westward and northwestward around Dame Point keeping in mid-channel. | | |
| *Reverse* | *Various* | *0. 6* |
| *Haul eastward and northeastward around Dame Point keeping in mid-channel.* | | |
| **19. Quarantine Island Upper Range Front Light 49** bearing 146°, distant 500 yards; 30°23′.2 N., 81°33′.8 W.: | | |
| Direct (Quarantine Island Upper Range astern) | 326 | 0. 7 |
| *Reverse (Quarantine Island Upper Range ahead)* | *146* | *0. 7* |
| **20. Brills Cut Light 51** bearing 260°, distant 175 yards; 30°23′.8 N., 81°34′.3 W.: | | |
| Direct (Brills Cut Range ahead) | 317 | 0. 9 |
| *Reverse (Brills Cut Range astern)* | *137* | *0. 9* |
| **21. Brills Cut Light 53** bearing 152°, distant 550 yards; 30°24′.5 N. 81°35′.1 W.: | | |
| Direct | Various | 0. 9 |
| Haul westward and southwestward, passing midway between the lights marking the edges of the channel. | | |
| *Reverse* | *Various* | *0. 9* |
| *Haul eastward and northeastward, passing midway between the lights marking the edges of the channel.* | | |
| **22. Dunn Creek Cut Light 57** bearing 090°, distant 400 yards; 30°24′.5 N., 81°36′.0 W.: | | |
| Direct (Drummond Creek Range astern) | 238°23′ | 1. 5 |
| *Reverse (Drummond Creek Range ahead)* | *058°23′* | *1. 5* |
| **23. Trout River Range Front Light 62** bearing 016°, distant 500 yards; 30°23′.8 N., 81°37′.4 W.: | | |
| Direct (Trout River Range astern) | 196½ | 1. 1 |
| *Reverse (Trout River Range ahead)* | *016½* | *1. 1* |
| **24. Long Branch lighted buoy 69** bearing 090°, distant 125 yards; 30°22′.7 N., 81°37′.8 W.: | | |
| Direct | Various | 0. 5 |
| Haul southward and southeastward passing about 200 yards south of Long Branch lighted buoy 71. | | |
| *Reverse* | *Various* | *0. 5* |
| *Haul northwestward and northward in mid-channel.* | | |
| **25. Long Branch lighted buoy 71** bearing 000°, distant 200 yards; 30°22′.2 N., 81°37′.6 W.: | | |
| Direct (Long Branch Range ahead) | 128°47′ | 0. 8 |
| *Reverse (Long Branch Range astern)* | *308°47′* | *0. 8* |
| **26. Junction of Long Branch and City Limits Ranges;** Long Branch Range Front Light 73 bearing 129°, distant 200 yards; 30°21′.8 N., 81°36′.9 W.: | | |
| Direct (City Limits Range ahead) | 176°55′ | 1. 1 |
| *Reverse (City Limits Range astern)* | *356°55′* | *1. 1* |
| **27. Junction of City Limits and Arlington Cut Ranges;** Arlington Cut lighted buoy 74 bearing 270°, distant 100 yards; 30°20′.6 N., 81°36′.8 W.: | | |
| Direct (Arlington Cut Range astern) | 195°08′ | 1. 5 |
| *Reverse (Arlington Cut Range ahead)* | *015°08′* | *1. 5* |

## Table 15.—St. Johns River Entrance to Jacksonville—Continued

CHART 577

| Positions (Reverse directions in *italics*—read upward) | True course | Distance |
|---|---|---|
| **28. Arlington Cut Light 77** bearing 030°, distant 500 yards; 30°19′.1 N., 81°37′.3 W.: | *Degrees* | *Nautical miles* |
| Direct | Various | 2.5 |
| Steer mid-channel courses past the wharves. | | |
| *Reverse* | *Various* | *2.5* |
| **29. Florida East Coast Railway drawbridge.** | | |

## Table 16.—Sea to Miami via Main Channel

CHARTS 1248, 547

| | | |
|---|---|---|
| **1. Miami lighted whistle buoy 2** bearing 000°, distant 100 yards; 25°46′.0 N., 80°05′.1 W.; Chart 1248: | | |
| Direct (Miami Entrance Range ahead) | 249½ | 1.6 |
| Pass midway between Outer Entrance lighted bell buoy 2A and Miami Outer Cut lighted buoy 1. Change to Chart 547 (*1248*). | | |
| *Reverse (Miami Entrance Range astern)* | *069½* | *1.6* |
| **2. Outer Cut lighted bell buoy 4** bearing 000°, distant 100 yards; 25°45′.4 N., 80°06′.8 W.: | | |
| Direct | 273 | 0.3 |
| *Reverse* | *093* | *0.3* |
| **3. Outer Cut lighted gong buoy 6** bearing 000°, distant 100 yards; 25°45′.4 N., 80°07′.0 W.: | | |
| Direct | 295 | 1.2 |
| *Reverse* | *115* | *1.2* |
| **4. Miami Main Channel lighted buoy 12** bearing 315°, distant 200 yards; 25°45′.9 N., 80°08′.2 W. Vessels are advised to favor the south side of the channel during southerly winds, as a pronounced northerly set of current may then be experienced. | | |
| NOTE.—Directions for Meloy Channel and Fisher Island Channel are given below. | | |
| To Miami Beach Wharves | | |
| **4. Miami Main Channel lighted buoy 12** bearing 315°, distant 200 yards; 25°45′.9 N., 80°08′.2 W.: | | |
| Direct | 340 | 0.1 |
| *Reverse* | *160* | *0.1* |
| **5A. Miami Main Channel lighted buoy 12** bearing 255°, distant 100 yards; 25°46′.0 N., 80°08′.2 W.: | | |
| Direct | 328 | 0.5 |
| Pass midway between eastern shoreline and buoys marking western side of channel. | | |
| *Reverse* | *148* | *0.5* |
| **6A. Off the wharves at Miami Beach.** | | |
| To Fisher Island Wharves | | |
| **4. Miami Main Channel lighted buoy 12** bearing 315°, distant 200 yards; 25°45′.9 N., 80°08′.2 W.: | | |
| Direct (Peninsula Channel Range ahead) | 268 | 0.6 |
| *Reverse (Peninsula Channel Range astern)* | *088* | *0.6* |
| **5B. Off the wharves at Fisher Island.** | | |

## Table 16.—Sea to Miami via Main Channel—Continued

CHARTS 1248, 547

| Positions (Reverse directions in *italics*—read upward) | True course | Distance |
|---|---|---|
| **4. Miami Main Channel lighted buoy 12** bearing 315°, distant 200 yards; 25°45′.9 N., 80°08′.2 W. Vessels are advised to favor the south side of the channel during southerly winds, as a pronounced northerly set of current may then be experienced. | *Degrees* | *Nautical miles* |
| Direct | 295 | 2.6 |
| *Reverse* | *115* | *2.6* |
| **5. Miami Main Channel Light 21** bearing 180°, distant 75 yards; 25°47′.0 N., 80°10′.8 W. Continue on course for about 200 yards, then cross the turning basin and enter the slips of the Municipal Terminal. If bound to the City Yacht Basin continue south from the municipal piers being guided by the lights and daybeacons through the channel. | | |

## Table 17.—Sea to Miami via Biscayne Channel

CHARTS 848, 547

| | | |
|---|---|---|
| **1. Cape Florida Shoal Light 2** bearing 000°, distant 100 yards; 25°38′.2 N., 80°07′.9 W.; Chart 848: | | |
| Direct | 289 | 0.5 |
| Pass midway between Biscayne Channel lighted buoy 5 and Biscayne Channel Daybeacon 4. | | |
| *Reverse* | *109* | *0.5* |
| **2. Biscayne Channel lighted buoy 5** bearing 128°, distant 500 yards; 25°38′.4 N., 80°08′.4 W.: | | |
| Direct (Bascayne Channel Inner Range ahead) | 326 | 0.9 |
| Pass 150 yards west of Biscayne Channel Daybeacon 6. | | |
| *Reverse (Biscayne Channel Inner Range astern)* | *146* | *0.9* |
| **3. Biscayne Channel Inner Range Front Light 8** bearing 326°, distant 100 yards; 25°39′.2 N., 80°09′.0 W.: | | |
| Direct | 270 | 1.6 |
| Pass close to northward of Biscayne Channel Daybeacon 9, close to southward of Daybeacon 10, about 100 yards southward of Daybeacons 12, 14, and 16, and midway between Daybeacon 18 and Biscayne Channel Light 19. | | |
| *Reverse* | *090* | *1.6* |
| **4. Biscayne Channel Light 19** bearing 110°, distant 500 yards; 25°39′.2 N., 80°10′.7 W.: | | |
| Direct (Biscayne Channel Light 19 astern) | 290 | 0.6 |
| Pass close to southward of Daybeacon 20 and close to northward of Daybeacon 21. | | |
| *Reverse (Biscayne Channel Light 19 ahead)* | *110* | *0.6* |
| **5. Biscayne Channel lighted buoy 23** bearing 180°, distant 100 yards; 25°39′.4 N., 80°11′.3 W.: | | |
| Direct | 004 | 5.0 |
| Pass 600 yards west of Biscayne Channel Daybeacon 22, 500 yards west of Biscayne Channel Daybeacon 24, 400 yards west of Southwest Point Daybeacon 26, 300 yards west of West Point Daybeacon 28, 200 yards west of Miami South Channel Entrance Range Rear Light and 100 yards west of Miami South Channel Entrance Range Front Light. | | |
| *Reverse* | *184* | *5.0* |

## Table 17.—Sea to Miami via Biscayne Channel—Continued

CHARTS 848, 547

| Positions (Reverse directions in *italics*—read upward) | True course | Distance |
|---|---|---|
| **6. Miami South Channel lighted buoy 2** bearing 090°, close aboard; 25°44′.5 N., 80°11′.0 W.: | *Degrees* | *Nautical miles* |
| Direct (Miami South Channel Entrance Range astern) | 358 | 1.2 |
| Pass close to westward of Miami South Channel Light 6 and Miami South Channel Daybeacon 8, and close to eastward of Middle Range Front Light 1. | | |
| *Reverse (Miami South Channel Entrance Range ahead)* | *178* | *1.2* |
| **7. Miami River Range Front Light 10** bearing 156°, distant 75 yards; 25°45′.7 N., 80°11′.1 W.; change to Chart 547 (*848*): | | |
| If bound for Miami River | | |
| **7. Miami River Range Front Light 10** bearing 156°, distant 75 yards; 25°45′.7 N., 80°11′.1 W.; Change to Chart 547 (*848*): | | |
| Direct (Miami River Range astern) | 336 | 0.4 |
| Pass between Miami River South Channel Daybeacons 2 and 3. | | |
| *Reverse (Miami River Range ahead)* | *156* | *0.4* |
| **8A. Northwest tangent of Burlingame Island** bearing 045°, distant 50 yards, 25°46′.1 N., 80°11′.3 W.: | | |
| Direct | 000 | 0.1 |
| *Reverse* | *180* | *0.1* |
| **9A. North tangent Brickell Point** bearing 245°, distant 100 yards; 25°46′.2 N., 80°11′.3 W.: | | |
| Direct | Various | |
| From Brickell Point steer mid-channel courses in Miami River. | | |
| *Reverse* | *Various* | |
| If Bound to Yacht Basin | | |
| **7. Miami River Range Front Light 10** bearing 156°, distant 75 yards; 25°45′.7 N., 80°11′.1 W.; Change to Chart 547 (*848*): | | |
| Direct (Middle Range astern) | 015 | 0.5 |
| Pass about 30 yards eastward of Miami River South Channel Daybeacon 2 and 50 yards westward of Miami South Channel Daybeacon 12. | | |
| *Reverse (Middle Range ahead)* | *195* | *0.5* |
| **8. Yacht Basin Range Front Light 14** bearing 154°, distant 75 yards; 25°46′.2 N., 80°10′.9 W.: | | |
| Direct (Yacht Basin Range astern) | 334 | 0.3 |
| Pass 50 yards northeastward of Daybeacons 5 and 1. | | |
| *Reverse (Yacht Basin Range ahead)* | *154* | *0.3* |
| **9. City Yacht Basin.** Chart 547. Follow along the city park water front 100 yards off. Note that the eastern limit of a turning basin off the park is marked by Daybeacons A, B, C, and D. | | |

# Table 18.—Miami (Main Channel Entrance) to Key West via Hawk Channel

CHARTS 1248, 1249, 1250, 1251, 576

| Positions (Reverse directions in *italics*—read upward) | True course | Distance |
|---|---|---|
| | *Degrees* | *Nautical miles* |
| **1. Miami lighted whistle buoy 2** bearing 270°, distant 100 yards; 25°46′.1 N., 80°05′.1 W.; Chart 1248: | | |
| Direct | 192 | 10.5 |
| *Reverse* | *012* | *10.5* |
| NOTE.—In approaching the above position from the north, pass 2.2 miles off Miami Beach. | | |
| **2. Soldier Key buoy 2** bearing 270°, distant 200 yards; 25°35′.8 N., 80°07′.5 W.; change to Chart 1249 (*1248*): | | |
| Direct | 191 | 5.5 |
| *Reverse* | *011* | *5.5* |
| **3. Bowles Bank buoy 8** bearing 270°, distant 200 yards; 25°30′.4 N., 80°08′.7 W.: | | |
| Direct | 207 | 2.5 |
| Pass 0.3 mile westward of Bache Shoal Light 9BS to avoid a shoal 300 yards west of the light. | | |
| *Reverse* | *027* | *2.5* |
| **4. Elliott Key buoy 10** bearing 270°, distant 200 yards; 25°28′.1 N., 80°09′.9 W.: | | |
| Direct | 180 | 1.2 |
| *Reverse* | *000* | *1.2* |
| **5. Elliott Key Daybeacon 13** bearing 090°, distant 75 yards; 25°26′.9 N., 80°09′.9 W.: | | |
| Direct | 198 | 6.0 |
| Pass midway between Caesar Creek Light 16 and buoy 17. | | |
| *Reverse* | *018* | *6.0* |
| **6. Old Rhodes Key buoy 19** bearing 090°, distant 200 yards; 25°21′.1 N., 80°12′.0 W.: | | |
| Direct | 215 | 9.7 |
| *Reverse* | *035* | *9.7* |
| **7. Basin Hill Light 31BH** bearing 135°, distant 400 yards; 25°13′.2 N., 80°18′.1 W.: | | |
| Direct | 210 | 9.1 |
| Pass 400 yards southeastward of Key Largo Daybeacon 22. | | |
| *Reverse* | *030* | *9.1* |
| **8. Mosquito Bank Light 35** bearing 205°, distant 1.0 mile; 25°05′.2 N., 80°23′.1 W.: | | |
| Direct | 223 | 12.9 |
| Pass about 600 yards northwest of Mosquito Bank Light 35. | | |
| *Reverse* | *043* | *12.9* |
| **9. Hen and Chickens Shoal Light 24** bearing 315°, distant 400 yards; 24°55′.8 N., 80°32′.8 W.; change to Chart 1250 (*1249*): | | |
| Direct | 233 | 4.1 |
| *Reverse* | *053* | *4.1* |
| **10. Upper Matecumbe buoy 41** bearing 135°, distant 100 yards; 24°53′.3 N., 80°36′.4 W.: | | |
| Direct | 239 | 11.9 |
| *Reverse* | *059* | *11.9* |
| **11. Long Key buoy 30** bearing 000°, distant 500 yards; 24°47′.2 N., 80°47′.5 W.: | | |
| Direct | 245 | 17.0 |
| Pass 350 yards northwestward of East Turtle Shoal Light 45 and 250 yards southeastward of Fat Deer Key buoy 32. | | |
| *Reverse* | *065* | *17.0* |
| **12. East Washerwoman Shoal Light 49** bearing 180°, distant 400 yards; 24°40′.2 N., 81°04′.4 W.; change to Chart 1251 (*1250*) when 2.0 miles north of Sombrero Key Light: | | |
| Direct | 256 | 5.1 |
| *Reverse* | *076* | *5.1* |

## Table 18.—Miami (Main Channel Entrance) to Key West via Hawk Channel—Continued

CHARTS 1248, 1249, 1250, 1251, 576

| Positions (Reverse directions in *italics*—read upward) | True course | Distance |
|---|---|---|
| | *Degrees* | *Nautical miles* |
| **13. Pigeon Key Bank buoy** bearing 000°, close aboard; 24°38′.9 N., 81°09′.8 W.: | | |
| Direct | 258 | 34.5 |
| Pass 300 yards northward of Bahia Honda Key buoy, 750 yards northward of Newfound Harbor Keys buoy, and 200 yards northward of Nine-foot Shoal Light. | | |
| *Reverse* | *078* | *34.5* |
| **14. Hawk Channel Turn buoy** bearing 000°, close aboard; 24°31′.5 N., 81°46′.7 W.; change to Chart 576 (*1251*): | | |
| Direct | 282 | 2.0 |
| *Reverse* | *102* | *2.0* |
| **15. Key West Main Channel lighted buoy 8** bearing 045°, close aboard; 24°31′.9 N., 81°48′.9 W.: | | |
| Direct | 002 | 0.9 |
| *Reverse* | *182* | *0.9* |
| **16. Key West Main Channel lighted buoy 10** bearing 110°, distant 75 yards; 24°32′.9 N., 81°48′.9 W.: | | |
| Direct (Key West Harbor Range ahead) | 024 | 1.2 |
| Pass 100 yards off navy yard docks and thence on range until off piers. | | |
| *Reverse (Key West Harbor Range astern)* | *204* | *1.2* |
| **17. Man-of-War Harbor.** Chart 576. | | |

These directions are good for a draft of 9 feet in a moderately smooth sea. A draft of 10 feet has been taken through Hawk Channel, but only in a smooth sea. Strangers are advised to take a pilot. In negotiating this channel, the navigator must rely wholly upon the charts and aids. Daybeacons and buoys cannot always be distinguished by their color as they soon become discolored. A number of daybeacons, some with distinguishing topmarks intended for guidance of vessels skirting along outside the reefs, can be seen from this channel. Hawk Channel can be entered from seaward at several points.

Along the keys is a slight tidal drift of not more than ½ knot setting on and off the reefs. This current will probably not be noticeable at a greater distance from the reefs than 1 mile. Between the keys, in the passes connecting Hawk Channel and Florida Bay, the current has considerable velocity in the immediate vicinity of the openings and is felt to some extent on and beyond the usual sailing line in Hawk Channel. Times and velocities of the currents in a number of the passes may be obtained from the *Atlantic Coast Current Tables*. Winds blowing across the line of keys influence the currents through the passes, increasing those setting with the wind and decreasing those setting against it.

## Table 19.—Key West Entrance to Key West via Main Ship Channel

CHARTS 584, 576

| Positions (Reverse directions in *italics*—read upward) | True course | Distance |
|---|---|---|
| **1. Sand Key Light** bearing 270°, distant 4.2 miles; Key West Entrance lighted whistle buoy bearing 000°, distant 900 yards; 24°27′.2 N., 81°48′.0 W.; Chart 584: | *Degrees* | *Nautical miles* |
| Direct (Key West Main Ship Channel Range ahead) | 356 | 3.8 |
| Pass close to westward of Key West Entrance lighted whistle buoy, close to eastward of Key West Main Channel lighted buoy 1, and midway between Eastern Triangle Light and Western Triangle lighted bell buoy 5. | | |
| *Reverse (Key West Main Ship Channel Range astern)* | *176* | *3.8* |
| **2. Key West Main Channel lighted buoy 6** bearing 090°, close aboard; 24°31′.0 N., 81°48′.3 W.; change to Chart 576 (*584*): | | |
| Direct | 325 | 1.1 |
| *Reverse* | *145* | *1.1* |
| **3. Key West Main Channel lighted buoy 8** bearing 015°, distant 225 yards; 24°31′.9 N., 81°49′.0 W.: | | |
| Direct | 003 | 1.1 |
| *Reverse* | *183* | *1.1* |
| **4. Key West Main Channel lighted buoy 10** bearing 110°, distant 75 yards; 24°32′.9 N., 81°48′.9 W.: | | |
| Direct (Key West Harbor Range ahead) | 024 | 1.2 |
| Pass 100 yards off navy yard docks and thence on range until off piers. | | |
| *Reverse (Key West Harbor Range astern)* | *204* | *1.2* |
| **5. Man-of-War Harbor.** Chart 576. | | |

## Table 20.—Northwest Channel Entrance to Key West

CHARTS 584, 576

| | | |
|---|---|---|
| **1. Northwest Channel Entrance lighted bell buoy 1** bearing 090°, distant 200 yards; 24°38′.9 N., 81°54′.0 W.; Chart 584: | | |
| Direct (Northwest Bar Range Front Light on range with Northwest Channel Entrance Range Rear Light ahead) | 171 | 0.8 |
| *Reverse (Northwest Bar Range Front Light on range with Northwest Channel Entrance Range Rear Light astern)* | *351* | *0.8* |
| **2. Northwest Channel buoy 5** bearing 090°, distant 150 yards; 24°38′.1 N., 81°53′.8 W.: | | |
| Direct | Various | 0.4 |
| Haul gradually eastward, passing between Northwest Bar Range Front Light and Northwest Channel lighted buoy 7. | | |
| *Reverse* | *Various* | *0.4* |
| *Haul gradually northward, passing between Northwest Bar Range Front Light and Northwest Channel lighted buoy 7.* | | |
| **3. Northwest Channel buoy 9** bearing 090°, distant 150 yards; 24°37′.8 N., 81°53′.6 W.: | | |
| Direct (Northwest Bar Range Front Light and Northwest Channel Turn Range Rear Light on range astern) | 118 | 0.9 |
| Pass 75 yards southwest of buoys 11 and 13 and 100 yards northeast of buoy 14. | | |
| *Reverse (Northwest Bar Range Front Light and Northwest Channel Turn Range Rear Light on range ahead)* | *298* | *0.9* |
| **4. Northwest Channel lighted buoy 16** bearing 150°, distant 300 yards; 24°37′.4 N., 81°52′.7 W.: | | |
| Direct (Northwest Channel Inner Range ahead) | 139 | 2.9 |
| Pass northeastward of buoy 16, southwestward of buoys 17, 19, 21 and 23 and northeastward of buoy 24. | | |
| *Reverse (Northwest Channel Inner Range astern)* | *319* | *2.9* |

## Table 20.—Northwest Channel Entrance to Key West—Continued

CHARTS 584, 576

| Positions (Reverse directions in *italics*—read upward) | True course | Distance |
|---|---|---|
| | *Degrees* | *Nautical miles* |
| **5. Northwest Channel Inner Range Front Light 25** bearing 139°, distant 500 yards; 24°35′.2 N., 81°50′.6 W.: | | |
| Direct | 157 | 0.8 |
| Deep-draft vessels favor buoys 26 and 28. | | |
| *Reverse* | *337* | *0.8* |
| **6. Northwest Channel lighted buoy 29** bearing 090°, distant 150 yards; 24°34′.4 N., 81°50′.3 W.; change to Chart 576 (*584*): | | |
| Direct | 148 | 1.1 |
| *Reverse* | *328* | *1.1* |
| NOTE.—Vessels drawing 14 feet or less can cross the middle ground by passing about 100 yards south of Northwest Channel Inner Range Rear Light. This light on range with Key West Light clears the 11-foot spot on the south side of the middle ground. | | |
| **7. Kingfish Shoal Light** bearing 270°, distant 150 yards; 24°33′.4 N., 81°49′.6 W.: | | |
| Direct | 165 | 0.7 |
| *Reverse* | *345* | *0.7* |
| **8. Northwest Channel lighted buoy 31** bearing 045°, distant 125 yards; 24°32′.7 N., 81°49′.4 W.: | | |
| Direct | 070 | 0.5 |
| *Reverse* | *250* | *0.5* |
| **9. Key West Main Channel lighted buoy 10** bearing 110°, distant 75 yards; 24°32′.9 N., 81°48′.9 W.: | | |
| Direct (Key West Harbor Range ahead) | 024 | 1.2 |
| Pass 100 yards off navy yard docks and thence on range until off piers. | | |
| *Reverse (Key West Harbor Range astern)* | *204* | *1.2* |
| **10. Man-of-War Harbor.** Chart 576. | | |

CHAPTER 4

# Chesapeake Bay Entrance

## Chart 1222

**CHESAPEAKE BAY,** the largest inland body of water on the east coast of the United States, is the approach to the seaports of Norfolk, Newport News, Baltimore, and many other important cities, and has a large trade carried in foreign and domestic vessels. The bay is also the center of a large oystering and fishing industry.

Description of Chesapeake Bay in this volume is confined to the entrance, and to the approaches to Norfolk and the southward routes of the Intracoastal Waterway. The bay is described in its entirety in the *United States Coast Pilot, Atlantic Coast, Section C, Sandy Hook to Cape Henry.*

The entrance to Chesapeake Bay is between Cape Charles on the north and Cape Henry on the south, and is about 10 miles wide. The main channel is on the south side and is broad and deep. The northern half of the entrance is obstructed by shoals through which are several minor channels.

From eastward, the entrance may be approached boldly, as there are no outlying dangers. Depths of 20 fathoms will be found about 45 miles eastward of Cape Henry; inshore of that depth the water shoals irregularly. In clear weather Chesapeake Lightship should be picked up and the buoys followed into the bay. A direct course from the lightship to abeam of Cape Henry has a ruling depth of about 34 feet. Courses and distances are given in Chapter 3.

**Chesapeake Lightship** is moored in 63 feet of water 15 miles 078° from Cape Henry Light. The lightship has a red hull with the word CHESAPEAKE on each side, and a tubular mast with lantern and gallery. The light is 66 feet above the water and visible 14 miles; a riding light is on the forestay. The fog signal is an air diaphone; the radiobeacon is synchronized with the fog signal for distance finding. The code-flag signal and radio call is NNBF. **Storm warnings** are displayed during the daytime.

In rough weather, deep-draft vessels should approach the entrance through the natural channel which extends southeastward from Cape Henry and has depths greater

than 50 feet. If sounding is resorted to in thick weather to enter the bay, it is recommended that the 60-foot depth curve be followed in rounding Cape Henry; this will insure passing at a safe distance of 1 mile. Depths in the neighborhood of 100 feet should be avoided as these are found dangerously close to the shoal northeast of the cape.

**Rules of the Road.**—Inland Rules shall be followed inside a line from Cape Henry Light to Cape Henry Junction lighted whistle buoy, thence to Cape Charles Light. This line is shown on Chart 1222.

**Cape Charles,** the name applied to the whole northern point of the entrance to Chesapeake Bay, includes Smith Island, Fisherman Island, and the south point of the mainland. The point is low and bare but the land back of it is high and wooded.

**Smith Island** is low and sparsely wooded, and is 6.5 miles long in a northeast-southwest direction. One mile from the southwest end of the island is **Cape Charles Light,** 180 feet above the water and visible 20 miles, and shown from an octagonal, pyramidal skeleton structure, upper part black and lower part white. Just west of the light is a Coast Guard station, and 0.7 mile to the eastward are the ruins of the old lighthouse.

**Smith Island Shoal** has a least depth of about 21 feet 7.5 miles 104° from Cape Charles Light. Depths of less than 36 feet extend 4.5 miles northeastward, and are marked at their outer limit by a lighted whistle buoy. In heavy weather the shoal breaks.

**Nautilus Shoal** has a least depth of about 9 feet 4 miles southwest of Cape Charles Light. The shoal covers an extensive area.

**Fisherman Island** is a low island 1 mile south of Cape Charles mainland. The tank at the quarantine station on the northwest end of the island is a prominent mark. The station wharf on the west side of the island extends out into deep water.

The channel south of Nautilus Shoal, and between Fisherman Island and **Inner Middle Ground,** and thence through either **North Channel** or **Beach Channel,** had a depth of 24 feet according to the last survey, but with spots of 16 and 17 feet on its southern side. The channel is used by fish steamers and tugboats up to 12 feet draft, but is not recommended for strangers.

**Cape Charles firing area.**—A restricted firing area has been established in the entrance to Chesapeake Bay as follows:

*The Area.*—An area consisting of the arc of a circle between two lines, each 14,000 yards in length and drawn 100° and 210° respectively from the southern extremity of Cape Charles.

*The Regulations.*—1. The above-described area shall be open to the public for fishing and traffic on week ends and holidays (as defined below) throughout the year, and on weekdays except when firing exercises are under way. The term week end shall include those hours between 6 p. m. of the day preceding a national (not State) holiday and 7 a. m. of the day following such a holiday.

2. At any time, even when exercises are in progress, vessels propelled by mechanical power at a speed of 5 miles per hour or more may proceed directly through the firing area without restriction except when notified to the contrary. Vessels propelled mechanically at less than 5 miles, and *all* sailing vessels, must keep clear of the area when firing flags are displayed as described below.

3. On days of firing a large red flag will be displayed from one of the towers on Fisherman Island and/or on Fort John Custis proper. These flags will be displayed not later than 7 a. m. of that day, and will be removed when firing ceases for that day.

4. When night firing is scheduled, large white flags will be displayed from the same towers at 4 p. m. of that day.

5. With reference to the provisions contained in section 1, act of July 9, 1918 (40 Stat. 892; 33 U. S. C. 3), the authority of the War Department to issue permits to food fishermen for operating within the restricted areas is hereby delegated to the Commanding General, Fort Monroe, Va.

6. These regulations shall be enforced by the Commanding General at Fort Monroe, Va., through such officers, enlisted men, and employees as may be assigned thereto.

**Fort Story firing area.**—The firing range off Fort Story includes the waters of the Chesapeake Bay and Atlantic Ocean within the following areas:

*The Danger Zone.*—A sector, the northerly limit of which bears 345° from Cape Henry Light, and the southerly limit bears 290° from Cape Henry Light, both limits having a length of 5,000 yards; and within another sector, the northerly limit of which bears 045° from Cape Henry Light and the southerly limit of which bears 150° from Cape Henry Light, both limits having a length of 30,000 yards.

*The Regulations.*—1. Except as hereinafter provided, the above-described waters are open throughout the year to the public for fishing and traffic from 12 noon Saturdays to 7 a. m., Mondays, and national (not State) holidays, from 6 p. m., of the preceding day to 7 a. m., on the day following the holiday. Announcements of schedule of firing will be made in advance in local newspapers, the daily Hydrographic Bulletin, and by Government radio.

2. On days of firing a large red flag will be displayed from the old Coast Guard station tower on the Fort Story Military Reservation and from the observation tower known as Granite located approximately 5,000 yards east of Lynnhaven Inlet. These flags will be displayed not later than 7 a. m., of that day, and will be removed when firing ceases for the day.

3. When night firing is scheduled, large white flags will be displayed from the same towers at 4 p. m. of that day.

4. With reference to the provisions contained in section 1, act of July 9, 1918 (40 Stat. 892; 33 U. S. C. 3), the authority of the War Department to issue permits to food fishermen for operating within the restricted areas so far as they pertain to the Fort Story Firing Ranges, is hereby delegated to the Commanding General, Fort Monroe, Va.

5. Fishermen desiring to set pound nets within the above-restricted waters are required in every case to have a written permit. These permits may be obtained by written application to the Commanding General, Fort Monroe, Va. Application for such permits will state the proposed location of their pound nets. Holders of pound-net permits must comply with the regulations stated herein. No permit is required for fishing with equipment other than pound nets.

6. On days and nights when firing is in progress, no boat or vessel will enter and remain in the restricted areas above described, except under the written authority of the Commanding General, Fort Monroe: *Provided, however,* That the Commanding General may designate, from time to time, by suitably posted bulletins at fishing docks and elsewhere, and at the Commission of Fisheries of Virginia, certain times within which the public, including trawler fishermen and other food fishermen, may enter upon such waters without the necessity of securing individual written permits.

7. Any vessel capable of being propelled by mechanical power at a speed of 5 miles per hour or more may proceed directly through the firing areas without restriction, except when notified to the contrary.

8. These regulations shall be enforced by the Commanding General at Fort Monroe, Va., through such officers, enlisted men, and employees as may be assigned thereto.

**Chesapeake Bay entrance, prohibited area.**—*The Area.*—North limit, latitude 37°08′00″ N.; east imit, longitude 75°50′00″ W.; south limit, latitude 36°53′00″ N.; west limit, lines drawn in 013° and 187° directions from a point in latitude 37°01′16″ N., longitude 76°02′09″ W.

*The Regulations*—Anchoring, trawling, crabbing, or fishing are prohibited in the foregoing area.

**Cape Henry** is a bold range of sand hills 80 feet high, with lower ones near the water. On the beach near the point of the cape is **Cape Henry Light,** 157 feet above the water and visible 19 miles, and shown from an octagonal, pyramidal tower, with the upper and lower half of each face alternately black and white. The fog signal consists of two air diaphones operated simultaneously. The radiobeacon is synchronized for distance finding. The old lighthouse, built in 1791, is 340 feet southwestward of the present light.

**Storm warnings** are displayed day and night from the Weather Bureau building near the light. The Hampton Roads Maritime Exchange maintains a reporting station

here, from which vessels entering Chesapeake Bay are reported to Norfolk and Baltimore either day or night, and with which vessels can communicate by use of the International Code by day or a flashing lamp and the Morse Code by night. Messages to or from vessels will be forwarded to destination.

The **pilot station** of the Virginia and Maryland pilots is off Cape Henry. White spar mooring buoys, maintained by the two pilot associations, are moored in 29 feet and 35 feet of water about 0.7 mile north-northwestward of Cape Henry Light.

**Chart 481.—Lynnhaven Roads,** an open bight just inside Cape Henry, is protected from southerly winds and is sometimes used as an anchorage. The former dumping-ground area in the western part of the roads has a least depth of about 16 feet; elsewhere, general depths are 20 to 28 feet. Westward of Lynnhaven Inlet the shoaling is gradual and depths of 18 feet can be found 0.8 mile from shore; eastward of the inlet the 18-foot curve is no more than 0.3 mile from shore.

The restricted and anchorage areas in Lynnhaven Roads are as follows:

**Restricted area.**—*The Area.*—Beginning at a point on the beach 1.8 miles east of East Jetty Light, at Little Creek, Va., thence on an angle 012° to the south edge of Thimble Shoal Channel, thence along the south edge of Thimble Shoal Channel to a point made by an intersection of a line drawn on an angle of 012° through Little Creek Harbor Approach lighted bell buoy 2A, thence in a southerly direction along said line extended to the shore, and thence eastward across Little Creek Inlet and along the shore to the point or place of beginning.

*The Regulations.*—1. No fish-pound stakes or structures shall be located in the area described above.

2. In accordance with general Captain of the Port regulations all boats shall stay at least 300 yards away from naval vessels and 600 yards away from any vessel displaying the red "Baker" burgee.

**Anchorage areas.**—The following anchorage areas have been established in Lynnhaven Roads:

*Anchorage L–A, Naval Anchorage.*—Beginning at a point 5,350 yards 308° from Cape Henry Light, a line thence 10,350 yards 288°, thence 1,820 yards 203°; thence 6,140 yards 108°; thence 1,350 yards 173°30′; thence 4,525 yards 108°; thence 3,075 yards 005°30′ to the point of beginning.

This anchorage is reserved primarily for the use of naval vessels, but in the absence of the fleet, the Captain of the Port may, in his discretion, permit it to be used by merchant vessels. Movement of vessels through the area will not be restricted.

*Anchorage L–C (Merchant Ship Anchorage).*—Beginning at a point 2,300 yards 145° from Thimble Shoal Light; a line drawn thence, 4,525 yards 108°; thence 1,900 yards 177°; thence 4,525 yards 288°; and thence to the point of beginning.

This anchorage is primarily for the use of merchant vessels but the Captain of the Port may in his discretion permit it to be used by naval vessels, the commercial conditions at the same time being given due consideration. No vessel may occupy any berth in this anchorage without first obtaining permission from the Captain of the Port.

*Anchorage L–E (Naval Anchorage for amphibious craft).*—The area between two parallel lines running 012° from the East Jetty Light at Little Creek, and from a point on the beach 1.8 miles east of East Jetty Light, and extending from the shore to the southern boundary of Anchorage Area A.

**Lynnhaven Inlet,** the approach to Lynnhaven Bay and several other shoal bays, had a depth across the bar of 2½ feet, according to the last survey, but is subject to frequent change, and local knowledge is required to enter. The bays have depths of 2 to 10 feet and are frequented by many small oystering and fishing craft.

Across the entrance to Lynnhaven Inlet are two adjacent drawbridges with a horizontal clearance of 40 feet and a vertical clearance, closed, of 4 feet at high water. Another drawbridge crosses **Long Creek** about 1 mile from the entrance, and has a horizontal clearance of 19 feet and a vertical clearance, closed, of 5 feet at high water.

**Little Creek** is a tidal estuary entering Chesapeake Bay about 8 miles west of Cape Henry. Extensive Government-owned facilities are at the head of the improved part of the waterway, and the Pennsylvania Railroad maintains a terminal for car ferries operating to Cape Charles. Little Creek Coast Guard Station is about 200 yards eastward of the railroad pier. There are no publicly owned wharves. The town of **Little Creek** has rail and highway connections with Norfolk.

The entrance to Little Creek is between jetties, the outer ends of which are marked by lights. A lighted bell buoy is 1 mile off the entrance on **Crumps Bank.** The entrance is also marked by a lighted range and several other lights.

The modified Federal project for the improvement of Little Creek provides for maintenance of an existing channel 20 feet deep and 400 feet wide extending inshore from that depth in Chesapeake Bay to the terminals of the Pennsylvania Railroad, a distance of about 1.2 miles, including a basin adjacent to the terminals of the same depth, 400 to 1,240 feet wide, and 1,160 feet long. In June 1946 naval officials reported a controlling depth of 18 feet in the channel and basin.

Passage into **Lake Whitehurst** from Little Creek is obstructed by a fixed bridge and a submerged wall. Little Creek itself is crossed 0.5 mile westward of the basin by a fixed highway bridge with a horizontal clearance of 27 feet and a vertical clearance of 5 feet at high water.

## Hampton Roads and Adjacent Ports

Chart 400

**Hampton Roads,** at the south end of Chesapeake Bay and 16 miles westward of Cape Henry, is the approach to Norfolk, Portsmouth, and South Norfolk and the adjacent industrial areas; and to Newport News and the neighboring cities on the Virginia Peninsula.

The harbor is one of the important anchorages on the east coast of the United States and is formed where the James, the Nansemond, and the Elizabeth Rivers meet the lower Chesapeake Bay. A well marked, deep-water channel leads into Hampton Roads where there is secure anchorage for vessels of any draft.

The ports adjacent to Hampton Roads carry on a large business in coal, tobacco, grain, cotton, fuel oil, and other commodities. Sugar, molasses, iron, chrome, bauxite, and manganese ores, rubber, fertilizer materials, coffee, and a wide variety of other raw materials are imported.

**Pilotage** at Hampton Roads ports is performed exclusively by the Virginia Pilots' Association, and is compulsory for all vessels, excepting those engaged in coastwise trade and those exempted by United States statute, if spoken outside of a line with Cape Henry bearing south. Rates of pilotage from sea to Norfolk or Newport News, or to any intermediate point, and vice versa, are as follows:

| Net registered tons | Cargo | Bunkers or orders |
|---|---|---|
| Under 501 ... per foot | $3. 00 | $2. 35 |
| 501 to 1,000 ... do | 3. 50 | 2. 65 |
| 1,001 to 1,500 ... do | 4. 00 | 3. 00 |
| 1,501 to 2,000 ... do | 4. 50 | 3. 35 |
| Over 2,000 ... do | 5. 00 | 3. 70 |
| | Any tonnage, paying no sea pilotage | Any tonnage, paying sea pilotage |
| Newport News to Richmond or intermediate points ... per foot | $3. 00 | $1. 50 |

For each message or order delivered to any ship ... $5
Shifting between Norfolk and Newport News or from one anchorage to another ... any tonnage ... 15
Detention after 6 hours later than sailing time $1 per hour, but not to exceed $7.50 for any 24-hour day.
Ships entering waters of Chesapeake Bay for shelter, and not entering into port are charged ½ of the full rates.

**Towboats** are available at Norfolk. The Chesapeake & Ohio Railway Co. operates a number of tugs for use at its terminals at Newport News. Towboats no longer cruise in Chesapeake Bay but may be ordered through the pilot boats. Adequate lighterage facilities are available at the various ports of Hampton Roads.

**Quarantine.**—Quarantine regulations for Hampton Roads are embodied in the national quarantine regulations.

All vessels subject to quarantine are inspected by the officers of the United States Public Health Service off Old Point Comfort. When awaiting or undergoing examination vessels are required to anchor in Temporary Anchorage A, Hampton Bar. This anchorage is shown on Chart 400 and is described in the following text.

The national quarantine station is at Craney Island, on the western side of the entrance to Elizabeth River. Patients from foreign vessels are cared for here.

The United States Public Health Service maintains an out-patient office in the United States Post Office and Courthouse Building in Norfolk. The United States Marine Hospital is located on Hampton Boulevard in Norfolk. Applications for admission to the hospital should be made to the officer in charge of the out-patient office.

**Hospitals.**—In the larger cities are many public and private hospitals. The most prominent of the public hospitals are as follows:

Norfolk, Va.:
- United States Marine Hospital, Hampton Boulevard.
- De Paul Hospital, corner of Granby Street and Kinsley Lane.
- Norfolk General Hospital, corner of Raleigh and Colley Avenues.

Portsmouth, Va.:
- The Kings Daughters' Hospital, corner Chestnut and Leckie Streets.

Newport News, Va.:
- Elizabeth Buxton Hospital, on boulevard overlooking Hampton Roads.
- Wittaker Memorial Hospital, corner of Twenty-ninth and Orcutt Avenues.
- Riverside Hospital, 245 Fiftieth Street.

Hampton, Va.:
- The Dixie Hospital, Old Point Road.

**Customs.**—The Customhouse is located at Main and Granby Streets, Norfolk.

**Immigration.**—The offices of the Immigration and Naturalization Services are located in the New Monroe Building, 254 Granby Street, Norfolk, and at 2500 West Avenue, Newport News.

**Anchorages.**—The limits of the anchorage areas are prescribed by the Department of the Army and fully described below. They are also shown in red on Charts 1222 and 400. Anchorage regulations are enforced by an officer of the United States Coast Guard designated as Captain of the Port, with offices in the United States Post Office and Courthouse Building, Norfolk.

**Hampton Roads, Regulations.**—In the Hampton Roads Area, no person is permitted to fish and no pleasure boats may operate within 300 yards of any naval vessel, or within 600 yards of any vessel loading, discharging, or laden with explosives. The latter vessels may be identified by the red "Baker" burgee which is flown from a forward halyard.

**Hampton Roads, Anchorage areas, Regulations.**—

1. *Temporary Anchorage A, Hampton Bar.*—To the westward of a line bearing 008° from a point "A" determined by the following cross bearings: Old Point Comfort Light, bearing 031°; range and beacon tower on west end of Fort Wool, bearing 100°; to the northward of a line bearing 229° from point "A" to a point "B," 425 yards distant; to the northeastward of a line bearing 289° from point "B" to the Elizabeth City County shore.

**Note 1.**—This area is reserved for the use of vessels while undergoing examination by quarantine, customs, and immigration authorities. Upon completion of these examinations, vessels shall move promptly to a regular anchorage area.

**Note 2.**—See Note 2 under Anchorage B below.

(*a*) The master of every steam vessel using this temporary anchorage shall keep his vessel in condition to move promptly under her own power upon notification by the Captain of the Port, and, when any such vessel is in charge of a pilot, the pilot shall remain on board until the vessel is safely anchored in a designated anchorage area. No sailing vessel, using this anchorage, shall be left unattended by a steam tugboat while undergoing examination by any of the authorities mentioned herein, except when her stay is likely to be of several hours' duration, when she shall be anchored in the western part of this temporary anchorage out of the way of other vessels before the tug and pilot leave her.

(*b*) No master of a vessel awaiting or undergoing quarantine inspection shall release any part of the crew until the vessel has been passed by the proper quarantine officials, and safely anchored or moored, in one of the designated areas.

2. *Anchorage B, Naval Anchorage.*—To the southward of a line extending 289° from point "B" defined under Temporary Anchorage "A"; to the westward of a line extending 3,680 yards 229° from point "B" to point "C"; and to the northward of a line extending 292° from point "C" to the Elizabeth City County shore.

**Note 1.**—This area is reserved for the use of naval vessels, but in the absence of the fleet, the Captain of the Port may, in his discretion, permit it to be used by merchant vessels.

**Note 2.**—The established anchorages for naval vessels having been found inadequate at times when an especially large number of naval vessels are gathered in Hampton Roads, and the Navy Department having requested the establishment of a series of anchorage berths for such occasions in order that a naval vessel may be ordered to proceed to a designated numbered or lettered anchorage berth in the harbor, the following arrangements have been made: An overlay for naval anchorage berths in Hampton Roads has been superimposed on U. S. C. and G. S. Chart 400 by the Hydrographic Office of the Navy Department. This overlay, known as H. O. Anchorage Chart G, shows naval anchorage berths in Anchorages A, B, C, E, F–1, and G. Those designated anchorage berths, with the exception of those in Naval Anchorage B which are primarily for naval vessels, are not set aside for the exclusive use of naval vessels, but permission will be given for naval vessels to use them when available. When the Captain of the Port receives notification from the proper naval authorities that it is desired to utilize certain of the anchorage berths set out on the above-mentioned overlay in Anchorages A, C, E, F–1, or G, he will authorize their use by naval vessels if they can be made available, the commercial condition at the time being given proper consideration. If in the opinion of the Captain of the Port there are sufficient reasons why the berths first asked for should not be used,

he will confer with the naval officer making the request and if other berths can be agreed upon he will authorize their use, otherwise he will communicate the request to the Secretary of the Navy with a statement of the circumstances and his recommendation.

3. *Anchorage C, Newport News Bar.*—To the southward of the southern boundary of Anchorage B, to the westward of an extension of the line forming the eastern boundary of Anchorage B; to the northward of a line running through the red buoys marking the 40-foot dredged channel to Newport News; to the eastward of a line bearing north through buoy 8, at the western entrance of the Newport News Channel.

**Note 1.**—Vessels shall be anchored so as to leave a clear fairway 200 yards wide from Newport News Channel buoy 5 to the lighted bell buoy off the Chesapeake Ferry Co.'s slip at Newport News, thence 200 yards wide to the said ferry slip, except that in an emergency the fairway may be closed and occupied for the anchoring of naval vessels.

**Note 2.**—See Note 2 under Anchorage B, above.

4. *Anchorage D.*—The area enclosed by lines drawn as follows: From buoy 1 at the entrance to the Newport News dredged channel to bell buoy 2, on the western side of the Norfolk Harbor dredged channel; thence 229° until Newport News Middle Ground Light bears 303°; thence 250° until Newport News Middle Ground Light bears 003°; thence bearing 003° for a distance of 775 yards to Anchorage buoy E; thence bearing 049° on a line in extension of the southeast boundary of Anchorage B to intersection with the first line.

**Note.**—This area is to be used by deep-draft vessels, wind-bound vessels from Lambert Point and Sewall Point, and vessels awaiting turn for docking. Other vessels may use this anchorage when permitted by the Captain of the Port. Vessels shall be anchored so as to leave a clear fairway 200 yards wide on a straight line between the slip of the Chesapeake Ferry Co. at Pine Beach and Newport News Channel buoy 5.

5. *Anchorage E, Middle Ground Anchorage.*—To the southward of a line running through the black buoys marking the southern edge of the 40-foot dredged channel to Newport News; to the westward of the northwest boundary line of Anchorage D; to the northeastward of a line bearing 310° from Anchorage buoy E.

**Note 1.**—Vessels shall be anchored so as to leave a clear fairway 200 yards wide on a straight line between the slip of the Chesapeake Ferry Co. at Pine Beach and Newport News Channel buoy 5, except that in an emergency the fairway may be closed and occupied for the anchoring of naval vessels.

**Note 2.**—See Note 2 under Anchorage B, above.

6. *Anchorage F, anchorage for explosives and other dangerous articles.*—To the southward of a line, bearing 310°, through two points determined by the following cross bearings: Easterly point, Newport News Middle Ground Light, bearing 020°; Craney Island Light, bearing 131°; Nansemond River Light, bearing 243°; westerly point, Newport News Middle Ground Light, bearing 089°; Nansemond River Light, bearing 219°; northern red light on the railroad pier at Newport News, bearing 327°45′. To the westward of a line bearing 183° through the above easterly point; to the eastward of a line bearing 183° through the above westerly point. The northeasterly limit of Anchorage F is parallel to and 425 yards southeast of the southeast boundary to Anchorage E. (See Note.)

**Note.**—All vessels are forbidden to anchor between the northern boundary line of Anchorage F, and the southwestern boundary line of Anchorage E, or within a zone 425 yards wide on the eastern and the western sides of Anchorage F.

7. *Anchorage F–1; anchorage for vessels carrying explosives and other dangerous articles and having drafts too great to permit them to use Anchorage F.*—An area within Anchorage C to the westward of the eastern boundary of Anchorage C; to the northward of a line bearing 292° from the southeasterly corner of Anchorage C, 1,800 yards; to the eastward of a line bearing 049° to a point in the northern boundary of Anchorage C, 1,800 yards distant from the easterly corner of Anchorage C; to the southward of the northern boundary of Anchorage C.

**Note 1.**—When Anchorage F–1 is not occupied by vessels carrying explosives, it may be used as a general anchorage in the same manner as other portions of Anchorage C except that it must be vacated upon notice from the Captain of the Port when a vessel of a draft too great to permit it to use Anchorage F carrying explosives desires to anchor. When Anchorage F–1 is occupied by a vessel carrying explosives, vessels shall not anchor in Anchorage B or C within a zone 425 yards wide on all sides of the area. No vessel carrying explosives shall be anchored in area F–1 so as to swing within 500 yards of the Newport News dredged channel.

**Note 2.**—See Note 2 under Anchorage B, above.

8. *Newport News, Anchorage G.*—The anchorage area lies to the southward of the following lines: From Fishing Point to buoy 3 off Naseway Shoal; thence to a point fixed by the following cross bearings; northern red light on railroad pier, Newport News, bearing 135°; Nansemond River Light, bearing 180°; thence to a point determined by the following cross bearings; northern red light on railroad pier, Newport News, bearing 045°; Newport News Middle Ground Light, bearing 119°; Nansemond River Light, bearing 189°35′; thence 145° to Anchorage buoy F, intersecting an extension of a line marking the northern boundary of Anchorage E; thence easterly to the westerly point of Anchorage E. To the westward of a line parallel to and 425 yards west of the western boundary of Anchorage F.

**Note.**—See Note 2 under Hampton Roads, Anchorage B.

9. *Anchorage H, Craney Island Flats.*—To the southward of the lines forming the southeastern boundary of Anchorage D; to the westward of a line through the red buoys marking the western side of the Norfolk Harbor Channel as far south as Craney Island Light; to the northward of an east and west line joining Craney Island Light and a point on the eastern boundary of Craney Island; generally eastward, northward, and westward of the northern portion of Craney Island between the point on the eastern boundary and the mainland west of the island; and to the eastward of a line parallel to and 425 yards easterly of the eastern boundary of Anchorage F.

**Note.**—Vessels shall be anchored so as to leave a clear fairway 200 yards wide on a straight line between the slip of the Chesapeake Ferry Co. at Pine Beach and Newport News Channel buoy 5.

10. *Anchorage H–1, West Norfolk.*—To the southward and eastward of the southern and eastern boundaries of Craney Island and to the southward of an east and west line joining a point on the eastern boundary of Craney Island and Craney Island Light; to the westward of a line through the red buoys marking the western side of the Norfolk Harbor Channel; to the northwestward of a line through buoys 20 and 8, marking the northern side of the Western Branch Channel; and to the northeastward of a line through buoy 8 and high stack at West Norfolk.

**Note.**—No vessel after receiving its load shall remain more than 12 hours in this anchorage, except by special permit from the Captain of the Port.

11. *Anchorage J, Sewall Point.*—To the southward of a line bearing 087° from lighted buoy 5 on the eastern side of the Norfolk Harbor Channel; to the northward of a line bearing 282° from the northwestern corner of the submarine basin, Naval Operating Base; to the eastward of a line through the black buoys marking the eastern side of the channel to Norfolk.

12. *Anchorage K.*—To the southward of lines bearing 087° and 220°, respectively, from buoy 2, marking the southern side of the channel to the Virginian Railway coal pier at Sewall Point; to the northward of a line through buoys 1 and 3, marking the northern side of the channel to the Norfolk & Western Railway terminal at Sewall Point; and to the eastward of a line through buoy 11, marking the eastern side of the Norfolk Harbor Channel.

13. *Anchorage K–1.*—To the southward of a line through buoy 4, marking the southern side of the channel to the Standard Oil Co.'s pipe-line pier; to the northward of a line 185 yards north of Pier No. 2 of the United States Army Supply Base; and to the eastward of the eastern side of the Norfolk Harbor Channel.

14. *Anchorage K–2.*—To the southward of two lines, one 185 yards south of Pier No. 1 of the United States Army Supply Base, and the other running easterly from the extreme tip of Tanner Point on the north side of Lafayette River, at its mouth, to the extreme tip of the most northerly point on the south side of the river; to the northward of a line bearing 112° from lighted buoy 21, about 835 yards northerly of Lambert Point; and to the eastward of a line through buoys 15, 19, and 21, marking the eastern side of Norfolk Harbor Channel.

15. *Anchorage K–3, Lafayette River (for yachts and pleasure craft).*—To the westward of Hampton Boulevard bridge crossing Lafayette River; and to the northward and eastward of a line running easterly from the extreme tip of Tanner Point on the north side of the river, at its mouth, to the extreme tip of the most northerly point on the south side of the river, this line constituting the dividing line between Anchorages K–2 and K–3.

**Note.**—It will be understood that the establishment of this area shall not interfere with navigation and oyster cultivation.

16. *Anchorage L, Lambert Point.*—To the southeastward of a line bearing 051° from lighted buoy 23 off Lambert Point; to the northwestward of a line bearing 051° from buoy 25 off Lambert Point

Creek; to the northeastward of a line through lighted buoy 23 and buoy 25 marking the eastern side of channel to Norfolk.

17. *Anchorage M.*—To the southeastward of a line bearing 047° from buoy 27, 75 yards southeastward of the southernmost pier of the Norfolk & Western Railway on the east side of the channel to Norfolk, to the northeastward of two lines, one bearing 132° from buoy 27, 530 yards to a point; and the other bearing 109° from that point.

18. *Anchorage N, Norfolk, Va.*—To the northeastward of a line running from the westerly end of the Pennsylvania Railroad pier in Norfolk to the southerly end of the pier at Fort Norfolk; and between two lines at right angles to above line, one passing 200 feet northwest of the Chesapeake & Ohio Railroad pier in Norfolk and the other passing 109 feet southeast of the Nottingham & Wrenn pier; and to the southward of a line drawn 100 feet north of and parallel to an extension of the north side of West Freemason Street.

19. *Anchorage N-1, Smith Creek*—(*a*) *Mowbray Arch.*—Between Mowbray Arch and a line described as follows: Beginning at Ghent Bridge 150 feet from Mowbray Arch and continuing westerly the same distance therefrom to the intersection of the prolongation of the east side of Colonial Avenue; thence in a straight line to a point on the south side of Mill Street prolonged and 70 feet from Mowbray Arch; thence parallel to and 70 feet from Mowbray Arch to the south side of Pembroke Avenue prolonged; thence along the prolongation of the south side of Pembroke Avenue to a point 50 feet from Mowbray Arch; thence in a straight line to a point on the south side of Fairfax Avenue prolonged and 40 feet from Mowbray Arch.

(*b*) *The Hague.*—Between the wall on the west side of the Hague, and the straight line joining the point 40 feet easterly thereof in the south side of Fairfax Avenue prolonged, with the point 70 feet easterly from the wall in the perpendicular to the wall at the south end thereof.

**Note.**—No floats, rafts, lighters, houseboats, or craft laid up for any reason shall be permitted within the Smith Creek anchorages, except by permission of the Captain of the Port. No vessel shall anchor, or moor, alongside any wharf or pier on Smith Creek, so as to extend more than 40 feet beyond the pierhead line, except in the authorized anchorages.

20. *Anchorage O, Hospital Point.*—To the southwestward of a line through the red buoys marking the western side of the Norfolk Harbor Channel; to the southward of a line bearing 242° from north tower elevator at Atlantic City.

21. *Anchorage P, Port Norfolk.*—To the southeastward of a line bearing 037° from the northeast corner of the Pennsylvania Railroad piers at Port Norfolk; to the southwestward of a line through the red buoys marking the southwestern side of channel to Norfolk; to the northwestward of the outside bulkhead at the north end of Pinner Point and its northeasterly extension.

22. *Anchorage Q.*—The area known as Spotico Creek Flats landward of the United States pierhead line, and not within 200 feet of wharves or other permanent improvements.

23. *Anchorage R.*—The area landward of the United States pierhead line on the south side of the Eastern Branch of the Elizabeth River extending from a point 700 feet to the eastward from Norfolk &Western Railway bridge to a point 250 feet from the Virginian Railway bridge and not within 200 feet of permanent improvements: *Provided*, That no vessel shall anchor within 100 feet of the eastern and western entrances of Steamboat Creek, or in a position that will obstruct passage thereto.

24. *Anchorage S.*—The area landward of the United States pierhead line on the northern side of the Eastern Branch of the Elizabeth River, between a point 250 feet from the Virginian Railway bridge and the western entrance of Broad Creek, not within 200 feet of permanent improvements and exclusive of the area included between the combined pierhead and bulkhead lines in Moseley Creek.

**The Regulations.**—1. Except in cases of great emergency no vessel shall be anchored in Hampton Roads or the harbors of Newport News and Norfolk, Va., outside of the anchorage areas hereby defined and established, nor be made fast to the exterior end of any pier, nor to any vessel lying at the exterior end of any pier, or along any bulkhead in such manner as to obstruct or endanger the passage of any vessel to or from the adjacent wharf property, or impede the movements of any vessel entering or leaving adjacent slips.

2. Except as provided in subparagraph (1) of this paragraph, vessels carrying explosives or other dangerous articles, including inflammable liquids, inflammable solids, oxidizing materials, corrosive liquids, compressed gases and poisonous substances, shall be anchored within the Anchorage Areas F and F-1 only, described above in paragraphs (6) and (7). Anchorage F is reserved for this

special purpose and is not to be used by vessels carrying other classes of freight except in cases of emergency.

3. Permits to anchor in channels within the limits of Hampton Roads and the harbors of Norfolk and Newport News, Va., may be granted by the Captain of the Port to wrecking plants legally engaged in recovering sunken property, when the application for such anchorage is approved by the district engineer in charge of works of river and harbor improvements.

**Ferry Channel, Caution.**—A ferry channel from Newport News Point to Sewall Point, crossing anchorages C, D, E, and H, is plainly marked on the chart. Complaint has been received that much interference has been encountered by the ferry boats. In taking anchorage at Hampton Roads all mariners are cautioned to keep the ferry channel clear at all times.

**Harbor Regulations,** aside from those prescribed by the Federal Government, are promulgated by the individual port cities and enforced by them.

**Bridge Regulations.**—For general bridge regulations see Chapter 2. Special regulations are included in the text.

**Tides.**—The mean range of tide in Hampton Roads is 2.5 feet. Daily predictions for Sewall Point are given in the *Tide Tables, Atlantic Ocean* published annually by the Coast and Geodetic Survey.

**Currents.**—Detailed current information for a number of locations in Hampton Roads may be obtained from the *Atlantic Coast Current Tables*. However, the currents are influenced considerably by the wind and at times attain velocities much in excess of the current-table values.

Along the wharves at Old Point Comfort the current turns about 1 hour earlier than in mid-channel to the southward. Consequently, there is about an hour preceding each mid-channel slack when the currents near the wharves and in the channel set in opposite directions.

**Ice.**—Ice seldom interferes with navigation in Hampton Roads for full-powered vessels, even in severe weather.

**Dockage Charges.**—No charge is made for dockage or wharfage against general cargo vessels while along piers for the loading or discharging of freight to the pier. If alongside a pier for the convenience of vessel the charge varies and is usually assessed on a net-registered-ton basis per day. In cases of cargo handled from vessel alongside pier to craft alongside, 1 cent per 100 pounds of cargo handled is assessed against vessel for privilege of so using dock space. Inquiries concerning rates should be made to the various terminals.

**Supplies.**—Supplies of all kinds are obtainable at Newport News and Norfolk and in limited quantities at Hampton. Ship-chandlers' stores may be had in quantity. Fuel oil can be obtained at the wharves of the various oil companies at Norfolk or from tank barges. Hampton Roads is the greatest coal trans-shipment port in America and bituminous coal can be obtained, through chutes, from the coal wharves at Newport News and the coal piers at Sewall Point and Lambert Point in Norfolk.

**Fresh water,** suitable for both drinking and boiler purposes, is obtainable at the wharves in Norfolk, Portsmouth, and Newport News. Water boats supply vessels in Hampton Roads and Norfolk Harbor.

**Repairs.**—Repairs to vessels and machinery of all kinds and sizes can be made. The Newport News Shipbuilding & Dry Dock Co. at Newport News has the largest equipment.

Most of the hoisting facilities for public use are located at the various terminals.

A derrick barge equipped with an A-frame derrick capable of handling single lifts up to 150 tons is available at Norfolk.

**Communications.**—The Hampton Roads area is served by eight trunk lines which have excellent terminal facilities. The Chesapeake & Ohio Railway has its terminals at Newport News and the remainder are in the Norfolk-Portsmouth area where they are interconnected by the Norfolk-Portsmouth Belt Line Railroad.

Hampton Roads has overseas steamship service and is the port of call of several coastwise lines.

Complete radio, telegraph, and telephone facilities are available. Airplane service is maintained between Norfolk and Washington and the north and west.

A **Coast and Geodetic Survey District Office** is located at Room 418, United States Post Office and Courthouse Building, Norfolk, where information relating to the coasts of the United States, Alaska, Hawaii, and the Philippine Islands is furnished without charge. The station also has for sale charts, Coast Pilots, current tables, tide tables, and other publications of the Coast and Geodetic Survey.

Mariners noting any dangers, changes in channels, shoals, etc., or any discrepancy in the charts or Coast Pilots are urgently requested to forward the information to the supervisor in charge of the district office.

**Chart agencies** of the United States Coast and Geodetic Survey are in Norfolk and Newport News.

A **United States Branch Hydrographic Office** is located in Room 213, United States Customhouse, Main and Granby Streets, Norfolk. Bulletins are posted here giving information of value to seamen, who are also enabled to avail themselves of publications pertaining to navigation and to correct their charts from standards. No charge is made for this service.

The **Headquarters, Fifth District, United States Coast Guard,** and the office of the Captain of the Port are located in the United States Post Office and Courthouse in Norfolk.

The Coast Guard, among other duties, is charged with the establishment and maintenance of aids to navigation. Mariners are requested to report direct to the District Coast Guard Officer at Norfolk or the Commandant, United States Coast Guard, Washington, D. C., by radio, collect, or other prompt means, defects or deficiencies in aids to navigation affecting the waters of Chesapeake Bay and tributaries and the outer coast between Cape Henlopen, Del., and the North Carolina-South Carolina boundary. Recommendations as to aids to navigation or their improvement may be submitted to these offices. The latest information pertaining to all aids to navigation in these waters is available at the district office.

**Storm warnings** are displayed day and night at Fort Monroe, at Newport News, and from a tower on the Royster Building in Norfolk. Daytime displays are made at the Naval Operating Base.

**Channels.**—The approach to Hampton Roads from eastward is through **Thimble Shoal Channel,** which is about 10 miles long and has project dimensions of 40 feet in depth and 750 feet in width. Project dimensions are maintained and the channel is well marked on both sides. Least depths outside of and near the dredged channel are about 27 feet.

The following regulations prescribed by the Government restrict the use of Thimble Shoal Channel:

1. The use and navigation of Thimble Shoal Channel are restricted to all vessels, tows, or other watercraft drawing 20 feet or more at the time of navigating the channel, provided that this restriction shall not apply to passenger vessels.

2. Vessels permitted to use Thimble Shoal Channel under section 1 of these regulations must proceed through channel at a reasonable speed such as not to endanger other vessels and not to interfere with any other work which may become necessary in maintaining, surveying, or buoying the channel; and they must not anchor in the channel, except in cases of emergency, such as fog or accident, which would render progress unsafe or impossible.

3. These regulations are not to be construed as prohibiting any necessary use of the channel by any Government boats while on Government duty, nor in emergencies by pilot boats, whether steam or sail, nor by police boats.

From the western end of Thimble Shoal Channel to the eastern end of **Newport News Middle Ground** is a natural channel with ample width and depth, and marked by Thimble Shoal, Old Point Comfort, and Fort Wool Lights, and by several buoys, some of which are lighted. **Thimble Shoal,** on the north side between Thimble Shoal Light and Old Point Comfort, has depths of 9 to 12 feet.

A Federal project provides for dredging a channel 40 feet deep and 600 feet wide, increased to 1,000 feet at the ends, for 2.8 miles through the shoal north of Newport News Middle Ground Light, from Hampton Roads to deep water in the James River. Project dimensions are maintained and the channel is marked by lighted buoys on both sides. The least depths outside of and near the dredged channel are 21 to 24 feet.

**Currents.**—The currents do not always set fair with the channel, especially with strong winds, and deep-draft vessels sometimes have trouble keeping in the channel.

**Old Point Comfort,** a summer resort on the north side of the entrance to Hampton Roads, is the site of **Fort Monroe** and has communication with Hampton and Newport News by steam and electric railroad, with Norfolk by steamer, and with the west end of Willoughby Spit by ferry. Most of the steamers plying from Norfolk to points on Chesapeake Bay and tributaries stop at Old Point Comfort, where the depth alongside the main wharf at the hotel is about 25 feet. Gasoline, provisions, and water in small quantities are available. The storm warning display tower is on the south water front.

**Caution.**—Landing at the wharf is often rendered difficult by the strong tidal currents. The first of the ebb sets southeastward from the wharf, and the last sets directly on the wharf and northward through the opening eastward of Hampton Bar. The direction of the flood current is approximately west-southwestward.

**Fort Monroe, restricted area.**—*The Area.*—Beginning at a point 825 yards 256°30′ from Old Point Comfort Light; thence about 315 yards 108° to the southeast corner of Old Point Comfort Main Pier at Fort Monroe; thence 425 yards 084°30′ to a point south of the Fort Monroe engineer's pier; thence directly to the southwest corner of the engineer's pier, then north and east along this pier and the Fort Monroe sea wall to latitude 37°00′30″ N., longitude 76°18′05″ W.; thence 675 yards 087°; thence 044° to the parallel of 37°01′ N.; thence due east along that parallel to latitude 37°01′00″ N., longitude 76°15′15″ W.; thence about 1,350 yards 100° to Thimble Shoal Light; thence 2,110 yards due south to Willoughby Bank, in latitude 36°59′49″ N., longitude 76°14′25″ W.; thence 1,110 yards 228°30′; thence in a direction approximately 252° to Fort Wool Light; thence about 900 yards 245° to Sewall Point Spit lighted bell buoy 2; and thence approximately 348°30′ to the point of origin.

*The Regulations.*—1. Anchoring, trawling, fishing, and dragging are prohibited in this area, and no object, attached to a vessel or otherwise, is to be placed on or near the bottom.

2. The Commanding Officer, Naval Station, Norfolk, Va., or his designated agent, will be the enforcing agency.

**Firing range off Fort Monroe.**—A danger zone, consisting of firing ranges, has been established in Chesapeake Bay eastward of Fort Monroe, Va., as follows:

*The Danger Zone.*—1. The sector of a circle, radius 15,000 yards, with center in, approximately, latitude 37°02′00″ N., longitude 76°17′42″ W., included between the bearings 030° and 050°13′ from the center.

2. The sector of a circle, radius 20,000 yards, with center in, approximately, latitude 37°02′00″ N., longitude 76°17′42″ W., included between the bearings 050°13′ and 116°32′ from the center.

3. A triangular area lying between the southern limit of the 20,000 yard radius sector, and a line bearing 105° 19,800 yards from Fort Monroe Light.

*The Regulations.*—1. During the periods of fire a red flag will be prominently displayed in the vicinity of the firing area.

2. All concerned are cautioned to keep out of this area during periods of fire. Attention is invited to section 3, chapter XIX, of the Army Act approved July 9, 1918, which provides that willful disregard of the above published provisions is a misdemeanor.

**Note.**—The intent of the above regulations is not to interfere with normal ship movements, but to prevent loitering, fishing, etc., in the area during firing. Local fishermen having pound nets, etc., in the area are expecially warned to stay clear during gunfiring.

**Mother Hawkins Hole** is an anchorage, with depths of 9 to 12 feet, much used by small local craft, on the west side of Old Point Comfort and north of the easterly end of Hampton Bar. The entrance is between the wharf at Old Point Comfort and the horizontally banded buoy close westward of it and has a depth of 18 feet.

**Phoebus Channel,** along the west shore of the Old Point Comfort peninsula also has its entrance between Old Point Comfort wharf and the horizontally banded buoy. The channel has been improved by dredging; the project provides for a channel 12 feet deep and 150 feet wide from deep water in Hampton Roads to the Phoebus water front, a distance of about 0.7 mile. In July 1946 the controlling depth was 12 feet. The channel is well marked by buoys. The ferry from Willoughby Spit lands on the east side of the channel about 0.3 mile above the entrance.

The wharves at **Phoebus,** at the head of the channel, had a depth of about 14 feet alongside in July 1946. Small boats find good anchorage just outside the channel in 8 to 20 feet of water.

**Mill Creek,** inside of Old Point Comfort, has large areas bare at low water and several narrow channels. It is crossed by three fixed bridges at the mouth, under which small boats can pass. The vertical clearance through the bridges is 4½ feet, the horizontal clearance 10 feet. The creek is little used.

**Hampton Bar,** with 1 to 5 feet over it, extends from 100 yards to 2 miles west-southwestward from Old Point Comfort; it is marked by buoys and lights on the south side, a horizontally banded buoy at the north end, and a lighted buoy at the southwest end.

**Hampton Creek,** 1.5 miles west-northwestward of Old Point Comfort, is the approach to the town of Hampton. The project for the improvement of Hampton Creek provides for a dredged channel 12 feet deep from the vicinity of Old Point Comfort across Hampton Flats and up the creek to the Hampton Highway Bridge at Queen Street, a distance of about 2.4 miles, with a width of 200 feet in the outer portion of the channel and a width of 150 feet in the creek, suitably widened at the bends. The controlling depth in the channel in July 1946 was reported to be 11 feet. The channel is well marked and easy to follow.

**Hampton Creek, restricted area.**—*The Area.*—All the waters of Hampton Creek bounded on the south by a line drawn 1,050 yards 267°30′ from a point on the eastern bank 810 yards 041° from Hampton Creek Light 6, through Hampton Creek buoys 7 and 8, to the western shore of the creek, and

on the north by the Chesapeake & Ohio Railway bridge, and on the east and west by the eastern and western shores of the creek, respectively.

*The Regulations.*—The regulations governing the above area are that no vessel shall proceed within the said area at a speed exceeding 4 knots.

The creek is crossed by several fixed bridges, and the only navigation above them is by small motorboats. The lower bridge is a fixed trestle with 26-foot span and 10-foot vertical clearance at MHW.

**Hampton** is the headquarters of a large number of boats engaged in oystering and fishing and has some trade by powerboats and barges, the deepest draft being 10 feet. Yachts harbor here. The part of the creek between the public wharf and the lower bridge, a distance of 0.3 mile, is used as an anchorage for boats. Gasoline, provisions, and coal and water are obtainable, and there are two shipyards and railways, the larger capable of hauling out vessels of 125 tons, 125 feet length, 9 feet draft aft, and 6 feet forward. The Hampton Yacht Club is on the western side of the inner harbor.

The gasoline company wharves at the western side of the entrance to the creek have a depth of 8 feet at the face; the gasoline company wharf in the upper part of the creek has a depth of 9 feet. The main commercial landings are just southward of the bridge and had about 11 feet of water alongside in July 1946.

Hampton Creek may be approached from either end of Hampton Bar, but the larger craft use the dredged channel.

**Jones Creek,** the eastern arm of Hampton Creek near the entrance, has depths of about 9 feet in the channel and serves as a protected anchorage for small boats. The bulkhead along the northern bank has similar depths. Permission to use this area should be obtained from the local authorities.

**Herberts Creek,** the western arm of Hampton Creek near the entrance, has depths of about 6 to 10 feet, and the wharves have depths of 6 to 9 feet. The entrance channel is narrow and crooked and should not be attempted without local knowledge. A small marine railway is on the southern shore.

**Newport News** is an important seaport. It is the terminal of the Chesapeake & Ohio Railway, which owns the piers, grain elevator, and coal chutes near the south end of the city, and it is the site of the Newport News Shipbuilding & Dry Dock Co. plant, which has wharves at the northwest end of the city.

Coastwise steamers use the Chesapeake & Ohio Railway pier 6 where there are depths of 20 to 21 feet. Both foreign and domestic steamers use pier 8 where there is a depth of 32 feet.

Depths alongside the railroad coal piers 9 and 15 are from 35 to 37 feet with shoal water on the upper side of pier 15. Coal can be loaded at the normal rate of 1,300 tons per hour with a maximum of 6,000 tons per hour. Other piers of the railroad company have depths of 15 to 35 feet.

The Newport News Shipbuilding & Dry Dock Co. piers have depths of 26 to 35 feet, with general depths of 32 feet. The graving dock has a length on keel blocks of 745 feet and a depth over the sill of 30 feet at MHW.

There are railroad car ferry service and railroad passenger boat service to Norfolk. A passenger and vehicular ferry leaves from just east of the municipal pier for Sewall Point, where electric cars make connection with Norfolk.

A small-boat harbor has been constructed by the city in the mouth of **Newport News Creek** at the southern end of Newport News. The Federal project for the im-

provement of the creek calls for a 12-foot channel, with widths from 200 to 60 feet from deep water in Hampton Roads to the **Municipal Boat Harbor;** and a turning basin and anchorage 12 feet deep, 220 feet wide and 400 feet long at the upper end of the harbor.

In April 1948, the controlling depth in the improvement was 12 feet. The many bulkhead wharves inside had 7 to 12 feet alongside. Gasoline, water, and yacht supplies can be obtained in the small-boat harbor.

Water can also be obtained at the municipal pier, at several of the railroad and shipbuilding docks, and by water boat.

Newport News principal exports are coal and small amounts of tobacco, grain, and lumber. The imports are pulpwood, wood pulp, manganese and chrome ore, paper, copra, asphalt, etc.

**Willoughby Bank** is on the south side of the channel into Hampton Roads. From **Fort Wool** the shoalest part of the bank extends 2.4 miles east-northeastward. Part of the bank has been used as a dumping ground and has little depth over it.

Just southward of Fort Wool is a narrow channel with a depth of 13 feet, which leads south of Willoughby Bank; it is little used except by local boats.

A submarine cable crosses from Old Point Comfort to Fort Wool and Willoughby Spit.

**Willoughby Bay,** between Willoughby Spit and Sewall Point, has depths of 5 to 12 feet. The greater part of the bay is used as a seaplane landing, and, with the exception of the extreme northern part, is a restricted area and closed to navigation. The eastern end is now a dried mud flat, formed by dredging. The slough between this mud flat and the spit itself is used by a few local fishermen as an anchorage for shallow-draft boats. The buildings of the Naval Operating Base and the Naval Air Station on the south side are prominent.

The wharf near the western end of **Willoughby Spit,** at which the ferry from Old Point Comfort lands, is marked by a light. There is bus service from here to Ocean View and Norfolk. The wharf immediately westward of the ferry slip has excellent accommodations for yachts and a controlling depth of 12 feet alongside. Gasoline, Diesel oil, and fuel oil are available.

**Prohibited area for seaplane operations.**—*The Area.*—Beginning at a point on the northeast corner of the Naval Operating Base; thence 278°, 4,850 feet; thence 012°, 7,600 feet; thence 100°, 2,150 feet; thence 189°, 3,600 feet; thence 135°, 2,000 feet; thence 112°, 850 feet; thence 092°30′, 7,300 feet; thence 177°, 3,000 feet; thence 249°, 2,200 feet; thence 159°30′, 550 feet to a point on the shoreline fronting the Naval Air Station extended, containing an area of about 1,630 acres.

*The Regulations.*—1. All vessels excepting those operated by the Navy and Coast Guard and the Chesapeake Ferry Co. shall be prohibited from entering that portion of the Seaplane Operating Area in Willoughby Bay at all times.

2. Boats without lights shall be prohibited from operating in that portion of the Seaplane Operating Area in Hampton Roads west of the western end of Willoughby Spit.

3. No vessel shall at any time moor or anchor within the Seaplane Operating Area.

4. No fishing, oystering, clamming or crabbing, or any other activities will be permitted at any time within the limits of the Seaplane Operating Area.

5. All vessels moving in the Seaplane Operating Area shall immediately proceed to leave the area when warned by aircraft employing the "buzzing" method which consists of low flight by an airplane and repeated opening and closing of its throttle.

6. These regulations will be enforced by the Captain of the Port, Norfolk, Va., and by the Commanding Officer, Naval Air Station, Naval Operating Base, Norfolk, Va., or such responsible agent or agents as they may jointly designate.

**Anchorage for small boats.**—Regulations provide a sheltered anchorage for small boats just inside the point of Willoughby Spit as follows:

*Anchorage J–1, Willoughby Bay (for small boats).*—To the westward of a line bearing 223° from the channelward end of the westerly fender of the Chesapeake Ferry Co. terminal at Willoughby Spit to the clock tower on the Officers' Club at the Naval Operating Base; and to the northward of a line bearing 138° through Willoughby Spit Ferry Light to the intersection with the line first described.

*Anchorage J–2, Willoughby Bay (for small boats).*—To the eastward of a line bearing 169° from the southeasterly corner of the bulkhead of the Chesapeake Ferry Co. terminal at Willoughby Spit to the northeasterly corner of the bulkhead at the Naval Air Station; to the northward of a line bearing 103° from Willoughby Spit Light through a spherical mooring buoy maintained by the Navy Department, and a triangular range target maintained by the War Department; to the southward of a line bearing 059° from the northeast corner of the bulkhead at the Naval Air Station to the intersection with the line last described and to the eastward of a line bearing 330° from the point immediately east of the mouth of Mason Creek to the intersection with the line last described.

**Note.**—Where special conditions justify, boats will be permitted to anchor channelward of the limits of Anchorage J–2, subject to written authority of the Captain of the Port.

A Federal project provides for dredging a channel 10 feet deep and 300 feet wide from deep water 0.4 mile westward of Fort Wool to the ferry slip on Willoughby Spit, a distance of about 1.5 miles. In March 1944, the controlling depth along the centerline of the channel was 10 feet. The cut through Sewall Point Spit is subject to shoaling, particularly along the west edge. The entrance to the channel is buoyed.

**Sewall Point** is on the eastern side of the mouth of the Elizabeth River. The north end of the point is occupied by the Naval Operating Base. The naval piers have depths alongside of 27 to 34 feet, and an inclosed basin affords protection in similar depths to small naval vessels.

**Sewall Point Spit** extends about 2 miles north-northeastward of the point and has depths of 2 to 5 feet over it. A channel, dredged through the spit and along the bulkhead on the north side of the Naval Operating Base, is buoyed and has a controlling depth of about 7 feet. The basin to which the channel leads has depths of 4 to 7 feet and is used only by small naval craft.

**Elizabeth River** empties into Hampton Roads from southward and is the approach to the cities of Norfolk and Portsmouth. The river is also an important link in the route southward of the Intracoastal Waterway.

The Federal project for improvement of Elizabeth River provides for a channel 40 feet deep and 750 feet wide to the mouth of the Southern Branch. Project dimensions are maintained, and the channel is well marked and easily followed in clear weather, although it is often crowded with traffic. Shoals rise abruptly in places along the sides of the channel, and there are no natural ranges. Large vessels generally use a towboat when docking.

**Restricted area.**—Pleasure boat operation and fishing are prohibited in the area east of Norfolk Main Channel.

**Elizabeth River, Traffic signals.**—The presence of vessels during daylight in the Norfolk Ship Channel between buoys 1 and 12 will be indicated by the following signals displayed from the signal station at the Naval Operating Base and at the signal yardarm of the tug office at the end of Pier 7:

(*a*) Vessel or vessels proceeding northward, one black ball.

(*b*) Vessel or vessels proceeding southward, two black balls.

The one black ball, indicating north-bound vessel in the Norfolk Ship Channel, will be hauled down when the vessel is abreast Pier 7 at the Naval Operating Base. The two black balls indicating south-bound vessel in the channel will be hauled down when the vessel is abreast of Pier 2.

Vessels leaving the piers at the Naval Operating Base are warned that the display of the black balls indicates traffic which might impede their departure from the piers.

The special ball-shaped signals are not in any way to be interpreted as giving right of way to ships in the Elizabeth River Ship Channel but rather are to be considered as a warning that such ships are to be handled with more than ordinary caution.

**Restricted area off Naval Operating Base.**—*The Area.*—Beginning at a point on the eastern shore of the Elizabeth River 3 miles and 50 yards 090° from Newport News Middle Ground Light; thence 279°, 825 yards to the eastern edge of the Norfolk Harbor Channel; thence along the eastern edge of the Norfolk Harbor Channel 004°, 1,200 yards; thence 099°, 875 yards to a point on the eastern shore of the Elizabeth River; thence along the shore of the Elizabeth River to the point of beginning.

*The Regulations.*—No commercial vessel other than those bound to or leaving the piers in that area may enter or cross the above-described area.

**Traffic signals.**—The following flag signals will be displayed by a traffic control boat in the Norfolk Ship Channel, to control the traffic leaving the piers at the Naval Operating Base:

(*a*) Flag B.—Dangerous to leave piers and pass beyond pier head line.

(*b*) Flag M.—Area not clear, but vessels may proceed from piers if extra precaution is taken.

(*c*) A white flag.—Reasonably safe for vessels to clear piers.

**Note.**—The traffic control boat is identified by the Union Jack at the gaff. The above signals are shown from the jackstaff.

**Tides.**—The mean range of tide is 2.6 feet at Craney Island and 2.8 feet at Portsmouth.

**Currents.**—In the Elizabeth River and each of its three branches the average velocity of the current at strength is about ¾ knot. The *Atlantic Coast Current Tables* give detailed information for a number of locations.

**Ice.**—The harbor is generally free of ice, and navigation is never obstructed for full-powered vessels. In severe winters the upper part of Southern Branch is sometimes closed for short periods.

South of the Naval Operating Base on Sewall Point is the ferry slip of a Newport News ferry, and just south of that are the two coal piers of the Virginian Railway Co., with depths of 24 to 35 feet alongside. Loading capacity is 3,600 tons of coal per hour at one pier and 7,200 tons per hour at the other.

The next three piers have depths of 21 to 26 feet alongside. South of these are the wharves of the municipal terminal with 30 to 35 feet alongside. The municipal grain elevator is operated by the Norfolk & Western Railway, and has a normal vessel-loading capacity of 75,000 bushels per hour. The terminal also handles general cargo, and is served by the Norfolk-Portsmouth Belt Line Railroad.

Next in order are the Standard Oil Co. pier, and Piers 1 and 2, with 32 to 40 feet alongside, operated by the Norfolk-Tidewater Terminal Co.

**Lafayette River** flows westerly into the mouth of the Elizabeth River between **Tanner Point** and Lambert Point, and is much frequented by small pleasure boats. The entrance to the river has been improved by dredging, and in 1947 a depth of about 7 feet could be carried from deep water to the fork in the river just beyond Granby Street Bridge. A depth of about 2 feet can be taken up either fork.

Hampton Boulevard Bridge, about 1.5 miles above the entrance to Lafayette River, has a fixed concrete arch with a horizontal clearance of 61 feet and a vertical clearance of 29 feet at high water. Granby Street Bridge, about 3.5 miles above the entrance, has a bascule draw with a horizontal clearance of 40 feet and a vertical clearance, closed, of 20 feet at high water. A day's notice is required to have this draw opened.

The channel in Lafayette River is marked by several lights and buoys. The turn is sharp at the light off **Lawless Point** and vessels must exercise care to keep from going aground. Between the two bridges the channel is narrow in places but is usually marked

by bush stakes. The maximum draft of vessels passing the first bridge is about 5 feet.

The wharf of the Norfolk Yacht and Country Club is on the north side of the river and just westward of the Hampton Boulevard Bridge. Gasoline, Diesel oil, fresh water, and ice are available. The depth at the face of the wharf is about 16 feet.

A commercial yacht landing is on the south side of the river and immediately westward of Granby Street Bridge. A depth of about 5 feet is available in the slips and at the face of the outer landing. Gasoline, Diesel oil, and fresh water can be obtained, and convenient transportation to downtown Norfolk is available.

In the tributaries of the river are numerous small private landings and three small marine railways.

## Craney Island to Intracoastal Waterway

Chart 452

**Craney Island,** on the west side of the entrance to Elizabeth River, is low and sparsely wooded and is the site of a quarantine station for the cities of Norfolk and Portsmouth. The island has been filled and bulkheaded until it is now a part of the mainland.

The southern end of Craney Island is occupied by a large fuel-oil depot. Pipe lines extend to the wharves on the southeast side where crude and refined oils are loaded and discharged. Depths alongside these wharves are more than 30 feet. South of the wharves and just outside the main channel is an anchorage with a project depth of 30 feet.

The quarantine-station wharf in **Craney Island Creek** has a depth at the face of about 3½ feet. The channel into the creek has filled in until the controlling depth to the wharf is only about 4 feet. Local knowledge is required to navigate the channel as it is narrow and unmarked.

**Craney Island Light,** 34 feet above the water, is shown from a white skeleton tower on piles off the northeast corner of Craney Island. The fog signal is sounded on a bell.

**Notice.**—A water-pipe line crosses the main channel from Craney Island to Lambert Point. The crossing is marked by a sign and range lights, and vessels are cautioned not to anchor in the vicinity.

**Lambert Point,** on the eastern side of Elizabeth River and 1 mile south of Craney Island Light, is the site of several large piers operated by the Norfolk & Western Railway. The coal-loading capacity at Pier 4 is 6,000 tons per hour. Depths of 25 to 35 feet are maintained alongside the piers, and vessels load to a draft of 33 feet. About 0.8 mile southeastward, the same company has three piers for overseas and coastwise merchandise; depths alongside are 32 to 35 feet.

**Norfolk,** on the east bank of the Elizabeth River, 7 miles above Sewall Point and 30 miles from the entrance to Chesapeake Bay, is one of the major ports of the United States. It has a large foreign and coastwise trade and is the terminus of eight railroads, all of which are linked on the Norfolk side by the Norfolk & Portsmouth Belt Line

Railroad. This industrial switching road is 36 miles in length and completely encircles the industrial section. The Belt Line has a car-float bridge at Sewall Point.

**Norfolk Harbor** consists of the Elizabeth River and certain parts of its Eastern, Southern, and Western Branches. The harbor is about 16 miles long and 0.2 to 2 miles wide. The limits of the harbor have been defined as follows:

All of the water-front terminals within the area bounded on the north by the north limit of the Naval Operating Base; on the east by the mouth of Mosely Creek, 2,300 feet upstream from the Virginian Railway bridge across the Eastern Branch of Elizabeth River; on the south by a limit 2,500 feet upstream from the Norfolk & Western Railway bridge across the Southern Branch of Elizabeth River; on the west by the limit 3,000 feet upstream from the West Norfolk bridge across the Western Branch of the Elizabeth River; all water-front property within the corporate limits of the city of Portsmouth, including Scott Creek; and Craney Island.

Several lines of coastwise and bay steamers ply from Norfolk, and it is the center of steamer traffic to Cape Charles city and to the tributaries on the west side of the bay as far as the Rappahannock River. Norfolk has ferry service to Berkley and Portsmouth, and frequent steamer service to Cape Charles city, Old Point Comfort, Hampton, and Newport News.

The water front is lined with wharves, four of which are public for small craft. One is at the foot of City Hall Avenue and has depths of 8 feet; another is at the foot of Main Street and has depths of 10 feet; a third is at the foot of Commerce Street and has depths of 18 feet; the fourth is the Municipal Pier at the foot of Nebraska Street and just eastward of the ferry slips. The last provides berthing in depths of 11 to 17 feet.

Gasoline, Diesel oil, and fresh water are available for small craft on the fish wharf at the foot of Southampton Street in **Atlantic City.** Depths alongside the wharf are 8 to 16 feet.

**Western Branch,** on the west side of the Elizabeth River, is used by medium-draft vessels to a wharf at West Norfolk, and by towboats, car floats, and barges to the railroad wharves at Port Norfolk.

The Federal project for improvement of Western Branch provides for a channel 24 feet deep and 300 to 200 feet wide from the main channel of the Elizabeth River to the West Norfolk highway bridge, thence 18 feet deep and 150 feet wide to a point 3,000 feet above the bridge. In December 1944 the controlling depth was 14½ feet.

For 3.4 miles from West Norfolk to just above the third bridge, Western Branch has a ruling depth of 7 feet in a narrow unmarked channel. It is shoal in places above the third bridge, but is navigable for small boats for a distance of about 3 miles farther.

Four drawbridges cross Western Branch between West Norfolk and the head of navigation. In order from the entrance, these bridges and their clearances, closed, at high water, are: West Norfolk, 140 feet horizontal and 4¾ feet vertical, south opening obstructed by piling; Churchland, 60 feet horizontal and 4¾ feet vertical, eastern opening shoal; Atlantic Coast Line Railroad, 50 feet horizontal and 4 feet vertical; Hodges Ferry bascule, 32 feet horizontal and 5½ feet vertical, 8 hours' notice required to open.

**West Norfolk,** on the north side of the entrance to Western Branch, is the site of a smelting plant. A shipyard and railway, just above the bridge, can haul out vessels 90 feet long and of 10-foot draft. Wharves at the smelting plant and shipyard have depths alongside of 12 to 18 feet.

The pier of a commercial yacht service at West Norfolk is about 400 yards above the bridge. Depths alongside are 10 feet at the outer face and 5 feet in the slips. Available at the pier are showers, telephone, gasoline, oil, Diesel oil, water, and supplies.

**Port Norfolk,** on the south side of the entrance to Western Branch, has a bulkhead wharf and ferry slip, at which car floats, towboats, and barges from the town of Cape Charles make landings. Depths of 15 to 16 feet can be taken to the wharf. Pile ruins of a former pier are just west of the ferry slip.

**Pinner Point,** on the southwest side of Elizabeth River and just above the entrance to Western Branch, is the main terminal of the Atlantic Coast Line and Southern Railroads and has several wharves at which large vessels load and discharge. Depths at the wharves are 15 to 30 feet.

**Scott Creek,** between Pinner Point and Hospital Point, has been improved by dredging a channel 12 feet deep and 100 feet wide from the main channel in Elizabeth River to a point just above the Atlantic Coast Line Railroad bridge. In 1946 the controlling depth was 10 feet. The channel is marked by daybeacons. The drawbridge, opened by hand, has two 35-foot spans with a vertical clearance, closed, of 3 feet at high water; depths under the southeast span are shoal. The creek is used by small boats, which land at the oyster houses above the bridge. Depths alongside the bulkhead are 9 to 11 feet.

**Hospital Point** is the site of a United States Naval Hospital. The point is wooded but a black water tank and the dome of the main hospital building are visible above the trees. The hospital landing has a depth of about 18 feet at the face.

**Smith Creek,** the **Hague Anchorage,** is on the opposite side of Elizabeth River from Hospital Point, and has a depth of 10 feet in the entrance. Depths at the wharves inside are 8 to 15 feet. On the western side of the creek is a marine railway and repair yard for small craft. On the eastern side of the entrance is a naval small-boat landing. The creek is frequented by motorboats, oyster boats, and sand and gravel barges, and motorboats use the northern arm as an anchorage.

Across the entrance to Smith Creek is a swing drawbridge, western side open to navigation, with a horizontal clearance of 49 feet and a vertical clearance, closed, of 5 feet at high water. The bridge is opened from 5 a. m. to midnight upon signal of three blasts of a whistle.

Gasoline, Diesel oil, and fresh water are available at a fuel barge moored off the entrance to Smith Creek. Depths alongside are 12 feet at the outer face and 9 feet at the inner face.

**Portsmouth,** on the west side of Elizabeth River opposite Norfolk and Berkley, is the site of the Norfolk Naval Shipyard and is the main terminus of the Seaboard Air Line Railroad. Portsmouth has numerous commercial wharves, at which the depths are 8 to 30 feet.

**Berkley,** a part of the city of Norfolk, is on the point between the Eastern and Southern Branches of the Elizabeth River. It is the main freight terminus of the Norfolk Southern Railway, and has several tobacco, lumber, and fertilizer wharves, a coal-bunkering wharf, and several shipyards and marine railways.

**Eastern Branch,** extending eastward between Norfolk and Berkley, has been improved by dredging. The Federal project for improvement of Eastern Branch provides for a channel 25 feet deep from the main channel of Elizabeth River to the Virginian

Railway bridge, 2.5 miles distant. The project is maintained. From the bridge to the fork 0.8 mile above, the branch has a natural channel, usually marked by bush stakes, with a ruling depth of 10 feet.

Four drawbridges cross Eastern Branch between the entrance and the fork. In order, from the entrance, these bridges and their clearances, closed, at high water, are: Berkley bascule, 126 feet horizontal and 35 feet vertical; Norfolk & Western Railway bascule, 140 feet horizontal and 5 feet vertical; Campostella bascule, 142 feet horizontal and 16 feet vertical; Virginian Railway swing, 60 feet horizontal and 6 feet vertical.

The ebb current through the Virginian Railway bridge has a southerly set. The Campostella bridge need not be opened, except for the passage of tugs with tows, between 7:35 a. m. and 7:50 a. m., weekdays only.

**Broad Creek,** the north fork of Eastern Branch, has a depth of 2 feet for 1.4 miles; the south fork has a depth of 2 feet for about 2 miles. Across the entrance to Broad Creek are two drawbridges, both with horizontal clearances of 28 feet, and the first with a vertical clearance, closed, of 2½ feet at high water, the second with a like clearance of 11 feet. A fixed bridge 1.1 miles above the entrance has a horizontal clearance of 30 feet and a vertical clearance of 4 feet at high water.

**Indian River,** on the south side of Eastern Branch just above the Virginian Railway bridge, has a depth of 3 feet for 0.8 mile above the mouth.

**Southern Branch** of Elizabeth River is of considerable commercial importance; along its banks are several large lumber mills, fertilizer factories, and other manufacturing plants. Southern Branch is also a link in the Intracoastal Waterway.

The Federal project for improvement of Southern Branch provides for a channel 40 feet deep and 450 feet wide from the main channel of Elizabeth River to the Belt Line Railroad bridge, thence 30 feet deep and 375 feet wide to the Virginian Railway bridge, thence 25 feet deep and generally 200 feet wide to a point 2,500 feet above the Norfolk & Western Railway bridge. Project dimensions are maintained, and the channel is well marked and easy to follow.

**Speed.**—Speed exceeding 6 knots is prohibited in the Southern Branch of Elizabeth River between the entrance and the Belt Line Railroad bridge. Vessels passing the Norfolk Naval Shipyard at too great speed are liable to damage floating equipment, small craft, or vessel moorings.

**Restricted area.**—No person is permitted to fish or operate pleasure boats in the Southern Branch of Elizabeth River off the Norfolk Naval Shipyard and St. Helena Annex, except when navigating the main channel.

The Norfolk & Portsmouth Belt Line Railroad bridge crosses Southern Branch at *Mile 2.2* from the foot of West Main Street, Norfolk, the *0.0 point* of Intracoastal Waterway mileage south. The bridge has a swing span with a horizontal clearance of 109 feet and a vertical clearance, closed, of 12 feet at high water.

The Norfolk-Portsmouth highway bridge at *Mile 2.5* has a vertical-lift span with a horizontal clearance of 220 feet and vertical clearances of 15 feet, closed, and 145 feet, open, at high water.

The Virginian Railway bridge at *Mile 3.2* has a swing span with a horizontal clearance of 110 feet and a vertical clearance, closed, of 9 feet at high water.

U. S. Highway 13 bridge at *Mile 5.5* has a double-leaf bascule span with a horizontal clearance of 125 feet and a vertical clearance, closed, of 7 feet at high water. The Norfolk & Western Railway bridge, alongside the highway bridge, has a single-leaf bascule span with the same clearances.

Aerial transmission lines across Southern Branch at *Mile 6.1* have a vertical clearance of 145 feet at high water.

The routes of the Intracoastal Waterway from Southern Branch to the sounds of North Carolina are described in Chapter 5.

CHAPTER 5

# Cape Henry to Cape Lookout

## Charts 1109, 1110

BETWEEN Cape Henry and Cape Lookout the seacoast of Virginia and North Carolina is a line of long, low, and narrow islands, behind which is a series of sounds and tributary rivers. Connecting the sounds with Chesapeake Bay to the northward are the two canalized routes of the Intracoastal Waterway, and the sounds are, themselves, important links in the Intracoastal Waterway chain. Considerable pleasure traffic and some commercial traffic passes through these inland waters.

## Outside Coast

Charts 1227, 1229, 1232, 1233, 419, 420

From Cape Henry the coast trends southward for 105 miles to Cape Hatteras and is broken by Oregon Inlet. For 11 miles from Cape Henry there are woods near the beach, but for the remainder of the distance the coast is a low, narrow strip of sand beach, from 0.2 to 2.8 miles wide, separating the ocean from the extensive interior waters of North Carolina. Currituck Beach, Bodie Island, and Cape Hatteras Lights, Diamond Shoal Lightship, the buoys, and the Coast Guard stations are the principal marks.

The coast between Cape Henry and Cape Hatteras is free from dangers if it be given a berth of 5 miles or more, and along the greater part of it 5 to 9 fathoms will be found as close as 1 mile from the beach. Off this stretch of coast are the False Cape shoals, Platt Shoals, Wimble Shoals, and the Cape Hatteras shoals. In thick weather the closest attention should be paid to the soundings and the chart, and even then the navigator may be confused by the irregularities in depth.

**Chart 1227.**—Cape Henry has been described in Chapter 4. Five miles southward from Cape Henry Light is the summer resort of **Virginia Beach.** The buildings are conspicuous, the most prominent being the Cavalier Hotel, which is distinguished by its size and cupola. A Coast Guard station is on the beach, and a high, silver-painted water tank is about 0.8 mile inland.

**Virginia Beach, targets anchored southward.**—Five unlighted targets about 40 feet in length and 15 feet in height have been anchored off Dam Neck, Va., in the following positions:

1. Latitude 36°46′24″ N., longitude 75°55′22″ W.
2. Latitude 36°46′46″ N., longitude 75°56′03″ W.
3. Latitude 36°46′07″ N., longitude 75°55′41″ W.
4. Latitude 36°46′08″ N., longitude 75°56′03″ W.
5. Latitude 36°46′31″ N., longitude 75°56′42″ W.

**Virginia seacoast, Dam Neck firing-range danger zones.**—*The Restricted Area.*—1. Seaward for a distance of 15 miles from the shore position latitude 36°46′.8 N., longitude 75°57′.4 W. between lines through the position bearing 075° and 150°.

2. Seaward for a distance of 12,000 yards from the shore position latitude 36°46′.8 N., longitude 75°57′.4 W. between lines through this position bearing 030° and 075°.

*The Regulations.*—1. Fishing vessels may enter the area only between the hours of midnight and 8 a. m. and must be clear of the area prior to 8 a. m. Other vessels shall proceed through the area with caution and remain in such area no longer than absolutely necessary for purposes of transit.

**Note.**—Day signals when ranges are actively in use consist of red flags on conspicuous locations on the beach. During night firing a red flag illuminated by a vertical white light will be shown from the tower controlling the gunfire.

2. The Commanding Officer, Antiaircraft Training and Test Center, Dam Neck, Va., or his designated agent, will be the enforcing agency. Adequate precautions will be taken by the Dam Neck activity to insure the safety of its firing operations.

About 22 miles southward of Cape Henry are **Wash Hill** and **Sheep House Hill,** sand hills 60 and 40 feet high, respectively. The locality is called **False Cape** because of its resemblance to Cape Henry when approaching from southward. Several spots with depths of 10 to 17 feet are 0.8 to 1.5 miles offshore from False Cape.

**Chart 1229.—Currituck Beach Light,** 158 feet above the water and visible 19 miles, is shown from a red, conical tower 34 miles southward of Cape Henry Light. The settlement of **Corolla** is adjacent to Currituck Beach Light; several small landings are on **Whale Head Bay,** a small and shallow arm of Currituck Sound.

**Virginia-North Carolina seacoast, target areas.**—*The Restricted Areas.*—Target No. 12. The area bounded by a line drawn from a point 5,900 yards 170° from Caffey Inlet Coast Guard Station, 7,650 yards 055° 30′, thence 8,700 yards 177° and thence to the point of beginning. The target is located in latitude 36° 10′ 28″ N., longitude 75° 45′ 04″ W.

Target No. 13. Those waters within 1,000 yards radius of the target located at latitude 36° 25′ 24″ N., longitude 75° 50′ 09″ W.

Target No. 18. Those waters within 1,000 yards radius of the target center at latitude 35° 51′ 44″ N., longitude 75° 34′ 47″ W.

*The Regulations.*—No person is allowed to fish nor are any boats allowed to operate in these areas except those boats attached to and operated by the United States Government Bases in these areas.

**Kittyhawk, defensive sea area southeastward.**—The water area bounded by the following lines, off the seacoast of North Carolina and southeastward of Kittyhawk, comprising approximately two-thirds of a square mile, is reserved as a defensive sea area for purposes of national defense:

Beginning at a point in latitude 36° 03′ 00″ N., longitude 75° 37′ 24″ W.; a line drawn to a point in latitude 36° 03′ 18″ N., longitude 75° 36′ 42″ W., thence to a point in latitude 36° 02′ 17″ N., longitude 75° 36′ 09″ W.; thence to a point in latitude 36° 02′ 00″ N., longitude 75° 36′ 48″ W., and thence to the point of beginning.

At no time shall vessels or other craft be navigated within the area above defined except such as are authorized by the Secretary of the Navy.

Any violations of the provisions of this order shall be subject to the penalties provided by law.

**Kittyhawk** is a village on the barrier beach 20 miles southward of Currituck Beach Light. On the Albemarle Sound side of the village is **Kittyhawk Bay,** into which depths of 3 to 4 feet can be carried.

**Wright Monument,** a high stone memorial on the highest of the **Killdevil Hills,** 3.5 miles southward of Kittyhawk, is very prominent and is a good landmark on this low, sandy coast where there are but few prominent objects.

**Nags Head** is a summer resort 5 miles southward of Wright Monument. A good paved highway extends northward along the outer beach past the monument and Kittyhawk, then crosses the lower end of Currituck Sound by **Wright Memorial Bridge** to Sampson Point, from whence there is a good highway to Norfolk. Three miles southward of Nags Head, the highway swings west on a causeway across Roanoke Sound to Roanoke Island. Clearances of the draw spans in the two causeways are given in the text for Currituck and Roanoke Sounds.

**Bodie Island Light,** 156 feet above the water and visible 19 miles, is shown from a conical tower, with alternate white and black horizontal bands above a granite base, 36 miles southward of Currituck Beach Light.

**Oregon Inlet,** about 2 miles southward of Bodie Island Light, is entered over a shifting bar, the depths on which vary from about 6 to 10 feet or more and change from month to month. A lighted whistle buoy marks the best water.

The inlet deepens with northwest winds and fills in with northeast winds; it is used by local fishing boats, but is not recommended to strangers. **Tidal currents** in the inlet have considerable velocity, sometimes from 3 to 4 knots, and even 5 knots on the ebb with strong westerly winds. A **ferry** crosses the inlet.

Two natural channels, **Old House Channel** and **Davis Slough**, lead southwest from Oregon Inlet to deep water in Pamlico Sound; the last surveys showed controlling depths of 3 to 5 feet. Narrow **Walter Slough** connects the inlet with the dredged channel in Roanoke Sound; see page 167. Lights mark the slough and the dredged channel.

**Platt Shoals,** a number of spots with 4½ to 6 fathoms over them, are east-southeast of Oregon Inlet and 2.5 to 4 miles from the beach. Between the shoals and the beach are depths of 8 to 14 fathoms. In easterly gales the shoaler spots are marked by breakers.

The village of **Rodanthe** is on the narrow barrier beach, about 12 miles southward of Oregon Inlet. The Coast Guard station is prominent. There are two wharves in the basin on the Pamlico Sound side of Rodanthe, in addition to the bulkheaded portion generally used by the Coast Guard. These facilities are open to the public when not in use by their owners.

A Federal improvement project provides for a channel 6 feet deep and 100 feet wide from the 6-foot contour in Pamlico Sound to the shore, with a basin at Rodanthe of the same depth 80 to 100 feet wide, and having a total length, including arms, of about 1,200 feet. The channel is well marked. In June 1947, the controlling depth was reported to be 4½ feet.

**Wimble Shoals,** about 15 miles southward of Oregon Inlet, are a number of ridges extending offshore about 4 miles, with depths ranging from 3½ to 6 fathoms. In easterly gales the shoaler parts are marked by breakers. A lighted whistle buoy is moored outside the shoals.

**Chart 1232.**—The village of **Avon** is on the barrier beach, about 6 miles north of Cape Hatteras. Shoal water extends about 3 miles from shore on the Pamlico Sound side of the village. **Cape Channel,** a natural opening in the shoal southwest of Avon, has a controlling depth of about 6 feet.

A Federal improvement project provides for a channel from Pamlico Sound through Cape Channel to Avon, 6 feet deep and 100 feet wide, with a basin at the shore end, same depth, 100 feet wide and 300 feet long. The channel from Pamlico Sound to Avon is well marked. In June 1947, the controlling depth was reported to be 5½ feet.

**Cape Hatteras,** where the coast makes a sharp turn westward, is low and sandy. **Cape Hatteras Light,** 166 feet above the water and visible 19 miles, is shown from a black skeleton tower well back from the ocean beaches. On the beach, 1.2 miles southeast of the light, is the old light structure, a black and white spirally banded masonry tower on a red brick base. A Coast Guard station is on the beach, 0.8 mile south of the old tower.

**Buxton** is a small village adjacent to Cape Hatteras Light. Four miles to the westward, and also on the Pamlico Sound side of the barrier beach, is the village of **Frisco.** There are no wharves at either village, and anything but a light-draft boat must anchor well offshore. Local fishermen usually approach Buxton through Cape Channel.

Shoals extend off Cape Hatteras in a southeasterly direction for nearly 10 miles. Depths of 4 and 5 feet are found on the shoaler parts. **Diamond Shoal,** 3 miles off the cape, has little water over it and is usually marked by breakers. **Outer Shoal** consists of irregular patches, with least depths of 5 to 12 feet, which are usually marked by breakers and sometimes by wrecks. Between Outer Shoal and Diamond Shoal are depths of 3½ fathoms, but the passage should not be attempted by strangers. During strong winds the currents set across the shoals with great velocity.

Wrecks on Outer Shoal are usually those of vessels northbound in thick weather. The difficulty of making proper allowance for the Gulf Stream, and the strong currents near the shoals, may cause considerable error in the reckoning. When approaching, and uncertain of the position, care should be taken to stay in at least 20 fathoms, or preferably 30 fathoms. Diamond Shoal Lightship, with its radiobeacon, is the guide for clearing the shoals.

**Diamond Shoal Lightship** is moored in 29 fathoms 15 miles southeast of Cape Hatteras Light. The lightship has a red hull with the word DIAMOND on each side, and two masts with a lantern at each masthead. The light is 66 feet above the water and visible 14 miles; a riding light is on the forestay. The fog signal is an air diaphone; the radiobeacon is synchronized with the fog signal for distance finding. The code-flag signal and radio call is NNBJ. **Storm warnings** are displayed during the daytime.

From Cape Hatteras to Cape Lookout the coast trends generally southwestward for 64 miles and is broken by several inlets. For 6 miles from Cape Hatteras it is thickly wooded near the beach, and between the woods and the beach is a range of sand hills 10 to 40 feet high. For the remainder of the distance the coast is a narrow barrier beach with numerous sand hills. The coast is fairly bold and depths of 4 to 7 fathoms will be found within 0.5 mile of shore, except off Hatteras Inlet, where shoals extend out 1.2 miles, and off Ocracoke Inlet, where they make out 1.6 miles.

**Hatteras Inlet,** 11 miles westward of Cape Hatteras Light, is entered over a shifting bar, on which the depth varies from about 5 to 12 feet. The inlet is used as a harbor of

refuge by small local coasting vessels and fishermen, there being fair anchorage inside the bar in depths of 2 to 3 fathoms. Strangers should not enter without a pilot, as the buoys and lights may not always mark the best water.

The channel from the inlet to Pamlico Sound had a controlling depth of 4 to 5 feet, according to the last survey, but it is subject to change both in position and depth. The channel is used chiefly by local fishermen.

Three miles east of Hatteras Inlet is the village of **Hatteras,** which has several wharves in the basin fronting on Pamlico Sound. **Storm warnings** are displayed day and night from the Weather Bureau building at Hatteras.

**Rollinson Channel** extends from deep water in Pamlico Sound to the basin at Hatteras. The Federal improvement project provides for a channel 100 feet wide and 6 feet deep from deep water to the basin.

Rollinson Channel is well marked. In June 1947, the controlling depth was reported to be 6 feet.

The coast on the west side of Hatteras Inlet is a bare sand beach; the Coast Guard station 1 mile from the inlet is the most prominent object in that direction.

**Tides.**—The range of the tide is about 2 feet on the bar. In the channels the height of the water depends upon the direction and force of the wind.

**Currents.**—The tidal currents in the channel through the inlet are much influenced by winds, and attain velocities of 2 to 3 knots. For predicted times and velocities see the *Atlantic Coast Current Tables*.

**Caution.**—The waters of the area within a 12-mile radius of a point in latitude 35°09′ N., longitude 75°43′.5 W., are safe for surface navigation; however, because of residual danger from mines on the bottom that are presumably dead, but possibly dangerous under certain circumstances, these waters are not safe for such purposes as anchoring, dredging, trawling, cable-laying, or laying on the bottom by submarines.

**Chart 419.—Ocracoke Inlet,** about 26 miles west-southwestward of Cape Hatteras Light, is entered over a shifting bar, on which the depth varies from about 10 to 12 feet. Strangers should not enter without a pilot, as the buoys may not always mark the best water. Coast Guardsmen from Ocracoke will board vessels and pilot them in if the sea will permit them to cross the bar; the Coast Guard station can be contacted by radio.

Several channels or sloughs lead from Ocracoke Inlet through the shoals in Pamlico Sound to deep water. **Teaches Hole Channel** follows the western side of Ocracoke Island to the vicinity of Ocracoke, where it is joined from the north by **Big Foot Slough Channel.** In 1947, the controlling depth over the bar at the inlet end of Teaches Hole Channel was about 8 feet, and about 10 feet could be carried through the channel and into and through Big Foot Slough Channel to Big Foot Slough bar, which is discussed later in connection with the channel to Silver Lake. Strong currents are experienced in these channels, and the buoys and lights must be followed closely.

Midway between Ocracoke and Big Foot Slough bar, a swash channel connects Big Foot Slough Channel with **Nine Foot Shoal Channel,** which leads off in a northwesterly direction. In August 1947, the controlling depth through the swash channel and Nine Foot Shoal Channel was 5 feet.

**Wallace Channel** leads northwestward from Ocracoke Inlet to a dredged cut into Pamlico Sound. The channel is well marked by buoys and lights. In March 1946, the controlling depth was 12 feet in the dredged cut.

789003°—48——10

**Sheep Island Slue,** leading westward from Wallace Channel, is well marked by lights but has a controlling depth of only about 2 feet.

**Ocracoke Light,** 75 feet above the water and visible 14 miles, is shown from a white tower near a clump of woods on the western part of Ocracoke Island and about 3 miles northward of Ocracoke Inlet.

The village of **Ocracoke,** adjacent to the light, is frequented by numerous fishing vessels. Supplies in limited quantities are available, and gasoline in considerable quantities can be obtained at any time. A hotel is open all year. Mail and passengers are transported daily by boat to Portsmouth and Atlantic. At Atlantic there is motorbus connection with the railhead at Beaufort. Boats also run at intervals to Washington. Facilities for repairing boats are limited.

**Silver Lake,** a circular basin at Ocracoke, affords good anchorage in depths of 14 feet, and has several small wharves extending from the shore to depths of about 10 feet.

A Federal improvement project provides for a channel 10 feet deep from that depth in Pamlico Sound to and including an anchorage basin of the same depth in Silver Lake, with widths of 100 feet across Big Foot Slough bar, and 60 feet in the entrance channel, together with a training wall 300 feet long to protect the outer end of the entrance channel from northeast storms.

In August 1947, the controlling depth in the channel between Big Foot Slough Channel and Silver Lake was 10 feet. The controlling depth over Big Foot Slough bar was only 3 feet, and local vessels were using Nine Foot Shoal Channel instead.

**Portsmouth** is a post village on the west side of Ocracoke Inlet. A spire in the village is a prominent landmark. The inactive Coast Guard station is the largest building and is nearest the inlet.

**Tides.**—The range of tide is about 2 feet over the bar at Ocracoke Inlet and about 1 foot in Silver Lake. In the channels the height of the water depends upon the direction and force of the wind.

**Currents.**—The currents in the inlet and the connecting channels are much influenced by the winds. The ebb current usually has a greater velocity than the flood, sometimes attaining a velocity of 2 to 2½ knots. Current predictions for several locations in the channels may be obtained from the *Atlantic Coast Current Tables.*

**Drum Inlet** is an opening through the barrier beach about 17 miles southwestward of Ocracoke Inlet. Several aids mark the inlet, but the channel is constantly shifting and should be used only with local knowledge.

A Federal project for the improvement of Drum Inlet provides for a channel 12 feet deep and 200 feet wide from the gorge in the inlet to the channel in Core Sound, a distance of about 1 mile. In June 1947, the controlling depth through the inlet was reported to be 3½ feet.

**Chart 1233.—Cape Lookout** is the extremity of a long and very narrow sand beach projecting into the sea where the coast angles sharply to the westward. **Cape Lookout Light,** 156 feet above the water and visible 19 miles, is shown from a black and white diagonally checkered tower about 2 miles northward of the point of the cape. There is a radiobeacon at the light station. A Coast Guard station is 1.3 miles south-southwestward of the light.

**Cape Lookout Shoals** extend about 9 miles south-southeastward from the cape. Their greatest width is about 2 miles, and depths over them range from 2 to 18 feet.

**Lookout Breakers** is the name given to the ridge, covered 2 feet, about 5 miles out on the shoals from the cape. Between Lookout Breakers and the cape are several other spots which break heavily.

Outside the shoals proper are two irregular shoals with depths of 28 feet over them. These can be avoided by passing close to the outermost lighted buoy. In thick weather a vessel should stay in depths of 14 fathoms or more if uncertain of its position.

**Chart 420.—Lookout Bight,** on the west side of the cape, affords good anchorage for large vessels, except with winds from south through west to northwest.

A Federal improvement project provided for a harbor of refuge in Lookout Bight enclosing, by means of a rubble-stone breakwater 7,050 feet long, an area of 575 acres of 30 feet or more in depth.

The breakwater has not been completed to full project length, but is considered adequate for present needs. It is awash at high water and is hardly visible when a heavy sea is running. Mariners should give it a wide berth in bad weather.

Good anchorage, with ample swinging room, may be had northeast of the breakwater in 30 to 35 feet, soft mud bottom. This anchorage is not free from swell, however, and small vessels at anchor may be uneasy if the seas are high. Large ocean-going vessels usually anchor north or northwest of the breakwater in 39 to 45 feet, soft sand and mud bottom.

Good anchorage for small vessels can be had in the inner bight south of **Wreck Point** in 14 feet, good holding ground of soft mud. Prevailing swell from the southwest is effectively excluded, but the force of the wind is little hindered by the surrounding low terrain. A severe blow from a northerly direction may cause a vessel to drag, but most boats drop an extra anchor if the wind reaches gale force from any direction.

A Federal improvement project provides for a channel 100 feet wide and 7 feet deep from deep water in Lookout Bight, through **The Drain** and **Lighthouse Bay,** to deep water in Back Sound. The channel is well marked. In June 1947, the controlling depth was reported to be 4 feet.

# Intracoastal Waterway, Norfolk to Neuse River

Charts 829, 830, 831, 832

The **Intracoastal Waterway** south from Norfolk is through Southern Branch of Elizabeth River, described in Chapter 4, thence by either the Albemarle and Chesapeake Canal route or the Dismal Swamp Canal. The first has the greater project depth and is about 2 miles shorter for the through passage south; the second offers a shorter and more protected passage to Elizabeth City and the towns at the western end of Albemarle Sound. The two routes rejoin in Albemarle Sound.

**Note.**—In the following text, mileage in *italics* is the distance along the route in **nautical miles,** measured from the foot of West Main Street, Norfolk, Va.

The Federal project for that portion of the Intracoastal Waterway between Norfolk and the Neuse River provides for a channel 12 feet deep by way of the Albemarle and

Chesapeake Canal route over bottom widths varying from 90 feet in land cuts and narrow portions of creeks to 250 feet in the wider portions of rivers and sounds, and 300 feet in North River Bar Channel. The project for the Dismal Swamp Canal provides for a channel 9 feet deep and 50 feet wide in the canal proper, and a depth of 10 feet over bottom widths varying from 80 feet in Turners Cut to 100 feet in Deep Creek and Pasquotank River. Maintenance dredging is continually going on. Controlling depths are not given here but are listed in every issue of the weekly *Notice to Mariners*.

**General regulations** governing bridges and locks and the handling of tows are quoted in Chapter 2. **Special regulations** prescribed by the Norfolk and Wilmington Districts, Corps of Engineers, for the handling of tows are as follows:

**Norfolk District** (Dismal Swamp Canal route to Wade Point Light; Albemarle and Chesapeake Canal route to Virginia-North Carolina line).—

1. All hawsers and towlines shall be shortened as much as practicable. The various parts of the tow must be securely assembled with the individual units connected as close as practicable.
2. Speed shall be reduced to such extent, and in time, to allow the tow to enter the draw with fair, but not excessive, headway and under complete control to assure safe and orderly passage through the bridge without accident.
3. Barges temporarily withdrawn from a tow shall be tied up at the dolphins or anchored well out of the channel. No barge shall be left drifting in the channel or swinging out from the tie-up dolphins into the channel.
4. The pushing of a barge with a towboat will be permitted. In a fair tide the barge may be drifted through the navigation passes of the bridge with the towboat trailing.

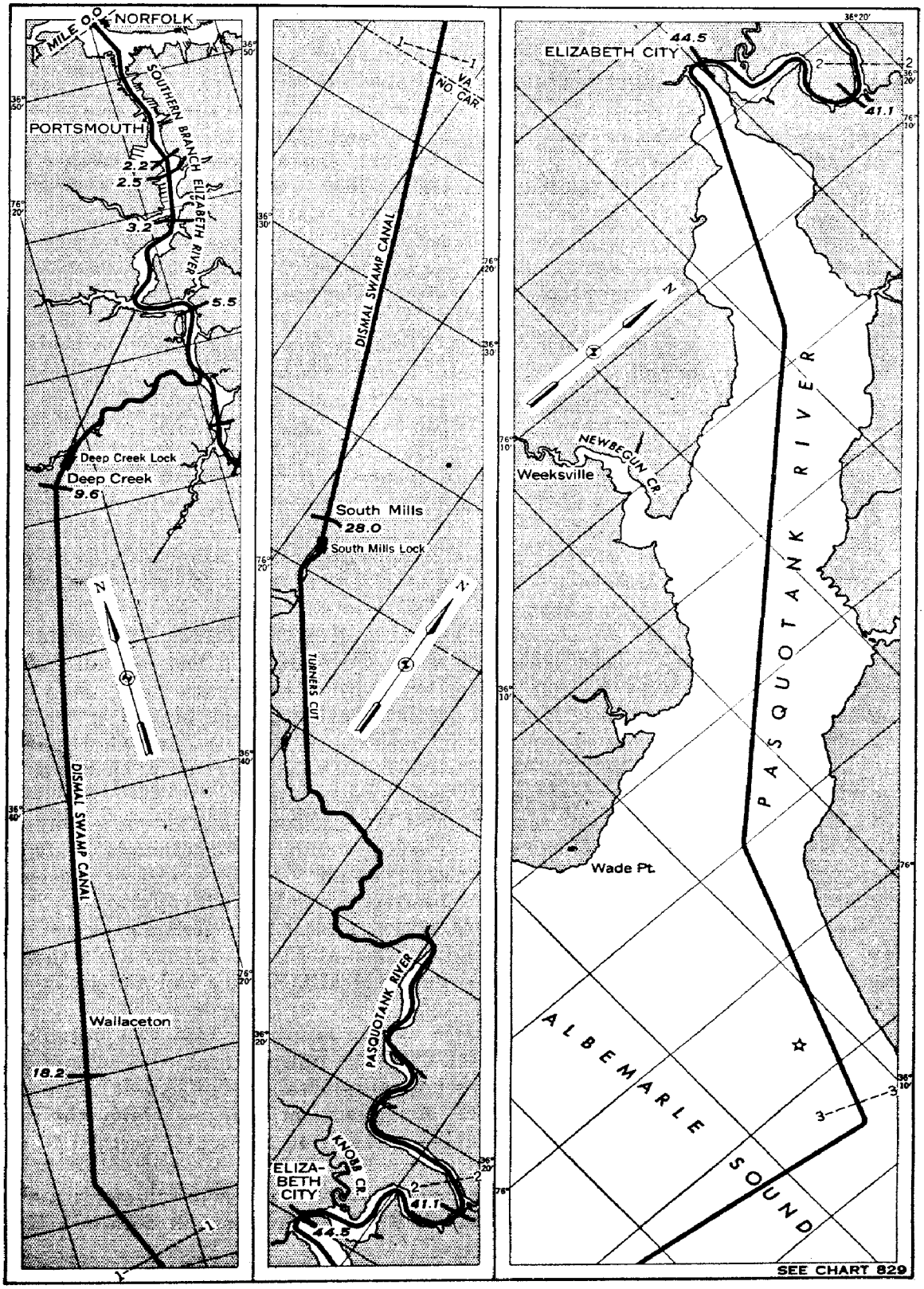
**Wilmington District.**—When adverse weather or tidal conditions prevail, making it hazardous for a tow to pass through the bridges, the tow will be tied up or anchored until conditions are such that tows may make safe passage through the bridges, or the tow shall be broken up and pass through the bridges as described below.

1. Tows consisting of two or more barges will break up their tows and pass through the bridges one barge at a time when proceeding with the tide or when strong winds prevail.
2. All hawsers and towing lines will be shortened to the greatest extent practicable.
3. No towboat with a barge abreast will be permitted to pass through the bridges.
4. The pushing of a barge with a towboat will be permitted, when properly equipped for such.
5. Barges temporarily withdrawn from a tow will be tied up at the dolphins, or securely anchored out of the channel, and no barges will be left drifting in the channel.
6. A tow proceeding with the current (fair tide) will have the right-of-way over a tow proceeding against the current or tidal flow.
7. The speed will be such that the tow is under control when approaching the bridges.

# Dismal Swamp Canal

## Chart 829

At *Mile 6.6*, **Deep Creek** leads westward from Southern Branch to the **Disma Swamp Canal,** a summit-level section extending 19 miles from Deep Creek, Va., to South Mills, N. C. The canal is controlled by a lock at each of the terminals, and has turn-outs spaced about 3 miles apart where vessels may pass each other. The locks are 300 feet long and 52 feet wide; the depth over the miter sills is 12 feet and the vertical lift is 12 feet. The established speed limit between the locks is 5 knots. At times, due to low water, navigation of the canal may be restricted or the canal closed. Normally, the


MILE 0.0
NORFOLK
PORTSMOUTH
SOUTHERN BRANCH
ELIZABETH RIVER
2.2
2.5
3.2
5.5
Deep Creek Lock
Deep Creek
9.6
DISMAL SWAMP CANAL
Wallaceton
18.2
VA.
NO. CAR.
DISMAL SWAMP CANAL
South Mills
28.0
South Mills Lock
TURNERS CUT
PASQUOTANK RIVER
KNOBBY CR.
ELIZA-
BETH
CITY
44.5
41.1
ELIZABETH CITY
44.5
41.1
NEWBEGUN CR.
Weeksville
PASQUOTANK RIVER
Wade Pt.
ALBEMARLE SOUND
SEE CHART 829

locks and bridges are in operation 24 hours a day. The canal is operated free of toll charges.

At Deep Creek lock, *Mile 9.2*, certain statistics are collected. The town of **Deep Creek,** *Mile 9.6*, has a public wharf and supplies are available. U. S. Highway 17 bridge across the canal at *Mile 9.6* has a bascule span with a horizontal clearance of 60 feet and a vertical clearance, closed, of 3½ feet at high water.

At *Mile 18.2*, a bascule bridge across the canal has a horizontal clearance of 48½ feet and a vertical clearance, closed, of 4 feet at high water. At *Mile 18.7*, a feeder ditch leads westward from the canal to Lake Drummond.

Supplies are available at **South Mills,** *Mile 28.0.* U. S. Highway 341 bridge across the canal at *Mile 28.0* has a bascule span with a horizontal clearance of 60 feet and a vertical clearance, closed, of 3½ feet at high water. The South Mills lock of the Dismal Swamp Canal is at *Mile 28.5.*

**Turners Cut** is a canal which extends in nearly a straight line from the Dismal Swamp Canal to a junction with Pasquotank River at *Mile 32.1.*

**Pasquotank River** has a length of 12 miles from the south end of Turners Cut to Elizabeth City, and thence 15 miles to Wade Point Light at the entrance from Albemarle Sound. The narrow upper part of the river has been improved by dredging, where necessary, to attain the project depth of the waterway. From Elizabeth City to the mouth, the river varies in width from 0.5 to 3 miles, has general depths of 9 to 12 feet, and is well marked by lights.

The Norfolk Southern Railway bridge across Pasquotark River at *Mile 41.1* has a hand-operated swing span with a horizontal clearance of 42½ feet and a vertical clearance, closed, of 2 feet at high water.

**Elizabeth City,** on the west bank of Pasquotank River at *Mile 44.3*, is one of the important towns on the inland waters of North Carolina, and has rail, airplane, and highway connections with Norfolk. The water-front bulkheads have good depths alongside, and a vessel can usually find a berth. Anchorage can be had in depths of 7 to 12 feet on the north side of the channel just below the city. N. C. Highway 30 bridge across the river at *Mile 44.5* has a bascule span with a horizontal clearance of 100 feet and a vertical clearance, closed, of 8½ feet at high water.

Complete supply and repair facilities and hotel accommodations are available at Elizabeth City. The shipyards can accommodate yachts and commercial craft of any size navigating these waters. The yacht club, about 0.2 mile south of the highway bridge, has considerable dockage space. The river water is practically fresh.

Elizabeth City is a customs port of entry, and marine documents are issued. **Storm warnings** are displayed day and night. Also at Elizabeth City are a third-class medical relief station of the United States Public Health Service and a chart agency of the Coast and Geodetic Survey.

**Knobb Creek** is a nontidal fresh-water stream emptying into Pasquotank River from the west on the north side of Elizabeth City. A railroad bridge 0.1 mile above the mouth of the creek has a swing span with a horizontal clearance of 35 feet and a vertical clearance, closed, of 4 feet at high water. A highway bridge, just above the railroad bridge, has a swing span with a horizontal clearance of 40 feet and a vertical clearance, closed, of 4 feet at high water.

The Federal project for the improvement of Knobb Creek provides for a channel 10 feet deep, from that depth in Pasquotank River to the Norfolk Southern Railway

bridge at the head of navigation 1 mile above the mouth of the creek. In March 1947, the controlling depth was reported to be 10 feet.

**Pasquotank River, restricted area for seaplane operations.**—*The Area.*—That portion of the Pasquotank River bounded by the following lines:

1. On the west by a line from Pasquotank River Light 7, located off Cobb Point, north across the river.
2. On the east by a line drawn between Pasquotank River Light 5 and Pasquotank River Obstruction Light B.
3. On the north by the 7-foot contour line.
4. On the south by the 7-foot contour line.

*The Regulations.*—1. Vessels without proper lights shall not operate within the area.

2. No vessel shall anchor or moor within the area.
3. No fishing, oystering, clamming, crabbing, or any other activities will be allowed within the area.
4. All vessels traversing the area shall navigate as near the northeast shore of the river as practicable, and shall remain in the area a minimum length of time.
5. These regulations shall be enforced by the Captain of the Port, Norfolk, Va., and the Commanding Officer, Coast Guard Air Station, Elizabeth City, N. C., and such other responsible agent or agents as they may jointly delegate.

**Newbegun Creek** empties into Pasquotank River from the west, midway between Elizabeth City and the mouth of the river. **Weeksville,** the principal town on the creek, is 3 miles from the mouth. A Federal project for the improvement of Newbegun Creek provided for a depth of 5 feet across the bar at the mouth of the stream. The controlling depth over the bar and in the main part of the creek is about 4 feet.

**Tides.**—The mean range of tide in Southern Branch and Deep Creek is 2½ to 3 feet. The remaining sections of the Dismal Swamp Canal route are nontidal, but at times there are variations of 1 to 2 feet in level, due to winds.

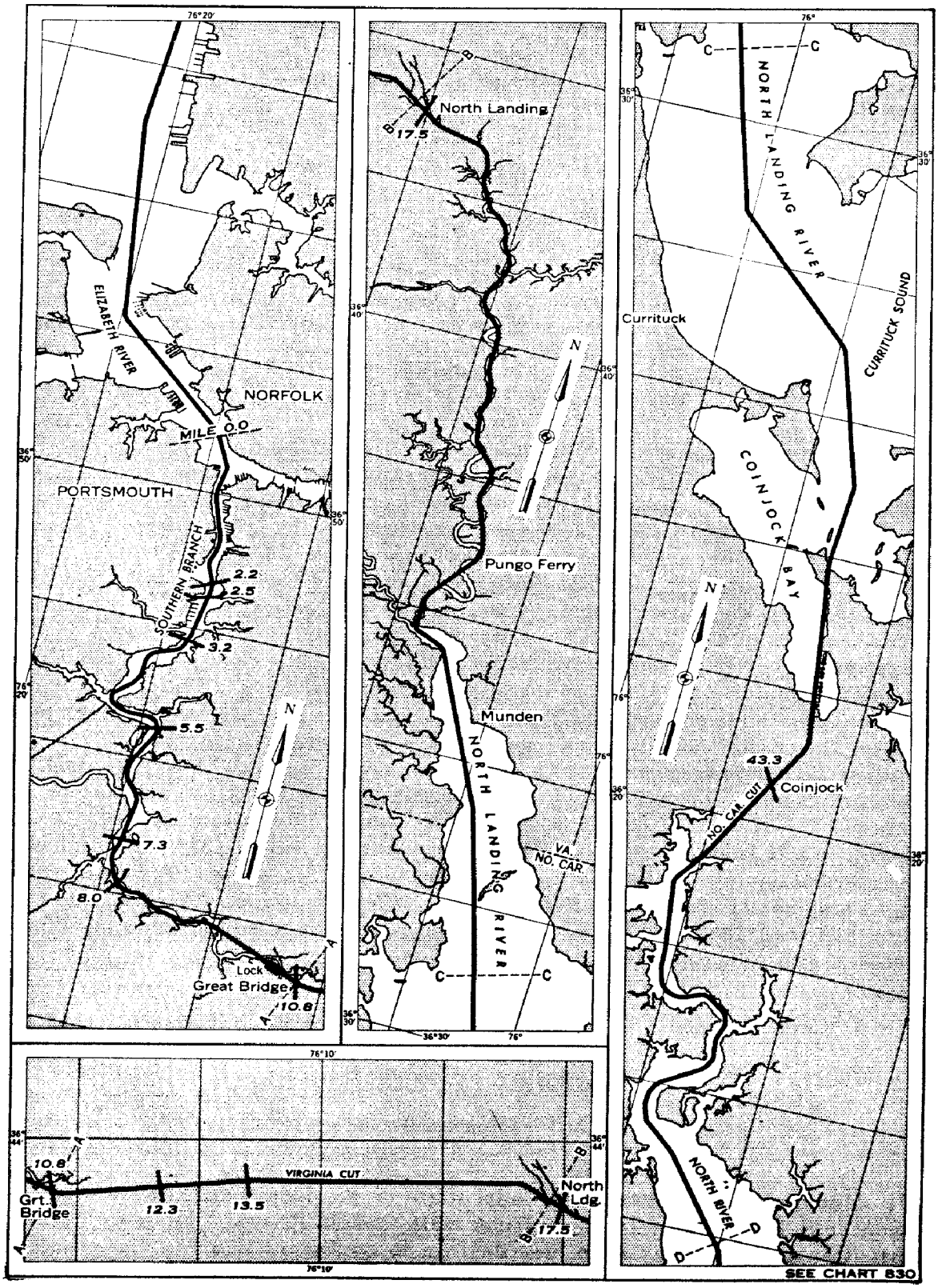
**Directions.**—Vessels proceeding with care and following the chart should be able to navigate the Dismal Swamp Canal route without undue difficulty. The places requiring extra caution are Deep Creek and Turners Cut, and the upper reaches of Pasquotank River where the channel is narrow and sharp bends are numerous.

South of Elizabeth City the route is through the open waters of Pasquotank River and Albemarle Sound. From a mid-channel position 0.5 mile below the highway bridge at Elizabeth City, steer **115°** for 3.5 miles, passing about 100 yards northward of Cobb Point Light, to a position 0.6 mile off **Brickhouse Point;** then steer **136°** for 7.6 miles to a position with Poquoson Point Light on the port beam; then steer **110°** for 4.4 miles, passing 0.4 mile northeast of **Wade Point Light** at *Mile 59.1*, to a position 1.4 miles past the light; then steer **188°** for 11.0 miles across Albemarle Sound to the lighted bell buoy at the entrance to Alligator River.

## Norfolk to North River

### Chart 830

The **Albemarle and Chesapeake Canal** route of the Intracoastal Waterway connects Southern Branch of Elizabeth River with North River. The route through Southern Branch has already been described as far as Deep Creek.


ELIZABETH RIVER
NORFOLK
MILE 0.0
PORTSMOUTH
SOUTHERN BRANCH
2.2
2.5
3.2
5.5
7.3
8.0
Lock
Great Bridge
10.8
North Landing
17.5
Pungo Ferry
Munden
NORTH LANDING RIVER
VA.
NO. CAR.
NORTH LANDING RIVER
Currituck
CURRITUCK SOUND
COINJOCK BAY
43.3
Coinjock
NO. CAR. CUT
NORTH RIVER
VIRGINIA CUT
Grt. Bridge
12.3
13.5
North Ldg.
SEE CHART 830

At *Mile 7.3* the Norfolk & Portsmouth Belt Line Railroad bridge across Southern Branch has a hand-operated swing span with a horizontal clearance of 80 feet and a vertical clearance, closed, of 7½ feet at high water. Virginia Highway 166 bridge at *Mile 8.0* has a hand-operated swing span with a horizontal clearance of 80 feet and a vertical clearance, closed, of 6½ feet.

**Virginia Cut** extends eastward in almost a straight line from Southern Branch to North Landing River. At the Southern Branch end of the cut, *Mile 10.4*, is a tidal guard lock 600 feet long and 75 feet wide; the vertical lift is 2½ feet and the depth over the miter sills is 16 feet. All vessels passing through the lock are required to furnish certain statistics relative to registry, tonnage, passengers, and the like. The established speed limit between the lock and the North Landing bridge at *Mile 17.5* is 8 knots.

**Great Bridge,** a post village on the south side of Virginia Cut at *Mile 10.8*, has telephone and bus connections with Norfolk. The bridge across the cut at *Mile 10.8* is a double-swing type with a horizontal clearance of 80 feet and a vertical clearance, closed, of 5 feet at high water.

The privately owned marine basin on the south side of the cut a short distance eastward of Great Bridge is available for mooring, dockage, and covered storage of pleasure craft. The marine railway can accommodate a weight of 15 tons and a length of 45 feet. Gasoline, Diesel oil, and fresh water, and groceries, ice, laundry service, showers, and marine supplies are obtainable here.

The Norfolk Southern Railway bridge across Virginia Cut at *Mile 12.3* has a bascule span with a horizontal clearance of 80 feet and a vertical clearance, closed, of 4½ feet at high water. Virginia Highway 604 bridge at *Mile 13.5* has a hand-operated swing span with a horizontal clearance of 80 feet and a vertical clearance, closed, of 4 feet at high water.

**North Landing,** *Mile 17.5*, is a small village at the junction of Virginia Cut and North Landing River. Virginia Highway 165 bridge across North Landing River at *Mile 17.5* has a bascule span with a horizontal clearance of 80 feet and a vertical clearance, closed, of 5 feet at high water.

For 9 miles from Virginia Cut, **North Landing River** is narrow and crooked, but the bends are, as a rule, easy. Several of the worst bends have been bypassed by dredging through the marshy points. At **Pungo Ferry,** *Mile 24.3*, the ferry is operated by the Virginia Department of Highways on a cable which rests on the bottom when not in use. Warning signs are located 0.5 mile each side of the ferry crossing.

From *Mile 26.0*, the route is through a dredged cut in the open waters of North Landing River and **Currituck Sound,** thence into **Coinjock Bay** and through North Carolina Cut to the head of North River.

**Munden** is a post village and rail terminal on the east side of North Landing River at *Mile 27.8*; the wharf at Munden is in ruins. **Currituck** is a village on the west side of the mouth of North Landing River opposite *Mile 35.0*.

**Coinjock,** *Mile 43.3*, is a post village midway along **North Carolina Cut.** Gasoline, Diesel oil, and some supplies can be obtained, but fresh water is not available in quantity. **Storm warnings** are displayed day and night from the Coast Guard depot at Coinjock. The bascule bridge across North Carolina Cut at *Mile 43.3* has a horizontal clearance of 80 feet and a vertical clearance, closed, of 7 feet. A good highway leads from Coinjock to Elizabeth City and Norfolk, and to Manteo on Roanoke Island.

A canal 22 feet wide and 1 foot deep branches northeastward from North Carolina Cut about 1 mile northward of the Coinjock bridge, and connects with Currituck Sound through Parker Creek. The canal is crossed by a fixed bridge with a horizontal clearance of 16 feet and a vertical clearance of 6 feet.

**Tides.**—South of Great Bridge, there are no periodic tides in these waters, the level depending upon the force and direction of the winds. Northerly winds lower the water level and southerly winds raise it, there being at times a difference of 2 feet or more above or below the normal with strong, long-continued winds from one direction.

**Directions.**—The route from Norfolk to North River is easily followed in daylight as it is well marked by the standard aids and by bush stakes. The route is well lighted for most of its length, but strangers are advised against running at night.

## North River to Alligator River-Pungo River Canal

Chart 831

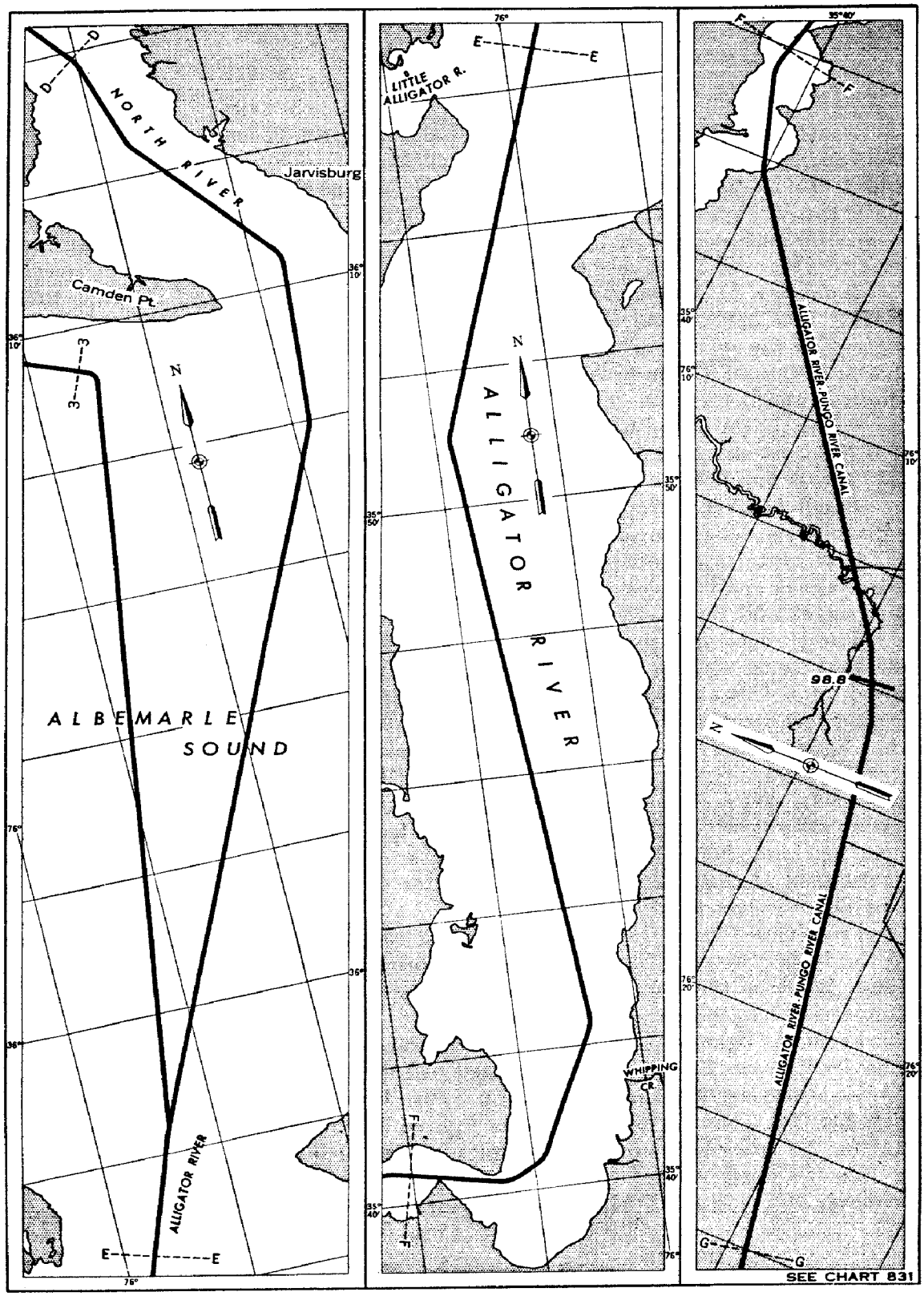
**North River** is about 12 miles long from North Carolina Cut to the entrance from Albemarle Sound, and has a general depth of about 9 feet outside the dredged cut of the Intracoastal Waterway. The channel is well marked by lights and buoys, and a lighted range marks the section through the bar at the river's mouth. On the east side of the river, near the mouth, is the post village of **Jarvisburg,** *Mile 55.8*. The dock at Jarvisburg is in ruins.

From the vicinity of the lighted bell buoy at the entrance to North River, the 10.5-mile run across **Albemarle Sound** to the lighted bell buoy at the entrance to Alligator River is made on a **202°** course. In heavy weather the passage is uncomfortable and even dangerous for open boats. The rise and fall of the water level in Albermarle Sound depends on the winds.

**Alligator River** has a southerly direction for about 18 miles, then turns west and narrows. The channel of the Intracoastal Waterway has been dredged the entire length of the wider part of the river and for about 4 miles through its western reach to the land cut connecting with the Pungo River. The channel is well marked by lights and buoys.

Alligator River and Little Alligator River are discussed in more detail in another section. **Whipping Creek** empties into Alligator River from eastward near the south end of the wide reach. A small-boat passage is reported to lead from Whipping Creek for 14 miles to Long Shoal River and Pamlico Sound.

The route of the waterway passes from Alligator River to the **Alligator River-Pungo River Canal** at *Mile 91.2*. The canal is a land cut extending about 19 miles in a westerly direction. At *Mile 98.8* a highway bridge over the canal has a swing span with a horizontal clearance of 80 feet and a vertical clearance, closed, of 7 feet at high water. Just east of the bridge the **Fairfield Canal,** privately owned, makes off from the main canal in a southerly direction through the town of **Fairfield** to the north shore of **Lake Mattamuskeet**.


NORTH RIVER
Jarvisburg
Camden Pt.
ALBEMARLE SOUND
ALLIGATOR RIVER
LITTLE ALLIGATOR R.
ALLIGATOR RIVER
WHIPPING CR.
ALLIGATOR RIVER-PUNGO RIVER CANAL
98.8
SEE CHART 831

# Alligator River-Pungo River Canal to Neuse River

Chart 832

At *Mile 109.3* a highway bridge over the Alligator River-Pungo River Canal has a hand-operated swing span with a horizontal clearance of 80 feet and a vertical clearance, closed, of 8 feet at high water. An overhead cable at the bridge has a vertical clearance of 102 feet at high water. The canal enters **Wilkerson Creek** at the bridge. The route is then through the dredged cut in the creek to **Pungo River,** southwestward and westward to abeam of Belhaven, then southward in Pungo River to Pamlico River.

**Belhaven,** at *Mile 119.8*, is on the northeastern side of the entrance to **Pantego Creek.** The harbor, which is protected by timber breakwaters at the creek's entrance, is excellent for small craft. Fuel, supplies, repair facilities, and guest rooms are available at Belhaven. The town and the channel into the harbor are discussed at greater length in another section.

From abeam of the light at *Mile 123.7* in the lower part of Pungo River, a course of **167°** for 3.7 miles leads to the lighted bell buoy off the mouth of the river; then steer **233°** across Pamlico River for 2.9 miles to the light at the entrance to Goose Creek.

**Pamlico River** is the approach to the important town of Washington. The river is discussed at length in another section.

The route of the Intracoastal Waterway follows the dredged channel through **Goose Creek** and its tributary, **Upper Spring Creek,** to the land cut which connects with **Gale Creek** and Bay River.

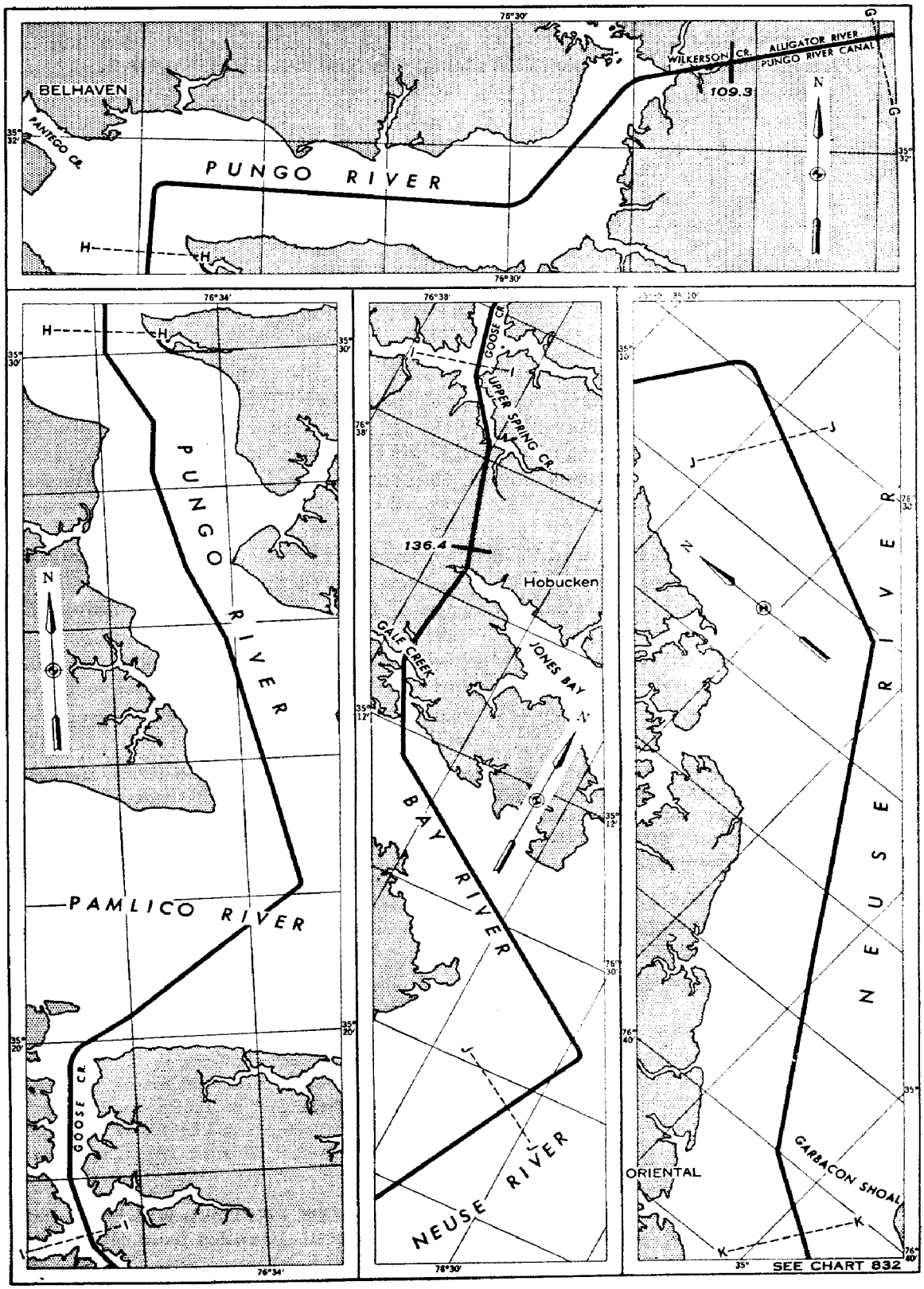
The Hobucken highway bridge, crossing the land cut at *Mile 136.4*, has a hand-operated swing span with a horizontal clearance of 79 feet and a vertical clearance, closed, of 6 feet at high water. The bridge is difficult to handle in windy weather. During such weather, the signal for opening the draw should be sounded well in advance when approaching the bridge with a fair current.

The post village of **Hobucken** is about 1 mile east of the bridge and has a landing on **Jones Bay,** which is discussed in another section. At the Hobucken bridge is a small marine railway which can handle vessels of 2 feet draft and 30 feet in length, and has a small machine shop. Gasoline, provisions, and miscellaneous small-boat supplies can be obtained at the pier, which has a keel-line depth of about 9 feet. A Coast Guard buoy depot is just north of the bridge.

From Gale Creek, the route of the Intracoastal Waterway is down **Bay River,** then up the **Neuse River.** Bay River is the approach to Bayboro and other small towns; Neuse River is the approach to the important city of New Bern. Both rivers are discussed at length in another section.

From the light at *Mile 139.6* off the entrance to Gale Creek, a course of **125°** for 5.0 miles leads down Bay River to a lighted bell buoy at the junction of Bay and Neuse Rivers; then steer **206°** for 4.5 miles up Neuse River to another lighted bell buoy; then steer **238°** for 7.5 miles to abeam of the lighted bell buoy off Garbacon Shoal; then steer **214°** for 2.6 miles to the lighted bell buoy off the entrance to Adams Creek.

On the north side of Neuse River opposite Garbacon Shoal is the post village of **Oriental,** *Mile 159.1*. Fuel, supplies, repair facilities, and guest rooms are available at


BELHAVEN
PANTEGO CR.
PUNGO RIVER
WILKERSON CR.
ALLIGATOR RIVER-PUNGO RIVER CANAL
109.3
N
PUNGO RIVER
PAMLICO RIVER
GOOSE CR.
GOOSE CR.
UPPER SPRING CR.
136.4
Hobucken
GALF CREEK
JONES BAY
BAY RIVER
NEUSE RIVER
NEUSE RIVER
ORIENTAL
GARBACON SHOAL
SEE CHART 832

Oriental. The village and its water front are discussed at greater length in connection with the Neuse River.

Description of the Intracoastal Waterway is continued in Chapter 6.

# Inland Waters

## Currituck Sound

Charts 1227, 1229

**Currituck Sound** is a narrow and shoal body of water which extends for 25 miles in a north-south direction behind the barrier beach at Currituck Beach Light. The southern part of the sound is navigable for boats of 4 to 5 feet draft to the junction with Albemarle Sound, but the navigation is difficult because of the extensive shoals. There are no periodic tides in Currituck Sound, the water level depending upon the force and direction of the wind.

**Chart 1227.—Back Bay,** and its connection with Currituck Sound, extends a little over 10 miles northward from the northeastern end of the sound. This shoal bay is navigable only for small boats. Northward of Back Bay are shallow **Shipps Bay** and **North Bay.**

**North Landing River** extends in a north-northwesterly direction from the north end of Currituck Sound. Depths range up to 7 feet in the unimproved sections. The river is a link in the Intracoastal Waterway and is more particularly described under that heading.

**Currituck Sound, target danger area.**—Target No. 10. The area bounded by a line drawn from a point 1,025 yards 065°30′ from Intracoastal Light 69, 6,000 yards 086°, thence 4,425 yards 193°, thence 2,775 yards 267°30′, and thence to the point of beginning. The target is located in latitude 36°27′16″ N., longitude 76°56′30″ W. No person is allowed to fish nor are any boats allowed to operate in this area except those boats attached to and operated by the United States Government bases in the area.

**Chart 1229.—Wright Memorial Bridge** crosses the south end of Currituck Sound between **Sampson Point** and the outer beach. The bridge has a swing span with a horizontal clearance of 40 feet and a vertical clearance, closed, of 4 feet at high water.

## Albemarle Sound

Charts 1228, 1229

**Albemarle Sound** is about 45 miles long in an east-west direction, and has a width ranging from 11 miles near its eastern end to 3 miles about 10 miles from the western

end. The sound has a good navigable depth for any vessel that can enter through the canals, and with its numerous tributaries forms the approach to a number of towns and landings.

There are depths of 10 to 18 feet along the tracks from North River and Pasquotank River to Croatan Sound and Alligator River, and less water farther eastward. Fish stakes and nets, extending long distances from shore, are often found on the shoals, especially at the northern entrance to Croatan Sound. The shores of Albemarle Sound are low and generally wooded; there are no prominent natural features.

The eastern end of Albemarle Sound, which is separated from the Atlantic Ocean by the barrier beach about 15 miles north of Bodie Island Light, is connected northward with Currituck Sound and southward with Croatan and Roanoke Sounds, and by the latter sounds with Pamlico Sound. Westward of Laurel Point the water in Albemarle Sound is usually fresh or slightly brackish. The rise and fall of the water level depends on the direction of the winds.

**Albemarle Sound, target danger area.**—Target No. 7. A circular area 2 miles in diameter with the center at latitude 36°02′42″ N., longitude 75°48′21″ W., near Powell Point. No person is allowed to fish nor are any boats allowed to operate in this area except those attached to and operated by the United States Government bases in the area.

**Albemarle Sound, restricted areas.**—Area 1. Beginning at a point on the northern shore of Albemarle Sound where the eastern highway bridge intersects the shore at Sandy Point; thence southerly along the eastern side of said bridge to the northern end of the draw; thence easterly on a line to a point 3,200 yards 180° from flashing green light 1 at the mouth of the Pasquotank River; thence due north to said light; thence 3,700 yards 270° to the shore at Wade Point; thence following the shoreline westerly to a point where the highway extension intersects the shore east of Mill Point; thence 3,600 yards 166° to a point 625 yards southeastward of spar buoy 11; thence 5,250 yards 235° to a point south of Reed Point Light; thence on a line 280° to red and black buoy C; thence 323°30′ to the shore at Harvey Point; thence westward along the shore line to the point or place of beginning.

Area 2. Beginning at the northernmost point at Laurel Point; thence on a line to Laurel Point Light; thence to a point in latitude 36°02′40″ N., longitude 76°04′26″ W.; thence direct to Lewis Point; thence following the shoreline westerly to a point 2,200 yards 068° from Scuppernong River Entrance Light; thence 263° to the shore south of Bull Creek entrance; thence along the shoreline across the entrance to Bull Creek and along the shoreline to Laurel Point. Excluded from this area is a passage 600 yards in width running due north from Scuppernong River Entrance Light.

*The Regulations.*—1. The above-described restricted areas will be used as target and bombing areas by naval aircraft. Live and dummy ammunition will be used.

2. No vessel shall enter these restricted areas during the hours of daylight without special permission obtained from the Captain of the Port, Norfolk, Va.

3. The area will be patrolled and the vessels will be warned not to enter. All operations will be conducted during daylight hours, and these areas are open to navigation at night.

4. Vessels wishing to enter or leave Perquimans River, Little River, and Scuppernong River shall use the areas excluded from the restricted area.

5. "Buzzing" by plane will warn vessels that they are in a restricted area, and upon such warning they shall immediately leave the area.

6. These regulations will be enforced by the Captain of the Port, Norfolk, Va., and by the Commanding Officer, Fleet Air Wing No. 5, Naval Air Station, Norfolk, Va.

**Albemarle Sound, bombing targets established** by the United States Navy. Targets are about 20 feet square, and about 15 feet above water and are composed of wood piles supporting a white slatted pyramidal-shaped superstructure. Four single pile markers are driven 200 feet from the target in northerly, southerly, easterly, and westerly directions from the main structures.

White reflectors are on Targets A, C, and D and adjacent pile markers and red reflectors are on target B and its adjacent pile markers.

Target A is located in 14 feet, 4,600 yards 134° from Laurel Point Light.

Target B is located in 16 feet, 4.9 miles 032° from Laurel Point Light.

Target C is located in 15 feet, 9,850 yards 059° from Alligator River Light 6.
Target D is located in 5 feet, 8,650 yards 147° from Reed Point Light.

**Albemarle Sound, bombing target established.**—A yellow pyramid-type floating target, 20 feet square, has been established in latitude 36°03′30″ N., longitude 76°20′00″ W., for use as a bombing-strafing target. The target is unlighted.

**Chart 1229.—North River,** on the north side of Albemarle Sound near the eastern end, is a link in the route of the Intracoastal Waterway and is more particularly described under that heading.

**Chart 1228.—Pasquotank River** flows southerly into Albemarle Sound and is marked at its entrance by **Wade Point Light,** which is 4 miles west of North River entrance. Pasquotank River and Elizabeth City are more particularly described in connection with the Dismal Swamp Canal route of the Intracoastal Waterway.

**Flatty Creek,** 3 miles westward of **Wade Point,** is 0.5 mile wide at the mouth but is shoal and little used. Depths are about 2 feet over the bar and 3 to 4 feet inside.

**Little River** is on the north side of Albemarle Sound and 4 miles westward of Flatty Creek. The channel at the entrance is about 0.3 mile wide between shoals and is buoyed. The river has a general northwesterly trend to the village of **Nixonton,** which is on the east bank 7 miles above the entrance. The only dock at the village is in ruins. About 7 feet is the deepest draft that can be taken to the village. Spits, with little water over them and generally steep-to, make out some distance in places from the shores, especially off the points. The channel in the upper reaches of the river is well marked by the outer ends of the fish stakes which make out from shore.

**Perquimans River,** on the north side of Albemarle Sound, has its entrance 3 miles northwestward of **Reed Point Light.** For a distance of 10 miles to the town of Hertford the river is from 0.8 to 1.5 miles in width and has a navigable depth of 8 to 11 feet.

**Albemarle Sound, Perquimans River, restricted area for seaplane operations.**—*The Area.*—Beginning at Blount Point (36°07′15″ N., 76°20′45″ W.) on the south side of Perquimans River; thence north-northeastward to the eastern side of the mouth of Canaan Cove on the north shore of the river; thence southeastward along the shoreline to Reed Point; thence 168° to Reed Point Light; thence 263° to nun buoy 2, off Drummond Point; thence 005° to the mouth of Minn Creek; thence along the shoreline, around Harvey Point to the point of beginning.

*The Regulations.*—1. Boats without lights shall be prohibited from operating in that portion of the Perquimans River which is restricted.

2. No vessels shall at any time moor or anchor within the Seaplane Operating Area.

3. No fishing, oystering, clamming, crabbing, or any other activities will be permitted in the Seaplane Operating Area.

4. All vessels moving in the Seaplane Operating Area shall immediately proceed to leave the area when warned by aircraft employing the "buzzing" method which consists of low flights by an airplane and repeated opening and closing of its throttle.

5. Vessels traversing the restricted area shall confine their movements as close to the north shore as possible.

6. These regulations will be enforced by the Captain of the Port, Norfolk, Va., and by the Commanding Officer, Harvey Neck Naval Air Station and such other responsible agent or agents as they may jointly designate.

**Hertford,** on the southwest side of the Perquimans River, has rail connections, and a paved highway leads to Edenton and Elizabeth City. Gasoline, fresh water, and some supplies can be obtained. **Storm warnings** are distributed locally.

At Hertford the narrow part of the river is crossed by a highway swing bridge which has a horizontal clearance of 55 feet and a vertical clearance, closed, of 4 feet at high

water. The wharves at Hertford are above the highway bridge, and, except for two fuel docks, are in ruins. Vessels can lie alongside the 65-foot bulkhead on the south side of the river immediately above the bridge in 10 feet of water. The river water is fresh at Hertford.

Above Hertford the river is narrow and crooked, but has fairly good depths for about 8 miles to a point near **Goodwin Creek.** Navigation is restricted to very small boats, however, by a closed railroad swing bridge 1 mile above the highway bridge. The railroad bridge has a horizontal clearance of 40 feet and a vertical clearance of 2 feet at high water.

**Yeopim River,** about 6 miles west of Perquimans River, is shoal and unimportant. The depth over the bar between **Batts Island** and **Drummond Point** is about 4 feet. Some logging is done along the south shore of the river.

Six miles southwestward from Drummond Point, a highway bridge crosses Albemarle Sound from **Sandy Point** to the south shore. The swing span, near the middle of the bridge, has a horizontal clearance of 140 feet in both openings and a vertical clearance, closed, of 14 feet at high water. The fixed spans have horizontal clearances of 23 feet and vertical clearances of 14 feet at high water.

Four miles westward of the highway bridge, a railroad trestle crosses the sound. About 1.5 miles from the northern end of the bridge is a bascule span with a horizontal clearance of 140 feet and a vertical clearance, closed, of 6 feet at high water. Five fixed girder spans, at intervals of about 0.5 mile, have horizontal clearances of 35 feet and vertical clearances of 8 feet at high water. A bell is struck by hand at the drawspan when the weather is thick or foggy. It is reported that the lights on the drawspan are low-powered and difficult to make out in hazy weather.

**Edenton Bay** is a small bay on the north side of Albemarle Sound, just westward of the railroad trestle which crosses the sound. The channel into Edenton Harbor is marked by buoys and range lights. The large water tank just west of the rear range light is most prominent from the sound. Also prominent are a brick chimney near the front range and a water tank on the east side of the bay.

A Federal project for the improvement of Edenton Harbor provides for a channel 12 feet deep and 150 feet wide from the 12-foot contour in Edenton Bay to the foot of Broad Street, Edenton, a distance of about 4,000 feet; and channels of the same cross-section, leading east and west along the water front from the main channel for distances of about 900 and 1,600 feet, respectively. In June 1947, the controlling depth in the channels was reported to be 10 feet.

**Edenton,** a town at the head of the bay, has rail and highway communication with Norfolk and the south. Some lumber is shipped by rail and in barges. The main industries are peanuts, lumber, cotton oil, veneer, and plywood. A towboat is stationed at Edenton. Supplies, ice, gasoline, coal, and water can be obtained. The river water is fresh and can be used in boilers. **Storm warnings** are displayed day and night at Edenton, and the town has a third-class medical relief station of the United States Public Health Service.

The city wharf, on which the front range light is located, has 12 feet of water alongside. The railroad wharf is in ruins. The inner anchorage, which is small and has a depth of about 9 feet, is close eastward of the range line. The larger anchorage is on the west side of the range line. The range lights are difficult to make out because of the automobile lights in town. The range is also hard to see in hazy weather.

**Pembroke Creek** is a small nontidal stream flowing easterly into the head of Edenton Bay. Bisecting the lower part of the creek for some 2,000 feet is a row of piles, maintained by a lumber company, which forms a log pond on the north side of the creek.

A United States fish hatchery has a small wharf and a boathouse on the south bank of the creek, 0.5 mile above the mouth. Just above the hatchery is a fixed highway bridge with a horizontal clearance of 19 feet and a vertical clearance of 5 feet at high water. Two miles from the mouth is another fixed highway bridge with a horizontal clearance of 12 feet. Only small boats without masts can pass under these bridges.

A Federal project for the improvement of Pembroke Creek provides for a channel 12 feet deep and 80 feet wide from the improved channel in Edenton Bay upstream 500 feet; thence 8 feet deep and 50 feet wide to the fish hatchery. In 1947, no work had been done on the project. A depth of about 3 feet could be carried to the fish hatchery.

**Chowan River** empties into the western end of Albemarle Sound from northward, and with its tributaries is one of the largest rivers in North Carolina. For a distance of 17 miles above its mouth the river has an average width of about 1.5 miles. Snags, many of which are under water, are generally found on the shoals in this part of the river; the worst place, known as **Stumpy Reach,** is between Colerain Landing and **Bennetts Creek,** a distance of about 6 miles.

A Federal project for the improvement of Chowan River provides for a channel 12 feet deep and 80 feet wide from the mouth to the confluence of the Nottoway and Blackwater Rivers, 45 miles above, including a cut-off channel of like dimensions through a sharp bend near Riddicksville. In 1947 no work had been done on the project, but a depth of 11 feet was available for its entire length.

**Salmon Creek** is a small stream which flows easterly into Chowan River just above the mouth. The entrance to the creek is a good harbor for boats of drafts up to 6 feet. **Avoca,** a post office, is on the south bank of the creek about 1 mile from the entrance.

A highway bridge crosses Chowan River 2 miles above the mouth. The swing span, about in the middle of the river, has a horizontal clearance of 80 feet and a vertical clearance, closed, of 4½ feet at high water.

**Colerain Landing** is on the west bank of the river and 12 miles above the entrance. At the landing is a large herring factory, just above which is a dock, in poor condition, used for pumping oil ashore from small tankers. No gasoline or supplies are available to the public. On a hill 0.5 mile inland is the village of **Colerain.**

**Tunis,** a landing on the south bank of Chowan River and east of the Atlantic Coast Line Railroad crossing, is about 30 miles above the river mouth. When coming into the railroad dock at Tunis, head for the draw of the railroad bridge until the dock is almost abeam, and then steer for it. The dock is not in good condition and is used only occasionally by vessels taking on coal. Depths alongside the easterly and northeasterly sides of the dock are 6 to 9 feet. The railroad bridge has a hand-operated swing span with a horizontal clearance of 54 feet and a vertical clearance, closed, of 2 feet at extreme high water. The draw is not attended between the hours of 1 to 7 a. m., 11 a. m. to 12 noon, 3 to 5 p. m., and 8 to 9 p. m.

**Winton** is a small town on the west bank of the river and 32 miles above its mouth. Gasoline and some supplies can be obtained in the town. The highway bridge across

the river at Winton has a swing span with a horizontal clearance of 60 feet and a vertical clearance, closed, of 2 feet at extreme high water. The one small dock at the town is above the bridge and is used for unloading oil. Barges loading pulpwood tie up at ramps below the bridge.

**Meherrin River** joins the Chowan River from westward about 2.5 miles above Winton. A bridge 3 miles above the mouth has a swing span with a horizontal clearance of 50 feet and a vertical clearance, closed, of 5 feet at high water. Along the river are seven small pile wharves, four of which are at **Murfreesboro,** a village 10.5 miles above the river mouth. The fixed highway bridge at Murfreesboro has a horizontal clearance of 138 feet and a vertical clearance of 15 feet at high water. Just below the bridge is a fertilizer factory. Pulpwood barges tie up at a ramp just above the bridge. The river's width varies from 100 to 350 feet. Small craft can operate as far as **Princeton Landing,** 4.5 miles above Murfreesboro.

The Federal project for the improvement of Meherrin River provides for a channel 10 feet deep from the mouth to the highway bridge at Murfreesboro, with a cut-off channel through Devils Elbow, 3.5 miles above the mouth, 80 feet wide through the cut-off and 100 feet wide elsewhere; and a turning basin of the same depth, 300 feet wide and 500 feet long, at Murfreesboro. In June 1947, the controlling depth was reported to be 9 feet.

The Blackwater and Nottoway Rivers unite to form the Chowan River about 13 miles above Winton. A Federal project for the improvement of **Blackwater River** provides for a channel 12 feet deep and generally 80 feet wide from the mouth to a point just downstream from the Seaboard Air Line Railroad bridge at Franklin, Va., a distance of 11 miles including cut-off channels of like dimensions through two bends at Cherry Grove and Georges Bend, and a turning basin of 3.2 acres at Franklin. The stream is nontidal. The portion of the river under improvement is subject to freshets of short duration, causing rises of 3 to 4 feet, but the general stage of the river remains for the greater part of the time at the elevation of Albemarle Sound. In March 1947, the controlling depth was reported to be 7 feet.

A highway bridge across the river 8 miles above the mouth has a swing span with a horizontal clearance of 60 feet and a vertical clearance, closed, of 15 feet at high water. About 1.5 miles below Franklin, power wires over the river have a minimum vertical clearance of 135 feet at times of freshets.

There is a wharf at **Franklin,** and three small wharves and a warehouse between the town and the mouth of the river. Small craft are able to reach Burdett, 10.5 miles above Franklin; passage is limited by three fixed bridges at Franklin to a horizontal clearance of 22 feet and a vertical clearance of 7½ feet at high water.

Navigation of **Nottoway River** is restricted by fixed bridges. The first is a highway bridge, 2.4 miles from the mouth, with a horizontal clearance of 97 feet and a vertical clearance of 15 feet at high water. The next is the **Monroe** highway bridge, 8.5 miles from the mouth, with a horizontal clearance of 90 feet and a vertical clearance of 10½ feet at high water. The third is the Seaboard Air Line Railroad bridge, 13 miles from the mouth, with a horizontal clearance of 58 feet and a vertical clearance of 12 feet at high water. Three other fixed bridges cross the river in the next 9 miles. Vessels of 4 to 5 feet draft can navigate the river as far as the Monroe bridge at any time of the year providing they can pass under the first bridge. Navigation above the Seaboard

789003°—48——11

Air Line Railroad bridge is limited to flatboats and rafts of 2 feet or less draft by the bars and snags.

**Chart 409.—Roanoke River** rises in the Blue Ridge Mountains, west of Roanoke, Va., and flows southeasterly for about 175 miles to Clarksville, Va., where it is joined by **Dan River,** its principal tributary; thence it flows in the same general direction for about 170 miles and empties into **Batchelor Bay,** a shoal bight at the southwestern end of Albemarle Sound. The river is subject to frequent and sudden freshets which overflow large areas of the lowland on both banks. Strangers are advised to take a pilot at Edenton.

A Federal project for the improvement of Roanoke River provides for dredging a channel 12 feet deep and 150 feet wide from the 12-foot contour in Albemarle Sound into Roanoke River and thence upstream to a point about 1 mile above the town of Plymouth, N. C., a distance of 9 miles; thence a channel 10 feet deep and 100 feet wide to Hamilton, a distance of 46 miles; thence a channel 8 feet deep and 80 feet wide to Palmyra Landing, a distance of 16 miles, with a cut-off channel of like dimensions about 2 miles above Hamilton; and thence a channel 5 feet deep and 50 feet wide to Weldon, N. C., a distance of 43 miles, by dredging, snagging, and regulation. Depths of channels are referred to mean low water. The rise and fall of the river, resulting from freshets, is from 18 to 33 feet for about 60 miles below Weldon, but this fluctuation diminishes toward the mouth, the variations in water levels being from 1 to 2 feet in the lower 15 or 20 miles. The total length of channels included in the project is 114 miles.

In June 1947, the controlling depths were reported to be 10 feet to 1 mile above Plymouth; 7½ feet to Hamilton; 3 feet to Palmyra; and 1 foot to Weldon.

**Plymouth** is an important town 6 miles above the mouth of Roanoke River. The town has good highway and rail connections; and fresh water, gasoline, Diesel oil, and provisions are available. There are several small wharves at Plymouth. A veneer factory is on the river front below the town, and 1 mile above the town is the large wharf of a pulp mill.

**Williamston** is 26 miles above the mouth of the river. In 1947 a new highway bridge was being built across the river at Williamston; the bridge has a swing span with a horizontal clearance of 80 feet. Just below the bridge are a fertilizer plant and an oil dock. The town dock, 0.2 mile above the bridge, is in poor condition and no longer in use. Fuel and groceries can be procured in Williamston; fresh water is available only by portage. Pulpwood, lumber, and oil constitute most of the shipping.

Other towns along the Roanoke River, and their distances above the mouth, are: **Jamesville,** 15 miles; **Hamilton,** 52 miles; **Palmyra,** 68 miles; **Halifax,** 102 miles; and **Weldon,** 112 miles. The Atlantic Coast Line Railroad bridge 82 miles above the mouth has a swing span with a horizontal clearance of 85 feet and vertical clearances, closed, of 8 feet at extreme high water and 24 feet at low water. The fixed bridge 89 miles above the mouth has a horizontal clearance of 342 feet and vertical clearances of 7 feet at extreme high water and 39 feet at low water. Three fixed bridges cross the river at Weldon.

**Cashie River** flows southeasterly about 50 miles to its intersection with the **Thorofare,** connecting Cashie and Roanoke Rivers; thence northeasterly about 6 miles, and empties into Batchelor Bay.

A Federal project for the improvement of Cashie River provides for the removal

of logs, snags, and other obstructions between the Roanoke River end of the Thorofare and Windsor, a distance of 18 miles; the construction of three cut-off channels 80 feet wide through sharp bends at points 1, 4, and 5 miles below Windsor; and a turning basin about 1.1 acres in area, all to a depth of 10 feet. The river is not subject to floods or freshets, but its water surface rises and falls as winds raise or lower the water level in Albemarle Sound. The maximum fluctuation of the water surface is about 4 or 5 feet. In June 1947 the controlling depth was reported to be 10 feet.

The Thorofare has several sharp bends, and at its junction with the Cashie River are two small islands. Pass eastward of the islands and follow mid-channel up the river.

The head of navigation in Cashie River is the fixed highway bridge at **Windsor.** The bridge has a horizontal clearance of 21 feet and a vertical clearance of 4 feet at high water. Gasoline and some supplies are available at Windsor.

**Chart 1228.—Kendrick Creek (Mackay Creek)** is on the south side of Albemarle Sound just westward of the railroad trestle which crosses the sound. Several fish houses and a small cannery are here. Gasoline, fresh water, and groceries are available.

A Federal project for the improvement of Kendrick Creek provides for a channel 9 feet deep and 100 feet wide from deep water in Albemarle Sound across the bar; and for the removal of obstructions between the sound and Mackeys. The project has been completed. In June 1947, the available depth was reported to be 6½ feet.

The channel into Kendrick Creek is marked on either side by rows of piles, and by a light on the eastern side of the entrance. There are stumps in places on the shoals at the mouth of the creek. The Norfolk Southern Railway bridge just above the mouth has a swing span with a horizontal clearance of 32 feet and a vertical clearance, closed, of 9 feet at high water. **Mackeys** is a post village 0.5 mile above the entrance. The highway bridge over the creek at Mackeys has a swing span with horizontal clearance of 31 feet and a vertical clearance, closed, of 4 feet. The head of navigation is at **Roper,** 6 miles above the mouth.

**Bull Bay** is on the south side of Albemarle Sound, several miles eastward of the highway bridge which crosses the sound. Several small creeks empty into the western side of the bay. A channel with a depth of about 7 feet leads through the flats to the entrances of the creeks.

**Scuppernong River** empties into the eastern end of Bull Bay from southeastward. Lights mark the entrance from the bay, and there are buoys at critical points between the entrance and Columbia.

A Federal project for the improvement of Scuppernong River provides for a channel 10 feet deep and 150 feet wide across the bar; thence 10 feet deep and 100 feet wide up to and in front of the town of Columbia; thence 8 feet deep and 40 feet wide to Spruills Bridge, near Creswell, including six cut-offs; thence 7 feet deep and 30 feet wide to the highway bridge near Cherry; and a turning basin 7 feet deep, of a triangular form 150 feet wide on a side, near Cherry bridge, at the mouth of Mauls Creek. The project has been completed. In June 1947, the controlling depths were reported to be 9 feet from the mouth to Columbia, 8½ feet to Spruills Bridge, and 6½ feet to Cherry.

**Columbia,** a village 4 miles above the mouth of the river, offers rail communication and some supplies and gasoline. **Storm warnings** are displayed in the daytime. The one dock at Columbia is 100 yards below the highway bridge; the dock is in poor condition but is used for unloading oil.

The highway bridge has a swing span with a horizontal clearance of 38 feet and a vertical clearance, closed, of 2 feet at high water. The Norfolk Southern Railway bridge, just above the highway bridge, has a swing span with a horizontal clearance of 39 feet and a vertical clearance, closed, of 5 feet at high water; just above the railway bridge, a power line over the river has a vertical clearance of about 75 feet.

**Cross Landing Bridge,** 12 miles above the mouth of Scuppernong River, has a swing span with a horizontal clearance of 42 feet and a vertical clearance, closed, of 1½ feet at high water. **Spruills Bridge,** 15 miles above the mouth and near **Creswell,** has a swing span with a horizontal clearance of 30 feet and a vertical clearance, closed, of 3½ feet at high water; opening of the bridge requires at least 24 hours' advance notice. The fixed bridge at **Cherry,** 17 miles from the mouth of the river, has a horizontal clearance of 40 feet and a vertical clearance of 4 feet at high water.

**Alligator River** is on the south side of Albemarle Sound directly opposite Pasquotank River. For about 18 miles above the mouth (see also Chart 1231), Alligator River has a southerly direction, is 2 to 3 miles wide, and has general depths of 8 to 11 feet. Above this the river has a further length of about 24 miles, is narrow and crooked, but has depths of 6 feet or more nearly to its head; the upper part, however, is too narrow to turn in. Logs are towed from the river in barges and rafts.

The entrance to Alligator River is full of shoals, but the channel of the Intracoastal Waterway has been dredged through the shoals and along the entire length of the wider part of the river. The route of the waterway through Alligator River is well marked, and is discussed further under its own heading.

On the eastern side of Alligator River and just above the mouth is the entrance to **East Lake** and **South Lake,** which have general depths of 6 to 8 feet. The post village of **East Lake** is on the east side of the river and 4 miles above the mouth. There is regular ferry service between **East Lake Landing** and Fort Landing on Little Alligator River. Connection between East Lake and Roanoke Island is by highway to Croatan Sound, thence by ferry across the sound.

Little Alligator River empties into Alligator River from westward just inside the entrance. The narrow, crooked channel of Little Alligator River has depths of 5 feet for about 6 miles above the mouth. **Fort Landing** is a post village on the north bank of the river and 2 miles from the mouth. Gasoline and some supplies are available at the village. A ferry runs to East Lake Landing. Off Fort Landing is an excellent small-boat anchorage in depths of 4 to 6 feet.

## Croatan and Roanoke Sounds

Chart 1229

**Croatan Sound,** between Roanoke Island and the mainland, connects Albemarle and Pamlico Sounds. A Federal improvement project provides for a channel 10 feet deep and 200 feet wide through Croatan Sound. In April 1947, the controlling depth was reported to be 7½ feet.

The dredged channel is well marked by buoys and lights, but strangers should not attempt passage at night. Fish stakes are numerous in the sound in season, particularly at the northern and southern ends.

Height of water in Croatan Sound depends entirely on the winds, which may under exceptional conditions lower or raise the level as much as 1½ feet from the normal; easterly winds lower the water and westerly winds raise it. Strong northerly or southerly winds produce currents which are especially marked when the wind shifts suddenly to the opposite direction.

There is a good harbor in **Peter Mashoes Creek,** westward of Croatan Light, but entrance is possible only for small craft. **Manns Harbor,** westward of Blockade Shoal Light, has a small dock to which a draft of about 4 feet can be carried. Gasoline can be procured at Manns Harbor. Regular ferry service plies between Manns Harbor and Roanoke Island.

**Roanoke Marshes** is the name of the point and fishing station opposite the south end of Roanoke Island. The fishing station and several small wharves are along the crooked slough, from 50 to 100 yards wide, which leads in a north-south direction across the point. A small vessel can enter either end of the slough and secure to the steep banks, or at the wharves, with good shelter. Least depth at either entrance is 7 feet and the depths inside are 12 to 16 feet. Both entrances at times are nearly blocked by fish stakes, but a narrow, clear passage is maintained.

**Roanoke Island** is about 10 miles long in a north-south direction and averages 2 miles in width. A causeway over **Roanoke Sound** connects the island with the outer beach and the highway to Norfolk; the causeway has a swing span with a horizontal clearance of 40 feet and a vertical clearance, closed, of 6 feet at high water. A ferry operates between **Weir Point,** near the north end of the island, and Manns Harbor, on the opposite side of Croatan Sound. The restoration of historic **Fort Raleigh,** site of the **Lost Colony,** is at the northern end of Roanoke Island.

**Manteo,** the principal town on Roanoke Island and the seat of Dare County, N. C., is at the head of **Shallowbag Bay,** which is entered from Roanoke Sound. A large elevated tank in Manteo is conspicuous; **storm warnings** are displayed day and night from the courthouse. Gasoline, Diesel oil, and some supplies are available.

A Federal improvement project provides for a channel 6 feet deep and 100 feet wide from that depth in Roanoke Sound to the town of Manteo, about 2.3 miles, and for a connecting channel of the same dimensions extending south through Roanoke Sound and Walter Slough to Oregon Inlet, about 9.5 miles. The project is completed. In June 1947, the controlling depths were reported to be 5½ feet to Manteo and 4½ feet to Oregon Inlet.

The channels to Manteo and Oregon Inlet are well marked. Boats of less than 5 feet draft can anchor in Shallowbag Bay just southeast of the Manteo wharves or between the wharves and **Ballast Point.**

**Wanchese** is a post village near the south end of Roanoke Island. On the Roanoke Sound side of the village are fish houses and small docks at which gasoline, water, groceries and small charter boats are available. On the Croatan Sound side of Wanchese is **Oyster Creek,** which affords good shelter for small craft; the entrance to the creek is marked by a daybeacon and a light. There is an ice plant on the shore of Oyster Creek.

# Pamlico Sound

Charts 1229, 1231, 1232, 537, 538

**Pamlico Sound,** the largest body of water in North Carolina, is separated from the Atlantic Ocean by a narrow beach extending from Bodie Island Light to Cape Hatteras, a distance of about 35 miles, and thence in a west-southwesterly direction for an additional 35 miles. From Croatan Sound to the mouth of Neuse River the distance through the middle of Pamlico Sound is about 65 miles. Maximum width of the sound is about 25 miles. Oregon, Hatteras, and Ocracoke Inlets pierce the narrow beach, giving access to the ocean, but all are blocked by inside bars with little depth over them; they are described elsewhere in this volume.

The northern and western shores of Pamlico Sound are broken by numerous small bays and two large rivers, Pamlico River and Neuse River. General depths in the middle of the sound are 14 to 24 feet, but shoals extend miles from shore in many places. Bluff Shoal, northward of Ocracoke Inlet, has 7 to 12 feet over it and extends completely across the sound.

In the exposed parts of the sound, strong winds from any direction raise a short, choppy sea uncomfortable to small craft and even dangerous to open boats; but protected anchorage for small craft can be found in the many bays along the northern shore, and along the southern shore in several sloughs which lead to sheltered berths in the lee of shoals. Middletown Anchorage and the anchorage in the bight formed by the hook of Royal Shoal can be made either day or night.

Tides, except at the inlets where there is a rise and fall of about 2 feet, are due entirely to winds. Easterly and westerly winds produce the greatest change in water level, which rarely exceeds 2 feet. Currents are negligible except in the vicinity of the inlets.

**Chart 1229.—Stumpy Point Bay,** on the west side of Pamlico Sound and 10 miles from the south end of Roanoke Island, affords good anchorage in depths of 3 to 4 feet. A dredged channel leads from deep water in the sound to **Lake Worth,** a small village at the head of the bay. Gasoline can be obtained at the village. The channel to Lake Worth is well marked. In April 1947, the controlling depth was 3 feet.

**Long Shoal River,** which flows southerly into Pamlico Sound about 8 miles southwestward of Stumpy Point Bay, is 1.5 miles wide at the mouth and is a good anchorage for vessels with drafts of 8 feet or less. Shoals, with 1 to 2 feet over them, on both sides of the entrance break up the sea from southward. The channel has a depth of 9 feet to an anchorage off **Pains Bay,** thence 7 feet for 1 mile, thence 4 feet for 2 miles. **Long Shoal,** to the east of the entrance, and **Pingleton Shoal,** on the west, are marked by lights, and buoys mark the points of shoals in the entrance. In a smooth sea vessels of less than 7 feet draft can cross Long Shoal just northwest of the light. With the aid of the chart, strangers should have little difficulty entering Long Shoal River in daytime.

The channel from Pamlico Sound to the village of Rodanthe on the barrier beach has been discussed in connection with the outer coast.

**Chart 1232.**—Cape Channel and the villages of Avon, Buxton, and Frisco have been described in connection with the outer coast.

**Pamlico Sound, prohibited area.**—*The Area.*—The area is bounded by a circle with a radius of 1.5 miles centered in latitude 35°32′16″ N., longitude 75°40′49″ W.

*The Regulations.*—1. The area will be dangerous and closed to navigation except for military vessels as may be directed by the enforcing agency to enter on assigned duties.

2. The regulations will be enforced by the Commanding Officer, Naval Aviation Ordnance Test Station, Chincoteague, Va.

**Far Creek,** on the northwest side of Pamlico Sound between Pingleton Shoal and **Gibbs Shoal,** leads to the town of **Englehard,** which is connected with the interior by a paved highway. Gasoline is obtainable at the town.

A Federal project for the improvement of Far Creek provides for a channel 7 feet deep and 60 feet wide from Pamlico Sound to a point about 200 feet below the highway bridge at Englehard, with a turning basin at the head. The total length of channels included in the project is about 2 miles. The project has been completed, and the channel is well marked. In June 1947, the controlling depth was reported to be 7 feet.

**Middletown Anchorage,** a broad, open bight in the northern shore of Pamlico Sound, has depths of 9 to 13 feet and is sheltered from eastward by Gibbs Shoal, which has 1 to 4 feet over it. There is no shelter from southeasterly or southerly winds. The anchorage is large and easy of access, and is used by tows and other vessels. **Middletown** is a short distance inland from the anchorage and is reached by light-draft boats by way of **Middletown Creek.** Vessels must pass south of the light on the southeast end of Gibbs Shoal in entering.

Caution should be used in approaching Middletown Anchorage at night, as the low, marshy shore extends long distances from the woods in places and does not show well. In rough weather vessels with drafts less than 5 feet prefer to pass inside Gull Shoal Light when bound southwestward from Middletown Anchorage. They enter Wysocking Bay, pass westward of Gull Rocks, and between the rocks and **Hog Island Point;** the southern end of this passage is marked by a light 0.4 mile eastward of **Hog Island.**

**Wysocking Bay** indents the north shore of Pamlico Sound northwestward of Gull Shoal Light. It is a convenient anchorage for small craft with drafts less than 6 feet when following the north shore of the sound. The entrance is obstructed by shoals, through which a buoyed channel leads northward of **Gull Shoal** and into the bay. **Gull Rocks,** on the south side of the entrance to the bay, are covered at ordinary water levels.

A canal, reported in March 1947 to have a depth of 3 feet, leads from the head of Wysocking Bay to **Nebraska,** a village 2 miles inland where gasoline and supplies can be obtained. A light marks the approach to the canal, but local knowledge is required to carry the best water between the spoil banks. The head of the bay has general depths of 2 to 5 feet.

**Chart 1231.**—**Bluff Point,** low and marshy, separates **East Bluff Bay** and **West Bluff Bay,** two unimportant bights southwestward from Wysocking Bay. A light marks the end of the shoal making eastward from Bluff Point. Extending southward from Bluff Point is a large area of shoal water, a tongue of which, called **Bluff Shoal,** extends completely across Pamlico Sound. Depths on Bluff Shoal are 7 to 12 feet, and the best crossing is marked by **Bluff Shoal Light,** 40 feet above the water and visible 11 miles, and shown from a black skeleton tower on piles. A 12-foot slough through the shoal is

1 mile northward of the light and is marked on its south side by a buoy. A buoy also marks the 4-foot shoal 2 miles south-southeastward of Bluff Point.

**Juniper Bay,** on the north side of Pamlico Sound 4 miles westward of Bluff Point, is about 1.5 miles wide at the entrance, but narrows gradually toward its head, and dwindles to a narrow, crooked stream 3 miles above the entrance. Shoals make off from both shores, but the middle of the bay has depths of 7 to 10 feet. The bay has considerable traffic in small craft with drafts less than 5 feet. These boats make the passage to and from Belhaven by way of Swanquarter Narrows, Swanquarter Bay, and the canal to Deep Bay.

**Pamlico Sound, Bombing Target No. 7.**—*The Danger Area.*—The waters of Pamlico Sound which are encompassed by a circle of 3,000 yards radius centered at 35°19′00″ N., 76°16′15″ W., said central point being on Great Island and approximately 4,030 yards 130° from Swanquarter Narrows Light.

*The Regulations.*—The waters in the above area shall be closed to navigation except for vessels proceeding along established waterways. The Commanding Officer, MCAS, Cherry Point, N. C., shall be the enforcing agency.

**Note.**—Adequate safety precautions shall be taken before and during target practice. Operations will be suspended, if necessary, to insure the safety of craft proceeding along established waterways.

**Great Island,** on the west side of the approach to Juniper Bay, is low and grassy. **Swanquarter Narrows (Great Island Narrows),** between the island and the mainland to the north, is navigable for vessels of 6 feet draft. A light marks the western entrance to the narrows.

**Swanquarter Bay,** northwestward of Great Island, is about 2 miles wide at the mouth, but narrows gradually toward its head 4 miles above. Depths in the bay are 7 to 12 feet to abreast the town of Swanquarter. The natural channel is marked by lights and buoys. Oyster beds are numerous in the bay.

**Swanquarter,** the seat of Hyde County, is the center of trade for much of this area. The town connects with the interior by a hard-surfaced highway via Belhaven and Washington. Gasoline and some supplies are obtainable at Swanquarter.

A Federal project provides for a channel 8 feet deep and 60 feet wide from Deep Bay through the marsh to Swanquarter Bay, and thence through **Swanquarter Canal** to a basin of the same depth about 500 feet long, and 60 to 300 feet wide, at Swanquarter. Lights mark both ends of the cut from Deep Bay and the entrance to Swanquarter Canal. In June 1947, controlling depths were reported to be 4½ feet from Deep Bay to Swanquarter Bay, and 5½ feet in the Swanquarter Canal.

**Rose Bay,** westward of Swanquarter Bay and on the north side of the entrance to Pamlico River, is 1.8 miles wide at the entrance, but shoals making out from both sides restrict the entrance channel to a width of 0.6 mile. The channel has depths of 8 feet or more for 4 miles from the entrance, and is marked by the entrance light and several buoys. Above this the channel is narrow and crooked but has a depth of 6 feet to **Watch Point,** where there is a pier which can accommodate boats of 4 feet draft.

**Deep Bay,** leading eastward from just inside the entrance of Rose Bay, is the approach to the land cut to Swanquarter Bay. Local vessels of 4 to 5 feet draft generally use this route. A narrow channel, locally known as **The Blowout,** has been cut through the narrow neck of **Judith Island** from Deep Bay to **Deep Cove,** on the Pamlico Sound side. The channel is used considerably by local fishermen, but strangers should not at-

tempt passage. In April 1947, the controlling depth was reported to be 4 feet over a width of 40 feet.

**Pamlico River** and Tar River are the two names applied to the same river, it being known as the Pamlico below Washington, N. C., and as the Tar above that point. The river rises in Person County, flows in a general southeasterly direction for 190 miles, and empties into the northwestern part of Pamlico Sound. The Pamlico River has depths of 12 feet or more for a distance of 20 miles above the mouth; above that point the river has been improved by dredging.

Pamlico River is nontidal; variations in the water level at Washington, due to prevailing winds, seldom exceed 2 feet. The extreme range of the flood or freshet stage for the Tar River is 34 feet at Tarboro. For the lower section, the extreme range due to winds is 8½ feet.

**Pungo River,** which empties into Pamlico River from northward about 5 miles above the mouth, has a channel well marked by buoys and lights and can be readily followed by a stranger for a distance of 15 miles. The river then narrows but still has a least channel depth of about 8 feet to **Leechville,** a village 18 miles above the mouth. The highway bridge over the river at Leechville has a swing span with a horizontal clearance of 34 feet; at least 24 hours' advance notice is required to have the bridge opened.

Tributary to the Pungo River are several navigable creeks from which logs are towed to Belhaven. The most important are Slade Creek, Wilkerson Creek, Pungo Creek, and Pantego Creek. The route of the Intracoastal Waterway follows the Pungo River from **Wilkerson Creek** to and across Pamlico River; the creek is the western end of the Alligator River-Pungo River Canal and empties into Pungo River about 2.5 miles below Leechville.

**Slade Creek** empties into Pungo River from eastward about 4 miles above the mouth. The creek has depths of 8 feet or more for a distance of 2 miles from the mouth, and 4 feet for 2 miles farther.

**Pungo Creek** empties into Pungo River from westward about 8 miles above the mouth of the river and 1.5 miles southwestward of Belhaven. A highway bridge 2.5 miles above the mouth of the creek has a swing span with a horizontal clearance of 35 feet and a vertical clearance, closed, of 3 feet at high water; at least 24 hours' advance notice is required to have the bridge opened. The creek has depths of 7 feet or more to the bridge and 6 feet for about 2 miles farther.

**Pantego Creek** empties into Pungo River from northward about 9 miles above the mouth of the river. Timber breakwaters make out from both shores of the entrance. The outer end of the north breakwater is marked by a light.

**Belhaven,** on the northeastern side of the entrance to Pantego Creek, has an excellent harbor for small craft. There are eight wharves along the Belhaven water front; one has rail connections. The City Pier has a depth of about 12 feet alongside and is open to all without charge. The oil dock immediately northwestward can accommodate a draft of about 9 feet, and the cooperage company wharf has a depth of about 10 feet at the outer end.

Belhaven is connected with the interior by highway and rail, the latter being used to ship oysters, crabs, and lumber. Gasoline, Diesel oil, water, ice, provisions, and some coal are obtainable at the town. One marine railway at Belhaven has a 25-ton capacity and can handle a length of 40 feet; however, draft to the railway is limited to 4 feet. In April 1947, two additional railways were being constructed at City Pier; the larger was

to have a capacity of 50 tons. A complete repair shop was being installed in connection with the new railways.

The Federal project for improvement of Belhaven Harbor provides for a channel 12 feet deep and 100 feet wide extending from deep water in Pungo River to a point 800 feet east of the highway bridge, with a turning basin 800 feet long and 300 feet wide at the upper end; and for the construction of timber breakwaters at the mouth of Pantego Creek. The project has been completed and the channel is well marked. The breakwaters are in fair condition. In June 1947, the controlling depths were reported to be 12 feet to Belhaven and 11 feet in the turning basin.

A highway bridge over Pantego Creek just above Belhaven has a swing span with a horizontal clearance of 40 feet and a vertical clearance, closed, of 4 feet at high water. The creek has depths of 7 feet for a distance of 1 mile above the bridge.

**Goose Creek** empties into Pamlico River from southward about 7 miles above the mouth of the river. The dredged channel of the Intracoastal Waterway, well marked by lights and buoys, crosses the shoals which obstruct the mouth of the creek, and passes southward to **Upper Spring Creek** and the land cut which connects with Bay River. Other navigable tributaries of Goose Creek are **Lower Spring Creek, Dixon Creek, Snode Creek, Eastham Creek,** and **Campbell Creek.** Logs are towed from Goose Creek.

**Chart 537.—South Creek** empties into Pamlico River from southward about 9 miles above the entrance. The deeper entrance is southward of **Indian Island** and the shoal extending westward from the island to **Hickory Point.** South Creek has depths of 7 feet or more for a distance of 4 miles above Hickory Point; above this the creek has been improved by dredging. A depth of about 5 feet can be taken across the shoal west of Indian Island; a light and buoys mark the best water. The deeper channel into South Creek is well buoyed.

**Bond Creek,** on the south side of South Creek opposite Hickory Point, has depths of about 6 feet to the small fish wharf at the post village of **South Creek.** Buoys mark the entrance to Bond Creek.

A Federal project for the improvement of the upper part of South Creek provides for a channel 7 feet deep and 100 feet wide, with necessary widening at bends, from the 7-foot contour in South Creek to the town of Aurora; thence 7 feet deep and 50 feet wide to Royal, thence 7 feet deep and 35 feet wide to Idalia. In June 1947, the controlling depth was reported to be 6 feet.

**Aurora,** a village with rail connections, is 7 miles above Hickory Point. Gasoline and some supplies are available at the village. The docks have a depth of about 7 feet alongside. The highway bridge over South Creek at Aurora has a swing span with a horizontal clearance of 40 feet and a vertical clearance, closed, of 5 feet at high water. The railroad bridge at **Royal,** 1.3 miles above Aurora, has a swing span with a horizontal clearance of 35 feet and a vertical clearance, closed, of 4½ feet at high water. At least 24 hours' advance notice is required to have either bridge opened. Small boats use the creek as far as **Idalia,** 1 mile above Royal.

**North Creek** empties into Pamlico River directly opposite South Creek. The channel has depths of 6 feet or more for about 1.5 miles and is buoyed at the entrance, but its navigation should not be attempted by strangers. Some lumber is shipped from North Creek.

**Durham Creek** empties into Pamlico River from southward 17.5 miles above the mouth and 2.5 miles westward of **Rumley Marsh Light.** The creek has depths of 3 feet or more nearly to **Bonnerton,** 4 miles above the entrance. A light marks the west side of the narrow entrance channel.

**Bayview** is a pleasure resort on the north bank of Pamlico River 2 miles above Rumley Marsh Light. Small tourist cabins are available, and a good secondary road connects with the paved highway about 7 miles northward. The nearest rail connections are at Washington, about 20 miles distant by highway. Several privately owned docks at Bayview can accommodate small yachts.

**Bath Creek** flows southerly into Pamlico River 3.5 miles above Rumley Marsh Light. The creek has depths of 7 feet or more for 1.8 miles to the bridge at the village of **Bath,** and 5 feet for about 1.7 miles farther. The most difficult part of the channel to Bath is the entrance, where a shoal with grass showing extends halfway across from the west side and drops off abruptly. The outer edge of the shoal is marked by a light.

The highway bridge at Bath has a swing span with a horizontal clearance of 39 feet and a vertical clearance, closed, of 4½ feet at high water; at least 24 hours' advance notice is required to have the bridge opened. The dock below the bridge has a depth of about 9 feet alongside; and the depth along the bulkhead north of the bridge is about 6 feet. Gasoline and some supplies are available at Bath.

**Blount Creek** flows northerly into **Blount Bay,** which is on the south side of Pamlico River and about 25 miles above the mouth. A fixed bridge 0.2 mile above the entrance to the creek has a horizontal clearance of 38 feet and a vertical clearance of 18 feet at high water. The creek has depths of 6 feet or more for about 1 mile above the bridge and 3 feet for an additional 2 miles.

**Washington,** 32 miles above the mouth of Pamlico River, is the seat of Beaufort County and an important business center with communications extending to nearly all points on Pamlico River and Pamlico Sound. The city has excellent rail and highway connections, and there is weekly freight-boat service to Ocracoke Island. Gasoline, oil, and lumber are the principal items shipped by water.

Washington has hotel accommodations, and gasoline, Diesel oil, water, ice, and bituminous coal are available. A small marine railway handles boats 50 feet long, and minor repairs can be made. The river water above Bath Creek is usually fresh enough for boilers. Marine documents may be issued at Washington, and the city has a third-class medical relief station of the United States Public Health Service. **Storm warnings** are displayed day and night.

The Federal project for the improvement of Pamlico and Tar Rivers provides for a channel 12 feet deep and 200 feet wide from the 12-foot contour in the river below Washington to the Atlantic Coast Line Railroad bridge at Washington; 12 feet deep and 100 feet wide from Washington to a turning basin of the same depth, 200 feet wide and 300 feet long, in Hardee Creek, 1,500 feet above its mouth; 6 feet deep and 75 feet wide to Greenville; 20 inches deep and 60 feet wide to Tarboro. The project has been completed. The channel to Washington is well marked. In October 1947 the controlling depth to the Atlantic Coast Line Railroad bridge at Washington was 11½ feet. In June 1947 controlling depths above Washington were reported to be 12 feet to and including the turning basin at Hardee Creek, 3½ feet to Greenville, and 1 foot to the mouth of Fishing Creek.

The principal towns on the **Tar River** above Washington are **Greenville,** 19 miles, and **Tarboro,** 43 miles. **Fishing Creek** joins Tar River 4 miles above Tarboro.

The three bridges at Washington have swing spans with minimum clearances of 57 feet horizontally and 7 feet vertically, when closed, at high water. The highway bridge 7 miles above Washington has a swing span with a horizontal clearance of 42 feet and vertical clearances, closed, of 3½ feet at extreme high water and 10½ feet at low water. The fixed highway bridge at Greenville has a horizontal clearance of 197 feet and vertical clearances of 10 feet at extreme high water and 31 feet at low water.

The railroad bridge at Greenville has a swing span with a horizontal clearance of 57 feet and vertical clearances, closed, of 11 feet at extreme high water and 22 feet at low water. At least 24 hours' advance notice is required to have this bridge, and all other drawbridges above it, opened.

The fixed highway bridge 9 miles above Greenville has a horizontal clearance of 40 feet and vertical clearances of 6 feet at extreme high water and 33 feet at low water. The highway bridge 17 miles above Greenville has a swing span with a horizontal clearance of 43 feet and vertical clearances, closed, of 2 feet at extreme high water and 25 feet at low water. The railroad bridge at Tarboro has a swing span with a horizontal clearance of 69 feet and vertical clearances, closed, of 19 feet at extreme high water and 31 feet at low water. The fixed highway bridge at Tarboro has a horizontal clearance of 46 feet and vertical clearances of 25 feet at extreme highwater and 37 feet at low water.

**Chart 1231.—Mouse Harbor, Big Porpoise Bay,** and **Middle Bay** are small, shallow bays on the western side of Pamlico Sound between Pamlico River and Jones Bay. Small-boat passages connect Mouse Harbor with Clark Creek, on the Pamlico River, and Big Porpoise Bay with Middle Bay. Neither is over 2 feet deep. The three bays are frequented only by local fishermen. There are no aids to assist a stranger.

**Jones Bay,** on the western side of Pamlico Sound just northward of the entrances of Bay and Neuse Rivers, has depths of 7 feet or more for a distance of 4 miles above its mouth. The entrance is somewhat obstructed by shoals through which a buoyed channel leads into the bay. On the north side, near the head of the bay, is the post village of **Hobucken.** Small craft bound for the village can land in the cove 0.8 mile above **Drum Creek. Ditch Creek,** on the opposite side of the bay from Drum Creek, leads to an old canal through which small boats can be taken at high water to Bay River. Hobucken is discussed further in connection with the Intracoastal Waterway which crosses the head of Jones Bay and links it with Goose Creek on the north and Bay River on the south.

The approach to Jones Bay from eastward is over or around **Brant Island Shoal,** which extends for 10 miles in a southeasterly direction from the north side of the entrance to the bay. For 6 miles to Brant Island Slue Light the shoal has depths of 2 to 3 feet; between that light and Brant Island Shoal Light at the outer end are depths of 5 to 7 feet.

**Bay River** empties into the western part of Pamlico Sound between Jones Bay and the mouth of Neuse River. The entrance is marked on the south side by a lighted bell buoy, and on the north side by Bay Point Light. For a distance of 11 miles above the entrance, the channel is marked by lights and buoys, has depths of 9 feet or more, and can be followed readily. Above this point a channel has been dredged to Bayboro, which is practically the head of navigation. The route of the Intracoastal Waterway is along Bay River for 4 miles from the mouth, thence northward through **Gale Creek.**

**Vandemere** is a village and rail terminal on the north side of Bay River and 8 miles above the mouth. Gasoline and some supplies are available.

**Stonewall** is a small village on the south side of the river and 13 miles above the mouth. The docks are mostly in ruins.

**Bayboro** is 14 miles above the mouth of the river. Navigation above Bayboro is restricted by the fixed bridges at the village. The docks, which are on the east side of the creek leading to Mill Pond, are in fair condition. Depths at the oil and fish docks are 8 to 10 feet. A small marine railway can handle boats 40 feet long, but has no facilities for machine work. Gasoline, ice, and some supplies are obtainable at Bayboro. Lumber and fish are shipped out by rail.

The Federal project for the improvement of the upper part of Bay River provides for a channel 10 feet deep and 150 feet wide to a point 3,500 feet below Stonewall, and thence 10 feet deep and 100 feet wide to Bayboro; for a channel 10 feet deep and 50 feet wide in the northwest prong to the mill dam in Bayboro, ending in a turning basin 100 feet wide and 150 feet long; also for a channel 10 feet deep and 100 feet wide from deep water in Bay River to and along the wharves at Vandemere, ending in an anchorage basin 10 feet deep and 150 feet wide on the north side of the town, The project has been completed. In June 1947, available depths were reported to be 8 feet to Stonewall and Bayboro, and 10 feet to Vandemere.

**Neuse River** rises in the northern part of North Carolina and flows in a southeasterly direction until it reaches Kinston; thence northeast to the mouth of Contentnea Creek; thence southeast to a point 17 miles below New Bern; thence northeast and into the western end of Pamlico Sound. The total length of the river is about 250 miles.

The mouth of Neuse River is about 5 miles wide, but is reduced to a navigable width of little more than 2 miles by the shoals which make out from either side. The river has depths of 13 feet or more for 25 miles above the mouth; above that point it has been improved by dredging. Lights and buoys mark the channel as far as New Bern.

**Tides.**—Neuse River has practically no tides, the variations in water level being due principally to winds. Easterly winds cause high water and westerly winds low water, the maximum variations with heavy gales amounting to about 2 feet above or below the normal in the lower part of the river, and about 3 or 4 feet at New Bern. Freshets of 10 to 20 feet occur in the upper reaches of the river above New Bern, but have little effect at or below the town.

**Broad Creek** empties into the north side of Neuse River about 4 miles above the river's mouth. A light marks the west side of the entrance to the creek. **Pamlico** is a post village on the south side of the creek and 2.5 miles above the entrance; **Whortonsville** is about 0.5 miles northeast of Pamlico and on the opposite side of the creek. Gasoline is available at the piers in both villages, but only small craft of 2 feet or less draft should attempt to go to either place. Minor logging operations are conducted in Broad Creek.

**Turnagain Bay** is on the south side of Neuse River opposite Broad Creek. The channel has depths of 6 feet or more for 2 miles above the entrance and is marked by daybeacons.

**South River** flows into the south side of Neuse River about 8 miles above the latter's mouth. The entrance is marked by buoys and a light. The channel has depths of 8 feet or more for about 6 miles above the entrance.

**Chart 538.—Garbacon Shoal** extends halfway across Neuse River from the southern shore 10 miles above the mouth, leaving a clear width of about 0.8 mile between the 12-foot contours. The outer end of the shoal is marked by a lighted bell buoy.

**Oriental,** a post office and rail terminus on the north side of Neuse River 11 miles above the mouth, has excellent anchorage for small boats, and gasoline, ice, water, and supplies are available. A marine railway at Oriental can handle a length of 50 feet, and some engine repairs can be made. Oysters and fish are trucked to the interior.

On the west side of Oriental is the entrance to **Smith Creek,** which is joined just inside the entrance by **Greens Creek.** A fixed highway bridge 0.2 mile above the entrance to Smith Creek has a horizontal clearance of 40 feet and a vertical clearance of 14 feet at high water.

The Federal project for the improvement of Smith Creek provides for excavation of a basin in the small cove in the center of the town of Oriental and just below the highway bridge to a depth of 10 feet, and the removal of several lumps and projecting points in the entrance channel. The project has been completed. Lights and buoys mark the channel. In February 1948, the controlling depth to Oriental was 10 feet.

**Adams Creek** empties into the south side of Neuse River about 13 miles above the river's mouth. The creek is more particularly described in connection with the Intracoastal Waterway.

**Clubfoot Creek** flows into Neuse River from southward about 15 miles above the mouth of the river. The entrance is marked by a light. The channel southward of the light is narrow with shoals rising abruptly on both sides. Depths in the channel are 5 feet or more for 2 miles above the light. The Clubfoot Canal, depth about ½ foot at low water, connects the head of Clubfoot Creek with Newport River.

**Hancock Creek** is on the south side of Neuse River and about 20 miles above the mouth. A depth of about 8 feet can be carried through the narrow entrance to the **Cherry Point** wharf just inside by following the lighted range. The depth at the wharf is about 12 feet.

**Slocum Creek** is on the south side of Neuse River and 22 miles above the mouth. The creek has depths of 4 feet or more for 4 miles to the forks, and up the west branch for 1 mile farther to **Havelock,** a post village with rail connections. Lights, daybeacons, and buoys mark the critical part of the channel at the creek's entrance. A fixed highway bridge crosses Slocum Creek 3 miles above the entrance.

**Beard Creek** is on the north side of Neuse River opposite Slocum Creek. The mouth of the creek is marked by a light which should be left on the port hand when entering. Beard Creek has depths of 3 feet or more to the bridge 2.5 miles above the mouth.

**Goose Creek** is on the northeast side of Neuse River and 27 miles above the mouth. The creek has depths of 5 feet or more for 3 miles above the entrance.

**Upper Broad Creek** is on the northeast side of Neuse River and 28 miles above the mouth. The creek has depths of 5 feet or more for several miles above the entrance.

**New Bern,** a city on the west bank of Neuse River and 34 miles above the mouth, is the seat of Craven County and an important commercial center for this area. The rectangular, lighted clock tower atop City Hall in New Bern is visible for 10 miles down river and is an excellent landmark. Vessels proceeding up the river to New Bern are advised to stay in the channel because of the numerous fish traps scattered indiscriminately throughout the unmarked areas. The river water is slightly brackish at New Bern except during freshets.

Some lumber is shipped from New Bern by barge, and lumber, fish, fertilizers, and farm produce are shipped by rail. Coal, gasoline, Diesel oil, fresh water, ice, and supplies are available at the city. Two shipyards are on the Trent River side of New Bern, one on either side of the highway bridge. The larger yard, with four ways, has a maximum capacity of 500 tons and can handle a length of 125 feet and a width of 30 feet.

A third-class medical relief station of the United States Public Health Service is in New Bern. There are no storm warning displays at the city but warnings are distributed locally. A United States Coast Guard cutter is based at New Bern.

The Federal project for the improvement of the upper part of Neuse River provides for a channel 300 feet wide and 12 feet deep at mean low water to and in front of New Bern; 4 feet deep at dead low water for 43 miles to **Kinston**; and during 9 months of the year 3 feet deep at dead low water to **Smithfield,** 130 miles above New Bern.

Controlling depths reported in June 1947 were 11 feet to New Bern, thence 4 feet to a point 20 miles above, thence 2½ feet to the mouth of **Contentnea Creek,** 26 miles above New Bern, thence 1 foot to **Seven Springs,** 65 miles above New Bern.

It is impracticable to obtain and maintain project depths above New Bern by dredging and snagging. Strangers should not attempt navigation of that portion of the river.

The highway bridge over Neuse River at New Bern has a swing span with a horizontal clearance of 60 feet and vertical clearances, closed, of 2½ feet at extreme high water and 8 feet at low water. The railroad bridge 0.5 mile above the highway bridge has a swing span with a horizontal clearance of 59 feet and vertical clearances, closed, of 0 feet at extreme high water and 2½ feet at low water.

The highway bridge 22 miles above New Bern has a swing span with a horizontal clearance of 53 feet and vertical clearances, closed, of ½ foot at extreme high water and 13½ feet at low water; at least 12 hours' advance notice is required to have the bridge opened. A fixed highway bridge 34 miles above New Bern has a horizontal clearance of 45 feet and vertical clearances of 10 feet at extreme high water and 30 feet at low water. Four drawbridges cross the river at Kinston and two more cross a few miles below the fixed bridge at Seven Springs; all require at least 24 hours' advance notice to open.

**Trent River** empties into Neuse River on the south side of New Bern. The Federal project for the improvement of Trent River provides for a channel 12 feet deep at mean low water and 300 feet wide in front of New Bern; a channel 6 feet deep at dead low water over Foys Flats; and a channel 4 feet deep and 50 feet wide to **Trenton,** 33 miles above the mouth.

Depths reported available in June 1947 were 12 feet at New Bern, 6 feet to Pollocksville, thence 3½ feet to Trenton.

The railroad bridge over Trent River at New Bern has a swing span with a horizontal clearance of 39½ feet and vertical clearances, closed, of 0 feet at extreme high water and 2½ feet at low water. The highway bridge just above the railroad bridge has a swing span with a horizontal clearance of 41 feet and vertical clearances, closed, of ½ foot at extreme high water and 4½ feet at low water.

The railroad bridge at **Pollocksville,** 15 miles above the mouth of Trent River, has a swing span with a horizontal clearance of 40 feet and vertical clearances, closed, of 1½ feet at extreme high water and 9½ feet at low water; at least 24 hours' advance notice is required to have this bridge and all other drawbridges above it opened. The highway bridge just above the railroad bridge has a swing span with a horizontal clearance of 34 feet and vertical clearances, closed, of 3 feet at extreme high water and 10 feet at low

water. Another highway bridge 6 miles above Pollocksville has a swing span with a horizontal clearance of 44 feet and vertical clearances, closed, of 1½ feet at extreme high water and 12 feet at low water. A fixed highway bridge crosses the river at Trenton.

**Chart 1231.—Cedar Island Bay** is a large irregularly shaped body of water on the southwest side of Pamlico Sound just southward of Neuse River entrance. The shores of the bay and its numerous branches are marshy, and it is of little importance other than for its oyster beds. A depth of 9 feet can be taken into the three principal arms of the bay through narrow and devious channels. The dredged channel from the head of the middle arm eastward to Thorofare Bay is described in connection with Core Sound. Lights and buoys mark the entrance to Cedar Island Bay and the channel in the middle arm.

Hook-shaped **Royal Shoal** extends northwestward from the vicinity of Ocracoke Inlet. A light marks the point of the hook, and an abandoned lighthouse is on the northwest extremity of the shoal. Tows and other vessels sometimes anchor inside the hook when the seas are too rough to make headway in the sound. The shoal, which bares in one place and otherwise is covered 1 to 4 feet, breaks the seas so as to leave comparatively smooth water in the anchorage. Depths in the anchorage are 9 to 14 feet and the bottom has good holding properties.

## Core Sound

### Charts 419, 420

**Core Sound** extends along and just inside the barrier beach from the south side of Pamlico Sound to Cape Lookout, a distance of about 27 miles. The trend of the sound is southwesterly and the width varies between 2 and 3 miles. The sound is mostly shoal but an improved channel, well marked by lights, extends along its entire length. Behind Cape Lookout, Core Sound is joined by Back Sound and The Straits, both of which connect with Beaufort Harbor.

**Tidal currents** of 1 to 2 knots may be found in the southern part of Core Sound. It is reported that a rise and fall of about 1 foot of tide is now experienced in Core Sound due to the forming of Drum Inlet.

A Federal improvement project provides for a channel 7 feet deep and 75 feet wide from Pamlico Sound to Beaufort Harbor by way of Wainwright Slue, Core Sound, The Straits, and Taylor Creek. The controlling depth reported in June 1947 was 6½ feet.

**Chart 419.—Wainwright Slue** is a small anchorage in the northeastern entrance to Core Sound. Shelter from the sea is provided by surrounding shoals, which have depths of 1 to 3 feet over them. Depths in the anchorage are 8 to 10 feet. The channel into Core Sound is through Wainwright Slue and east of **Wainwright Island.**

**Core Sound, Bombing Target No. 1.**—*The Danger Area.*—The waters of Pamlico and Core Sounds which are encompassed by a circle of 2,000 yards radius centered at 34°

58′50″ N., 76°15′ 13″ W., said central point being approximately 1,785 yards 043° from Hog Island Point Light.

*The Regulations.*—The waters included in the above area shall be closed to navigation except for vessels proceeding along established waterways. The Commanding Officer, MCAS, Cherry Point, N. C., shall be the enforcing agency.

**Note.**—Adequate safety precautions will be taken before and during target practice. Operations will be suspended, if necessary, to insure the safety of craft proceeding along established waterways.

**Thorofare Bay** is on the northwest side of Core Sound and 8 miles from the northeastern entrance. A Federal project provides for a channel 7 feet deep and 50 feet wide from the head of Thorofare Bay, through the Thorofare, to Cedar Island Bay and Pamlico Sound. The controlling depth reported in June 1947 was 5 feet.

The **Thorofare** is a convenient passage from Core Sound to the mouth of the Neuse River and is used by local fishermen. The critical part of the channel is marked by daybeacons and lights. A highway bridge over the Thorofare near its eastern end has a retractile span with a horizontal clearance of 30 feet and a vertical clearance, closed, of 8 feet at high water.

**Atlantic** is a town on the northwest side of Core Sound about 2 miles southwestward of the entrance to Thorofare Bay. Gasoline and supplies are available at the town, and a small marine railway can handle a length of 30 feet. A mail boat operates daily from Atlantic to Portsmouth and Ocracoke on the outer beach.

A Federal project provides for a channel 7 feet deep and 75 feet wide from the main channel in Core Sound to the town of Atlantic. The controlling depth reported in June 1947 was 6½ feet.

**Chart 420.—Sealevel** is a small fishing community about 3 miles southwest of Atlantic and on the same side of Core Sound. Gasoline and some supplies are available, and the village has a small machine shop but no railway. A Federal project provides for a channel 7 feet deep and 75 feet wide from the main channel in Core Sound to Sealevel. The controlling depth reported in April 1947 was 6 feet.

**Davis,** another small community 5 miles southwest of Sealevel, ships fish and crabs to the interior by truck. Gasoline and some supplies are available at the village. A Federal project provides for a channel 5 feet deep and 75 feet wide from the main channel in Core Sound to the piers at Davis. Project depth was reported available in April 1947.

**Marshallberg** is on the west side of Core Sound and on the north side of the eastern entrance to The Straits. Fish is shipped from Marshallberg to the interior by truck. Gasoline and some supplies are available at the village, and a small marine railway has a capacity of 10 to 15 tons and can handle a length of 50 feet. Depths to the wharves at Marshallberg are 3 to 4 feet.

**Back Sound** leads westward from Core Sound for 6 miles to Beaufort Inlet, and varies in width from over 2 miles to 0.5 mile. A Federal project provides for a channel 7 feet deep and 75 feet wide through Back Sound by way of channels at the east and west ends of Harkers Island. In June 1947 no work had been done on this project and the available depth from Core Sound to Back Sound was about 3 feet.

The improved channel from Back Sound to Lookout Bight has been discussed in an earlier section.

**The Straits** parallel Back Sound on the opposite side of **Harkers Island** and afford a through passage from Core Sound to Beaufort Harbor. The average width is about 0.5 mile, but in places the channel is only 100 yards wide. However, the channel is well marked by lights. A highway bridge over the western end of The Straits connects Harkers Island with the mainland. The bridge has a swing span with a horizontal clearance of 34½ feet and a vertical clearance, closed, of 7½ feet at high water.

**Core Sound, Bombing Target No. 6.**—*The Danger Area.*—The waters of Eastmouth Bay, at the east end of Harkers Island, which are encompassed by a circle of 1,000 yards radius centered at 34°42′26″ N., 76°31′39″ W., said central point being approximately 1,690 yards 182° from Core Sound Light 44.

*The Regulations.*—The waters included in the above area shall be closed to navigation except for vessels proceeding along established waterways. The Commanding Officer, MCAS, Cherry Point, N. C., shall be the enforcing agency.

**Note.**—Adequate safety precautions will be taken before and during target practice. Operations will be suspended, if necessary, to insure the safety of craft proceeding along established waterways.

The town of **Harkers Island** is in the central part of the island and has piers both on Back Sound and at the head of **Westmouth Bay,** a cove on The Straits side of the island. Fish is shipped from Harkers Island by truck and boat. Gasoline is available at the town, and there are boat-building shops and a small machine shop. Depths to the piers are only about 2 feet.

From The Straits, the improved channel to Beaufort leads southwestward and along the north side of **Middle Marshes,** thence westward to abeam of **Lenoxville Point** where it turns sharply northward and then westward into **Taylor Creek.** The route is then westward through Taylor Creek to the wharves at Beaufort.

CHAPTER 6

# Cape Lookout to Cape Fear

## Chart 1110

THE coast extends about 8 miles in a northwesterly direction from Cape Lookout to Beaufort Inlet, and then curves gradually westward and southward to Cape Fear. This coast, nearly 100 miles in length, is similar to that between Cape Hatteras and Cape Lookout, but the strips of land forming it are separated from the mainland by much narrower bodies of water, and consequently the thick woods of the mainland can be seen from much farther seaward.

Depths along this stretch of coast are regular, and 4 to 6 fathoms can be taken to within 1.5 miles of the beach. The 10-fathom curve is nearly parallel to the shore, and at an average distance of about 10 miles off, until eastward of Cape Fear, where it bends southeastward around Frying Pan Shoals. The 20-fathom curve is from 20 to 45 miles offshore.

## Beaufort Inlet

Chart 420

**Beaufort Inlet** is the approach to the most important coastal harbor between Cape Henry and Cape Fear. Prominent and easily recognized objects are a hotel 3 miles west of Morehead City, a standpipe at the eastern end of that city, the marine biological station on **Piver Island** near Beaufort, a water tank in Beaufort, and the cupola of the Fort Macon Coast Guard Station on the west side of the entrance. **Fort Macon,** now a State park, is just east of the Coast Guard station.

A Federal project provides for a channel 30 feet deep and 400 feet wide across the ocean bar at Beaufort Inlet, thence same depth and 300 feet wide to the marine terminal



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at Morehead City, enlarged to 600 feet to form a turning basin at that point; for a channel 12 feet deep and 100 feet wide from the 30-foot channel to Sixth Street, Morehead City, thence same depth and 200 to 400 feet wide to Tenth Street, thence 6 feet deep and 75 feet wide to deep water in Bogue Sound. The channels are maintained and are well marked.

**Morehead City,** on the western side of the harbor, connects with the interior by rail and paved highways, has telephone and telegraph communications, and is a shippoing point for oysters, clams, fish, and fish products. Coal, gasoline, Diesel oil, ice, fresh water, and provisions are available, and there are good hotel accommodations. The largest of the several marine railways has a capacity of 350 tons, can handle a length of 120 feet and a draft of 11 feet, and has complete facilities for hull and engine repairs. The marine terminal, fronting on the main channel, provides dockage for large vessels. Small vessels dock at the piers north of the railroad bridge and at those fringing the channel along the water front west of the terminal. **Storm warnings** are displayed day and night at Morehead City.

**Pilotage.**— Pilotage from the sea to the Morehead City Terminal is compulsory for vessels in foreign trade, and also for vessels in domestic trade except those under 60 tons lawfully engaged in coastwise trade and coastwise vessels having on board a pilot licensed by the United States Coast Guard. Vessels are boarded by pilots at the sea buoy.

The following table gives charges for one-way pilotage for vessels with cargo or entering the port for bunkering.

| Draft, feet | Total charges | | Draft, feet | Total charges | |
|---|---|---|---|---|---|
| | Cargo | Bunkering | | Cargo | Bunkering |
| 10 and under | $25 | $15. 00 | 19 to 20 | $110 | $55. 00 |
| 10 to 11 | 30 | 15. 00 | 20 to 21 | 120 | 60. 00 |
| 11 to 12 | 35 | 17. 50 | 21 to 22 | 130 | 65. 00 |
| 12 to 13 | 40 | 20. 00 | 22 to 23 | 140 | 70. 00 |
| 13 to 14 | 50 | 25. 00 | 23 to 24 | 150 | 75. 00 |
| 14 to 15 | 60 | 30. 00 | 24 to 25 | 160 | 80. 00 |
| 15 to 16 | 70 | 35. 00 | 25 to 26 | 165 | 82. 50 |
| 16 to 17 | 80 | 40. 00 | 26 to 27 | 170 | 85. 00 |
| 17 to 18 | 90 | 45. 00 | 27 to 28 | 175 | 87. 50 |
| 18 to 19 | 100 | 50. 00 | | | |

**Quarantine.**—Morehead City has no quarantine station. Vessels subject to visitation will be boarded by an officer of the United States Public Health Service stationed at the port. A third-class relief station for seamen is in the Morehead City General Hospital.

**Customs.**—A deputy collector of customs will come from Wilmington when requested.

**Immigration.**—The Immigration Service has an office in the post-office building at Wilmington, from which an official will be detailed for such services as may be required.

**Tides.**—The mean range of tides at Morehead City is 2½ feet.

**Currents.**—Tidal currents in the entrance attain velocities of 2 to 3 knots. They usually set along the channel, but near the end of the flood and the beginning of the ebb

they may set across the channel. See the *Atlantic Coast Current Tables* for predicted times and velocities.

**Beaufort,** on the eastern side of the harbor, has rail, highway, telephone, and telegraph communication with the interior, and hotel accommodations are available. Gasoline, Diesel oil, ice, fresh water, provisions, and some ship chandlery may be obtained here. Oysters and fish products are shipped inland by rail and truck. Two marine railways, each with two ways and depths of about 8 feet in their slips, have capacities of 30 to 35 tons and can handle craft up to 50 feet in length. Both engine and hull repairs can be made. Beaufort is a customs port of entry at which marine documents are issued. **Storm warnings** are displayed day and night. A third-class medical relief station of the United States Public Health Service is in the Potter Building.

The town of Beaufort is reached from Beaufort Inlet and the deep-water channel by way of **Bulkhead Channel,** and from the north and the main channel of the Intracoastal Waterway by way of **Gallant Channel.** The channel eastward along the Beaufort water front, and through Taylor Creek to The Straits and Core Sound, has been discussed in a previous section.

A Federal project provides for a channel 12 feet deep, 100 feet wide in Bulkhead and Gallant Channels and 600 feet wide in front of the town of Beaufort. The controlling depth reported in June 1947 was 11½ feet.

Rail and highway connect Beaufort and Morehead City by means of bridges over Gallant Channel, causeways across the marsh islands, and bridges over the main route of the Intracoastal Waterway. The highway bridge over Gallant Channel has a bascule span with a horizontal clearance of 60 feet and a vertical clearance, closed, of 7 feet at high water. The railroad bridge 100 yards to the north has a bascule span with the same horizontal clearance and a vertical clearance, closed, of 8 feet at high water. The bridges over the Intracoastal Waterway are described under that heading.

**Newport River** is a broad, shallow stream emptying into the head of the harbor. The route of the Intracoastal Waterway from Core Creek into Newport River, and past Morehead City into Bogue Sound, is discussed in another section.

**Atlantic Beach** is a resort on the ocean side of Bogue Banks, directly opposite Morehead City. The highway bridge connecting the resort with Morehead City is described in connection with the Intracoastal Waterway.

## Beaufort Inlet to Cape Fear River

Charts 1234, 1235, 1236, 777

Between Beaufort Inlet and Cape Fear River are several inlets through which 2 to 6 feet can be carried to sheltered anchorage, but all are obstructed by shifting bars on which the sea breaks when at all rough. An onshore wind, even if light, will cause a heavy break on the bars, while an offshore wind may be heavy without making the bars dangerous. Strangers bound southward in small craft should not leave a sheltered anchorage with the wind anywhere between southeast and southwest, and should find

anchorage as soon as possible after the wind begins to blow from those directions. The best guide for entering or leaving the inlets is the appearance of the water, as breakers always form on the shoal areas; but strangers should not attempt to enter an inlet when breakers form entirely across it.

**Chart 1234.—Bogue Sound** is shallow and extends 22 miles westward along the coast from Beaufort Inlet to Bogue Inlet. The sound is separated from the ocean by Bogue Banks, a wooded beach 0.1 to 0.7 mile wide. The sound has a width of about 2 miles midway of its length, but narrows at each end; at its western end are numerous marshy islets. Passage through Bogue Sound by way of the Intracoastal Waterway is well marked by lights and should give strangers no difficulty.

Tides in Bogue Sound vary from about 2½ feet average rise and fall near the inlets to about 1 foot where the tides meet near the middle. Strong south or southwest winds may raise the tide a foot or more, and north to northwest winds lower it the same amount.

**Bogue Sound, prohibited area.**—The area is enclosed by the following four points:

1. 34°42′00″ N., 76°55′35″ W. This point being approximately 4,200 yards 289° from the spire southeastward of Rock Point.
2. 34°42′12″ N., 76°53′48″ W. This point being approximately 2,030 yards 330° from said spire.
3. 34°38′05″ N., 76°54′55″ W. This point being approximately 7,150 yards 204°30′ from said spire.
4. 34°38′17″ N., 76°53′10″ W. This point being approximately 6,140 yards 180°30′ from said spire.

A float is located within the area at a point 2,290 yards 262° from the Rock Point spire and 12 white buoys are placed at intervals of 50 feet bearing 340° from the float, the buoy closest to the float being 600 feet distant.

*The Regulations.*—1. No vessel shall enter the area for any purpose other than operations or maintenance work ordered by the enforcing agency.

2. The Commanding Officer, MCAS, Cherry Point, N. C., will be the enforcing agency. Adequate safety precautions will be taken.

**Bogue Inlet** is the seaward approach to the town of Swansboro, which can be seen from outside. The entrance is used almost exclusively by local fishermen. The inlet is between a high wooded ridge on the west and a long low spit on the east. On the inside of the spit, and 1 mile eastward of the inlet, is Swansboro Coast Guard Station. The entrance is obstructed by a shifting bar extending about 1 mile seaward, through which the channel depth does not exceed 3 feet at low tide. The tides have a range of about 2½ feet on the bar, and high water occurs 2 hours earlier than at the head of the marshes inside.

The channel into Bogue Inlet is continually changing and the buoys marking it are shifted frequently. Strangers should wait for a rising tide and never attempt to enter when the bar is breaking. If fishermen happen to be coming in, it is advisable to follow them. The channels inside the inlet also are subject to considerable change, particularly during southeast and southwest storms.

**Swansboro,** a small town on the west bank of White Oak River and 3 miles north of Bogue Inlet, is reached by the shifting channel from the inlet, and from Bogue Sound and Cape Fear River through the Intracoastal Waterway. Numerous fishermen base at Swansboro. The fixed highway bridge over White Oak River at the town has a horizontal clearance of 30 feet and a vertical clearance of 12 feet at high water. Swansboro is more particularly described in connection with the Intracoastal Waterway.

**White Oak River,** for a distance of 4 miles above Swansboro, has a width of 1 mile or more through which there is a narrow, tortuous channel between flats and oyster rocks. Farther up, the river is narrow and deep, and leads between marshes. The head of navigation is the fixed bridge at **Stella,** a post office about 8 miles above Swansboro.

**Bear Inlet,** 3 miles westward of Bogue Inlet, is used only by local boats. The entrance is about 0.3 mile wide and is between high sand dunes. The buoys marking the entrance are shifted to conform to the shifting channel. The depth over the bar and through the waters connecting the inlet with the Intracoastal Waterway is only about 2 feet. Strangers should not attempt to enter the inlet.

**Browns Inlet,** 3 miles southwestward of Bear Inlet, has a controlling depth of 1 to 2 feet. It is rarely used, and strangers are advised not to attempt passage.

**Bear Inlet, Bombing Target No. 5.**—*The Danger Area.*—The waters of the Atlantic Ocean which are enclosed in a rectangle formed by joining points at (1) 34°36′33″ N., 77°13′18″ W.; (2) 34°38′03″ N., 77°10′06″ W.; (3) 34°31′15″ N., 77°09′41″ W.; (4) 34°32′53″ N., 77°06′30″ W. Said rectangle includes all of the entrance to Bear Inlet and extends westward to a point approximately 1,000 yards east of Browns Inlet, and seaward approximately 5.5 miles from Bear Inlet.

*The Regulations.*—The waters included in the above area shall be closed to navigation except for vessels proceeding along established waterways. The Commanding Officer, MCAS, Cherry Point, N. C., shall be the enforcing agency.

**Note.**—Adequate safety precautions will be taken before and during target practice. Operations will be suspended, if necessary, to insure the safety of craft proceeding along established waterways.

**New River, restricted area for firing range.**—*The Area.*—That portion of the Atlantic Ocean within a sector of a circle bounded by radii of 25,000 yards bearing 085° and 220°, respectively, from Hurst Beach, Onslow County, N. C. (34°34′15″ N., 77°16′10″ W.), and the included arc.

*The Regulations.*—1. Sailing vessels or any watercraft having a speed of less than 5 knots will keep clear of this area at all times after notices of firing have been given. Any vessel or other watercraft propelled by mechanical power at a speed greater than 5 knots may enter the firing area without restriction except when the signals enumerated in paragraphs 4 and 5 are being displayed. When the signals are displayed, all vessels in the area will clear immediately and no vessel will enter the area until the signals indicate that firing has ceased.

2. Firing over the range will take place during both daylight and nighttime hours, at irregular periods throughout the year.

3. Two days in advance of the day when firing in the area is scheduled to begin, the Commanding General, Marine Barracks, New River, N. C., will warn the public of the contemplated firing through the public press, the Coast Guard, and Cape Fear Pilots Association at Southport, N. C., and the Pilots Association at Morehead City, N. C.

4. A tower shall be erected near the shore in the area, at least 50 feet in height. On days when there is firing in a sector, a red flag will be displayed on the tower. This flag will be displayed not later than 8 a. m. and will be removed when firing ceases for the day.

5. During night firing, red lights will be displayed on the tower and searchlights will be employed as barrier lights to enable safety observers to detect vessels which may attempt to enter the danger zone

6. The regulations shall be enforced by the Commanding General, Marine Barracks, New River, N. C., or such repsonsible agent or agents as he may designate.

**Chart 777.—New River Inlet,** 35 miles westward of Beaufort Inlet, is considered dangerous by local pilots, and entrance should not be attempted except under the most favorable conditions. There is a strong ebb current from the inlet which causes a break on the bar when there is a sea outside. The break is especially bad when the ebb sets against a south or southeast wind. Current predictions may be obtained from the *Atlantic Coast Current Tables.* The mean range of tide at the inlet is 3 feet. At the head of the marshes, 2 miles above the entrance, the range is about 1 foot.

A Federal project provides for an entrance channel 6 feet deep and 90 feet wide at New River Inlet, with a connecting channel of the same dimensions to the Intracoastal Waterway at the head of the marshes. Buoys mark the approach over the bar, and lights mark the channel through the marshes. A controlling depth of 6 feet was reported in June 1947.

The entrance to New River Inlet is subject to rapid change. Strangers should obtain local information as to conditions before entering.

**New River** has a width of 1 to 2 miles from the head of the marshes above the inlet to within 2 miles of Jacksonville, above which it is a narrow stream. There is practically no periodic tide in the river.

A Federal project provides for a channel 10 feet deep and 90 feet wide in New River from the Intracoastal Waterway at the head of the marshes to the Atlantic Coast Line Railroad bridge at Jacksonville. The channel is well marked by lights and daybeacons. A controlling depth of 8 feet was reported in June 1947.

A highway bridge over New River 3 miles above the Intracoastal Waterway has a swing span with a horizontal clearance of 50 feet and a vertical clearance, closed, of 8 feet at high water.

**New River, danger areas for firing ranges.**—*The Areas.*—1. *Jacksonville sector.*—Bounded on the north by a line extending east and west through Daybeacon 41 (34°43′38″ N., 77°25′38″ W.), to the river banks on each side; on the south by a line extending 243°30′ from Paradise Point to Ragged Point (including Northeast Creek to the meridian of longitude 77°23′30″ W., and Southwest Creek to a point where it narrows to a width of 200 feet).

2. *Morgan Bay sector.*—Bounded on the north by a line extending 243°30′ from Paradise Point to Ragged Point; on the south by a line extending 285°30′ from Hadnot Point to Holmes Point (including Wallace Creek to the meridian of longitude 77°22′ W.).

3. *Farnell Bay sector.*—Bounded on the north by a line extending 285°30′ from Hadnot Point to Holmes Point; on the south by a line extending from Town Point to the south side of the mouth of French Creek (including French Creek to the meridian of longitude 77°20′ W.).

4. *Grey Point sector.*—Bounded on the north by a line extending from Town Point to the south side of the mouth of French Creek; on the south by a line extending 291°30′ from a point on the east bank of New River opposite the head of Sneads Creek to the south side of the mouth of Stone Creek.

5. *Stone Creek sector.*—That portion of the Grey Point sector at the upper end of Stone Bay lying west of the meridian of longitude 77°26′ W.

6. *Stone Bay sector.*—Bounded on the north by a line extending 291°30′ from a point on the east side of New River opposite the head of Sneads Creek to the south side of the mouth of Stone Creek; on the south by Sneads Ferry Bridge.

7. *Courthouse Bay sector.*—Bounded on the north by Sneads Ferry Bridge; on the south by a line extending 232° from Wilkins Bluff to Hall Point.

8. *Traps Bay sector.*—Bounded on the north by a line extending 232° from Wilkins Bluff to Hall Point; on the south by a line extending 280° from Cedar Point to Light 70 at the mouth of New River; thence in a 254° direction to Hatch Point.

**Note.**—Each of the above-described danger areas includes only the water area to the high-water mark.

*The Regulations.*—1. Sailing vessels or any watercraft having a speed of less than 5 knots will keep clear of the closed sectors at all times after notices of firing have been given. Any vessel or other watercraft propelled by mechanical power at a speed greater than 5 knots may enter the firing sectors without restriction except when the signals enumerated in paragraphs 4 and 5 are being displayed. When the signals are displayed all vessels in the sectors will clear immediately and no vessel will enter the sectors until the signals indicate that firing has ceased.

2. Firing will take place during both daylight and nighttime hours, at irregular periods throughout the year.

3. Two days in advance of the day when firing in any sector except the Stone Creek Sector is scheduled to begin, the Commanding Officer of the Marine Barracks, New River, N. C., will warn the public of the contemplated firing, stating the sector or sectors to be closed, through the public press and the United States Coast Guard. The Stone Creek sector may be closed without advance notice.

4. A tower, 25 feet in height, is erected near the easterly shore at the upper and lower limits of each sector. On days when firing is scheduled, a red flag will be displayed on each of the towers bordering the sector or sectors to be closed. These flags will be displayed not later than 8 a. m., and will be removed when firing ceases for the day.

5. During night firing, red lights will be displayed on the towers.

6. These regulations shall be enforced by the Captain of the Port and by the Commanding Officer, Marine Barracks, New River, N. C., or such responsible agent or agents as they may jointly designate.

**Jacksonville** is on the east bank of New River about 17 miles above the Intracoastal Waterway. Supplies, gasoline, Diesel oil, coal, and ice are obtainable at the town. Hotel accommodations are available, and there is a county hospital. Fish are moved by rail and truck to the interior, and pulpwood is shipped by barge down the Intracoastal Waterway.

The Atlantic Coast Line Railroad bridge over New River at Jacksonville has a swing span with a horizontal clearance of 48 feet and a vertical clearance, closed, of 3½ feet at high water. The fixed highway bridge 0.3 mile above the railroad bridge has a horizontal clearance of 28 feet and a vertical clearance of 13 feet at high water.

**Chart 1235.—New Topsail Inlet,** 19 miles southwestward of New River Inlet, has an unmarked channel which is obstructed by a shifting bar. The inlet is rarely used by local boats and should not be entered by strangers.

**Old Topsail Inlet** is constantly changing. The depth in the entrance is about 3 feet. Small boats can enter the inlet at low water, and at high water they can pass through the inside channels to the Intracoastal Waterway and the mainland. Strangers should not use this inlet. The shores on both sides are low sand beaches without distinguishing marks.

**Rich Inlet,** 5 miles southwestward of New Topsail Inlet, has a depth of about 4 feet over the bar. Local fishermen sometimes use it, but strangers should not.

**Mason Inlet** has a depth over the bar of less than 2 feet. Strangers should not attempt it.

**Moore Inlet,** 10 miles southwest of New Topsail Inlet, has closed to the extent that navigation has ceased.

**Wrightsville Beach** is a summer resort between Moore Inlet and Masonboro Inlet. The large hotels and buildings are visible from far offshore. A paved highway connects Wrightsville Beach with Wrightsville and Wilmington.

**Masonboro Inlet** is 2.5 miles southward from Moore Inlet and 22 miles northward from Cape Fear Light. The entrance is buoyed but the buoys are frequently shifted to conform to the changing depths over the bar. Entrance should not be attempted except with thorough local knowledge and under the most favorable conditions. In northeasterly weather the bar is bad. Strong tide rips form on the ebb current. The mean range of tide on the bar is about 4 feet.

A Federal project provides for a channel 8 feet deep and 90 feet wide from the Intracoastal Waterway at Wrightsville to a point just within Masonboro Inlet at

Wrightsville Beach. The channel is well marked by daybeacons. In November 1947, the controlling depth over the ocean bar and through the inside channel was about 5 feet.

**Carolina Beach** is a resort 12 miles northward from Cape Fear Light. A yacht basin at the resort connects with Myrtle Sound and the Intracoastal Waterway by way of a shallow channel 1.5 miles long. There is no inlet to the basin from the ocean. Gasoline, ice, and provisions are available.

**Corncake Inlet,** 4 miles north of Cape Fear Light, connects with Cape Fear River by way of several shallow slues north of Smith Island. Depths over the bar are 1 to 2 feet, but the channel is shifting and treacherous. Strangers should not attempt entrance under any conditions.

**Chart 1236.—Cape Fear** is a low, sharp, sandy point at the southern extremity of **Smith Island.** This island, on the eastern side of the entrance to Cape Fear River, is mostly low and marshy, but has a thick growth of trees on its western side. **Cape Fear Light,** 159 feet above the water and visible 19 miles, is shown from a white octagonal, pyramidal, iron skeleton tower, upper part black, near the tip of the cape. On the west side of Smith Island and 2.4 miles northwest of Cape Fear Light is **Bald Head Radiobeacon;** the structure is a white octagonal, unused light tower 99 feet high.

**Frying Pan Shoals,** extending south-southeastward from Cape Fear, are bare in spots near shore and have general depths of 2 to 12 feet in an unbroken line to a point 10 miles out from the cape; for 6 miles farther the shoals are broken, with depths ranging from 10 to 20 feet. Broken ground, with depths of 5 to 7 fathoms, extends from the shoals proper almost to the lightship. Lighted buoys are moored at critical points along the shoals.

**Frying Pan Shoals Lightship** is moored in 60 feet of water 30.5 miles 138° from Cape Fear Light. The lightship has a red hull with the word FRYINGPAN on each side, and two masts with a circular gallery and lantern at each masthead. The light is 63 feet above the water and visible 14 miles; a riding light is on the forestay. The fog signal is a two-tone air diaphone; the radiobeacon is synchronized with the fog signal for distance finding. The code-flag signal and radio call is NNBM. **Storm warnings** are displayed during the daytime.

The partly exposed wreck of the *S. S. Mount Dirfys* lies on Frying Pan Shoals about midway between Cape Fear and the lightship. An obstruction, covered 19 feet at most, is reported to lie in 75 feet of water 5.3 miles 280° from the lightship.

## Cape Fear River

Charts 424, 425

**Cape Fear River,** the approach to the city of Wilmington, has a total length of about 370 miles and empties into the sea immediately westward of Cape Fear. Approaching the river from northward, the safer course, and the one used generally by deep-

draft vessels, is outside of Frying Pan Shoals Lightship. From a position 1 mile south of the lightship, steer **297°** for 22.4 miles, passing 0.4 mile south of lighted whistle buoy 2AFP, to a position 2.5 miles south of lighted whistle buoy 2FP. Next steer **342°** for 14 miles to a position about 100 yards west of Cape Fear River Entrance lighted whistle buoy 2CF.

The principal danger southward of Frying Pan Shoals is the broken ground extending offshore between Cape Romain and Winyah Bay; a lighted bell buoy marks a depth of 11 feet at the wreck of the *Hector*, 11 miles from shore. Deep-draft vessels should pass outside of this broken ground, giving the coast a berth of over 12 miles, and this is the safer course for all vessels at night. When clear of the broken ground, the course can be shaped for Cape Fear River Entrance lighted whistle buoy 2CF. When approaching from southwestward in daytime, the water tanks on Fort Caswell will generally be picked up before Cape Fear Light. Except with northeasterly winds, some overrun, probably amounting to ½ knot at times, may be expected in approaching from southward.

Courses and distances for the navigation of Cape Fear River from the entrance buoy to Wilmington are given in Chapter 3.

**Tides.**—See the *Atlantic Ocean Tide Tables* in which the tides are predicted for every day at Wilmington. Proceeding toward the mouth of the river, the tides are earlier than at Wilmington. The mean range at the entrance is about 4½ feet and at Wilmington, about 3 feet.

**Currents.**—The tidal currents on the bar run with considerable velocity, and as a rule set nearly in the direction of the channels, but on the last of the flood and first of the ebb they tend more or less across the shoals. In the river their set is generally in the direction of the channel. The relative velocities of flood and ebb depend upon the stage of the river. During freshets the flood at times is completely overcome by the river current and the ebb is greatly increased. At low river stages, a strong flood is felt for a considerable distance above Wilmington, where it runs 5¼ hours to nearly 7 hours of ebb; going down the river from Wilmington, the periods of flood and ebb become more nearly equal. Current predictions for a number of locations in Cape Fear River may be obtained from the *Atlantic Coast Current Tables*.

A Federal project for improving Cape Fear River at and below Wilmington provides for a channel 32 feet deep and 400 feet wide from the outer end of the ocean bar to Wilmington, with increased widths at bends; for an anchorage basin at Wilmington of the same depth, 2,000 feet long, 900 feet wide at the upper end, 1,100 feet wide at the lower end, with approaches 1,500 feet long at the upper end, and 4,500 feet long at the lower end; and for a turning basin opposite the principal terminals at Wilmington, 32 feet deep, 1,000 feet long, 800 feet wide, with suitable approaches at each end. The channel is maintained and is well marked by lights and buoys.

**Chart 424.—Western Bar Channel,** close to **Fort Caswell** on the western side of the entrance to Cape Fear River, is used considerably by small craft bound westward along the coast. The channel is good for about 6 feet at low tide but is not buoyed. The best water lies from 100 to 200 yards offshore south of Fort Caswell, and from there the channel through the shoals trends about 256°. Abreast of the Coast Guard station the shore should not be approached closer than 0.3 mile.

**Southport** is on the west bank of Cape Fear River, 1.5 miles above Fort Caswell. There is deep water at the wharves and good anchorage in the river abreast the town. Holding ground at the anchorage is good, but, because of strong tidal currents, vessels should anchor with a good scope of chain. This anchorage is sometimes used as a harbor of refuge in the winter by coasting vessels.

Fresh water, gasoline, ice, and provisions are available at Southport. A marine railway just off the Intercoastal Waterway has a capacity of 20 tons, and can handle a length of 50 feet and a draft of 4 feet. Minor engine repairs can be made. Fuel oil can be obtained at the wharves of the oil companies. A third-class medical relief station of the United States Public Health Service is in Southport. Pilots for the bar and river maintain a lookout tower in the town. **Storm warnings** are displayed day and night.

**Chart 425.**—About 11 miles above the mouth of Cape Fear River, a channel 100 feet wide has been dredged eastward and southeastward from the main ship channel to the Ethyl-Dow Chemical Co. dock on the east side of the river. The controlling depth is about 7 feet.

The Intracoastal Waterway northward leaves the main ship channel at a point about 11.5 miles above the mouth of the river. The distance from the intersection of the two channels to the western end of the land cut of the waterway is 2 miles. A Federal project provides for a channel 12 feet deep and 100 feet wide from a point near the end of the land cut to a connection with the main ship channel at a point about 15 miles above the mouth of the river. No work had been done on the project in 1947, but a depth of about 5 feet was available through a well-marked slough which follows the general course of the proposed improvement.

**Brunswick River, anchorage area.**—*The Area.*—All of that portion of Brunswick River, a tributary of Cape Fear River west and southwest of Wilmington, N. C., from its mouth northward to the North Carolina State Highway and Public Works Commission bridge on U. S. Route No. 74, a distance of about 2.75 miles.

*The Regulations.*—1. All vessels and other watercraft, except such as are authorized by the United States Maritime Commission, shall keep clear of the above-described anchorage ground at all times.

2. These regulations shall be enforced by the United States Maritime Commission, Washington, D. C., and such agencies as it may designate.

**Wilmington,** on the east bank of the Cape Fear River and 25 miles above the mouth, is North Carolina's chief port. Its extensive shipping industry moves such principal items as gasoline, fuel oil, lumber, cotton, tobacco, and fertilizer materials. The city has excellent hotel accommodations. A Coast Guard cutter is stationed at Wilmington. **Storm warnings** are displayed day and night from the customhouse.

**Pilotage.**—Pilotage from the sea to Southport is compulsory for vessels in foreign trade, and also for vessels in domestic trade except those under 60 tons lawfully engaged in coastwise trade and coastwise vessels having on board a pilot licensed by the United States Coast Guard. Pilotage between Southport and Wilmington is not compulsory. Vessels are boarded by pilots at the sea buoy. The pilotage rates for inward and outward bound vessels are the same. The following table gives charges for one-way pilotage for foreign vessels. The charges for coastwise vessels are 30 percent less.

| Draft, feet | Sea to Southport | Southport to Wilmington | Total | Draft, feet | Sea to Southport | Southport to Wilmington | Total |
|---|---|---|---|---|---|---|---|
| 6 and under | $9.00 | $6.00 | $15.00 | 20½ | $81.00 | $44.00 | $125.00 |
| 7 | 10.00 | 7.50 | 17.50 | 21 | 85.00 | 45.00 | 130.00 |
| 8 | 11.00 | 9.00 | 20.00 | 21½ | 90.00 | 45.00 | 135.00 |
| 9 | 13.00 | 9.50 | 22.50 | 22 | 92.50 | 47.50 | 140.00 |
| 10 | 15.00 | 10.00 | 25.00 | 22½ | 95.00 | 50.00 | 145.00 |
| 10½ | 17.00 | 10.50 | 27.50 | 23 | 100.00 | 50.00 | 150.00 |
| 11 | 19.00 | 11.00 | 30.00 | 23½ | 100.00 | 55.00 | 155.00 |
| 11½ | 21.00 | 14.00 | 35.00 | 24 | 105.00 | 55.00 | 160.00 |
| 12 | 23.00 | 17.00 | 40.00 | 24½ | 108.00 | 57.00 | 165.00 |
| 12½ | 25.00 | 20.00 | 45.00 | 25 | 110.00 | 60.00 | 170.00 |
| 13 | 30.00 | 20.00 | 50.00 | 25½ | 112.00 | 63.00 | 175.00 |
| 13½ | 35.00 | 20.00 | 55.00 | 26 | 115.00 | 65.00 | 180.00 |
| 14 | 39.00 | 21.00 | 60.00 | 26½ | 118.00 | 67.00 | 185.00 |
| 14½ | 43.00 | 22.00 | 65.00 | 27 | 121.00 | 69.00 | 190.00 |
| 15 | 45.00 | 25.00 | 70.00 | 27½ | 125.00 | 70.00 | 195.00 |
| 15½ | 47.00 | 28.00 | 75.00 | 28 | 128.00 | 72.00 | 200.00 |
| 16 | 50.00 | 30.00 | 80.00 | 28½ | 130.00 | 75.00 | 205.00 |
| 16½ | 54.00 | 31.00 | 85.00 | 29 | 133.00 | 77.00 | 210.00 |
| 17 | 57.00 | 33.00 | 90.00 | 29½ | 135.00 | 80.00 | 215.00 |
| 17½ | 61.00 | 34.00 | 95.00 | 30 | 138.00 | 82.00 | 220.00 |
| 18 | 65.00 | 35.00 | 100.00 | 30½ | 140.00 | 85.00 | 225.00 |
| 18½ | 67.00 | 38.00 | 105.00 | 31 | 143.00 | 87.00 | 230.00 |
| 19 | 70.00 | 40.00 | 110.00 | 31½ | 146.00 | 89.00 | 235.00 |
| 19½ | 73.00 | 42.00 | 115.00 | 32 | 150.00 | 90.00 | 240.00 |
| 20 | 76.00 | 44.00 | 120.00 | | | | |

**Quarantine.**—Vessels requiring quarantine treatment will be accorded such treatment on arrival at berth. Medical relief for seamen is available.

**Customs.**—The customhouse is located on Water Street between Princess and Market Streets.

**Immigration.**—The Immigration Service has an office in the post-office building.

**Dockage facilities.**—There are many wharves of all classes, mostly privately owned, at Wilmington. Warehouse and bulk freight storage are available. A bonded warehouse is available for sugar only. All facilities within the city limits are served by the belt line railway paralleling the water front, with private connections to the larger piers and wharves. Depths alongside the Wilmington wharves are 30 to 32 feet.

**Communications.**—Railroad connection to the interior and coastal cities is offered by the Atlantic Coast Line and Seaboard Airline Railroads. Several paved Federal and State highways radiate out from the city. Steamship service is irregular.

**Supplies.**—Provisions and ship chandlers' stores are obtainable at Wilmington. Bunker coal is available; also Diesel oil. Fresh water can be obtained alongside all principal piers or from a water boat. River water is generally of only fair quality for boiler purposes, and at times during protracted droughts or high tides it becomes brackish.

**Repairs.**—Ordinary repairs to steamship machinery can be made at Wilmington. There are three marine railways, the largest of which has a capacity of 1,000 tons. The floating drydock has a lifting capacity of 400 tons.

**Towage.**—Vessels seldom find it necessary to employ tugs between the sea buoy and the anchorage basin at Wilmington, but tugs are generally used to assist in docking and undocking and for movements within the port or to upriver facilities. Inbound vessels are usually met by tugs near the anchorage ground just below the city.

The Federal project for the improvement of Cape Fear River above Wilmington

provides for a channel 25 feet deep and 200 feet wide to **Navassa,** 3.5 miles above Wilmington, with a cut-off across Horseshoe Bend and a turning basin approximately 550 feet long and 400 feet in average width at Navassa; and a navigable depth of 8 feet at low water to the head of navigation at **Fayetteville,** 100 miles above Wilmington, by the construction of three locks and dams and by dredging the river shoals. Depths reported available in June 1947 were 24 feet to Navassa, 22 feet to a point 8 miles above Wilmington, thence 5½ feet to Fayetteville.

The locks between Navassa and Fayetteville have a usable length of 200 feet, a width of 40 feet, and a depth over miter sills of 9 feet at low water. The highway bridge over Cape Fear River opposite Wilmington has a bascule span with a horizontal clearance of 120 feet and a vertical clearance, closed, of 26 feet at high water. The railroad bridge at Navassa has a bascule span with a horizontal clearance of 102 feet and a vertical clearance, closed, of 6½ feet at high water.

**Black River** empties into Cape Fear River about 12 miles above Wilmington. In June 1947, it was reported that a draft of 3 feet could be carried at low stages to Still Bluff, 12 miles above the mouth of Black River; above Still Bluff the stream was in poor condition.

**Northeast Cape Fear River** empties into Cape Fear River from northward at Wilmington. The part of the river below Hilton railroad bridge is maintained to main-channel dimensions. The project further provides for a channel 25 feet deep and 200 feet wide from the bridge to a turning basin of the same depth, 600 feet wide, 1 mile above.

In 1947 no work had been done on this part of the project, and the controlling depth reported was 15 feet. Also reported were controlling depths of 6 feet to a point 42 miles above the mouth of the river, thence 3 feet to Crooms Bridge, 49 miles above the mouth.

The highway bridge over Northeast Cape Fear River 1 mile above the mouth has a bascule span with a horizontal clearance of 150 feet and a vertical clearance, closed, of 26 feet at high water. The Hilton railroad bridge 1.3 miles above the mouth has a bascule span with a horizontal clearance of 95 feet and a vertical clearance, closed, of 5 feet at high water.

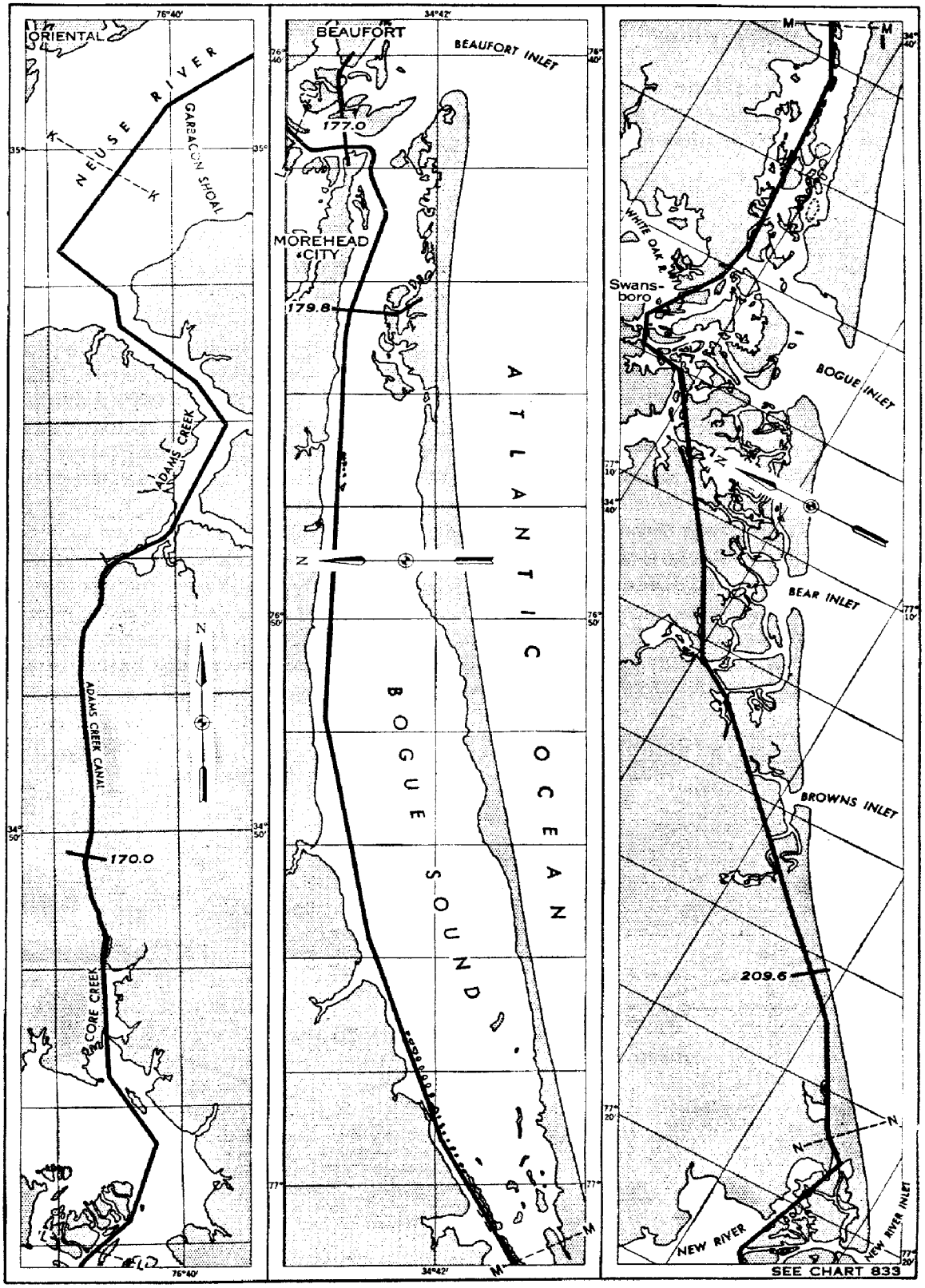
**Smith Creek** empties into Northeast Cape Fear River from eastward 2 miles above the river's mouth. A Federal project provided for a channel 100 feet wide and 12 feet deep through the bar at the mouth of Smith Creek. The controlling depth reported in June 1947 was 8½ feet.

**Freshets.**—Low-water stages prevail in the rivers above Wilmington from 2 to 4 months during the summer, and freshets usually occur as often as once a month during the remainder of the year, but with no regularity.

# Intracoastal Waterway, Neuse River to Southport

**Charts 833, 834**

The Federal project for that portion of the Intracoastal waterway between Neuse River and Southport provides for a channel 12 feet deep over bottom widths varying


ORIENTAL
NEUSE RIVER
GARRACON SHOAL
ADAMS CREEK
ADAMS CREEK CANAL
CORE CREEK
170.0
BEAUFORT
BEAUFORT INLET
177.0
MOREHEAD CITY
179.8
ATLANTIC OCEAN
BOGUE SOUND
WHITE OAK R.
Swansboro
BOGUE INLET
BEAR INLET
BROWNS INLET
209.6
NEW RIVER
NEW RIVER INLET
SEE CHART 833

from 90 feet in land cuts to 250 feet in the wider portions of rivers and sounds. The project is maintained and the channels are well marked. Controlling depths are listed in every issue of the weekly *Notice to Mariners*.

**General regulations** governing bridges and locks and the handling of tows are quoted in Chapter 2. **Special regulations** prescribed by the Wilmington District, Corps of Engineers, are quoted in Chapter 5, page 148.

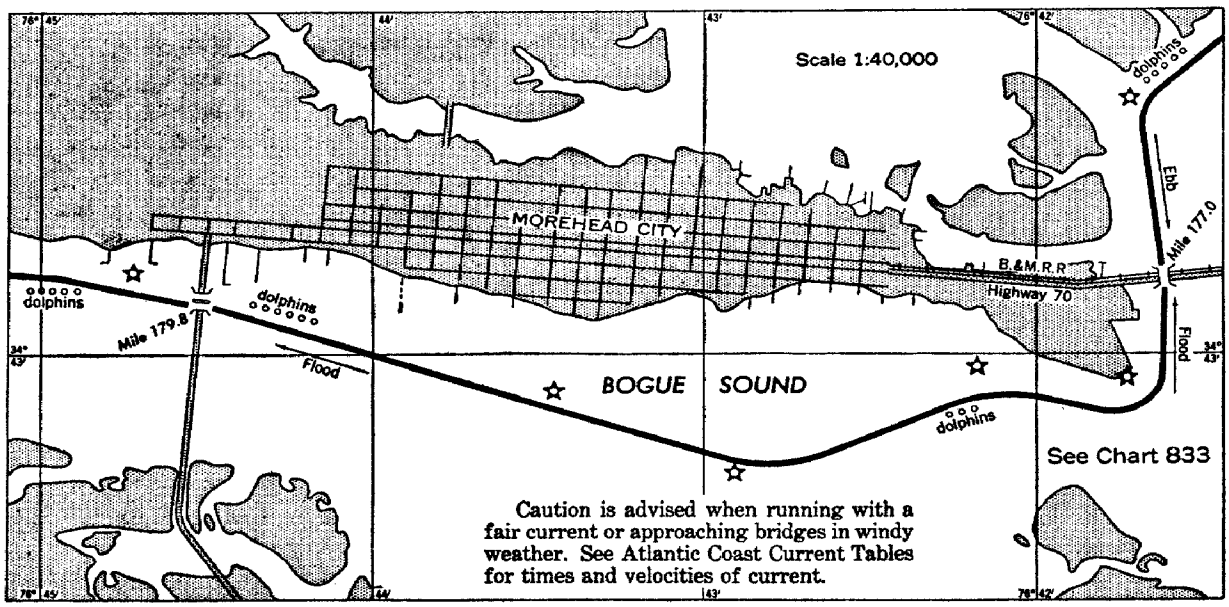
# Neuse River to New River Inlet

Chart 833

The Intracoastal Waterway leaves Neuse River about 13 miles above the mouth and follows a dredged channel through **Adams Creek** to **Adams Creek Canal,** a land cut 5 miles long which connects with the head of **Core Creek.** The highway bridge over Adams Creek Canal at *Mile 170.0* has a swing span with a horizontal clearance of 80 feet and a vertical clearance, closed, of 15 feet at high water. An overhead cable at the bridge has a vertical clearance of 97 feet at high water.

From Core Creek the route of the waterway is through **Newport River** to Morehead City. At *Mile 175.6*, **Gallant Channel** branches off from the through route of the waterway and leads to **Beaufort,** which has been described in a previous section.

The railroad bridge over the Intracoastal Waterway at *Mile 177.0* has a swing span with a horizontal clearance of 52 feet and a vertical clearance, closed, of 2½ feet at high water. Closely adjacent on the south is a highway bridge which has a bascule span with a horizontal clearance of 79 feet and a vertical clearance, closed, of 7 feet at high water.



**Special regulations.**—It has been found that tidal conditions which are hazardous to navigation obtain in the navigation channel under the Beaufort and Morehead Railroad Bridge at Morehead City, N. C., and the adjacent North Carolina State Highway bridge, and that the horizontal clearance of the channel under the railroad bridge is presently restricted and will remain so restricted until the bridge is reconstructed to conform to the standard clearance prescribed for bridges on this waterway. In view of these conditions and in order to avoid an obstruction to navigation or damage to property, it is necessary that:

1. All tows of more than one barge shall be broken up and passed through the above-mentioned drawbridges one at a time each under full control of a suitable towboat: *Provided*, That tows not greater than 250 feet in length, closely coupled (not more than 6 inches between barges), may be passed through the draws of these bridges under the full control of one or more towboats of ample power and properly manned.

2. No person in command or control of any towboat shall propel or drift such towboat, or cause or permit the same to be propelled or drifted through either of the above-mentioned drawbridges under any circumstances while towing more than one barge, except as provided above.

Fuel, supplies, repair facilities, and hotel accommodations are available at **Morehead City,** *Mile 178.4*. The city and its water front are discussed at greater length in connection with Beaufort Inlet.

From Morehead City, the waterway follows a dredged channel through **Bogue Sound.** The highway bridge over Bogue Sound at *Mile 179.8* has a swing span with a horizontal clearance of 85 feet and a vertical clearance, closed, of 7 feet.

At **Bogue Inlet,** the waterway passes around the head of the marshes to **Swansboro,** *Mile 199.6*. Swansboro has mail and telephone facilities and highway connections to the interior. Gasoline, ice, provisions, and guest rooms are available. The marine railway has three ways and can handle a length of 45 feet. Facilities are available for engine repairs. The town has a municipal wharf and there are several other wharves which may be used when not required by their owners.

From Swansboro, the route of the waterway follows cuts through the marshes to New River. A pontoon highway bridge over the waterway at *Mile 209.6* has a horizontal clearance of 80 feet.

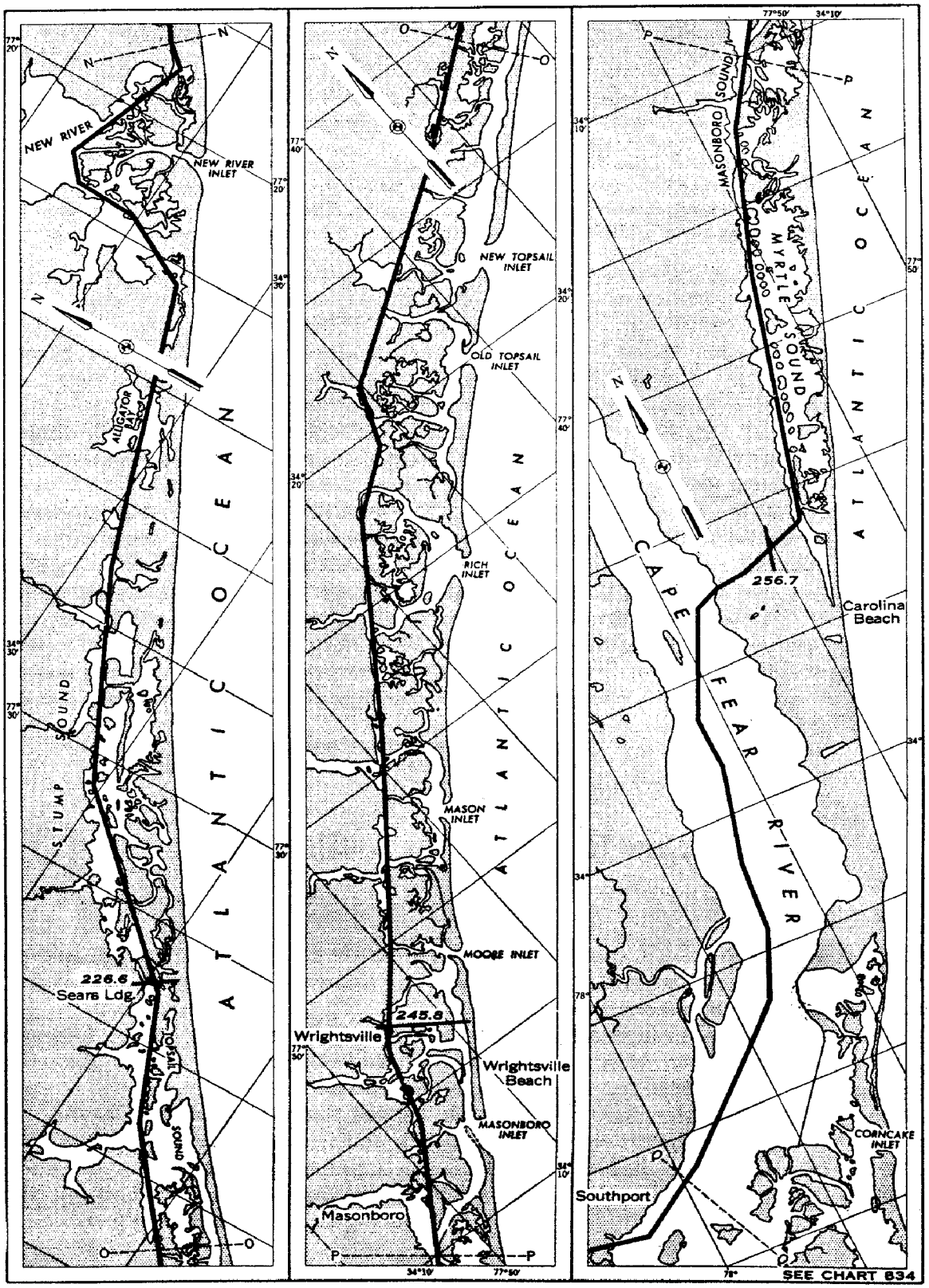
## New River Inlet to Southport

Chart 834

At **New River Inlet** the waterway passes around the head of the marshes in **New River** to the land cuts southward. New River is the approach to the town of Jacksonville, described in a previous section.

The route continues through **Alligator Bay** and **Stump Sound.** A pontoon highway bridge over the waterway at *Mile 226.6* has a horizontal clearance of 80 feet. An overhead power wire at the bridge has a vertical clearance of 84 feet at high water.

From Stump Sound the channel is through **Topsail Sound** and **Middle Sound.** A yacht basin is on the southwest side of **Page Creek** and northwest of the waterway at *Mile 242.1*. Gasoline, fresh water, ice, and marine supplies are available at the dock, which has a depth of about 7 feet alongside. The marine railway can haul out and repair boats up to 25 tons and 60 feet in length. The depth at the ways is 4 feet.

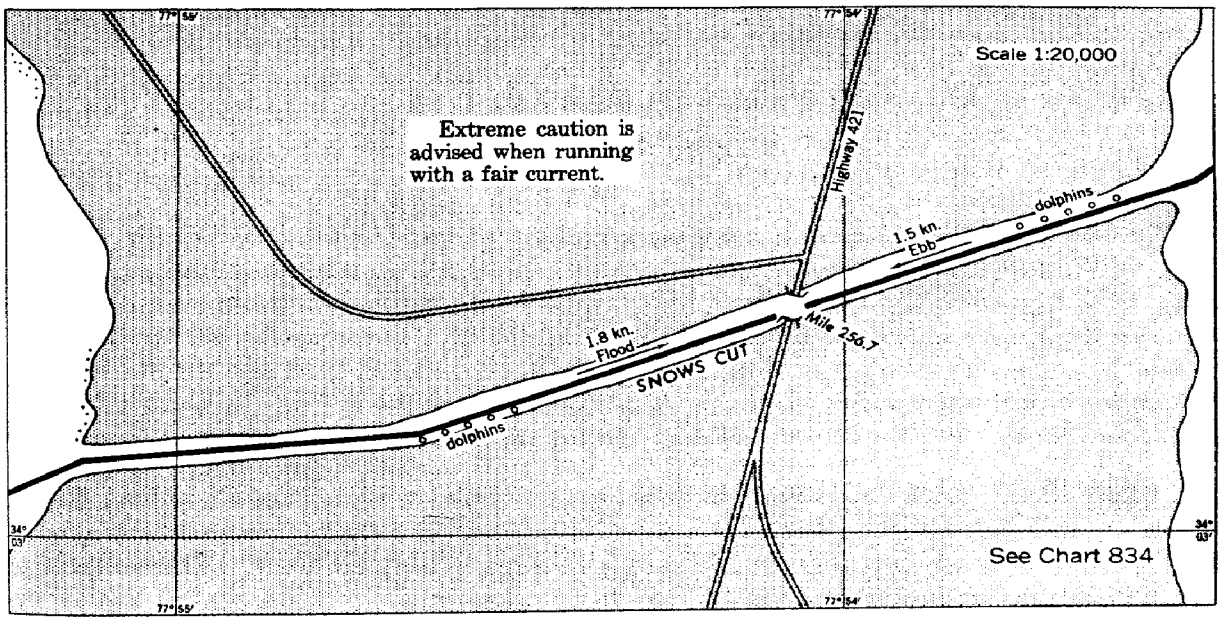

NEW RIVER
NEW RIVER INLET
ALLIGATOR
ATLANTIC OCEAN
STUMP SOUND
226.6
Sears Ldg.
TOPSAIL SOUND
NEW TOPSAIL INLET
OLD TOPSAIL INLET
RICH INLET
MASON INLET
MOORE INLET
245.8
Wrightsville
Wrightsville Beach
MASONBORO INLET
Masonboro
MASONBORO SOUND
MYRTLE GROVE SOUND
256.7
Carolina Beach
CAPE FEAR RIVER
CORNCAKE INLET
Southport
SEE CHART 634

A highway bridge over the waterway at **Wrightsville,** *Mile 245.8,* has a bascule span with a horizontal clearance of 80 feet and a vertical clearance, closed, of 4 feet at high water. An overhead power cable at the bridge has a vertical clearance of 85 feet at high water.

Gasoline, fuel oil, ice, water, bituminous coal, and supplies are available at Wrightsville. Each of the three ways at the shipyard has a capacity of 40 tons and can handle a length of 60 feet. Depths at the ways are about 9 feet. Engine repairs can be made. Taxis operate over good highways from Wrightsville to Wilmington. **Wrightsville Beach,** on the outer coast, has been discussed in a previous section.

From Wrightsville the waterway continues south through **Masonboro Sound** and **Myrtle Sound** to Snows Cut. The shallow channel from the waterway to Carolina Beach, at the south end of Myrtle Sound, has been discussed in a previous section.

**Snows Cut** connects Myrtle Sound with Cape Fear River. The highway bridge over Snows Cut at *Mile 256.7* has a swing span with a horizontal clearance of 80 feet and a vertical clearance, closed, of 13 feet at high water. An overhead power cable at the bridge has a vertical clearance of 86 feet at high water.




From the western end of Snows Cut the waterway swings southward into the main channel of **Cape Fear River,** which is the approach to the city of Wilmington, and continues along the river to Southport. Fuel, supplies, repair facilities, and guest rooms are available at **Southport.** The town is discussed at greater length in connection with Cape Fear River.

CHAPTER 7

# Cape Fear to Charleston Harbor

## Chart 1110

### Cape Fear to Winyah Bay

Charts 1236, 1237

FROM Cape Fear the coast curves gradually westward and southward for 80 miles to Winyah Bay Entrance, and is a sand beach, with numerous small sand hills, separated from the heavily wooded mainland by small streams and marsh. From offshore the woods appear to extend to the outer beach. The coast is clear and a depth of 3 fathoms can be taken to within 1 mile of the beach, except at Murrells Inlet where a 16-foot spot is about 2 miles offshore. The 10-fathom curve is from 18 to 21 miles offshore, and inside of it the water shoals gradually as the shore is approached.

**Chart 1236.—Lockwoods Folly Inlet** is about 11 miles westward of Cape Fear River. There are aids for entering, but entrance without local knowledge is not recommended as the inlet is closed by breakers at virtually all stages of tide and wind. The controlling depth over the bar is about 2 feet. Two wrecks, one visible at low water, are at the mouth of the inlet. A high sand dune is east of the inlet.

**Lockwoods Folly River** is navigable from the ocean to the Intracoastal Waterway at the head of the marshes inside the inlet, thence to **Supply,** post office, the practical head of navigation 16 miles above the waterway. The channel is narrow and is bordered on either side by oyster bars which are covered at high tide. The mean range of tide is about 4 feet at the inlet and about 2 feet at Supply.

A Federal project for improving Lockwoods Folly River provides for a channel 100 feet wide and 6 feet deep from the ocean to the bridge at Supply, to be secured by dredging through the oyster rocks and mud flats. Controlling depths reported in June 1947 were 2 feet over the ocean bar, and 3 feet between the Intracoastal Waterway and Supply.

**Shallotte Inlet,** about 19 miles westward of Cape Fear River, has a shifting bar and a winding entrance channel which is used only by local fishermen. **Shallotte River** is navigable from the ocean to the Intracoastal Waterway at the head of the marshes inside the inlet, thence to the town of **Shallotte,** about 8 miles above the inlet. The mean range of tide is about 4½ feet near the inlet and 3 feet at Shallotte.

A Federal project for the improvement of Shallotte River provides for securing a channel 4 feet deep and 36 feet wide from the inlet to Shallotte. The controlling depth reported in June 1947 was 3 feet.

**Tubbs Inlet,** 6 miles westward of Shallotte Inlet, is rarely used even by local fishermen.

**Chart 1237.—Little River Inlet,** South Carolina, is about 28 miles westward of Cape Fear River. The entrance is between **Waiter Island** on the west and **Bird Island** on the east. The mean range of tide at the inlet is about 4½ feet. The channel across the bar changes in depth and position and is marked by buoys which are frequently shifted. A light on Bird Island and daybeacons mark the channel in Little River from the inlet to the junction with the Intracoastal Waterway 2 miles above. The controlling depth over the ocean bar was reported to be 3 feet in May 1947.

**Myrtle Beach,** a summer resort with rail and bus communication, is on the outer beach nearly 20 miles southwestward of Little River Inlet and 32 miles north-northeastward from Georgetown Light. **Storm warnings** are displayed by day only at Myrtle Beach. The tall central superstructure of a large white hotel at **Ocean Forest,** 3.5 miles northeast of Myrtle Beach proper, is the most prominent landmark between Beaufort, N. C., and Winyah Bay. An aviation light is on the cupola of the hotel.

**Atlantic Ocean off Murrells Inlet, aerial gunnery target range.**—*The Danger Zone.*—The target range covers a strip 10 miles wide located approximately 5 miles offshore extending between Pawleys Island, S. C., and White Point Swash, a distance of about 30 miles. The geographic positions locating the corners of the range are as follows: Northeast corner, latitude 33°39′ N., longitude 78°35′ W.; northwest corner, latitude 33°44′ N., longitude 78°43′ W.; southeast corner, latitude 33°17′ N., longitude 78°56′ W.; southwest corner, latitude 33°23′ N., longitude 79°05′ W.

*The Regulations.*—1. The fact that aerial target practice is to take place over the designated area shall be advertised to the public through the usual media for the dissemination of information. Inasmuch as such practice is likely to be engaged in throughout the year without regard to season, such advertising of firing shall be repeated at frequent intervals which shall not exceed 3 months and which shall be more frequent when, in the opinion of the Commanding Officer responsible for the use of the range, such frequent repetition is necessary in the interests of public safety.

2. Prior to the conducting of each target practice the area shall be patrolled by Army aircraft to insure that no watercraft are within the dangerous area and any such watercraft seen in the vicinity shall be warned by means of signals that target practice is about to take place. The patrol aircraft shall employ the method of warning known as "buzzing" which consists of low flight by the airplane and repeated opening and closing of the throttle.

3. Any such watercraft shall, upon being so warned, immediately leave the vicinity and shall, until the conclusion of the practice, remain at such a distance that it will be safe from falling projectiles.

4. All aircraft and watercraft shall be presumed to know their whereabouts by distances and directions from landmarks or other topographical features along the shore.

5. These regulations shall be enforced by the Commanding Officer, Charlotte Army Air Base, Charlotte, N. C., and such agencies as he may designate.

**Murrells Inlet,** 12 miles southwest of Myrtle Beach, connects with **Main** and **Oaks Creeks,** which drain a considerable area of marsh between the mainland and the outer beach. The bar at the entrance is shifting and the channel changing. Inside the inlet,

where the channel turns sharply to northward into Main Creek, the tide rips are strong at full ebb or flood. Good water can be carried up this channel for about 1.8 miles to a launch landing. A light marks the north side of the entrance, and the channel is marked by buoys and daybeacons to the landing. The controlling depth over the bar was reported to be 2 feet in August 1947.

**North Inlet,** about 6 miles northward of Georgetown Light, connects with Winyah Bay by way of both **Town Creek** and **Jones Creek.** Jones Creek, the southerly of the two, is easier to follow and is good for about 6 feet at high tide. However, there is little water on the Winyah Bay side, and navigation is restricted to craft of shallow draft. Some fishermen use North Inlet, but strangers should not enter before obtaining local information as to conditions. A boiler of a wreck shows on the north side of the entrance. The controlling depth over the bar was reported to be 5 feet in August 1947.

## Winyah Bay

Chart 787

**Winyah Bay** is the first harbor southward of Cape Fear River navigable for medium-draft vessels. The entrance is between **North** and **South Islands** and is protected by jetties on both sides. **Georgetown Light,** 85 feet above the water and visible 15 miles, is shown from a white tower and dwelling near the south end of North Island. There is a radiobeacon at the light.

The jettied entrance to Winyah Bay is dangerous of navigation for small craft except in favorable weather. Heavy tide rips prevail near the ends of the jetties, and heavy seas are present in moderate to heavy weather. The south jetty is visible only at low tide. Vessels of 5 feet or less draft can enter the jettied channel close to the outer end of the north jetty.

Courses and distances for the navigation of Winyah Bay from the sea buoy to Georgetown are given in Chapter 3.

A Federal project for the improvement of Winyah Bay provides for a channel 27 feet deep from that depth in the Atlantic Ocean to and including a turning basin in Sampit River, 600 feet wide across the outer bar and in the gorge and 400 feet wide thence to the turning basin, widened at the bends, to be secured and maintained by the construction of two jetties of stone on brush mattresses, springing respectively from North and South Islands, the north jetty having a length of 11,139 feet and the south jetty, 21,051 feet. The channel is well marked. In 1947 dredging was in progress to provide the new 27-foot project depth. In September 1945, the controlling depth was 18 feet from deep water in the ocean to the mouth of Sampit River, thence 15 feet to the head of the project.

The entrance to **Sampit River,** 10 miles above Georgetown Light, is protected on its east side by a timber and brush training wall, 2,000 feet long and marked at its outer end by a light. The principal landing on the river above Georgetown is **Sampit,** 10 miles from the river's mouth. The highway bridge over Sampit River just above Georgetown has a swing span with a horizontal clearance of 60 feet and a vertical clearance, closed, of 8 feet at high water.

**Georgetown,** S. C., on the north bank of Sampit River just inside its mouth, has considerable trade in lumber and is the terminus of a branch of the Seaboard Air Line Railroad. Depths at the wharves are adequate for vessels able to enter the bay, and convenient sheltered berths are available for small craft.

Gasoline, Diesel oil, provisions, fresh water, and limited amounts of ship chandlers' stores and coal can be obtained at Georgetown. Hotel accommodations are available. Repair facilities are limited to small machine shops and one marine railway, which has a capacity of about 50 tons and can handle boats up to about 50 feet in length and 5 feet in draft. The shipyard also builds boats.

Georgetown is a customs port of entry at which marine documents are issued. A third-class medical relief station of the United States Public Health Service is at Georgetown; the nearest marine hospital is at Savannah, Ga. **Storm warnings** are displayed day and night at the town.

**Tides.**—The mean rise and fall at Georgetown is about 3½ feet. The tide at Georgetown Light occurs about 15 minutes later than at Charleston, while at Georgetown it occurs about 1 hour 55 minutes later than at Charleston.

**Currents.**—Tidal currents in Winyah Bay are affected by variations in the flow of its tributary rivers. The velocity is greatest between the jetties where, at strength, it is 2 to 3 knots. The set is diagonally across the south jetty. During freshets in the rivers, also with westerly winds, the buoys between the jetties are nearly towed under at times on the ebb. Off South Island the average velocity is from 2 to 2½ knots. Between North and South Islands, the set of the flood current is toward Mud Bay until past the north point of South Island, when the set is more westward. Northward of Frazier Point the flood sets into the channel eastward of Hare Island and also into Waccamaw River. In the western channel the current sets generally fair with the course to be steered. Current predictions for a number of places in Winyah Bay may be obtained from the *Atlantic Coast Current Tables.*

**Waccamaw River** rises at Lake Waccamaw, N. C., and flows southwest 120 miles into Winyah Bay just above Georgetown. The river is now little used, freight boating having been discontinued some years ago. The drawbridge over Waccamaw River just above the mouth is described in connection with the Intracoastal Waterway.

A Federal project for improvement of Waccamaw River provides for a channel 12 feet deep at low water and 80 feet wide from the mouth of the river to Conway, a distance of approximately 36 miles; thence a channel 4 feet deep at low water and 50 feet wide to Red Bluff, 22 miles above Conway; thence a clear channel to Lake Waccamaw. The channel to Conway has been completed and is maintained. In August 1947 project depth was reported available to Conway, but above this point the river is obstructed by logs, snags, and sand bars.

The mean range of tide in Waccamaw River is about 3½ feet at the mouth and 1½ feet at Conway. The head of the tidal reach is at Bellamys Landing, 80 miles above the mouth. The flood range at Conway is about 13½ feet.

**Pee Dee River** rises in the North Carolina mountains and flows generally southeastward 375 miles into Winyah Bay just westward of Waccamaw River. Above the Uharie River, 200 miles from the mouth, it is called the Yadkin. The highway bridge over Pee Dee River just above the mouth has a swing span with a horizontal clearance of 80 feet and a vertical clearance, closed, of 12½ feet at high water; at least 12 hours' advance notice is required to have the bridge opened.

A Federal project for improvement of Pee Dee River provides for a channel 9 feet deep from Waccamaw River, via Bull Creek, to Smiths Mills, 48 miles above the mouth of Pee Dee River; thence 3½ feet deep at all stages of water to Cheraw. The project is maintained to Smiths Mills, but above this point the river is obstructed by logs, snags, and sand bars. The mean range of tide in Pee Dee River is about 3½ feet at the mouth and 3 inches at the mouth of Little Pee Dee River 33 miles above. Usual variation in water surface due to freshets is 18 feet at Smiths Mills, 17 feet at Mars Bluff, and 35 feet at Cheraw.

**Black River** empties into Pee Dee River from northward about 3 miles above the mouth of the latter, and is navigable for a distance of 44 miles. The highway bridge 8 miles above the mouth of Black River has a swing span with a horizontal clearance of 70 feet and a vertical clearance, closed, of 5 feet at high water; at least 12 hours' notice is required to have the bridge opened.

**Mingo Creek** joins Black River about 22 miles above the river's mouth. The Federal project for improvement of Mingo Creek provides for a channel 8 feet deep at mean low water and 60 feet wide from the mouth to Hemingway Bridge, a distance of approximately 10 miles, by making four short cut-offs. The project is maintained. There are many sharp bends in the stream. The mean range of tide is 2 feet and the freshet range is 4½ feet.

## Winyah Bay to Charleston Harbor

Charts 1238, 1239

Between Winyah Bay and Charleston Harbor are several rivers and inlets into which depths of from 1 to 6 feet can be carried from sea at low water. These inlets are changeable in character, and local knowledge and favorable conditions are essential to enter. Suitable anchorages can be found inside these inlets or in their tributary waters. At most of the entrances, the channels trend in a northerly direction, and shoals and breakers pretty well mark the channel edges inside the bars. Entrances to North Santee River and Bull Bay are less difficult of navigation than the other entrances in this locality.

**Chart 1238.—East Bank,** with 10 feet of water over it, is about 2 miles south of the outer end of Winyah Bay south jetty. Between East Bank and Cape Romain are other shoal spots, one, with a depth of 15 feet over it, about 6 miles offshore. Broken ground, with depths of 5 fathoms or less, extends as far as 11 miles from shore. The wreck of the *Hector* lies on the outer edge of the shoals, 12 miles southward of the outer end of Winyah Bay south jetty and 13 miles eastward of Cape Romain. The wreck, which has a depth of 11 feet over it, is marked by a lighted bell buoy. Deep-draft vessels should stay outside this buoy.

**Santee River,** formed by the confluence of Congaree and Wateree Rivers, flows generally southeast for 124 miles and enters the ocean between Winyah Bay and Cape Romain. Its two mouths, known as **North Santee River** and **South Santee River,** are

both obstructed by shifting bars, with little depth, as shown on the chart. In the tidal reach are several privately owned landings which are used infrequently.

A Federal project for improving Santee River provides for snagging the entire river. In 1941 the river was closed to navigation at Wilson Landing, Mile 75, by construction of the Santee Dam of the Santee-Cooper hydroelectric project. The controlling depth in the 10 miles next above the Intracoastal Waterway crossing at Mile 6 is about 9 feet; thence 4 feet to Lenuds Ferry, 27 miles above the crossing. The head of the tidal reach is at Mile 42, about 9 miles upstream from Lenuds Ferry. The controlling depth from Lenuds Ferry to Santee Dam, about 42 miles, has been reduced to probably no more than 2 feet by diversion of the waters to the Pinopolis Reservoir and Cooper River.

Vessels bound for the Santee River are advised to enter by way of Winyah Bay and the Intracoastal Waterway. Navigation between the coast and points on the Santee River above the dam is possible by way of Cooper River and the Santee-Cooper project. A highway bridge over North Santee River 12 miles above the mouth has a swing span with a horizontal clearance of 68 feet and vertical clearances, closed, of 3 feet at extreme high water and 16 feet at low water. A fixed span over South Santee River on the same highway has a horizontal clearance of 33 feet and the same vertical clearances as the swing span.

**Cape Romain Shoal,** with depths of 6 to 15 feet over it, extends 4 miles southeastward from Cape Romain. A depth of 7 feet at the outer end of the shoal is marked by a buoy. **Cape Romain Daybeacon** is an unused lighthouse 161 feet high on the east end of **Raccoon Key.** The structure is an octagonal pyramidal tower, with the lower half white, upper faces alternately black and white, and a black top.

**Cape Romain Harbor**, an unimportant cove with depths of 1 to 2 feet, is used only by small local fishing boats. A narrow, crooked, unmarked channel with a limiting depth of 5 feet leads from the sea around the north end of **Cape Island** to **Horsehead Creek.** Into **Casino Creek,** which joins the Intracoastal Waterway, about 3 feet can be carried. The mean rise and fall of the tide is about 5 feet. The inlet leading to Cape Romain Harbor from the south is practically closed at low water.

**Five Fathom Creek,** at the western end of Raccoon Key, has a controlling depth of 6 feet from the sea to the Intracoastal Waterway. Crooked and narrow at its upper end, the creek enters the sea through an unmarked inlet. Strangers are advised not to attempt an entrance because the outer bar is subject to change.

**Bull Bay,** southwest of Raccoon Key, is broad and shallow, and has numerous shoals, many of which are bare at high water. The narrow channel into **Bull Creek,** on the southwest side of the bay, has a depth of about 9 feet over the bar and is occasionally used as an anchorage. **Bull Breakers** extend 4 miles southward from **Bull Island,** on the southwest side of the entrance to Bull Bay, and are marked at their outer end by a buoy.

**Chart 1239.—Price Inlet,** between Bull Island and **Capers Island,** has a depth of about 6 feet over the bar. The channel is unmarked. The inlet is the best between Bull Bay and Charleston and is used by local fishermen. With average weather conditions, there are heavy breakers on the shoal on the eastern side of the channel and small breakers on the west side. Good anchorage is available in **Price Creek,** which connects with the Intracoastal Waterway.

**Capers Inlet,** between Capers Island and **Dewees Island,** has a depth of about 3 feet over the bar. The channel is narrow and unmarked, and is little used. It can be entered when the wind is southwest because of a shoal that extends eastward on the south side of the inlet and breaks the southwesterly seas. A shoal, bare at about half tide, extends southward along the eastern side of the inlet. There are numerous stumps and snags outside the high-water line in **Capers Creek.**

**Dewees Inlet,** between Dewees Island and **Isle of Palms,** has a depth of about 4 feet over the bar. The narrow channel is unmarked, and is of little use. Under average conditions, seas break entirely across the inlet. A standpipe at the pleasure resort near the southwest end of Isle of Palms is a prominent landmark.

**Breach Inlet,** between Isle of Palms and Sullivans Island, has very little water over the bar. There are breakers entirely across the entrance under almost all weather conditions. Currents are extremely strong in this inlet. A fixed highway bridge over the inlet has a horizontal clearance of 13 feet and a vertical clearance of 7 feet at high water.

**Rattlesnake Shoal,** 3 miles southeastward of Isle of Palms and the same distance east-northeastward of Charleston jetties, is about 2 miles long east and west and has a least depth of about 9 feet. A buoy marks the outer end of the shoal.

## Charleston Harbor

Charts 1239, 491, 470, 680, 681

**Charleston Harbor,** 264 miles southwestward of Cape Hatteras and about 65 miles northeastward of Savannah River, is the approach to the city of Charleston and to Cooper and Ashley Rivers. The harbor is easy of access either day or night in clear weather, and is one of the best harbors of refuge on the south Atlantic coast.

From northward, the safer approach to Charleston Harbor, and the one generally used by deep-draft vessels, is outside Frying Pan Shoals Lightship. From a position about 1 mile south of the lightship, make good a **245°** course for 73 miles to a position about 2 miles south-southeast of Cape Romain lighted whistle buoy 2CR. From this position a **250°** course made good for 46 miles should lead to Charleston lighted whistle buoy 2C.

From southward, a **046°** course made good for 66 miles from a position 2 miles southeastward of Savannah Lightship leads to the sea buoy. Courses and distances from the sea buoy to Charleston are given in Chapter 3.

**Caution.**—Along the coast from Charleston to Jacksonville, the courses between lightships and sea buoys are comparatively close inshore, and vessels must guard against an inshore set which may amount to a knot or more, due to indraft of current into the various inlets. In this section, preceding a northeasterly or following a southerly gale, an atmospheric condition known as *southern haze* may be encountered, resulting in low visibility of lights even in fine weather when it is clear overhead. During the periods when this condition exists it is reported that excessive inshore sets have been experienced.

**Rules of the Road.**—Inland Rules shall be followed inside a line from Sullivans Island Coast Guard Station to Charleston lighted whistle buoy 2C, thence to Charleston Light.

A Federal project for the improvement of Charleston Harbor provides for a channel 35 feet deep, 1,000 feet wide from the sea to the inner end of the jetties, thence 600 feet wide to Town Creek, thence 500 feet wide through Town Creek, thence 600 feet wide to the Naval Shipyard, and thence 400 feet wide to Goose Creek, with a turning basin 700 feet wide at the Port Terminal, together with a channel 30 feet deep and 600 feet wide in Cooper River around the east and north sides of Drum Island. The channels are maintained and are well marked.

**Chart 491.**—The entrance to Charleston Harbor is between converging jetties which extend nearly 3 miles seaward from shore. Prominent to the northward of the entrance are two tanks on **Sullivans Island** and a standpipe on Isle of Palms. **Fort Moultrie** and the town of **Moultrieville** are on the north side of the entrance, and **Fort Sumter** is on the southwest side of the channel just inside the entrance. Charleston's spires and housetops can be seen from outside the bar when the entrance is fairly opened out.

**Charleston Light,** 155 feet above the water and visible 19 miles, is shown from a black and white horizontally banded, conical tower, black at top, 3.5 miles south of Fort Sumter. **Charleston Radiobeacon** is at Fort Sumter.

**Charleston Harbor Entrance, restricted areas and danger zones for firing ranges.**—*The Areas.*—1. The artillery firing range of Fort Moultrie includes the waters of Charleston Harbor and approaches within a sector described as follows: Beginning at Fort Sumter, thence due south 8,300 yards; thence 210° 8,000 yards to a point 20,000 yards from Marshall Reservation, thence along this arc (20,000 yards from Marshall Reservation) in an easterly direction to its intersection with a line due south from Fort Sumter; thence south 3,100 yards to a point 20,000 yards from Fort Sumter; thence easterly along an arc with a radius of 20,000 yards, using Fort Sumter as a center, until it intersects an arc with a radius of 20,000 yards using Marshall Reservation as a center; thence easterly and northerly along this latter arc until it intersects a line due east of Marshall Reservation; thence due west 20,000 yards to Marshall Reservation; thence westerly along the shoreline to Battery Lord; thence 200° to the intersection with a line due east from Fort Sumter; thence due west to point of beginning.

2. The small arms and antiaircraft firing ranges include the waters of Charleston Harbor and approaches within a sector described as follows: Beginning at a point at the south end of Sullivans Island; thence 130° for 6,000 yards to bell buoy 12, which is located southeast of the outer end of the North Jetty; thence along a line 6,000 yards seaward of and paralleling the shoreline of Sullivans Island, in a northeasterly direction, to a point 6,000 yards due east of Marshall Reservation; thence northerly along an arc with a radius of 6,000 yards, with Marshall Reservation as a center, to the intersection of a line 070° from Marshall Reservation; thence 250° 6,000 yards to Marshall Reservation; thence westerly along the shoreline of Sullivans Island to the point of beginning.

*The Regulations.*—1. Except as hereinafter provided the waters described above are open throughout the year to the public for fishing and traffic except during target practice.

2. On days when artillery firing is to be conducted, a large red flag will be displayed from the Signal Tower at Old Fort Moultrie at the west end of the Reservation. This flag will be displayed not later than 7 a. m. of that day, and will be removed when firing ceases for the day. In addition a red flag will be displayed at the firing battery during the actual firing.

3. On days when small arms or antiaircraft firing is to be conducted, a large red flag with a large white flag beneath it will be displayed from the Signal Tower at Old Fort Moultrie at the west end of the Reservation. These flags will be displayed not later than 7 a. m. of that day, and will be removed when firing ceases for the day. In addition a similar red flag and a white flag will be displayed at the firing position during the actual firing.

4. When night firing is scheduled, a large white flag will be displayed from the same tower at 4 p. m. of that day.

5. On days and nights when firing is in progress, no boat or vessel will enter and remain in the restricted area described in paragraph 2 of this report, except under the written authority of the Commanding Officer, Harbor Defenses of Charleston, S. C.

6. Any vessel proceeding at a speed greater than 5 miles per hour may proceed directly through the firing area without restriction, except when notified to the contrary.

7. These regulations shall be enforced by the Commanding Officer, Harbor Defenses of Charleston, Fort Moultrie, S. C., through such officers, enlisted men, and employees as may be assigned thereto.

**Chart 470.—Cooper River** enters Charleston Harbor from northward on the eastern side of the city of Charleston. The main channel of the harbor extends several miles up the river. Two miles above the mouth of the river is **Drum Island.** The channel on the west side of the island is known as **Town Creek.** A fixed cantilever bridge spans Town Creek, Drum Island, and Cooper River proper. Over Town Creek the bridge has a vertical clearance of 135 feet at high water for a width of 600 feet; over Cooper River the bridge has a vertical clearance of 150 feet at high water for a width of 300 feet and 135 feet for a width of 1,000 feet.

**Charleston,** largest city and port in the State of South Carolina, is at the confluence of the Cooper and Ashley Rivers at the head of the largest natural deep-water harbor on the Atlantic coast south of Hampton Roads. The distance from the ends of the jetties to the city wharves is 7 miles. The city is in the center of a rich agricultural district which it serves as a distributing point. Numerous manufacturing plants are in or near Charleston. Coal, cotton, lumber, fertilizer, and petroleum products are shipped. The principal wharves of the city are along the west bank of Cooper River. The climate is equable, and the port is comparatively free of fog and high winds.

**Pilotage.**—With the exception of vessels of American registry under 100 tons and coastwise vessels having a duly licensed pilot aboard, all vessels are subject to pilotage. Pilots can be found cruising in the vicinity of the sea buoy. It is customary to request a pilot 24 hours in advance of arrival through the agents or direct to the Pilots Association. Masters of outbound vessels are required by law to notify pilots at least 12 hours prior to sailing time.

Vessels entering port in distress are charged pilotage one way only. If no bar pilot is engaged by vessels under enrollment, the rates for moves up or down rivers will be doubled. The following charges assessed against vessels for pilot service are fixed by State law and are applicable to both inbound and outbound movements.

| Draft (feet and under) | Cargo or empty | For bunker coal | Draft (feet and under) | Cargo or empty | For bunker coal |
|---|---|---|---|---|---|
| 6 | $14.00 | | 13½ | $54.00 | $33.75 |
| 7 | 16.50 | | 14 | 56.00 | 35.00 |
| 8 | 20.00 | $12.00 | 14½ | 58.00 | 36.25 |
| 8½ | 21.25 | 12.75 | 15 | 60.00 | 37.50 |
| 9 | 22.50 | 13.50 | 15½ | 62.00 | 38.75 |
| 9½ | 23.75 | 14.25 | 16 | 68.00 | 48.00 |
| 10 | 30.00 | 20.00 | 16½ | 74.25 | 49.50 |
| 10½ | 36.75 | 21.00 | 17 | 76.50 | 51.00 |
| 11 | 38.50 | 22.00 | 17½ | 78.75 | 52.50 |
| 11½ | 40.25 | 23.00 | 18 | 81.00 | 54.00 |
| 12 | 42.00 | 24.00 | 18½ | 85.00 | 55.50 |
| 12½ | 43.75 | 25.00 | 19 | 90.00 | 57.00 |
| 13 | 50.00 | 32.50 | 19½ | 95.00 | 58.50 |

| Draft (feet and under) | Cargo or empty | For bunker coal | Draft (feet and under) | Cargo or empty | For bunker coal |
|---|---|---|---|---|---|
| 20 | $100. 00 | $60. 00 | 26½ | $159. 00 | $79. 50 |
| 20½ | 107. 75 | 61. 50 | 27 | 162. 00 | 81. 00 |
| 21 | 115. 50 | 63. 00 | 27½ | 165. 00 | 82. 50 |
| 21½ | 118. 25 | 64. 50 | 28 | 168. 00 | 84. 00 |
| 22 | 121. 00 | 66. 00 | 28½ | 171. 00 | 85. 50 |
| 22½ | 123. 75 | 67. 50 | 29 | 174. 00 | 87. 00 |
| 23 | 126. 50 | 69. 00 | 29½ | 177. 00 | 88. 50 |
| 23½ | 129. 25 | 70. 50 | 30 | 180. 00 | 90. 00 |
| 24 | 132. 00 | 72. 00 | 30½ | 183. 00 | 91. 50 |
| 24½ | 134. 75 | 73. 50 | 31 | 186. 00 | 93. 00 |
| 25 | 139. 50 | 75. 00 | 31½ | 189. 00 | 94. 50 |
| 25½ | 146. 75 | 76. 50 | 32 | 192. 00 | -------- |
| 26 | 154. 00 | 78. 00 | | | |

*Moves, etc.*

| | |
|---|---|
| From anchorage or city up Cooper River | $8 |
| Down Cooper River to city or anchorage | 8 |
| From anchorage or city up Ashley River | 8 |
| Down Ashley River to anchorage or city | 8 |
| From city to quarantine or roads | 4 |
| From quarantine or roads to city | 4 |
| Docking when requested | 4 |
| Streaming when requested | 4 |
| Detention per day or fraction thereof | 4 |
| All barges and vessels under enrollment, in tow, under 6 feet | Free |
| All barges and vessels under enrollment, in tow, 10 feet or under, no pilot | 5 |

**Quarantine.**—The quarantine station is located at **Fort Johnson,** on the northeast point of **James Island** about 2 miles southeast of the customhouse. The anchorage is on the south side of **South Channel,** abreast of Fort Johnson, and is marked by two yellow buoys. Vessels are boarded while at this anchorage. Medical relief for seamen is available at the customhouse. The nearest marine hospital is at Savannah, Ga.

**Customs.**—The customhouse is located on the water front at the foot of Market Street.

**Immigration.**—The immigration office is located in the customhouse.

**Anchorages.**—The anchorage grounds include all the navigable portions of the harbor, and the portions of Cooper, Ashley, and Wando Rivers adjacent thereto, except for certain prescribed areas.

**Areas of prohibited anchorage.**—1. That portion of Cooper River which is bounded on the north by an east-and-west line through the north customhouse wharf, on the east by Shutes Folly Island, on the south by an east-and-west line through the south shore of Shutes Folly Island, and on the west by the water front of Charleston.

2. A ship channel between the jetties and the Naval Shipyard 600 feet wide (or as much wider as an improved channel may hereafter be dredged) following the established ranges and usual courses and passing east of Drum Island. Between the north customhouse wharf and the northernmost building ways of the Charleston Shipbuilding & Dry Dock Co. this shall include all the area between the eastern limit of said channel and the eastern water front of Charleston.

3. A ship channel 500 feet wide from the vicinity of the northernmost building ways of the Charleston Shipbuilding & Dry Dock Co. north through Town Creek Channel, following the established ranges and usual courses and connecting at both ends with the main channel.

4. A ship channel in Ashley River from its mouth to Standard Wharf 240 feet wide following the established ranges and usual courses and widened at the eastern end to connect with the main channel in Cooper River.

5. The commonly used channel in Wando River with width of 200 feet.

6. A channel 200 feet wide in Hog Island Channel from Cooper River to the area opposite the mouth of Shem Creek having its northern limit along the line of lighted beacons in Hog Island Channel.

7. An area 1,200 feet wide extending from Ripley Daybeacon toward the head of the Seaboard Air Line Wharf (foot of Hasell Street) to its junction with the prohibited area described in paragraph 1.

8. An area 1,200 feet wide extending from Ripley Daybeacon to Fort Sumter Light with its axis connecting these structures.

9. An area 1,200 feet wide extending from Fort Sumter Light to Old Fort Moultrie, with its axis connecting the centers of those structures.

10. An area 1,200 feet wide extending from the tank at Fort Johnson north to its junction with the prohibited area described in paragraph 8, with its axis passing through the tank.

11. An area 900 feet in width, extending from the prohibited area described in paragraph 1 to Haddrell Point, with its axis passing through the center of Buoy 36 and the center of the rear range light of the Mount Pleasant Range, and with its axis turning at a point 600 yards beyond the rear range light of the Mount Pleasant Range so as to run in a west-east line.

**Special anchorages.**—Special anchorages may be assigned by the Captain of the Port. Designated by a letter and numeral, these special anchorages are described below.

The distances and bearings for the centers of the following anchorages are from the tank on the Battery, Charleston (32°46′12″ N., 79°55′56″ W.):

| | | | |
|---|---|---|---|
| A 1 | 1,920 yards 131° | B 3 | 1,340 yards 059° |
| A 2 | 1,570 yards 136° | B 4 | 1,200 yards 078° |
| A 3 | 1,210 yards 141° | B 5 | 1,280 yards 099° |
| A 4 | 890 yards 153° | B 6 | 2,350 yards 129° |
| A 5 | 625 yards 174° | B 7 | 2,775 yards 126° |
| A 6 | 575 yards 216° | F 1 | 1,750 yards 087° |
| A 7 | 700 yards 249° | F 2 | 1,680 yards 098° |
| A 8 | 1,000 yards 268°30′ | F 3 | 2,000 yards 094° |
| A 9 | 1,325 yards 278° | F 4 | 1,850 yards 108° |
| A 10 | 1,670 yards 284°30′ | F 5 | 2,150 yards 103° |
| A 11 | 2,180 yards 290° | F 6 | 2,430 yards 111°30′ |
| A 12 | 3,000 yards 296°30′ | F 7 | 2,820 yards 111° |
| B 1 | 2,460 yards 029° | F 9 | 2,825 yards 090° |
| B 2 | 1,975 yards 035° | | |

The distances and bearings for the centers of the following anchorages are from the tank at Fort Johnson (32°45′09″ N., 79°53′55″ W.)

| | | | |
|---|---|---|---|
| B 8 | 850 yards 298° | C 5 | 2,650 yards 046° |
| F 8 | 1,075 yards 337° | C 6 | 2,370 yards 057° |
| F 10 | 2,075 yards 353° | C 7 | 2,875 yards 055° |
| F 11 | 2,075 yards 003° | C 8 | 2,575 yards 068° |
| F 12 | 2,075 yards 013° | C 9 | 1,280 yards 015° |
| C 1 | 2,200 yards 024° | C 10 | 590 yards 030° |
| C 2 | 1,800 yards 033° | C 11 | 1,080 yards 040° |
| C 3 | 2,440 yards 035° | C 12 | 1,175 yards 092° |
| C 4 | 2,100 yards 045° | | |

The anchorage diameters are as follows: A 1 to A 12, 1,050 feet; F 1 to F 5, 1,050 feet; F 6 to F 8, 1,200 feet; F 9 to F 12, 1,050 feet; B 1 to B 8, 1,400 feet; and C 1 to C 12, 1,500 feet.

**The Regulations.**—1. Vessels assigned a special anchorage will place their anchors as near as possible in the center of the anchorage. Vessels not assigned a special anchorage will not place their anchors within the areas of prohibited anchorage, but vessels may be so anchored as to swing into these areas: *Provided*, That they are so placed, with reference to the customary winds, tides, and currents of the harbor, that they will so swing only during slack water.

2. Vessels must be anchored in such a way as not to interfere with the free navigation of channels of the port, including Cooper, Ashley, and Wando Rivers, or to obstruct the approach to any pier or entrance to any slip, or to impede the movement of any ferry boat.

3. Except in cases of great emergency, or when assigned a special anchorage by the Captain of the Port, no vessel shall be so anchored that it can swing within 400 feet of the eastern water front of Charleston. S. C.

4. Except in cases of great emergency, or when assigned a special anchorage by the Captain of the Port, no light vessel (vessel not laden) nor small craft shall be anchored in Cooper River north of an east and west line through the north customhouse wharf.

**Dockage facilities.**—There are many wharves of all types at Charleston, most of which are on Cooper River. Depths of 30 feet or more are available at the principal terminals. Several of the terminals are owned by railroads and steamship companies. The coal-handling pier of the Southern Railway Co. is opposite the upper end of Drum Island.

The South Carolina State Ports Authority owns the Port Terminal on Cooper River 9 miles above the Battery. The Ports Authority also owns terminals on Cooper River at Tradd Street, at Market Street, and at Columbus Street, and operates the belt-line railroad serving the piers and warehouses and connecting with trunk lines entering the city. Dockage and wharfage charges are assessed against vessels using the terminals operated by the Ports Authority.

The Coast Guard depot wharves are on Ashley River at Tradd Street. Several fertilizer wharves are about 4 miles up the river from the Coast Guard wharves.

**Supplies.**—Bunker coal and oil are available at Charleston. Fresh water is available at the piers or from water boats. Provisions and ship chandlers' stores are obtainable in the city. Gasoline, Diesel oil, fresh water, and ice are available to small vessels at a marine service station in Cooper River 1.2 miles above the Battery.

**Repairs.**—A floating drydock at Charleston has a lifting capacity of 8,500 tons. The largest of the four marine railways has a capacity of 350 tons. The drydock plant is equipped to make any type of repairs to seagoing vessels, or to their engines, boilers, and deck machinery. The smaller plants can handle small vessel repairs and some machine work.

**Towage.**—Steam vessels usually proceed from the ocean to the city without assistance. Towboats can be had by making signal while outside the bar or at the wharves, or may be ordered from the towboat offices in the city.

**Communications.**—Charleston is served by the Southern Railway, the Atlantic Coast Line Railroad, and the Seaboard Air Line Railroad. Steamship service is available to foreign, intercoastal, and coastwise ports. The municipal airport is a scheduled stop for air-line service.

**Storm warnings** are displayed day and night at the Coast Guard depot on Ashley River and at the Sullivans Island Coast Guard Station at Moultrieville; daytime displays are made at the Charleston Customhouse.

**Tides.**—Daily tide predictions for Charleston are given in the *Atlantic Ocean Tide Tables*. The mean range of tide at Charleston and Fort Sumter is about 5 feet. At Fort Sumter the tides occur about 10 minutes earlier than at Charleston.

**Currents.**—Tidal currents off the entrance to Charleston Harbor are rotary; see Table 5, *Atlantic Coast Current Tables*. Currents between the jetties and in the harbor generally set fair with the channel near its axis. About 1 mile outside Fort Sumter, branches from the main ebb current set through the openings between the jetties and the shore with a velocity of about 2 knots at strength. The maximum velocities at strength of ebb are about 3 knots between the jetties, 3 knots between Fort Sumter

and Fort Moultrie, and 2 knots in South Channel and off the eastern water front of Charleston; the velocity of the flood current is less than the ebb, depending on the freshet flow from the rivers. Daily predictions of the times of slack water and the times and velocities of strength of flood and ebb between the Charleston jetties are given in the *Atlantic Coast Current Tables*. Similar predictions for a number of other places in Charleston Harbor and vicinity can be obtained through use of Table 2 of the Current Tables.

**Ashley River** empties into Charleston Harbor from northwestward on the southwest side of Charleston. There are no towns or villages of importance above Charleston; the principal landings are at numerous phosphate works, all of which have wharves extending to the channel. A Federal project for improving Ashley River provides for a channel 30 feet deep and 300 feet wide from the mouth to the Standard wharf, 5.5 miles above the Battery, suitably widened at bends and at the head of the improvement. The channel is maintained and is well marked.

A municipal yacht basin is on the northeast side of Ashley River 1 mile above the Battery and opposite the entrance to **Wappoo Creek,** the route of the Intracoastal Waterway southward. Gasoline, Diesel oil, fresh water, and some supplies are available at the yacht basin; a nominal charge is made for dockage. A Federal project provides for a channel 12 feet deep and 100 feet wide into the basin. The channel is well marked. The controlling depth was 4 feet in March 1947.

A highway bridge over Ashley River 2 miles above the Battery has a bascule span with a horizontal clearance of 110 feet and a vertical clearance, closed, of 14 feet at high water. A railroad bridge 3 miles above the Battery has a swing span with a horizontal clearance of 100 feet and a vertical clearance, closed, of 10 feet at high water. The railroad bridge 10 miles above the Battery has a bascule span with a horizontal clearance of 60 feet and a vertical clearance, closed, of 3 feet at high water.

From the upper end of the maintained channel, the ruling depth is about 5 feet to a point 8 miles above the third bridge, thence 3 feet for a distance of 1.5 miles to **Greggs Landing** (*Chart 1239*).

**Hog Island Channel** and **Shem Creek** lead to **Mount Pleasant** on the lower east side of Charleston Harbor. In the lower part of Shem Creek are a small boatyard, marine railways, and small wharves. A fixed bridge 0.4 mile above the mouth of the creek has a horizontal clearance of 33 feet and a vertical clearance of 19 feet at high water.

A Federal project provides for a channel in Shem Creek 10 feet deep and 110 feet wide from a flared entrance from Hog Island Channel to and including a turning basin 130 feet wide and 400 feet long with the upper end 250 feet upstream of the Mount Pleasant public wharf. A lighted range marks the entrance to the creek. The controlling depth in June 1947 was 8½ feet.

**Wando River** empties from the northeast into Cooper River eastward of Drum Island. A lighted range marks the channel at the mouth of the river. Westward of the range and opposite the mouth of **Hobcaw Creek** a series of mooring dolphins extends about 900 yards in depths of 30 to 36 feet.

**Chart 681.—Cainhoy (Wando)** is a post village on Wando River about 9 miles above Drum Island. A depth of 12 feet can be taken to Cainhoy wharf, which has a depth of 6 feet alongside. Provisions and gasoline are available in limited quantities. A highway bridge 0.4 mile above Cainhoy has a swing span with a horizontal clearance of 62 feet and a vertical clearance, closed, of 6 feet at high water. A lumber company has a

long landing about 1 mile above Cainhoy. A depth of 12 feet can be carried to the principal loading wharf, which has 10 feet alongside. Wando River continues for about 7 miles to **Wards Bridge,** fixed, at the head of navigation. **Guerin Creek** empties into Wando River from the northeast about 2 miles above Cainhoy. **Guerin Bridge,** fixed, the head of navigation, is some 3 miles above the mouth of the creek.

**Chart 470.—Shipyard Creek** empties into Cooper River from the west about 1 mile above the north end of Drum Island. This waterway has considerable traffic in oil, phosphates, and lumber. A Federal project for improvement of Shipyard Creek provides for a channel 30 feet deep and 200 feet wide, widened at the entrance, from deep water in Cooper River to the vicinity of the plant of the Pittsburgh Metallurgical Co., with a turning basin 30 feet deep opposite the Gulf Oil Corp. terminal and a turning basin 30 feet deep at the upper end of the project. A lighted range marks the entrance to the Creek. In June 1947, controlling depths were 30 feet to a point 100 feet upstream of the upstream end of the Gulf Oil Corp. dock, thence 20½ feet to the head of the project.

The **Charleston Naval Shipyard** is on the west side of Cooper River 6 miles above the Battery. Just north of the shipyard is **North Charleston,** the site of several oil wharves, a cotton compress, and several cotton warehouses. The **Port Terminal** is 9 miles above the Battery and at the head of the main channel in Cooper River.

**Chart 680.**—Cooper River is marked as far north as the bend at **Bushy Park,** 7 miles above the Port Terminal. Depths of 20 feet or more are available in the river from the terminal to the **Tee,** 18 miles above, where the river divides into East and West Branches. Marshland, with occasional bluffs 15 to 20 feet high, borders this section of the river.

In **East Branch,** the controlling depth is about 9 feet to **Pompein Chapel,** 6 miles above the Tee. The channel is narrow and follows the ebb-tide bends.

In **West Branch,** the controlling depth is about 14 feet to the Seaboard Air Line Railroad bridge 4 miles above the Tee. The first bend west of the Tee is a bad spot; deep water is on the inner side of the bend.

The Seaboard Air Line Railroad bridge has a swing span with a horizontal clearance of 30 feet and a vertical clearance, closed, of 8 feet at high water. From October to April, a bridge tender is on duty from 7 a. m. to 7 p. m.; from April to October, at least 24 hours' advance notice is required to have the bridge opened. Extreme caution is necessary at the bridge; the current is strong, and about 40 minutes is needed to open the draw. The mean range of tide at the bridge is about 4 feet.

About 12 miles above the Tee, a tailrace canal enters West Branch from **Pinopolis Reservoir.** The distance along the canal from West Branch to the Reservoir is about 4 miles. The two bridges over the canal have minimum clearances of 100 feet horizontally and 50 feet vertically. A marginal wharf 200 feet long and 40 feet wide is on the west side of the canal about 1 mile above the junction with West Branch.

A depth of about 11 feet is available from the Seaboard Air Line Railroad Bridge over West Branch to the tailrace canal and thence to the dam. The lock in the Pinopolis Dam has a length of 180 feet, a width of 60 feet, and a depth over the miter sills of 12 feet; the vertical lift is 75 feet. A draft of 14½ feet has been taken to the reservoir with favoring tides.

Light-draft vessels can navigate to Columbia, S. C., by way of Pinopolis Reservoir,

Santee Reservoir, and the Congaree River. The last 18 miles are treacherous because of the twisting channel and the varying water levels caused by a dam above Columbia. The reservoirs are fouled by submerged trees. In 1947, a project was under way to pull stumps and trees. Navigation should not be attempted without local information as to conditions.

# Intracoastal Waterway, Southport to Charleston Harbor

Charts 835, 836, 837

The Federal project for that portion of the Intracoastal Waterway between Southport and Charleston Harbor provides for a channel 12 feet deep and not less than 90 feet wide. The project is maintained and the channels are well marked. Controlling depths are listed in every issue of the weekly *Notice to Mariners*.

**General regulations** governing bridges and locks and the handling of tows are quoted in Chapter 2. **Special regulations** prescribed by the Wilmington District, Corps of Engineers, are quoted in Chapter 5, page 148. Special regulations prescribed by the Charleston District (southward of North Carolina-South Carolina State line) are the same as those for the Norfolk District; see Chapter 5, page 148.

## Southport to Socastee Creek

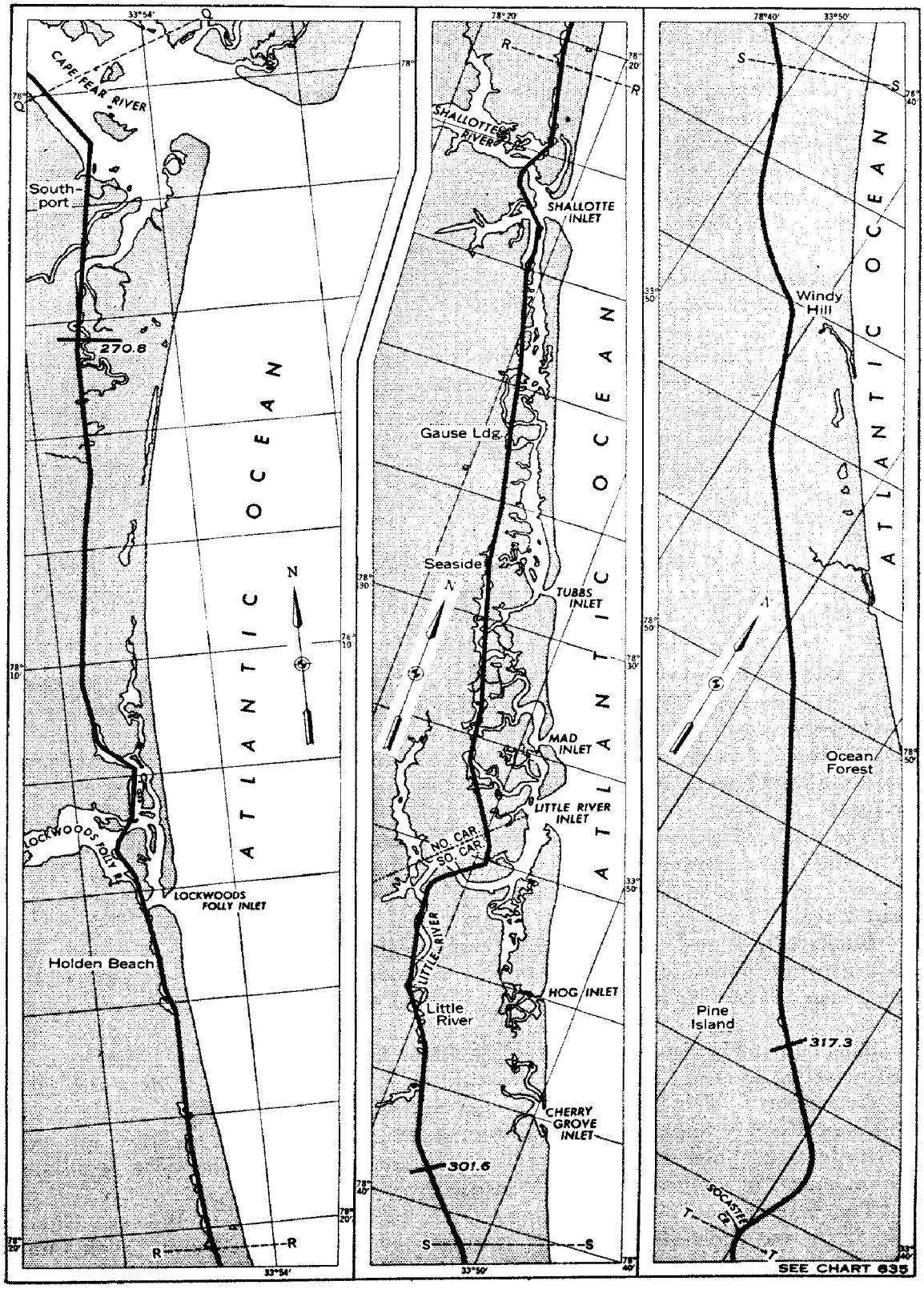
Chart 835

At Southport, the route of the Intracoastal Waterway leaves Cape Fear River and proceeds westward through land cuts to Lockwoods Folly River. A highway bridge over the waterway at *Mile 270.8* has a swing span with a horizontal clearance of 80 feet and a vertical clearance, closed, of 9 feet at high water.

In **Lockwoods Folly River,** the waterway passes around the head of the marshes just inside **Lockwoods Folly Inlet.** At **Holden Beach,** *Mile 280.6*, a cable ferry across the waterway has a horizontal clearance of 80 feet. Gasoline is available at the pier near the ferry crossing.

The waterway passes around the head of the marshes inside **Shallotte Inlet** and proceeds westward by way of cuts through the marshes and sloughs. **Shallotte River** causes strong cross-currents in the waterway. At **Gause Landing,** *Mile 290.0*, is a small public wharf; some provisions are available. Gasoline is available at **Seaside,** *Mile 292.1*.

The waterway joins **Little River** at *Mile 296.7*. **Calabash Creek** extends northeastward from Little River just north of the waterway cut-off and has a depth of about


CAPE FEAR RIVER
South-port
270.8
ATLANTIC OCEAN
LOCKWOODS FOLLY
LOCKWOODS FOLLY INLET
Holden Beach
SHALLOTTE RIVER
SHALLOTTE INLET
Gause Ldg.
Seaside
TUBBS INLET
MAD INLET
LITTLE RIVER INLET
NO. CAR.
SO. CAR.
LITTLE RIVER
Little River
HOG INLET
CHERRY GROVE INLET
301.6
Windy Hill
Ocean Forest
Pine Island
317.3
SOCASTEE CK.
SEE CHART 635

3 feet to the village of **Calabash,** N. C., 0.6 mile above the creek's entrance. A marine railway at Calabash has a capacity of 15 tons and can handle a length of 40 feet and a draft of 4 feet.

There is considerable dock space at the town of **Little River,** S. C., *Mile 298.8*; fuel and groceries are available. The mean range of tide at Little River is about 5 feet.

A highway bridge over the waterway at *Mile 301.6* has a swing span with a horizontal clearance of 79 feet and a vertical clearance, closed, of 7½ feet at high water. An overhead cable at the bridge has a vertical clearance of 85 feet at high water.

From Little River, the waterway follows a long land cut southwestward to Socastee Creek and Waccamaw River. Near **Windy Hill,** *Mile 306.4*, is a yacht basin, at which gasoline, Diesel oil, water, ice, groceries, and some marine supplies are available. There is a small charge for overnight dockage. The basin is about 10 miles northeast of Myrtle Beach proper.

At *Mile 317.3*, a combination highway and railroad bridge over the waterway leads to Myrtle Beach. The bridge has a bascule span with a horizontal clearance of 80 feet and a vertical clearance, closed, of 16 feet at high water. Overhead cables at the bridge have a vertical clearance of 80 feet at high water.

## Socastee Creek to McClellanville

Chart 836

A highway bridge over the waterway at **Socastee,** *Mile 322.2*, has a swing span with a horizontal clearance of 79 feet and a vertical clearance, closed, of 11½ feet at high water. An overhead power cable at the bridge has a vertical clearance of 94 feet at high water. A county-owned yacht basin is on the north side of the waterway just west of the bridge. There are no wharves in the basin. Supplies can be obtained in limited quantities at Socastee.

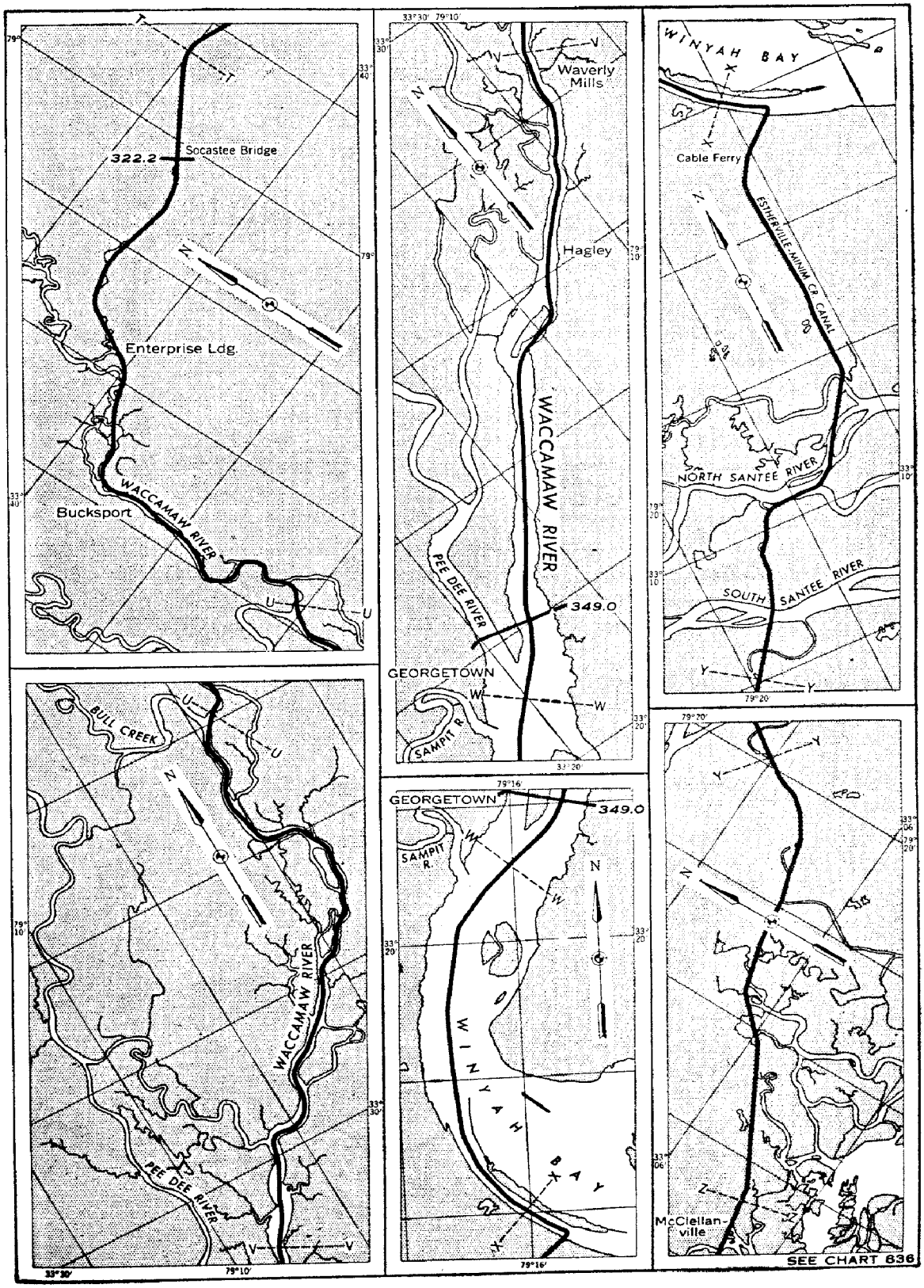
The route of the waterway enters **Waccamaw River** at **Enterprise Landing,** *Mile 325.4*, and follows the river to Winyah Bay. The direction of flow of the current in the waterway changes at Enterprise Landing. The mean range of tide at the landing is about 2 feet.

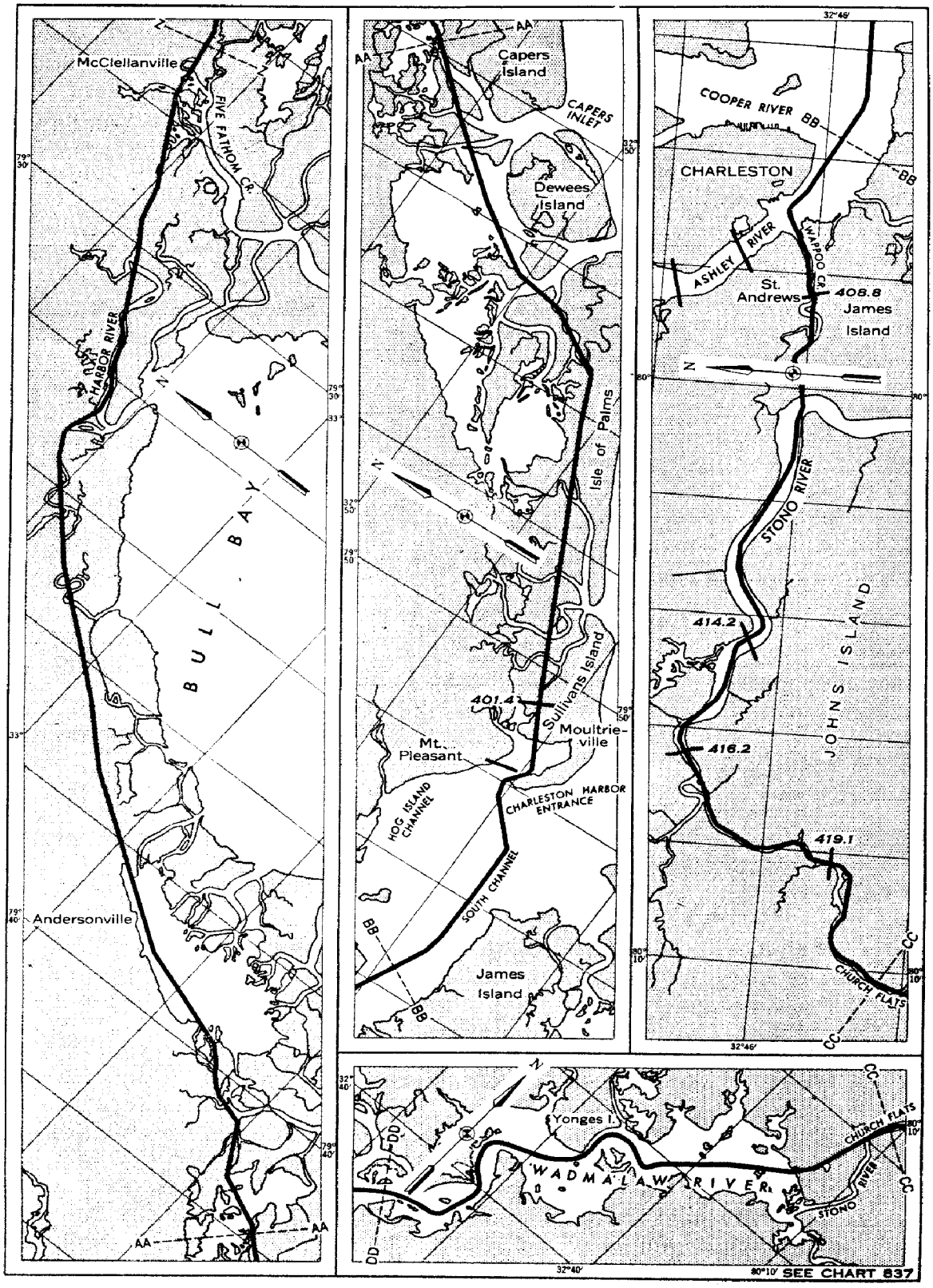
**Bucksport,** on the west side of Waccamaw River at *Mile 327.4*, has a yacht basin at which gasoline, Diesel oil, water, ice, and provisions are available. There is plenty of dock space. The marine railway can haul vessels up to 70 feet in length for general repairs.

The highway bridge over Waccamaw River at *Mile 349.0* has a swing span with a horizontal clearance of 120 feet and a vertical clearance, closed, of 12½ feet at high water.

**Georgetown,** *Mile 350.8*, is at the head of Winyah Bay and just inside the mouth of **Sampit River.** Supplies, hotel accommodations, and repair facilities are available at Georgetown. The mean range of tide is about 3½ feet. The town is discussed at greater length in connection with Winyah Bay.

The Intracoastal Waterway leaves Winyah Bay by way of Western Channel at *Mile 356.5* and proceeds southward through the **Estherville-Minim Creek Canal.** A


322.2
Socastee Bridge
Enterprise Ldg.
Bucksport
WACCAMAW RIVER
Waverly Mills
Hagley
WACCAMAW RIVER
PEE DEE RIVER
349.0
GEORGETOWN
SAMPIT R.
WINYAH BAY
Cable Ferry
ESTHERVILLE MINIM CR. CANAL
NORTH SANTEE RIVER
SOUTH SANTEE RIVER
BULL CREEK
WACCAMAW RIVER
PEE DEE RIVER
GEORGETOWN
349.0
SAMPIT R.
WINYAH BAY
McClellanville
SEE CHART 836


McClellanville
FIVE FATHOM CR.
HARBOR RIVER
BULL BAY
Andersonville
AA
Capers Island
CAPERS INLET
Dewees Island
Isle of Palms
Sullivans Island
401.4
Mt. Pleasant
Moultrieville
HOG ISLAND CHANNEL
CHARLESTON HARBOR ENTRANCE
SOUTH CHANNEL
BB
James Island
COOPER RIVER
CHARLESTON
ASHLEY RIVER
WAPPOO CR.
St. Andrews
408.8
James Island
STONO RIVER
414.2
JOHNS ISLAND
416.2
419.1
CC
CHURCH FLATS
Yonges I.
DD
WADMALAW RIVER
STONO RIVER
SEE CHART 837

cable ferry crosses the canal at *Mile 357.3*. An overhead power cable over the canal at *Mile 359.2* has a vertical clearance of 97 feet at high water. Southwest of the canal, the waterway crosses **North** and **South Santee Rivers** and proceeds by way of cuts through the marsh to McClellanville.

## McClellanville to Charleston Harbor

Chart 837

**McClellanville,** *Mile 373.3*, is on **Jeremy Creek** 1 mile north of the waterway. Boats lie alongside the bulkhead on the east side of the dredged channel from the waterway. Telephone and mail facilities, gasoline, provisions, and fresh water are available at McClellanville. The mean range of tide at McClellanville is about 5 feet.

From McClellanville the waterway follows land cuts and sloughs through the marshes back of **Bull Bay**; thence through shoal **Sewee Bay** and along **Price Creek**; through the marshes and along **Capers Creek**; behind **Dewees Island** and across **Dewees Creek** to the land cuts behind **Isle of Palms** and Sullivans Island. The several outlets to the ocean along this stretch are described in another section.

The highway bridge to **Sullivans Island** over the waterway at *Mile 401.4* has a swing span with a horizontal clearance of 93 feet and a vertical clearance, closed, of 32 feet at high water. The bridge which formerly crossed the waterway at *Mile 402.5* has been abandoned and the channel spans have been removed.

The route of the waterway enters the lower east side of **Charleston Harbor** between Sullivans Island and the town of **Mount Pleasant,** which is about 1 mile north of the waterway and is reached through a well-marked channel that branches off from the waterway at *Mile 403.0*.

Complete supply and repair facilities are available at **Charleston,** *Mile 406.0*. The city is described at length in another section. The route of the waterway leaves the water front of Charleston in **Ashley River** and proceeds westward and southward through Wappoo Creek. The mean range of tide at Charleston is about 5 feet.

789003°—48——14

CHAPTER 8

# Charleston Harbor to Savannah River

## Charts 1239, 1240

FROM Charleston Harbor to Savannah River the coast trends in a southwesterly direction for a distance of about 65 miles. The coast is low and timbered, and is broken by St. Helena, Port Royal, and Calibogue Sounds, and by numerous inlets from which there is access to the interior by way of the rivers emptying into them. Shoal water extends offshore for distances varying from 3 to 8 miles.

## Charleston Harbor to Port Royal Sound

Charts 792, 793, 794

**Chart 792.—Lighthouse Inlet,** between Charleston Light and **Folly Island,** has no channel across the bar; entrance should be attempted only with local knowledge, and with a rising tide on a smooth day. Entrance is not possible for boats of over 3 feet in draft. The inlet is used only by local fishermen. Small craft pass into Charleston Harbor by way of **Lighthouse Creek** and also into the numerous sloughs north of Folly Island.

**Folly Beach,** an amusement park on Folly Island, is connected by highway with Charleston. The buildings and lights are prominent from seaward.

**Stono Inlet,** between Folly Island and **Kiawah Island,** is about 7 miles southwestward of Charleston Light. A shifting bar obstructing the entrance to the inlet is

marked by several buoys. A draft of about 4 feet can be taken into Stono River with local knowledge. The entrance is used by local fishermen.

**Stono River,** which joins the inlet from northward, is of little commercial importance. Its upper reach, above **Elliott Cut,** forms part of the Intracoastal Waterway. Vessels enter the river by way of the Intracoastal Waterway from Charleston. During summer months, numerous pleasure craft belonging to residents of Folly Beach use this means of reaching the resort by way of Folly River.

**Folly River** flows into Stono Inlet from the northeast and **Kiawah River** from the west. Both are relatively unimportant. Folly River is used by pleasure craft and local fishermen desiring to reach Folly Beach. The fixed highway bridge over Folly River has a horizontal clearance of 32 feet and a vertical clearance of 15 feet at high water.

**North Edisto River** entrance is 17 miles southwestward of Charleston Light. This river, of little commercial importance, is rarely used. At its entrance, shoals extend offshore for more than 3 miles, forming a shifting bar over which there is a depth of about 10 feet. The channel is marked by buoys which are moved, when practicable, to indicate the best water. It is well defined by breakers.

Two of the tributaries of North Edisto River, **Wadmalaw River** from eastward, and **Dawho River** from westward, are part of the Intracoastal Waterway. Entrances to **Bohicket Creek, Steamboat Creek,** and Dawho River are marked by lights. **Rockville** is a village on Bohicket Creek, which is 2.5 miles above the entrance to North Edisto River. A depth of 14 feet can be carried up Bohicket Creek to Rockville, where there are two docks at which fresh water can be obtained.

The mean rise and fall of tides in North Edisto River entrance is about 6 feet. On the bar the direction of the current is generally across the channel. The flood current sets about westward, and the ebb eastward, and both have considerable velocity. Inside the bar, in the channel between the breakers, the ebb current is to be guarded against, especially when it sets across the north breakers. Predicted currents for the North Edisto River entrance may be obtained from the *Atlantic Coast Current Tables.*

**Chart 793.**—The entrance to **St. Helena Sound** is 7 miles wide between **Bay Point** on the northeast and **Hunting Island** on the southwest. **Hunting Island Daybeacon,** 1.2 miles from the north end of the island, is the principal guide for entering the sound; the structure is a conical tower 128 feet high, lower part white and upper part black. There are several channels through the shoals which extend about 6 miles seaward from the entrance to the sound. The principal channel has depths of 13 to 16 feet over the bar, and is marked by buoys which are shifted to indicate the best water. The mean rise and fall of tides on the bar and in the entrance to the sound is about 6 feet.

Most important of the several navigable rivers emptying into the sound are South Edisto, Ashepoo, Coosaw, Morgan, and Harbor Rivers; the first three are links in the route of the Intracoastal Waterway.

**South Edisto River,** which empties into St. Helena Sound immediately westward of Bay Point, is of little commercial importance. Above its junction with Dawho River, the South Edisto is known as **Edisto River.**

An unmarked channel into South Edisto River has depths of 12 to 16 feet over the ocean bar. The river is usually entered from the Intracoastal Waterway; the entrance from the ocean is rarely used. The mean rise and fall of tides is about 6 feet in the lower

part of the river. Currents at the entrance have a velocity of about 2 knots; current predictions may be obtained from the *Atlantic Coast Current Tables*.

The railroad bridge over Edisto River 20 miles above the mouth has a swing span with a horizontal clearance of 62 feet and a vertical clearance, closed, of 5½ feet at high water; at least 96 hours' advance notice is required to have the bridge opened. A draft of about 3 feet can be taken about 8 miles above this bridge to the fixed bridge at **Jacksonboro.**

**Ashepoo River** empties into St. Helena Sound from northward on the west side of **Otter Islands.** A highway bridge over the river 13 miles above the mouth has a swing span with a horizontal clearance of 60 feet and a vertical clearance, closed, of 7 feet at high water; at least 24 hours' advance notice is required to have the bridge opened. The railroad bridge 4 miles above the highway bridge has a swing span with a horizontal clearance of 60 feet and a vertical clearance, closed, of 4½ feet at high water; at least 96 hours' advance notice is required to have the bridge opened. The river has a controlling depth of about 9 feet to the second bridge.

**Coosaw River,** which enters the head of St. Helena Sound from westward, is important only as a link in the Intracoastal Waterway. The river channel is irregular in depth, partly because of the phosphate dredges which once operated here.

**Combahee River,** which empties into Coosaw River from northward 3 miles above the latter's mouth, is navigable for boats of about 5 feet draft to a fixed bridge 35 miles above the entrance. A railroad bridge 12 miles above the mouth of the Combahee River has a swing span with a horizontal clearance of 42 feet and a vertical clearance, closed, of 6 feet at high water. The highway bridge 8 miles above the railroad bridge has a swing span with a horizontal clearance of 100 feet and a vertical clearance, closed, of 8½ feet at high water. At least 12 hours' advance notice is required to have either bridge opened. The tides have a range of about 6 feet at the mouth of the river and 4½ feet at the highway bridge.

**New Chehaw River,** which empties into Combahee River from northward at the latter's mouth, is unimportant and has no traffic. **Old Chehaw River** enters the Combahee from northward about 2 miles above New Chehaw River. The village of **Wiggins** is about 1 mile above the junction of Old and New Chehaw Rivers.

**Chart 794.—Bull River** enters Coosaw River about 5 miles above the latter's mouth. Two miles above its mouth, Bull River divides into **Williman Creek** and **Wimbee Creek,** which pass north and south, respectively, of **Williman Islands** and rejoin 4.5 miles above the lower junction.

**Chisolm** is a village on the south bank of Wimbee Creek about 1.5 miles above the lower junction; the controlling depth to Chisolm is about 8 feet. A railroad bridge over Wimbee Creek 1 mile above the upper junction with Williman Creek has a swing span with a horizontal clearance of 40 feet and a vertical clearance, closed, of 5½ feet at high water; at least 24 hours' advance notice is required to have the bridge opened. The controlling depth to the bridge by way of Bull River and Williman Creek is about 10 feet; between Chisolm and the upper junction, Wimbee Creek is nearly dry in places at low water.

**Parrot Creek,** which enters Coosaw River on the south side directly opposite Bull River, is a 2-mile link between Coosaw and Morgan Rivers. The controlling depth through the creek is about 13 feet.

**Lucy Point Creek,** about 2 miles westward of Parrot Creek, also connects Coosaw and Morgan Rivers; the controlling depth through the creek is about 6 feet. A wharf and an oyster-packing plant are just inside the Coosaw River entrance to the creek.

**Chart 793.—Morgan River** empties into St. Helena Sound from westward. The river is about 8 miles long, and at its head connects with Chowan Creek, a tributary of Beaufort River; at the divide, this passage is nearly dry at low water. The mean range of tide near the head of Morgan River is about 7 feet.

**Fripp Inlet,** between Hunting Island and **Fripp Island,** is obstructed at its mouth by shoals over which but 3 or 4 feet can be taken in the smoothest weather. **Harbor River,** at the head of the inlet, connects with St. Helena Sound to the eastward, and **Story River** connects the inlet with Trenchards Inlet and Station Creek to the westward. A depth of about 4 feet can be taken from St. Helena Sound to Port Royal Sound by way of Harbor River, Story River, and Station Creek. A highway bridge over Harbor River 0.5 mile above the mouth has a swing span with a horizontal clearance of 64 feet and a vertical clearance, closed, of 15 feet at high water; at least 24 hours' advance notice is required to have the bridge opened.

**Skull Inlet,** 3 miles southwest of Fripp Inlet, is a narrow passage with little water over the bar.

## Port Royal Sound

Charts 571, 794

**Pritchards Inlet,** 5 miles northeast of Port Royal Sound, is a narrow passage from the ocean to the upper part of Trenchards Inlet and has very little water over the bar.

**Trenchards Inlet,** just northeast of Port Royal Sound, has a bar which extends about 2 miles from shore; the narrow unmarked channel over the bar has a controlling depth of about 4 feet. Station Creek connects the head of the inlet with Port Royal Sound to the westward.

**Port Royal Sound,** the largest and best of the unimproved harbors on the South Carolina coast, has an entrance about 2 miles wide between **Bay Point** on the northeast and **Hilton Head** on the southwest. There are two channels through the bar at the outer end of the shoals which extend 8 miles in a general south-southeast direction from the entrance. **Southeast Channel** has a depth over the bar of about 19 feet and is marked by lighted buoys. **South Channel** has less depth and is not marked.

**Beaufort River,** which enters Port Royal Sound from northward just inside Bay Point, is the approach to Beaufort, Port Royal, and the United States Marine Training Station on Parris Island. The river is a link in the Intracoastal Waterway, is well marked, and has depths of 20 feet or more to Battery Creek entrance, above which the controlling depth to Beaufort is about 12 feet.

**Station Creek** joins Beaufort River from eastward at the latter's mouth. A depth of about 4 feet can be taken from Port Royal Sound to St. Helena Sound by way of Station Creek, Story River, and Harbor River.

**Chowan Creek,** which empties into Beaufort River from northeastward 5 miles above Bay Point, connects at its head with Morgan River. A fixed highway bridge 5 miles above the mouth of the creek has a horizontal clearance of 28 feet and a vertical clearance of 4 feet at high water. The passage to Morgan River is also obstructed by shoals.

**Parris Island,** on the west side of the entrance to Beaufort River, is the site of a United States Marine Training Station. The dock on Parris Island opposite the mouth of Chowan Creek has a depth at the face of about 15 feet.

**Battery Creek** empties into Beaufort River from northwestward 7 miles above Bay Point. The creek has depths of 17 feet or more to the highway bridge 1 mile above Port Royal; above the bridge there is a controlling depth of about 5 feet in a narrow, winding channel to a point back of Beaufort Station. The highway bridge has a swing span with a horizontal clearance of 99 feet and a vertical clearance, closed, of 12 feet at high water; at least 24 hours' advance notice is required to have the bridge opened.

**Archers Creek,** a narrow passage leading westward from the mouth of Battery Creek to Broad River, is shoal at its eastern end and is blocked midway of its length by a fixed highway bridge which has a vertical clearance of only 2 feet at high water.

**Archers Creek, United States Marine Corps rifle range.**—*The Danger Zone.*—The firing range, which constitutes a danger zone, is located on the western side of Parris Island, and west of the Marine Barracks on the island, the direction of the firing being northwesterly across Ribbon Creek and Archers Creek.

*The Regulations.*—Firing over this range will normally take place between the hours of 6 a. m. and 5 p. m. on all days except Saturdays, Sundays, and legal holidays.

2. When firing is in progress, patrol boats will be stationed at each end of Archers Creek to restrict the use of the creek for navigation and to notify boats desiring to pass through Archers Creek when such passage will be safe and permissible.

3. These regulations will be enforced by the Commanding General, Marine Barracks, Parris Island, S. C., through such officers, enlisted men, and employees as may be designated, using such Government equipment as may be necessary.

On the north bank of Battery Creek, and just inside its entrance, is the town of **Port Royal**, a terminus of the Charleston & Western Carolina Railway. A depth of 17 feet is available in Battery Creek to and alongside the railway wharf, one end of which was in ruins in 1947. The town has highway connections with Parris Island and Beaufort, and with other points inland. Considerable shrimp and fish are trucked inland. The principal commercial activity at Port Royal is the handling of supplies for Parris Island.

**Beaufort** is on a point of land jutting eastward into Beaufort River 11 miles above Bay Point. The town has good highway connections with Charleston, Savannah, and other points, and is served by the Charleston & Western Carolina Railway. The principal commercial activities are in fish, shrimp, and truck farming. The wharves are on the south side of the town and west of the drawbridge which crosses the river to Ladies Island; depths at the principal wharves are 12 to 14 feet. There is fair anchorage in the stream off the wharves. The bridge is discussed further in connection with the Intracoastal Waterway.

Hotel accommodations, gasoline, Diesel oil, water, ice, and provisions are available at Beaufort. Across the river from Beaufort, and above the bridge, is a yacht marina at which gasoline, Diesel oil, water, and ice are available; the depth alongside the dock is about 6 feet. The two marine railways at the marina have a capacity of 75 tons each, and can handle a length of 65 feet and a draft of 6 feet for general repairs.

**Anchorage.**—The usual and best anchorage is in the mouth of Beaufort River abreast of Station Creek; the holding ground south of Bay Point is poor. There is good anchorage, with a depth of about 4 fathoms, in Beaufort River within 0.3 mile of the Parris Island wharf. Port Royal Sound is sometimes used as a harbor of refuge in winter.

**Storm warnings.**—Storm warnings are displayed day and night from a signal station at Port Royal.

**Tides.**—The mean range of tide is about 6½ feet on the ocean bar and 7½ feet at Beaufort.

**Currents.**—The currents on the ocean bar have an estimated velocity of 1½ knots and set fair with the channel. The currents in the sound have a velocity of 2 or more knots at times, and the tide rips on Fishing Rip and Middle Shoal sometimes have the appearance of breakers. Current predictions for a number of places in Port Royal Sound and vicinity can be obtained from the *Atlantic Coast Current Tables*.

**Broad River,** which enters Port Royal Sound on the west side of Parris Island, extends northwestward about 16 miles. The river is not difficult to navigate as far as Whale Branch.

**Chart 794.**—A railroad bridge over Broad River 2 miles above Whale Branch has a swing span with a horizontal clearance of 55 feet and a vertical clearance, closed, of 7 feet at high water; at least 24 hours' advance notice is required to have the bridge opened. **Pocotaligo, Tulifiny,** and **Coosawhatchie Rivers** are shallow streams which empty into the head of Broad River.

**Whale Branch,** which connects Broad River with Coosaw River to the eastward, has a controlling depth of about 7 feet. The railroad bridge over Whale Branch 4 miles from Broad River has a swing span with a horizontal clearance of 51 feet and a vertical clearance, closed, of 5½ feet at high water. The highway bridge 1.5 miles above the railroad bridge has a horizontal clearance of 34 feet and a vertical clearance, closed, of 5 feet at high water. The State is not required to keep the highway draw in operation between 8 p. m. Saturday and 6 a. m. Monday, and on other days between 8 p. m. one day and 6 a. m. on the next succeeding day; at least 24 hours' advance notice is required to have the bridge opened during these periods.

**Brickyard Creek,** 5 miles eastward of the highway bridge over Whale Branch, connects Coosaw River with Beaufort River to the southward and is a link in the Intracoastal Waterway. The creek is well marked. The mean range of tide at the mouth of Brickyard Creek is about 7 feet.

**Chart 571.**—**Chechessee River** empties into the head of Port Royal Sound from westward. **Colleton River,** one of its tributaries, is of little importance but has a good channel for some distance. A depth of 19 feet can be taken up the Chechessee to the mouth of Colleton River, thence up the latter for a distance of 5 miles. These rivers are of no commercial significance.

**Mackay Creek** joins the Chechessee River from westward about 1 mile above the river's mouth. An unused and unlighted route from Port Royal Sound to Calibogue Sound is through Mackay Creek past the north side of **Pinckney Island,** and parallel with Skull Creek. This passage is more difficult than the route through Skull Creek, but equally deep water is found by those having local knowledge.

**Skull Creek** enters Port Royal Sound from southwestward about 4 miles above Hilton Head. The creek is a link in the Intracoastal Waterway and is well marked. The controlling depth is about 16 feet. An oyster factory and wharf are at **Seabrook Landing,** 1 mile from the Calibogue Sound entrance.

To the westward of Port Royal Sound is **Hilton Head Island,** which is more than 10 miles long and nearly 5 miles wide on its northeastern face, tapering to a rounded point at its southwestern end.

**Hilton Head Island firing range.**—*The Danger Zone.*—The firing range includes the waters bounded by lines as follows: Beginning at the abandoned rear range light tower on Hilton Head Island located at latitude 32°09′59″ N., longitude 80°44′23″ W.; thence along a straight line bearing 188° for a distance of 15,000 yards from the said old range tower; thence eastward on an arc of a circle, whose center is the said old range tower, for an angular distance of 31°; thence 157° for a distance of 8,000 yards to a point bearing 011°45′, 2.9 miles from the Savannah Lightship; thence northeastward on an arc of a circle, whose center is the said old range tower, for an angular distance of 13°; thence in a straight line 054° to its intersection with a line bearing 138° from the northeasternmost tip of Hunting Island; thence along the last-named line to the northeasternmost tip of Hunting Island; thence along the southeasterly shore lines of Hunting, Fripp and Pritchards Islands to a point on the shore of Capers Island, 1.8 miles northeastward of Bull Point, bearing 054°, 23,000 yards from the said old range tower; thence 234° to the starting point.

*The Regulations.*—1. Sailing vessels or any watercraft having a speed of less than 5 miles per hour will keep clear of these sectors at all times after notices of firing have been given. Any vessel or other watercraft propelled by mechanical power at a speed greater than 5 miles per hour may enter the firing sectors without restriction except when the signals enumerated in paragraphs 4, 5, and 6 are being displayed. When the signals are displayed, all vessels in the sectors will clear immediately and no vessel will enter the sectors until the signals indicate that firing has ceased.

2. Firing over the range will take place during both daylight and nighttime hours, at irregular periods throughout the year.

3. The headquarters of the Savannah Bar pilots will be advised at least 2 days in advance of the day when firing in the sectors is scheduled to begin, in order that the directing heads of the local shipping agencies may be notified. On the same day when firing is to begin the sectors will be posted at the headquarters of the shrimp industries at Thunderbolt, Ga., Jenkins Island, and Beaufort, S. C. and published in local newspapers.

4. On days when there is firing in the sectors, a red flag will be displayed from a tower near the shore on the former lighthouse reservation on Hilton Head Island. The flag will be displayed not later than 7 a. m., and will be removed when firing ceases for the day.

5. During night firing, a searchlight will be in operation on the eastern shore on Hilton Head Island near the aforementioned old range tower.

6. During either day or night firing, the firing sector will be patrolled by boats and by low-flying aircraft, and all craft in or near the danger area warned and given instructions and orders to insure safety. During the day, the patrol boats will display a square red flag. At night the patrol boats will fire red rockets at half-hourly intervals while firing is in progress and a green rocket when firing ceases. During day or night firing, the low-flying aircraft will discharge red flares at frequent intervals while firing is in progress and green flares when firing has ceased.

7. These regulations shall be enforced by the Commanding General, Marine Barracks, Parris Island, S. C., or such responsible agent as he may designate.

The entrance to **Calibogue Sound** is between Hilton Head Island and **Daufuskie Island** and about 5 miles northward of Tybee Light. The entrance is obstructed by shifting shoals through which are several crooked channels. The best approach to the sound is from Tybee Roads, and has a depth of about 10 feet over the bar. Depths are ample inside the bar.

**Cooper River** empties into Calibogue Sound from westward about 3 miles above the entrance. This river is of importance only as a unit in the route of the Intracoastal Waterway.

**May River,** which empties into the sound from westward about 6 miles above the entrance, is the approach to the village of **Bluffton,** 7 miles above the river's mouth. The controlling depth in May River to Bluffton is about 13 feet. Passage is sometimes made from May River to Cooper River by way of **Bull Creek.** The tides meet in Bull Creek, forming flats over which there is a depth of about 2 feet at mean low water.

**Broad Creek** enters Calibogue Sound from the eastward and extends 6 miles into Hilton Head Island. The creek is of no importance, but has a depth of 12 feet or more for several miles.

## Savannah River

Chart 440

**Savannah River,** the boundary between the States of South Carolina and Georgia, is navigable for deep-draft vessels to the upper end of Savannah Harbor, about 19 miles above the outer ends of the entrance jetties, and for shallow-draft vessels to the city of Augusta, 172 miles above Savannah.

Deep-draft vessels approach Savannah River from outside the lightship. Courses and distances from the lightship to Savannah Harbor are given in Chapter 3.

**Savannah River, explosives dumping areas established eastward.**—1. An explosives dumping area for limited use, designated area A, has been established in an area with a radius of 5 miles centered in latitude 32°16′ N., longitude 78°41′ W.

2. A dumping ground for ammunition, designated B1, has been established in an area with a radius of 5 miles centered in latitude 31°40′ N., longitude 77°00′ W.

**Savannah Lightship** (see *Chart 1241*) is moored in 48 feet of water 10.5 miles 117° from Tybee Light. The lightship has a red hull with the word SAVANNAH on each side, and two masts, the foremast carrying a circular gallery and lantern. The light is 66 feet above the water and visible 14 miles; a riding light is on the forestay. The fog signal is an air-diaphragm horn; the radiobeacon is synchronized with the fog signal for distance finding. The code-flag signal and radio call is NNCX. **Storm warnings** are displayed during the daytime.

**Rules of the Road.**—Inland Rules shall be followed inside a line from the southwesternmost extremity of Braddock Point on Hilton Head Island to Tybee lighted whistle buoy T, thence to the southernmost point of Savannah Beach, bearing approximately 278°.

The main channel into Savannah River is through **Tybee Roads,** an anchorage surrounded by shoals to the eastward of Tybee Light. The anchorage can be entered day or night; general depths are 17 to 27 feet, and the shoals help to break the seas from any direction.

**Tybee Light,** 144 feet above the water and visible 18 miles, is shown from an octagonal brick tower, lower 50 feet black, middle part white, upper part black, on the northeast end of Tybee Island.

The modified Federal project for the improvement of Savannah River provides for a channel 36 feet deep and 500 feet wide from the 36-foot contour in the ocean to the inner end of the jetties, 8.4 miles; thence 34 feet deep and generally 400 feet wide

to a turning basin above the Seaboard Air Line Railroad bridge, 14.9 miles; thence 30 feet deep and 300 feet wide to the lower end of Kings Island, 0.5 mile; thence 30 feet deep and 200 feet wide to Port Wentworth turning basin, 1.8 miles; thence 30 feet deep and 200 feet wide to a point 1,500 feet below U. S. Highway 17 bridge, 1.2 miles; a total length of 26.8 miles.

The channel is well marked by buoys, lights, and ranges. Controlling depths are published at frequent intervals in the *Notice to Mariners*. In 1948, the original 30-foot project was being maintained. No work had been done on the 1.2-mile reach above Port Wentworth.

**Savannah,** one of the leading southern ports, is on the south bank of Savannah River about 15 miles above the outer end of the jetties. It is the second largest city and chief port of the State of Georgia, and is the main distributing point for supplies to the surrounding country. It has considerable coastwise and foreign trade, and is connected with coastal cities to the north and south by the Intracoastal Waterway which crosses the Savannah River several miles below the city. The city has excellent hotel accommodations. The climate is equable, and high-velocity winds are infrequent.

**Pilotage.**—At the bar, pilotage is compulsory for vessels in foreign trade and also for vessels in domestic trade except domestic vessels drawing under 12 feet or domestic vessels in charge of regularly licensed pilots.

The pilot boat is stationed at **Cockspur Island,** at the mouth of the river. The boat is equipped with a radiotelephone, and also has direct telephone communication with Savannah Radio Station WSV, which is operated by the Radio Marine Corp. of America. This arrangement permits constant contact with all ships bound to the port of Savannah.

The table below gives pilotage rates to and from the harbor. Vessels calling for bunkers or repairs pay one-half the regular rate. The detention rate is $10 per day. The charge for movements within the harbor is $25 per vessel in each direction.

| Draft (feet and under) | Bar to Cockspur | Cockspur to Savannah | Total | Draft (feet and under) | Bar to Cockspur | Cockspur to Savannah | Total |
|---|---|---|---|---|---|---|---|
| 6 | $9 | $6. 00 | $15. 00 | 20½ | $85 | $40. 00 | $125. 00 |
| 7 | 9 | 8. 50 | 17. 50 | 21 | 88 | 42. 00 | 130. 00 |
| 8 | 11 | 9. 00 | 20. 00 | 21½ | 90 | 45. 00 | 135. 00 |
| 9 | 13 | 9. 50 | 22. 50 | 22 | 93 | 47. 00 | 140. 00 |
| 10 | 15 | 10. 00 | 25. 00 | 22½ | 95 | 50. 00 | 145. 00 |
| 10½ | 17 | 10. 50 | 27. 50 | 23 | 98 | 52. 00 | 150. 00 |
| 11 | 19 | 11. 00 | 30. 00 | 23½ | 100 | 55. 00 | 155. 00 |
| 11½ | 21 | 14. 00 | 35. 00 | 24 | 103 | 57. 00 | 160. 00 |
| 12 | 23 | 17. 00 | 40. 00 | 24½ | 105 | 60. 00 | 165. 00 |
| 12½ | 25 | 20. 00 | 45. 00 | 25 | 108 | 62. 00 | 170. 00 |
| 13 | 30 | 20. 00 | 50. 00 | 25½ | 110 | 65. 00 | 175. 00 |
| 13½ | 35 | 20. 00 | 55. 00 | 26 | 113 | 67. 00 | 180. 00 |
| 14 | 40 | 20. 00 | 60. 00 | 26½ | 115 | 70. 00 | 185. 00 |
| 14½ | 45 | 20. 00 | 65. 00 | 27 | 118 | 72. 00 | 190. 00 |
| 15 | 48 | 22. 00 | 70. 00 | 27½ | 120 | 75. 00 | 195. 00 |
| 15½ | 50 | 25. 00 | 75. 00 | 28 | 123 | 77. 00 | 200. 00 |
| 16 | 55 | 25. 00 | 80. 00 | 28½ | 125 | 80. 00 | 205. 00 |
| 16½ | 58 | 27. 00 | 85. 00 | 29 | 128 | 82. 00 | 210. 00 |
| 17 | 60 | 30. 00 | 90. 00 | 29½ | 130 | 85. 00 | 215. 00 |
| 17½ | 65 | 30. 00 | 95. 00 | 30 | 133 | 87. 00 | 220. 00 |
| 18 | 65 | 35. 00 | 100. 00 | 30½ | 135 | 90. 00 | 225. 00 |
| 18½ | 70 | 35. 00 | 105. 00 | 31 | 137 | 93. 00 | 230. 00 |
| 19 | 75 | 35. 00 | 110. 00 | 31½ | 140 | 95. 00 | 235. 00 |
| 19½ | 78 | 37. 00 | 115. 00 | 32 | 143 | 97. 00 | 240. 00 |
| 20 | 80 | 40. 00 | 120. 00 | | | | |

**Towage.**—Vessels usually proceed from the bar to Savannah without assistance. Towboats are available at Savannah upon call to assist in docking, undocking, and shifting berth. Docking or undocking charges are made on the following basis: Vessels up to 2,000 tons net register, $50; for each additional 250 tons, the charge is $5. Over 7,000 tons, there is an additional charge of $10 for each 250 tons.

Shifting is based on gross register tons, $55 for vessels up to 2,000 tons, and $5 for each additional 250 tons. Over 7,000 tons, a charge of $10 is made for each additional 250 tons. If more than one tug is used, an additional charge of $25 per tug is made.

**Quarantine.**—There is no quarantine detention station in Savannah. The medical officer in charge of quarantine is stationed at the United States Public Health Service Marine Hospital, at York and Abercom Streets. Vessels subject to visitation are boarded from a launch in the river while proceeding to berth, or at the berth.

**Customs.**—Savannah is a port of entry at which marine documents are issued. The customhouse is at Bull and Bay Streets, practically on the river front and near the center of the principal shipping district.

**Immigration.**—The immigration office is in the customhouse at Bull and Bay Streets.

**Anchorages.**—The usual anchorage for vessels is in Tybee Roads, described previously. Anchorage near the sea buoy affords greater depth with good holding ground. Vessels rarely anchor in the river, as there is insufficient swinging room for large ships.

**Harbor Regulations.**—The Savannah Port Authority regulates Savannah Harbor and Port.

**Tides.**—Tide predictions for both Savannah River Entrance and Savannah are given for every day of the year in the *Atlantic Ocean Tide Tables.* At the bar, high and low waters occur about 30 minutes earlier than at Savannah River Entrance. The mean range of tide is about 7 feet at Tybee Light and 7½ feet at Savannah.

**Currents.**—The mean velocity of the strength of ebb current from the entrance jetties to Savannah is from 2½ to 3 knots. The flood current has a velocity at strength of from 1½ to 2 knots. The current is considerably influenced by winds and freshets. The predicted times of slack water and the times and velocities of strength of flood and ebb at the entrance to Savannah River are given in the *Atlantic Coast Current Tables.* Similar predictions for a number of other places in Savannah River may be obtained through use of Table 2 of the Current Tables.

Currents set in the direction of the channel except at the entrance near Tybee Light, where the flood sets northwestward across the channel. Between the jetties the flood sets 260°. Freshets occasionally occur in the spring, but do not endanger shipping at the Savannah wharves.

Detailed results of current observations, including a set of hourly tidal current charts for Savannah River referred to times of high and low waters at Tybee Light, are contained in Coast and Geodetic Survey Special Publication No. 211, *Currents in St. Johns River, Savannah River, and Intervening Waterways,* which is sold by the Superintendent of Documents, Washington 25, D. C. for 60 cents a copy.

**Bridges.**—The only bridge across the improved deep-water channel is that of the Seaboard Air Line Railroad, located about 2 miles above Savannah proper. The bridge has a bascule span with a horizontal clearance of 116 feet and a vertical clearance, closed, of 10½ feet at high water. Caution must be exercised in passing through the draw, especially during adverse tide, current, and weather conditions.

**Dockage.**—No charge is assessed for dockage, that is, berthing or making fast to a wharf, except at the railway terminals when no cargo is taken or discharged.

**Terminal facilities.**—There are many piers and wharves of all types at Savannah with depths of water alongside ranging from zero to 32 feet. Several are opposite the city on **Hutchinsons Island,** but most of them are on the south side of the river between a point 2.5 miles below and a point 4.5 miles above the center of the city. Nearly all of the wharves are of open-pile, timber-deck construction. About one-half of the wharves have direct rail connections; others have connections to the plants in the rear, or have tracks in the street at the rear. The commercial wharves are not generally equipped with hoisting facilities, and consequently nearly all cargo is handled by ship's tackle, but heavy lift cranes are available at some wharves. There are ample storage facilities for existing commerce.

**Supplies.**—Three companies at Savannah have facilities for supplying vessels with bunker coal. Two are at wharves where coal can be delivered at the rate of 30 to 55 tons per hour, and all will bunker by lighter and derrick-barge at ship's berth. Three companies supply fuel oil and Diesel oil at their wharves, and one is equipped to supply fuel oil at ship's berth from a barge at the rate of 1,000 barrels per hour. The water front is well supplied with fresh water, which is suitable for boiler use as well as for drinking, and is supplied by pipe lines or water barge. Gasoline, provisions, and ship chandlers' stores are available.

**Lighterage.**—The floating equipment at Savannah is sufficient to satisy the harbor needs. Most of it is available for public use.

**Salvage and wrecking gear.**—Towboats equipped for salvage and wrecking operations, diving outfits, underwater torches, and floating repair plants are available when necessary.

**Marine repairs.**—Marine repair facilities at Savannah are provided by several companies which can make repairs to hulls of both wood and steel vessels, as well as the usual type repairs to engines, boilers, dynamos, radios, and electrical equipment. Machine shops are available. One graving dock 475 feet long and 73 feet wide has 22 feet of water over its keel blocks at high water and can accommodate a 470-foot vessel. Four marine railways are available, the largest having a capacity of 1,000 tons, 7-foot draft forward and 13 feet aft.

**General port activities.**—The water-borne commerce of Savannah is of a widely varied nature, and includes a great number of commodities, the principal ones being petroleum and petroleum products, sugar, lumber, cotton and cotton goods, naval stores, fertilizers, bagging, paper and paper goods, clay and fuller's earth, sodium sulfate, iron and steel articles, and scrap iron and steel.

**Communications.**—Savannah has excellent transportation facilities by rail, water, highway, and air. The port is served by the Atlantic Coast Line Railroad, Central of Georgia Railway, Seaboard Air Line Railroad, Savannah & Atlanta Railway, and the Southern Railway.

In September 1947, there was no regular coastwise steamship service, but resumption of this service was anticipated in the near future. There is considerable shipping to European, South American, West Indian, and Far East ports. Approximately 50 steamship companies are represented by 5 agencies in Savannah.

Three large commercial air lines and several local lines operate out of Savannah, providing transportation to any part of the United States.

**Storm warnings** are displayed day and night at Savannah and Savannah Beach.

Savannah River above Savannah Harbor is navigable during the greater part of the year for vessels of 5-foot draft to the city of **Augusta**, a distance of about 172 miles. This portion of the river has been improved under a Federal project which provides for a channel 6 feet deep and 75 feet wide, at ordinary summer flow, from the upper end of Savannah Harbor to the head of navigation at Augusta, 3 miles above Fifth Street Bridge. The improvement was obtained by construction of one lock and dam at New Savannah Bluff, use of contraction works, closure of cut-offs, bank protection, removal of snags, overhanging trees and wrecks, and dredging of troublesome bars. A controlling depth of 5 feet at ordinary summer flow was reported in 1947.

The freshet variation above the normal pool level of the **New Savannah Bluff** lock and dam, 163 miles above Savannah, is about 13 feet ordinarily, with an extreme of 34 feet. The lock is 360 feet long, 56 feet wide, and has a depth over the lower miter sill of 10 feet at low water. The depth over the upper miter sill at normal pool level is 13½ feet; the vertical lift is 15 feet. There is no navigable connection between the pool of the navigation dam and the pool of the Augusta city dam.

Four swing drawbridges cross the river between Savannah Harbor and the New Savannah Bluff lock and dam. The minimum clearances, closed, are 67 feet horizontally and —3 feet vertically at extreme high water; the minimum vertical clearance at low water is 13 feet.

Two bascule drawbridges, one swing drawbridge, and two fixed bridges cross the river between the New Savannah Bluff lock and dam and the Augusta city dam, the head of navigation. The minimum horizontal clearance is 75 feet; the minimum vertical clearance is 26 feet at normal pool level and —9 feet at flood stages. At least 24 hours' advance notice is required to have the bridges at Fifth and Sixth Streets, in Augusta, opened.

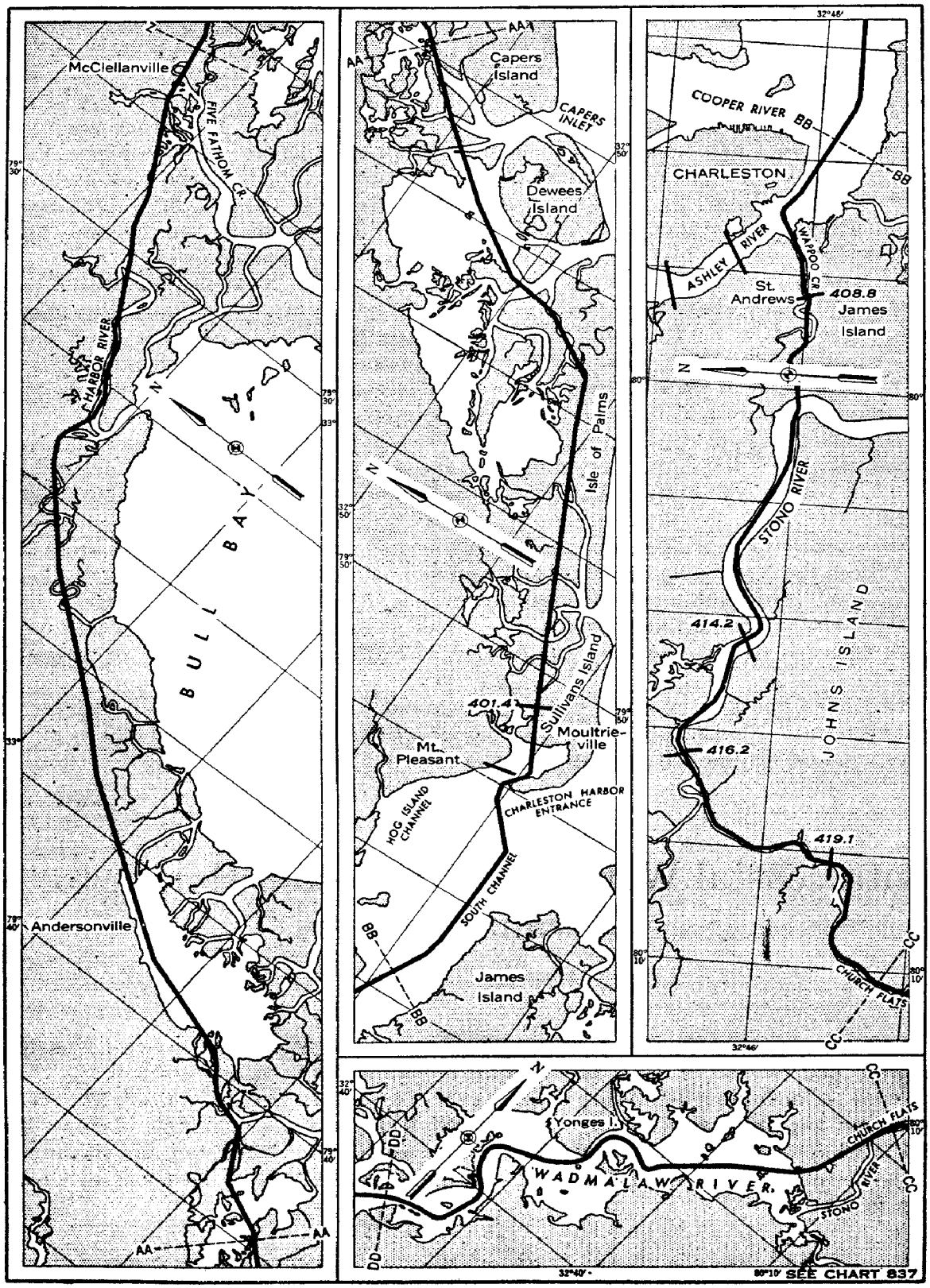
There are numerous landings between Savannah and Augusta without wharves or rail connections. At Augusta there is a city wharf and warehouse, available to all on equal terms, and several privately owned wharves used mostly for barges.

# Intracoastal Waterway, Charleston Harbor to Savannah River

Charts 837, 838, 839

The Federal project for that portion of the Intracoastal Waterway between Charleston Harbor and Savannah River provides for a channel 12 feet deep and not less than 90 feet wide. Controlling depths are listed in every issue of the weekly *Notice to Mariners*.

**General regulations** governing bridges and locks and the handling of tows are quoted in Chapter 2. **Special regulations** prescribed by the Charleston and Savannah Districts, Corps of Engineers, are the same as those for the Norfolk District; see Chapter 5, page 148.

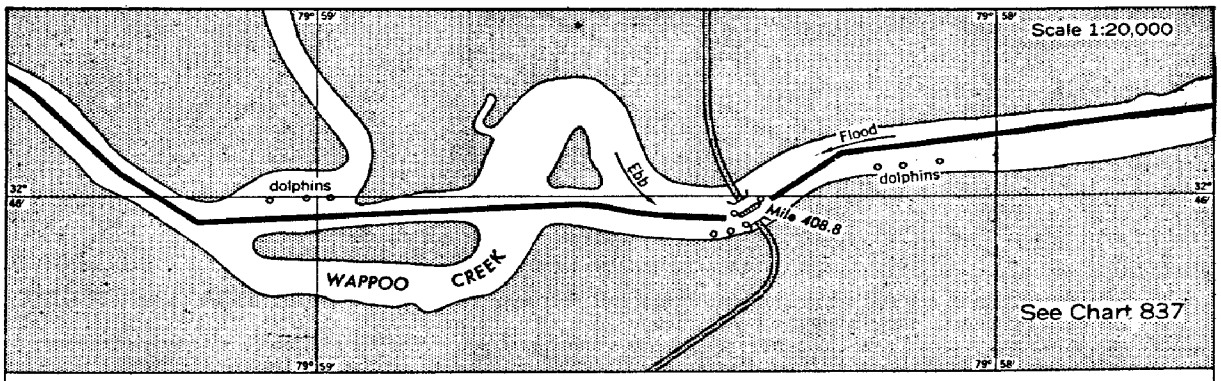

McClellanville
FIVE FATHOM CR.
HARBOR RIVER
BULL BAY
Andersonville
AA
Capers Island
CAPERS INLET
Dewees Island
Isle of Palms
Sullivans Island
401.4
Moultrieville
Mt. Pleasant
HOG ISLAND CHANNEL
CHARLESTON HARBOR ENTRANCE
SOUTH CHANNEL
BB
James Island
COOPER RIVER
CHARLESTON
ASHLEY RIVER
WANDOO CR.
St. Andrews
408.8
James Island
STONO RIVER
414.2
JOHNS ISLAND
416.2
419.1
CHURCH FLATS
CC
Yonges I.
WADMALAW RIVER
DD
STONO RIVER
SEE CHART 837

# Charleston Harbor to Wadmalaw River

Chart 837

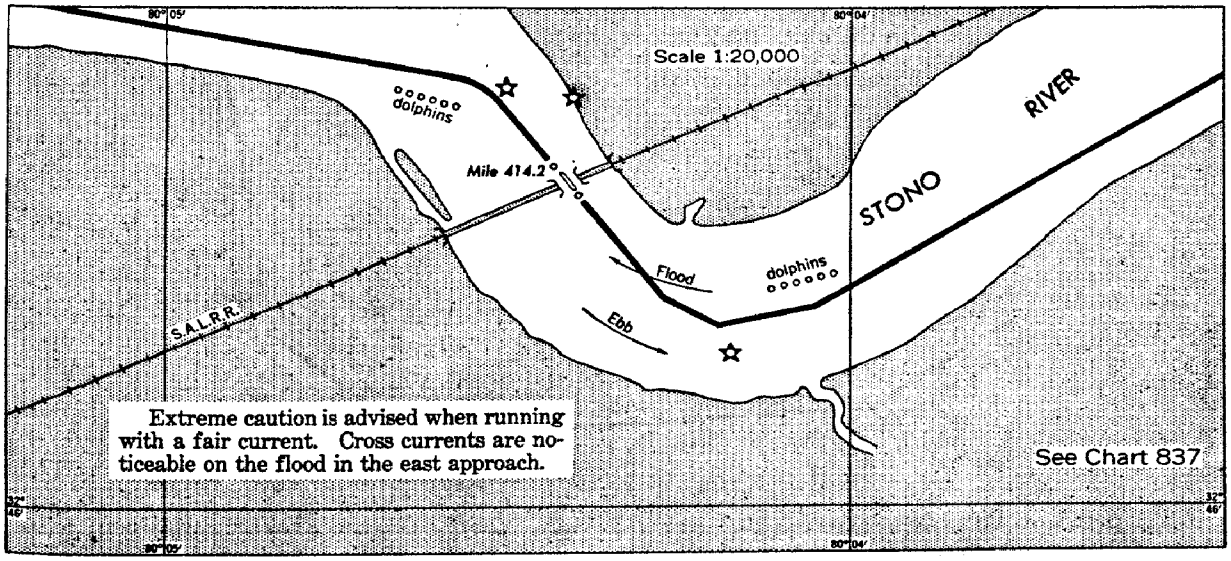
The route of the waterway leaves Charleston Harbor at *Mile 407.6* by way of **Wappoo Creek.** A yacht basin in Wappoo Creek at *Mile 408.4* has a depth of about 10 feet. Gasoline, Diesel oil, fresh water, provisions, some marine supplies, showers and laundry service, and privileges at the Wappoo Country Club are available. A nominal charge is made for dockage.

A highway bridge over Wappoo Creek at *Mile 408.8* has a swing span with a horizontal clearance of 80 feet and a vertical clearance, closed, of 10½ feet at high water.




Extreme caution is advised when running with a fair current. Cross currents from the old channel of Wappoo Creek are encountered on the ebb current in the west approach, and are noticeable on the flood in the east approach due to the bend in the channel.

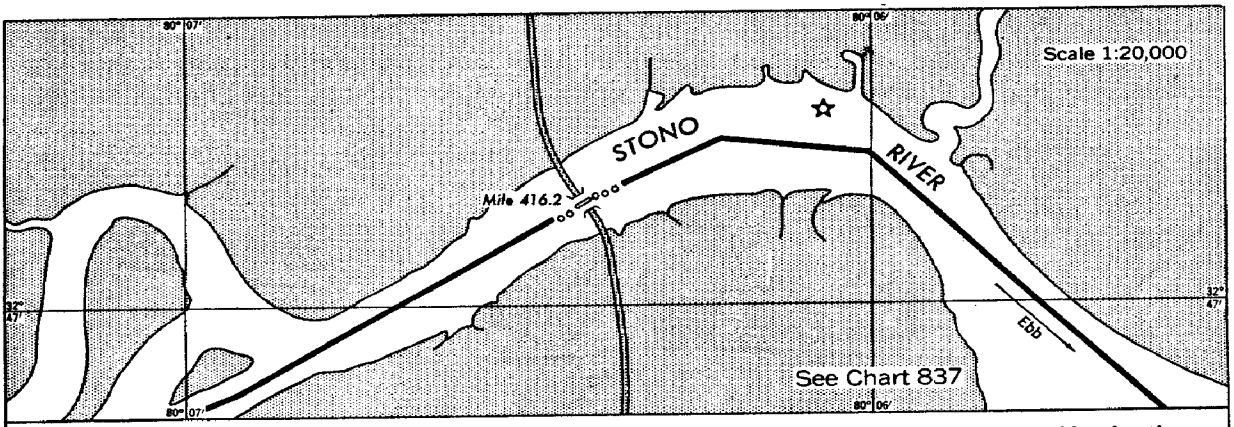
From Wappoo Creek, the route of the waterway is through **Elliott Cut** and **Stono River** to Wadmalaw River. The Seaboard Air Line Railroad bridge over Stono River




Extreme caution is advised when running with a fair current. Cross currents are noticeable on the flood in the east approach.

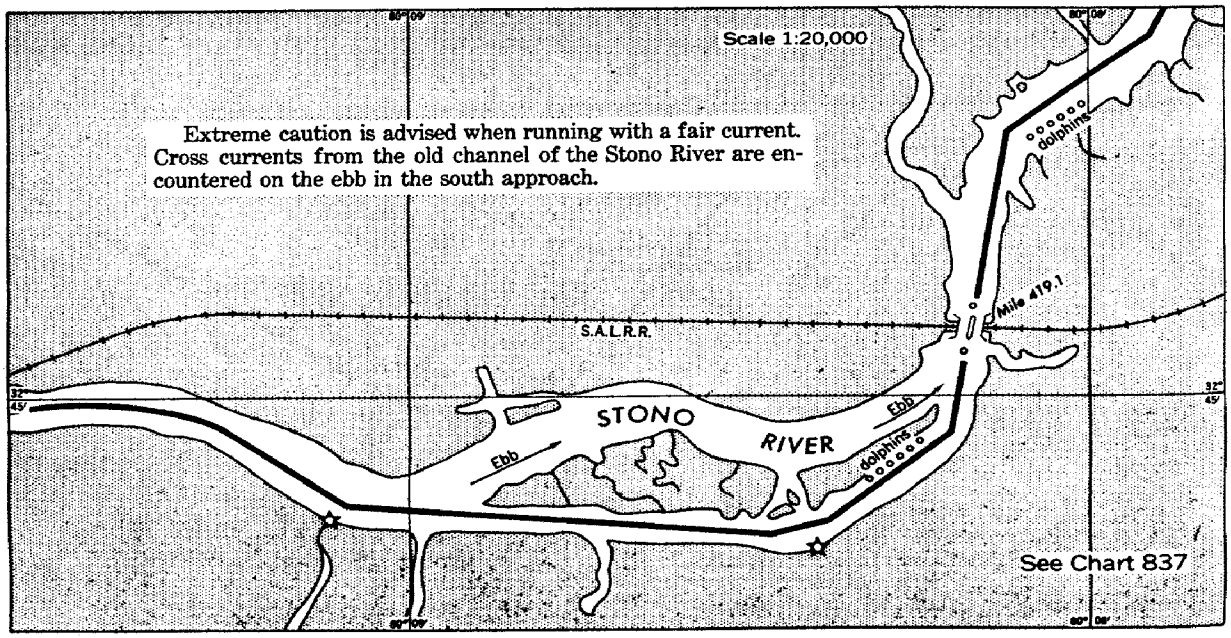
at *Mile 414.2* has a hand-operated swing span with a horizontal clearance of 66 feet and a vertical clerance, closed, of 6 feet at high water. The mean range of tide at the bridge is about 5½ feet.

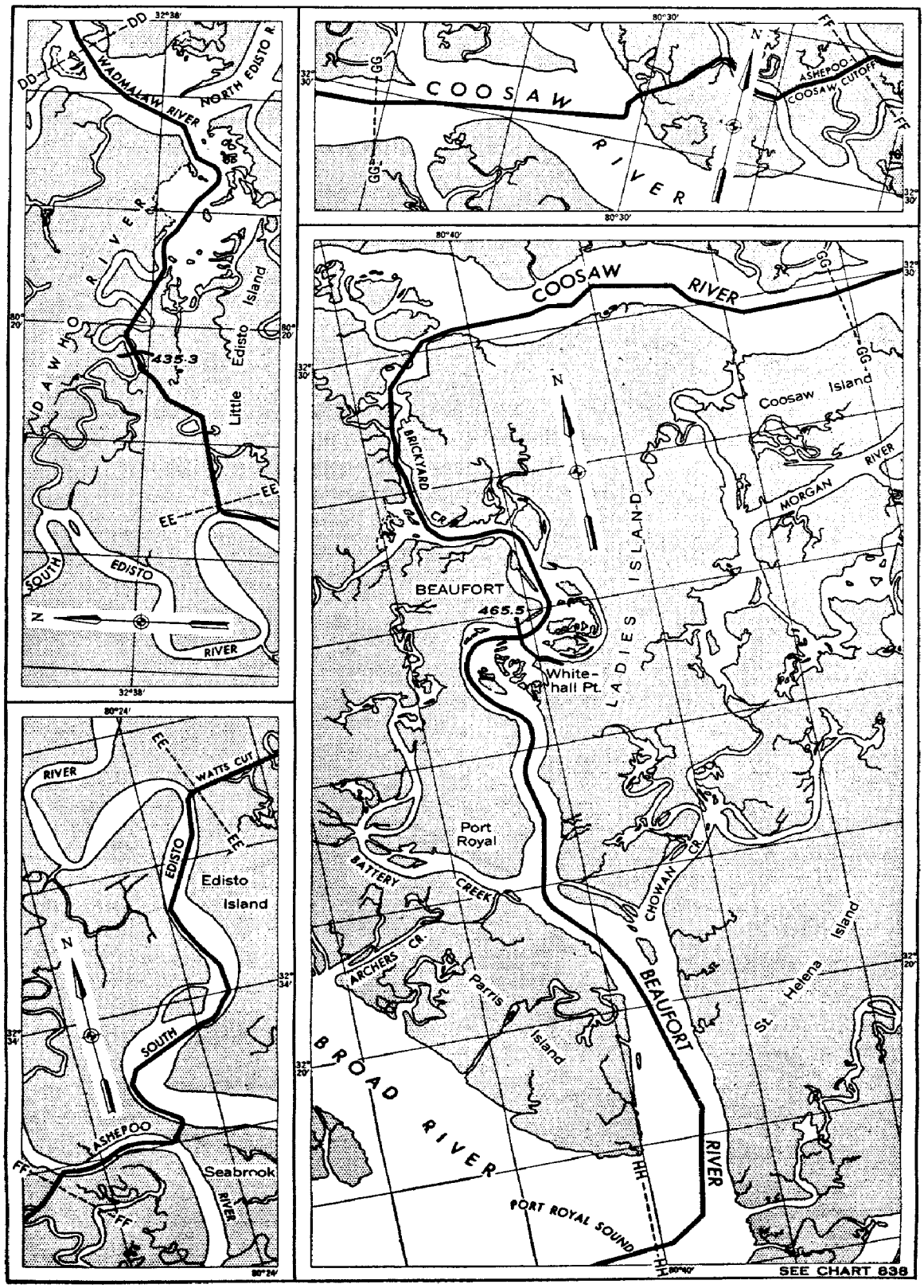
The highway bridge over Stono River at *Mile 416.2* has a hand-operated swing span with a horizontal clearance of 59 feet and a vertical clearance, closed, of 6 feet at high water. An overhead power cable at the bridge has a vertical clearance of 92 feet at high water.




Extreme caution is advised when running with a fair current. See Atlantic Coast Current Tables for times and velocities of currents at the bridge.

The Seaboard Air Line Railroad bridge over Stono River at *Mile 419.1* has a hand-operated swing span with a horizontal clearance of 67 feet and a vertical clearance, closed, of 6 feet at high water. The tides meet in the vicinity of this bridge.



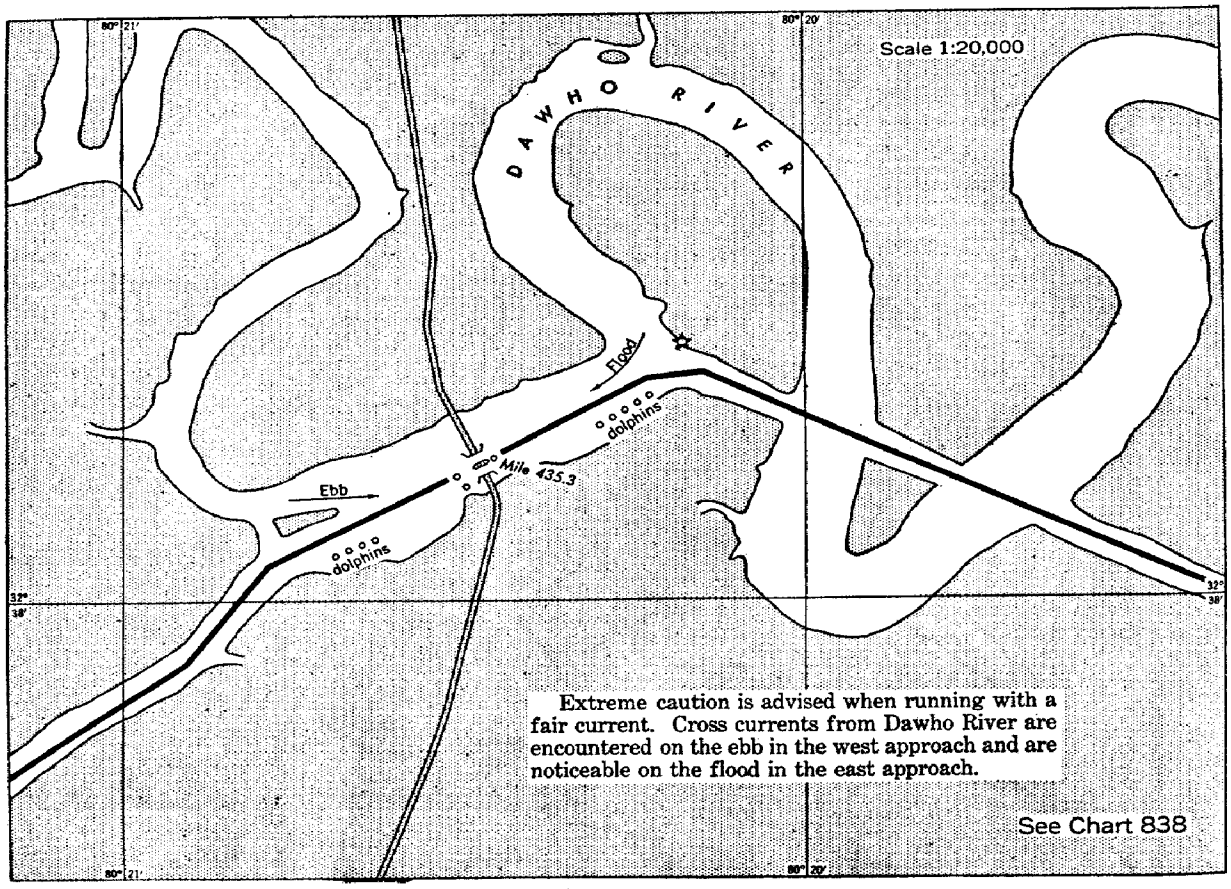

WADMALAW RIVER
NORTH EDISTO R.
DD
DD
IDAWHO RIVER
435.3
Little Edisto Island
EE
EE
SOUTH EDISTO RIVER
N
32°38'
80°20'
80°24'
RIVER
WATTS CUT
EE
EE
EDISTO
Edisto Island
N
SOUTH
ASHEPOO
FF
FF
Seabrook
RIVER
80°24'
32°34'
COOSAW RIVER
GG
GG
ASHEPOO-COOSAW CUTOFF
FF
FF
80°30'
32°30'
80°40'
COOSAW RIVER
GG
GG
Coosaw Island
N
BRICKYARD CR.
MORGAN RIVER
LADIES ISLAND
BEAUFORT
465.5
White-hall Pt.
Port Royal
BATTERY CREEK
CHOWAN CR.
ARCHERS CR.
Parris Island
BEAUFORT RIVER
St. Helena Island
BROAD RIVER
PORT ROYAL SOUND
HH
HH
32°20'
80°40'
SEE CHART 838

The route of the waterway enters **Wadmalaw River** at *Mile 422.7*. A rail-water terminal of the Atlantic Coast Line Railroad is at the village of **Yonges Island,** on the northwest side of the river at *Mile 425.9*. The terminal is used for receiving farm produce by water and reshipment by rail. Supplies are available to a limited extent at Yonges Island. Two marine railways, owned by the transportation company and used to overhaul its own vessels, can handle a length of 90 feet and a draft of 6 feet. The mean range of tide at Yonges Island is about 6½ feet.

## Wadmalaw River to Port Royal Sound

### Chart 838

From Wadmalaw River, the route of the waterway follows **Dawho River, North Creek,** and **Watts Cut** to South Edisto River. The highway bridge over Dawho River at *Mile 435.3* has a hand-operated swing span with a horizontal clearance of 61 feet and a vertical clearance, closed, of 4½ feet at high water.

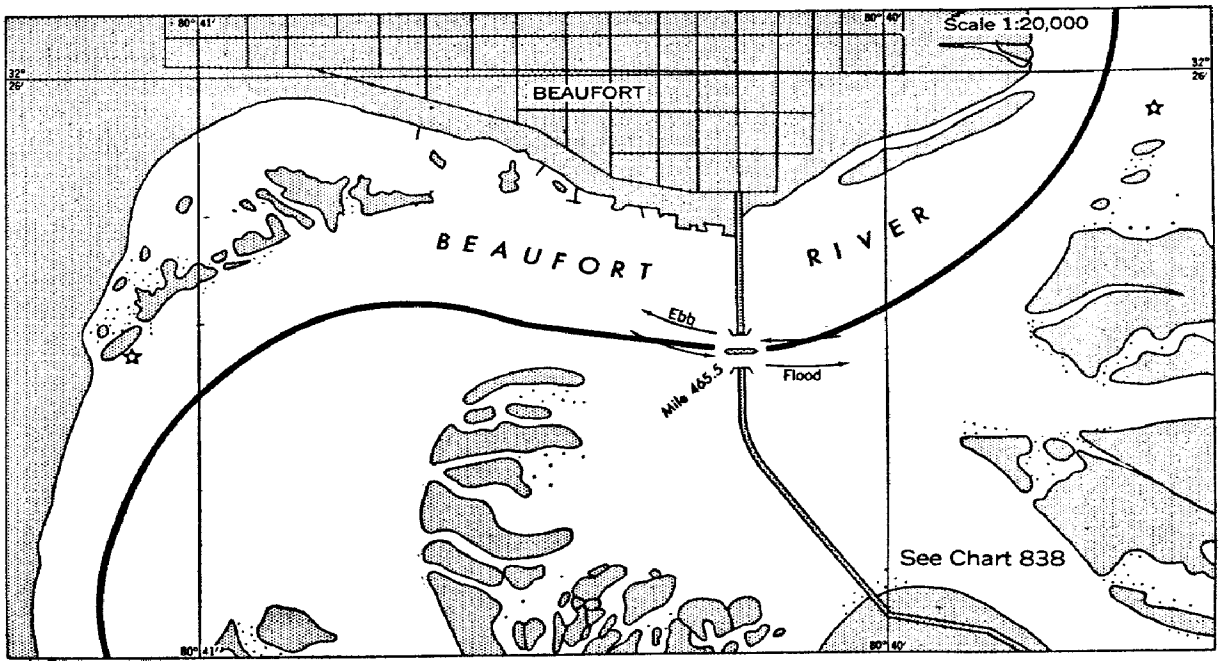


Careful steering is required in the Dawho River between **White Point** and the entrance to the cut-off. The channel is well marked but strong currents are experienced. Strong currents are also found at the crossings of the cut-off with the river. The mean range of tide in Dawho River is about 6 feet.

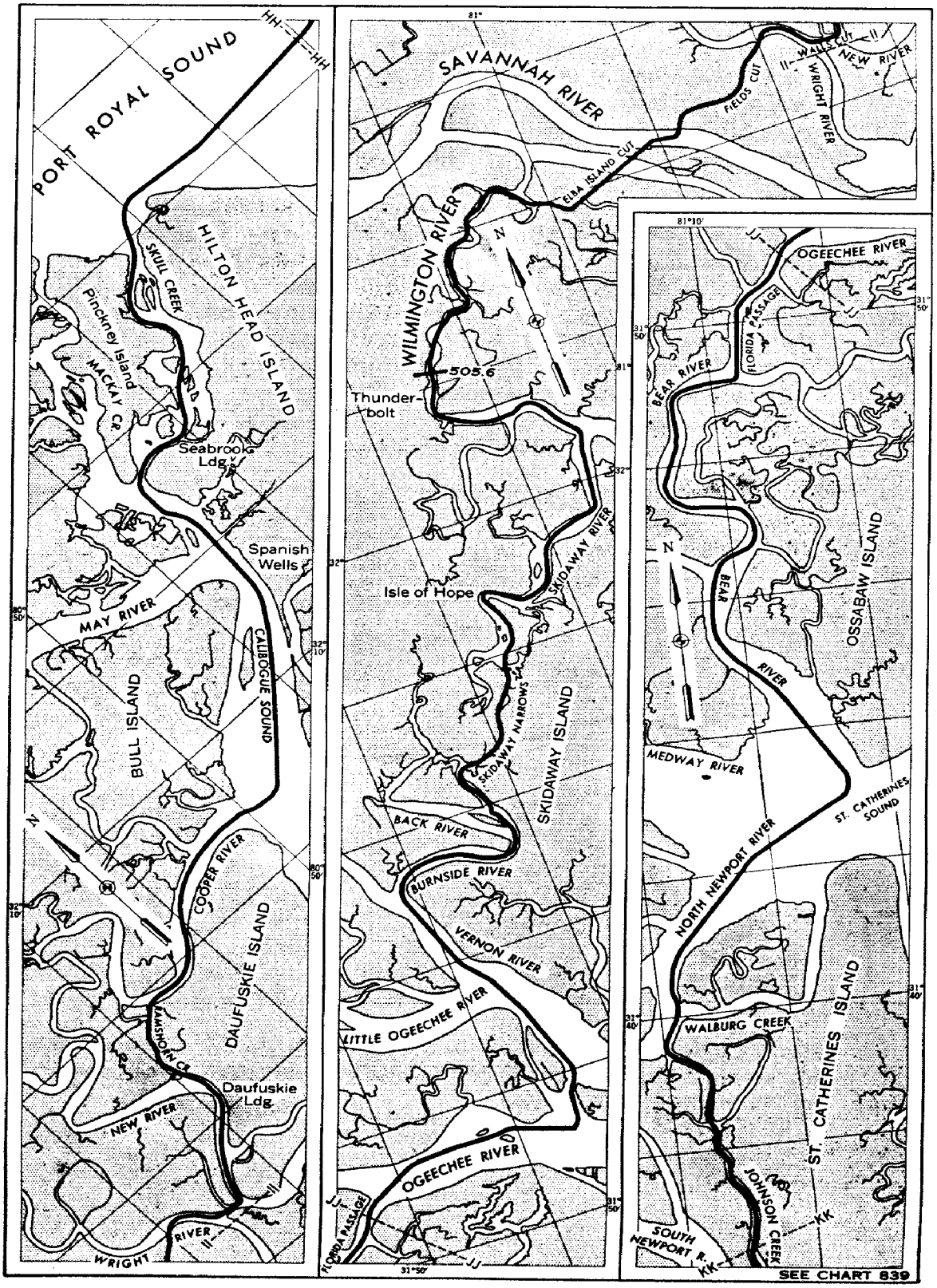
The waterway follows **South Edisto River** from Watts Cut to **Fenwick Cut,** thence along the **Ashepoo River** for a short distance to **Ashepoo-Coosaw Cut-off,** thence along the **Coosaw River** to Brickyard Creek.

The entrance to **Brickyard Creek** is between marshy shores, but the marsh on the south side is narrow and terminates just inside the creek in a red, eroded bank leading up to somewhat higher ground; this bank is visible for some distance along the Coosaw River. The mean range of tide at the entrance to Brickyard Creek is about 7 feet.

The waterway continues along Brickyard Creek and into **Beaufort River.** On the west side of the waterway at *Mile 465.5* is the town of **Beaufort,** at which fuel, supplies, repair facilities, and hotel accommodations are available. The town is described at length in connection with Port Royal Sound. The highway bridge over Beaufort River at *Mile 465.5* has a hand-operated swing span with a horizontal clearance of 81 feet and a vertical clearance, closed, of 20 feet at high water.




The waterway follows Beaufort River past **Port Royal,** at *Mile 470.0,* and into **Port Royal Sound,** which is described at length in another section. **Storm warnings** are displayed day and night at Port Royal.


PORT ROYAL SOUND
HILTON HEAD ISLAND
SKULL CREEK
Pinckney Island
MACKAY CR.
Seabrook Ldg.
Spanish Wells
MAY RIVER
BULL ISLAND
CALIBOGUE SOUND
COOPER RIVER
DAUFUSKIE ISLAND
FAMSHORN CR.
Daufuskie Ldg.
NEW RIVER
WRIGHT RIVER
SAVANNAH RIVER
ELBA ISLAND CUT
FIELDS CUT
WALLS CUT
NEW RIVER
WRIGHT RIVER
WILMINGTON RIVER
505.6
Thunder-bolt
Isle of Hope
SKIDAWAY RIVER
SKIDAWAY NARROWS
SKIDAWAY ISLAND
BACK RIVER
BURNSIDE RIVER
VERNON RIVER
LITTLE OGEECHEE RIVER
OGEECHEE RIVER
FLORIDA PASSAGE
OGEECHEE RIVER
FLORIDA PASSAGE
BEAR RIVER
OSSABAW ISLAND
BEAR RIVER
MEDWAY RIVER
ST. CATHERINES SOUND
NORTH NEWPORT RIVER
WALBURG CREEK
ST. CATHERINES ISLAND
JOHNSON CREEK
SOUTH NEWPORT R.
SEE CHART 839

# Port Royal Sound to Savannah River

Chart 839

After crossing Port Royal Sound, the route of the waterway follows **Skull Creek** to **Calibogue Sound,** thence down the sound to the mouth of Cooper River. An oyster factory and wharf are at **Seabrook Landing,** *Mile 483.7*, on the south bank of Skull Creek.

The route follows **Cooper River** to **Ramshorn Creek,** thence along **New River** to Walls Cut. The tides meet in Ramshorn Creek. Care is required in New River as cross currents may be experienced.

The mean range of tide in **Walls Cut** is about 7 feet. The route is through the cut and along **Wright River** for a short distance, thence through Fields Cut and into Savannah River at *Mile 499.4*. The river ebbs through the cut and strong cross currents may be experienced at the ends of the cut.

**Savannah River** is the approach to the important city of Savannah, about 7.5 miles upstream from the Intracoastal Waterway crossing. **Savannah** has complete supply and repair facilities and is described at length in another section. The municipal wharf at the foot of Bull Street is suitable for berthing large yachts and is available at no cost, but this wharf and others in Savannah Harbor are not as suitable for small craft as those at Thunderbolt and Isle of Hope, described in the next chapter.

Daily predictions of currents in Savannah River can be obtained from the *Atlantic Coast Current Tables.*

CHAPTER 9

# Savannah River to St. Johns River

## Charts 1241, 1242, 1243

THE COAST from Savannah River to St. Johns River extends in a south-southwesterly direction for about 100 miles. Islands separated by numerous sounds and rivers constitute the entire coast. In general these islands are heavily wooded, with marshy areas bordering them on their western sides. The 5-fathom curve extends about 7 miles offshore except in the vicinity of St. Simons Sound where 5 fathoms can be found as much as 12 miles offshore.

Caution must be observed along this section of the coast due to the inshore sets caused by the numerous rivers and sounds. Detailed results of current observations taken at a number of locations in the navigable entrances and passages of this area are contained in Coast and Geodetic Survey Special Publication No. 211, *Currents in St. Johns River, Savannah River, and Intervening Waterways*. Included are a set of hourly tidal current charts referring to times of high and low waters at Tybee Light.

**Rules of the Road.**—Inland Rules shall be followed inside a line starting from the hotel about 0.8 mile 063° from St. Simons Light, thence to St. Simons lighted whistle buoy St. S, thence to St. Andrew Sound bar buoy, thence to Fernandina lighted whistle buoy 1F, thence to Amelia Island Light.

## Savannah River to Wassaw Sound

### Chart 440

From Savannah River to Wassaw Sound, a distance of about 7 miles, the coast is formed by the shores of **Tybee Island** which lies in a northeasterly and southwesterly direction.

**Savannah Beach,** a summer resort at the northern end of Tybee Island, is conspicuous from seaward. An inside approach to Savannah Beach is made through **Lazaretto** and **Tybee Creeks.** A swing bridge crosses Lazaretto Creek about 0.3 mile above its mouth. The bridge has a horizontal clearance of 90 feet and a vertical clearance, closed, of 6 feet at high water. The bridge is closed between 7 a. m. and 10 a. m. and between 4 p. m. and 7 p. m., except on the hour when the span opens to allow accumulated traffic to pass. This regulation does not apply to tows, common carriers, or vessels in distress.

The remaining portion of Tybee Island is generally low and marshy, although it has many wooded hummocks with numerous creeks winding among them. Several creeks flow into the sea but are of little importance as their mouths are obstructed by shoals, with crooked channels of 2 to 3 feet in depth.

The southeast part of Tybee Island, separated from the main body by a stretch of marsh, is **Petit Chou Island.** It is distinguishable by a large and heavily wooded hummock which marks the northern point of the entrance to Wassaw Sound. Dangerous shoals make off from the shore of Tybee Island for a distance of 4.5 miles.

The entrance to **Wassaw Sound** is about 9.5 miles southwestward of Tybee Light. Shoals extend offshore a distance of 4 to 4.5 miles from the entrance, forming a shifting bar through which is a channel with a depth of about 14 feet. The entrance is used only by small boats. Pilots will not take a ship into Wassaw Sound.

After crossing the bar at the entrance to Wassaw Sound, a channel with depths of 19 to 50 feet leads along the southern and western parts of the sound and up the Wilmington River, a distance of 6 miles, to the Intracoastal Waterway.

The tidal currents in Wassaw Sound have considerable velocity. Current predictions for a number of places in the sound and vicinity may be obtained from the *Atlantic Coast Current Tables.* The mean rise and fall of the tide varies from about 7 feet in the sound to 8 feet up the rivers.

The Wilmington and Tybee Rivers and numerous creeks empty into Wassaw Sound. The **Wilmington River** enters from the northwestward. Above its junction with the Skidaway River, the Wilmington River forms a portion of the Intracoastal Waterway. **Turner Creek,** with a depth of about 7 feet, connects the Wilmington River and the Tybee River. A swing bridge over Turner Creek 1.7 miles above the mouth has a horizontal clearance of 90 feet and a vertical clearance, closed, of 6 feet at high water. This bridge is governed by the same regulations which apply to the Lazaretto Creek bridge. At the junction of Turner Creek and Tybee River, St. Augustine Creek joins Tybee River.

**Turner Creek anchorage area.**—The area in Turner Creek, in the vicinity of its mouth and described below, is hereby established as anchorage grounds for vessels, and the following rules and regulations relating thereto are hereby adopted:

*The Area.*—To the southwestward of the following-described line: A line beginning at a point on the northerly high-water shoreline of Wilmington Island, 750 feet northwesterly from the Savannah Yacht Club wharf and bearing 034°25′, 200 feet, to a buoy; thence bearing 124°25′, 1,800 feet, to a buoy; thence bearing 214°25′, 150 feet, to the high-water line of Wilmington Island.

**Note.**—Temporary floats or buoys for marking anchors or moorings in place will be allowed in this area. Fixed mooring piles or stakes are prohibited.

*The Regulations.*—1. Except in cases of great emergency, no vessels shall anchor in Turner Creek between its mouth in Wilmington River and a point 4,000 feet to the eastward, except in the anchorage area hereby defined and established: *Provided, however,* That vessels may moor to any lawfully constructed wharf.

2. Anchors must not be placed outside the anchorage area, nor shall any vessel be so anchored that any portion of the hull or rigging shall at any time extend outside the boundary of the anchorage area.

3. Any vessel anchoring under circumstances of great emergency outside of the anchorage area should be placed near the edge of the channel and in such position as not to interfere with the free navigation of the channel nor obstruct the approach to any pier nor impede the movement of any boat, and shall move away immediately after the emergency ceases or upon notification by the United States District Engineer Officer at Savannah, Ga., charged with the enforcement of these regulations.

4. A vessel, upon being notified to move into the anchorage limits or to shift its position on anchorage grounds must get under way at once and must change position as directed, with reasonable promptness.

5. Whenever the maritime or navigation interests of the United States so require, the District Engineer, Corps of Engineers, enforcing these regulations is hereby empowered to shift the position of any vessel anchored within the anchorage area and of any vessel which is so moored or anchored as to impede or obstruct vessel movements in any channel.

6. Nothing in these rules and regulations shall be construed as relieving the owner of or person in charge of any vessel from the penalties of the law for obstructing navigation or for not complying with the navigation laws in regard to lights, fog signals, or for otherwise violating the law.

**Tybee River,** about 7 miles long, formed by St. Augustine and Turner Creeks, flows into the sound from northward. By **St. Augustine Creek** and Wilmington River it is connected with the South Channel of the Savannah River about 5 miles below the city of Savannah. The Tybee River mouth is obstructed by shoals. The bridge across Tybee River 5.7 miles above the mouth has a swing span with a horizontal clearance of 95 feet, and a vertical clearance, closed, of 6 feet at high water. See Lazaretto Creek for regulations for this bridge.

**Romerly Marsh Creek** flows into the western end of Wassaw Sound at the mouth of Wilmington River.

The coast between Wassaw and Ossabaw Sounds is formed by **Wassaw Island,** which is triangular in shape and has a length of about 4.5 miles and a breadth of about 3.5 miles in its widest part. In general, the island is low and marshy, the strip of firm land forming the coastline being only 0.3 to 0.8 mile wide. The firm land is heavily wooded and has a broad sand beach backed by sand hills. From this shore dangerous shoals make off to a distance of 3 to 4 miles. The marshy portion of the island is cut by numerous creeks winding among the heavily wooded hummocks. Romerly Marsh Creek and **Odingsell River** separate the island from the islands to the westward.

# Ossabaw Sound and St. Catherines Sound

Chart 573

**Ossabaw Sound** is a broad opening in the coast about 15 miles southwestward of Tybee Light. Most of the sound is shallow, and shifting shoals extend seaward about 4 miles. Two channels lead through the shoals into the sound. Small local fishing craft are the principal traffic seaward from the sound. Pilots are not available and strangers are advised not to enter. Vernon River, Ogeechee River, and numerous smaller rivers and creeks enter the sound.

**Adams Creek** empties into Ossabaw Sound 3.5 miles above the entrance and separates **Little Wassaw** and **Skidaway Islands.**

**Chart 440.—Vernon River** enters Ossabaw Sound from the northwestward. The Intracoastal Waterway traverses a portion of this river. The **Burnside** and **Little Ogeechee Rivers** and several creeks enter the Vernon River. **Montgomery,** a post village on Vernon River 5 miles above the mouth, has highway connections with Savannah.

**Charts 573, 1241.—Ogeechee River** flows into the western part of Ossabaw Sound. The river drains an extensive area and is subject to flood conditions, altering its channel with each succeeding flood. Pilots are not available. Navigation to the Seaboard Air Line Railroad bridge, about 27 miles above the sound, is possible with local knowledge. This swing bridge has a horizontal clearance of 45 feet in the south draw, 40.5 feet in the north draw, and a vertical clearance, closed, of 11 feet at low water and ½ foot at extreme high water. The adjacent Atlantic Coast Line Railroad vertical-lift bridge has a horizontal clearance of 60 feet and a vertical clearance, open, of 45 feet at low water; the vertical clearance, closed, is 8 feet at low water and −3 feet at extreme high water. Two miles above these bridges is a highway swing bridge with a horizontal clearance of 47 feet and a vertical clearance, closed, of 13½ feet at low water and 2½ feet at extreme high water. At least 24 hours' advance notice is required to have any of these bridges opened.

The currents in the Ogeechee River and Ossabaw Sound have considerable velocity, particularly the ebb setting out of Ogeechee River. Current predictions for several locations in Ossabaw Sound and vicinity can be obtained from the *Atlantic Coast Current Tables*. The mean rise and fall of tides is about 7 feet, decreasing to about 1 foot at the highway bridge.

**Chart 573.**—The coastline between Ossabaw and St. Catherines Sounds is formed by the eastern shore of **Ossabaw Island,** which lies in a northeasterly and southwesterly direction and has a length of 7.4 miles and a width of 5.5 miles. The eastern half of this island is heavily wooded. The north end of the island forms the south shore of Ossabaw Sound, into which flows **Bradley River,** a small stream, from the center of the island.

The seaward side of the island appears unbroken by streams, and shows as a white sand beach backed by heavy woods. Dangerous shoals make off from this shore to a distance of nearly 5 miles.

The southwestern point of the island borders on St. Catherines Sound and is well wooded. The western half is almost entirely marshy and is cut up by numerous creeks which provide access to the higher ground to the eastward. On the west the island is separated from the marshes of the mainland by Bear River and Florida Passage, connecting streams which afford an inside passage from one sound to the other. From these streams, **Queen Bess, Cane Patch, Buckhead, Big Tom,** and **Newell Creeks** run through the marshes to the wooded portions of the island.

**St. Catherines Sound** is about 24 miles southwestward of Tybee Light. The entrance is over a shifting bar which extends 5 miles off shore and is marked by a sea buoy. With the aid of a chart it should not be difficult for boats drawing 11 feet to enter by closely following the buoyed channel. The points on its northern and southern sides are wooded.

There are no towns on the sound and strangers seldom enter. Except for light-draft fishing craft, little traffic crosses St. Catherines Bar. Pilots are not available. Channels with depths of 13 to 38 feet lead from inside the bar into the entrances of its tributaries. The main body of the sound is exposed and becomes quite rough in moderately bad weather. Protected anchorage is in **Walburg Creek.**

The mean rise and fall of tide in the sound is about 7 feet, increasing to about 8 feet at Belfast and **Kilkenny Club.** Tidal currents have considerable velocity at the entrance and in the rivers. For predicted currents the *Atlantic Coast Current Tables* should be consulted.

The Intracoastal Waterway crosses St. Catherines Sound just inside the entrance, and affords passage northward through Bear River to Ossabaw Sound, and southward through North Newport River and Johnson Creek to Sapelo Sound.

Three main rivers enter the sound. **Bear River** and **North Newport River,** which form a portion of the Intracoastal Waterway, flow into the sound from the northwestward and southwestward respectively. Passage northward to Florida Passage via Bear River is possible through the Intracoastal Waterway route or by way of **Kilkenny Creek** and **Skipper Narrows.** The latter route should not be attempted without local knowledge as the crooked narrow section at the upper end of Skipper Narrows almost bares at low water.

**Medway River** enters St. Catherines Sound from the westward. A draft of 12 feet can be carried to **Sunbury,** a small settlement on the western shore of the river. Water can be obtained at the one wharf which serves an oyster plant.

By way of the Medway River and **Belfast River** a draft of 7 feet can be carried to **Belfast.** A pile of rocks, bare about 3 feet at low water, stands in the mid-channel with surrounding depths of 12 feet off the bluff at Belfast.

**Timmons** and **South Newport Rivers** have no importance above the sections near the waterway.

**St. Catherines Island** forms the coast from St. Catherines Sound to Sapelo Sound, lies in a nearly north and south line, and has a length of 9 miles and a breadth at its widest part of about 3 miles. The island is flat and much of it is marshy with the higher part heavily wooded.

When viewed from a distance seaward, only dense woods in level silhouette are to

be seen. Closer inspection reveals a white sand beach, with sand hills 20 feet high near the center of the island which show up from some directions. A prominent sand dune 3 miles south of the north end of St. Catherines Island and about 1 mile north of McQueen Inlet, is reported to show well from seaward. **McQueen Inlet,** the only break in the shoreline visible from seaward, is unimportant, as it is blocked by shoals at low water. Dangerous shoals extend off from the shore to a distance of 5 miles.

The island is separated from the marshes lying between it and the mainland by Walburg Creek, Johnson Creek, and South Newport River. Between the south point of this island and the north point of Blackbeard Island is the entrance to Sapelo Sound.

## Sapelo Sound and Doboy Sound

Chart 574

**Sapelo Sound** is about 34 miles southwestward of Tybee Light. When approaching from seaward, Sapelo lighted whistle buoy 2S is encountered about 15 miles eastward of the sound in 48 feet of water. About 8 miles from the entrance the break in the shore can be seen on a clear day. **Sapelo Brick Daybeacon,** the red and white tower of a former lighthouse 10 miles southwestward of Sapelo Sound, can also be seen from off the bar and is a good mark.

Shoals extend about 5 miles from the shore and vessels should keep in a depth of over 5 fathoms until the sea buoy is sighted.

With the aid of the chart, and on a rising tide and a smooth sea, vessels up to 15-foot draft should have no difficulty in entering during daylight hours by following the buoys. A comparison of the surveys made since 1859 shows virtually no change in the bar except in the vicinity of the shoalest part of **Experiment Shoal,** which has moved more than 0.25 mile southward. The slough between the shoal and St. Catherines Island also has deepened and extended, and now shows up as a swash channel with a least depth of 9 feet. Another unmarked channel south of the main channel had a depth of 8 feet according to the last survey and is used by fishing boats.

Pilots are not available for Sapelo Sound. No towns or villages of any importance are on the sound or its tributaries. In northeasterly weather anchorage can be made in the lower part of South Newport River with fair protection.

The mean rise and fall of the tide is about 7 feet. In the entrance to the sound the average velocities of flood and ebb strengths are about 2 and 2.5 knots. The *Atlantic Coast Current Tables* should be consulted for current predictions.

The Intracoastal Waterway enters Sapelo Sound from the northward through South Newport River and continues southward to Doboy Sound through Sapelo River, Front River, Creighton Narrows, and Old Teakettle Creek.

**South Newport River** flows into the sound from northward just inside the entrance, and has a channel depth of 11 feet for a distance of 11 miles to its junction with North Newport River. At high water, 8 feet can be taken about 5 miles farther up the river. **Barbour Island River** enters the sound from the northwestward and is of little importance. **Sapelo River,** entering the sound from westward, is used only by small

fishing boats, except for the lower part below **Front River** which forms a part of the Intracoastal Waterway.

In 1947 a draft of 13 feet could be carried from the deeper waters of Sapelo River into the mouth of Front River, at the head of which a dredged channel through **Creighton Narrows** offers passage to Old Teakettle Creek and thence to Doboy Sound. The Intracoastal Waterway follows this route.

**Mud River,** flowing into the head of Sapelo Sound from southward, is a broad shallow body of water.

The coastline from Sapelo Sound to Doboy Sound is formed by the shores of **Blackbeard** and **Sapelo Islands.** These are separated by **Blackbeard Creek,** which empties into **Cabretta Inlet.** From all points of view, they appear as a single island and are described as such. Taken together they have a length of 10 miles in a north-northeasterly direction and a width of about 4 miles. Large portions of both islands are heavily wooded. Seen from seaward, these islands present no well-marked distinguishing features, nothing being visible other than the usual sand beach backed by dense woods in level outline, except for the abandoned lighthouse tower, Sapelo Brick Daybeacon, near the south point of Sapelo Island. The western part of Sapelo Island consists almost entirely of broad marshes through which run numerous creeks. Most important of these is Duplin River, which has deep water for several miles and affords means of communication to the island. Sapelo Island is separated from the marshes lying between it and the mainland by Mud River and New Teakettle Creek.

Blackbeard Island is a game refuge under the control of the United States Fish and Wildlife Service.

**Doboy Sound** is 46 miles southwestward of Tybee Roads and 16 miles northeastward of St. Simons Light. The entrance, between Sapelo Island and Wolf Island, is about 1 mile wide and obstructed by shifting shoals extending about 4.5 miles offshore. When approaching Doboy Sound a depth of 5 fathoms or more should be kept until the sea buoy is sighted. From this point the abandoned lighthouse tower and an elevated water tank about 0.5 mile northeast of the lighthouse tower may be seen. If there is too much sea to cross Doboy bar vessels are advised to enter via St. Simons Sound and the Intracoastal Waterway.

The marked channel over Doboy bar is not considered safe for strangers with draft of more than 8 feet and only then under the safest condition of a rising tide and a smooth sea. The bar has been changing over the past years. An unmarked swash channel with a least depth of 7 feet makes into the sound close under the south point of Sapelo Island. Doboy Channel is used by local shrimp boats. Pilots are not available.

Doboy Sound extends northwestward about 5 miles from the bar with a width of about 0.8 mile. The mean rise and fall of the tide is about 7 feet in the sound and about 7½ feet at Darien. Tidal currents in the sound have an average velocity of about 1½ to 2 knots. Predicted currents may be obtained from the *Atlantic Coast Current Tables.* Good anchorage is found anywhere in the channel of the sound upstream from **Commodore Island** except in the cable area.

The Intracoastal Waterway enters Doboy Sound through Old Teakettle Creek and passes southward through North River, Darien River, Rockdedundy River, and Little Mud River to Altamaha Sound.

**Duplin River,** entering Doboy Sound from northward about 1.5 miles inside of

Sapelo Brick Daybeacon, is a small stream about 5 miles long and good for a reported depth of 10 feet until near its head. A large private dock is on the eastern bank of the river approximately 0.25 mile upstream from the entrance.

**Sapelo,** a post office near the southern part of Sapelo Island, is reached by boat going up Duplin River 2 miles to **Barn Creek** on the eastern shore; thence up the creek and its south fork to the landing. Some supplies and gasoline can be obtained here in an emergency.

**Old Teakettle Creek** enters the sound from northward about 1 mile northwestward of Duplin River. It forms a part of the Intracoastal Waterway. **New Teakettle Creek** branches from Old Teakettle and joins Mud River. A depth of 7 feet can be carried up **Shellbluff Creek** to the small shrimp packing plant at **Valona.** The docks are privately owned by a shrimp-boat building yard with a small marine railway for hauling them out. Business with passing craft is not solicited, but gasoline may be procured in an emergency.

**Atwood** and **Hudson Creeks** are small streams emptying into the head of Doboy Sound from the northwestward. About 10 feet can be taken up Atwood Creek for a distance of 2 miles. Hudson Creek has a depth of 9 feet to the mouth of the small creek leading to a small shrimp-packing plant at **Meridian Landing.**

**Connegon River** enters the head of the sound from southwestward, and is connected with North River by a branch known as **Buzzard Roost Creek. North River** enters Doboy Sound west of Doboy Island. It extends westward 6 miles to the post village of **Ridgeville** where it joins **May Hall Creek,** which, running southward, connects with Darien River 5 miles above its mouth.

**Back River,** on the southern side of Doboy and Commodore Islands, forms another, and little used, entrance from the sound to North and Darien Rivers.

**South River,** also little used, empties into Doboy Sound from southwestward about 0.75 mile inside the entrance. It extends in a general westerly direction for 3 miles, where it joins **Little Mud River,** a part of the Intracoastal Waterway.

**Darien River** runs southwestward for a distance of 11.5 miles, where it joins the Altamaha River. The controlling depth to Darien in September 1947 was 9 feet. Care is necessary when navigating this river due to the shoals and numerous floating snags. Water is fresh in the river at Darien after the ebb has been running for about 3 hours. The best route from Doboy Sound to the Darien River is via the Intracoastal Waterway.

**Darien** is 8.5 miles above Doboy Island on the north bank of the Darien River. It is of little commercial significance. Fishing and pulpwood are the main industries. Some shrimp and shad fishermen base here. It has telephone communication, and a good highway passes through Darien from Savannah to Brunswick, 18 miles away. Gasoline, ice, fresh water, and supplies are procurable. Three small marine railways capable of hauling out boats up to 45-foot length are here. The depth of water alongside the wharves is 7 to 14 feet. A fixed highway bridge, with vertical clearance of about 30 feet at high water under the arch, crosses the Darien River at the town.

**Generals Cut** and **Threemile Cut,** connecting Darien River and Altamaha River, are not navigable by any type of boat at low tide.

**Doboy Island** is wooded, with several buildings on its southwest end. A small private landing is on the island.

# Altamaha Sound

## Chart 575

Between Doboy Sound and Altamaha Sound is **Wolf Island,** which is about 2.5 miles long in a north-south direction. Wolf Island is almost entirely marsh cut by numerous creeks.

**Altamaha Sound** is 5 miles southward of Sapelo Brick Daybeacon and about 11 miles northeastward of St. Simons Light. The entrance and the sound are obstructed by shoals, which are dangerous to navigation. An unmarked, shifting channel through the shoals extends 4 miles from the entrance. It is advisable in every case where a vessel desires to enter Altamaha Sound to approach via the Intracoastal Waterway. The mean rise and fall of the tide in the entrance is about 6½ feet.

**Altamaha Sound approach, practice bombing area.**—A submerged wreck in latitude 31°17′ N., longitude 81°13′ W., will be used for aircraft bombing practice with inert bombs.

**Altamaha River** is formed by the confluence of the Oconee and Ocmulgee Rivers, 110 miles above the town of Darien and 119 miles above its mouth, and flows in a general southeasterly direction, entering the western end of Altamaha Sound. The river is subject to freshets, and depths change radically.

A Federal project for improving the Altamaha, Oconee, and Ocmulgee Rivers provides for maintenance of a 3-foot depth during ordinary summer low water, and to gradually increase the channel depth by removing rock shoals, snags, overhanging trees and other obstructions; closing incipient cut-offs; revetting caving banks, and use of spur dikes and training walls. This project covers the entire Altamaha River (including a channel between the river and Darien) a length of 119 miles, the lower 126 miles of the Oconee River, and the lower 178 miles of the Ocmulgee River.

In 1946 the controlling depth on the Altamaha River was 4 feet for 15 miles and thence 2½ feet to the forks during 9 months of the year, and about ½ to 1½ feet less in the summer low-water period. Influence of the tides is felt a distance of about 20 miles above Darien.

**Bridges and regulations.**—All drawbridges over the Altamaha, Ocmulgee, and Oconee Rivers require at least 24 hours' advance notice to open; see Chapter 2 for general bridge regulations.

Highway 17 crosses the divisions of the Altamaha River near Darien with fixed bridges as follows: Over the South Altamaha River with a vertical clearance of approximately 30 feet in the arch at high water; over **Middle (Champney) River,** not used for navigation, with a vertical clearance of 5½ feet at high water; over the **Butler River,** not used for navigation, with a vertical clearance of 5½ feet at high water.

Above Darien the Altamaha River is crossed by four swing and two bascule bridges. The minimum clearances are 53 feet horizontal; 11½ feet vertical, closed, at low water. Ocmulgee River is crossed by nine swing and four fixed bridges. The minimum clearances are 67 feet horizontal; vertical, closed, in the swing bridges 15½ feet at low water; in the fixed bridges, 26½ feet at low water. Oconee River is crossed by six swing, one bascule, and three fixed bridges. The minimum clearances are 34 feet horizontal;

vertical, closed, in the swing bridges and bascule bridge, 8 feet at low water; in the fixed bridges 33½ feet at low water.

**Oconee River** had a depth for 9 months during 1946 of 3 feet to **Dublin** and 1 foot from Dublin to **Milledgeville,** a town 126 miles above the junction with the Altamaha River. During the low-water period controlling depths were ½ to 1½ feet less than those given above. Other towns on this river are **Mount Vernon** and **Oconee.**

**Ocmulgee River** had a depth for 9 months during 1946 of 2 feet for 63 miles above the fork with the Altamaha River and 1 foot from this point to **Macon,** 178 miles above the fork. During the low-water periods, controlling depths were ½ to 1½ feet less than those given above. The principal towns on this river are **Lumber City, Abbeville, Hawkinsville,** and Macon.

**Little Mud River** enters Altamaha Sound from northward about 2.5 miles inside the entrance. The Intracoastal Waterway passes through Little Mud River. **Buttermilk Sound,** which enters Altamaha Sound from the southwestward, has an average width of 0.5 mile. At its head the sound connects with Frederica River and Mackay River, the latter connecting with Back River. These three rivers enter the western end of St. Simons Sound from northward, and Mackay River with Buttermilk Sound forms part of the Intracoastal Waterway.

The coast between Altamaha and St. Simons Sound is formed by the shores of **Little St. Simons Island, Sea Island,** and St. Simons Island. These islands are separated only by stretches of marsh traversed by small streams, and from seaward appear as one body of land although from certain points the marshes, alternating with patches of trees, give the land an unusually broken appearance.

Of the three, **St. Simons Island** is the main body of land between the two sounds, and in general description the other two may be considered as parts of it. The three taken together are 11 miles long and 6 miles wide at the northern end, diminishing gradually to 2.5 miles near the southern end. Immediately along the coast and in the central parts it is heavily wooded. Between the two wooded portions is a stretch of marsh from 1 to 1.5 miles wide extending nearly the whole length of the island, and to the westward it is separated from the mainland by extensive marshes, through which flow the Frederica and Mackay Rivers, joining Altamaha and St. Simons Sound.

The northern portion is mainly marshy and traversed by **Hampton River,** a sizable stream flowing in an easterly and southeasterly direction, which separates St. Simons and Little St. Simons Islands and comes out on the coast 5 miles below Altamaha Sound. Over the bar at the entrance is about 6 feet of water. The dangerous shoals on both sides and the channel are unmarked. Inside the bar 8 feet can be carried through to Buttermilk Sound at low water.

**Village Creek** flows into Hampton River from the southward, about 1.5 miles above its mouth. It goes through a stretch of marsh separating Sea Island and St. Simons Island. At low water the channel of Village Creek is practically dry about 4.5 miles above the mouth. After a crooked course of several miles, it joins the **Blackbank River,** a narrow and twisting stream flowing to the southward between the two islands and entering the sea about 4 miles south of Hampton River.

A fixed highway bridge across the Blackbank River has a horizontal clearance of 15 feet and a vertical clearance of 7½ feet at high water. A commercial airfield is on the southern part of St. Simons Island.

# St. Simons Sound and Brunswick

Chart 447

**St. Simons Sound,** an inlet 0.8 mile wide, lies 17 miles southward of Sapelo Brick Daybeacon and 27 miles northward of Amelia Island Light. This sound forms a good harbor and is the approach to the city of Brunswick, Ga. The entrance is obstructed by dangerous shifting shoals which make offshore for a distance of 5.5 miles, forming a bar through which is a dredged channel. This channel is part of a Federal improvement project which provides for a channel 30 feet deep and 500 feet wide through the bar. In February 1947, its controlling depth was 26 feet. The channel is marked by lighted and unlighted buoys. St. Simons Range Front Light, which along with St. Simons Light, formerly provided an entrance range, has been discontinued. The structure remains as a daybeacon, but cannot be used as a day range as it is not on the range line. Inside the bar, and in the channel of the sound, there is good depth of water and excellent anchorage.

**Prominent features.**—In clear weather, **St. Simons Light,** shown from a white conical tower attached to a brick dwelling, is easily made out when off the bar. The light is 104 feet above the water and visible 16 miles. Little Cumberland Island Daybeacon, a white, conical unused lighthouse, can be seen to the southward. Near the beach eastward and northeastward of St. Simons Light are many palatial homes and summer residences extending to the vicinity of Hampton River. A hotel cupola 0.8 mile east-northeastward of St. Simons Light, the tall stacks of the Hercules Powder Co. in Brunswick, and the aviation light at the airfield on St. Simons Island are prominent.

Brunswick lighted whistle buoy 2B is moored in 49 feet of water off the entrance to St. Simons Sound and Brunswick Harbor approximately on the prolongation of the bar channel line.

**Tides.**—The mean rise and fall of the tide is about 6½ feet on the bar and 7½ feet at Brunswick.

**Currents.**—Tidal currents normally follow the general direction of the dredged channel across the bar and have an estimated velocity of 1 to 2 knots. They set diagonally across the Plantation Creek Range with an average velocity at strength of about 2 knots. Current predictions for a number of locations in the vicinity of St. Simons Sound may be obtained from the *Atlantic Coast Current Tables*.

**Directions,** St. Simons Sound approach.—When approaching St. Simons Sound from any direction, shape the course for Brunswick lighted whistle buoy 2B, from which a **303°** course for 7 miles will lead to St. Simons lighted whistle buoy St. S, at the entrance to the bar channel. In clear weather, when Brunswick lighted whistle buoy 2B is sighted, a course can be shaped to pass as much as 5 miles inside of it. Then, bring it astern on a **303°** course until up with St. Simons lighted whistle buoy St. S. Depths of 27 to 34 feet have been found on what appears to be a bank or broken ground lying 3 miles east of St. Simons lighted whistle buoy St. S. This area should be avoided in heavy weather. Also a spot with 27 feet over it is about 0.4 mile north-northeastward of St. Simons lighted whistle buoy St. S. For courses and distances, St. Simons lighted whistle buoy St. S to Brunswick, see Chapter 3.

**St. Simons** is a summer resort with a landing at the south end of St. Simons Island.

**Frederica River** joins St. Simons Sound from the northward about 1 mile inside the entrance and for several miles, to the junction with Mackay River, is the main route of the Intracoastal Waterway and is described at length under that heading.

**Mackay River** enters the sound from northward but is obstructed by a fixed highway bridge about 1.5 miles above the mouth, on the west side of Lanier Island. The bridge has a horizontal clearance of 33 feet and a vertical clearance of 6 feet at high water. To the northward of **Lanier Island,** Mackay River is joined by Frederica River and becomes the route of the Intracoastal Waterway.

**Back River,** an alternate route of the Intracoastal Waterway, enters St. Simons Sound from northward and has a controlling depth of about 5 feet to its junction with Mackay River. The lower reach of Back River is part of a Federal project for improvement of Brunswick Harbor, which provides for a channel 20 feet deep and 150 feet wide from the sound to the mouth of **Mill Creek,** a distance of about 2.5 miles. When last ascertained, in May 1943, the controlling depth in the improvement was 10½ feet. A highway swing drawbridge crosses the river 1.5 miles above the mouth. It has a horizontal clearance of 85 feet and a vertical clearance, closed, of 11 feet at high water. Above the bridge the channel to the head of the improvement is marked by unlighted ranges.

**Terry Creek** flows into Back River 0.3 mile above the highway bridge and leads westward 1.5 miles to the city of Brunswick. The entrance is marked by an unlighted range. The creek is included in a Federal project for improvement of Brunswick Harbor which provides for a channel 10 feet deep and 80 feet wide from Back River to a point immediately above the wharf of the Glynn Canning Co. In September 1947, the controlling depth in the creek was 7½ feet. A yacht basin on the creek, within the city limits of Brunswick, offers good protection from storms and has 450 feet of dock space and a float with 10 feet of water alongside. Gasoline, ice, fresh water, and showers are available, and provisions and Diesel oil may be delivered from the city. A good restaurant is nearby. A marine railway at the basin is capable of hauling out vessels of 15 tons and 60 feet length, for general repairs.

**Plantation Creek** and **Clubbs Creek** offer a protected short cut between Back River and Brunswick River, and can be used safely by small craft on a rising tide. The channel is through the mouth of Clubbs Creek and into Plantation Creek, keeping in mid-channel. The controlling depth on this route is about 3 feet.

**Brunswick River** enters the sound from southwestward just inside the entrance and provides access for ocean-going vessels to the city of Brunswick. For a distance of 2.8 miles above its mouth the river has an average width of 1.3 miles, but the deep-water channel averages only 0.3 mile in width. Above **Brunswick Point** the river has an average width of 0.7 mile to **Buzzards Island,** which divides it into two branches. The southern branch is known as **Turtle River** and the northern branch, on which the city of Brunswick is situated, is known as **Oglethorpe Bay** to the mouth of **Academy Creek** and thence as **East River** to its junction with Turtle River. All of the channels, except East River and Academy Creek, are well marked by lighted ranges, lights, and lighted and unlighted buoys.

The major portion of the deep-water channel of the Brunswick River is of sufficient natural depth for existing commerce, except for shoals off Brunswick Point. A Federal project for improvement of Brunswick Harbor provides for a channel 27 feet deep and 400 feet wide through these shoals as well as a channel 27 feet deep and 350 feet wide in

Oglethorpe Bay to the mouth of Academy Creek and thence 24 feet deep and 150 feet wide in Academy Creek, a total distance of 2.7 miles, and for a cut to Turtle River from Academy Creek if deemed advisable, and for a channel 27 feet deep and 300 feet wide in Turtle River to the upper end of the Atlantic Refining Co. wharf. It further provides for a stone jetty 4,350 feet long at the entrance to Oglethorpe Bay.

The controlling depths in February 1947 were: Brunswick River, 25 feet; Oglethorpe Bay, 20 feet; and Turtle River, 26 feet. Academy Creek had a controlling depth of 10 feet in September 1947.

A highway swing drawbridge crossing Turtle River just above the head of improvement has a horizontal clearance of 80 feet and a vertical clearance, closed, of 4½ feet at high water. There is little traffic above the bridge.

**South Brunswick River** enters Turtle River from westward opposite Buzzards Island. **Fancy Bluff Creek** enters South Brunswick River from the southwestward 1.3 miles above its mouth. This creek affords a passage at high water to Little Satilla River but is dry at mean low water. A fixed highway bridge, with a horizontal clearance of 36 feet and a vertical clearance of 12 feet at high water, crosses the South Brunswick River about 1.5 miles above the entrance to Fancy Bluff Creek.

**Jekyll Creek** enters Brunswick River from southward about 2.5 miles above its mouth. With Jekyll and St. Andrew Sounds, it forms part of the Intracoastal Waterway to Fernandina. The entrance is marked by a lighted range and protected by a jetty on its west side, the outer end of which is marked by a light. Jekyll Island Range Front Light stands about 25 yards to the westward of this light. The jetty covers at high tide but is marked by daybeacons. To enter be guided by the range, lights, and daybeacons marking the route of the Intracoastal Waterway. A settlement is on the east side of the creek on Jekyll Island.

**Brunswick** is on the eastern bank of Oglethorpe Bay and Academy Creek opposite Buzzards Island, 7.5 miles above St. Simons Light and 4.5 miles off the track of the Intracoastal Waterway, by which it is connected with ports to the north and south. Adequate hotel accommodations are available.

**Pilotage.**—Pilots are obtained by wire or telephone to the Brunswick Pilots Association, St. Simons Island. Pilotage is compulsory for vessels of more than 10-foot draft. The following rates of pilotage for the Bar of St. Simons and Turtle and Satilla Rivers were adopted by the Pilot Commissioners June 1, 1942. Vessels calling for bunkers, or repairs only, pay one-half rates. The detention rate is $10 per day.

| Draft (feet) | Pilotage | Draft (feet) | Pilotage | Draft (feet) | Pilotage | Draft (feet) | Pilotage |
|---|---|---|---|---|---|---|---|
| 6 | $18. 00 | 13 | $52. 00 | 19½ | $95. 00 | 26 | $156. 00 |
| 6½ | 19. 50 | 13½ | 54. 00 | 20 | 100. 00 | 26½ | 159. 00 |
| 7 | 21. 00 | 14 | 56. 00 | 20½ | 105. 00 | 27 | 162. 00 |
| 7½ | 22. 50 | 14½ | 58. 00 | 21 | 110. 25 | 27½ | 165. 00 |
| 8 | 24. 00 | 15 | 60. 00 | 21½ | 115. 00 | 28 | 168. 00 |
| 8½ | 25. 50 | 15½ | 62. 00 | 22 | 121. 00 | 28½ | 171. 00 |
| 9 | 27. 00 | 16 | 64. 00 | 22½ | 130. 00 | 29 | 174. 00 |
| 9½ | 28. 50 | 16½ | 74. 25 | 23 | 138. 00 | 29½ | 177. 00 |
| 10 | 30. 00 | 17 | 76. 50 | 23½ | 141. 00 | 30 | 180. 00 |
| 10½ | 36. 75 | 17½ | 78. 50 | 24 | 144. 00 | 30½ | 190. 00 |
| 11 | 38. 50 | 18 | 81. 00 | 24½ | 147. 00 | 31 | 200. 00 |
| 11½ | 39. 25 | 18½ | 83. 25 | 25 | 150. 00 | 31½ | 210. 00 |
| 12 | 42. 00 | 19 | 90. 25 | 25½ | 153. 00 | 32 | 220. 00 |
| 12½ | 43. 75 | | | | | | |

**Towage.**—No towboats are available.

**Quarantine.**—There is no quarantine station at Brunswick. Quarantine inspection is performed by a medical officer after the vessel arrives at berth. The office of the medical officer in charge at the port is located in the Dunwoodie Building.

**Customs.**—Brunswick is a port of entry and marine documents are issued. The customs office is in the post-office building, located four blocks from the water front, at Gloucester Street.

**Immigration.**—There is no immigration office at Brunswick. Inspectors are sent from Savannah when such services are required.

**Hospitals and relief stations.**—The Brunswick City Hospital, located on Norwich Street, maintains a ward for the United States Public Health Service. A third-class relief station is maintained by the United States Public Health Service at 1501½ New Castle Street.

**Anchorages.**—There is good anchorage anywhere in the channel in St. Simons Sound or Brunswick River off the range lines. Off the city of Brunswick, however, anchorage is only for small craft, in the area westward of the Brunswick Harbor Range. Small vessels can anchor in the East River near the mouth of Academy Creek.

**Bridges.**—No bridges cross the main channels of this port.

**Dockage.**—No dockage charges are assessed against vessels while loading or discharging cargo.

**Wharfage.**—No wharfage charges are made at the municipal and private wharves, but are made by the railroads.

**Terminal facilities.**—Brunswick has over 20 piers and wharves, most of which are along the east side of Oglethorpe Bay, adjacent to the streets of the city. All are of timber-pile construction except for a dock at the shipyard. The wharves of the Brunswick Pulp & Paper Co. and the Atlantic Refining Co. both located on Turtle River, have sufficient depths for large vessels to dock, but limited depths at most wharves permit docking of small vessels only and at some wharves vessels can dock only at high tide. Facilities for loading and discharging cargoes and storage are limited, but improvement of the harbor is planned.

**Supplies.**—Ships do not take bunker oil at Brunswick, but provisions, ship chanlers' stores, coal, gasoline, ice, and fresh water are procurable.

**Lighterage.**—Lighters are seldom used for handling cargo at Brunswick and are available only by private arrangement.

**Salvage and wrecking gear.**—There are no special facilities at the port for use in wrecking or salvage operations. When such equipment is needed, it is obtained from Savannah or Jacksonville.

**Marine repairs.**—Brunswick has good facilities for repair and construction. Several marine railways are available, the largest capable of hauling vessels of 500 tons, 160 feet length, and draft of 5 feet forward and 10 feet aft. Complete machine, boiler, steel, and wood fabrication facilities are available. One wharf is equipped with a derrick capable of handling a 50-ton lift.

**General port activities.**—In September 1947, there was little coastwise shipping and no foreign commerce, it having been curtailed during the war, but resumption of both was planned for the near future. In normal times fertilizer, refined sugar, and petroleum products comprised the bulk of imports, and the principal products exported were naval stores, scrap iron, lumber, and wood pulp.

The principal industries are crude-oil refining, wood creosoting, sea-food packing, and manufacture of rosin, turpentine, wood containers, fertilizers, powder, paper, and plywood.

**Communications.**—The port of Brunswick is served by the Southern Railway and the Atlantic Coast Line Railroad. Two major air lines using Malcolm B. McKinnon Field, the county airfield on St Simons Island, provide air connections to cities on the Atlantic coast and make western connections.

**Storm warnings** are displayed day and night at Brunswick, and by day only at the St. Simons Coast Guard Station.

# St. Andrew Sound

## Chart 448

From St. Simons Sound to St. Andrew Sound the coast is formed by the shores of **Jekyll Island** which extends nearly north and south for a distance of 6.5 miles and has a width of 2 miles. The island is wooded all along its eastern shore and from seaward shows the typical stretch of sand beach with many conspicuous bluffs and sand hills, backed by dark woods which are quite level in silhouette, but have tall pines frequently looming above the general group. Shoals make off the shore to a distance of 3 to 5 miles.

The western portion of Jekyll Island is marshy, bordered by the Brunswick River, Jekyll Creek, and Jekyll Sound. A settlement on the western side is reached through Jekyll Creek. Jekyll Island is a State park.

**St. Andrew Sound,** between Jekyll Island and Little Cumberland Island, is about 7 miles southward of St. Simons Sound and 17 miles northward of St. Marys Entrance.

**St. Andrew Sound approach, practice bombing area.**—A point in latitude 31°00′ N., longitude 80°15′ W., will be used for aircraft bombing practice with live bombs. (See *Chart 1111*).

The entrance to St. Andrew Sound is over a shifting bar which extends about 5 miles offshore. Brunswick lighted whistle buoy 2B is the principal aid in a northerly approach. Vessels should keep in 5 fathoms or better until the sea buoy is sighted. The channel is marked by buoys. The entrance is marked by Little Cumberland Island Daybeacon, an unused lighthouse tower on the north end of the island. Vessels of about 10-foot draft should have no trouble entering the sound. There is a licensed pilot for St. Andrew Sound at Brunswick. The entrance is used mostly by local shrimp boats.

In the sound are extensive shoals, between which channels lead to the principal tributaries; Jekyll Sound on the north, Satilla River on the west, and Cumberland River on the south. The mean rise and fall of the tide is 6½ feet. Currents in the entrance are strong, averaging about 2 knots at strength of flood and ebb. Current predictions are given in the *Atlantic Coast Current Tables*.

The best anchorage in the sound is in the channel on the western side of Little Cumberland Island in depths of 21 to 27 feet, good holding ground. Good anchorage is also found in the entrance to Jekyll Sound westward of Jekyll Point.

The Intracoastal Waterway, which crosses the sound, enters from the northward

through Jekyll Creek and Jekyll Sound and passes southward through Cumberland River to Cumberland Sound and St. Marys Entrance.

**Jekyll Sound,** which enters St. Andrew Sound from northward just inside the entrance, has many shoals. Three channels lead to its three principal tributaries. **Jekyll Creek** enters the sound from northward, forming a part of the Intracoastal Waterway. Its northern part connects with Brunswick River. **Jointer Creek** enters Jekyll Sound from northwestward. It is crooked and has a number of narrow branches which connect with Brunswick River above Jekyll Creek.

**Little Satilla River** enters Jekyll Sound from westward and has a controlling depth of 13 feet at its entrance and for several miles above its mouth. Above its mouth, it is of little importance. Small craft going to landings on Little Satilla River enter from South Brunswick River through Fancy Bluff Creek, which is navigable only at high tide as the creek dries at low water.

**Satilla River** enters St. Andrew Sound from the westward. Its entrance is through a narrow channel in the shoals. A Federal project for the Satilla River provides for the removal of snags and similar obstructions from the mouth to Burnt Fort, 45 miles above St. Andrew Sound, and the removal of obstructions and the closing of incipient cut-offs from Burnt Fort to Waycross, 144 miles above the sound. Controlling depths in December 1945 were: 9 feet to about 35 miles above the sound, 4½ feet to Burnt Fort, and 1 foot from Burnt Fort to Waycross. Principal towns on the Satilla River to the head of the project are **Woodbine, Burnt Fort, Atkinson, Trudie,** and **Waycross.**

The mean tidal range is 6½ feet at the mouth and 3¼ feet at Burnt Fort. The freshet variation at Waycross is about 12 feet.

Two swing bridges cross the river at Woodbine. The horizontal clearances are 80 and 50 feet and vertical clearances, closed, are 4 and 5½ feet at high water. Traffic through these bridges consists mostly of pulpwood tows. Above these bridges 1 bascule bridge and 11 fixed bridges cross the river with minimum clearances of 50 feet horizontal and 9¾ feet vertical at low water.

**Cumberland River** enters St. Andrew Sound from southward just inside Little Cumberland Island. Its general direction is southerly for a distance of 11 miles, where it joins Cumberland Sound. The Intracoastal Waterway follows this route and is well marked by ranges in the more difficult sections.

**Brickhill River** branches from Cumberland River about 5 miles above its mouth and rejoins it at **Cumberland Dividings. Floyd Creek** enters Cumberland River from westward about 4.5 miles above the north end of Little Cumberland Island, and joins with Satilla River through a cut to form an alternate passage to the Intracoastal Waterway.

**Shellbine** and **Delaroche Creeks** enter Cumberland River from westward. They are both narrow, crooked, and of no importance.

Between St. Andrew Sound and Cumberland Sound the coastline, extending in a southerly direction for about 16 miles, is formed by the shores of Little Cumberland and Cumberland Islands. These two islands are separated only by a stretch of marsh and **Christmas Creek,** and appear as one island from seaward. The coastline shows a broad white sand beach backed by an almost continuous range of sand hills with dense woods backing them.

The north end of **Little Cumberland Island,** heavily wooded, has a bluff appearance and is marked by the unused lighthouse tower. **Cumberland Island** is almost entirely

789003°—48——16

covered by woods, though somewhat marshy to the westward. The island is separated from the mainland by extensive marshes through which flow the Cumberland and Brickhill Rivers. The extreme southern point of the island, which forms the north side of the entrance to Cumberland Sound, shows a large clump of heavy trees with several conspicuous sand hills. To the northward is a stretch of marsh about 1 mile in width through which flows Beach Creek. Several buildings and water tanks north of the marsh are conspicuous landmarks.

For about 9 miles from the entrance to St. Andrew Sound, the coast is bordered by dangerous shoals making off from 3 to 5 miles. For the remaining distance to Cumberland Sound, a depth of 3 fathoms may be taken within 1 mile of the beach.

## Fernandina Harbor

Chart 453

**St. Marys Entrance** and **Cumberland Sound** are 16 miles southward of St. Andrew Sound and 19 miles northward of St. Johns River. The sound is the approach to the city of Fernandina and the town of St. Marys, as well as an inland passage to St. Andrew Sound through its connection with the Cumberland River.

**Prominent features.—Amelia Island Light,** 107 feet above the water and visible 16 miles is shown from a white conical tower on Amelia Island about 2 miles southward of the entrance. The water tank at Dungeness on Cumberland Island is about 2 miles north of the entrance. The water tank at **Old Fernandina,** about 1 mile from the entrance, and the city water tank at Fernandina, about 2 miles from the entrance, are also prominent from seaward. A lighted whistle buoy is moored in 30 feet about 6 miles off St. Marys Entrance.

**Tides.**—The mean range of tide at the entrance and at Fernandina is about 6 feet.

**Currents.**—The tidal currents at the entrance have considerable velocity and are dangerous at times, especially on the flood. Local pilots state that the conditions are about as follows: Between the bell buoy and the end of the north jetty the flood current sets southwestward; with northeasterly winds, it sets strongly in a direction about south-southwest. Under the worst conditions of the flood on spring tides and a northeast gale, the velocity near the end of the north jetty is estimated to be as much as 5 knots at times. On the flood an eddy current sets close along the inside of the north jetty. The ebb current appears to set directly out across the bar. In the present position of the channel, near the north jetty, the worst conditions for entering are on the flood with northeasterly winds, when vessels, especially long ones, are liable to strike the inside of the north jetty. Freshets in the St. Marys River may cause the ebb to run 7 or 8 hours. Current predictions for Cumberland Sound vicinity may be obtained from the *Atlantic Coast Current Tables.*

**Directions, St. Marys Entrance,** from northward.—From a position about 2 miles southeast of Savannah Lightship, make good a course of **205°** for 79 miles, passing about 2 miles southeast of Sapelo lighted whistle buoy 2S and Brunswick lighted whistle buoy 2B, to a position where Amelia Island Light bears 252°, distant 9 miles. On this

bearing, Fernandina lighted whistle buoy 1F is in range with the lighthouse. Then head for the buoy and lighthouse on range and steer **252°** for 2 miles. In this position the whistle buoy is 0.5 mile dead ahead and in range with the lighthouse. In clear weather, in daytime, the lighthouse and nearby standpipe are reported to be visible about 9 miles. In thick weather, if not certain of position, keep in a depth of not less than 7 fathoms.

From southward.—From a position about 0.2 mile southeast of St. Johns lighted whistle buoy 2 St. J, a **005°** course made good for 19 miles will pass 0.5 mile east of Fernandina lighted whistle buoy 1F, to a position where the buoy and Amelia Island Light are in range, bearing 252°, and the buoy 0.5 mile distant. On this course, Sea Buoy 6A off Nassau Sound entrance will be left about 2.9 miles to westward.

**Entrance to Fernandina.**—A Federal project for improving Fernandina Harbor provides for two stone jetties at the harbor entrance, the north jetty 19,150 feet long, and the south jetty, 11,200 feet long; for a channel 28 feet deep at mean low water from deep water in the Atlantic Ocean to deep water at the junction of Lanceford Creek with Amelia River, 400 feet wide below Calhoun Street in the city of Fernandina, and generally 300 feet wide above; and for widening the channel at the first bend below Lanceford Creek to 800 feet to form a turning basin. Length of the section included in this project is about 7 miles.

Controlling depths were 23½ feet through the outer harbor in January 1948; 26½ feet through the inner harbor in December 1943; and 14 feet in the turning basin in January 1948.

The outer ends of the jetties are 0.7 mile apart. The jetties are awash at half-tide, making them a menace to navigation when visibility is limited. Currents are strong off the ends of the jetties. The channel between the jetties is subject to frequent change. The currents scour out the channel during spring tides, but the shoals build up again during neap tides.

The channel between the jetties is marked by a lighted range, but the depth across the outer bar on the prolongation of the range line is only 21 feet. Vessels now approach the jetties from the north, passing north of Fernandina lighted bell buoy 3F and east of Fernandina Jetty lighted whistle buoy 4. The depth on this approach was 34 feet in 1947.

Two 18-foot spots are 0.5 mile inside the outer ends of the jetties and about 200 yards south of the range line. A 14-foot shoal is about midway between the ends of the jetties. Medium-draft vessels bound south take a short-cut across the bar, avoiding the 14-foot spot. A shoal with a least depth of 11 feet makes out more than a mile from the end of the south jetty.

**Directions.**—From a position 0.5 mile from Fernandina lighted whistle buoy 1F, with the buoy and Amelia Island Light in range and bearing 252°, make good a course of **286°** for 4.4 miles to a position 0.5 mile northwest of Fernandina lighted bell buoy 3F, passing 0.3 mile north of the buoy.

Then make good a course of **211°** for 1.2 miles, passing close eastward of Fernandina lighted whistle buoy 4, off the east end of the north jetty and between that buoy and buoy 5. Come onto the lighted range and steer **260°** between the jetties, following the range past the north end of Amelia Island and passing about 100 yards south of buoys 4, 6, and 8. Round the northwest end of Amelia Island at a distance of about 300 yards;

then steer **168°** for the elevated water tank in Fernandina, and follow the wharves at a distance of about 100 yards.

**Fernandina,** the principal city on Cumberland Sound, is on the east bank of **Amelia River** 2 miles south of Cumberland Sound entrance.

**Pilotage.**—Pilots for Fernandina and St. Marys are available and will come out from their headquarters at Fernandina when called. The usual procedure is to request their services by radio through the pilot station at Jacksonville, Fla. Pilotage is compulsory for certain vessels. Cumberland Sound rates follow.

| Draft (feet) | Pilotage | Draft (feet) | Pilotage | Draft (feet) | Pilotage | Draft (feet) | Pilotage |
|---|---|---|---|---|---|---|---|
| 6 | $12. 00 | 12½ | $48. 00 | 18½ | $92. 50 | 24½ | $147. 00 |
| 6½ | 16. 75 | 13 | 50. 00 | 19 | 95. 00 | 25 | 150. 00 |
| 7 | 20. 25 | 13½ | 52. 50 | 19½ | 97. 50 | 25½ | 153. 00 |
| 7½ | 21. 75 | 14 | 56. 00 | 20 | 100. 00 | 26 | 156. 00 |
| 8 | 23. 00 | 14½ | 65. 00 | 20½ | 123. 00 | 26½ | 159. 00 |
| 8½ | 24. 50 | 15 | 72. 00 | 21 | 126. 00 | 27 | 162. 00 |
| 9 | 26. 00 | 15½ | 75. 00 | 21½ | 129. 00 | 27½ | 165. 00 |
| 9½ | 27. 75 | 16 | 80. 00 | 22 | 132. 00 | 28 | 168. 00 |
| 10 | 30. 00 | 16½ | 82. 50 | 22½ | 135. 00 | 28½ | 171. 00 |
| 10½ | 37. 00 | 17 | 85. 00 | 23 | 138. 00 | 29 | 174. 00 |
| 11 | 40. 00 | 17½ | 87. 50 | 23½ | 141. 00 | 29½ | 177. 00 |
| 11½ | 42. 50 | 18 | 90. 00 | 24 | 144. 00 | 30 | 180. 00 |
| 12 | 45. 00 | | | | | | |

**Towage.**—Towboats can be obtained only from Jacksonville or Savannah.

**Quarantine.**—The old quarantine station off **Fort Clinch** has been abandoned. Ships are boarded now in the harbor abreast the town.

**Customs.**—Fernandina is a customs port and marine documents are issued. The customs headquarters are in the post-office building.

**Hospitals and relief stations.**—The nearest marine hospital is at Savannah. A county hospital is at Fernandina. Third-class relief stations are at Brunswick and Jacksonville.

**Anchorages.**—Good anchorage can be had in the channel of Cumberland Sound and in the Amelia River up to the city of Fernandina.

**Harbor master.**—For vessels over 500 tons, the harbor master's fee is $20.

**Wharves.**—Seagoing vessels use three wharves which have 29 feet of water alongside at low water. One is equipped with mechanical devices for loading bulk cargo at the rate of 400 tons per hour. Numerous smaller wharves operate for the shrimp-fishing fleet and a small municipal dock is at the foot of Main Street.

**Supplies.**—Water, gasoline, and oil are available at the wharves. Provisions and some ship chandlery can be obtained.

**Salvage and wrecking gear.**—No special facilities are available for wrecking or salvage operations. When such equipment is needed it is obtained from Jacksonville.

**Marine repairs.**—For large vessels facilities are not available. Jacksonville is the nearest place for repairs and haul-out services. Three marine railways are capable of hauling out vessels of 60-foot length and 6-foot draft. Hull and engine repairs can be made.

**General port activities.**—Fernandina is a shipping port for fertilizer products, pulp, and naval stores. Sulphur, salt cake, and caustics are imported. A moderate amount of foreign and coastwise shipping serves this port.

**Communications.**—The city is served by the Seaboard Air Line Railroad. An improved highway connects with the mainland.

**Storm warnings.**—Night storm warnings only are displayed at Fernandina.

Cumberland Sound is entered by Cumberland River and Crooked River on the north, St. Marys River and Jolly River on the southeast, Amelia River on the south, and numerous lesser rivers and creeks.

The Intracoastal Waterway enters Cumberland Sound from the Cumberland River and continues through the Amelia River on the south.

**Beach Creek** extends northward into Cumberland Island from a point just inside the entrance to Cumberland Sound. The controlling depth was 3 feet to the landing at **Dungeness** in 1947.

**St. Marys River,** the principal tributary of Cumberland Sound, enters from the westward and is a portion of the boundary between Georgia and Florida. A Federal project provides for a channel 17 feet deep and 200 feet wide from the mouth to **Crandall,** 11 miles above the mouth, and for clearing the channel of snags to **Traders Hill,** 51 miles above the mouth. The controlling depths were: The mouth to St. Marys, 15 feet in September 1947; St. Marys to Kings Ferry, 32 miles above the mouth, 10 feet in April 1946; Kings Ferry to the Atlantic Coast Line Railroad bridge 48 miles above the mouth, 7 feet in April 1946; the Atlantic Coast Line Railroad bridge to Traders Hill 51 miles above the mouth, 5½ feet in April 1946.

The mean rise and fall of tide on St. Marys River is about 6 feet at the entrance, 5 feet at Crandall, 3 feet at Kings Ferry, and 1½ feet at the Atlantic Coast Line Railroad bridge. The water is fresh above the Seaboard Air Line Railroad bridge about 17 miles above the mouth.

The St. Marys River below the head of navigation is crossed by four bridges. At **Kingsland,** 20 miles above the mouth, a highway bridge and the Seaboard Air Line Railroad bridge cross the river. The highway swing bridge has a horizontal clearance of 88 feet in the south draw and 86 feet in the north draw, and a vertical clearance, closed, of 5 feet at high water. The railroad swing bridge has a horizontal clearance of 57 feet and a vertical clearance, closed, of 5 feet at high water. A fixed highway bridge, with a horizontal clearance of 60 feet and a vertical clearance of 23 feet at low water and 16 feet at high water, crosses 46 miles above the mouth near Folkston. The Atlantic Coast Line Railroad bridge crosses 48 miles above the mouth. This fixed bridge has a horizontal clearance of 150 feet and a vertical clearance of 7 feet at extreme high water, 27 feet at low water.

**Directions, St. Marys River.**—From a position 300 yards south of St. Marys River Light 2, enter St. Marys River on course **265°**. Change course as necessary to keep in the main channel. Continue until on Long Beach Range. Leaving the range, round the bend to the southward and follow the east and south shore at a distance of 100 to 150 yards to the Town Point Range which leads to the water front at the town of St. Marys.

Above St. Marys follow the ebb-tide bends. Devils Elbow Range marks the dredged channel in the river about 2 miles above St. Marys. Vessels of about 10-foot draft should have no difficulty going as far as **Kings Ferry,** 32 miles above the mouth, on a rising tide. The river is very crooked; some of the turns are sharp. Except for a short length shown on Chart 1242, no chart covers the river above the town of St. Marys. Pilots are available at Fernandina.

The St. Marys River is used primarily by shrimp fishermen and tugs towing pulpwood and sand as far as St. Marys, and above St. Marys by pulpwood tows.

The town of **St. Marys** is situated on the north bank of St. Marys River 4 miles above its mouth. Rail, bus, telegraph, and telephone connections, and ordinary provisions are available. Gasoline, fuel oil, and water can be obtained at the water front. The St. Marys wharves are in good condition, the larger ones having 15 feet of water alongside at mean low water. The larger of the two marine railways is capable of hauling out boats up to 65 feet in length and 7-foot draft.

A good haven for small vessels, particularly in southwesterly weather, can be found at St. Marys. Launches also can obtain refuge in bad weather by anchoring near the pulp mill 1 mile up North River or near the bridges 16 miles above St. Marys on the St. Marys River. **North River** branches from St. Marys River about 1 mile above its mouth. A draft of 8 feet can be carried to the docks in the North River. This depth can be carried an additional mile, then a draft of 5 feet for an additional 5 miles, after which the controlling depth becomes 1 foot.

**Bell River** branches from St. Marys River about 1.5 miles above the town of St. Marys. This river flows in an easterly direction to its junction with the Amelia River at Fernandina. The ruling depth of Bell River is 5 feet.

**Chester,** a village on the Bell River, has a number of small docks. Two of the docks are in good condition and had a depth of 5 feet at mean low water alongside in September 1947.

**Jolly River** branches eastward from Bell River about 6 miles above its mouth, and empties into Cumberland Sound at the mouth of St. Marys River. Ruling depth in Jolly River was 5 feet in September 1947.

**Lanceford Creek** has a ruling depth of 8 feet to the docks at Black Rock. The creek widens at the docks into tidal flats which bare at low tide. Small boats cross from Lanceford Creek to Amelia River at high water through **Soap Creek,** which passes through numerous mud flats and oyster beds which bare at low tide.

## Fernandina to St. Johns River

Chart 577

From Cumberland Sound to St. Johns River the coast is formed by the shores of Amelia, Talbot, Little Talbot, and Fort George Islands. **Amelia Island** is nearly north and south, with a length of about 12 miles and a width varying from 1 to 2.5 miles. The island is low and gently undulating with heavy woods along the shore.

Seen from seaward, no prominent natural features distinguish Amelia Island from other land in the vicinity. It shows a long line of dark woods, irregular in outline, with numerous tall trees rising conspicuously above the general level. In front of these woods a range of sand hills, partly covered with coarse grass and scrub, back the broad stretch of white sand beach. About 2 miles from its northern end, the white tower of Amelia Island Light rising from a grove of large trees is a conspicuous landmark. About 3 miles south-southeast of Amelia Island Light is a pier extending 800 feet into the ocean.

The western portion of Amelia Island is marshy. Separating the island from the mainland is a broad stretch of marsh through which flow the Amelia and South Amelia Rivers connecting Cumberland Sound and Nassau Sound.

**Nassau Sound** is 10 miles southward of Amelia Island Light and 6 miles northward of St. Johns River. The entrance is obstructed by shifting shoals which extend about 1.5 miles seaward and form a shallow bar. In September 1947 breakers were observed across the entire entrance. Small craft are advised not to attempt passage through the shoals without local information. The mean range of tide in Nassau Sound is 5½ feet.

South Amelia River and Nassau River are the principal tributaries of Nassau Sound. **South Amelia River** enters from the northward and is a portion of the Intracoastal Waterway.

**Nassau River** enters Nassau Sound from the northwestward. A draft of 9 feet can be carried up Nassau River at low water for 16 miles to a fixed highway bridge which has a horizontal clearance of 80 feet and a vertical clearance of 10½ feet at high water. About 1 mile above this bridge is a fixed railroad bridge with a horizontal clearance of 39 feet and a vertical clearance of 9 feet at high water. Occasional sunken logs and numerous shoals are a menace to navigation.

**Nassauville** is a small settlement on the north bank of Nassau River about 7 miles above the entrance. Small boats coming alongside the Nassauville docks should exercise caution, as the current forms an eddy with a pronounced whirlpool effect between Wilder Dock and the crab cannery dock. The Wilder Dock has a depth alongside of 13 feet.

**Alligator Creek** connects South Amelia River and Nassau River. Its twisting channel leads through tidal flats and between oyster bars. **Pumpkin Hill** and **Edwards Creeks** enter Nassau River above Nassauville. Both are unimportant and connect several miles inland.

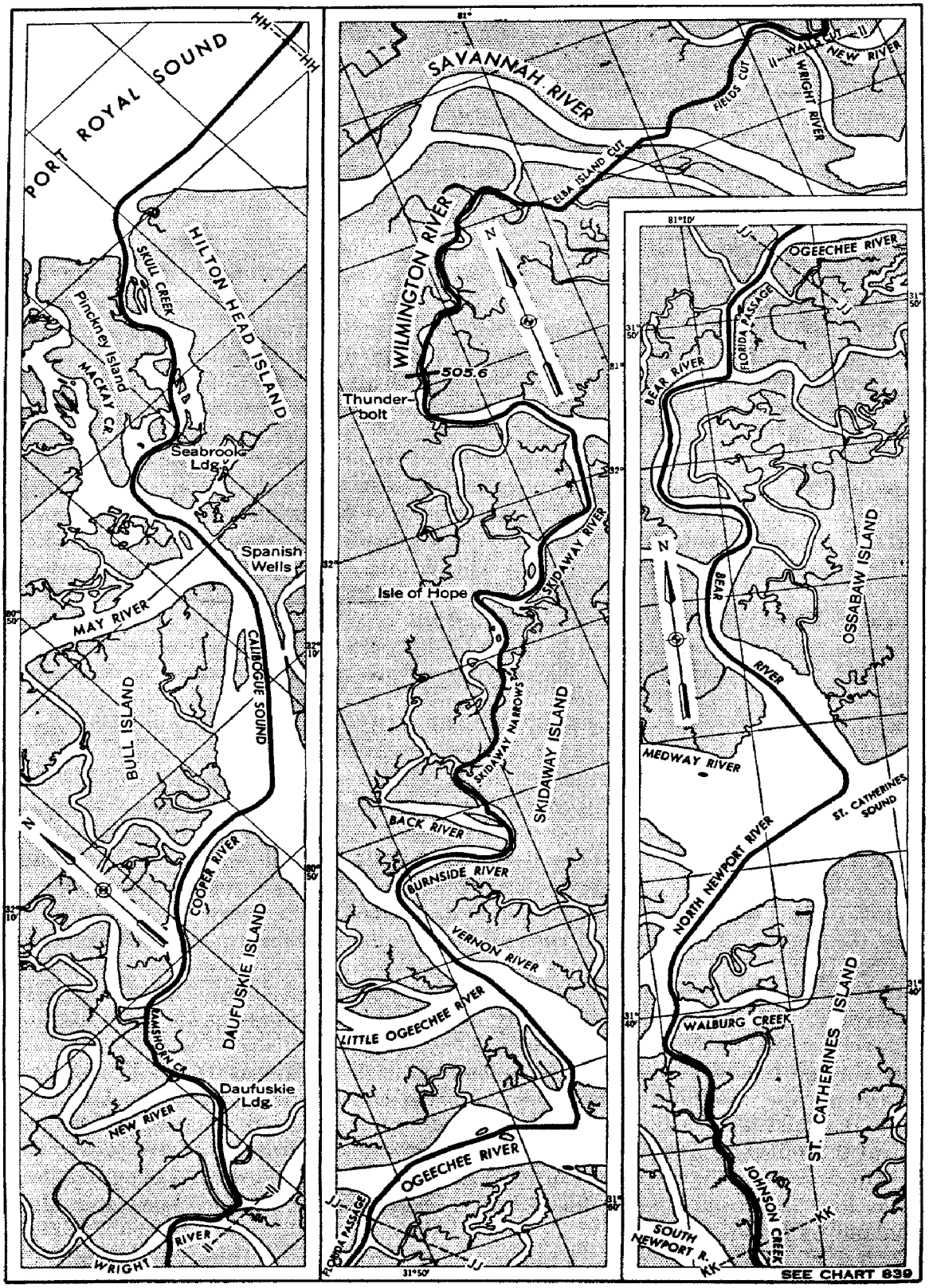
**Sawpit Creek** enters the sound from the westward. A portion of this creek forms a part of the Intracoastal Waterway.

**Talbot Island,** about 4 miles in length and 1.5 miles in width, is partly wooded and partly marshy. Along the marshy eastern shore flow several creeks which separate Talbot and Little Talbot Islands.

**Little Talbot Island,** a strip of low flat land about 4 miles in length and averaging about 0.8 mile in width, lies in a north-south direction. The island is wooded along its outer coast. From seaward it shows a strip of dark woods with many conspicuous sand hills near the beach. Its south end runs off in a low point of bare sand bordering on Fort George Inlet.

**Fort George Inlet** is a narrow body of water separating Little Talbot and Fort George Islands. The inlet changes rapidly, due to shifting sands at its entrance, and should never be used without local knowledge.

**Fort George Island** is immediately southward of Fort George Inlet. Its eastern shore, forming the coastline, shows a broad strip of white sand beach backed by a range of high sand hills. Mount Cornelia, 63 feet high and thickly wooded, and a water tank about 0.3 mile southward of it, stand out prominently near the north end of the island. On clear days they can be seen 12 to 15 miles from seaward, providing excellent landmarks for the entrance to St. Johns River. Fort George Island is separated from the mainland by Sisters Creek.


PORT ROYAL SOUND
HILTON HEAD ISLAND
SKULL CREEK
Pinckney Island
MACKAY CR.
Seabrook Ldg.
Spanish Wells
MAY RIVER
CALIBOGUE SOUND
BULL ISLAND
COOPER RIVER
DAUFUSKIE ISLAND
MAMSHORN CR.
Daufuskie Ldg.
NEW RIVER
WRIGHT RIVER
SAVANNAH RIVER
FIELDS CUT
WRIGHT RIVER
NEW RIVER
ELBA ISLAND CUT
WILMINGTON RIVER
505.6
Thunderbolt
Isle of Hope
SKIDAWAY RIVER
SKIDAWAY NARROWS
SKIDAWAY ISLAND
BACK RIVER
BURNSIDE RIVER
VERNON RIVER
LITTLE OGEECHEE RIVER
OGEECHEE RIVER
FLORIDA PASSAGE
OGEECHEE RIVER
FLORIDA PASSAGE
BEAR RIVER
BEAR RIVER
OSSABAW ISLAND
MEDWAY RIVER
ST. CATHERINES SOUND
NORTH NEWPORT RIVER
WALBURG CREEK
ST. CATHERINES ISLAND
JOHNSON CREEK
SOUTH NEWPORT R.
SEE CHART 839

# Intracoastal Waterway, Savannah River to Nassau Sound

Charts 839, 840, 841

The Federal project for that portion of the Intracoastal Waterway between Savannah River and Nassau Sound provides for a channel 12 feet deep and 90 feet wide in the land cuts and narrow streams and 150 feet wide in open waters; a protected channel 7 feet deep and 75 feet wide around St. Andrew Sound; an alternate route 9 feet deep and 150 feet wide in that part of Frederica River not traversed by the main route; and an alternate route 7 feet deep through Back River and Plantation Creek. For controlling depths, see the weekly *Notice to Mariners*.

**General regulations** governing bridges and locks and the handling of tows are given in Chapter 2. **Special regulations** prescribed by the Savannah District, Corps of Engineers, are the same as those for the Norfolk District; see Chapter 5, page 148.

## Savannah River to Johnson Creek

Chart 839

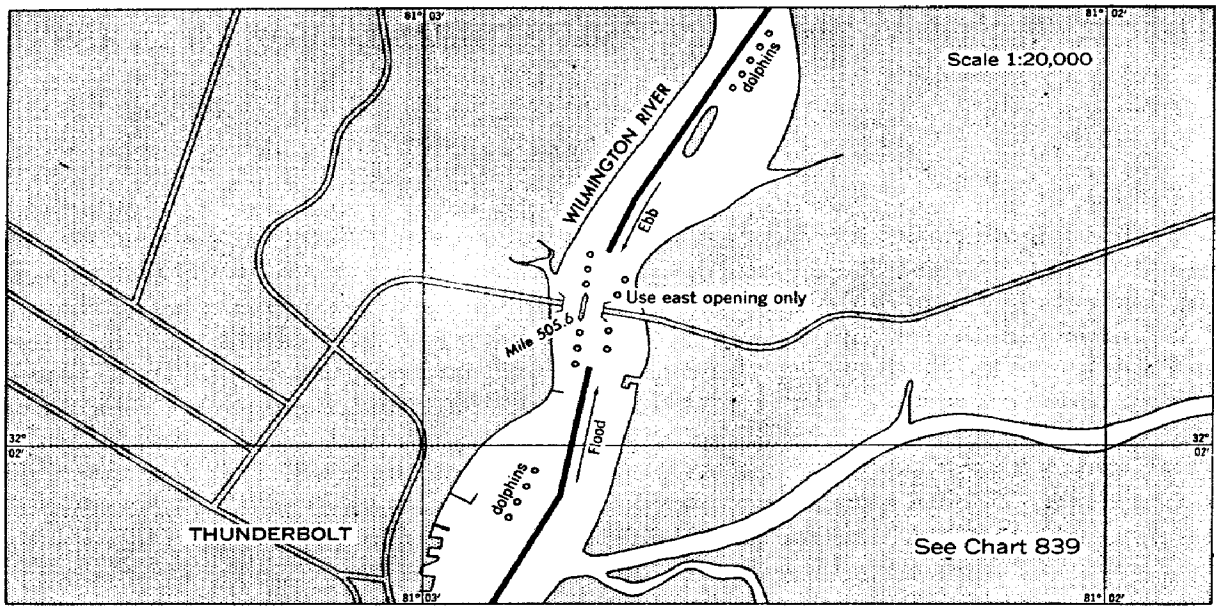
The Intracoastal Waterway leaves the Savannah River at *Mile 500.0* and enters **Elba Island Cut,** which leads into **St. Augustine Creek.** At the junction of St. Augustine Creek and **Wilmington River,** *Mile 502.1*, the abandoned route from the south channel of the Savannah River joins the waterway.

A highway swing bridge crosses the Wilmington River at *Mile 505.6*. This bridge has a horizontal clearance of 93 feet and a vertical clearance, closed, of 6 feet at high water. The mean range of tide at the bridge is between 7 and 8 feet.

No cross currents during either flood or ebb are experienced, the currents following the direction of the channel. The ebb currents are very strong. The east opening of the draw should be used at all times. Mooring dolphins are on each side of the bridge for tying up or breaking up the tow. When proceeding with the tide, the tow should be secured to the dolphin to await favorable currents, or broken up and taken through singly. When proceeding against the tide, the tow may be taken through without breaking up.

**Thunderbolt,** *Mile 506.1*, is a small village and pleasure resort on the west bank of the Wilmington River. Small boats and yachts prefer Thunderbolt to Savannah as a stopping place for here they can avoid the pounding against wharves caused by the surge of vessels passing in the Savannah River. Bus, telephone, telegraph, and post-office services are available. Gasoline, Diesel oil, water, and some provisions are to be had at the small wharves which have 4 to 10 feet of water alongside. Boat building and repair shops and seven marine railways, the largest having a capacity to haul out a boat of about 60 tons, 100 feet in length, and 8-foot draft, are in or near the yacht basin.

**Wilmington River anchorage area**—*The Area.*—The area in Wilmington River, in




the vicinity of Thunderbolt Harbor, Ga., described below is hereby established as anchorage grounds for vessels, and the following rules and regulations relating thereto are hereby adopted:

To the westward of the following described line: A line bearing 183°, 480 feet, from the southeasterly corner of the outer end of the wharf of the Shrine Club to a buoy; thence bearing 204½°, 2,280 feet, to the Maggioni Packing Plant.

**Note.**—Temporary floats or buoys for marking anchors or moorings in place will be allowed in this area. Fixed mooring piles or stakes are prohibited.

*The Regulations.*—1. Except in cases of great emergency, no vessel shall anchor in Wilmington River, Ga., between the State Highway Bridge, Thunderbolt, Ga., and 4,000 feet to the southward, except in the anchorage area hereby defined and established: *Provided, however,* That vessels may moor to any lawfully constructed wharf.

2. Anchors must not be placed outside the anchorage area, nor shall any vessel be so anchored that any portion of the hull or rigging shall at any time extend outside the boundary of the anchorage area.

3. Any vessel anchoring under circumstances of great emergency outside of the anchorage area should be placed near the edge of the channel and in such position as not to interfere with the free navigation of the channel nor obstruct the approach to any pier nor impede the movement of any boat, and shall move away immediately after the emergency ceases or upon notification by the District Office, Corps of Engineers, at Savannah, Ga., charged with the enforcement of these regulations.

4. A vessel, upon being notified to move into the anchorage limits or to shift its position on anchorage grounds, must get under way at once and must change position as directed, with reasonable promptness.

5. Whenever the maritime or navigation interests of the United States so require, the District Office enforcing these regulations is hereby empowered to shift the position of any vessel anchored within the anchorage area and of any vessel which is so moored or anchored as to impede or obstruct vessel movements in any channel.

6. Nothing in these rules and regulations shall be construed as relieving the owner of or person in charge of any vessel from the penalties of the law for obstructing navigation or for not complying with the navigation laws in regard to lights, fog signals, or for otherwise violating the law.

At *Mile 508.5* the route leaves Wilmington River and enters **Skidaway River.** At this junction is **Plantation Harbor,** a section of the Wilmington River between the mouths of Skidaway River and Turner Creek. Hotel accommodations and yacht club privileges are available to the public. A highway connects Plantation Harbor with Savannah, about 9 miles distant. Good anchorage can be had in the river.

**Isle of Hope,** *Mile 511.9,* is a pleasure resort on the north bank of the Skidaway River. Gasoline, Diesel oil, water, provisions, small boat repairs, and bus service to Savannah are available. The small wharves have depths up to 10 feet at low water. Anchorage for small craft can be made near the west shore about 0.3 mile south of the town. Three marine railways capable of hauling out boats up to about 20 tons and 50 feet in length are available.

**Skidaway Narrows,** between Skidaway River and **Burnside River,** is easily navigated by small craft. Larger vessels will encounter no difficulty if speed is decreased sufficiently to accommodate the sharp turns. The average velocity at strength of current in the narrows is about 1 knot. Current predictions can be obtained from the *Atlantic Coast Current Tables.*

**Vernon View**, *Mile 517.6*, on the north shore of Burnside River, has several small privately owned docks where gasoline may be obtained in an emergency.

At *Mile 518.4* the Intracoastal Waterway enters **Vernon River,** proceeding thence to **Hell Gate** and **Ogeechee River.** The ebb currents setting out of the Ogeechee River are particularly strong.

The waterway enters **Florida Passage** at *Mile 525.3* and joins **Bear River** at *Mile 527.8.* The current runs swiftly in the lower part of Bear River.

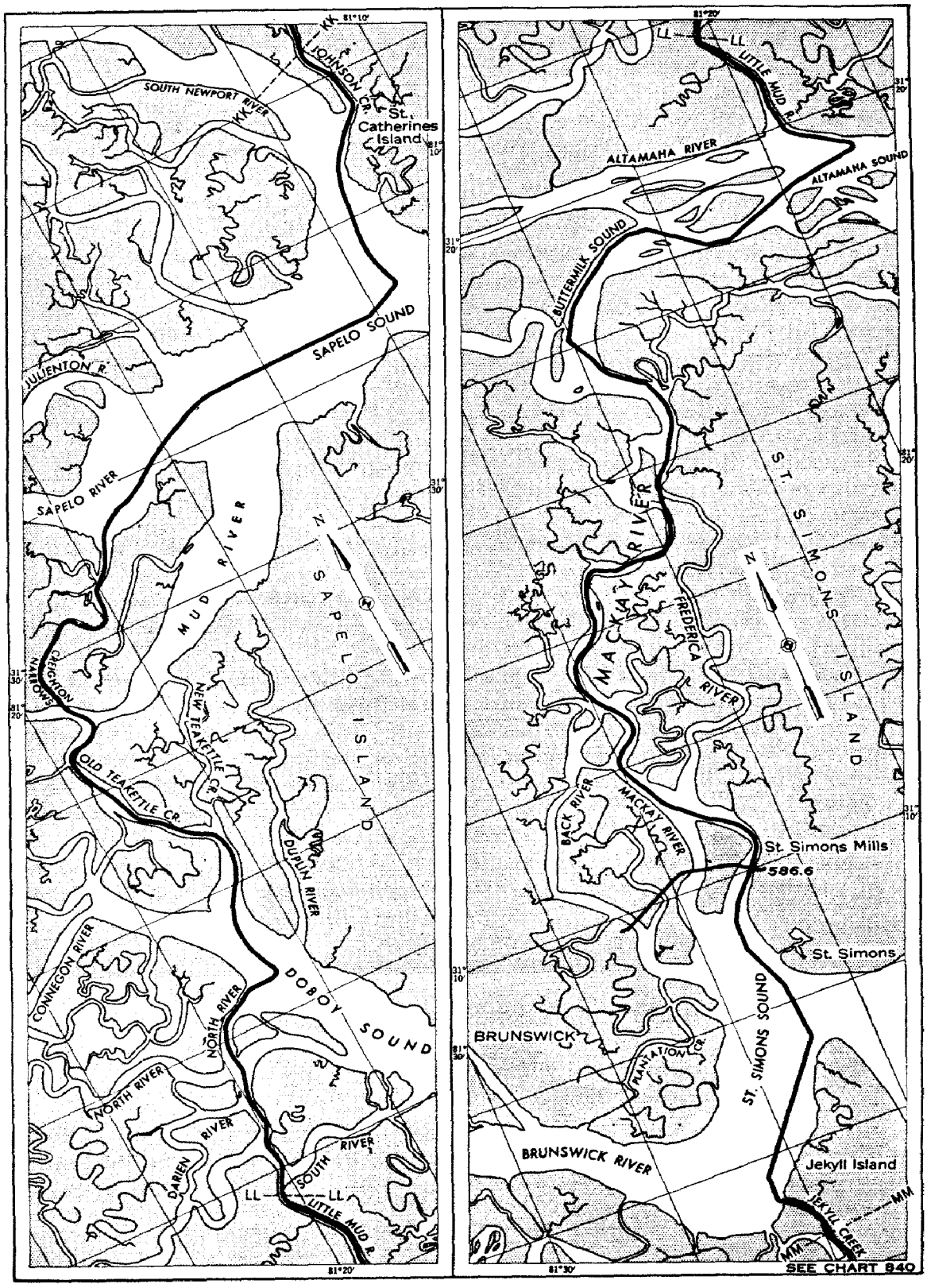
**St. Catherines Sound,** *Mile 536.0,* becomes quite rough in moderately bad weather, especially with strong east and northeast winds. Strong cross currents may be encountered during periods when flood waters are being discharged from **Medway River.**

The waterway leaves St. Catherines Sound through **North Newport River** and at *Mile 541.1* joins **Johnson Creek.** An alternate route leaving the waterway at *Mile 536.0* proceeds through **Walburg Creek** and joins the main route at *Mile 540.4.* This alternate route is not marked and is seldom used. Good anchorage can be found in Walburg Creek.

## Johnson Creek to Brunswick River

### Chart 840

At *Mile 546.5* the Intracoastal Waterway leaves Johnson Creek and enters **South Newport River,** following the river to **Sapelo Sound** at *Mile 548.9.* Sapelo Sound is somewhat rough when the winds are strong east or northeast. For description of Sapelo Sound see page 243.


SOUTH NEWPORT RIVER
JOHNSON CR.
St. Catherines Island
SAPELO SOUND
JULIENTON R.
SAPELO RIVER
MUD RIVER
SAPELO ISLAND
CRIGHTON NARROWS
NEW TEAKETTLE CR.
OLD TEAKETTLE CR.
DUBLIN RIVER
CONNEGON RIVER
NORTH RIVER
DOBOY SOUND
DARIEN RIVER
SOUTH RIVER
LITTLE MUD R.
ALTAMAHA RIVER
ALTAMAHA SOUND
BUTTERMILK SOUND
MACKAY RIVER
FREDERICA RIVER
ST. SIMONS ISLAND
BACK RIVER
St. Simons Mills
586.6
St. Simons
BRUNSWICK
PLANTATION CR.
ST. SIMONS SOUND
BRUNSWICK RIVER
Jekyll Island
JEKYLL CREEK
SEE CHART 840

The route leaves **Sapelo River** and enters **Front River** at *Mile 554.6*. About 7-foot draft can be carried 6 miles up the Sapelo River above this junction to the landing at **Fairhope.**

Continuing down Front River, the waterway passes through **Creighton Narrows** and joins **Old Teakettle Creek** at *Mile 556.7*. **Shellbluff Creek** flows into Old Teakettle Creek at *Mile 557.4*. In an emergency, gasoline may be obtained at **Valona,** 0.7 mile up Shellbluff Creek.

At *Mile 561.1*, the route enters **Doboy Sound.** In an emergency, gasoline and limited supplies may be obtained at **Sapelo,** a small village on the sound, which is reached by **Duplin River** and **Barn Creek.** The waterway leaves Doboy Sound via **North River** at *Mile 562.3* and at *Mile 564.4* the route passes **Darien River.**

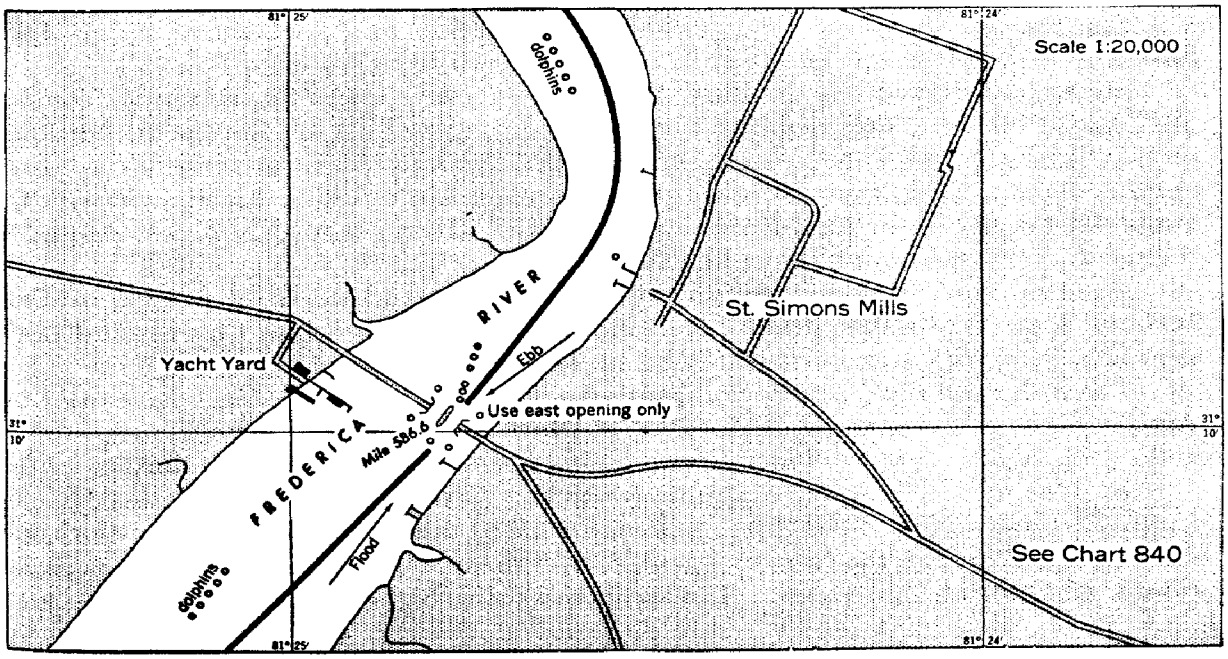
**Little Mud River** connects the waterway with **Altamaha Sound** at *Mile 569.4*. The **Altamaha River** enters Altamaha Sound from westward.

The Intracoastal Waterway enters **Buttermilk Sound** at *Mile 573.7* and continues down the **Mackay River.**

Two alternate routes branch off the waterway on the Mackay River. The first, at *Mile 578.6*, proceeds down the **Frederica River** past the ruins of **Fort Frederica (Oglethorpe Barracks),** now a National Monument, and Frederica Yacht Club and rejoins the waterway at *Mile 585.3*. The controlling depth is about 7 feet.

The second alternate route leaves Mackay River at *Mile 582.7* and enters **Back River** proceeding down through **Plantation Creek** to Brunswick River. This route bypasses St. Simons Sound offering a more sheltered route in easterly weather and a shorter route to Brunswick, but boats over 3-foot draft are advised to use Plantation Creek only on the higher stages of the tide. The mean range of the tide is about 7 feet. The swing bridge over Back River is described in another section.

At *Mile 585.3* the main route joins the Frederica River and continues in that river to St. Simons Sound. A swing bridge and an overhead cable cross the Frederica River



at *Mile 586.6*, just south of **St. Simons Mills.** The Frederica River bridge has a horizontal clearance of 84 feet and a vertical clearance, closed, of 11 feet at high water. The cable has a vertical clearance of 80 feet at high water. During flood tide the current in the vicinity of the bridge follows the direction of the channel and is very strong. During ebb tide, a strong east-to-west current extends across the channel. The east opening should be used at all times. Mooring dolphins are on each side of the bridge. When proceeding with the tide, tows should stop at the dolphins to await favorable current or be broken up and taken through singly. Caution should be exercised while passing through this bridge, especially with a light tow proceeding south.

Just south of the bridge is the Sea Island Yacht Club. Opposite on **Lanier Island** is a yacht yard with a dock 420 feet long and 80 feet wide, which has 10 feet of water alongside. Moorings are provided off the dock and a tender is available. Gasoline, Diesel oil, electricity, telephone, water, and ice are available here, and provisions may be obtained from **St. Simons,** a distance of 2 miles. The yard has a marine railway capable of hauling out boats of 75 tons, 65 feet length and 8 feet draft, for general repairs.

From Frederica River, the waterway continues through **St. Simons Sound** and **Brunswick River** to Jekyll Creek. About 4.5 miles up Brunswick River from *Mile 591.3* on the route is the city of **Brunswick,** at which hotel accommodations, fuel, supplies, and repair facilities are available. Brunswick is described at length in another section.

## Brunswick River to Nassau Sound

Chart 841

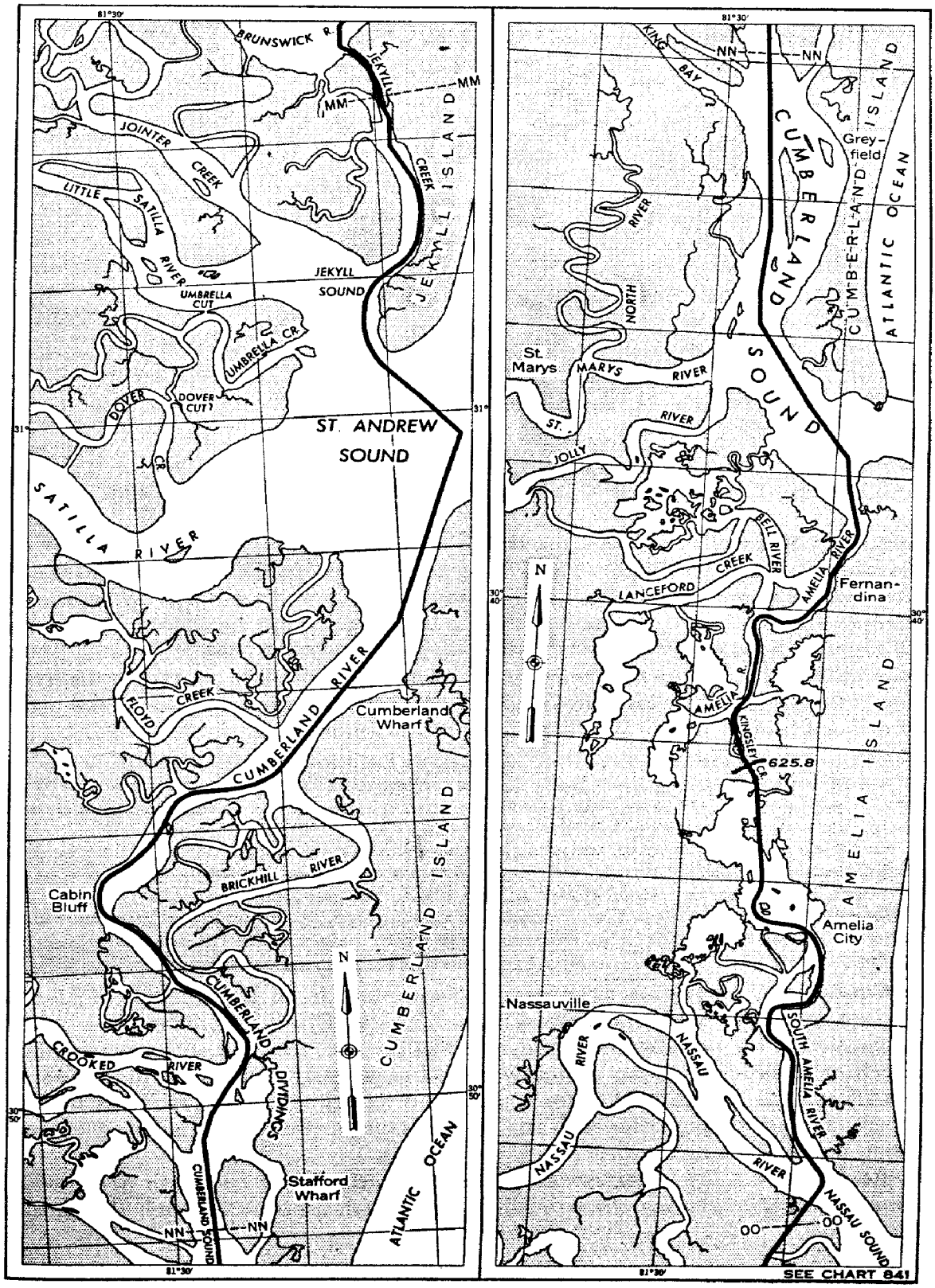
The Intracoastal Waterway, passing the settlement on Jekyll Island, enters **Jekyll Sound** from **Jekyll Creek** at *Mile 596.2* and proceeds to St. Andrew Sound.

**St. Andrew Sound** has the most hazardous exposure along the waterway south of Port Royal Sound. The sound is very rough during periods of high north, northeast, or east winds. A protected route bypassing St. Andrew Sound leaves the waterway at *Mile 596.4*. This alternate route passes through **Little Satilla River, Umbrella Cut, Umbrella Creek, Dover Cut, Dover Creek, Satilla River, Floyd Creek,** and rejoins the waterway in Cumberland River at *Mile 604.0*.

From St. Andrew Sound the waterway enters **Cumberland River** passing by **Cumberland Wharf** and **Cabin Bluff.** The Cumberland River becomes **Cumberland Dividings** and joins with **Cumberland Sound** at *Mile 612.5*.

The waterway continues down Cumberland Sound by the St. Marys River and into **Amelia River** to **Fernandina,** *Mile 622.0*, at which hotel accommodations, fuel, supplies, and repair facilities are available. Fernandina is described at length in another section.

At *Mile 625.0* the waterway enters **Kingsley Creek.** Two bridges cross Kingsley Creek at *Mile 625.8*. The first, a hand-operated railway bridge, has a horizontal clearance of 47 feet in the east draw, 46½ feet in the west draw, and a vertical clearance, closed, of 3 feet at high water. The second, a swing highway bridge, has a horizontal


BRUNSWICK R.
JEKYLL
MM
JOINTER CREEK
LITTLE SATILLA RIVER
JEKYLL SOUND
JEKYLL ISLAND
UMBRELLA CUT
UMBRELLA CR.
DOVER
DOVER CUT?
ST. ANDREW SOUND
SATILLA RIVER
FLOYD CREEK
CUMBERLAND RIVER
Cumberland Wharf
BRICKHILL RIVER
Cabin Bluff
CUMBERLAND
CROOKED RIVER
DIVIDINGS
CUMBERLAND ISLAND
Stafford Wharf
CUMBERLAND SOUND
NN
ATLANTIC OCEAN
KING BAY
CUMBERLAND SOUND
Grey-field
NORTH RIVER
St. Marys
MARYS RIVER
ST. JOLLY RIVER
BELL RIVER
LANCEFORD CREEK
AMELIA RIVER
Fernan-dina
AMELIA R.
KINGSLEY CR.
625.8
AMELIA ISLAND
Amelia City
Nassauville
NASSAU RIVER
SOUTH AMELIA RIVER
NASSAU SOUND
OO
SEE CHART 841
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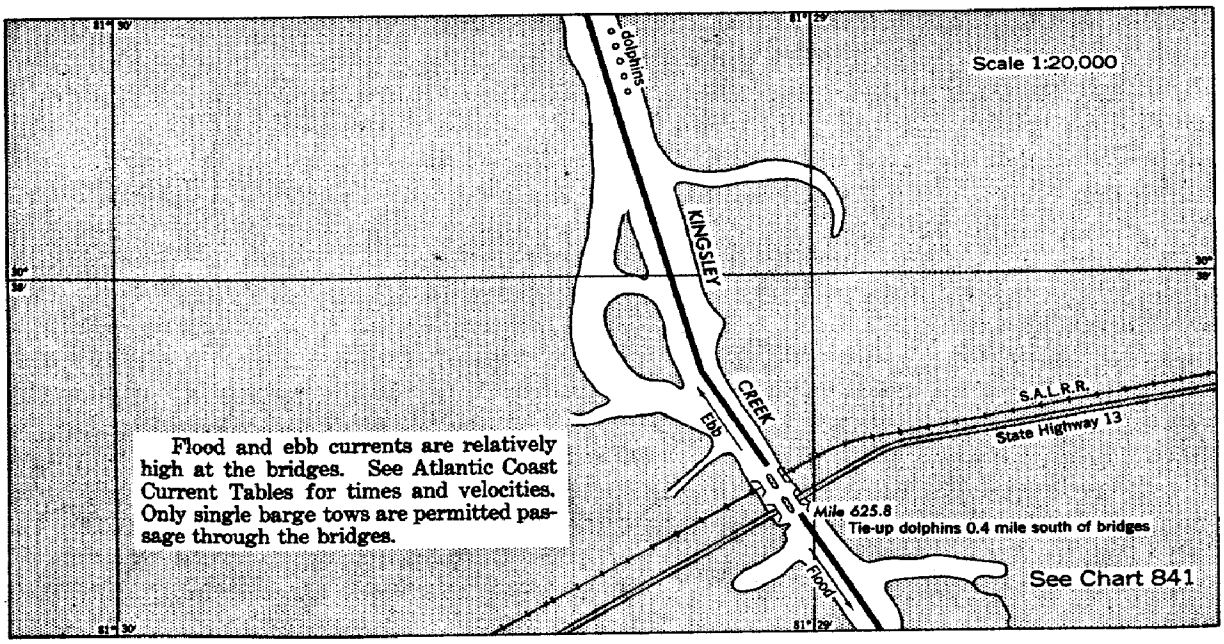


clearance of 80½ feet in the east draw, 76½ feet in the west draw, and a vertical clearance, closed, of 6 feet at high water. The mean range of tide at the bridges is 6 feet. Flood and ebb currents are normal to the bridge openings and are relatively high. Flood currents up to 2.2 knots and ebb currents up to 2.6 knots may be expected, particularly with favoring winds. The railroad bridge openings have the least horizontal clearance of the waterway. Tie-up dolphins north and south of the bridges and protective dolphins at the bridges have been provided. Special regulations applicable to the highway and railroad bridges across Kingsley Creek are as follows:

All tows of more than one barge shall be broken up and passed through these two bridges one at a time each under full control of a suitable towboat: *Provided*, That tows not greater than 250 feet in length, closely coupled (not more than 6 inches between barges) may be passed through the draws of these bridges under full control of one or more towboats of ample power and properly manned.

No person in command or control of any towboat shall propel or drift such towboat, or cause or permit the same to be propelled or drifted through either of these drawbridges under any circumstances while towing more than one barge, except as provided in the preceding paragraph.

Tie-up dolphins which have been erected near these bridges by the Jacksonville District Corps of Engineers Office at Jacksonville, Fla., will serve as an aid to the operators of towboats in observing the foregoing regulations.

**Caution.**—A permit has been issued to the State Road Department of Florida to construct a bridge, with drawspan, across Kingsley Creek. In connection with the construction of the proposed new bridge, which involves removal of the existing bridge, the permittee proposes to permanently close the westerly channel at the drawspan of the said existing bridge. All vessels using the waterway will be required to use the easterly channel through the said existing drawspan. Vessels are advised to exercise caution in approaching the bridge.

At *Mile 626.1* the waterway enters **South Amelia River** and until *Mile 630.4* the channel is narrow, winding through shoals and marsh islets. Although the most diffi-

cult part of this section of the route, the channel is well marked by daybeacons and lights. At low water the extensive mud flats and oyster beds on each side of the channel are well defined. **Amelia City** is at *Mile 628.9*. The Intracoastal Waterway enters **Nassau Sound** at *Mile 633.1*.

## CHAPTER 10

# St. Johns River

## Charts 577, 685, 686, 687, 688

**ST. JOHNS RIVER,** the largest river of eastern Florida, is about 244 miles in length. It rises in the swamps near the Atlantic coast, in about latitude 28°10′ N., flows in a northerly direction nearly parallel to the coast, and empties into the sea immediately north of St. Johns River Lighthouse, in latitude 30°24′ N. The river is the approach to the city of Jacksonville and a large number of towns and villages, some of which are winter resorts, and others are centers of farming districts and citrus groves, the more important of which are Green Cove Springs, Palatka, Welaka, Georgetown, and Sanford. Sanford is the present head of commerical navigation, although small boats have navigated the river as far as Lake Washington, 216 miles above Jacksonville. The river above Jacksonville and the larger tributaries are very scenic.

The Cross-Florida Barge Canal will connect the St. Johns River with the west coast of Florida when completed.

The Federal project for the improvement of St. Johns River from the ocean to Jacksonville provides for a channel 34 feet deep from the ocean to Commodore Point via a cut-off channel from St. Johns Bluff (Fulton) to Dame Point over widths of 500 to 1,450 feet, and via Terminal Channel along the west bank of the river just below Commodore Point, and thence 30 feet to the Florida East Coast Railway bridge at Jacksonville over widths of 300 to 1,115 feet; a depth of 24 feet between that depth contour and the pierhead line at Jacksonville from Hogan Creek to the foot of Laura Street; a depth of 28 feet to within 60 feet of the pierhead line in the area between the foot of Laura Street and the upper State (formerly Duval County) highway bridge; a navigation and floodway channel 26 feet deep and 200 feet wide along the south side of the Commodore Point Terminals, terminating in deep water at each end; an approach and mooring basin 20 feet deep, 1,300 feet long at the 20-foot depth contour and 600 feet long at the pierhead line in front of the Naval Reserve armory in South Jacksonville; and the construction of training walls and revetments.

The controlling depths in the St. Johns River from the ocean to Jacksonville are as

follows: From the entrance to Broward Point 25 feet in April 1945; from Broward Point to Chaseville 29 feet in June 1947; Long Branch Range Channel 30 feet in April 1945; Terminal Channel 25 feet in January 1945; Arlington Channel 27 feet in January 1945.

A Federal project for the improvement of St. Johns River, Jacksonville to Lake Harney, provides for a channel 13 feet deep and 200 feet wide from the Florida East Coast Railway bridge at Jacksonville to Palatka (47.8 miles), thence 12 feet deep and 100 feet wide to Sanford (79.4 miles) with a side channel of like dimensions to Enterprise and with cut-offs and easing of bends, and thence 5 feet deep and 100 feet wide to Lake Harney (19.6 miles) with a cut-off channel 5 feet deep and 75 feet wide between Lake Monroe and the vicinity of Osteen Bridge; and for a channel 8 feet deep, 100 feet wide, across the bar at the mouth of Deep Creek and thence 50 feet wide to Hastings Landing, 4.3 miles above the mouth.

In November 1947 dredging was in progress above Jacksonville and completion to Lake Harney is contemplated in mid 1948.

**Tides.**—For tides at Mayport see the tide tables for the Atlantic Ocean, published annually in advance by the Coast and Geodetic Survey, in which the tides are predicted for every day of the current year. At the entrance between the jetties of St. Johns River the time of high and low water occurs about 20 minutes earlier than at Mayport. Proceeding up St. Johns River, the tide is later than at Mayport, the differences being approximately as follows: Fulton, 25 minutes; Dame Point, 50 minutes; Phoenix Park, 1 hour 10 minutes; Jacksonville (Hogan Street), 1 hour 45 minutes.

The approximate mean rise and fall of the tide is as follows: Entrance between jetties, 5 feet; Mayport, 4½ feet; Fulton, 3 feet; Dame Point, 2½ feet; Phoenix Park, 1½ feet; and Jacksonville (Hogan Street), 1 foot.

From Jacksonville to Palatka the mean rise and fall of tide is about 1 foot while at the mouth of Dunns Creek and Oklawaha River it is about 1 foot and ½ foot respectively, and diminishes in passing up these streams. At low-water stages tidal action is felt to Lake George.

**Currents.**—The tidal currents are strong in St. Johns River as far up as Jacksonville. The currents at the entrance between the jetties require special attention. With northerly winds there is a strong southerly set on the flood at the end of the north jetty, and the conditions here are often dangerous, especially in heavy weather. The mean velocities in the channel at the strength of the current are about as follows: Mayport, 2½ knots; New Berlin, 2 knots; Phoenix Park, 1½ knots; Jacksonville (off Washington Street), 2 knots. The velocity of the flood is increased by northeasterly and easterly winds, and the ebb by southwesterly and westerly winds.

Daily predictions of the times of slack water and the times and velocities of strength of flood and ebb in St. Johns River entrance are included in the *Atlantic Coast Current Tables*. Differences for obtaining predictions at other stations in the St. Johns River will be found in Table 2 of that publication.

The tidal currents set in the direction of the channel, except on the crossing from Fulton to the mouth of Clapboard Creek, where there is some set on the ebb from the channel between Fulton and Le Barons Island, and on the flood into the sloughs northeastward of Le Barons Island.

The tidal currents have little velocity above Jacksonville. The winds have considerable effect on the water level and velocity of the currents. Strong northerly and

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northeasterly winds raise the water level about 2 feet at Jacksonville, about 1 foot at Palatka, and about 1½ feet at the mouth of Dunns Creek. Strong southerly and southwesterly winds lower the water level about 1 to 1½ feet, increase the velocity of the ebb, and decrease or may interrupt the flood. The currents in Deep Creek are weak, being due primarily to the winds and tide. There is a moderate drainage current in the Oklawaha River. The wind has no appreciable effect on the water level at the head of Dunns Creek and in Lake Crescent.

The flood stages in the river usually occur during the fall months and are about 1 foot above ordinary low-water level at Jacksonville, 2 feet at Palatka, 3 feet at Lake George, 5 feet at Sanford, and 6½ feet at Lake Harney.

The river water may be fresh at Jacksonville at low water with westerly winds, while with northeasterly winds the water may be brackish to Doctors Lake.

The route to Sanford is well marked by lights and daybeacons and is comparatively easy to navigate south of Jacksonville with the aid of the charts. However, if a local pilot is desired for this part of the river local fishermen from Jacksonville, Palatka, or Sanford will serve. The river south of Jacksonville is partly obstructed by hyacinths at certain times during the year, and floating snags are a continual menace to navigation. In the upper section of the St. Johns River system, approximately 69,560 linear feet of hyacinth traps have been constructed in addition to a permanent control structure 9 miles downstream from Palatka. The snags and overhanging trees are periodically removed by the snag boats of the United States Engineers The unimproved creeks tributary to the St. Johns River are apt to be obstructed by logs and hyacinths.

Fish traps, pilings, and remains of old wharves are generally found close inshore or on the bars in midstream. Fish traps are usually constructed of small poles and are frequently destroyed and rebuilt. In some cases, they extend several feet above high water and can be avoided in daylight hours, but in some places they have been broken off a foot or so below low water and are a serious menace to small boats. In some areas where the water is 2 feet or less, a fine stem grass grows nearly to the surface of the water. This grass fouls the propellers of small boats and makes navigation difficult except in water 3 feet or more in depth.

## Ocean to Jacksonville

### Chart 577

**Mount Cornelia,** 63 feet high and thickly wooded, and a black water tank about 0.3 mile southward are conspicuous northward of the entrance. Prominent to the south of the entrance are tanks at Atlantic, Neptune, and Jacksonville Beaches. The tank at Neptune Beach is distinctive because of its oblate form. Also prominent at Jacksonville Beach is a roller-coaster located just inshore of the pier.

**St. Johns River Lighthouse,** latitude 30°23′36″ N., longitude 81°25′34″ W., on the south side of the entrance at Mayport, is a conical tower painted with red and white spiral stripes. Four fixed red lights around the top are operated for low-flying aircraft. The navigation light has been discontinued.

**St. Johns Lightship** is moored in 57 feet of water on the prolongation of St. Johns Bar Cut Range Line and 6.5 miles 091½° from St. Johns River Lighthouse. The hull is red with the words ST. JOHNS on each side. It has two masts with cylindrical grating at each masthead. The light is 66 feet above the water and visible 14 miles; a riding light is shown from the forestay. The fog signal is an air diaphragm horn. A bell is sounded by hand if the horn is disabled. The radiobeacon is synchronized for distance finding. The code flag signal and radio call is NNBW. **Storm warnings** are displayed during the daytime.

**Pilots** will come out to a vessel making a signal. The pilot boat is equipped with radiophone. The bar pilots keep a lookout from the pilot station for approaching vessels. The station is on the south side of the St. Johns River just inside the jetties. Up-river pilots can be obtained at Jacksonville. Bar pilotage is compulsory for all vessels except yachts and Government ships.

**Pilotage.**—The rates for pilotage from the sea to Jacksonville or vice versa are as follows:

| Draft (feet) | Pilotage | Draft (feet) | Pilotage | Draft (feet) | Pilotage | Draft (feet) | Pilotage |
|---|---|---|---|---|---|---|---|
| 6 | $18. 00 | 13 | $48. 75 | 19 | $91. 20 | 25 | $150. 00 |
| 7 | 21. 00 | 13½ | 52. 38 | 19½ | 95. 60 | 25½ | 153. 00 |
| 8 | 24. 00 | 14 | 56. 00 | 20 | 100. 00 | 26 | 156. 00 |
| 8½ | 25. 50 | 14½ | 59. 13 | 20½ | 107. 65 | 26½ | 159. 00 |
| 9 | 27. 00 | 15 | 62. 25 | 21 | 109. 00 | 27 | 162. 00 |
| 9½ | 28. 50 | 15½ | 65. 13 | 21½ | 112. 50 | 27½ | 165. 00 |
| 10 | 30. 00 | 16 | 68. 00 | 22 | 125. 00 | 28 | 168. 00 |
| 10½ | 32. 88 | 16½ | 71. 88 | 22½ | 135. 00 | 28½ | 171. 00 |
| 11 | 35. 75 | 17 | 75. 75 | 23 | 138. 00 | 29 | 174. 00 |
| 11½ | 38. 88 | 17½ | 79. 28 | 23½ | 141. 00 | 29½ | 177. 00 |
| 12 | 42. 00 | 18 | 82. 80 | 24 | 144. 00 | 30 | 180. 00 |
| 12½ | 45. 38 | 18½ | 87. 00 | 24½ | 147. 00 | 31 | 186. 00 |

1. Docking $10, undocking $10, shifting $20. 600 gross tons and over. Less than 600 gross tons ½ above rate.
2. Detention: Pilots $5 per hour first 5 hours. After which $25 per day applies.
3. Vessels on river trial $5 per hour, first 5 hours, after which the $25 per day detention applies. Plus draft 1 way.
4. Vessels on sea trial $5 per hour first 5 hours after which $25 per day applies plus draft both ways.
5. Delivering orders to vessels outside $50.
6. Pilots carried away when taking vessels to sea, detention of pilot rate applies with transportation back to Jacksonville, Fla.

**Anchorages.**—Vessels waiting outside the bar generally anchor, if the wind and sea are not too heavy, in the vicinity of St. Johns lighted whistle buoy 2 St. J. An alternate anchorage is in 6 fathoms, about 3 miles northeastward of St. Johns River Lighthouse, with the end of the north jetty bearing nearly south.

The best and usual anchorage inside the mouth of the river is abreast of Mayport on the west side of the channel; however, strong currents may cause vessels to drag in this basin.

**Anchorage limits** within the St. Johns River and the regulations are as follows:

1. *Anchorage A.*—The northern limits of this anchorage shall be about 1,200 yards south of drawbridge crossing the St. Johns River at Jacksonville, Fla., and extending on a line running east and west through Grassy Point Middle Ground Lower End Light 31. The southern limits of this anchor-

age from Grassy Point Middle Ground Light 34 shall be a line running east to the eastern edge of anchorage. The eastern edge of the anchorage shall be a line running between Hendricks Point and La Vista Point, South Jacksonville, Fla. The western edge of the anchorage shall be a line from Grassy Point Middle Ground Light 34 to Winter Point, Jacksonville, Fla.

**Note.**—Permanent anchorage for deep-draft vessels.

2. *Anchorage B.*—The northern limits shall be the southern limits of Anchorage A. The eastern and western limits shall be the continuation of the eastern and western limits of Anchorage A. The southern limits shall be a line east and west from La Vista Point, South Jacksonville, Fla., to Sadler Point, Ortega, Jacksonville, Fla.

**Note.**—Permanent anchorage for shallow-draft vessels.

3. *Anchorage C.*—The southern and eastern limits of this anchorage are the shores of the St. Johns River. The western and northern limits are from a point on the shoreline north to Twenty Foot Rock buoy 81, thence to Commodore Point lighted buoy 79, thence northeast by north 600 yards, thence east to Empire Point. This anchorage shall be an anchorage for vessels exceeding 24 feet in draft. No vessel shall remain in this anchorage more than 24 hours without obtaining a permit from the Captain of the Port.

4. *Anchorage D.*—The area included within the following buoys and lights: From Terminal Channel Light 7 to Cross Channel buoy 78, to Arlington Cut buoy 76 to Terminal Channel Light 5 and to Terminal Channel Light 7. No vessels shall anchor within 300 feet of Terminal Channel or within 300 feet of Terminal Channel or Arlington Cut.

**Note.**—Permanent anchorage for light-draft barges and schooners.

5. *Anchorage E.*—From Long Branch Range Front Light 73, due west to Texas Co. wharf, thence to Chaseville Middle Ground buoy, thence northeast by east to shoreline 1,100 yards south of Chaseville, Fla. This anchorage shall be used only by vessels awaiting quarantine inspection, or by special permit from the Captain of the Port.

6. *Anchorage F.*—From Long Branch Range Front Light 73, to Chaseville Middle Ground buoy, thence northeast by east to shoreline 1,100 yards south of Chaseville, Fla.

**Note.**—Permanent anchorage for deep-draft barges and schooners.

7. *Anchorage G (explosive).*—The area to the westward of the Trout River Cut, Main Ship Channel, St. Johns River, and to the northward of buoy 66. No vessel shall anchor within 200 yards of the Trout River Cut.

**Directions, from northward.**—From a position about 2 miles southeast of Savannah Lightship steer **199½°** for 97 miles to a position about 2 miles east of St. Johns Lightship. This course passes 7 miles offshore from Brunswick lighted whistle buoy 2B. From close aboard Brunswick lighted whistle buoy 2B a **188½°** course made good for 37 miles will lead to a position about 2 miles east of St. Johns Lightship.

Along the coast from Charleston to Jacksonville the courses between lightships and sea buoys are comparatively close inshore, and vessels must guard against an inshore set, which may amount to a knot or more, due to current at the inlets.

The principal danger in the northern approach to St. Johns River is the bar at the entrance of Nassau Sound, on which a number of vessels have been lost. In each case the vessel was standing in for the coast on a southwesterly course, obtained a sounding of over 9 fathoms (high water) in the deep hole a short distance outside the bar, and stranded before obtaining another sounding. A contributory cause for the disasters is the prevailing northerly current, which is felt until well inside the 10-fathom curve, except with northeasterly or northerly winds. The bar is marked off its northeast side by a buoy. St. Johns River is so well marked by the lightship, lighthouse, ranges, the jetties, and usually a number of vessels outside the bar, that it is unnecessary to get in dangerously close to the coast to recognize the entrance.

**From southward.**—Approaching Cape Canaveral from southward the 15-fathom curve is a good guide. Rounding Cape Canaveral in a depth of 15 fathoms will lead about 15 miles off the light and in sight of it on a clear night. Passing about 3 miles

eastward of Hetzel Shoal lighted whistle buoy 8 a 334° course made good for 117 miles will lead to a position 2 miles eastward of St. Johns Lightship; the course, if made good, leads within the limits of visibility of Ponce de Leon Inlet and St. Augustine Lights. On this course a set due to the prevailing current may be expected, except with northerly or northeasterly winds, of ½ to ¾ knot in a northerly direction parallel with the coast.

Broken ground with least depths of 5 to 6 fathoms lies from 4 to 6 miles from the coast for a distance of 15 miles northward of St. Augustine Light. A shoal about 430 yards long in an east-and-west direction, with a least depth of 25 feet, exists on the southern side of the approach from the sea to the passage between the jetties. From the center of the shoal St. Johns River Lighthouse bears 270°, distant 3.2 miles. Deeper water is found between the shoal and the bank making off from St. Johns Point. With these exceptions the coast southward of St. Johns River is clear, and it is better to make the coast southward than northward of the entrance.

Bound southward from St. Johns River, vessels, except deep-draft ones, can avoid the northerly set due to the prevailing current by following the coast at a distance of about 3 miles to abreast Ponce de Leon Inlet Light, and then shaping the course to pass outside of Hetzel Shoal lighted whistle buoy 8.

**River channel.**—The courses and distances in the St. Johns River to Jacksonville are given in Chapter 3. The channel is a dredged cut from 400 to 1,450 feet wide. The tidal currents have considerable velocity and large vessels do not run the river at night.

In northeasterly gales a strong current generally sets southward across the entrance to the jetties.

For many years, navigation of the reach of the St. Johns River between Fulton and Dame Point has been difficult. The channel cuts in that reach of the river have been dredged considerably in excess of project widths. They now vary from a minimum width of 750 feet in Browns Creek cut to a maximum of 1,400 feet in Dame Point cut. Widening these cuts has improved navigation conditions but vessels still encounter much difficulty, particularly at **Dame Point.** This is a relatively high peninsula covered with a heavy growth of underbrush and tall trees, with several residences, which obstruct the sight of vessels. Dame Point cut has a deflection angle of 124°15′, a radius of 2,000 feet, and a length of 4,250 feet. It is the most troublesome bend in the river to navigate due to its abruptness, the strength of the tidal currents that sweep around it, and the very limited sight distance.

Around Dame Point, both ebb and flood currents naturally swing over against the right bank of the river. Vessel operators proceeding either upstream or downstream elect to round the bend near the outside of the curve, to take advantage of the longer radius and to avoid the shoals that continually form on the west side of the point. Under any but the most favorable tidal conditions, masters and pilots experience considerable difficulty in keeping the bows of large vessels off the bank, despite the fact that the channel at this bend is approximately 1,400 feet wide. This difficulty is experienced in navigating either up or down the river but more so on the ebb tide on account of stronger currents. The same difficulty obtains at the Fulton-St. Johns Bluff bend, although to a lesser extent because that bend is less abrupt and the currents are therefore not as concentrated as at Dame Point. This condition at Dame Point results at times in actual groundings of vessels, and is dangerous due to the possibility of collision if vessels proceeding in opposite directions attempt to round the bend at the same time. Vessels have to pass one another at the bend infrequently, but there is always the possi-

bility and, in order to reduce the danger of collision, vessels have to proceed with extreme caution and at slow speed. In proceeding upstream, vessels usually slow down almost to a stop before rounding the bend to avoid the possibility of collision with another vessel rounding the bend from the opposite direction. Vessels proceeding downstream usually slow down for similar reasons. Groundings and near-collisions are reported to have occurred at Dame Point, but details as to their number, and the delays and damages sustained, are not available.

Navigation of the bends at Browns and Clapboard Creeks is especially dangerous during ebb tides, when strong tidal currents issuing from these creeks tend to deflect vessels off range and to force them over against the opposite bank of the channel cut. Although no groundings are reported at these two bends, pilots report several near-groundings, and point out the difficulties encountered, particularly when passing other vessels or long tows. Vessels have particular difficulty when meeting or passing tows at Dame Point, as well as at the other bends between there and Fulton, because winds and currents often tend to swing the tows crosswise of the channel, resulting in danger of collision or grounding, or both. This hazard is augmented at the mouths of San Carlos, Browns, and Clapboard Creeks by strong ebb currents from those streams sweeping across the ship channel, causing both difficulty in maintaining steerageway and shoaling, with consequent reduction in width of the navigable channel.

The hazards of operating large tankers on the river at night are great and such tankers arriving off the bar after sundown therefore anchor and await daylight before proceeding up the river and departures from Jacksonville are scheduled for daylight. The larger dry-cargo vessels do not operate on the river at night; such vessels ordinarily do not attempt to maintain a definite schedule. They anchor when arriving off the bar after darkness and schedule their departure from Jacksonville after daylight.

A channel leads southwestward along the inshore end of the south entrance jetty from **St. Johns Point** to **Ribault Bay.** The channel is marked by a lighted range, lights, and buoys. In October 1947, the controlling depth in the channel was 24½ feet. A United States Coast Guard Training Base is in Ribault Bay.

**Ribault Bay, prohibited area.**—*The Area.*—All waters constituting the Turning Basin within the Mayport Coast Guard Reservation, Mayport, Fla., and inclosed by a line bearing approximately 180° from Ribault Channel Light No. 4, to the shoreline at a point connecting with the United States Coast Guard Training Station boundary line fence.

*The Regulations.*—1. All vessels and craft excepting those operated by the United States Navy or United States Coast Guard are prohibited from entering the above described area, except in cases of extreme emergency.

2. This section shall be enforced by the Commander, Seventh Coast Guard District, and by the Commanding Officer, United States Coast Guard Training Station, Mayport, Fla.

**Mayport** is a village on the south bank of the St. Johns River, 3 miles inside the entrance jetties. It has communication by highway, telephone, and telegraph with Jacksonville. The only wharves are the private ones used by fishing vessels where gasoline and some supplies can be obtained.

The Corps of Engineers maintains a small wharf with 12 feet at the end where fresh water may be obtained. Mooring is not permitted without permission.

**Pilot Town** is a village on the north bank opposite Mayport.

The village of **Fulton** is on the south bank of the river about 2 miles above the

Intracoastal Waterway crossing. Gasoline, Diesel oil, and water are available at the L-wharf which has a depth of 8 feet alongside the outer face. A dredged basin adjacent has over 500 feet of dock space. A repair yard is being constructed.

**Clapboard Creek**, Browns Creek, Dunn Creek, Broward River (Cedar Creek), and Trout River are tributary streams on the north side of the St. Johns River between the ocean and Jacksonville. These streams have an even bottom of soft mud with spots of hard sand.

Clapboard Creek has a depth of 7 feet or more for over 2 miles above its mouth. The bascule bridge at the entrance is not in operating condition. The horizontal clearance is 30 feet and the vertical clearance, closed, is 7 feet at high water.

**Browns Creek** is shoal and of no importance. A fixed bridge over the entrance has a horizontal clearance of 30 feet and a vertical clearance, closed, of 6 feet at high water.

**Dunn Creek** has depths of 3 to 4 feet for 1.5 miles above the mouth. The fixed bridge at the mouth has a horizontal clearance of 28 feet and a vertical clearance, closed, of 7 feet at high water.

**Broward River** (**Cedar Creek**) has depths of 3 to 4 feet to Cedar Heights and of 2 feet to the forks above the bridges. The draw of the bridge at the mouth will be opened after an advance notice of 12 hours has been given to the State Roads Department at Baldwin. The bascule span has a horizontal clearance of 35 feet and a vertical clearance, closed, of 9 feet at high water. About 0.4 mile upstream is an abandoned railway bridge. The swing span of this bridge is kept open; the horizontal clearance is 43 feet.

**Trout River** has depths of 10 feet to the mouth of **Ribault River** and 6 feet to Lem Turner Road Bridge. The three bridges near the mouth of the river have drawspans with horizontal clearances of 46 to 60 feet. The first is an abandoned railroad bridge and the drawspan is kept open. The second bridge has a vertical clearance closed, of 8½ feet at high water. The third bridge has a vertical clearance, closed, of 2½ feet at high water but a small boat opening in this bridge has a vertical clearance of 6 feet at high water with a horizontal clearance of 11½ feet.

Near the shores of Trout River are groups of piles, sunken wrecks, barges, and so forth. When outboard motorboat races are held in this river near the mouth of **Moncrief Creek** several barrel buoys temporarily mark the course.

**Jacksonville** is about 24 miles above the entrance between the jetties. The climate is such that the winters are mild and temperate, free from extreme cold, and summers are tempered by sea breezes from the Atlantic Ocean.

The city of Jacksonville is an important railroad center and distributing point, with steamship lines operating to all coastwise points, Pacific, and foreign ports. It has traffic with up-river points and along the Intracoastal Waterway.

The principal exports are lumber, paper, tobacco, naval stores, and citrus fruits. The principal imports are crude oil, gasoline, fertilizer materials, coffee, sugar, and bananas.

**Towboats** are available at Jacksonville.

**Quarantine.**—The quarantine office is just north of the gypsum plant in Trout River. The anchorage is on the east side of the St. Johns River, 1 mile south of Chaseville, and north of Long Branch front range light. Vessels are boarded abreast the municipal docks at Jacksonville.

**Customs.**—Jacksonville is a port of entry and marine documents are issued. The customhouse is at Monroe and Julia Streets.

**Immigration.**—The office of the Immigration Service is in the United States Courthouse and Post Office at Monroe and Julia Streets.

**Hospitals.**—Jacksonville has a Relief Station of the United States Public Health Service and private hospitals.

**Terminal facilities.**—The harbor embraces the entire river from a point 2 miles below the city to a point 2 miles above it. There are 75 wharves and piers in Jacksonville in addition to the municipal docks and terminals composed of three piers which are operated by the city of Jacksonville. Twelve of the piers are owned by the major rail lines, four by steamship lines, three by the city of Jacksonville, and the remainder by private corporations or individuals. Of the privately owned piers those of the Commodores Point Terminal Co. are the largest, having a 5,000-foot berthing space parallel to the channel.

The depth of water at the principal piers ranges from 18 to 30 feet. Good rail and highway connections are available along the entire water front. The municipal terminals are supplemented by a cotton warehouse and compress and are equipped with mechanical freight-handling devices.

Yachts can find berthing facilities at the foot of Newman Street which is two blocks downstream from the highway bridge on Route 1; or at the yacht yard just upstream from the Florida East Coast Railway bridge. Both places are on the Jacksonville side of the St. Johns River and within walking distance of the business district.

**Supplies.**—Provisions can be obtained at Jacksonville. Ship chandlers' stores, anthracite and bituminous coal, gasoline, fuel oil, and water can be obtained alongside the wharves at Jacksonville.

The Chart Agency at Jacksonville carries Coast and Geodetic Survey, Hydrographic Office, and Coast Guard charts and publications.

**Repairs.**—The facilities for repairs to vessels and machinery of yachts and commercial ships are excellent. The largest shipyard has two floating drydocks, one with a capacity of 12,000 tons for vessels up to 500 feet in length and 20-foot draft. The machine shop is capable of both heavy and light repairs. Floating derricks with a capacity of 40 tons and cranes on the piers with a capacity of 60 tons are available.

Salvage and wrecking gear, including diving equipment, is available.

**Communications.**—The port is reached by four railroad lines and is also served by three terminal companies. The railroads are the Atlantic Coast Line Railroad, the Seaboard Air Line Railroad, the Southern Railway, and the Florida East Coast Railway.

Numerous steamship lines connect with all the principal ports on the Atlantic, Gulf, and Pacific coasts, as well as with the principal foreign ports.

Bus and truck systems operate over the excellent highways which reach the city. Air transportation facilities and telephone, telegraph, and radio communications are available.

**Harbor master.**—The office of the harbor master is at 205 Graham Building.

Pilot commissioners are also port wardens and have control of shipping in the port of Jacksonville.

**Storm warnings** are displayed at Jacksonville from the Graham Building (one of the tallest buildings) and are visible from the river.

# Jacksonville to Racy Point

Chart 685

Between Jacksonville and **South Jacksonville** at **Hendricks Point** are two highway bridges and one railroad bridge. The first highway bridge has a vertical lift span with a horizontal clearance of 350 feet and vertical clearance, closed, of 36 feet and 135 feet when open, at high water. The other two bridges are adjacent and 0.3 mile upstream from the first bridge. The highway bridge has a vertical lift span with a horizontal clearance of 174 feet and vertical clearances of 56 feet, closed, and 164 feet when open, at high water. The railroad bridge has a bascule span with a horizontal clearance of 195 feet and a vertical clearance, closed, of 5 feet at high water.

A measured course, 1 nautical mile in length, is near the northwest shore of the St. Johns River between the mouth of Ortega River and **Winter Point.** The targets at the ends of the course are two pile structures 8 feet apart having a steel rod at the top of each pile. These markers are perpendicular to the course. An observer's platform connects the two pilings.

**Ortega River,** 3 miles above the Florida East Coast Railway bridge at Jacksonville, is crossed by three drawbridges near its mouth. The first, a highway bridge connecting **Ortega** and **St. Johns Park,** has a double-leaf bascule span with a horizontal clearance of 53 feet and a vertical clearance, closed, of 9 feet at high water. The second, a highway bridge about 1 mile from the mouth of the river, has dual single-leaf bascule drawspans about 20 feet apart, each with a horizontal clearance of 40 feet and a vertical clearance, closed, of 4 feet at high water. The third, Atlantic Coast Line Railroad bridge, adjacent to the second highway bridge, has a single-leaf bascule span with a horizontal clearance of 40 feet and a vertical clearance, closed, of 2 feet at high water. A draft of 7 feet can be taken across the bar above the bridges into the narrowest part of the river.

Three yacht basins are near the mouth of the Ortega River. One is about halfway between the highway bridges. It has a small marine railway and berthing facilities for small yachts in depths of 7 to 10 feet. The second and largest yacht basin is adjacent to, and upstream of, the railroad bridge. This marina has a protected basin 300 feet by 250 feet with a 40-foot entrance and a number of finger piers for berthing yachts in depths from 10 to 15 feet. Excellent facilities are available for complete yacht repairs to vessels up to 65 feet in length, 7-foot draft, and 25 tons. Ice and provisions are available. Yachts up to 100 feet in length, 4½-foot draft, and 50 tons are built here. The third basin is about 0.3 mile upstream from the railroad bridge at the plant of a small yacht building yard. A wide pier extending out from the plant has depths of 7 feet alongside and 9 feet at the face, which has four finger slips. Storage and repair facilities are available. Gasoline, Diesel oil, and fresh water may be obtained at each of these basins.

**Orange Park,** about 10 miles south of Jacksonville on the west bank of the St. Johns River, is a winter resort.

**Doctors Lake,** 11 miles above Jacksonville, has a depth of 7 to 8 feet in the entrance. It is an excellent fishing ground for sportsmen and a haven for small boats in stormy weather. A highway bridge at the mouth has a swing drawspan with a horizontal clearance of 62 feet and a vertical clearance, closed, of 8 feet at high water. A sunken barge,

awash at low water, is 460 feet southward from the center pier of the bridge on the upstream side.

**Julington Creek,** 13 miles above Jacksonville, has a least depth of 5 feet to the bridge about a mile inside from the entrance. The bridge has a fixed span with a horizontal clearance of 40 feet and a vertical clearance of 10 feet at high water.

**Black Creek,** 18 miles above Jacksonville, is navigable for vessels of 8-foot draft about 15 miles to the village of **Middleburg.** The creek is used by small boats as a refuge during hurricanes. The trees along the bank form an excellent windbreak. Just inside the entrance is a highway bridge with a swing span having a horizontal clearance of 62 feet and a vertical clearance, closed, of 9 feet at high water. A railroad bridge crossing the creek 5 miles above the mouth has a swing span with a horizontal clearance of 50 feet and a vertical clearance, closed, of 6 feet at high water. A fixed bridge at Middleburg has a horizontal clearance of 30½ feet and a vertical clearance, closed, of 15 feet at high water.

**Green Cove Springs,** a village on the west bank of the St. Johns River about 20 miles above Jacksonville, is a winter resort. The municipal dock has a depth of 7½ feet along its face. Fresh water is piped to the dock. Gasoline and supplies can be secured in the town. Storm warnings are displayed by night only.

A highway bridge crosses the St. Johns River about 2 miles above Green Cove Springs at **Red Bay Point.** It has a single-leaf bascule drawspan with a horizontal clearance of 100 feet and a vertical clearance, closed, of 10 feet at high water.

**Trout Creek** and **Sixmile Creek** have a common entrance about 24 miles above Jacksonville. These creeks are navigable about 3 or 4 miles for boats of 6-foot or less draft. About 0.5 mile above the entrance of Trout Creek is a fixed highway bridge with a horizontal clearance of 40 feet and a vertical clearance of 13 feet at high water. Sixmile Creek is crossed by a fixed bridge with a horizontal clearance of 40 feet and a vertical clearance of 10 feet at high water about 1 mile above the entrance.

## Racy Point to Crescent Lake

### Chart 686

**Deep Creek,** 36 miles above Jacksonville, extends past **Hastings,** a town 4 miles up the creek on a railroad. The project provides for a channel 8 feet deep, and 100 feet wide across the bar and thence 50 feet wide to **Hastings Landing.** The last survey showed a depth of 7 feet in the entrance. Two fixed bridges cross the creek at Hastings. The first, a railroad bridge, has a horizontal clearance of 27 feet and a vertical clearance, closed, of 9 feet at high water. The second is a highway bridge with a horizontal clearance of 15 feet and a vertical clearance, closed, of 6½ feet at high water.

A permanent hyacinth control structure is in the river about 2 miles southwest of **Federal Point** and 41 miles above Jacksonville. The navigation pass is 120 feet long and and 100 feet wide, centered on Dancy Point Lighted Range, and lighted at night. When needed a floating boom is maintained on the downstream end of the navigation pass. The boom tender will open the boom for traffic on signal as for a bridge opening.

**Rice Creek,** 44 miles above Jacksonville, is navigable for small craft of 6-foot or less draft about 5 miles to the fork and a short distance up both branches. About 0.6 mile above the entrance is a railroad bridge having a swing span with a horizontal clearance of 29 feet and a vertical clearance, closed, of ½ foot at high water. A highway bridge crossing the creek 0.8 mile above the mouth has a swing span with a horizontal clearance of 40 feet and a vertical clearance, closed, of 3 feet at high water.

A large pulpwood plant is about 0.3 mile up **Little Rice Creek (South Fork).** Most of the raw and finished materials are shipped by rail, but a small quantity of pulpwood is brought in by barges.

**Palatka,** population 10,500 in 1947, is an important town and railroad center on the St. Johns River, 48 miles above Jacksonville. There are good facilities for the transfer of freight between rail and water. Lumber and citrus fruits are shipped. There are large sawmills. A yacht storage house in Palatka has a marine railway capable of handling vessels of 100 tons, 80-foot length, and 5-foot draft. A machine shop is in Palatka. Gasoline, Diesel oil, supplies, and fresh water can be obtained, and coal in quantities when prearranged for.

Two bridges cross the St. Johns River at Palatka. The Florida East Coast Railway bridge has a swing drawspan with horizontal clearance of 98 feet and a vertical clearance, closed, of 1 foot at high water. The highway bridge, about 200 yards above the railroad bridge, has a single-leaf bascule drawspan with a horizontal clearance of 100 feet and a vertical clearance, closed, of 19 feet at high water.

Water hyacinths present a serious menace to navigation in this area. The Corps of Engineers generally has a tug in the vicinity of the bridges to push the floating masses through the spans and thus keep the channel open.

Along the water front, north of the railroad bridge, are old wharves and groups of piling. The area is not used by large vessels and is generally clogged with floating masses of water hyacinths.

The depths at the commercial wharves south of the bridge are 10 feet and 16 feet at the north and south docks respectively, and a channel with a controlling depth of 13 feet leads to them. The city dock is in ruins but fresh water can be obtained at the outer end.

**Wilson Cove** is very shallow and fouled by hulks, piling, and concrete-ballast blocks.

Along the southern shore of the St. Johns River between **San Mateo** and **Edgewater,** submerged piling of old piers are a menace to inshore navigation. Keep at least 150 yards off this shore.

**Dunns Creek,** 6.5 miles above Palatka, is navigable for small fishing and pleasure boats. A depth of 5 feet can be taken to Crescent Lake, a distance of 7.5 miles. Some of the bends in the creek are sharp. Northeast storms raise the height of water in the creek.

From the St. Johns River the creek should be entered from a point northeast of its mouth, passing about 50 yards off the fish traps on the east side of the entrance. The eastern entrance of Polly Creek lies just to the west of the mouth of Dunns Creek and care should be taken not to confuse the two.

**Cross Creek** crosses Dunns Creek 0.45 mile inside the entrance. The easterly section of Cross Creek is obstructed by a row of piling in Dunns Creek. The westerly

section (**Murphy Creek**) is used for the storage of surplus barges. These block through traffic.

About 0.8 mile from the St. Johns River, Dunns Creek is crossed by a swing drawbridge having a horizontal clearance of 60.5 feet and a vertical clearance, closed, of 11 feet at high water. The bridge is hand operated and moves slowly. Pass through either opening; the southwest side has the deeper channel. An overhead cable at the bridge has a vertical clearance of 74 feet at high water. Boats may land at either bank just downstream from the bridge.

**Crescent Lake** is about 11 miles long and has a maximum width of about 2 miles. The general depth is between 8 and 13 feet, gradually shoaling toward shore. There are no periodic tides in the lake, the range in Dunns Creek becoming zero near its end. Sudden squalls in the lake cause a chop dangerous to small boats. In the center of the lake, the bottom is extremely soft mud; an 8-pound lead dropped in 6 feet of water sank 3½ feet in the mud. Near the shore, the bottom changes to hard sand. Large patches of hyacinth drift about the lake with the changing wind. A close watch should be maintained for floating logs in the drifting hyacinth. The lake appears to be free of sunken logs but when navigating near the shore a close watch should be maintained for broken-off piling and sunken logs.

**Crescent City** is on the west side of the lake about 6.5 miles from the north end. One small wharf is used by fishing boats. Along the water front are the ruins or near ruins of small wharves and a yacht basin.

The mole and small slip at **Shell Bluff Landing** are in ruins and not used.

A depth of 5 feet can be taken into **Haw Creek** at the head of Crescent Lake. About 3 miles above the mouth is the hulk of a gunboat sunk during the Civil War which completely blocks navigation.

**Dead Lake** is about 1 mile long and 0.5 mile wide at the head of Crescent Lake, and has a depth in the center of about 8 feet. **St. Johns Park** and the ruins of a dock are on the northeast shore. Considerable hyacinths are found in Dead Lake at times.

## Dunns Creek to Lake Dexter

Chart 687

**Polly Island,** on the south side of St. Johns River just west of Dunns Creek, is separated from **Murphy Island** by **Polly Creek.** This creek is generally clogged by water hyacinths and is not used.

At **Buffalo Bluff,** 9.8 miles above Palatka, the river is crossed by a railroad swing drawbridge. The horizontal clearances are 89 feet in the south opening and 95 feet in the north opening. The vertical clearances, closed, are 8½ feet at mean low river stage.

Stokes Landing is a small-boat landing. The northern channel around **Stokes Island** has a depth of 7 feet. Follow the row of pilings along the north side of the channel at a distance of 30 yards. The channel on the west side of the island is used frequently, but a 4-foot shoal is in midstream west of a small-boat landing near the south end of the island.

At the settlement of **Saratoga** is a small wharf with clock faces on the cupola of the shelter roof. About 1.5 miles upstream is a marine railway capable of hauling a vessel 100 feet in length, draft of 4 feet forward and 7 feet aft, and 500 tons weight. This railway is primarily for the use of the owner's barges and tugs.

The **Cross-Florida Barge Canal** will enter the west side of the St. Johns River about 3.9 miles north of Welaka.

A Federal project for the construction of the Cross-Florida Barge Canal provides for a lock canal with project depth 12 feet and minimum bottom width of 150 feet, with five locks 75 feet wide, 600 feet long, and 13 feet deep over the sills.

**Welaka** is a village on the east side of the river 18 miles above Palatka. Gasoline and fresh water can be secured at one of the fish wharves. At the face of the docks the depth is 9 feet. The village has telephone, telegraph, surfaced road connections, and two hotels. Supplies are obtainable. There is a small marine railway capable of hauling out a boat 30 feet in length and 6-foot draft. Local fishermen capable of rendering pilot service to Silver Springs and Eustis can be found here.

**Oklawaha River** has its source in the system of large lakes in the central part of the peninsula of Florida and flows in a general northerly direction, then eastwardly, emptying into the St. Johns River 22 miles above Palatka. The extreme head of the system may be taken as Lake Apopka, 120 miles above the mouth of the river.

The river is extremely tortuous and obstructed by shoals, and the upper part above Silver Springs Run is obstructed by hyacinths and eelgrass.

A Federal project for improving Oklawaha River provides for deepening the channel to 6 feet at mean low water from the mouth to the head of **Silver Springs Run,** 50 miles; for clearing the channel of obstructions from Silver Springs Run to **Lake Griffin,** including the **Kyle and Young Canal** and its extension to **Morrisons Landing** and the **J. D. Young Canal** from Morrisons Landing to **Starkes Ferry,** and maintaining the dikes with a view to obtaining a navigable depth of about 4 feet to **Leesburg,** 75 miles above the mouth. The work embraces dredging, snagging, cut-offs at sharp bends, removal of overhanging trees and obstructive aquatic vegetation, and construction of a lock and dam at Moss Bluff to retain the water level in Lake Griffin.

The lock at Moss Bluff has a width of 30 feet, length of 125 feet, and depth over the sill of 7 feet.

In June 1946, controlling depths, which were about 1 to 3 feet above ordinary low stages, were: Mouth of the river to Silver Springs Run, 4½ feet; Silver Springs Run, 6 feet; Silver Springs Run to **Moss Bluff** lock, 4 feet, and thence to Leesburg, 6 feet.

The mouth of the Oklawaha River is often obstructed by hyacinths and is narrow. Do not confuse the entrance of **Bear Creek** to the southward with the mouth of the river. A creek enters from the northwest about 2 miles above the entrance. **Dean Creek** enters the river from the left side about 12 miles above the mouth. The creek is blocked by hyacinths about 0.3 mile inside its entrance. **Deep Creek** enters about 16 miles above the mouth of the Oklawaha River. It is blocked by hyacinths about 1.5 miles inside its mouth.

Snags are liable to be encountered by boats. Leesburg and Silver Springs have railroad communication. The downstream current in the river is about 1 knot. A pilot for the river can be obtained at Palatka, East Palatka, and Welaka.

The Oklawaha River is crossed by seven swing-span bridges. The minimum

horizontal clearance is 34 feet. The minimum vertical clearance, closed, is ½ foot at high water and 4 feet at mean low water stage.

About 0.9 mile south of **Buzzards Point** a ferry crosses the river. It consists of a tug and barge. The ferry slips are in good condition.

**Mount Royal** is marked by two small water tanks.

**Fort Gates** has a hotel with a water tank and a good wharf.

The fish plant at **Keeths Point** stores gasoline for the use of the fish boats.

Vessels should pass to the north and east of **Drayton Island.** A ferry consisting of a barge and tug crosses the river between Georgetown and the island during daylight only.

**Georgetown** is a small village on the east bank of the St. Johns River at the north end of Lake George. The village has a post office. About 1 mile above Keeths Point is a marine railway capable of hauling a boat 50 feet in length, and 4-foot draft. Hull and engine repairs can be made. Gasoline can be obtained at a fish wharf about 0.4 mile above the marine railway.

**Lake George,** the first of the larger lakes on the St. Johns River, is about 10 miles long and 5.5 miles wide. The bottom is fairly uniform with depths of 8 to 11 feet in the center, shoaling rather abruptly near the shores. In strong northerly or southerly winds the water of this lake becomes very rough. Large patches of hyacinth drift about the lake with changing winds. A close watch should be maintained for floating logs in the drifting hyacinths. Numerous old piling are found near the lake shore in 2 to 8 feet of water. These were formerly wharves which have rotted away. The creeks emptying into Lake George are shoal and filled with hyacinths.

The river is crossed by a highway swing bridge at **Astor,** 3.5 miles above **Zinder Point,** the head of the lake. The mechanically moved swing span has a horizontal clearance of 90 feet and a vertical clearance, closed, of 10 feet above mean low river stage. Astor has a post office.

## Lake Dexter to Lake Harney

### Chart 688

The main channel of the St. Johns River flows through the northwest portion of **Lake Dexter.** This very shallow lake is 3.7 miles long and about 0.9 mile in its widest part.

A draft of 3 feet can be carried eastward through Lake Dexter, **Tick Island Creek, Lake Woodruff, Spring Garden Creek,** and the northern portion of **Spring Garden Lake** to **De Leon Springs.** The channel and aids to navigation are privately maintained. De Leon Springs is one of the larger fresh-water springs in Florida. At the end of the channel are the wharves of a hotel and a recreation park. Gasoline and water are piped to each wharf.

On the St. Johns River 14.4 miles above **Dexter Point** at **Crows Bluff** the river is crossed by a mechanically-operated highway-swing drawbridge. The horizontal clearance is 90 feet in the west opening and 92 feet in the east opening. The vertical

clearance, closed, is 7 feet at high water and 3½ feet at extreme high water. Gasoline can be obtained at a filling station 0.3 mile west of the bridge.

A small lumber mill and a dock are on the west side of the river below the Crows Bluff drawbridge.

**Lake Beresford** is a small lake 2.2 miles long north and south and 0.5 mile wide on the east side of the St. Johns River. The lake has many lily pads and hyacinths.

**Beresford** is a small village and landing at the north end of Lake Beresford. A draft of 4 feet can be taken to the dock.

**Wekiva River,** 75 miles above Palatka, is reported navigable for boats of 4-foot draft for a distance of about 2 miles above its mouth, and of 2-foot draft to **Wekiva Spring,** a winter resort 15 miles above the mouth. The river is little used. Three bridges of fixed span cross the river at **Tufts.** The highway bridge, 4.3 miles from the St. Johns River, has a horizontal clearance of 20.9 feet and a vertical clearance, closed, of 16 feet at high water. The Atlantic Coast Line Railroad bridge, 0.2 mile beyond the highway bridge, has a horizontal clearance of 40 feet and a vertical clearance, closed, of 13 feet at high water. The highway bridge 5.2 miles above the mouth has a horizontal clearance of 25 feet and a vertical clearance, closed, of 10 feet at high water. The logging railroad hinge lift bridge at **Palm Springs,** 8.7 miles above the mouth, has a horizontal clearance of 14 feet and a vertical clearance, closed, of 3 feet at high water.

At the western end of **Lake Monroe** where the St. Johns River flows out of the lake are two swingspan bridges. The lower one is a hand-operated railroad bridge with a horizontal clearance of 91 feet in the south opening and 90 feet in the north opening; the vertical clearance, closed, is 7 feet at high water. The upper one is a mechanically-operated highway bridge with horizontal clearances of 90 feet and a vertical clearance, closed, of 13 feet at high water. The center piers of these two bridges form a continuous structure. Vessels should always use the right-hand opening.

Just east of the highway bridge in the north bank is a dredged slip used for the storage of barges.

On the north shore of the lake is the town of **Enterprise.** The power plant of the Florida Power & Light Co. is prominent. A channel marked by lights and daybeacons leads to the wharf of the power plant.

**Sanford** is an important city and railroad center on the south side of Lake Monroe and in the heart of the Florida celery district. In November 1947, water traffic consisted of canned goods out-bound and petroleum products in-bound. The municipal commercial wharf and municipal yacht pier are in good condition. Both have depths of 8 feet at the face. The three privately owned commercial wharves for general cargo are now in poor condition but are to be repaired. The yacht pier is distinguished by the bandstand near the outer end.

Provisions and ice are obtainable in Sanford. Fresh water is piped to the municipal wharves. Excellent hotel accommodations are available.

Yachts intending to remain any length of time at Sanford usually go to the boat works on the south bank of the St. Johns River about 3 miles east of the city and above Lake Monroe. Gasoline, lubricating oil, ice, electricity, and water are available at the boat works. Boats 75 feet in length can use the docks and moorings. The marine railway is capable of hauling boats 65 feet in length, 4-foot draft, and 50 tons. Hull and engine repairs can be made.

The route from Lake Monroe to Lake Harney is well marked by daybeacons and

navigation is not difficult except during periods of high water when the banks are flooded. Then a local pilot should be taken. Dredging of the new channel between the two lakes is scheduled to begin early in 1948.

Three miles east of Sanford and above Lake Monroe a highway bridge crosses the river. The swing drawspan has a horizontal clearance of 65 feet and a vertical clearance, closed, of 7½ feet above mean low stage. The bridge is hand operated.

At the entrance to **Lake Jessup,** 6 miles east of Sanford, a highway bridge crosses the channel entering the lake. The draw is a swing span with a horizontal clearance of 48 feet and a vertical clearance, closed, of 9 feet at mean low stage. The bridge is hand moved and used mostly by hunting and fishing parties. Lake Jessup is about 8.5 miles long with a greatest width of 2.2 miles. It is very shallow at the entrance and is little used. A cut-off channel for the main river just north of the bridge has been dredged to 6 feet.

The Florida East Coast Railway crosses the river about 1 mile northward of **Lake Harney.** The draw is a single-leaf bascule span with a horizontal clearance of 50 feet and a vertical clearance, closed, of 8 feet at mean low stage. Advance notice of at least 8 hours is required to have this bridge opened.

The St. Johns River flows through Lake Harney. The lake is about 3.6 miles long with a greatest width of 2.2 miles. It is uniformly 6 to 7 feet deep except along the shores where it shoals. Boats do not go above Lake Harney.

Above Lake Harney the river continues generally southward through **Lakes Poinsett, Winder, Washington, Sawgrass,** and **Hellen Blazes,** then into the swamps.

## CHAPTER 11

# St. Johns River to Miami

## Charts 1243, 1244, 1245, 1246, 1247, 1248

THE coast from St. Johns River to Cape Canaveral trends south-southeastward for 125 miles. Three inlets, St. Augustine, Matanzas, and Ponce de Leon indent the coast. From St. Johns River to Ponce de Leon Inlet the coast is bold in appearance, with an almost continuous range of sand hills backed by woods. The section southward of Ponce de Leon Inlet for 25 miles is formed by a very narrow strip of lowland lying between the sea and Hillsborough River and Mosquito Lagoon. From seaward this coast shows a low line of sand hills partially covered by grass and scrub trees, with distant woods showing over them. The only natural object distinctive in appearance is Turtle Mound, a green hillock about 10 miles south of Ponce de Leon Inlet. When seen from the northward and eastward, it is quite conspicuous but is less marked when viewed from other directions. The woods in the vicinity of Cape Canaveral are farther back from the beach and are less distinct when seen from seaward. Man-made landmarks such as lighthouses, tanks, radio towers, buildings, piers, and so forth, will be of material assistance in fixing position of southbound vessels sailing close in to avoid the Gulf Stream.

The depths from St. Johns River to Cape Canaveral are irregular. Five to seven fathoms can be taken as close as 1 mile and 3 fathoms as close as 0.4 mile to the beach except off St. Johns River, St. Augustine, and Ponce de Leon Inlets, and from about 7 miles north of False Cape to Cape Canaveral.

Shoal spots with depths of 33 to 38 feet over them are from 4 to 6 miles offshore and from 12 to 16 miles north-northeastward of St. Augustine Light. These shoals are about 8 miles long in a southeasterly direction and about 2.5 miles wide. A swash channel with a depth of 40 to 50 feet is inside these shoals and about 2 miles from the beach.

Off Ponce de Leon Inlet 10 fathoms will be found within 2 miles of the beach. Two shoal spots, with depths of 37 to 39 feet, are about 7 miles north-northeast of Ponce de Leon Inlet and about 5.5 miles off the beach. Going southward the 10-fathom curve gradually works offshore to a distance of 10 miles off False Cape. From about 7 miles north of False Cape to Cape Canaveral are dangerous off-lying shoals.

From Cape Canaveral to Fort Pierce Inlet the coast trends generally south-southeastward for 61½ miles and is broken only by Sebastian Inlet, which in November 1947, was a narrow dredged channel, not distinguishable from any appreciable distance offshore except by the sand spoil bank on the north side which is bare and a little higher than other sand dunes in the vicinity. This section of the coast is formed almost entirely by a low, narrow strip of sand, covered with vegetation, which lies at a distance of 1 to 2 miles from the mainland, from which it is separated by the shallow waters of Banana and Indian Rivers, a part of the Intracoastal Waterway. From seaward the coast shows a line of sand hills partly covered with grass and scrub palmetto. At several places real-estate developments have sprung up and the buildings show prominently from seaward. Access to the mainland from these developments is secured by bridges across the Banana and Indian Rivers. Behind all is the background of heavy woods on the mainland.

The coast between Cape Canaveral and Fort Pierce Inlet has broken ground in places, which extends off a greatest distance of about 10 miles at Bethel Shoal, least depth 29 feet.

From Fort Pierce Inlet to Lake Worth Inlet, the coast trends generally south-southeastward for 42.5 miles and is broken by St. Lucie and Jupiter Inlets. This section of the coast is formed by a low, narrow strip of sand, covered with vegetation, and separated from the mainland by the shallow waters of Indian River and by the Intracoastal Waterway connection between the Indian River and Lake Worth. From seaward the coast shows a line of sand hills partly covered with grass and scrub palmetto. Behind all is the background of heavy woods on the mainland. Buildings of the many real-estate developments along this section show prominently from seaward. Access to these developments is secured by bridges across Indian River and the Intracoastal Waterway.

From Lake Worth Inlet the general trend of the coast is south for 67 miles to Cape Florida. The coastline is broken by Port Everglades and several unimportant inlets. It is formed almost entirely by a low sand beach covered with grass and scrub palmetto, back of which it is wooded. Conspicuous from seaward are the buildings and pier at Palm Beach, Hillsboro Inlet Light, the large buildings and tanks at Fort Lauderdale, Hollywood, Miami Beach, and Miami.

This section of the coast is also fairly bold, and the 20-fathom curve runs parallel to the beach at a distance of about 2 miles until in the vicinity of Miami entrance where the curve of the shore becomes south-southwestward and the 20-fathom curve is about 4 miles offshore. Between Port Everglades and Cape Florida shoaling is rapid and northward of Miami entrance 6 to 8 fathoms are found in places 1.5 miles from the beach.

## St. Johns River to St. Augustine

### Chart 1243

The coast between St. Johns River and St. Augustine Inlet is straight with the 5-fathom curve about 0.5 mile off the shore except at the entrances. A series of shoals

with depths of 33 to 40 feet are about 5 miles offshore and 14 to 20 miles south of St. Johns Lightship. A swash channel with depths of 41 to 60 feet is shoreward of the shoals.

The first 9 miles south of St. Johns River are marked by the water tanks of **Atlantic Beach, Neptune Beach, Jacksonville Beach,** and **Ponte Vedra.** Otherwise the coast is unmarked except for St. Augustine Light.

## St. Augustine Harbor

Chart 842

**St. Augustine,** the oldest city in the United States, is a popular winter resort and has several fine hotels. It is situated about 30 miles south of Jacksonville.

**St. Augustine Light,** 161 feet above the water and visible 19 miles, is shown from a conical tower, with black and white spirally-banded shaft, on the north end of **Anastasia Island.** Other prominent features are an elevated water tank about 250 yards southeast of the light, a cupola on the south end of a large building in the city, a standpipe in the city, a radio tower in the northern part of the city and west of the new inlet, and an aviation light about 2 miles northwest of the center of the city.

The Federal improvement project for the **St. Augustine Channel** provides for an entrance channel 200 feet wide and 27 feet deep from the ocean across **North Point** to deep water in Tolomato River opposite the mouth of Matanzas River and protected at its outer end by a steel-sheet-pile sand trap extending from the coast north of and parallel to the cut.

Investigation in October 1947 discloses that this project has shoaled to an unusable degree. The currents have cut a circular channel between **Vilano Beach** and **Vilano Point,** extending into the ocean in a northeasterly direction.

The channel is subject to frequent changes in depth and direction due to current and storm action. Until further work is done on the project, all vessels are advised against using this channel without a local pilot.

Dangerous and shifting shoals extend 1.5 miles seaward. Although the anchorage inside of the inlet is good, it is not used as a harbor of refuge, because in strong northeasterly and northwesterly winds the sea makes the bar impassable even for small vessels.

**St. Augustine Inlet,** the former entrance to St. Augustine Harbor, about 2 miles southeast of St. Augustine Channel, is now closed and the aids to navigation have been removed as this passage is not safe for navigation. A survey by the Corps of Engineers in July 1947 discloses a bar circling the entrance with depths of less than 6 feet and one place near the center has only ½ foot at mean low water.

**Pilots.**—All vessels including yachts not having local knowledge of the channel are advised to take a local licensed pilot both entering and leaving the inlet. Licensed pilots are available at St. Augustine. The usual procedure to obtain a pilot is to telegraph the harbor master the expected time of arrival so that a pilot will be waiting outside the bar. The rates are $3 per foot of draft.

The anchorage in **St. Augustine Harbor** is good abreast of the city in the Matanzas River, both above and below the bridge, through whcih is a wide draw. A number of

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small private landings are on the east side of the city, north and south of the bridge. The municipal pier is about 100 yards south of the Bridge of Lions which crosses the Matanzas River opposite the center of the city. It affords good berths for yachts and free fresh water is obtainable. This pier, on which the local harbor master has his office, has depths of 10 to 20 feet in the various slips, and from 15 to 22 feet at its face.

**Tides.**—The average rise and fall of tides is about 4½ feet, and high water occurs about one-half hour later than at Mayport.

**Directions.**—When approaching St. Augustine Inlet, the shore should be given a berth of at least 2 miles, so as to keep outside the sea buoy.

No stranger should attempt to enter without a pilot, as the channel shifts frequently, and no information as to buoys or courses would be reliable for any length of time, unless some means of making a permanent channel are devised in the future.

**Tolomato** or **North River** enters St. Augustine Channel from the northward just inside Vilano Beach. It rises about 15 miles northward of the inlet, has an average width of 0.3 mile and depth of 13 feet or better for several miles from its mouth. It is important in being a part of the Intracoastal Waterway. A highway bridge is about 0.5 mile north of the junction of the Tolomato River and St. Augustine Channel. The bascule span has a horizontal clearance of 68.4 feet and a vertical clearance, closed, of 8 feet at high water. The tidal currents set at an angle to the bridge. Flood currents of 1 knot and ebb currents of 1½ knots may be expected during normal weather. Caution is imperative. Extensive repairs were being made to this bridge in October 1947. Estimated time of completion is October 1948. An overhead power cable crosses the river southward of the bridge with a vertical clearance of 110 feet at high water.

**Matanzas River** enters St. Augustine Channel from the southward. It is about 15 miles long to Matanzas Inlet and separates Anastasia Island from the mainland. Above St. Augustine the river has a channel depth of 16 feet or better for a distance of 6 miles. The channel is well marked and, through the broader section of the river, is very narrow and winds between shoals which are visible at low water. The most difficult part of the river is in the narrow channel northwest of Crescent Beach, where the least depth is 8 feet at low water. The Intracoastal Waterway follows the channel of Matanzas River.

The **Bridge of Lions** crosses the Matanzas River 0.6 mile above the mouth. This bascule span has a horizontal clearance of 72 feet and a vertical clearance of 25 feet, closed, at high water. The tidal currents, particularly the ebb, set at angles to the bridge. Caution is advised. A velocity of the flood of 1 knot and of the ebb of 1.6 knots may be expected.

**San Sebastian River** flows past the west side of the city of St. Augustine and empties into Matanzas River 1.4 miles south of the bridge. The channel from the Matanzas River to the wharves is marked by daybeacons. It has a ruling depth of 7 feet at the entrance with deeper water inside the entrance to the fixed highway bridge at the head of navigation. An overhead power cable crosses the river about 300 yards south of the bridge with a vertical clearance of 60 feet at high water.

An extensive shrimp industry is conducted along the wharves in the upper part of the river, being supplied by over 100 sea-going shrimp boats during the shrimp season. Several small shipyards and shrimp boat-building yards are located along the river. Shrimp boats and yachts up to 75 feet can be hauled out for general repairs.

Supplies and gasoline may be taken at wharves on San Sebastian River on the

west side of the city. In stormy southeasterly weather, smaller boats may find a good haven in this river.

**Supplies.**—Provisions, water, gasoline, and Diesel oil can be had here.

**Repairs.**—There are facilities for making repairs to hulls and machinery and ways for hauling out craft up to 75 feet in length. The repair yards are on the San Sebastian River.

**Harbor master.**—The office of the harbor master is in the small house on the outer end of the city dock.

## St. Augustine to Ponce de Leon Inlet

Chart 1244

From St. Augustine to Ponce de Leon Inlet the coast continues straight, broken only by Matanzas Inlet. The 5-fathom curve is within 0.5 mile of the shore except off St. Augustine and Matanzas Inlet.

An **Oceanic Spring** is about 8.2 miles southeast of St. Augustine Light and 2.4 miles east of **Crescent Beach.** The location of the spring can easily be detected by the appearance of the water; noticeable swirls, similar to those in a swiftly running stream, can be seen at a distance of about a mile. At times, especially in rough weather, there is a marked disturbance of the water, a yellowish color which trails off to the northeastward. In choppy weather, a slick is the most noticeable feature. In fact, it has all the appearance of a shoal or reef.

A closer view shows a slick swirl with a slight overfall, the center of the swirl moving about 100 feet, first to the eastward and then to the westward, and a noticeable streak of current to the northeastward. The swirls and overfalls vary rapidly in intensity, as though large bubbles or intermittent volumes of water were being emitted. A boat will be thrown out of the swirl so that it is difficult to hold it in position.

A strong odor, quite similar to the smell of water from the various sulphur springs of Florida, is noticeable, and under favorable circumstances can easily be detected 2 miles away.

**Matanzas Aviation Light** is about 0.8 mile northward of Matanzas Inlet. The light is 64 feet above high water.

**Matanzas Inlet** is 11 miles southward of St. Augustine Light. It affords an outlet for Matanzas River, which extends northward to St. Augustine and southward, following the coast for a distance of 8 or 10 miles to **Graham Swamp,** in which it takes its rise. The inlet is obstructed by a shifting bar and is no longer used by boats of any type. A highway bridge crosses the inlet. It is a fixed bridge as the operating machinery was removed early in 1947.

A canal runs southward from Matanzas Inlet for 21½ miles to Halifax River and in general parallels the coastline. It is part of the Intracoastal Waterway.

**Matanzas Park** on the north and **Summer Haven** on the south side of Matanzas Inlet are each marked by a water tank.

About 2.5 miles southward of Matanzas Inlet is a conspicuous building housing the world's only oceanarium.

**Flagler Beach** is 15 miles southward of Matanzas Inlet. The hotel, ocean pier, and aviation light are good landmarks. The T-shaped pier is 650 feet long and 20 feet wide. The aviation light is 64 feet above high water.

**Daytona Beach** is a popular winter resort about 42 miles southward of St. Augustine. The buildings on the beach, the water tanks and radio towers, are visible from seaward. The large recreation pier on the ocean front is a prominent landmark for passing vessels.

## Ponce de Leon Inlet to Cape Canaveral

Chart 1245

From Ponce de Leon Inlet to False Cape the coast is straight. The 5-fathom curve follows the shore about 0.5 mile off for about 24 miles. Beyond this distance dangerous shoals will be found up to 15 miles offshore.

**Ponce de Leon Light,** 159 feet above the water and visible 19 miles, is shown from a red brick conical tower on the coast, north of and close to the inlet. A radiobeacon is at the light.

**Ponce de Leon Inlet** is about 53 miles southward of St. Augustine Lighthouse and 41 miles northwestward of Cape Canaveral Light. The entrance, which is about 0.5 mile wide, is obstructed by shifting shoals which extend about 0.7 mile seaward and form a bar, over which there is a channel depth of about 7 feet.

The inlet channel moves with the season. It leads north in the winter and south in the summer. A close watch on the depths is kept by the Coast Guard and the latest information is published in *Local Notice to Mariners.* The currents are very strong. An outer lighted whistle buoy and four uncharted buoys mark the channel. They are shifted in position and color as the channel changes. The inlet is easy to enter only on a smooth sea, but in case of necessity when the sea is breaking on the bar, a pilot can be obtained from the Coast Guard station. Signal either by International Code using flag hoist **G** or **PT,** or by radio on 2670 kc., call NMA3.

**Ponce de Leon Coast Guard Station** is on the south side of the inlet. The buildings and wharves of the station are on the inside of the inlet. Buoys mark the channel from the inlet to the wharves and the Intracoastal Waterway in the Hillsborough River. The flood current sets a boat on to the Coast Guard wharves while the ebb current sets a boat off the wharves.

Ponce de Leon Inlet is used by fishing parties, shrimp and commercial fishermen bound for New Smyrna or Daytona Beach and an occasional stranger entering for an anchorage. The average rise and fall of tide is about 2½ feet; high water occurs about the same time as at Mayport.

**Halifax River** extends north from the inlet about 25 miles, running parallel to the ocean from which it is separated by a low strip of land only 0.2 to 0.5 mile in width. **Ponce Park** and Inlet Harbor, near the inlet, Port Orange, Daytona Beach, and Ormond, are the principal landings on the river.

**Inlet Harbor** is a small fishing port about 1 mile north of the inlet. The wharf has a depth of 12 feet at the end. Gasoline and water are available.

**Spruce Creek** leads across the Intracoastal Waterway to **Strickland** and **Turnbull Bays.** Small vessels able to pass under the fixed highway bridge, horizontal clearance 24 feet and vertical clearance 10 feet at high water, go up the creek through Strickland Bay and continue up the creek for about 17 miles.

**Hillsborough River** extends southward from the inlet for a distance of 15½ miles through the marshes to Mosquito Lagoon. The river in some places is narrow and crooked and requires careful steering and close attention to the channel beacons. A drawbridge crosses the river 1¾ miles above the inlet, and another crosses it at New Smyrna, about 3 miles from the inlet. The Intracoastal Waterway passes southward through Hillsborough River.

About 10 miles southward of Ponce de Leon Inlet is **Turtle Mound.** This prominent hill is 50 feet high. It is under the protection of the Florida State Historical Society. The original Indian name was **Mount of Surruque.** It was charted on Florida maps in 1564. Spanish galleons stopped here for repairs, wood, and water.

**Eldora,** a fishing camp and marked by a water tank, is 1.5 miles southward of Turtle Mound.

**False Cape** is the name given to a small part of the coast about 9 miles northward of Cape Canaveral, which it resembles when seen from seaward. About 2 miles north of False Cape is a large clubhouse surrounded by small cabins.

**Chester Shoal** extends in a southeast direction from the coast just above False Cape. This shoal is unmarked and has a least found depth of 9 feet 2.8 miles offshore. The depth of 17 feet exists 4.8 miles offshore.

**The Bull,** about 7.2 miles northeast from Cape Canaveral Light, is a narrow shoal 1.7 miles long north and south, and 0.2 mile wide. The least found depth is 13 feet.

**Cape Canaveral,** where the coast makes a sharp bend westward, is low and sandy and is marked by Cape Canaveral Light. The shore of the cape is constantly moving eastward.

**Cape Canaveral Light,** 137 feet above the water and visible 18 miles, is shown from a conical iron tower with white and black horizontal bands, on the beach near the point of the cape. A radiobeacon is at the light. Vessels may communicate with the light station by the International Signal Code.

Broken ground and shoals extend 13 miles northward and northeastward from Cape Canaveral, terminating in **Hetzel** and **Ohio Shoals,** which have depths of 12 and 19 feet, respectively. The area inside of Hetzel and Ohio Shoals should be navigated with extreme caution.

Hetzel Shoal lighted whistle buoy 8 is moored in 66 feet with Cape Canaveral Light bearing 224°, distant 14.8 miles. A nun buoy is moored alongside.

The fishing village of **Canaveral** is just north of the light.

A wreck, marked by a lighted buoy, is 9.6 miles 084° from Cape Canaveral Light. The wreck was cleared by a wire drag with a depth of 38 feet.

**Southeast Outer Shoal** buoy 2 is moored in 24 feet of water, with Cape Canaveral Light bearing 302½°, distant 7.5 miles.

The least depths found on the inner shoals range from 5 to 16 feet, with shoaler water inside; the shoals are subject to some change in position and depth, and only small light-draft craft can safely pass inside the outer shoals. In a heavy sea the shoals

are marked by breakers, but with a smooth sea there is nothing to indicate them except Cape Canaveral Light and the buoys marking Hetzel, Ohio, and Southeast Outer Shoals.

The effect of the Gulf Stream may be expected well in on the shoals, and this should be kept in mind in approaching the shoals from southward, as a vessel will generally overrun her log. Approaching from southward, 15 fathoms is a good depth by which to avoid the shoals; from northward, 13 fathoms. Vessels are advised to use great care when navigating in the vicinity of the shoals off Cape Canaveral.

## Cape Canaveral to Bethel Shoal

Chart 1246

A wreck marked by a lighted buoy is 13.8 miles 108° from Cape Canaveral Light. It was cleared with a wire drag at a depth of 36 feet.

The wreck of the *Mohican* marked by a buoy is 3.8 miles 173° from Cape Canaveral Light. It was cleared by a wire drag at a depth of 30 feet.

**The Bight,** southwest of Cape Canaveral, is used as an anchorage by local fishing boats and is frequently used by moderate-draft vessels seeking shelter in heavy northerly weather. It furnishes excellent shelter for all winds from southwest, around through northwest to north-northeast. If the wind hauls more to eastward the swell is somewhat broken by the shoals, but the anchorage is likely to be uncomfortable. No directions are necessary. Along the shore are the homes of some fishermen.

At **Canaveral Harbor** is a fish wharf about 2 miles southwest from the light. The wharf has a depth of 10 feet at the end and is extended eastward as the depth decreases. Gasoline, lubricating oil, and water are available at the wharf. There is good highway connection from this region to the town of Cocoa, on the mainland.

About 4 miles southwest of Canaveral Light will be the jettied entrance of the new deep-water Canaveral Harbor. The Federal project provides for a turning basin 27 feet deep and 1,000 feet wide, with an average length of about 1,900 feet, near the easterly shores of Banana River and enclosed by a dike; an entrance channel 27 feet deep and 300 feet wide extending from the turning basin through the barrier beach to deep water in The Bight, protected at its seaward entrance by two jetties to the 12-foot curve; a barge canal 8 feet deep and 100 feet wide from the turning basin to the Intracoastal Waterway and a lock 50 feet wide and 250 feet long to pass the barge canal through the dike inclosing the turning basin.

In December 1947, no work on this project had been done by the Federal Government. A bond issue had been voted by local interests to furnish their part of the cost.

About 4.5 miles southward of **Cocoa Beach** are two large water tanks. Three radio towers about 2.5 miles farther south make a good landmark. **Eau Gallie Beach** is marked by a small water tank and a casino with a small fishing pier. **Indialantic** is marked by a prominent white casino and a large water tank.

**Sebastian Inlet.**—An artificial channel has been dredged through the outside beach, leading into the Indian River in latitude 27°51′30″ N. It is 38 miles south

of Cape Canaveral Light and is abreast the mouth of Sebastian Creek, which empties into the Indian River from the west side. At the entrance two jetties have been built, the north one extending eastward 400 feet from shore; the south jetty extends 300 feet from shore. These jetties are to be extended. A steel bulkhead has been constructed leading in a west-northwest direction for a distance of about 1,500 yards from the south side of the inlet into the Indian River. In November 1947, the depth was less than 2 feet. A month later it was reported that the channel had scoured itself to 6 feet.

**Thomas Shoal,** with a least found depth of 26 feet, is 7.2 miles eastward of Sebastian Inlet.

Bethel Shoal lighted whistle buoy is moored off the east side of **Bethel Shoal,** about 11 miles from shore. A nun buoy is moored close by, lying 47 miles southward of Cape Canaveral and the same distance northward of Jupiter Inlet Light. A 28-foot shoal is 3.6 miles northeast of Bethel Shoal lighted whistle buoy.

## Bethel Shoal to Fort Pierce Inlet

Chart 1247

The hotel dome at **Riomar** is not very prominent. Just offshore are two wrecks which show at high water. The northern one shows as an old boiler and the southern one as a mast. **Indian River Shoal** is about 8 miles north of Fort Pierce Inlet about 1.6 miles offshore. A depth of from 10 to 30 feet will be found on this shoal.

Two sunken wrecks are just offshore about 2.9 and 2.5 miles northward from Fort Pierce Inlet.

## Port of Fort Pierce and Fort Pierce Inlet

Chart 582

**Fort Pierce,** on the west shore of Indian River opposite Fort Pierce Inlet, is the St. Lucie County seat. Hotel accommodations are available, and there are railroad, highway, telephone, and telegraph connections. The city ships citrus fruits and vegetables. It is a distributing point for supplies to the surrounding country. The Intracoastal Waterway passes through Indian River east of the city.

**Fort Pierce Inlet** is 33.5 miles northward of Jupiter Inlet Light and 61 miles southward of Cape Canaveral Light.

A Federal project for improving Fort Pierce Harbor provides for a channel 350 feet wide at the 27-foot contour in the ocean, tapering to 200 feet wide near the westerly side of the inlet, thence 200 feet wide across Indian River, thence flaring to a turning basin 750 feet wide, the depth to be 25 feet in the basin and in the channel to the shore end of the jetties and thence 27 feet to the 27-foot contour in the ocean; and for mainte-

nance of the jetties at the ocean end of the inlet, and shore revetments within the inlet in prolongation of the jetties. The two parallel rubblestone jetties with revetment extensions are 900 feet apart; the north jetty and revetment is about 3,500 feet long, and the south jetty and revetment about 3,200 feet in length.

In November 1947 the controlling depths were 26 feet in the channel and 25 feet in the basin.

Fort Pierce Inlet lighted whistle buoy 2 is located in 30 feet on the outer range, 1 mile off the end of the jetties.

Just southward of the city of Fort Pierce, an aviation light is visible well to seaward. The city also maintained a fixed red light on top of a water tank located 0.5 mile southwestward of the town. This light is also visible well to seaward and is a good navigational mark in clear weather.

A large two-storied, rose-colored casino on the beach marks the inner end of the south jetty. Adjoining it is the lookout tower of the **Fort Pierce Coast Guard Station.**

The tower of radio station WIRA looms up, and at night its top light should not be confused with the lighted whistle buoy at the entrance of the channel.

A prominent white house on the high point of land, about 0.3 mile westward of Indian River, and about 3.5 miles northward of Fort Pierce, is a much-used landmark by the fishermen approaching the inlet from sea. In southeasterly weather with an ebb tide the entrance is rough.

**Pilots** are available and will meet vessels off the bar on advance notice. The pilot may be called by radio through the Coast Guard on 2670 kc. NMA 2. One of the pilots is also the harbor master.

**Pilotage** is compulsory for vessels in foreign trade. It is also compulsory for other vessels except those carrying a pilot licensed by the United States Government.

Pilot rates for Fort Pierce Inlet are:

| | *Per foot of draft* |
|---|---|
| Up to 10 feet | $1.50 |
| 10 to 13 feet | 2.00 |
| 13 to 17 feet | 2.50 |
| 17 to 20 feet | 3.00 |
| 20 feet and up | 4.00 |

Minimum charge $10.

A flat rate of $50 is made to companies whose ships serve the port regularly.

The master of any vessel not carrying a pilot, entering the Port of Fort Pierce, who does not accept the services of a pilot shall be compelled to pay full legal rates of pilotage.

Any pilot detained on board of any vessel by the master or quarantine officer shall receive for each and every day's service the sum of $5 per day over and above his pilotage.

A pilot carried away when taking a vessel to sea in bad weather, shall receive $5 per day during his absence and expenses back to Fort Pierce, Fla.

Due to tricky currents in the turning basin, running of lines is compulsory for all vessels. Pilot boat will render this service. A flat rate of $10 a ship will be charged.

All vessels moving from one wharf to another shall have the harbor master or pilot aboard; the pilot boat will assist in this movement. A flat rate of $10 per ship will be charged.

**Quarantine.**—Vessels are boarded by the quarantine officer at the docks.

**United States Public Health Service.**—There is a relief station of the United States Public Health Service at Fort Pierce.

**Tides.**—Mean range of tide at the jetties is about 2½ feet, and at the city dock about ¾ foot.

**Currents.**—The tidal currents in the inlet have a velocity at strength of about 3 knots. Current predictions may be obtained from the *Atlantic Coast Current Tables*. It has been reported that a strong current, about 5 knots, runs through the cut parallel with the channel, but at the turn in the channel, extreme caution should be used as the current sets across the channel, flood to the south and ebb to the north. Across Indian River the currents run parallel with the channel, which parallels the causeway fill. At the western end of this fill, cross currents are sometimes encountered, especially where the channel crosses the Intracoastal Waterway. The northwestern corner of this intersection is marked by a buoy. Currents in this section are influenced by the winds.

Vessels traveling the Intracoastal Waterway experience strong cross currents at the causeway bridge. They should not approach the bridge from either direction until it is fully opened for passage. At all times maintain sufficient headway to avoid being carried against the fender systems.

**Directions.**—The dredged channel is marked by range lights and buoys, is narrow, and the currents are strong. Care must be exercised in entering. Water outside the channel is shallow.

**Terminal facilities.**—Fort Pierce has terminal facilities for seagoing vessels consisting of a turning basin and slips, which provide berthing space of about 1,500 feet. Depths of 24 feet are in the slip on the north side of the municipal pier and at the pier of the Indian River Refrigeration Terminal Co. The depth of the turning basin is 25 feet. The two piers are 320 feet and 400 feet in length. The southern, or municipal, pier is now in ruins and not used. The northern pier is open on both north and south sides. Vessels also dock across the end of this pier, which is 178 feet in width. No vessel of greater length, however, may lie there.

Immediately south of the bridge across the Indian River is a fish wharf to which a depth of about 4 feet can be carried. Approach from the channel of the Intracoastal Waterway must be made from a point 500 yards south of the bridge as spoil banks, with a controlling depth of about 2 feet over them, parallel the channel immediately eastward of this dock.

A yacht basin is just south of **Moore Creek,** with an approach channel from the Intracoastal Waterway, about 0.4 mile south of the causeway bridge. In 1947 the depth was 7.5 feet in the channel and 7 feet in the basin.

The channel is marked by buoys and a privately maintained lighted range consisting of a front light on an ornamental street light pole, and a rear light on a telephone pole about 250 yards from the front light. Currents across the channel are strong. All boats are tied between finger piers or to the bulkhead. Dockage is charged. No free time is allowed. Gasoline, Diesel oil, oil, fresh water, and electricity are available at the piers. Showers are available in the administration building.

**Repairs.**—There is a marine railway for hull repairs only about 0.2 mile northward of the terminals. Vessels of 5-foot draft, 50 feet in length, and about 30 tons, can be hauled out. Local knowledge is required to carry the best water to the railway.

**Communications.**—Fort Pierce is served by the Florida East Coast Railway.

There are regular freight-boat connections to Baltimore, Philadelphia, and New York during the fruit season.

**Chart agency.**—A Coast and Geodetic Survey chart agency is in Fort Pierce.

**Storm warnings** are displayed daytime only at the Coast Guard station and at the yacht basin.

## Fort Pierce Inlet to Jupiter Inlet

Chart 1247

For a distance of 13 miles southward of Fort Pierce Inlet, broken ground with 18 to 28 feet over it extends from 2.5 to 6 miles offshore.

**Capron Shoal** has a depth of 18 feet about 3.6 miles southeastward of Fort Pierce Inlet. Capron Shoal buoy 10A is moored in 24 feet 300 yards northeastward of the 18-foot spot.

**St. Lucie Shoal,** with 16 to 24 feet over it, is the principal danger. It lies from 3 to 6 miles offshore, and 22 to 26 miles northward of Jupiter Inlet Light. The northern end of the shoal is marked by St. Lucie Shoal lighted whistle buoy 12 moored in 52 feet of water. A red nun station buoy is moored 100°, 200 yards from the lighted buoy.

A sunken wreck is 0.25 mile south of the lighted whistle buoy. A wreck, which has been cleared by a wire drag to a depth of 42 feet and marked on its eastern side by a lighted buoy, is 4.2 miles eastward of the lighted whistle buoy. St. Lucie Shoal buoy 14 is moored in 24 feet, 200 yards eastward of the 16-foot spot near the southern end of the shoal.

**Gilbert Shoal,** 1 to 1.5 miles off the beach about 3 miles north of St. Lucie Inlet, has depths of from 19 to 26 feet.

A shoal with a least found depth of 36 feet lies 3 miles from shore off St. Lucie Inlet, 13 miles northward of Jupiter Inlet Light.

**St. Lucie Inlet** forms the mouth of St. Lucie River and the south end of Indian River. It lies 13.5 miles north of Jupiter Light and 20 miles south of Fort Pierce Inlet. A jetty extends 0.25 mile offshore on the north side of the inlet. A rock ledge lies across the inlet and extends southward from the east end of the jetty for a distance of a little over 1 mile.

During World War II the Army Amphibian Forces did some blasting on the ledge. In November 1947 a least depth of 9 feet at mean low water was found over this ledge on range. Also in November 1947 the controlling depth in the channel to the Intracoastal Waterway route was 5 feet. The sand bars in the channel are reported to shift frequently. Strangers are advised not to enter the inlet without assistance of a local pilot who can be obtained at Toleys Boat Works, located at the south end of Manatee Pocket.

A project was scheduled for early 1948 to widen and deepen the channel through the rock ledge to a depth of 10 feet and 200 feet wide.

An aviation light near Stuart, west of St. Lucie Inlet, shows a revolving white flash seaward. This should not be confused with Jupiter Light by vessels approaching from the north and east.

The mean range of tide at the jetties is about 2½ feet.

**St. Lucie River** enters the sea through St. Lucie Inlet and connects with the Gulf coast via the Okeechobee Waterway. There is an overhead cable crossing at the bridges at Stuart, vertical clearance of 93 feet at mean high water. The Florida East Coast Railway bridge at Stuart, a single-leaf bascule draw, has a horizontal clearance of 50 feet and vertical clearance, closed, of 6½ feet over high water. The highway bridge immediately above the railway bridge has a horizontal clearance of 80 feet and a vertical clearance of 9 feet over high water.

The confluence of the St. Lucie River and the Intracoastal Waterway at Sewall Point develops a hazardous condition in making the short turn between the river and the waterway as cross currents will cause barges in tow to swing out of the channel and either go around or destroy the piling channel markers at this point.

All vessels are advised to keep 100 yards southward of the line between buoy 4 and daybeacon 6 to avoid hitting the hard ledge on the north side of the channel.

The St. Lucie River also has several branches of some commercial importance. These, with the main river, form an important center for yachting and fishing in winter months.

**Manatee Pocket** is a protected body of water approximately 1 mile in length and ¼ mile in width with a controlling depth of 5 feet in November 1947. The entrance is 0.6 mile west of the intersection of the St. Lucie River and the Intracoastal Waterway. The channel in the entrance is marked by three daybeacons. On entering, pass halfway between daybeacon 1 and the point of land to the westward and then steer to pass between daybeacons 3 and 4. Gasoline, Diesel oil, and fresh water can be obtained at any of several marine service stations. Small boats can obtain protection from tropical storms in Manatee Pocket. The holding bottom is good. Yachts can anchor anywhere for overnight stops.

**Salerno,** a small town located at the head of Manatee Pocket, has a vegetable-packing plant, an asphalt plant, a shark factory, and is headquarters for a fishing fleet. Sharks are processed to obtain vitamin ingredients and numerous byproducts. The boat yard has a marine railway capable of hauling out vessels up to 15 tons and 65 feet in length and 4½-foot draft for engine and general repairs. Gasoline, Diesel oil, fresh water, and overnight dockage or seasonal storage can be obtained at the boat yard. Groceries can be obtained from nearby stores.

**Pilots** for the St. Lucie Inlet can be obtained at the boat yard.

In the St. Lucie River west of Light 14 is a private dock of the Sunrise Inn. The dock is 50 feet wide with 6 feet of water at its front. Passing yachts can stop for fresh water and obtain permission to stop overnight alongside the dock.

**Rio** is a small real-estate development on the north bank of the St. Lucie River 3½ miles above Sewall Point. A dredged channel with a depth of 8 feet in November 1947 leads to a private T-dock. Visitors are welcome.

**Stuart** is a progressive city on the St. Lucie River 5 miles above Sewall Point. It is the county seat of Martin County and is located on the Florida East Coast Railway, U. S. Highway No. 1, and the Okeechobee Waterway. The city is the distributing center to the surrounding area which is noted for its winter vegetables, citrus and tropical fruits, poultry raising, ranching, commercial fishing, and flowers.

Gasoline, Diesel oil, fresh water, ice, marine supplies, and provisions are available. The municipal dock is on the south side of the river east of the bridges, and the city

dock is on the south side west of the bridges. In November 1947 there was 4½ feet of water at the face of the municipal dock and 10 feet at the face of the city dock at mean low water.

General repairs can be obtained at the shipyard on the north side of the river, just east of the bridges. In November 1947, there was 9½ feet of water at mean low water up to the dock. The shipyard has two marine railways, one for hauling out boats up to 35 feet in length, and the other with a capacity for hauling out vessels up to 65 feet in length with a draft up to 7 feet. A machine shop and a 2-ton electric hoist are located at the yard. Marine supplies, yacht storage, and mail service are available.

Although there is no large yacht basin, yachts can obtain dockage at a number of places. The small basin in Frazier Creek is well protected. The Chamber of Commerce carries a small supply of charts for navigating in the nearby waterways.

**Storm signals** are displayed at the Stuart Marine Service.

**Pilots** for the St. Lucie Inlet and connecting waterways can be obtained through the Stuart Chamber of Commerce.

West of Stuart the St. Lucie River forks. The **North Fork** extends several miles in a north-northwest direction. It is approximately 0.75 mile in width with an even bottom of 10 to 12 feet in depth. At the head of the west fork is a canal which used to lead to Silver City. In October 1947, a depth of 2 feet could be carried up the canal about 1.5 miles to a point where the canal choked up with hyacinths and other marine vegetation. The South Fork and Okeechobee Waterway are described on page 337.

Southward from St. Lucie Inlet to Jupiter Inlet a depth of 37 feet has been found on the shoal which extends 3 miles from shore 4.5 miles northward of Jupiter Inlet Light.

A wreck cleared by the wire drag to a depth of 31 feet and marked by a lighted buoy is south of the 37-foot shoal and 3.2 miles 029° from Jupiter Inlet Light. Two unmarked wrecks are 6.3 and 7.4 miles northward of Jupiter Inlet Light along the 10-fathom curve.

These shoals and wrecks should be avoided by deep-draft vessels. The 15-fathom curve is a safe guide.

A wreck dangerous to small vessels is reported 4.3 miles 000° from Jupiter Inlet Light and about 0.5 mile off the shoreline. It is the bow of a tanker; the anchor winch shows at extreme low water.

## Jupiter Inlet to Lake Worth Inlet

### Chart 1248

Jupiter Inlet to Lake Worth Inlet, a distance of about 10.5 miles, is clear of shoals with the 10-fathom curve about 1 mile offshore.

**Jupiter Inlet Light,** 146 feet above the water and visible 18 miles, is shown from a red brick tower on the north shore of Jupiter Inlet about 95 miles south of Cape Canaveral Light. A radiobeacon is operated from the light. The top of the radio tower is marked by a fixed red light. In November 1947, the keeper at Jupiter Light stated that the north tower would be dismantled soon. **Storm warnings** are displayed.

**Jupiter Inlet** is an unimportant opening through the beach just south of Jupiter Inlet Light, and forms the connection with Jupiter Sound from northward, with Jupiter River from westward and Lake Worth Creek from southward. A short stone jetty has been built to seaward on the north side of the entrance. In August 1947, the channel was dredged to a depth of 8 feet and a concrete apron constructed halfway across the entrance from the south side. The September 1947 hurricane formed a sand bar directly seaward of the inlet, blocking it to navigation. In November 1947, it was reported that the depth over the bar was 2 feet.

Small boats of the fishing fleet are the only ones using this inlet. Strangers never use it. The town of **Jupiter** is on the south bank of Jupiter River about 1 mile from the inlet.

# Lake Worth Inlet

Chart 846

**Lake Worth Inlet** is an opening cut through the beach about 11 miles south of Jupiter Inlet Light and 31 miles north of Hillsboro Inlet Light. This cut has been improved by dredging and the construction of jetties and affords connection from the sea through a dredged channel to the Port of Palm Beach.

In December 1947, the channel depth was 23 feet from the sea to the turning basin at Port of Palm Beach, except in the outer part of the channel where dredging operations were in progress. The project depth is 25 feet. Depth in the turning basin was 25 feet. The channel is well marked by lights and ranges.

Lake Worth Inlet lighted whistle buoy 2LW is moored in 36 feet 0.6 mile off the entrance to the inlet.

**Lake Worth Inlet Coast Guard Station** is on the south side of **Peanut Island.** A reef in the form of a ridge having a depth of about 4 feet, with scattered boulders covered about 3 feet, extends for about 300 yards eastward of Peanut Island, parallel with and about 25 feet north of, the north line of the improved channel. This reef is extremely dangerous for small boats which should keep south of Lake Worth Inlet buoy 4 as the ebb current sets across the reef in a northeasterly direction at times with sufficient velocity to tow this buoy under the surface.

**Currents.**—The currents in the inlet are strong and must be carefully guarded against, the velocity at strength of flood and ebb being about 5 knots. Current predictions may be obtained from the *Atlantic Coast Current Tables.* On the ebb between the jetties is a heavy tide rip, part of which may be avoided by holding close to the outer end of the north jetty. On the flood, the current sets against the north jetty and care must be taken to avoid it.

**Tides.**—The mean range of tide at the Port of Palm Beach is about 2 feet.

**Prominent objects.**—The ocean pier at Palm Beach, 4.3 miles south of the entrance, shows up well, and hotels and buildings at Palm Beach also are conspicuous from seaward. The red occulting lights on several radio towers in the area show prominently at night.

**Directions for entering.**—From a position about 100 yards south of Lake Worth Inlet lighted whistle buoy 2LW, close Lake Worth Entrance range ahead, both daymarks, white square with black vertical stripe, on skeleton structure, and steer **270°** for 0.5 mile to a position about 125 yards northeast of Lake Worth Inlet Light 1A. Thence, change course to close Lake Worth inner range ahead (front daymark is a white platform and ventilator with black vertical stripe on roof of warehouse, the rear daymark is a black and white diagonally striped square on white skeleton tower) and steer **253°** to the turning basin off the docks, passing north of Lake Worth Inlet Lights 3 and 8.

**Port of Palm Beach** is a marine-terminal development on the west side of Lake Worth, abreast Lake Worth Inlet. The wharves are in the town of **Riviera Beach**, about 3 miles north of West Palm Beach, and have good rail, bus line, and highway connection. They are known locally as **Palm Beach Terminals.** The Port of Palm Beach is a port of entry.

A turning basin 900 by 1,000 feet has been dredged and a slip with two concrete wharves and one storage shed have been completed. North of the slip and along the west side of the turning basin is a steel bulkhead about 400 feet long. The basin is being enlarged to 1,000 by 1,200 feet. The depth is 25 feet in the slip and 22 feet along the face of the bulkhead.

**Pilots.**—A vessel requiring a pilot may obtain one by making the usual signal of code flag **G** or by radio, calling the Lake Worth Coast Guard Station on 2670 kc., NMA6.

**Pilotage.**—The following rates of pilotage have been prescribed for the Port of Palm Beach:

| | |
|---|---|
| Up to 6 feet | $9.60 |
| 7 feet | 16.80 |
| 8 feet | 19.20 |
| 9 feet | 21.60 |
| 10 feet | 24.00 |
| 11 feet | 35.20 |
| 12 feet | 38.40 |
| 13 feet | 41.60 |
| 14 feet | 44.80 |
| 15 feet | 60.00 |
| 16 feet | 64.00 |
| 17 feet | 68.00 |
| 18 feet | 72.00 |
| 19 feet | 76.00 |
| 20 feet | 80.00 |

Over 20 feet the rate is $4.80 per foot.

**Towboats.**—It is desirable at present to make advance arrangements for towboats. A small gasoline towboat is usually available to assist vessels in entering and docking, if desired, and larger tugs can be sent from Miami on short notice.

**Quarantine.**—Vessels subject to quarantine inspection are boarded at the wharves on arrival.

**Anchorage.**—For yachts up to 14-foot draft, anchorage is available in the buoyed channel leading southward on the east side of Lake Worth. Best area is about 0.8 mile from the main channel.

**Supplies.**—Gasoline, oil, and provisions can be obtained at the Port of Palm Beach. Small boat and yacht supplies are available. Fresh water is piped to all wharves. Coal must be ordered in advance as no local supply is kept on hand.

**Repairs.**—In the immediate vicinity of Lake Worth Inlet are three repair yards. The first, about 0.5 mile north of the ship channel, has a marine railway capable of handling vessels 175 feet long, 10-foot draft, and 500 tons. Hull and engine repairs can be made. A machine shop is at the plant. Dry storage facilities are available.

The second railway, about 1.1 miles south of the ship channel, has units able to haul out boats 70 feet long, of 6-foot draft, and 75 tons. Engine and wooden hull repairs can be made. Machine shop work is done by contract. Dry storage facilities and some overnight wet storage are available.

The third, about 1.2 miles south of the ship channel, has a marine railway capable of hauling out a vessel 140 feet long, 15-foot draft, and 800 tons weight. Complete repairs can be made. A machine shop is at the plant. Both wet and dry storage are available.

**Communications.**—West Palm Beach and the Port of Palm Beach are served by the Florida East Coast and Seaboard Air Line Railways.

**Chart agencies.**—Two chart agencies for Coast and Geodetic Survey charts and publications are in West Palm Beach. One of these agencies is also an agency for the Hydrographic Office.

**Storm warnings** are displayed by day from the post office in West Palm Beach, and at the Coast Guard station.

**West Palm Beach,** a city on the west shore of Lake Worth, has a business district about 3 miles south of the Port of Palm Beach. It is of some commercial importance and is a division point on the Florida East Coast and the Seaboard Air Line Railways. Three highway bridges connect this city with the fashionable winter resort of Palm Beach, which is directly across Lake Worth. Excellent hotel accommodations are in both cities. Berthing space for vessels is limited. A depth of about 8 feet is along the offshore face and in the northern slips of the city wharf, which is about 400 yards south of the first highway bridge south of Lake Worth Inlet.

The channel from the Intracoastal Waterway to the city dock is marked by daybeacons and has a controlling depth of 8 feet. There are numerous private piers. The yacht club wharf is north of the first highway bridge. Gasoline, Diesel oil, water, ice, and electricity are available at the yacht club docks. Yacht supplies and provisions are in the city. Repairs to hulls and machinery of launches can be made in West Palm Beach and at Riviera, near Lake Worth Inlet.

**Lake Worth** is a narrow, shallow body of water separated from the ocean by an island varying in width from about 0.5 mile to 200 yards. The main part of the lake lies south of Lake Worth Inlet. The Intracoastal Waterway traverses the lake from one end to the other. Considerable dredging has been done in Lake Worth for private channels and for real-estate development. Local knowledge is necessary to carry the best water outside the limits of the marked channels.

From the westward two drainage canals extend through the Everglades from Lake Okeechobee.

# Lake Worth Inlet to Port Everglades

Chart 1248

From Lake Worth Inlet the general trend of the coastline is south for 41 miles to Port Everglades. It is broken by several inlets of little importance. The coast is formed almost entirely by a low sand beach, with more or less conspicuous hills partly covered with grass and scrub palmetto, back of which it is wooded. Extensive building operations have materially changed the appearance of this section of the shoreline, and numerous towns, tanks, radio towers, and scattered buildings are visible from seaward. Conspicuous from seaward are the buildings and pier at Palm Beach, the lighthouse at Hillsboro Inlet, and the large buildings and tanks at Fort Lauderdale.

The coast between Lake Worth Inlet and Port Everglades is fairly bold. The 20-fathom curve runs parallel to the beach and for a greater part of the distance is less than 2 miles from it.

**Palm Beach,** a resort on the narrow island between Lake Worth and the sea, is due east from West Palm Beach, with which it is connected by highway bridges. At this place there is an ocean pier, built solely for amusement purposes. Several other towns and cities are built along the shores of Lake Worth.

**South Lake Worth Inlet,** at the south end of Lake Worth, is a small dredged cut through the outside beach, about 200 feet wide and 5 feet deep at low water. It is crossed by a fixed bridge. Only small boats with local knowledge use this cut, and then only at or near slack water. Currents through it have great velocity, and with an easterly wind it is impassable on account of breakers at the entrance.

**Boca Raton Inlet** is a narrow dredged cut through the beach 5 miles north of Hillsboro Inlet Light. The hotel at **Boca Raton** is a prominent landmark. The mouth is protected by short jetties. In November 1947, the controlling depth was 6 feet at mean low water on the bar outside the jetties, and at the junction of the Intracoastal Waterway the depth was 5½ feet, with deeper water between. The inlet is crossed by a bascule bridge with clearances of 15 feet horizontal, and 5½ feet vertical, over high water, closed.

**Hillsboro Inlet** is 31 miles south of Lake Worth Inlet. It connects with Hillsboro River and the Intracoastal Waterway. It is of no commercial importance, and in November 1947, was bare at low water. It is occasionally used by small local fishing boats, but should not be used by strangers.

**Hillsboro Inlet Light,** 136 feet above the water and visible 18 miles, is shown from an octagonal, pyramidal skeleton tower, with lower third white and upper two-thirds black, on the beach on the north side of the inlet. A radiobeacon is at the light.

Inside the curve of Hillsboro Inlet the shoaling is rapid, and 6 to 8 fathoms are found in places 1.5 miles from the beach. A wreck 3 miles south of the lighthouse and 0.5 mile offshore has a depth of about 10 feet over it at mean low water.

Formerly two small rocky islets, formed by the jettisoning of a cargo of cement, part on each side of a stranded vessel, were about 5 miles south of Hillsboro Inlet Light and 0.4 mile offshore. They were blasted away during World War II, but until the depth has been ascertained, that area should be avoided by light-draft vessels sailing close along the edge of the reef.

Two short jetties 9 miles south of Hillsboro Inlet Light mark the former channel of **New River Inlet.** This inlet is sometimes opened in times of flood of New River, but quickly heals itself.

# Port Everglades

## Chart 546

**Port Everglades,** a deep-water port 20 miles north of Miami, is close to the Florida Atlantic ship lanes, and borders on the Intracoastal Waterway. It is a customs port of entry.

A dredged channel, marked by a lighted range, leads directly from the sea to a turning basin and slips on the west side of the port. The ship channel and part of the turning basin were originally dredged to 35 feet in rock bottom. The United States Engineers have taken over maintenance of the channel, turning basin, and jetties.

A Federal project provides for a channel 500 feet wide at its seaward end, converging to 400 feet at the jetty entrance, thence converging to 300 feet at a point 1,000 feet within the jetty entrance, and thence of that width to a turning basin 1,200 feet in length and 1,550 feet wide, all to a depth of 35 feet.

In November 1947, the controlling depth in the channel was 34½ feet, with depths of 27 to 35 feet in the turning basin.

Two converging angular stone jetties, 500 feet apart at their outer ends, protect the harbor entrance. They are 6 feet above mean low water. Two lines of submerged mats of rock for proposed breakwaters extend about 1,500 yards seaward, one line on either side of the channel. The general depth over them is about 10 feet and they are about 1,200 feet apart at their seaward ends and are unmarked.

Because of adverse current conditions, it is not advisable for vessels larger than small yachts to navigate the channel at night. Vessels arriving at the entrance during darkness anchor just west of the sea buoy and 0.3 mile south of it in 60 feet. The holding ground is good.

**Pilots** are available from sunrise to sunset. Vessels requiring a pilot may secure one by previous notification by telegraph or through the agent. Pilotage is mandatory for all vessels in foreign trade drawing more than 6 feet. Vessels in domestic trade, coastwise, are not required to take pilots, but such vessels are required to have on board a United States licensed pilot. The pilot boat is a gray motorboat flying the code flag **P.** Vessels are boarded at the sea buoy.

**Pilotage.**—Rates for Port Everglades, effective October 20, 1947, are based on draft, and are as follows, in-bound or out-bound:

| | |
|---|---|
| 13 feet and under | $30.00 |
| 14 feet | 33.60 |
| 15 feet | 37.50 |
| 16 feet | 41.60 |
| 17 feet | 45.90 |
| 18 feet | 50.40 |
| 19 feet | 55.10 |
| 20 feet | 60.00 |

| | |
|---|---|
| 21 feet | 65. 10 |
| 22 feet | 70. 40 |
| 23 feet | 75. 90 |
| 24 feet | 81. 60 |
| 25 feet | 87. 50 |
| 26 feet | 93. 60 |
| 27 feet | 99. 90 |
| 28 feet | 106. 40 |
| 29 feet | 113. 10 |
| 30 feet | 120. 00 |
| 31 feet | 127. 10 |
| 32 feet | 134. 40 |
| 33 feet | 141. 90 |
| 34 feet | 149. 60 |
| 35 feet | 157. 50 |
| Vessels drawing less than 10 feet and under 150 gross tons | 20. 00 |

**Towboats.**—A small tug is available for docking and undocking.

**Quarantine.**—Vessels subject to examination are boarded at the docks.

**Customs offices** are located in the new customhouse. Marine documents are not issued. Vessels are boarded at docks.

The **Immigration Service** office is located in the customhouse.

**Tides.**—The mean range of tide in Port Everglades entrance is about 2½ feet. The tidal current in the entrance has a velocity of about 1 knot at strength. Current predictions may be obtained from the *Atlantic Coast Current Tables*.

**Directions for entering.**—From the vicinity of Port Everglades lighted whistle buoy, close Port Everglades Entrance Range ahead (front daymark white and black diagonal striped diamond on skeleton tower, rear daymark white and black diagonal striped circle on skeleton tower) and follow the range on course **269°** direct to the terminal slip. In addition to the range the channel is marked on either side by several buoys, daybeacons, and lights. This channel should not be used by large ships at night because of the adverse currents in the turning basin.

**Dockage** is charged on the basis of gross registered tonnage for all vessels except barges which are charged per linear foot.

**Wharfage** is charged at commodity rates. Harbor master's fees are charged as follows: Vessels under 500 net tons, $10; 500 to 5,000 net tons, $25; over 5,000 net tons, $30.

**Terminal facilities.**—Slip 1, directly in line with the entrance, affords berthing space for several large vessels. Fuel oil and water are piped to the wharf. A steel warehouse has been built at the terminal, with railway and highway connections. The slip is 1,200 feet long by 300 feet wide, with steel bulkhead at the end and both sides, with a depth of water of 35 feet.

Slip 2, north of Slip 1, is 700 feet long and 300 feet wide, with a depth of 25 feet. Slip 3, south of Slip 1, is 1,200 feet long and 300 feet wide and was being dredged (December 1947) to a depth of 35 feet. The turning basin, adjacent to the slips, has steep rock sides extending almost to the low-water level.

Tide swirls of varying characteristics exist in the turning basin and make handling of ships difficult. Prevailing winds from the southeast and east coupled with a rising tide are the most hazardous times. Near accidents of vessels striking the piers or the rocky sides of the turning basin are avoided by prompt response of engineroom crews to signals

and by utmost precaution in maneuvering vessels within the limitations of the turning basin.

Northward of the turning basin dredging operations are in progress from time to time to obtain rock for real estate fill.

**Running lines.**—Linesmen for handling lines for docking and undocking or shifting berths will be furnished at the following rates:

| | |
|---|---|
| Vessels under 150 net tons | $5 |
| 150 net tons to 500 net tons | 10 |
| 500 net tons to 5,000 net tons | 15 |
| 5,000 net tons and over | 20 |

An additional charge will be made for handling lines in shifting a vessel from one berth to another. Such charge will be the same as applies for docking and undocking.

**Supplies.**—Fuel oil for bunkering of ships is available in any quantity for ship-side delivery. Coal in small quantities can also be delivered direct to ships at the dock on short notice. An ample supply of water is available and is supplied from the city of Fort Lauderdale. Subsistence and ship chandlers' supplies are procurable in limited quantities.

**Repairs.**—A small machine shop with ship-repair equipment and mechanics is located at the port.

**Port authority.**—Port Everglades is under the jurisdiction and control of the Broward County Port Authority, empowered to make regulations and charges for use of waterways and facilities. Operation is in charge of the port manager, whose office is at the port office building.

**Communications.**—There is regular freight-boat service to northern and Gulf coast ports. Nearby is autobus connection with Fort Lauderdale and Miami.

**Storm warnings** are displayed daytime only at Port Everglades.

For Fort Lauderdale see Intracoastal Waterway.

## Port Everglades to Miami

Chart 1248

Between Port Everglades and Cape Florida, 26 miles to the southward, the general trend of the coastline is south, and it is formed almost entirely by a low sand beach. The large buildings and tanks in Hollywood, Miami Beach, and Miami are particularly conspicuous from seaward.

This section of the coast is also fairly bold, and the 20-fathom curve runs parallel to the beach at a distance of about 2 miles until in the vicinity of Miami entrance where the curve of the shore becomes south-southwestward and the 20-fathom curve lies about 4 miles offshore. Inside this curve, between Port Everglades and Cape Florida, the shoaling is rapid, and northward of Miami entrance 6 to 8 fathoms are found in places 1.5 miles from the beach.

**Hollywood** is a popular resort 5 miles south of Port Everglades and about 1 mile west of the Intracoastal Waterway. The Hollywood Hotel, a very prominent structure,

is situated on the ocean beach east of the city. Midway between Port Everglades and Miami and 1.5 miles offshore is North Miami Beach lighted buoy 4. Ships wishing to stay beyond the 10-fathom curve should stay 0.6 mile seaward of the buoy.

**Bakers Haulover Cut** has been dredged through the barrier beach at the north end of Biscayne Bay to provide circulation of water in the bay. It is crossed by a fixed bridge with horizontal clearance of 69 feet and vertical clearance of 15 feet over high water. The channel is 12 feet deep. The tidal current in Bakers Haulover Cut has an average velocity at strength of about 2.6 knots at flood to 3.9 knots at ebb. This creates a hazardous condition. It has been reported that a number of small craft have been forced against the bridge piers, which obstruct the channel, and destroyed. Slacks and strengths occur about one-fourth hour earlier than in Miami Harbor entrance.

Charter-boat fishermen use the cut in good weather. The tower on the north side resembles a conical lighthouse and a light is shown from dusk to 3 a. m., visible about 5 miles. An overhead cable crosses the cut. Two prominent hotel buildings are south of the inlet.

## Miami Harbor and Miami

Chart 547

**Miami** is the principal city on Biscayne Bay, is internationally famous as a winter resort, and is also growing in commercial importance. It is on the main line of the Florida East Coast Railway and is the southern terminus of the Seaboard Air Line Railroad. The city is an important yachting center, particularly in winter, and a large number of small boats operate out of the port, fishing and cruising along the Florida Keys. In addition to steamer connection with northern cities Miami has vessels running to Nassau and to Habana.

**Prominent objects.**—The group of skyscrapers in Miami and the large hotels at Miami Beach and Coral Gables form landmarks visible for miles in all directions. Among those most easily distinguished are the courthouse dome, the Daily News tower, and the Everglades Hotel tower in Miami; the clock tower and an amusement pier on the east water front at Miami Beach, and the Miami Biltmore Hotel southwest of Miami, at Coral Gables. Cape Florida unused lighthouse tower, a white tower on the south point of Key Biscayne, is easily seen. An aviation light about 7 miles northwest of Miami, and several high radio towers with red occulting lights on top show prominently at night. Numerous other tanks and towers shown on the charts need no description.

**Channels.**—The **Main Channel** is a dredged cut from the 30-foot contour, through the jettied entrance south of Miami Beach, and thence across the flats in Biscayne Bay, parallel and close to the MacArthur Causeway, to the municipal piers on the Miami water front.

A shoal marginal strip about 100 feet wide is between the northern edge of the channel and MacArthur Causeway along its entire length. Lights marking this channel are established about 25 feet back from the edges of the channel. Vessels are advised to favor the south side of the channel during southerly winds, as a pronounced northerly set of current may then be experienced.

Miami Channel is regulated as a one-way channel for all large commercial vessels. In-bound they must stop and ascertain if the channel ahead of them is clear before entering from seaward, and similarly, all out-bound vessels before sailing must telephone the bar pilots at Miami Beach to ascertain if the channel ahead of them is clear.

In December 1947, the controlling depth was 30 feet in the main channel and 23 to 30 feet in the turning basin.

A Federal project for improving Miami Harbor provides for two parallel stone jetties at the entrance, and a channel 30 feet deep and 500 feet wide from the 30-foot contour in the ocean to near the outer end of the north jetty, thence 300 feet through the entrance and across Biscayne Bay to and including a turning basin 1,400 feet long and 1,350 feet wide; a channel at the mouth of Miami River, 15 feet deep and 250 feet wide at the outer end and tapering to 170 feet at Brickell Point in a distance of 1,400 feet; thence a channel in Miami River, 15 feet deep under flood conditions, 150 feet wide for 3 miles, thence 125 feet wide for 1.1 miles; and thence 90 feet wide for 1.4 miles; a channel 12 feet deep and 100 feet wide from Miami River to Harbor of Refuge in Palmer Lake; a channel 15 feet deep and 200 feet wide from the mouth of Miami River to the turning basin at Municipal Terminals; a channel 8 feet deep and 200 feet wide from the mouth of Miami River to the Intracoastal Waterway, and thence 100 feet wide to Government Cut.

**Miami Beach Channel** (**Meloy Channel**) branches from the Main Channel at the inside end of the jetties and extends northwestward along the west shore of Miami Beach as far as the causeway bridge. Depth in this channel and at the wharves on the east side of the channel is 19 feet at low water.

A channel about 0.5 mile westward of the Miami Beach Channel leads northwestward from the Main Channel to the MacArthur Causeway. Controlling depth in this channel is 30 feet at mean low water.

**Fisher Island Channel** branches from the Main Channel just inside the jetties and extends westward for about 1,200 yards along the north side of Fisher Island to the Belcher Oil Co. property, and is maintained by the company at a depth of 25 feet. The channel westward of this point and on the west side of the island was dredged by private interests and no maintenance work has been done since. In December 1947, the depth on the range shoaled to 8 feet at the western point of the island.

**Fishermans Cut** (**Railroad Channel**) extends westward from Fisher Island Channel to the city water front. This channel, used by yachtsmen and charter-boat fishermen, is not maintained. It is marked by daybeacons. The controlling depth in December 1947 was 6 feet. From this channel a natural channel with a controlling depth of 7 feet in December 1947 leads to the southward. It is little used and marked only at the northern end.

**Biscayne Channel** leads through the shoals south of Cape Florida into Biscayne Bay. It is partially dredged, but shoals are close to the channel line in places. Craft whose drafts are close to the limiting depth of the channel should exercise great care. The route is well marked and easily followed in daytime. Several channels leading through the shoals between Biscayne Channel and Key Biscayne are used by local boats. For these channels the chart is the best guide.

**South Channel** is a dredged cut leading from Biscayne Bay, northward of Key Biscayne, to the Miami city water front. An extension of this channel leads to the railroad pier 325 yards south of Pier 3. The Intracoastal Waterway southward to Key

West passes through this channel. One branch of it leads into the Miami River and the other leads directly into the turning basin off the city park. South Channel and the fork east of Burlingame Island form a part of the Intracoastal Waterway, and had a controlling depth of 10½ feet in December 1947. Aids to navigation are numbered from south to north, and the South Channel Entrance Range shows through the center of the drawspan of the Rickenbacker Causeway from northward. The channel in the fork west of Burlingame Island had a controlling depth of 8 feet in December 1947. The connecting channel into the Miami River alongside the Bay Front Park had a controlling depth of 13 feet at mean low water in December 1947.

A mooring buoy for a marine fuel vessel is about opposite the center of **Bay Front Park** and 125 yards offshore. When not in use it is inconspicuous, and accordingly, vessels should proceed with caution until the buoy is sighted. It is unlighted and therefore hazardous at night.

**Small-boat channels.**—The area between the two causeways connecting Miami and Miami Beach is used as an anchorage by yachts and small boats. There are numerous slips and wharves on the made islands in this area. Channels are not marked but the depths of from 9 to 10 feet are ample for the size of craft using them.

A channel follows the east shore of Biscayne Bay northward from the Miami Beach Channel. It has a controlling depth of 9 feet to the Venetian Causeway and 8 feet beyond it and is used by the owners of the various estates in this vicinity.

A small cross-over channel with a least depth of 8 feet in December 1947 extends in a southerly direction from the main ship channel in the vicinity of Causeway Island to the channel along the north side of Fisher Island. It leads just east of a small unnamed island and is marked by a privately maintained range on Fisher Island 300 yards west of the Belcher Oil Co. slip.

**Collins Canal** leads northeasterly along the southeast side of the highway prolongation of the Venetian Way to Indian Creek. Controlling depth in the canal in December 1947 was 4 feet. Navigation is limited by the fixed bridges crossing the canal, the lowest having a vertical clearance of 5 feet at mean high water.

A channel up the Miami River had a controlling depth of 15 feet at the entrance thence 8 to 7 feet from the NW. Twenty-seventh Avenue highway bridge to the head of navigation in December 1947. A Federal project provides for a channel 15 feet deep and 150 feet wide at the mouth to 90 feet at the head of navigation.

**Pilots.**—Pilotage is compulsory for certain vessels. The pilot station is at Miami Beach on the end of the pier close to the North Jetty. The pilot boat will come out to meet any vessel making signal for a pilot, Code flag **G**, or radioing in advance to the agents at Miami the expected time of arrival. Code flag **H** flies from the pilot boat which is black with buff deck and housing.

**Pilotage.**—The following are extracts from the rules adopted by the Board of Pilot Commissioners:

The rates as given below shall apply to all steamers or vessels, whether owned wholly by citizens of this State or not: *Provided,* That all steamers or vessels carrying the regular United States mail shall pay half pilotage only: *Provided further,* That all steamers or vessels drawing less than 6 feet of water, and having coastwise license, shall be exempt from paying whole or half pilotage, unless they employ a pilot.

Any pilot detained on board of any vessel by the master or quarantine officer shall receive from such vessel for each and every day's services the sum of $4 per day over and above his pilotage.

The rates charged for placing letters or orders on board any vessel shall be one pilotage; this rate

shall apply to vessels seeking and not taking cargo. The maximum charge for taking a physician out to any vessel or for taking any sick or injured person from such vessel shall be $75.

The master of any vessel subject to pilotage entering the Port of Miami, who does not accept the services of a pilot, shall be compelled to pay the regular legal rates of pilotage: *Provided*, That services of a pilot are offered such vessel outside the entrance bar buoy to Miami Harbor.

All vessels subject to pilotage crossing the bar, either in or out, shall be required to pay full pilotage to the pilot offering his services, whether such craft to be in tow or otherwise.

Every master of a vessel who shall detain a pilot after the time appointed, so that he cannot proceed to sea, though wind and water should permit, shall pay such pilot $10 per day, or fraction thereof exceeding one-half hour, during the time of his actual detention; and if any vessel which shall be boarded by a pilot without or within the harbor limits, shall by violence of the weather or otherwise be driven to sea the master or owner of such vessel shall allow and pay the pilot $10 per day, or fraction thereof exceeding one-half hour, for every day he shall be on board, besides the fee of pilotage.

All vessels at anchor or under way within the bar at night shall exhibit a light in some conspicuous place, at least 10 feet above the deck, so as to be seen by vessels or boats passing, under a penalty of $100 for each and every neglect, and shall also be liable for all damages or the amount of injury sustained by any vessel or boat coming in contact with such anchored vessel because of the absence of such light. And it shall be the duty of the pilot to notify the master of each vessel coming over the bar of the existence of this requirement.

**Pilotage rates.**—The rates for pilotage are as follows:

| | *Per foot* |
|---|---|
| 6 feet or less draft | $2. 00 |
| 6 to 10 feet draft | 2. 50 |
| 10 to 13 feet draft | 3. 00 |
| 13 to 17 feet draft | 4. 00 |
| Over 17 feet draft | 5. 00 |

**Quarantine.**—The quarantine station is on Fisher Island on the south side of the main channel just inside the jetties. Vessels are boarded off the station. Large vessels unable to pass quarantine anchor in anchorage area outside the jetties. Smaller vessels anchor in Fisher Island Channel.

Miami is a **customs port** and **marine documents** are issued.

**United States Public Health Service.**—A second-class relief station of the United States Public Health Service is at Miami. The nearest marine hospital is at Savannah, Ga.

**Anchorages.**—There is no available anchorage for oceangoing vessels inside Miami Harbor. Such vessels must use the anchorage grounds described hereafter. Yachts and small craft usually lay alongside the various wharves but in winter such accomodations are crowded and a large number of these boats anchor between the two causeways in the vicinity of Star Island or lie to moorings off the city yacht basin.

*Anchorage Area.*—The area to the eastward of a line bearing 012° through a point X which is 1.5 miles due east of the intersection of the Miami Beach shoreline with the north jetty; to the northward of a line bearing 102° and intersecting the 012° line at a point A, 0.5 mile north of the said point X and to the southward of a line bearing 102° and intersecting the 012° line at a point B, 2.5 miles north of the said point X. The northern and southern extremities of the 012° line are marked by spar buoys The entire anchorage area lies north of the entrance channel to Miami Harbor.

*Regulations.*—Except in cases of great emergency, no vessel shall be anchored in the Atlantic Ocean in the vicinity of the entrance to the approach channels leading to the cities of Miami Beach and Miami, Fla., outside of the anchorage area hereby defined and established—that is, they shall not anchor shoreward of the line first named nor southward of the second nor northward of the third line—but may anchor as far to the eastward as may be desired.

**The harbor master.**—The harbor master's jurisdiction shall extend over all waters within Miami Harbor limits and all waters within Dade Country.

**Speed limits.**—Speed: This is a very important matter in the port of Miami, and vessels and boats of all descriptions will carefully observe the following rules and please remember the law is clear that you are responsible for damage caused by your boat regardless of speed.

1. On the Miami River, 6 miles per hour.

2. From mouth of Miami River, south, 6 miles per hour until striking the main channel, then there is no speed limit, except ship's officers must use discretion in passing smaller craft at a high rate of speed, so as not to endanger life.

3. From the mouth of the Miami River to the Government Cut by the old channel, no speed limit.

4. From the mouth of the Miami River, north along Bay Front Park, the city yacht docks and 400 feet north of same, 6 miles per hour.

5. Main channel, no speed limit.

6. The channel between the two causeways to Miami Beach, 10 miles per hour.

7. In the channel north of the Venetian Causeway, no speed limit.

8. Between the east drawbridge on the MacArthur Causeway and the east drawbridges of the Venetian Way, no speed limit, if the boats are held squarely in the channel, but any boat using the waters between these two points, and for 200 feet from the shore, 6 miles per hour.

9. North of the east drawbridge of the Venetian Way, around Belle Isle to Fisher's slips, 6 miles per hour.

10. In Indian Creek, Miami Beach, and in all canals in Dade County, 6 miles per hour.

11. From Fisher's slips, north, no speed limit.

12. From the west drawbridge of the Venetian Way in the main channel to the northern boundaries of the bay, no speed limit.

13. No boat or vessel shall travel at a speed in going through any drawbridge that in any way endangers the drawbridge or at such a speed as to cause water to be thrown that damages through wetting the machinery used in connection with such drawbridge.

High-powered vessels shall not pass each other at a speed of more than 15 miles per hour. When passing smaller boats, such as row boats and the like, all vessels and power boats must slow down so that such small boats will not be endangered.

All tugs and other vessels towing, being in tow, or running light shall keep to one side of the channel when a ship is passing in either direction.

When passing the causeway dock, vessels shall slow down to only such speed as will give steerage way. This is left to the judgment of the master and pilots.

Any vessel or boat which causes damage to other crafts by suction or the swell from such vessels shall be responsible for any damage which may occur by reason thereof, if the injured vessel has taken reasonable safety precautions.

Speed limits for the canals, rivers, and creeks in Dade County shall be 6 miles per hour.

**Penalty.**—Whoever violates any of the foregoing rules or regulations shall be punished by imprisonment not exceeding 60 days, or by fine not exceeding $100 as provided by section 7995, Compiled General Laws of Florida, 1927.

**Tides.**—The mean rise and fall of tide at Miami is about 2 feet and at Miami Beach about 2½ feet. High and low waters at Miami occur about 1½ hours later than at Mayport, but at Miami Beach they occur about the same time as at Mayport.

**Currents.**—Strong tidal currents run in the Main Channel entrance, the average strength of current being about 2 knots. Daily predictions of times of slack water and times and velocities of strength of flood and ebb for Miami Harbor entrance are given in the *Atlantic Coast Current Tables*. A strong north wind causes considerable southerly current across the ends of the jetties. Between the entrance cut and Causeway Terminal the current sets north with the flood and south with the ebb.

**Bridges.**—The channels to Miami Harbor docks and the entrance to Miami River are free of bridges with the exception of a bascule bridge crossing the southern

approach from Hawk Channel. This bascule bridge on the Rickenbacker Causeway has a horizontal clearance of 80 feet and a vertical clearance of 23 feet, closed, at high water.

During the period from December 1 to April 1, inclusive, the following regulations govern operation of the drawspan of the MacArthur Causeway across the eastern channel: The draw remains closed from 7 a. m. to 9 a. m. except on the half-hour and even hour for sufficient time to pass any vessels awaiting passage. The draw remains closed from 4:30 p. m. to 6:30 p. m., except that it is opened at 5:30 for sufficient time to pass any vessels awaiting passage.

**Directions, Miami Harbor.—Approaches to main channel.**—From northward: From a position 1.5 miles east of Hillsboro Inlet Light, make good a **183°** course for 29.4 miles to a position close to Miami lighted whistle buoy 2. Then head into the dredged channel passing close to lighted bell buoy 2A.

From southward: From a position 2 miles east of Fowey Rocks Light, make good a **353°** course for 10.6 miles to a position close to Miami lighted whistle buoy 2.

From seaward: Steer to a position close to Miami lighted whistle buoy 2.

From Hawk Channel: Practically all boats from this channel are able to enter Miami Harbor via Biscayne Channel. If entrance by main channel is desired, follow directions for Hawk Channel given in Chapter 3, northbound, until Miami lighted whistle buoy 2 bears 070°, then head in on the entrance range.

**Approaches to Biscayne Channel.**—From northward: Use the main channel instead of Biscayne Channel.

From southward, via Hawk Channel: Follow the course for Hawk Channel until about 2.4 miles north of Soldier Key Daybeacon 2. This position is on Biscayne Channel entrance range.

From seaward: Come to a position on Biscayne Channel entrance range, about 1 mile east-southeast from Cape Florida Shoal Light.

Courses and distances, main channel, Sea to Miami. See Chapter 3.

**Wharves.**—The principal wharves in the Miami River can accommodate any boats able to enter the river.

**Towboats** usually are available for any kind of towing required.

**Supplies** and provisions of any kind are obtainable in Miami, and the wharves service gasoline, fuel oil and lubricating oils, and fresh water. Coal in limited quantities is always available and large quantities upon advance notice.

**Miami River** trends westward through the southern part of the city of Miami to the Everglades. The river is a very important part of the Miami water front for both commercial and pleasure craft. The largest repair yards and a great many storage basins are along the river banks. Supplies of all kinds are available.

A Federal project provides for a channel 15 feet deep and 150 feet wide from the entrance at Brickell Point in Biscayne Bay to the mouth of South Fork, thence 125 feet wide for 1 mile, and thence 90 feet wide for 1.2 miles.

In December 1947, the controlling depths were as follows: To the NW. Twenty-seventh Avenue highway bridge, 15 feet, thence 8 feet to the Seaboard Air Line Railroad bridge, thence 7 feet to the NW. Thirty-sixth Avenue bridge which is 400 yards above the head of the project and is the head of navigation. Currents are strong on the ebb and cause whirls at the bends.

Within the limits of the improvement project 9 highway and 2 railway bridges cross the river. The minimum horizontal clearance is 60 feet and vertical 6½ feet over

high water. All bridges having vertical clearances of more than 7 feet post gage boards on both sides to show clearances at center of the spans. Speed is limited to 6 miles per hour.

| Nautical miles above mouth | Name of location | Type of bridge | Horizontal clearance | Vertical clearance at high water |
|---|---|---|---|---|
| | | | *Feet* | *Feet* |
| 0. 1 | SE. 2d Ave | Bascule | 94 | 20½ |
| 0. 2 | S. Miami Ave | do | 75 | 8 |
| 0. 4 | Florida East Coast Ry. at SW. 1st Ave | Swing | 50. 2 | 6¼ |
| 0. 5 | SW. 2d Ave | Bascule | 75 | 11 |
| 0. 8 | SW. 1st St | do | 75 | 18½ |
| 0. 9 | W. Flagler St | do | 60 | 8 |
| 1. 3 | NW. 5th St | do | 70 | 12½ |
| 1. 7 | NW. 12th Ave | do | 85 | 17½ |
| 2. 3 | NW. 17th Ave | do | 75 | 17½ |
| 3. 5 | NW. 27th Ave | do | 75 | 18 |
| 4. 6 | Seaboard Air Line RR. at NW. 38th Ave | do | 60 | 6 |

**Rules governing these bridges are:** *Miami River, Fla.; highway bridges from mouth to and including city of Miami bridge at NW. Fifth Street, Miami.*

1. Except as otherwise provided in paragraphs 2, 3, and 4 of this section, the owners of or agencies controlling these bridges shall not be required to open the drawspans for the passage of vessels from 8 a. m. to 9 a. m. and from 5 p. m. to 6:30 p. m. on all days other than Sundays and legal holidays.

2. This section shall not apply to vessels owned or operated by the United States. All such vessels shall be passed without delay through the draw of any bridge at any time on giving the usual signal.

3. During the existence of a hurricane alert duly issued by the United States Weather Bureau affecting the Miami area, all of the bridges shall be opened for the passage of vessels giving the usual signal at any time.

4. The draw of any bridge shall be opened at any time for the passage of a vessel in an emergency involving danger to life or property. Such an emergency shall be indicated by four blasts of a whistle, horn, or megaphone.

5. The owners of or agencies controlling the bridges shall keep a copy of these regulations conspicuously posted on both the upstream and downstream sides thereof, in such manner that it can be easily read at any time.

6. This section shall remain in full force and effect until revoked or modified by the Secretary of the Army.

**Repairs.**—Ordinary repairs to machinery and engines can be made at Miami. A floating drydock just south of the municipal piers at Miami has a capacity of 1,000 tons and takes a vessel 240 feet long with a draft of 15 feet. The largest marine railway on the Miami River is capable of hauling out a vessel 190 feet in length, 11½-foot draft, and 1,800 tons. Other smaller shipyards are situated along the Miami River. Heavy repairs may be made in Jacksonville, Fla., or Charleston, S. C.

**Storm warnings** are displayed from the flagpole at the city yacht basin.

**Miami Beach** is the colorful resort and play spot on the peninsula and the outside beach, east of Miami and Biscayne Bay. Several bridges cross the bay forming good highway connection with the city of Miami. Miami Beach is wholly residential except for shops and recreational establishments. On its southwest end, south of MacArthur Causeway and just inside the jettied entrance of the main channel, are located the only commercial wharves. The municipal wharf is located at this point with a depth of 19 feet alongside and in Meloy Channel, connecting with the main channel. Numerous small

wharves are along the west side of the city and these are used entirely by pleasure craft. The east side of the city fronts directly on the ocean. An amusement pier extends out into the sea about 0.3 mile north of the jetties. Several structures are prominent from seaward.

**Coconut Grove** is situated in the city limits of Miami, 3.5 miles southwest of the courthouse. A channel with a controlling depth of 6 feet at mean low water and well marked by beacons leads from the deeper waters in Biscayne Bay. Biscayne Bay Seaplane Base (Coast Guard) is at Dinner Key. A marine railway at Coconut Grove has a capacity of 1,500 tons, 150-foot length, and 10-foot draft.

**Coral Gables,** another picturesque resort, adjoins Miami on the southwest. A canal has been dug through the coral rock to the highway bridge on U. S. Route 1, approximately 2 miles. The canal is deep and makes a scenic passageway. There are no docks along the sides. The canal was cut to obtain coquina rock, and for drainage purposes. Fixed bridges with limited clearances cross the canal. A reported draft of 4 feet can be taken into the mouth of the canal at mean low water. An important landmark is the tower of the Miami Biltmore Hotel at Coral Gables, which shows well over the lower part of Biscayne Bay and the approach to Miami from the southwest.

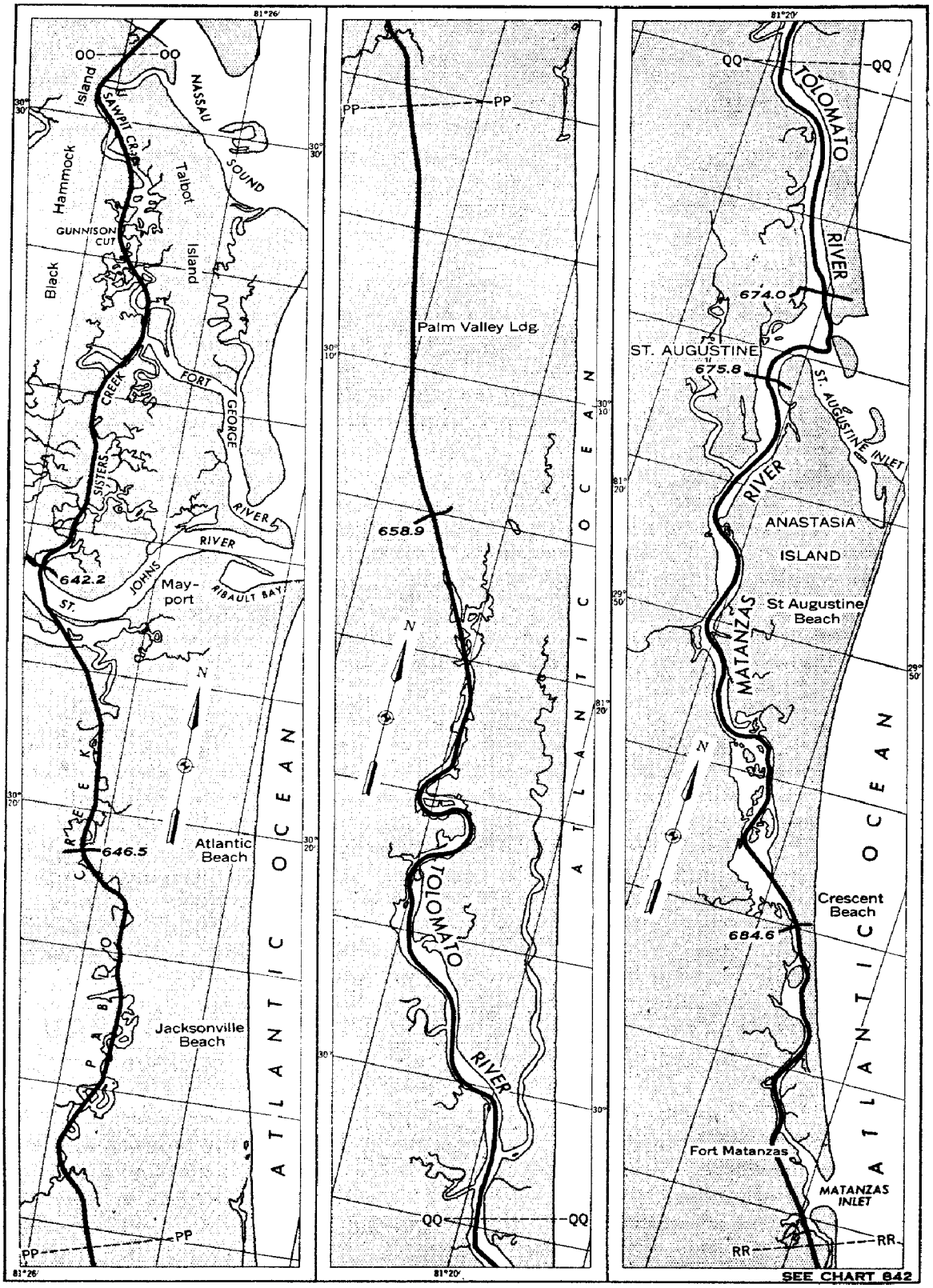
**Biscayne Bay** is a large shallow body of water extending in a southerly direction 33 miles between 25°55′ and 25°22′N. For the upper 9 miles the bay has a width of about 2 miles and is separated from the Straits of Florida by a narrow peninsula and Virginia Key and Key Biscayne. For the remainder of the distance the average width of the bay is nearly 7 miles, and it is separated from Hawk Channel by a number of keys and coral banks between which there are several narrow and shallow passages. A great part of the bay has depths of 9 and 10 feet, and there are a few places with depths of 13 and 15 feet, but near its head it is very shallow. South of Cape Florida, on Key Biscayne, the bay has little importance.

The north end of the bay is the center of an extensive commercial development which has entirely changed the shoreline and the channel depths. The city of Miami Beach occupies the peninsula that separates the upper part of Biscayne Bay from the ocean. Miami now covers virtually the whole of the west side of the bay north of Key Biscayne. These two cities, together with adjoining cities, form a unit known as "Greater Miami." This is an important commercial center. The winter tourist trade accounts for the biggest part of the business of the port. Biscayne Bay is unexcelled as a yachting and small-boat center.

# Intracoastal Waterway, Nassau Sound to Miami

Charts 842, 843, 844, 845, 846, 847

The Federal project for that portion of the Intracoastal Waterway between Nassau Sound and St. Johns River provides for a channel 12 feet deep and 90 feet wide in the land cuts and narrow streams and 150 feet wide in open waters. Dredging to provide project dimensions has been completed. For controlling depths see the weekly *Notice to Mariners*.



81°26′
OO
OO
Black Hammock Island
SAWPIT CREEK
NASSAU SOUND
Talbot Island
GUNNISON CUT
FORT GEORGE RIVER
SISTERS CREEK
ST. JOHNS RIVER
642.2
May-port
RIBAULT BAY
N
646.5
Atlantic Beach
PABLO CREEK
Jacksonville Beach
ATLANTIC OCEAN
PP
PP
81°26′
PP
PP
Palm Valley Ldg.
658.9
N
TOLOMATO RIVER
ATLANTIC OCEAN
QQ
QQ
81°20′
81°20′
QQ
QQ
TOLOMATO RIVER
674.0
ST. AUGUSTINE
675.8
ST. AUGUSTINE INLET
RIVER
ANASTASIA ISLAND
St Augustine Beach
MATANZAS
N
Crescent Beach
684.6
Fort Matanzas
MATANZAS INLET
RR
RR
ATLANTIC OCEAN
SEE CHART 842

From St. Johns River to Miami the project provided for a channel 8 feet deep and 100 feet wide which was completed. The former project has been modified to provide a channel generally 125 feet wide and 12 feet deep. To date, February 1948, no funds have been appropriated for construction of the new portion of the project.

**General regulations** governing bridges and locks and the handling of tows are quoted in Chapter 2.

## Nassau Sound to Matanzas Inlet

### Chart 842

At *Mile 633.5*, the Intracoastal Waterway leaves Nassau Sound through a cut 0.9 mile long. The route then enters **Sawpit Creek.** In an emergency, gasoline may be obtained at a small settlement on the west bank of the creek at *Mile 634.7*. The waterway continues along Sawpit Creek, **Gunnison Cut,** and to the head of Fort George River.

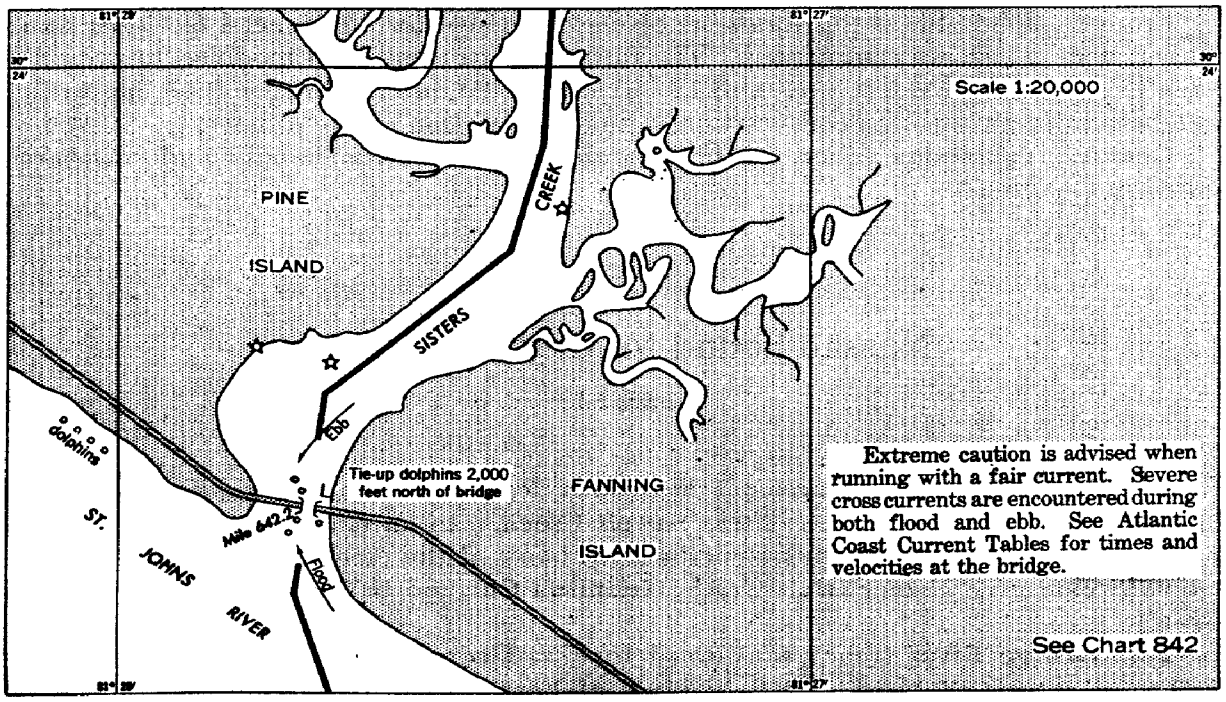
**Fort George River** trends southward to Fort George Inlet. When coming from northward care is required at the junction of Fort George River and Sisters Creek, *Mile 638.2*, to avoid being misled by the daybeacons marking the river. A yacht basin in Fort George River is considered one of the best havens in the vicinity.

The waterway continues down **Sisters Creek.** About 1 mile north of the south entrance to Sisters Creek and at the south end of Gunnison Cut the tide divides. The tidal currents in this section vary from 0 to 2½ knots. Flood (north) and ebb (south) currents in the lower section of Sisters Creek occur about 3½ hours earlier than in the St. Johns River. Hence, on the last half of the ebb and the first half of the flood in the St. Johns River the current flows from the river into Sisters Creek and on the last half of the flood and the first half of the ebb in St. Johns River, it flows from Sisters Creek into St. Johns River.

At *Mile 642.2*, across Sisters Creek at the junction with St. Johns River, is Sisters Creek bascule bridge with a horizontal clearance of 77.2 feet and a vertical clearance, closed, of 9¼ feet at high water. Cross currents are encountered during both flood and ebb tides at this bridge and extreme caution should be exercised. When approaching the bridge from upstream on the St. Johns River side during flood tide, tugs should approach opening with tow well straightened out and at right angles to the bridge. Sufficient headway should be maintained to avoid being carried toward the west fender. When proceeding south during ebb tides tows should be well straightened out at right angles to the bridge with sufficient headway maintained to avoid encountering the west fender. It is suggested that long tows be broken up. Caution is advised; flood and ebb currents up to 2½ knots may be expected. The mean tidal range at the bridge is 3¾ feet.

Docking facilities and Government-owned tie-up dolphins are available at Sisters Creek bridge.

For facilities and supplies on the St. Johns River see pages 272 to 286.




The Intracoastal Waterway continues south across St. Johns River and into **Pablo Creek.** About 3.7 miles south of St. Johns River at *Mile 646.5* is Pablo Creek bascule bridge. It has a horizontal clearance of 59 feet and a vertical clearance, closed, of 5¼ feet at high water. The mean tidal range at the bridge is 2½ feet. Strong currents may be experienced in the passage through this bridge. At the bridge is 200 feet of dock space with a 10-foot depth alongside; dockage is not charged. Gasoline, fuel oil, fresh water, ice, meals, and some groceries are available. Bus and telephone service to Jacksonville and Jacksonville Beach are maintained. An overhead cable crosses the creek at the bridge with a vertical clearance of 86¼ feet at high water.

At *Mile 648.8*, a Federal project provides for the **Jacksonville Beach** turning basin 8 feet deep, 400 feet wide, and 800 feet long. No work has been done.

Overnight docking facilities are available at *Mile 649.3*, just south of the old railroad fill. The yacht basin has 9 slips available for yachts up to 50 feet in length and 6-foot draft. Gasoline was not available in October 1947, but plans were under way to install tanks.

At *Mile 651.9* the waterway leaves Pablo Creek and enters a long cut.

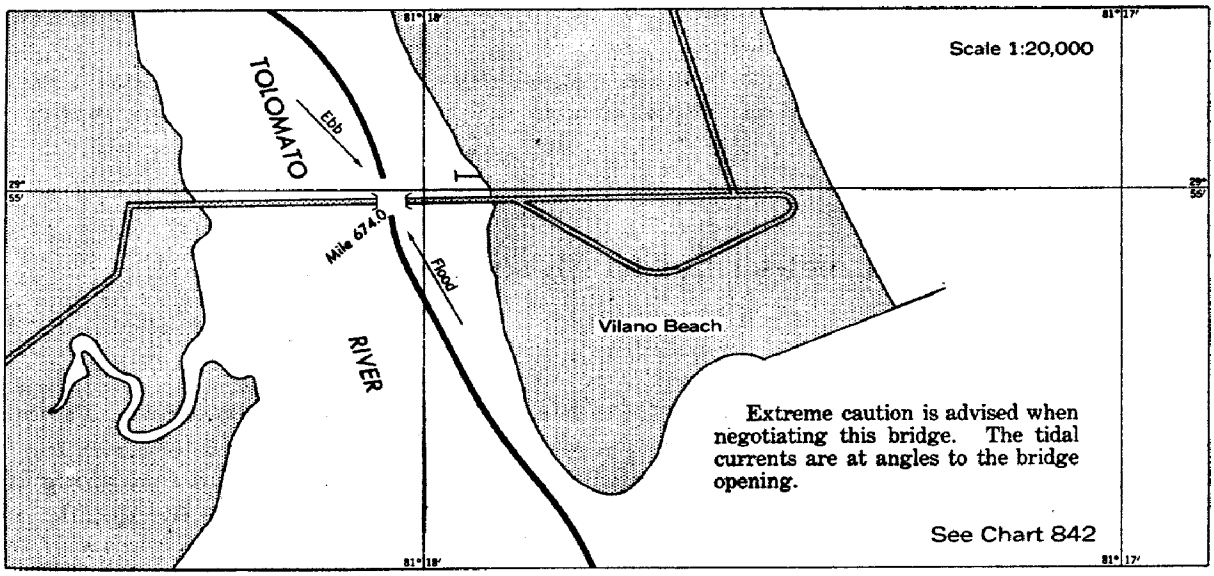
**Palm Valley Landing,** *Mile 656.1*, has two locations with docking facilities for yachts. Gasoline, Diesel oil, water, and fresh provisions are available. A marine railway and general repairs as well as anchorage areas are provided.

Palm Valley bascule bridge with a horizontal clearance of 80 feet and vertical clearance, closed, of 11½ feet at high water crosses the cut at *Mile 658.9*. The mean tidal range at the bridge is 2 feet.

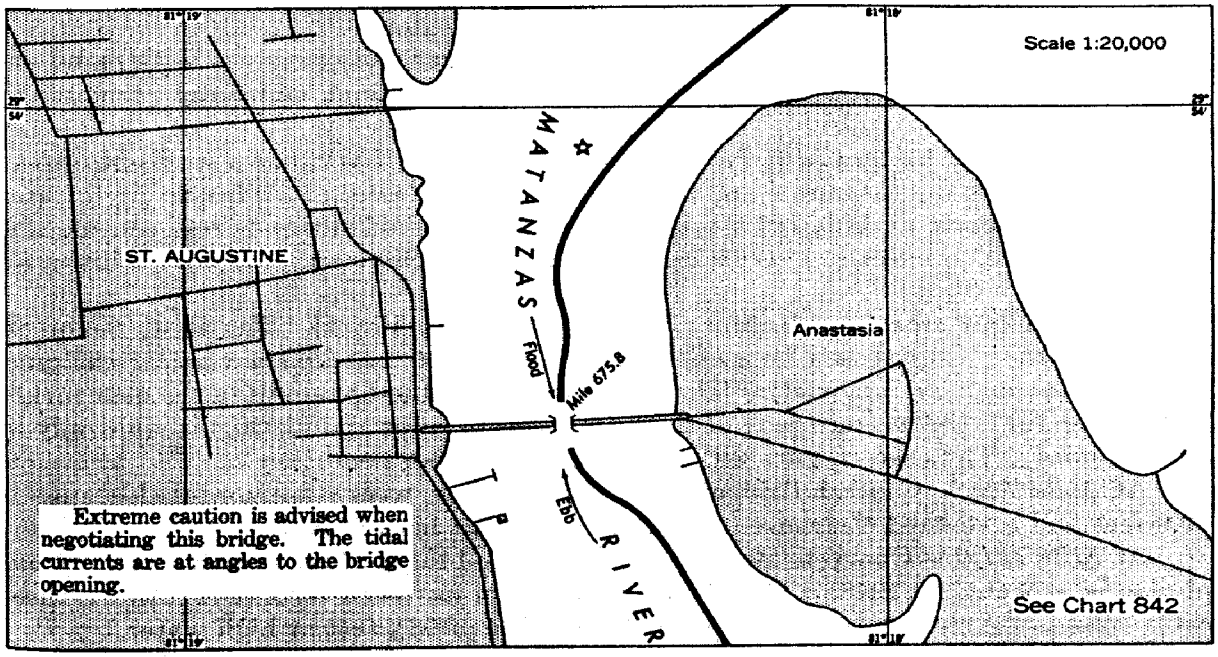
The route continues through the long cut to **Tolomato (North) River,** *Mile 661.1*.

At *Mile 674.0* the Vilano Beach bascule bridge with a horizontal clearance of 68.4 feet and a vertical clearance, closed, of 8½ feet at high water crosses the Tolomato

River. The mean tidal range at the bridge is 4¼ feet. A new bridge is under construction at Vilano Beach and the old bridge swing span was removed, leaving the space open to waterway traffic at all times, February 1948. Tidal currents are at angles to the bridge. Flood currents up to 1 knot and ebb currents up to 1½ knots may be expected during normal weather. Caution is imperative. 5




The waterway continues on beyond St. Augustine Inlet into the **Matanzas River** and **St. Augustine.** They are described in another section.



At *Mile 675.8* is the Bridge of Lions, a bascule bridge across the Matanzas River with a horizontal clearance of 72 feet and vertical clearance, closed, of 25 feet at high water. The tidal range at the bridge is 4¼ feet. Tidal currents, particularly ebb, are at angles to the bridge. Caution is advised. It is advisable to drift large tows through this opening with favorable currents. Normal flood currents of 1 knot and ebb currents of 1½ knots may be expected.

The Intracoastal Waterway continues down the Matanzas River which separates Anastasia Island from the mainland.

At *Mile 684.6* **Crescent Beach** bascule bridge across the Matanzas River has a horizontal clearance of 79 feet and a vertical clearance, closed, of 6½ feet at high water.

## Matanzas Inlet to Mosquito Lagoon

Chart 843

South of Matanzas Inlet at *Mile 691.4* is **Marineland.** At the oceanarium, various species of fish and marine life are shown in their natural habitat; an admission fee is charged. A marine depot has 300 feet of dock space with a depth of 5 feet along its face. Gasoline, Diesel oil, water, bus and taxi service are available at the depot. A hotel and restaurants are within walking distance.

At **Flagler Beach,** *Mile 704.0* is a hand-operated swing bridge with horizontal clearance of 54 feet and vertical clearance, closed, of 4 feet at high water. The channel is through the west draw. An overhead cable crosses at the bridge with a vertical clearance of 80 feet at high water.

At *Mile 708.7* is a hand-operated swing bridge with a horizontal clearance of 58½ feet and vertical clearance, closed, of 3½ feet at high water.

At *Mile 710.7* the waterway enters the **Halifax River** and continues to **Ormond** and **Ormond Beach.** Gasoline, provisions, water, rail connections, and hotel accommodations are available.

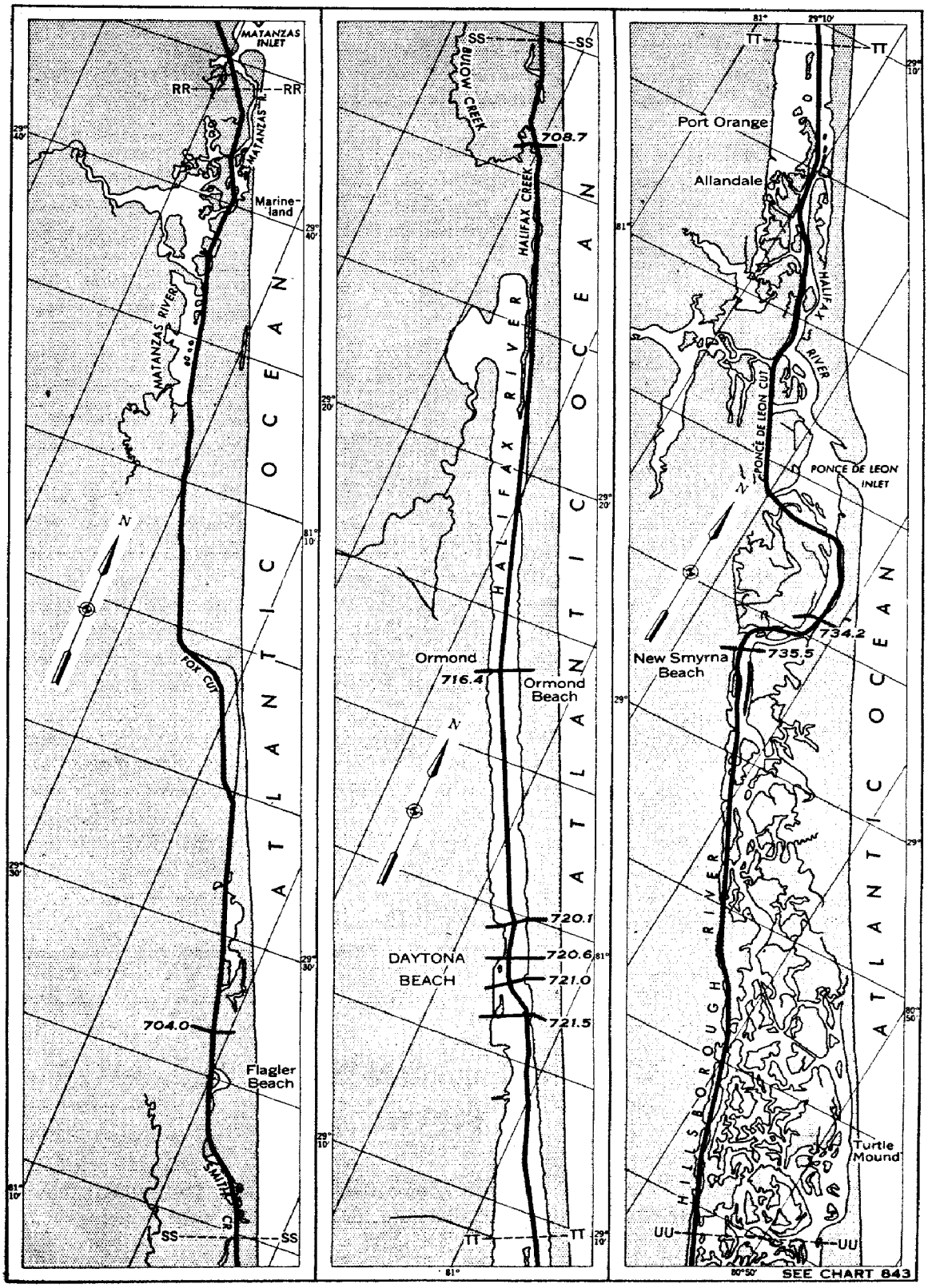
Ormond swing bridge, *Mile 716.4*, across the Halifax River, has a horizontal clearance of 54 feet at the east draw and vertical clearance, closed, of 3¼ feet at high water.

**Daytona Beach,** at *Mile 721.0* is a large resort with good stores, hotels, considerable dock space, and practically everything needed by a yachtsman. Repair facilities are excellent.

Four bridges cross the Halifax River at Daytona Beach. The first, Seabreeze Bridge, at *Mile 720.1*, has a horizontal clearance of 110 feet and a vertical clearance unlimited (swing span removed). The bridge is expected to be rebuilt in the near future. In October 1947, the western part of the bridge was in ruins and distinguishable only by rows of piles. The eastern part was standing but in poor condition.

At *Mile 720.6*, Central Bridge has a bascule span with a horizontal clearance of 59.9 feet and a vertical clearance, closed, of 8½ feet at high water.

At *Mile 721.0* is Concrete Bridge, a new bascule bridge under construction. Completion is expected in 1948. The former swing span has been removed. An overhead cable crosses the river here with a vertical clearance of 98½ feet at high water.


MATANZAS INLET
RR
MATANZAS R.
Marineland
MATANZAS RIVER
FOX CUT
ATLANTIC OCEAN
704.0
Flagler Beach
SMITH CR.
SS
BLOW CREEK
708.7
HALIFAX CREEK
HALIFAX RIVER
Ormond
716.4
Ormond Beach
720.1
DAYTONA BEACH
720.6
721.0
721.5
TT
Port Orange
Allandale
HALIFAX RIVER
PONCE DE LEON CUT
PONCE DE LEON INLET
734.2
New Smyrna Beach
735.5
HILLSBOROUGH RIVER
Turtle Mound
UU
SEE CHART 843

At *Mile 721.5*, South Bridge has a bascule span with a horizontal clearance of 60.7 feet and a vertical clearance, closed, of 9.6 feet at high water.

A 6-foot channel leads to the city wharf which can accommodate a large number of yachts. At the Yacht Club, reciprocal courtesies are extended to visiting members of other yacht clubs.

Yacht storage and repair facilities are available at two shipyards, one 0.3 mile south of Seabreeze Bridge and the other about 0.5 mile south of the yacht club. Here an 8-foot channel leads to an almost land-locked yacht basin with 5,000 feet of dock space. The largest of the three marine railways is capable of hauling out vessels up to 600 tons, 165 feet in length, 28-foot beam, and 12-foot draft. Hot showers, groceries, mail and laundry service, gasoline, Diesel oil, and so forth are available at both yards.

About 1.3 miles south of South Bridge is a **Measured Statute Mile.** The targets are on the east shore.

The waterway continues down the Halifax River to *Mile 729.4* where it enters **Ponce de Leon Cut.** Strong cross currents may be felt at times in this cut due to the currents from **Spruce Creek** veering from one side of the channel to the other.

About 0.5 mile east of the northern entrance of Ponce de Leon Cut is **Inlet Harbor**; gasoline and fresh water can be obtained. About 1 mile below Inlet Harbor is **Ponce Park.**

From Ponce de Leon Cut the waterway enters **Hillsborough River** at *Mile 732.8*.

At *Mile 734.2* is Coronado Beach swing bridge with horizontal clearance of 60 feet and vertical clearance, closed, of 6¾ feet at high water.

New Smyrna Beach swing bridge is at *Mile 735.5* with a horizontal clearance of 56 feet and vertical clearance, closed, of 4¾ feet at high water. During flood, southerly flow, current from **Sheephead Cut** makes a cross current in a westerly direction north of this bridge. Boats with tows proceeding southward during flood tide are advised to allow for this cross current.

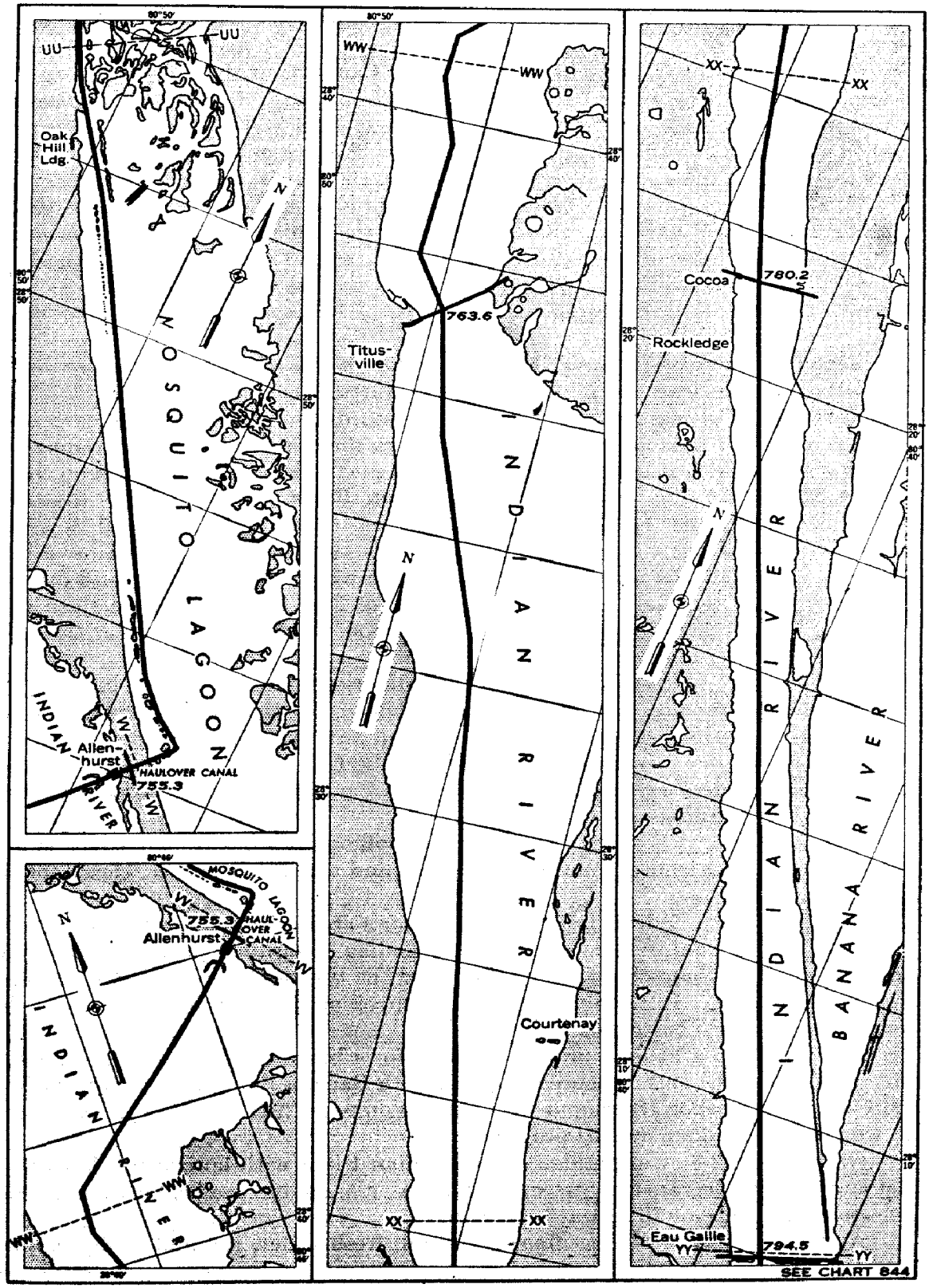
At **New Smyrna Beach,** *Mile 735.5*, gasoline, fuel oil, fresh water, and food can be obtained. Dock space is available at the city wharf and at the Anglers Club, which operates a yacht basin in the protected waters 600 yards northwest of New Smyrna Bridge. In October 1947, the depth was 11 to 13 feet in the channel leading to the yacht basin and 8½ feet alongside the dock inside. At the bend in the river north of New Smyrna Bridge is a marine railway capable of hauling out boats up to 75 tons, 60 feet in length and 6-foot draft. Facilities for hull and engine repairs and storage are available. The depth into the storage yard was 8 feet.

The route continues southward on the Hillsborough River to Mosquito Lagoon.

## Mosquito Lagoon to Eau Gallie

### Chart 844

The Intracoastal Waterway through **Mosquito Lagoon** and Indian River is not well protected, hence high winds and rough water must be taken into consideration when navigating.


UU
UU
Oak Hill Ldg.
N
MOSQUITO LAGOON
INDIAN RIVER
Allen-hurst
HAULOVER CANAL
755.3
WW
WW
763.6
Titus-ville
N
INDIAN RIVER
Courtenay
XX
XX
XX
XX
Cocoa
780.2
Rockledge
N
INDIAN RIVER
BANANA RIVER
Eau Gallie
YY
794.5
YY
SEE CHART 844
MOSQUITO LAGOON
755.3
HAUL-OVER CANAL
Allenhurst
N
INDIAN RIVER
WW
WW

**Oak Hill Landing,** *Mile 745.7*, has railroad connections, a post office, and telegraph service.

At *Mile 755.0* the waterway enters **Haulover Canal,** a cut about 0.4 mile long through a strip of land that separates Mosquito Lagoon from the Indian River. Jetties extend approximately 0.5 mile out from the mainland at each end of the cut. Storms have washed sand up along the outside of the jetties which are now covered by brush. This gives the channel the appearance of being about 100 feet in width.

Wind tides are quite pronounced at times producing strong currents in the canal. Southerly winds will build up the water level on the Indian River side of the canal and at the same time lower the water level on the Mosquito Lagoon side. Northerly winds will cause the reverse effect. At such times the normal water level varies as much as 2 feet, with currents through the channel up to 1½ knots setting in the direction of the wind.

Near the center of Haulover Canal at *Mile 755.3* is a hand-operated swing bridge with a horizontal clearance of 55 feet and a vertical clearance, closed, of 7½ feet at normal stage. The channel is through the south draw. Care must be exercised if it becomes necessary to stop before passing through the drawbridge when a strong current is setting as the sides of the canal are rocky. A post office is at **Allenhurst** on the canal.

At *Mile 755.5* the waterway enters **Indian River.** It extends southward from Haulover Canal to St. Lucie Inlet, a distance of 103 miles. In general it is a broad lagoon quite shallow in places. The spoil banks alongside the channel have built up in recent years and now appear as small islets on which are mangrove and other trees.

The river is nontidal except in the vicinity of Fort Pierce and for a short distance above St. Lucie Inlet where the depth may vary as much as 2 feet under the influence of strong northerly and southerly winds.

At **Titusville,** *Mile 763.6*, the principal industries are pleasure-boat building, citrus-fruit and flower growing, crab packing, and fishing. North of the bridge is an excellent yacht basin, well protected, and connected to the waterway by a dredged channel which had a controlling depth of 7 feet in October 1947. Gasoline, Diesel oil, and fresh water are available but dock space is limited. There are neither repair facilities nor municipal docks. **Storm warnings** are distributed locally.

The hand-operated swing bridge at Titusville across the Indian River is at *Mile 763.6*. It has a horizontal clearance of 54 feet and vertical clearance, closed, of 9½ feet at high water.

At *Mile 774.1* a Federal project provides for a channel 100 feet wide and 8 feet deep from the Intracoastal Waterway to and including a turning basin of same depth at **Courtenay**. The channel is 1.5 miles long and the turning basin averages 550 feet long and 250 feet wide. In October 1947, the controlling depth was 7 feet. The channel was dredged to ship out citrus fruit.

At *Mile 777.3* a Federal project provides for a barge canal 8 feet deep and 100 feet wide connecting the Intracoastal Waterway with Banana River, across Banana River to the Canaveral Harbor Development described on page 294. To date, November 1947, no work has been done on this project.

At *Mile 780.2* a swing bridge crosses Indian River with horizontal clearance of 82 feet and vertical clearance of 5¼ feet at high water. An overhead cable crosses here with a vertical clearance of 79 feet at high water.

At **Cocoa,** *Mile 780.2*, gasoline, Diesel oil, fresh water, ice, and yacht supplies are

available. South of the bridge is a yacht basin where passing yachts can obtain dock space. A marked channel with a depth of 7 feet in October 1947 leads to the docks. The yacht basin has a small marine railway with a capacity of 20 tons where boats up to 40 feet in length can be hauled out for hull repairs.

Across the Indian River from Cocoa is a repair yard with a marine railway capable of hauling out boats up to 45 feet in length and 4½-foot draft for general repairs. Gasoline, Diesel oil, fresh water, and dock space for a few yachts are available. A dredged channel 50 feet wide, paralleling the bridge on the north side, had a controlling depth of 5 feet in October 1947.

The waterway continues down the Indian River to Eau Gallie and the Banana River.

## Eau Gallie to Walton

### Chart 845

At *Mile 794.5* a swing bridge with a horizontal clearance of 60.8 feet and a vertical clearance, closed, of 10 feet at high water crosses the Indian River.

At **Eau Gallie,** *Mile 794.5*, gasoline, Diesel oil, fresh water, hot showers, laundry service, and the like are available at the yacht basin near the mouth of **Elbow Creek (Eau Gallie River).** Provisions can be obtained in town. Yacht docks, storage, and general repairs are available at the yacht basin. A machine shop and two marine railways, the larger of which is capable of hauling out boats up to 85 feet in length and 6-foot draft, are in the basin. Good protection from storms is offered in this practically landlocked basin. Eau Gallie has a harbor master.

The channel leading into the basin from the Intracoastal Waterway had a controlling depth of 7 feet in November 1947. Inside the basin the depth was 9 feet with 3 to 4 feet up Elbow Creek above the basin. A city ordinance limits the **speed** to 4 miles per hour in Elbow Creek.

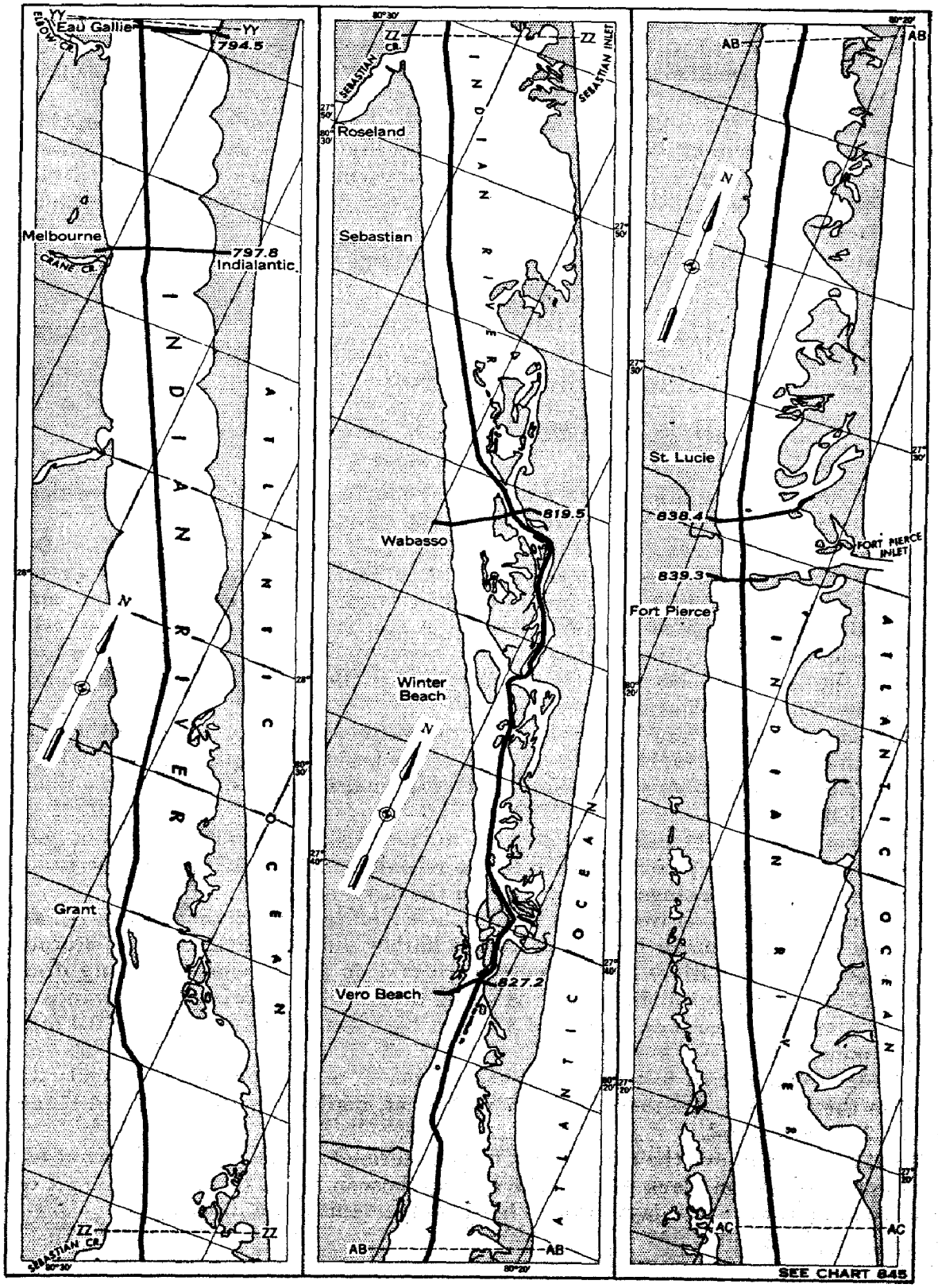
In November 1947, the municipal dock on the north side of the bridge was in poor condition and its use by passing yachts is not recommended. The city water has a sulphur odor. **Storm warnings** are displayed in the daytime only.

Across the Indian River from Eau Gallie is the entrance to the **Banana River (Chart 1246)** which is used by small boats as a refuge harbor during hurricanes and storms. The channel in Banana River leading northward is deep and navigable by any draft boat which can enter the Indian River. A swing bridge with a horizontal clearance of 31 feet and a vertical clearance, closed, of 8 feet at high water crosses this river 0.4 mile above the mouth.

A dredged channel 15 feet deep, marked by buoys and daybeacons, extends 3.7 miles from the mouth. Another channel 7 to 12 feet, marked by the unlighted range, extends 2.2 miles beyond.

About 3.5 miles above the mouth is an unlighted range. The front daybeacon has a white square target on black piles. The rear daybeacon has a rectangular target on a white skeleton tower; this daybeacon is hard to distinguish at a distance.

789003°—48——20


Eau Gallie
YY
794.5
Melbourne
797.8
Indialantic
CRANE CR.
INDIAN RIVER
ATLANTIC OCEAN
Grant
ZZ
SEBASTIAN CR.
Roseland
SEBASTIAN INLET
Sebastian
Wabasso
819.5
Winter Beach
Vero Beach
827.2
AB
St. Lucie
838.4
FORT PIERCE INLET
839.3
Fort Pierce
AC
SEE CHART 845

A causeway, 13.2 miles above the mouth, has a swing span with a horizontal clearance of 60 feet and a vertical clearance, closed, of 5 feet at high water.

At *Mile 797.8* (**Chart 845**) is a hand-operated swing bridge with horizontal clearance of 79 feet and vertical clearance, closed, of 6 feet at high water.

**Melbourne,** *Mile 797.8,* is a winter resort. Gasoline, Diesel oil, fresh water, laundry service, groceries, ice, and the like are available. In **Crane Creek,** *Mile 798.1,* is a yacht basin with docking facilities. The marine repair and storage plant on the east side of the basin has a marine railway capable of hauling out boats up to 65 feet in length and 8-foot draft for hull and engine repairs. A machine shop is at the yard. Facilities are also available for unloading boats which are brought in by trailer. The city dock is on the north side of the basin. The harbor master is also a port commissioner. A marked channel with a city maintained lighted range leading from Indian River to the yacht basin had a controlling depth of 6 feet in November 1947. **Storm warnings** are distributed locally.

**Grant,** on the west side of the Indian River at *Mile 807.7,* has railway connections and a post office.

**Grant Farm Island,** in the middle of the Indian River at *Mile 807.9,* is on the east side of the waterway.

**Sebastian Creek,** *Mile 812.6,* is used by local fishing and kelp-gathering boats going to Sebastian and Roseland. All boats using this creek should avoid the piles of the old highway bridge. A fixed bridge crosses the creek with a horizontal clearance of 40 feet and a vertical clearance of 11 feet at high water.

**Sebastian,** *Mile 815.0,* and **Roseland,** *Mile 812.6,* are fishing towns. No docks nor marine service facilities are available to passing vessels.

From *Mile 818.5,* about 1 mile north of Wabasso Bridge, southward to Vero Beach, the Intracoastal Waterway route is crooked and subject to strong currents in narrow places. Caution must be observed at bends where vision is limited.

At *Mile 819.5,* a hand-operated swing bridge crosses the waterway near Wabasso with a horizontal clearance of 60 feet and a vertical clearance of 9¾ feet at high water. An overhead cable crosses with a vertical clearance of 85 feet at high water.

South of the bridge is a public wharf serving **Wabasso,** where railroad connection and hotel accommodations are available.

At *Mile 822.1* is the old **Winter Beach** bridge. The eastern section was removed in the latter part of 1947 and will not be replaced. All piling has been taken out. The middle and western sections of the bridge were in ruins.

About 1 mile north of Vero Beach bridge at *Mile 826.2* is a particularly bad bend. All vessels are advised to give ONE LONG BLAST at a reasonable distance before reaching the bend and proceed on the right-hand side of the channel at a reduced speed. Keep a sharp lookout for an approaching vessel even though no signal is heard.

A hand-operated swing bridge at *Mile 827.2* crosses the waterway at Vero Beach. The bridge has a horizontal clearance of 60 feet and a vertical clearance, closed, of 9¾ feet at high water. Caution must be exercised when approaching this bridge from the north due to a sharp turn 250 feet above the bridge.

**Vero Beach** proper is off the water front. **Riomar,** a subdivision on the eastern side of the Indian River at *Mile 827.2,* has a city dock where gasoline, fresh water, showers, and docking facilities for passing yachts are available. Provisions are available in town. **Storm warnings** are distributed locally.

From Vero Beach to Walton the Indian River widens out and is quite shallow. The Intracoastal Waterway route is well marked and easy to follow. Spoil banks parallel the channel at a distance of several hundred yards and are mostly covered with mangrove and a few Australian pines.

North of the port of Fort Pierce at *Mile 838.4* is a swing bridge with a horizontal clearance of 80 feet and a vertical clearance, closed, of 9 feet at high water. A partially submerged wreck lies in the bight northwestward of this bridge.

At *Mile 839.3* a swing bridge crosses the waterway at **Fort Pierce** with a horizontal clearance of 80 feet and a vertical clearance, closed, of 8½ feet at high water. A strong cross current exists at this bridge. Vessels proceeding north or south should not approach the bridge until it is fully opened for passage. At all times maintain sufficient headway to avoid being carried against the fender system.

Fort Pierce Inlet and Fort Pierce are discussed in another section.

## Walton to Delray Beach

Chart 846

At *Mile 852.6* Jensen Beach swing bridge crosses the waterway. It is hand operated with a horizontal clearance of 60 feet in east draw and a vertical clearance, closed, of 9 feet at high water. The west opening is obstructed; all vessels will use the east opening as indicated by signs at the bridge.

**Jensen Beach,** *Mile 852.7,* is a winter resort on the west bank of the Indian River. The industries of the town are fishing and the manufacturing of agar-agar, a substitute for pectin used in jellies, jams, and potted meats. Agar-agar is manufactured from seaweed obtained from the Indian River. Dock space at Jensen Beach is limited to shallow-draft craft.

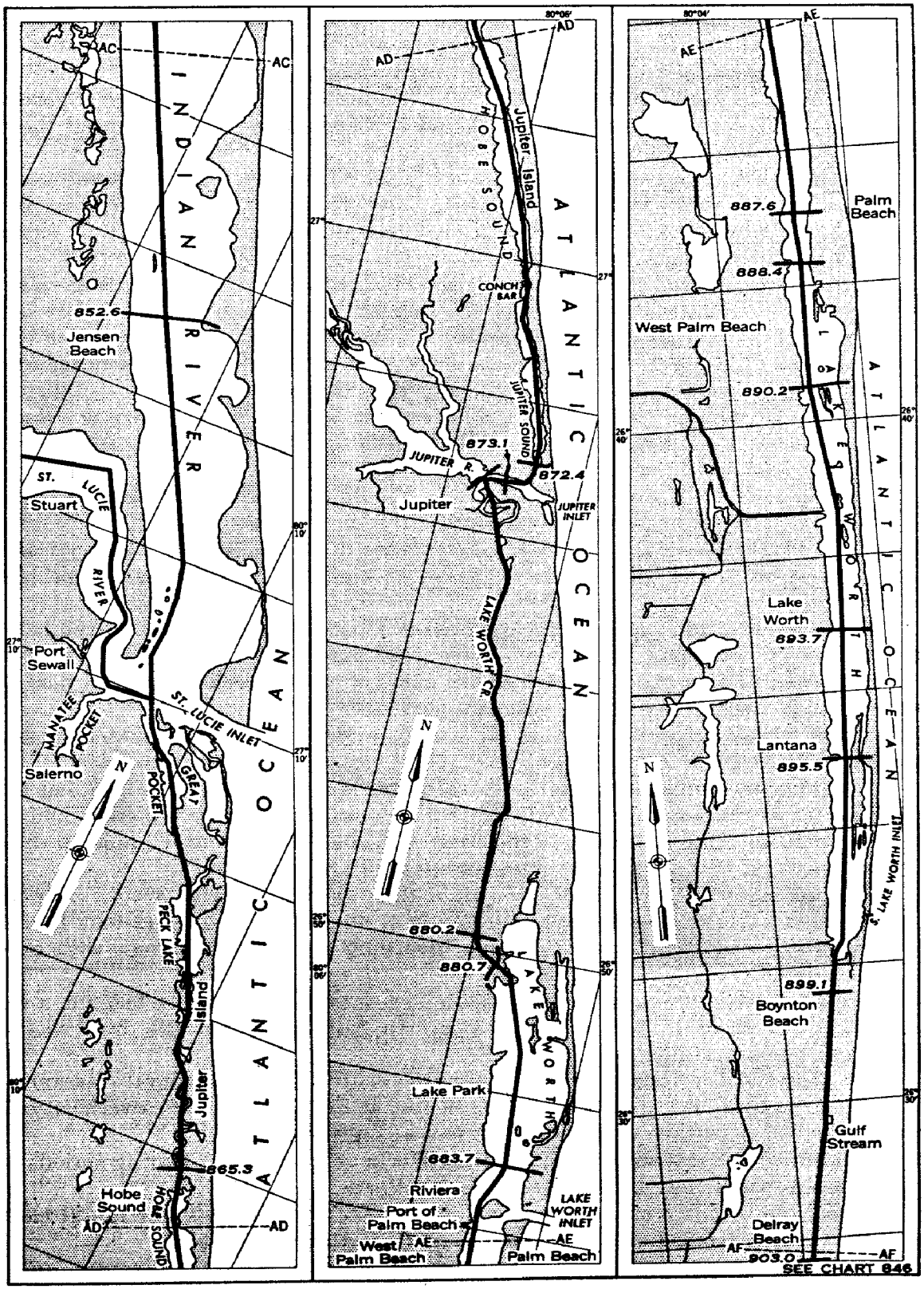
At *Mile 853.8*, a dredged channel leads from the Intracoastal Waterway to a small repair shop on the west side of Indian River. Repair facilities are limited. A marine railway can haul out vessels up to 30 or 40 tons and 50 feet in length for hull repairs. Wet and dry storage for small boats is available. In November 1947, the channel was unmarked and reported to have a depth of 8 feet.

The junction of the Atlantic Intracoastal Waterway and the Okeechobee Waterway is at St. Lucie Inlet, *Mile 857.7*. For description of St. Lucie Inlet and River, Salerno, Port Sewall, and Stuart, see pages 299 to 300.

For description of Okeechobee Waterway see pages 337 to 344.

Extreme caution is advised when crossing the St. Lucie River. Cross currents will give a vessel an east or west set, depending on the velocity and strength of the current in the St. Lucie River. Ranges are established on each side of the intersection and no trouble will be encountered, if vessels are kept on range. If turning from the Intracoastal Waterway into the St. Lucie River or vice versa, allowance must be made for the cross currents to prevent swinging too wide or too short.

The Intracoastal Waterway enters Great Pocket at *Mile 857.7* and proceeds to a canal at *Mile 859.3* continuing to **Hobe Sound,** *Mile 865.6*.


AC
AC
INDIAN RIVER
852.6
Jensen Beach
ST. LUCIE RIVER
Stuart
Port Sewall
MANATEE POCKET
Salerno
ST. LUCIE INLET
GREAT POCKET
PECK LAKE
Jupiter Island
ATLANTIC OCEAN
865.3
Hobe Sound
HOBE SOUND
AD
AD
AD
HOBE SOUND
Jupiter Island
CONCH BAR
JUPITER SOUND
JUPITER R.
873.1
872.4
Jupiter
JUPITER INLET
LAKE WORTH CR.
ATLANTIC OCEAN
880.2
880.7
LAKE WORTH
Lake Park
883.7
Riviera
Port of Palm Beach
West Palm Beach
AE
AE
LAKE WORTH INLET
Palm Beach
AE
AE
887.6
Palm Beach
888.4
West Palm Beach
LAKE WORTH
890.2
ATLANTIC OCEAN
Lake Worth
893.7
Lantana
895.5
LAKE WORTH INLET
899.1
Boynton Beach
Gulf Stream
Delray Beach
AF
AF
903.0
SEE CHART 846

A bascule bridge crosses the route at *Mile 865.3* with a horizontal clearance of 87 feet and vertical clearance, closed, of 11 feet at high water. An overhead cable crosses here with a vertical clearance of 79 feet at high water.

The town of **Hobe Sound** at *Mile 865.7* has railway connections and a post office. The waterway continues in Hobe Sound to **Conch Bar,** *Mile 869.9*, and then proceeds down to Jupiter Sound.

At *Mile 872.4* is a swing bridge with a horizontal clearance of 55 feet and a vertical clearance, closed, of 8½ feet at high water. The channel is through the west draw.

A bascule bridge with a horizontal clearance of 58 feet and a vertical clearance, closed, of 6½ feet at high water crosses Jupiter River at *Mile 873.1*.

Caution is advised when crossing the **Jupiter River.** A sharp, dangerous turn exists at *Mile 873.4*, 0.3 mile west of the Jupiter River bridge. Vessels are advised to give ONE LONG BLAST on approaching the bend and then proceed at reduced speed on the right-hand side of the channel. Overtaking vessels must never attempt to pass another vessel proceeding in the same direction on bends where visibility ahead is restricted to such an extent that a collision with an unseen approaching vessel may result. See the *Pilot Rules for Certain Inland Waters of the Atlantic and Pacific Coasts and of the Coast of the Gulf of Mexico.*

Just west of the Intracoastal Waterway the Jupiter River is crossed by 2 bascule bridges. Care must be taken not to confuse the route with the passage through these bridges. The bridges have a horizontal clearance of 45 and 40 feet and vertical clearance, closed, of 5 and 4½ feet, respectively, at high water. Beyond the bridges the river shoals.

Gasoline, fuel oil, water, or docks were not available at **Jupiter** in November 1947; the docks were destroyed by the September 1947 hurricane.

At *Mile 874.5* on the west bank of the channel is the wreck of a patrol boat. The wreck was 90 percent out of the water in November 1947.

An overhead cable, with a vertical clearance of 86 feet at high water, crosses the waterway at *Mile 875.1*.

**Frenchmans Creek,** entering the Intracoastal Waterway at *Mile 876.6*, has natural facilities for overnight stops. Draft up to 6 feet can be taken up the creek and yachts anchor or tie up along the banks of the creek. A boat basin about 0.2 mile up the creek has wet storage; however, no gasoline nor supplies are available.

A small shipyard is on the west bank of the waterway at *Mile 879.6*. The marine railway is capable of hauling out vessels up to 40 feet in length, 12-foot beam, and 4½-foot draft, for general repairs. A machine shop and gasoline pumps were on order in November 1947.

Monet bascule bridge, *Mile 880.2*, has a horizontal clearance of 58 feet and a vertical clearance, closed, of 4¼ feet at high water. In November 1947 the draw was out of order and remained open at all times.

At *Mile 880.7* a bascule bridge crosses the route with a horizontal clearance of 58 feet and a vertical clearance, closed, of 13½ feet at high water. The overhead cable at this bridge has a vertical clearance of 85 feet at high water.

The Intracoastal Waterway enters **Lake Worth** at *Mile 881.0*. During periods of high winds, rough water may be expected in Lake Worth.

A bascule bridge crosses the waterway at *Mile 883.7* with a horizontal clearance of 59 feet and a vertical clearance, closed, of 9½ feet at high water.

**Lake Worth Inlet; Riviera** *Mile 884.8;* **Port of Palm Beach,** *Mile 885.7* and **Palm Beach,** *Mile 889.5*, are described in another section.

South of Lake Worth Inlet five bridges cross the waterway in Lake Worth.

At *Mile 887.6* is Flagler Memorial bascule bridge with a horizontal clearance of 80 feet and a vertical clearance, closed, of 18 feet at high water.

Royal Palm swing bridge, *Mile 888.4*, has a horizontal clearance of 59 feet, and a vertical clearance, closed, of 10½ feet at high water.

Southern Boulevard bascule bridge, *Mile 890.2*, has a horizontal clearance of 59 feet and a vertical clearance, closed, of 10½ feet at high water.

At *Mile 893.7* is a bascule bridge with a horizontal clearance of 80 feet and a vertical clearance, closed, of 15 feet at high water.

At Lantana, *Mile 895.5*, is a hand-operated swing bridge with a horizontal clearance of 60 feet and a vertical clearance, closed, of 11 feet at high water.

**Lantana,** *Mile 895.5*, a town on the west side of the lake, has a yacht basin and repair yard north of the bridge. A marine railway can haul out vessels up to 200 tons weight, 110 feet in length, and 6-foot draft, for general repairs. Gasoline, Diesel oil, fresh water, electric service, ice, marine supplies, overnight docking, and storage are available. Provisions are available in the town.

**South Lake Worth Inlet,** *Mile 897.8* is used only by small boats with local information. During periods of easterly winds currents through this inlet have great velocity and must be reckoned with when navigating the waterway in this section.

At *Mile 898.5* the Intracoastal Waterway leaves Lake Worth and enters a canal.

A bascule bridge crosses the waterway at *Mile 899.1* with a horizontal clearance of 86 feet and a vertical clearance, closed, of 8 feet at high water.

The route continues through the canal to Delray Beach.

## Delray Beach to Miami

Chart 847

**Delray Beach,** *Mile 903.0*, has a small yacht basin on the west side of the waterway with a number of finger piers for mooring small yachts. Gasoline and Diesel oil are delivered by truck or portage. Supplies are procurable in town.

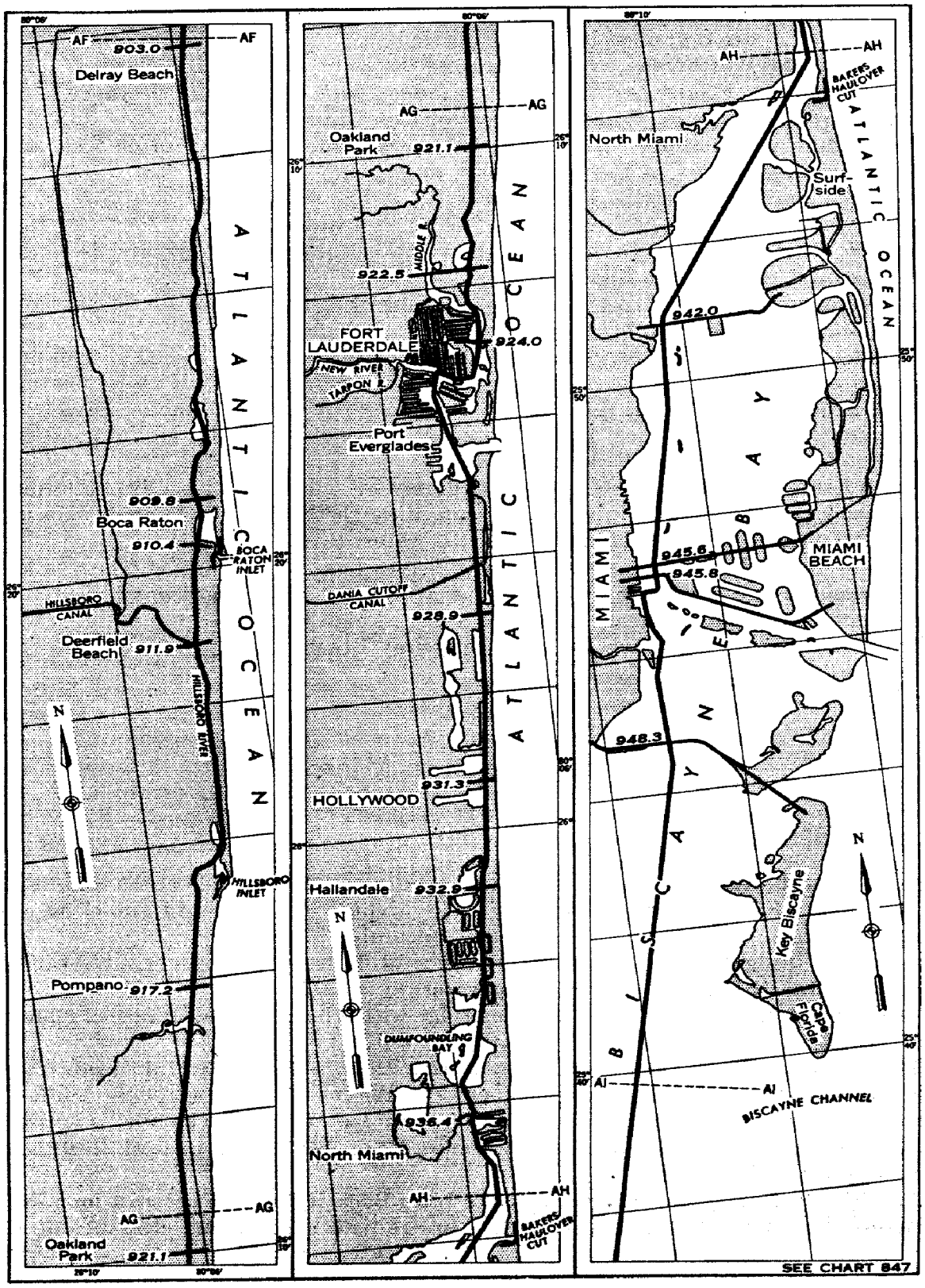
A bascule bridge with a horizontal clearance of 60 feet and a vertical clearance, closed, of 5½ feet at high water crosses the waterway at *Mile 903.0*.

At **Boca Raton,** *Mile 909.8*, is a bascule bridge with a horizontal clearance of 80 feet and a vertical clearance, closed, of 9 feet at high water.

The waterway enters **Lake Boca Raton** at *Mile 910.0*. **Boca Raton Inlet** leads from the lake to the Atlantic Ocean. In December 1947, the inlet had a controlling depth of 5½ feet. Just seaward of the inlet was a shoal with 6 feet over it. The inlet is crossed by a bascule bridge with a horizontal clearance of 15 feet and a vertical clearance, closed, of 6 feet at high water.

At *Mile 910.3* the inland waterway leaves Lake Boca Raton and enters a long cut.

Across the cut at *Mile 910.4* is a bascule bridge with a horizontal clearance of 85


AF
903.0
Delray Beach
ATLANTIC OCEAN
909.8
Boca Raton
910.4
BOCA RATON INLET
HILLSBORO CANAL
Deerfield Beach
911.9
HILLSBORO RIVER
HILLSBORO INLET
Pompano
917.2
AG
Oakland Park
921.1
AG
Oakland Park
921.1
922.5
MIDDLE R.
FORT LAUDERDALE
924.0
NEW RIVER
TARPON R.
Port Everglades
DANIA CUTOFF CANAL
928.9
931.3
HOLLYWOOD
Hallandale
932.9
DUMPOUNDLING BAY
936.4
North Miami
AH
BAKERS HAULOVER CUT
AH
North Miami
Surfside
942.0
MIAMI BEACH
945.6
945.8
948.3
BISCAYNE BAY
Key Biscayne
Cape Florida
AI
BISCAYNE CHANNEL
SEE CHART 847

feet and a vertical clearance, closed, of 10 feet at high water. Care should be exercised at this bridge, for strong currents may be experienced. The sides of the canal are rocky.

At *Mile 910.5* on the eastern side of the waterway is a boat shed. Gasoline and fresh water can be obtained. At Boca Raton railroad connection, hotel accommodations, and a post office are available.

A hand-operated swing bridge crosses the cut just below **Hillsboro Canal** at *Mile 911.9*, near **Deerfield Beach.** The bridge has a horizontal clearance of 52 feet and a vertical clearance, closed, of 5½ feet at high water. The channel passes through the west draw. The confluence of the Hillsboro Canal and the Intracoastal Waterway on the north side of the bridge develops a dangerous condition in the channel. Vessels proceeding south should not approach the bridge until it is fully opened for passage. Sufficient headway should be maintained at all times to avoid being carried toward the east fender system of the bridge by flow of water from Hillsboro Canal. This flow of water generates considerable cross current here, especially during periods of flood.

**Hillsboro Inlet,** at *Mile 915.2*, is discussed in another section.

A hand-operated swing bridge and overhead cable crosses the waterway near **Pompano Beach** at *Mile 917.2*. The bridge has a horizontal clearance of 55 feet and a vertical clearance, closed, of 4¾ feet at high water. The channel is through the east draw. The overhead cable has a vertical clearance of 91 feet at high water.

At *Mile 921.1* a hand-operated swing bridge crosses the waterway near **Oakland Park.** The bridge has a horizontal clearance of 60 feet and a vertical clearance, closed, of 7½ feet at high water. The waterway passes through the east draw.

**Fort Lauderdale,** *Mile 924*, a large and colorful city known as the "Venice of America" is served by the Florida East Coast and Seaboard Air Line Railways. Navigable waters include the Intracoastal Waterway, New River, Middle River, and the myriad of man-made canals. All facilities for yachts are available. In the 1946–47 winter season more than 3,500 yachts were reported to have based here. Excellent hotels, stores, and restaurants abound.

**Landmarks.**—Three large elevated tanks, painted in black and yellow bands and having lights on top, are prominent landmarks in the Fort Lauderdale area.

**Channels.**—The Intracoastal Waterway extends the entire length of Fort Lauderdale. For controlling depth see weekly *Notice to Mariners*.

**New River** is the main navigation channel in this area. A Federal project provides for a dredged channel 8 feet deep and 100 feet wide from the Intracoastal Waterway to **Tarpon Bend,** and for snag removal in the river and **South Fork** to the intersection of Dania Cut-off Canal, 7.9 miles above the mouth of the river. To date (1947) no funds have been appropriated.

In November 1947, the controlling depth in the channel center was 4½ feet. A depth of 5 feet can be carried from the waterway to Tarpon Bend by passing north of daybeacon 2, 0.3 mile west of the waterway, which is an identification marker only, and continuing along the north side of the waterway. Above Tarpon Bend the depth is much greater. Small boats may obtain good protection in the upper part of New River during hurricanes.

**Middle River** had a controlling depth of 4 feet in November 1947, to the fixed bridge 2.2 miles above its mouth. Venetian canal-like developments were in progress on each side of the lower part of the river.

The channel from the Intracoastal Waterway to the former Coast Guard operating base is marked by finger piles and in November 1947 had a least depth of 8 feet.

The canals between the man-made islands are used only by the riparian owners and their guests.

The **city dockmaster** is in charge of all berthing assignments. His police powers extend to all waterways within the city limits. His office is on the north bank of New River just west of the SE. Sixth Avenue Bridge.

**Mooring facilities.**—The former Coast Guard operating base about 0.3 mile south of **Mooney Point** has been purchased by the city and is used for docking. Berths are assigned by the city dockmaster. The city collects a nominal charge for space. A monument marking the site of the original Fort Lauderdale, built in 1838 during the Seminole War, stands in the former Coast Guard base.

Both sides of the New River between SE. Sixth Avenue and South Andrews Avenue Bridge are owned by the city and berths for yachts are provided along the bulkheads. Fresh water and electricity are available. Arrangements for space are made with the city dockmaster.

Three large storage yards are on the New River about 2.5 miles above the city berth area.

**Speed.**—New River has a speed limit of 4 miles per hour.

**Tide.**—The mean range of tide is about 2½ feet.

**Currents.**—Strong currents may be encountered in New River above the SE. Sixth Avenue Bridge, and strangers going up river are advised to obtain information from the dockmaster.

**Bridges,** Intracoastal Waterway.—Two bridges cross the waterway. The first, Tenth Street Bascule Bridge at *Mile 922.5*, has a horizontal clearance of 85 feet and a vertical clearance, closed, of 16 feet at high water. The overhead cable which crossed here was temporarily removed in February 1948. The second bridge, **Los Olas Boulevard** Bridge at *Mile 924.0*, is a swing bridge with a horizontal clearance of 59 feet and a vertical clearance, closed, of 6½ feet at high water.

New River and South Fork are crossed by 5 bascule bridges.

| Miles above junction of New River and Intracoastal Waterway | Name | Horizontal clearance | Vertical clearance above high water |
|---|---|---|---|
| | | *Feet* | *Feet* |
| 1.0 | SE. 6th Ave | 60 | 5½ |
| 1.3 | S. Andrews Ave | 59 | 5¾ |
| 1.4 | Florida East Coast Ry | 50 | 6 |
| 1.8 | SW. 7th Ave | 40 | 11 |
| 3.0 | Seaboard Air Line Ry | 63½ | 4 |

The SE. Sixth Avenue Highway Bridge, during the period from December 1 to April 30, inclusive, is closed to navigation between the hours of 11 a. m. and 6:30 p. m. except on the hour and half-hour, and at 12:45, 1:15, 2:45, 4:15, 4:45, and 5:15 p. m., when the bridge is opened to allow passage of any sightseeing boat authorized to carry passengers for hire; other craft awaiting passage may also pass the drawspan provided the bridge is opened for passage of a sightseeing boat. These closed periods do not

apply to tows or vessels in distress. Time of opening is taken from the clocks hung on each side of the bridge. Gage boards are also on each side to show vertical clearances.

Middle River is crossed by two bridges. The first, a bascule bridge 0.9 mile from the Intracoastal Waterway, has a horizontal clearance of 28 feet and a vertical clearance, closed, of 2½ feet at high water. To have this bridge opened, arrangements must be made in advance with the city manager. The second, a fixed bridge 2.2 miles above the mouth, has a horizontal clearance of 30 feet and a vertical clearance of 4 feet at high water.

Fixed bridges connect the man-made islands at certain points.

**Supplies.**—All kinds of supplies for yachts can be obtained here. Gasoline is available at three of the repair yards, and one of them has Diesel oil. All oil companies make truck deliveries of gasoline and Diesel oil direct to boats.

**Repairs.**—Several repair yards and storage basins are located up the New River. The largest shipyard has a marine railway capable of hauling out vessels up to 500 tons, 120 feet in length, 20-foot beam, and 7½-foot draft. All kinds of hull and engine repairs can be made. Complete machine shops are available. Some yards have cranes of up to 50-ton capacity for rail-water or truck-water transfer.

A **chart agency** of the Coast and Geodetic Survey is in the **city.**

**Port Everglades,** *Mile 926.5*, is described in another section.

At *Mile 926.9* the waterway leaves **Lake Mabel** and enters a **cut.**

**Dania Cutoff Canal** enters the cut at *Mile 928.1*. Constructed for drainage purposes, the canal during floodwater periods may cut through the beach to the ocean. Although a county project and not maintained for navigation, the canal in November 1947 had a controlling depth of 8 feet for approximately 5 miles to the intersection with the South Fork of the New River at the power plant.

A yacht basin is on this canal at **Dania** 1.7 miles from the waterway. Gasoline and fresh water are procurable here. West of the basin, navigation is restricted by overhead obstructions having a vertical clearance of about 10 feet.

At *Mile 928.9* a swing bridge with a horizontal clearance of 53 feet and a vertical clearance, closed, of 3½ feet at high water crosses the Intracoastal Waterway. The channel is in the west draw of this bridge.

An overhead cable crosses the cut at *Mile 930.9* with a vertical clearance of 79½ feet at high water.

**Hollywood Beach,** *Mile 931.3*, is about 1 mile west of the waterway. On the ocean side, east of the city, is the Hollywood Hotel, a very prominent structure. A yacht basin and marine service station are along the western side of the waterway. Dock space, gasoline, Diesel oil, fresh water, ice, and other supplies are available. No facilities for repairs are available.

A bascule bridge with a horizontal clearance of 57.6 feet and a vertical clearance, closed, of 9½ feet at high water, crosses at *Mile 931.3*.

At *Mile 932.9* is **Hallandale Beach** swing bridge with a horizontal clearance of 52.5 feet and a vertical clearance, closed, of 9¼ feet at high water. The channel is in the west draw of this bridge.

The waterway enters **Dumfoundling Bay,** a shallow bay at *Mile 935.1*. Care is required here; spoil banks are close aboard on both sides of the dredged channel. A sharp turn to the left is necessary to enter **Biscayne Creek** at *Mile 935.8*.

At *Mile 936.4* two bridges cross the waterway. The **North Miami Beach** Fulford

Bridge is a hand-operated swing bridge with a horizontal clearance of 53 feet and a vertical clearance, closed, of 6½ feet at high water. The channel is through the west draw. An overhead cable with a vertical clearance of 83½ feet at high water crosses here. A new bridge about 175 feet south of Fulford Bridge was under construction; abutments and fenders were in place. The abutments of the new bridge were not normal to the channel, having a horizontal clearance of 50 feet normal to the channel. Only short straight approaches exist to either bridge. Ebb and flood currents tend to set tows against the west fender of the bridges. Caution is advised when passing through these bridges; it is suggested that long tows be broken up. On the completion of the new bridge the Fulford Bridge will be removed and the channel changed.

The waterway enters **Biscayne Bay** and at *Mile 938.4* is Bakers Haulover Cut, discussed in another section.

The Intracoastal Waterway extends southwestward in Biscayne Bay to the vicinity of Little River mouth, and then southward along the western side of the bay to Miami.

On the eastern side of the bay a narrow, thickly settled peninsula separates the bay from the ocean. **Indian Creek** extends southward along the eastern part of the bay to Collins Canal in Miami Beach. In December 1947 the controlling depths in the creek were 6 feet and 4 feet in Collins Canal. Fixed bridges limit navigation in the canal to craft with vertical heights of less than 5 feet.

**Bal Harbour,** a private development, is immediately southward of Bakers Haulover Cut. Its two large hotels are conspicuous landmarks. A dredged channel from *Mile 938.6* to the yacht basin leads in a south-southeasterly direction from the waterway. The channel has been dredged 200 feet wide and 7 feet deep; in December 1947 the controlling depth was 6 feet. The channel is marked by an unlighted range. The front target is a yellow diamond, the rear is a yellow circle. The yacht basin has a depth of 14 feet. The basin is for members only; however, other craft may take refuge here during bad storms.

At *Mile 941.4* a dredged channel leads to a private yacht basin in **Island Harbor.** In December 1947, the controlling depth was 12 feet. The channel is marked by an unlighted range. The front target is diamond shaped with red and white diamonds; the rear, square with black and white squares.

At *Mile 942.0* the waterway is crossed by the Seventy-ninth Street causeway bascule bridge with a horizontal clearance of 60.3 feet and a vertical clearance, closed, of 18½ feet at high water.

**Little River** flows into Biscayne Bay at *Mile 942.2*. Yachts tie up along the banks of the river. In December 1947 a depth of 6 feet could be taken for a distance of 1 mile above the mouth, thence 4 feet to a turning basin above the railroad bridge. Three fixed bridges cross the river. The first, 0.6 mile above the mouth, has a clearance of 30 feet horizontal and 6 feet vertical, at high water. A gage board showing the vertical clearance is on the south bank 0.25 mile downstream of the bridge.

**Venetian Causeway** bascule bridge crosses the waterway at *Mile 945.6*, with a horizontal clearance of 60.5 feet and a vertical clearance, closed, of 8½ feet at high water.

**MacArthur Causeway** bascule bridge, at *Mile 945.8*, has a horizontal clearance of 57 feet and a vertical clearance, closed, of 8 feet at high water. Operation of this span is limited by the following regulations in the period from December 1 to April 1, inclusive: The draw remains closed from 7 to 9 a. m. except that it is opened at 8 a. m. for sufficient time to pass any vessels awaiting passage. The draw remains

closed from 4:30 to 6:30 p. m. except that it is opened on the half hour and even hour for sufficient time to pass any vessel awaiting passage.

**Miami and Miami Beach,** *Mile 946.1*, are described in another section.

## Okeechobee Waterway

Chart 1289

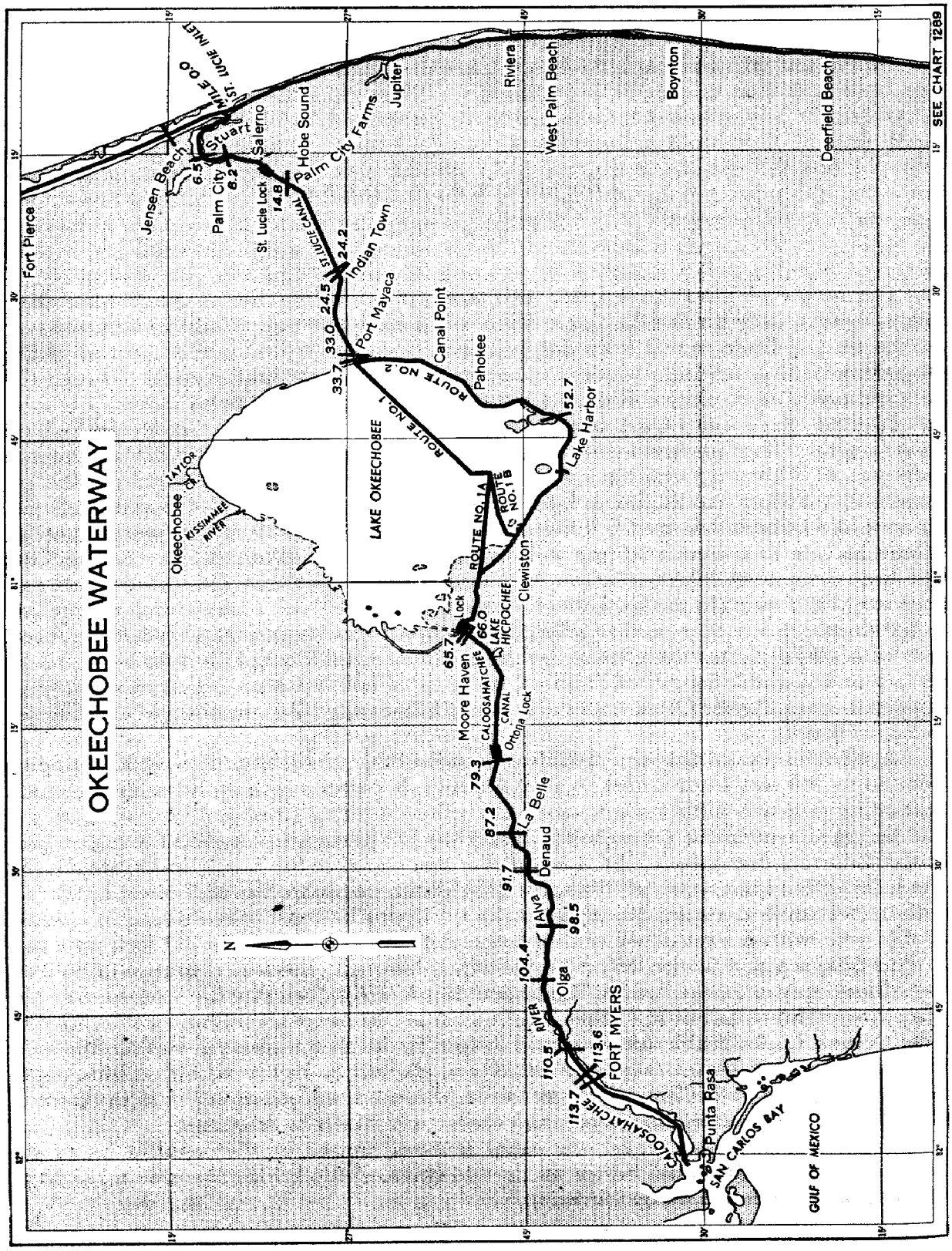
During the period 1913 to 1926, the State of Florida constructed canals connecting Lake Okeechobee with the St. Lucie River on the east and the Caloosahatchee River on the west. These canals were dug in connection with a drainage project for Lake Okeechobee and provided a waterway, navigable for shallow-draft vessels between the Atlantic coast at St. Lucie River and the Gulf coast at San Carlos Bay.

In 1930 the Lake Okeechobee Drainage Project was taken over by the Federal Government. The improvement project provides for: (*a*) A channel 8 feet deep from the Intracoastal Waterway near Stuart to Fort Myers with widths of 80 feet from the Intracoastal Waterway to St. Lucie Locks, thence 100 feet through the St. Lucie Canal, across Lake Okeechobee to the hurricane gate at Clewiston, 80 feet in the channel to Moore Haven, and thence 90 feet to Fort Myers; (*b*) a channel 10 feet deep and 100 feet wide from Fort Myers (Edison Memorial Bridge) to Punta Rasa, thence 12 feet deep and 200 feet wide to the Gulf of Mexico; (*c*) a levee and a navigation channel 80 feet wide and 6 feet deep (8 feet from Moore Haven to Clewiston) following in general the south shore of the lake (Route 2); (*d*) St. Lucie Canal lock with a usable width of 50 feet and a usable length of 250 feet, a depth of not less than 8 feet over the sills; (*e*) a channel in Taylor Creek 6 feet deep and 60 feet wide from the town of Okeechobee to Lake Okeechobee.

A modification of this act provides for a channel 8 feet deep with widths ranging from 80 to 100 feet from Stuart to Fort Myers. No work has been done on the modification.

Improvement in the **Okeechobee Waterway** has been completed and is maintained at the following dimensions: St. Lucie River and Canal to St. Lucie Locks, channel 80 feet wide with a least depth of 6 feet; St. Lucie Locks, a usable size of 250 feet by 50 feet with 11 feet over the sills; St. Lucie Locks to Moore Haven Locks (Route 2) channel 80 feet wide with a least depth of 6 feet except for the bypass of the old lock structure at Port Mayaca and Torry Island bridge which have a horizontal clearance of 50 feet; the Moore Haven Locks, usable dimension 250 feet by 50 feet with 11 feet over the sills; Moore Haven Locks to Ortona Locks, channel 90 feet wide with a least depth of 8 feet; Ortona Locks usable dimensions 250 feet by 50 feet with 11 feet over the sills; Ortona Locks to Edison Bridge at Fort Myers, channel 90 feet wide with a least depth of 7 feet; Taylor Creek Channel, 60 feet wide with a least depth of 6 feet to the town of Okeechobee. For controlling depths see the weekly *Notice to Mariners*.

The vertical clearance over the canal route is limited by the vertical lift of the Seaboard Air Line Railroad bridge at Port Mayaca. This bridge raises to a height of 51 feet above minimum water elevation.


OKEECHOBEE WATERWAY
SEE CHART 1289
Fort Pierce
Jensen Beach
Palm City
Stuart
Salerno
St. Lucie Lock
St. Lucie Canal
Hobe Sound
Palm City Farms
Jupiter
Riviera
West Palm Beach
Boynton
Deerfield Beach
Indian Town
Port Mayaca
Canal Point
Pahokee
Lake Harbor
Route No. 1
Route No. 1A
Route No. 1B
Lake Okeechobee
Okeechobee
Taylor Cr.
Kissimmee River
Clewiston
Lake Hicpochee
Caloosahatchee Canal
Ortona Lock
Moore Haven
La Belle
Denaud
Alva
Olga
Fort Myers
Caloosahatchee River
Punta Rasa
San Carlos Bay
Gulf of Mexico
Mile 0
St. Lucie Inlet
6.5
8.2
14.8
24.2
24.5
33.0
33.7
52.7
65.7
66.0
79.3
87.2
91.7
98.5
104.4
110.5
113.6
113.7
N

**Water levels.**—The elevation of the water in Lake Okeechobee is controlled by means of drainage through the canals. The lake level is generally maintained at between 14 and 16 feet on the gages. The bridge clearances, controlling dimensions, and soundings on Chart 1289 and in the Coast Pilot are referred to **minimum water elevations** which are: From the Intracoastal Waterway to St. Lucie Lock, mean low water at Sewall Point; from St. Lucie Lock to Moore Haven Lock, 14 feet above **Lake Okeechobee datum** or 12.56 feet above mean sea level; from Moore Haven Lock to Ortona Lock, 11½ feet above Lake Okeechobee datum; from Ortona Lock to the Gulf, mean low water at Punta Rasa.

**Staff gages** are maintained by the Corps of Engineers for the convenience of the public at several lock and hurricane gate structures.

**Lock operation.**—The navigation locks on the Okeechobee Waterway are normally operated only from 6 a. m. to 10 p. m. eastern standard time. During periods of excessive rainfall in the Lake Okeechobee area, the canals are used for drainage purposes and the locks are restricted to navigation at certain times.

The maintenance of the Okeechobee Waterway and the operation of the locks are in charge of the Corps of Engineers with field headquarters at Clewiston. Before attempting passage through any portion of this route, the latest information regarding available depths, operation of the locks, and other existing conditions should be secured from the offices of the Corps of Engineers either at Clewiston or at 575 Riverside Avenue, Jacksonville.

**General regulations** governing bridges and locks and the handling of tows are given in Chapter 2.

St. Lucie Inlet to the South Fork of St. Lucie River is described on pages 299 to 300.

The Intracoastal Waterway at St. Lucie Inlet is described on page 328.

All *Miles* are measured from junction of the Intracoastal Waterway and Okeechobee Waterway. The **South Fork** of the **St. Lucie River** starts at *Mile 6.7* and extends to the St. Lucie Canal.

**Palm City,** *Mile 8.2,* is a small village on the west bank of South Fork. A small boat yard with marine railway capable of hauling out boats up to 30 feet in length for hull repairs is situated here.

Palm City bascule bridge crosses South Fork at *Mile 8.2* with a horizontal clearance of 60 feet and a vertical clearance, closed, of 10½ feet above minimum water elevation. During periods of high water in Lake Okeechobee, shoaling may occur in the vicinity of the bridge.

At *Mile 11.4* is a fork in the channel. The right or west fork is the **St. Lucie Canal.** The left or east fork is the old South Fork of the St. Lucie River. This old fork is deep and winding and affords good protection for small boats during hurricane weather. About 2 miles up the old south fork is a fixed highway bridge with a vertical clearance of 4½ feet. Current was observed to be flowing up the river at this bridge.

The new **St. Lucie Lock,** *Mile 13.1* has a width of 50 feet, length of 250 feet, and controlling depth over the sill of 11 feet. During periods of high water in Lake Okeechobee this lock may be closed to navigation for parts of the day. Caution should be used by vessels when approaching this lock during periods when it is used for discharging water from Lake Okeechobee. An overhead cable crosses the waterway here with a vertical clearance of 80 feet above minimum water elevation. Docking facilities are available at St. Lucie Lock.

A hand-operated swing bridge crosses the canal at *Mile 14.8* with a horizontal clearance of 54 feet and a vertical clearance, closed, of 9¾ feet above minimum water elevation.

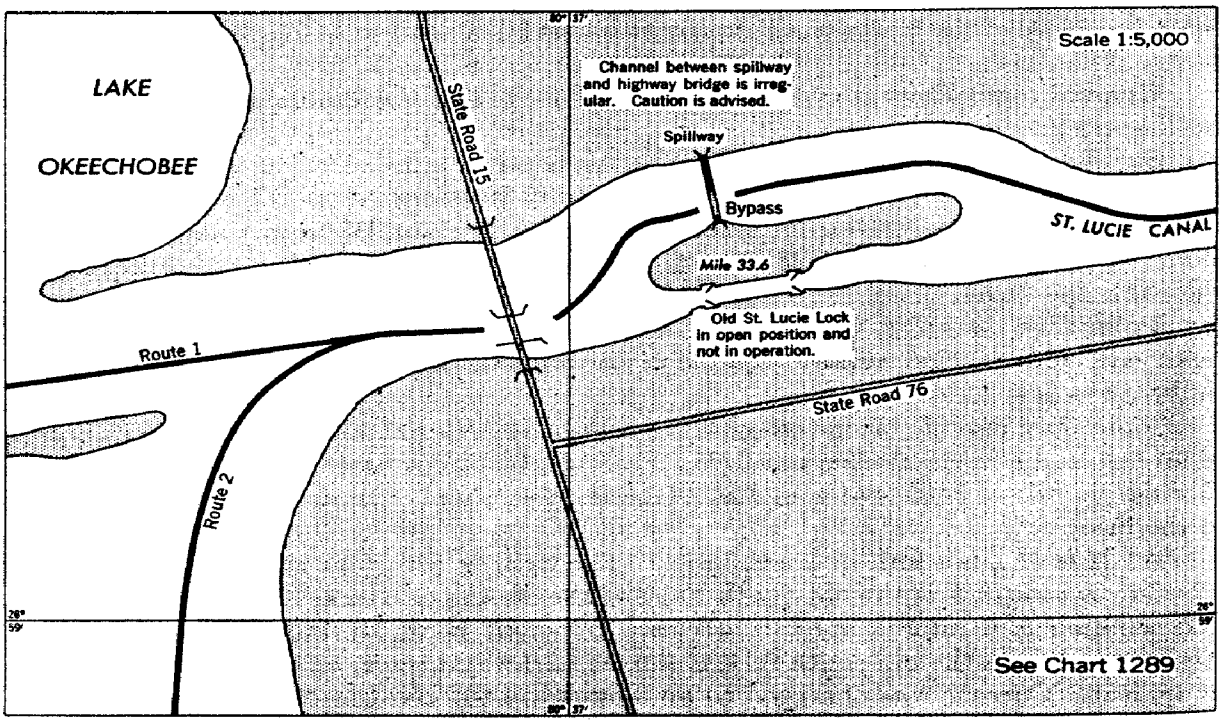
At **Indian Town** two hand-operated swing bridges and one overhead cable cross the waterway. The first bridge at *Mile 24.2* has a horizontal clearance of 56 feet and a vertical clearance, closed, of 15 feet above minimum water elevation.

The second, the Seaboard Air Line Railroad bridge at *Mile 24.5* has a horizontal clearance of 50 feet and a vertical clearance, closed, of 9½ feet above minimum water elevation. The channel passes through the north draw. The overhead cable crosses here with a vertical clearance of 80 feet above minimum water elevation.

In the vicinity of Port Mayaca, St. Lucie Canal is crossed by three overhead cables. The cables at *Mile 32.1*, *Mile 32.8*, and *Mile 33.0* have a vertical clearance of 80 feet above minimum water elevation.

At *Mile 33.0* the Florida East Coast Railway bridge crosses the canal with a horizontal clearance of 56 feet and vertical clearance, **open,** of 51½ feet above minimum water elevation.

A dangerous situation exists at Old St. Lucie Lock No. 1 and St. Lucie Lock No. 1 bypass at *Mile 33.6*.




A highway bridge is located just west of the abandoned lock. Two approaches lead to this draw. The first, through the old St. Lucie Lock which has a width of 30 feet, length of 130 feet, and depth over the sills of 6.2 feet, gives a straight but narrow approach. The second and more widely used, is on the north side of the island and over the old spillway. This passage has a width of 50 feet with a depth of 8.5 feet. Although wider and deeper, caution must be exercised, for between the west end of the

island and the bridge draw is only 400 feet to swing into position. With strong currents this is especially dangerous, particularly for vessels heading eastward with the current.

**Port Mayaca** has no gasoline, fresh water, or provisions. There are no docks but vessels may tie up in the old lock.

The swing highway bridge, just west of the lock at *Mile 33.7*, has a horizontal clearance of 53 feet and a vertical clearance, closed, of 13.3 feet above minimum water elevation. The channel is through the north draw.

The waterway enters **Lake Okeechobee** at *Mile 33.8*. Lake Okeechobee is an approximately circular fresh-water lake in southern Florida, about 26 miles from the Atlantic coast, 50 miles from the Gulf coast and 90 miles from the south end of the mainland. The lake varies in width from 22 to 30 miles and is shoal along its west and southwest sides for a distance of 100 to 500 yards of the shore. The center of the lake is comparatively deep. The shoal areas are generally filled with a thick growth of water grass which makes it necessary to equip boats with weedless propellers if operating in the lake for any length of time.

**Observation Shoal** is an extensive sand shoal extending as much as 7 miles off the southwest shore of the lake. **Rocky Reef** extends across the south end of the bay between **Observation Island** and **Bacom Point**; depths of 3 to 4 feet are over it in places. Channels to the eastward and westward of Rocky Reef are marked by lights. **North Lake Shoal** extends 4 miles off the northwest shore of the lake. **Halifax Bank** is a sand shoal toward the south end of South Bay.

**Hurricane gates** are in the levee at Taylor Creek, Clewiston Industrial Canal, Miami Drainage Canal, Hillsboro Canal-North New River Drainage Canal, and West Palm Beach Drainage Canal. Shelter during storms can be found in these canals. The gates will ordinarily be kept open in order that traffic will have access to the canals. Should the gates be closed, notify the Corps of Engineers Suboffice at Clewiston. Depths of 10 feet may be taken over the sills with the exception of the levee at Taylor Creek where 7 feet may be taken. All gates have a width of 50 feet. These canals are not navigable and have filled with hyacinths and other obstructions.

Shelter may also be found in Taylor Creek, north end of the lake, and **Pelican Bay,** at the southeast corner of the lake. Where depths are sufficient in the water grass off the west and southwest sides of the lake, anchorage in moderate weather can be made, as the holding bottom is good and protection is afforded by the watergrass.

**Route 2** proceeds around the southern portion of the lake close to the shore. During periods of rough water and high winds in Lake Okeechobee this route is recommended. Levees are along the southern bank of this route.

On Route 2 at *Mile 41.2* is **Canal Point.** Docking space is available. **West Palm Beach Drainage Canal** joins the lake here.

At *Mile 44.0* is **Pahokee,** a town on the southeast side of the lake.

A marked channel enters Route 2 at *Mile 46.8*. This channel was built by the contractor who built the levee along the lake.

At *Mile 52.7* is the only bridge crossing the South Shore Navigation Channel. This swing bridge connects the mainland at **Chosen** with **Torry** and **Kreamer Islands** with a horizontal clearance of 50 feet and a vertical clearance, closed, of 13¾ feet above minimum water elevation. The channel is through the west draw.

About 0.3 mile below the bridge at *Mile 53.0* the **Hillsboro** and **North New River Drainage Canals** join the lake.

Docking space is available at **Lake Harbor,** *Mile 58.3.* The **Miami Drainage Canal** joins the lake here.

**Okeechobee** is on the north side of Lake Okeechobee, 3 miles above the mouth of **Taylor Creek.** There are no docks in the creek and gasoline, fresh water, and provisions are not available except by portage from town. A swing bridge crosses the creek about 0.2 mile above the mouth with horizontal clearance of 50 feet and a vertical clearance, closed, of 7 feet above high water. The west draw is used. A new highway bridge, bascule type, is under construction here. The present draw is scheduled to be removed upon completion of the new bridge. The head of navigation is at the railroad bridge about 4 miles up the creek.

From St. Lucie Canal to Moore Haven three routes cross Lake Okeechobee. **Route 1** proceeds in a southwesterly direction for about 13 miles, then south for about 1.5 miles where it divides into Route 1–A and Route 1–B. **Route 1–A** proceeds westerly and is the shortest of the three routes. The channel is well marked and generally free of hyacinths. **Route 1–B** proceeds westerly and southwesterly to Clewiston where it joins Route 2. It is open to navigation and well marked. Vessels leaving St. Lucie Canal at the highway swing bridge on Route 1 should not change course until 1,000 yards lakeward of the bridge.

**Clewiston,** *Mile 65.7* via Route 2, *Mile 56.4* via Route 1–B, is an agricultural community on the southwest side of Lake Okeechobee. The field offices and general headquarters of the Corps of Engineers engaged upon the maintenance of the Okeechobee Waterway are here. There are facilities for hauling out boats up to 25 feet in length for minor repairs. Gasoline, some supplies and provisions can be obtained, and there is a hotel. Dock space is available along the bulkhead of the **Clewiston Industrial Canal** south of the levee.

The waterway continues westward to **Liberty Point** where Route 1-A joins Route 2 and Route 1–B. All distances from this point to the Gulf were computed by using Route 1–A. Liberty Point is *Mile 59.3* via Route 1–A, *Mile 61.1* via Route 1–B, and *Mile 70.4* via Route 2.

At *Mile 65.5* is **Moore Haven Lock,** with a width of 50 feet, length of 250 feet, and a least depth of 11 feet over the sills.

**Moore Haven,** *Mile 65.5,* is at the entrance to the canal leading to the Calloosahatchee River and the Gulf. It is on a branch of the Atlantic Coast Line Railroad. Gasoline may be obtained at the small dock just west of the highway bridge. Fresh water may be obtained at the locks. A Government yacht basin with four slips for medium-size boats is just west of the locks. Provisions are available in town, but no Diesel oil.

Two hand-operated swing bridges cross the canal in the vicinity of Moore Haven. The first, a railroad bridge at *Mile 65.7,* has a horizontal clearance of 56 feet and a vertical clearance, closed, of 8 feet above minimum water elevation. The channel is through the east draw. An overhead cable crosses south of the railroad bridge with a vertical clearance of 86 feet. The second, a highway bridge at *Mile 66.0,* has a horizontal clearance of 51 feet and a vertical clearance, closed, of 8 feet above minimum water elevation. The channel is through the east draw.

At *Mile 68.2* the canal passes through **Lake Hicpochee,** a shallow, fresh-water lake about 5 miles long and 2.5 miles wide. Most of the surface is covered with hyacinth and saw grass. The bottom of the lake is soft mud.

**Ortona Lock,** *Mile 78.9*, has a width of 50 feet, a length of 250 feet, and a depth of 11 feet over the sills.

The waterway now enters **Caloosahatchee River.** Normal current in the Caloosahatchee River and Canal is about 1½ knots; however, velocities in the lower Caloosahatchee Valley are increased considerably during periods of flood.

The river is crossed by a hand-operated swing bridge at *Mile 79.3* with a horizontal clearance of 54 feet and a vertical clearance, closed, of 14 feet above minimum water elevation. The channel is through the south draw.

An overhead cable crosses at *Mile 79.9* with a vertical clearance of 85 feet.

**La Belle,** *Mile 87.2*, has a 100-foot dock and a turn-out basin. Groceries and docking space may be obtained here.

A hand-operated swing bridge and overhead cable cross the river at *Mile 87.2*. The bridge has a horizontal clearance of 50 feet and a vertical clearance, closed, of 12½ feet above minimum water elevation. The channel passes through the south draw. The overhead cable has a vertical clearance of 80 feet.

At *Mile 91.7* a hand-operated swing bridge crosses the channel with a horizontal clearance of 57 feet and a vertical clearance, closed, of 11½ feet above minimum water elevation. The channel is through the north draw. Docking space may be obtained here.

**Alva,** *Mile 97.6*, has small gas docks where gasoline and oil can be obtained.

A hand-operated swing bridge and overhead cable cross the river west of the town at *Mile 98.5*. The bridge has a horizontal clearance of 63 feet and a vertical clearance, closed, of 11 feet above minimum water elevation. The channel is through the north draw. The cable has a vertical clearance of 80 feet.

At **Olga,** *Mile 104.4*, a hand-operated swing bridge crosses the river with a horizontal clearance of 55 feet in the south draw and 53 feet in the north draw and a vertical clearance of 9 feet above minimum water elevation. Docking space is available.

**Orange River** enters the waterway at *Mile 109.5*. A draft of 6 feet can be carried to the boat yard about 0.5 mile above the mouth. The channel is marked by three private daybeacons. The yard can haul out and repair boats up to 80 feet in length, 5-foot draft, and 30 tons. Wet storage facilities are available. Orange River is a hurricane refuge for small yachts.

The Caloosahatchee River is crossed by a hand-operated swing bridge at *Mile 110.5* with a horizontal clearance of 50 feet and a vertical clearance, closed, of 6 feet above minimum water elevation.

At *Mile 113.6* a hand-operated swing bridge and overhead cable cross the river. The bridge has a horizontal clearance of 59 feet in the southeast draw and 59.9 feet in the northwest draw and a vertical clearance, closed, of 6½ feet above minimum water elevation. The overhead cable has a vertical clearance of 90 feet. Segments of an abandoned highway bridge stand in ruins just north of this bridge.

Edison Memorial Bascule Bridge at *Mile 113.7* has a horizontal clearance of 79.5 feet and a vertical clearance, closed, of 9½ feet above minimum water elevation.

**Fort Myers,** *Mile 113.7*, 14 miles above the mouth of the Caloosahatchee River, is the commercial center for this section of the State. It is on the Atlantic Coast Line and Seaboard Air Line Railroads and on the Tamiami Trail connecting Tampa and Miami. The city is the distributing point for several oil companies, and a complete line of petroleum products is available. There are good facilities for making deck and

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engine repairs to small vessels as well as for storing such craft. Vessels up to 125 feet in length and 7-foot draft can be hauled out. Fort Myers has numerous stores and several machine shops, a municipal airport, a hospital, both seasonal and year-round hotels, and a protected yacht basin. This basin has space for 75 yachts, and a draft of 6 feet can enter the basin with depths of 7 to 9 feet inside. Berthing facilities and docking accommodations are excellent. A dockmaster is in attendance; charges are nominal. In connection with the yacht basin is a civic center. Electricity and hot showers are available.

For directions from Fort Myers to the Gulf coast and Gulf-coast ports, see *United States Coast Pilot, Gulf Coast.*

CHAPTER 12

# Miami to Dry Tortugas

## Charts 1248, 1249, 1250, 1251, 1252, 1351

THE **Florida Keys** consist of a remarkable chain of low islands, beginning with Virginia Key and extending in a circular sweep to Loggerhead Key, a distance of about 192 miles. For some 100 miles of that distance they skirt the southeast coast of the Florida Peninsula, from which they are separated by shallow bodies of water known as Biscayne Bay, Card Sound, Barnes Sound, Blackwater Sound, and Florida Bay, which are connected in the order named. Biscayne Bay has a depth of 9 to 10 feet for most of its length, and the other bodies of water are shallow, containing small keys and shoals, and of no commercial importance except as a cruising ground for small boats. Westward of Florida Bay the Florida Keys separate the **Straits of Florida** from the Gulf of Mexico.

The keys are mostly of coral formation, are low, and are generally covered with dense mangrove growth, though some are wooded with pine, and on a few are groves of coconut trees. Some keys along Hawk Channel are inhabited. Key West is the most important of these.

U. S. Highway 1 leads across the keys to Key West. Openings under the viaduct and bridges are indicated on the charts. At Indian Key Channel, Channel Five east of Jewfish Key, and Moser Channel are drawbridges through which a depth of 5 to 7 feet can be taken from the Straits of Florida to Florida Bay and the Gulf of Mexico. The bridge across Moser Channel has two 107.5-foot openings, and the girder spans are 65-foot openings, with 23 feet vertical clearance above high water.

The tidal current at this bridge has an average velocity at strength of about 1½ knots. Current predictions may be obtained from the *Atlantic Coast Current Tables*. Wind effects may be expected to modify the current-table velocities considerably at times. These channels are used only by small craft and should not be attempted by a stranger without a pilot. Currents are strong through the openings between the keys; see page 115.

**Florida Reefs.**—The Florida Keys are skirted on the side next to the straits throughout their whole extent by the Florida Reefs, a chain of dangerous reefs and shoals lying at an average distance of about 5 miles from the line of keys. Primarily because the reefs are not marked by breakers in smooth weather and that few reefs show above water, they are especially hazardous. On the outer edge of and between the reefs the water shoals abruptly.

In approaching the reefs from seaward, warning of their proximity usually will be given by the difference in color of the water, from deep blue to light green, or by the Bank Blink, described in Chapter 2. Too much reliance in these warnings, however, may lead to trouble. In clear weather the lights and daybeacons make navigation along the reefs easy, but in thick weather the lead should be relied upon for safety. Fifty-fathom soundings indicate a distance of 2 to 3 miles from the reefs, and great caution should be used in approaching them closer. Fogs are not frequent in this locality.

For directions, Straits of Florida, see Chapter 3.

The water always becomes milky following windy weather. The usual color of the water on the reefs is bluish green and the shoal rock patches show dark, shading through brown to yellow as they approach the surface. The shoal sand patches show as a bright green. At depths of 10 to 15 feet, grass patches on the bottom show quite similar to rocks. When piloting in this area a time should be chosen so that the sun will be astern, conning the vessel from aloft or from an elevated position forward, for then the line of demarcation between deep water and edges of the shoals will be indicated with surprising clarity.

**Boundary lines of inland waters.**—The line of demarcation between Inland Rules and International Rules from Miami to Dry Tortugas is as follows: From the east end of the north jetty at the entrance to Miami, to Miami lighted whistle buoy 2, to Fowey Rocks Light to Pacific Reef Light, to Carysfort Reef Light, to Molasses Reef Light, to Alligator Reef Light, to Tennessee Reef Light, to Sombrero Key Light, to American Shoal Light, to Key West Entrance lighted whistle buoy, to Sand Key Light, to Cosgrove Shoal Light, and to the westernmost extremity of Marquesas Keys.

On the Gulf side of the keys the line extends from the northwesternmost extremity of Marquesas Keys to Northwest Channel Entrance lighted bell buoy 1, to the southernmost extremity of East Cape, Cape Sable.

**Hawk Channel** is the navigable passage inside Florida Reefs and outside the keys from Cape Florida to Key West, a distance of about 127 miles. For directions see Chapter 3. It varies in depth from 10 to 34 feet, and is 0.25 mile wide at its narrowest part. Vessels drawing 10 feet, bound southward and westward, may use this channel with great advantage, avoiding entirely the adverse current of the Gulf Stream and finding comparatively smooth water in all winds, except when passing the large openings between the reefs in southerly winds. These openings are principally between Alligator Reef Light and American Shoal Light. Steamers or sailing vessels with a leading wind may run the courses through this channel without difficulty. Sailing vessels drawing more than 7 feet are advised not to try to beat through without a pilot.

Reports indicate that the current in Hawk Channel usually sets fair with the channel. However, possible cross currents should be guarded against, especially in the vicinities of the openings between the keys.

Pilots generally can be found at Miami or at Key West. Strangers using this

channel may anchor at night which can be done where the bottom is soft. The channel is lighted and may be navigated at night. It is reported that vessels seldom anchor along the Hawk Channel route since the lights were set up. Where the bottom is hard the holding ground is bad and vessels are liable to drag if it blows.

The Intracoastal Waterway between Miami and Key West is described in detail later in this chapter. This waterway on the western and northern side of the keys passes southward through Biscayne Bay, Card, Barnes, and Blackwater Sounds and connecting waterways in Florida Bay to Moser Channel. From there it is necessary to pass either through Moser Channel and proceed to Key West via Hawk Channel, a distance of 40 miles, or to remain on the northern side of the keys and proceed to Key West via Big Spanish Channel and the Gulf of Mexico, a distance of 54 miles.

The waterway route is through smooth waters except in Hawk Channel and the Gulf of Mexico. The apparent inside route from Porpoise Key to Key West, shown on Chart 1251 by an irregular line of daybeacons extending between the smaller keys northward of U. S. Highway 1, is too shoal for any type of craft except a small skiff. In December 1947, the controlling depth in this channel was less than 1 foot. This section of the Intracoastal Waterway is scheduled for improvement to a project depth of 7 feet by 90 feet wide, but no funds have been appropriated nor any work accomplished as of December 1947.

**Florida Bay** (Charts 1251 and 1250) northward of the Florida Keys and southward of the mainland of Florida, is a triangular-shaped body of water extending in a general east and west direction from Barnes Sound to Cape Sable. The depths are shallow and irregular, and the bottom is mostly coral with a thin covering of silt in the eastern part. From April to October the waters of the bay are clear and the shoals plainly discernible, but during the winter months the water is frequently milky and the shoals indistinguishable.

In the eastern part of the bay are numerous ridges and reefs which show bare or nearly bare. Numerous small wooded keys dot the area. Only small craft can navigate this part of the bay which is frequented by small motor yachts, spongers, fishing craft, and the flat-bottomed shoal-draft boats of the inhabitants of the keys. The western part of the bay is comparatively clear, with depths ranging from 7 to 13 feet. The bottom is covered with loggerhead sponges and small coral heads.

The northern part of Florida Bay is described in *U. S. Coast Pilot, Gulf Coast.*

**Restricted, danger, and anchorage areas.**—The locations and regulations of areas from Miami to Dry Tortugas follow.

**An area eastward of Miami** between the parallels of 25°31′ N., and 25°41′ N., and between the meridians of 79°38′ W., and 79°48′ W., has been established as a danger area for firing practice.

A submarine exercise area off Key West has been established within the following points:

1. Coalbin Shoal buoy.
2. Key West Light.
3. American Shoal Light.
4. Latitude 24°15′00″ N., longitude 81°31′00″ W.
5. Latitude 24°15′00″ N., longitude 82°05′30″ W.

All vessels are to proceed through this area with due caution and to obey signals from naval craft in the area.

**A restricted area for firing range** has been established in Key West Harbor approach in the waters of the Atlantic Ocean (Straits of Florida) within a sector described as follows:

Beginning at the beacon on the end of the Navy Yard mole; thence to buoy 8 (450 yards west by north of the flagstaff at Old Fort Taylor); thence to buoy 6 (1,300 yards southwest of Whitehead

Point); thence to East Triangle Beacon; thence to buoy 2 (at the entrance to the main ship channel); thence due south (magnetic) a distance of 15,000 yards (7½ nautical miles); thence northeast (magnetic) a distance of approximately 20,000 yards (10 nautical miles) to a point on line from Key West Light to Beacon J (on Western Sambo), extended, this point being approximately 6,000 yards (3 nautical miles) southeasterly of said Beacon J; thence to the said Beacon J; thence along the said line to Daybeacon (Red) No. 4 (500 yards south of the Casa Marina Hotel); thence to the foot of Whitehead Street.

*The Regulations.*—1. Except as hereinafter qualified, the above-described waters are open throughout the year to the public for fishing and traffic from 12 noon, Saturdays, to 7 a. m., Mondays, and national (not State) holidays from 6 p. m. of the preceding day to 7 a. m., on the day following the holiday.

2. On days when firing is to be carried on, a large red flag will be displayed from the flagpole at Old Fort Taylor not later than 7 a. m. of that day and will be removed when firing ceases for the day.

3. When night firing is scheduled a large white flag will be displayed from the same flagpole at 4 p. m. of that day.

4. Flags displayed from time to time at other locations on the reservations will have no significance in connection with these regulations.

5. On days and nights when firing is in progress no boat or vessel will enter and remain in the restricted area above described except under the written authority of the Commanding Officer, Harbor Defenses of Key West.

6. Any vessel capable of being propelled by mechanical power at a speed greater than 5 miles per hour may proceed directly through the firing area without restriction, except when notified to the contrary. Such a vessel shall proceed while in the danger area on as nearly an easterly or westerly course as possible (paying due consideration to safety of navigation), and at the maximum practicable speed.

7. The presence within the area, or approaching its limits, of a towing vessel flying a large red flag, and towing one or more targets, shall be considered as notification to vessels not to enter the area while the red flag is displayed from the towing vessel, and to vessels within the area to stop or to proceed on an easterly or westerly course away from the towing vessel while the red flag is so displayed.

8. These regulations shall be enforced by the Commanding Officer, Harbor Defenses of Key West, through such officers, enlisted men, and employees as may be properly designated by him for the purpose.

**A danger zone** has been established by Federal regulation to govern the use and navigation of the waters surrounding Woman and Ballast Keys and, along with regulations governing it, is defined as follows:

*The Danger Zone.*—The restricted area is rectangular, approximately 3 miles long from east to west and 2.4 miles wide from north to south, with Woman Key at or near the center, and is bounded as follows:

North boundary: Latitude 24°32′37″ N.
East boundary: Longitude 81°56′40″ W.
South boundary: Latitude 24°30′12″ N.
West boundary: Longitude 81°59′53″ W.

The danger zone will be marked by buoys located at the four corners of the rectangular area.

*The Regulations.*—1. The danger zone is open to navigation except when naval operations are in progress, when no vessel or other craft shall enter or remain within this area.

2. Since naval operations will take place in this area at frequent and irregular intervals throughout the year regardless of season, advance notice will be given of the date on which the first such operations will begin. At intervals of not more than 3 months thereafter, notice will be sent out that operations are continuing. Such notices will appear in the local newspapers and in the *Notice to Mariners.*

3. Prior to the conduct of operations, the area will be patrolled by naval craft which will warn navigation to leave the area. Upon receiving such warning any watercraft within the danger zone shall leave it and no craft shall enter the area until operations have ceased.

4. These regulations shall be enforced by the Commandant, Seventh Naval District, Miami, Fla., and such agencies as he may designate.

Key West operating areas and gunnery targets for aircraft have been established as follows:

Target A in latitude 24°32′45″ N., longitude 82°02′45″ W.
Target B in latitude 24°32′40″ N., longitude 81°59′50″ W.
Target C in latitude 24°31′30″ N., longitude 81°57′50″ W.
Target D in latitude 24°32′45″ N., longitude 81°55′15″ W.
Target E in latitude 24°35′10″ N., longitude 81°57′30″ W.
Target F in latitude 24°36′10″ N., longitude 81°56′00″ W.

All areas within a 2-mile radius of each of the targets have been officially declared as Operating Areas and the only time that commercial or private craft will be allowed in these areas is when they are actually in transit through the areas.

**A prohibited area** has been established in Florida Bay and, along with regulations governing it, is defined as follows:

*The Prohibited Area.*—The area for live firing is bounded on the north by latitude 24°51′08″ N., on the south by latitude 24°48′52″ N., on the east by longitude 81°13′52″ W., and on the west by longitude 81°16′21″ W. The hull of a vessel is located in the center of the area and is used by United States Fleet Aircraft for live strafing.

*The Regulations.*—1. The area is closed to all vessels at all times.

2. These regulations shall be enforced by the Captain of the Port, Key West, Fla.

**A point** to the northwestward of Smith Shoal in latitude 24°45′ N., longitude 82°00′ W., is used for aircraft bombing with live depth bombs.

# Miami to Fowey Rocks

## Chart 1248

**Norris Cut** is a shallow inlet between Fisher Island and Virginia Key.

The target on the east end of **Virginia Key** is the old rear range of the Miami Entrance Range. The marker is a white square daymark and tank house with black vertical stripe on skeleton tower on piles.

**Key Biscayne** is connected to the mainland by a causeway which crosses **Bear Cut,** Virginia Key, and Biscayne Bay. **Cape Florida Lighthouse,** at the south end of the key, is maintained privately as an unlighted daymark and is painted white.

Cape Florida Anchorage, just inside the cape, is good for vessels of about 9-foot draft. To enter, follow the daybeacons of the Biscayne Channel, see Chapter 3, Table 17, to Biscayne Channel Inner Range Front Light 8. Pass close to the westward of this light, and steer **313°,** coming to anchor about 300 yards westward of the south end of Cape Florida, with the unused light tower bearing northward of 069°, in a depth of 12 to 20 feet.

**Fowey Rocks Light,** shown from a brown, octagonal, pyramidal skeleton tower on pile foundation enclosing a white dwelling and stair cylinder, is 110 feet above the water, visible 16 miles. A radiobeacon has been installed at the light. Hurricane warning flags are displayed, daytime only. Storm and small-craft warnings are not displayed.

Fowey Rocks Anchorage, about 1.25 miles westward of Fowey Rocks Light, is fairly well sheltered, and can be reached by vessels of about 14-foot draft. Vessels up to this draft may follow the directions for entering Hawk Channel and anchor 0.25 mile westward of Fowey Rocks buoy 3V, on the north edge of a red sector of Fowey

Rocks Light. Or, from outside pass 2.4 miles northward of Fowey Rocks Light and steer **288°** for Cape Florida Shoal Light in range with Biscayne Channel Entrance Range Rear Light for 1.25 miles. Now, steer **184°** for about 1.4 miles to the anchorage.

## Fowey Rocks to Alligator Reef

Chart 1249

**Dangers.**—A shoal of 5 feet and another of 10 feet exist 0.2 mile and 0.7 mile, respectively, south of the light. The broken iron stub of a former beacon, 1½ feet below the surface, is 3.2 miles 186° from the light.

Eastward of **Ragged Keys** is an 8½-foot shoal bearing 345° 0.6 mile from Ragged Key buoy.

About 0.2 mile south-southeast from Bowles Bank buoy 8 is a pile dolphin broken off below water level.

Eastward of the northern end of Elliott Key and 300 yards westward of Bache Shoal Light is a 9-foot shoal.

**Legare Anchorage** lies between the reefs westward of **Triumph Reef** and 7 miles south-southwestward of Fowey Rocks Light. The bottom is mostly hard, but there are some soft spots on which vessels may anchor and ride out a moderate gale. The entrances are not marked and the anchorage is not generally used.

**Bowles Bank Anchorage,** with depths of 14 to 16 feet, soft bottom in places, is good in all winds and lies about 0.5 mile north of Bache Shoal Light, eastward of the north end of **Elliott Key.**

On the eastern edge of **Long Reef** and **Ajax Reef** are several wrecks which bare at low water.

**Caesar Creek Bank Anchorage,** with depths of 10 to 12 feet, soft bottom, is good in all winds and lies on the west side of Hawk Channel between **Margot Fish Shoal** and **Caesar Creek Bank.** Caution must be observed to avoid a stub of old piling with 3½ feet over it, 175 yards northwest of Pacific Reef Daybeacon 5.

Excellent anchorage for small craft will be found in **Caesar Creek,** just north of Caesar Creek Bank. The entrance to the creek is marked by Caesar Creek Light, and has about 6 feet on the bar. The channel is marked by private markers. There is also a secure anchorage between **Adams Key, Meigs Key,** and Elliott Key. Through a privately marked channel, 5½ feet can be carried into Biscayne Bay. This channel leads along the northwest side of Adams Key.

**Pacific Reef Light,** shown from a white square, pyramidal skeleton structure, is 45 feet above the water and visible 12 miles.

**Pacific Reef Channel** has ample depths for vessels that use Hawk Channel. The entrance is north of the light, and the channel is marked. The chart is an adequate guide.

**Angelfish Creek** is about 4.5 miles southwestward of Caesar Creek. The channel leading to Card Sound is marked by lights and beacons. The outer end of the creek offers good protection, but the bottom is rock ledge and the anchor should be buoyed.

Gasoline, Diesel oil, water, and ice may be obtained at the dock just inside the east entrance. Vessels up to 6-foot draft can cross the bar and pass into Angelfish Creek. A draft of 5 feet can be carried into Card Sound at mean low water.

**Key Largo Anchorage.**—About 0.5 mile west of Key Largo buoy 25 off the north end of Key Largo, with Carysfort Reef Light bearing about 150°, soft bottom in 14 feet will be found, and vessels may anchor in safety without regard to wind direction.

**Key Largo Harbor** is a dredged harbor on the east side of Key Largo about 2 miles southwestward of Angelfish Creek Light 2. It has good anchorage and wharf facilities for small boats. A private pyramidal daybeacon about 10 feet high is on the north side of the entrance to the dredged channel, and a spoil-bank jetty on the north side of the channel. Controlling depth in the channel is reported 5 feet. Gasoline and limited supplies are available.

**Turtle Harbor,** a well-sheltered anchorage between the reefs lying northwestward of Carysfort Reef Light, is entered from the Straits of Florida by a marked passage. Vessels of 15-foot draft can use this passage in smooth water. Depth in the approach ranges from 4 to 6 fathoms, and at the anchorage from 4 to 4½ fathoms. Turtle Harbor West Shoal buoy 2 is moored 5 miles 030° from Carysfort Reef Light. From the sea buoy a **274°** course for 2.2 miles will lead to Turtle Harbor Entrance buoy. Then steer **214°** for about 1 mile, passing about 400 yards westward of Ten Foot Shoal Daybeacon and close aboard Middle Ground Northeast End buoy 2. Steer this course to an anchorage in the vicinity of Turtle Harbor Anchorage buoy. Vessels can enter Hawk Channel from this harbor by proceeding a short distance south of this buoy in mid-harbor and then heading a little north of Turtle Harbor buoy 27 on a **270°** course.

**Dangers.**—A pile which bares 8 feet and another which bares 5 feet are 5 miles 359° and 3.9 miles 350°, respectively, from Carysfort Reef Light.

**Carysfort Reef Light,** shown from a brown octagonal pyramidal skeleton structure on pile foundation, enclosing a conical dwelling and stair cylinder, is 100 feet above water and visible 16 miles. Small craft, storm, and hurricane flags are displayed by daytime only.

**Dangers.**—The following navigational hazards lie between Carysfort Reef Light and Garden Cove:

The wreck of a barge grounded and still intact about 2.1 miles 248°30′ from the light.

A pile about 700 yards east of Basin Hill Light and 4.4 miles 266°30′ from Carysfort Reef Light.

A cluster of three broken iron stubs with 3 feet of water over them, eastward of Key Largo, 17 yards westward of Basin Hill Light.

A wreck, the cabin of which bares 6 feet, lies 6.5 miles 250°15′ from Carysfort Reef Light. This wreck is not securely grounded and is subject to shifting.

**Garden Cove** is a shallow protected anchorage on the east side of Key Largo. Local knowledge is required to enter this anchorage with more than 2½-foot draft, but the shelter and holding ground are good when inside the cove. It is well protected except from the east and northeast, and is used occasionally by local charter fishing boats.

Local interests have improved the anchorage by dredging a narrow channel through the bank to a wharf at the end of a road connecting with U. S. Highway 1. The channel is marked at the entrance by a single pile daybeacon with a cross target, and on the

north side by finger daybeacons. A real-estate development at the cove has been abandoned.

To enter Garden Cove, follow outside the 3-foot curve until due east of the wharf. Then turn, heading to pass south of the private daybeacon marking the entrance. Proceed slowly through the channel, which is narrow in places but has a straight axis, to a point 100 yards east of the wharf, turn, and pick up good anchorage at a distance about 100 yards offshore. Gasoline and some provisions may be obtained here.

**The Elbow,** on which several wrecks have occurred, is a reef about 5.75 miles south-southwest from Carysfort Reef Light, marked on its seaward edge by Daybeacon B, a brown circular daymark on skeleton tower on piles, which is often destroyed by wind and sea. A boiler awash at high water is located on the northerly end, and other wrecks covered about 5 feet at mean low water are on the easterly side. Several broken piles show above water at the southern end. Stand well clear of this reef.

**Largo Sound** is the only protected harbor on the Hawk Channel side of the keys. To enter this sound from Garden Cove wharf, follow the west shore of the cove at a distance of 20 to 30 yards, to the creek entrance at the head. Use the eastern fork of the creek when 0.2 mile northward from the sound. To enter Largo Sound from Hawk Channel by way of the southern creek at an entrance about 0.8 mile southwestward of **Lower Sound Point,** follow a narrow dredged channel marked on its western side by a spoil bank and at the turn into the creek by a finger daybeacon. Follow the left bank of the creek into the sound. The other entrance to the southern creek, 0.5 mile southwestward of Lower Sound Point, is unmarked but is good for 2 feet draft.

A cylindrical tank structure baring 12 feet is 5 miles 066° from Mosquito Bank Light. This structure with underwater glass ports for viewing marine life is locally known as **The Glass House.**

A buoy marks the edge of the reef 5 miles southwest of The Elbow near **Dixie Shoal.**

**Mosquito Bank Light** is a black pointer and tank house on a triangular skeleton structure on piles. It is 37 feet above the water and visible 10 miles.

A reef baring 2 feet at mean low water lies 0.8 mile 043° from Molasses Reef Light. It disappears at intervals, but a rock remains awash.

**Molasses Reef Light,** shown from a brown square pyramidal skeleton structure, is 45 feet above the water and visible 12 miles.

Molasses Reef Channel has a controlling depth of about 8 feet. The entrance is just south of the light and the shoalest part of the channel is marked. The chart is a sufficient guide.

**Rock Harbor,** a shallow but well-protected harbor except from the southwest, is used by fishing boats and to a slight extent by pleasure craft. A 3-foot dredged channel leads to a bulkhead on the west side where a road connects with U. S. Highway 1.

To enter Rock Harbor, round the east point outside of the 3-foot depth curve and head for finger pile daybeacon at the channel entrance. Follow beacons to bulkhead. Channel is straight, but narrow. Strangers should keep a lookout on the bow, especially when 100 yards south of the bulkhead.

Yachts and small craft can find shelter north of **Rodriguez Key** in all winds except in the northeast quadrant.

**Tavernier Key Anchorage.**—Anchorage with soft bottom in 12 to 21 feet will be

found with Tavernier Key bearing between west and northwest, distant about 1 mile, or anchor in 13 to 17 feet from 0.5 to 0.75 mile westward or northward of Triangles Daybeacon 39 T. There is an anchorage with a depth of 5 feet northward of Tavernier Key. Immediately northward of Tavernier Key are two wrecks—a boiler, awash at high water, and the wreck of a barge, least depth 1½ feet at mean low water.

**Conch Reef** is marked by a buoy.

**Crocker Reef** is marked by Crocker Reef Daybeacon E which is a brown triangular daymark on piles.

**Hen and Chicken Shoals Light** is a red pointer and tank house on skeleton structure on piles, 35 feet above the water, visible 7 miles.

**Whale Harbor** has a dock where gasoline, fresh water, and ice can be obtained. A draft of 5 feet can be taken to the dock. Provisions and mail service are available at **Islamorada.**

## Alligator Reef to Sombrero Key

Chart 1250

**Alligator Reef Light,** shown from a white octagonal, pyramidal skeleton tower on black pile foundation, enclosing a white dwelling and a stair cylinder, is 136 feet above the water and visible 18 miles. Small-craft, storm, and hurricane flags are displayed, daytime only.

**Indian Key Channel,** crossed by the highway viaduct with a drawbridge, has a controlling depth of 6 feet from ocean to bay, and is about 200 yards wide, well defined, but marked only by private temporary stakes. Vertical clearance of the drawbridge is 14 feet at high water, when closed. Horizontal clearance is 40 feet.

**Channel Five** is a natural channel crossed by the highway viaduct with a single-leaf bascule span. Controlling depth on the ocean side is 7 feet and on the bay side 9 feet. However, a draft of 9 feet may be taken from the ocean with local knowledge. A strong current sometimes sets through this channel. Vessels with drafts up to 6 feet can follow the marked route leading westward and northwestward and pass off Cape Sable to the Gulf of Mexico.

**Long Key Anchorage.**—Soft bottom in from 15 to 18 feet will be found 0.75 mile westward of Long Key buoy, but the anchorage is exposed to southerly winds.

**Tennessee Reef** is marked by a daybeacon on its eastern side and by Tennessee Reef Light on its southwestern end. The structure, black with tank house on hexagonal, pyramidal skeleton tower on piles, is 49 feet above the water, visible 12 miles.

**Storm warnings,** day only, are shown from **Grassy Key.**

**Turtle Shoal Anchorage.**—Fair anchorage in fine weather will be found in about 4½ fathoms, soft bottom, about 1 mile west of East Turtle Shoal Light, and also 1 mile west of West Turtle Shoal buoy, in from 4 to 6 fathoms.

The remains of an old beacon near the eastern end of **Coffins Patch** is marked by Coffins Patch obstruction buoy, a horizontal-banded buoy.

The seaward edge of the reef near Coffins Patch is marked by **Coffins Patch Daybeacon F,** a black square daymark on skeleton tower on piles.

**Knight Key Anchorage** is a good anchorage about 0.75 mile southwestward of **Knight Key,** but it is exposed to southwesterly winds. To make this anchorage, bring Sombrero Key Light astern on a **343°** course, anchor in 3 to 5 fathoms, sticky bottom. The westerly edge of a red sector in Sombrero Key Light leads to the anchorage. The west side of Knight Key should be given a berth of about 0.5 mile.

**Boot Key Harbor** lies close south of **Hog Key.** During construction of the Florida East Coast Railway, this was an important base of operations. A narrow channel with a least depth of 6 feet has been dredged to Hog Key and affords a secure harbor for launches and small craft. The entrance is about 0.4 mile southward of Knight Key and is marked by a light and daybeacons. The color of the banks is a good guide in the narrow channel.

Boot Key Harbor has a repair yard with a marine lift capable of hauling out a vessel 45 feet in length, 12-foot beam, 6-foot draft, and 70 tons. Hull and engine repairs can be made. Gasoline and fresh water are available. Provisions can be obtained in **Marathon** on **Vaca Key.** Several fish wharves are in the harbor.

**Sister Creek** is a narrow passage separating **East** and **West Boot Keys.** It has several arms which provide very secure refuge during a tropical hurricane. Vessels tie to the mangroves. The entrance to the creek is between **West Sister** and **East Sister Rocks,** and is privately marked. A channel 6 feet deep connects the eastern end of the Boot Key Harbor with Sister Creek.

## Sombrero Key to Key West

### Chart 1251

**Sombrero Key Light,** shown from a brown octagonal, pyramidal skeleton tower on pile foundation enclosing a square dwelling and stair cylinder, is 142 feet above the water and visible 18 miles. Small-craft, storm, and hurricane flags are displayed, daytime only.

**Moser Channel,** 95 miles from Miami, affords a passage between the Florida Keys from the Straits of Florida to Florida Bay, for vessels of 7- to 8-foot draft. Small craft can find comparative shelter in the shallow waters of Florida Bay. Moser Channel is crossed at its southerly end by a highway swing bridge with an opening 107.5 feet wide on each side of the central pier, and a vertical clearance, closed, of 23 feet at high water.

A strong tidal current is always found, except at slack water, in Moser Channel in the vicinity of the bridge, and during spring tides there are overfalls which may swamp a small boat. This tidal current is caused by the difference in the tides on the south and north sides of the keys. Winds also affect the currents very noticeably. The northerly current is increased by easterly winds and the southerly current by westerly winds, due to the effect of these winds in driving out or piling up, respectively, the waters in Florida Bay. The flood current runs northward and the ebb current southward through the draw of the bridge.

**Directions.**—From the bridge steer **336°** for 0.5 mile, thence **000°** for 2.75 miles to a position 200 yards west of Red Bay Bank Daybeacon 2, then **024°** 4.0 miles to a

position 0.5 mile east of Billard Bank Daybeacon 1, thence **350°** 25.5 miles to a position 3.0 miles west of North West Cape of Cape Sable, thence to destination.

**Bahia Honda** was formerly an anchorage for vessels. When turning northwestward, after passing under the bridge, the direction of the current should be carefully watched in order to avoid being grounded on the banks on either side of the channel. These banks are usually visible. Currents through the bridge have a velocity of 3 to 4 knots. The center span in the highway bridge has a horizontal clearance of 230 feet and a vertical clearance of 22 feet at mean high water. From Bahia Honda vessels may proceed via Big Spanish Channel to the Gulf of Mexico. For directions see page 373.

**Big Pine Shoal Daybeacon G** marks the seaward side of the Florida Reef. This is a black square daymark on skeleton tower on piles.

**Looe Key Daybeacon H** marks the seaward edge of the key. It is a red diamond daymark on piles.

**Newfound Harbor Keys.**—Anchorage is good in the channel close northwest from the Newfound Harbor Keys. To enter, head northeast for Newfound Harbor Anchorage Daybeacon on the point of shoal west of the keys. The daybeacon stands in water 6 feet deep and should be passed close to westward.

**Newfound Harbor Channel** is clearly defined by the appearance of the water. A strong current sets fair with the channel.

**Niles Channel** lies between **Big Torch Key** and **Ramrod Key** on the east side and **Summerland Key** on the west. It is the best channel from the ocean to the Gulf between Bahia Honda and Key West, although it is not as well marked as Sugarloaf Channel about 4 miles to the westward. It is wide with depths of 5 to 6 feet at mean low water and marked at its narrowest sections by private stakes. It is used to greater extent than any other channel in this immediate area. The size of boat is limited by the fixed highway bridges which have vertical clearances of 9 feet at mean high water. The chart is the best guide, but caution should be exercised when close to the highway bridge as a number of pilings are on the north side of the bridge.

**Loggerhead Key Anchorage,** with a depth of 15 feet, soft bottom, is about 0.75 mile eastward of **Loggerhead Key** and about 1 mile north-northeast of Loggerhead buoy. This is a fair anchorage in all but southerly winds. When going to the anchorage pass at least 0.25 mile eastward of the buoy.

**Sugarloaf Channel,** lying between **Sugarloaf** and **Cudjoe Keys,** is marked by daybeacons from Hawk Channel to the highway bridge. This bridge has a vertical clearance of 7 feet at high water.

**Caution.**—Sugarloaf Channel currents are strong, and set fair with the channel; north with the flood and south with the ebb. This channel is not recommended for a draft of over 2 feet without a pilot. The latter may be obtained at the fishing camp in Pirates Cove during the winter season. Boats over 30 feet in length should not proceed north of Pirates Cove without a pilot. Controlling depths are reported to be 4 feet from Hawk Channel to the highway bridge, thence 2 feet to the Gulf. **Cudjoe (Sacarma) Bay,** eastward of the channel and south of Cudjoe Key, offers fair holding ground for fishing boats.

A hotel and boat harbor with wharves are located at **Pirates Cove,** Sugarloaf Key. The cove is reached from Sugarloaf Channel by a dredged channel with 3-foot depth. This channel leads to the south side of the fishing camp pier. A strong current sets

across the channel and boats tied up alongside the pier must be held off with an anchor to avoid damage. Gasoline, fresh water, and telephone service are available.

About 1.4 miles south of Pirate Cove a dredged cut with a depth of 4 feet extends westward 0.4 mile to a highway where gasoline and lubricating oil are procurable. Charter fishing boats are moored here. Other charter boats at **Perky** make pleasure fishing trips northward into the Gulf. These boats have a draft of 4 feet. Passage through the keys can be made only with local information.

**American Shoal Light,** shown from a brown, octagonal, pyramidal skeleton tower on pile foundation enclosing dwelling and white stair cylinder, is 109 feet above the water and visible 16 miles. Small-craft, storm, and hurricane flags are displayed, daytime only.

**Ninefoot Shoal Light** has red pointers and a black tank house on red and black banded skeleton structure on piles, and is 33 feet above the water, visible 10 miles.

**West Washerwoman Anchorage,** with a depth of 23 feet, soft bottom, is 1.2 miles 295° of Ninefoot Shoal Light.

**Pelican Shoal Daybeacon I** marks the seaward edge of the reef. It is a white cross daymark on skeleton tower on piles.

**Saddle Hill Anchorage,** with a depth of 24 feet, soft bottom, is 1 mile 268° off Pelican Key buoy.

**Saddlebunch Harbor,** 10.5 miles eastward of Key West, is a good hurricane anchorage for small craft.

**Boca Chica Key** and **Stock Island** are comparatively high. The small keys to the northward are very low and covered by a thick growth of red mangrove. In general, the deeper waters dividing the keys are inaccessible due to the shoals surrounding the deep-water areas.

**Boca Chica Channel** leads to a good hurricane anchorage for small vessels.

**Western Sambo Daybeacon J** marks the eastern end of the key. It is a white triangular daymark on piles.

## Key West Harbor

Chart 584

**Key West Harbor** is large and commodious and one of the best anchorages for large vessels south of Chesapeake Bay. The harbor proper lies in front of the city of Key West, protected on the eastern side by the island and on the other sides by submerged reefs and sand flats. Its length is 2 miles, and width, 0.25 mile. Southwest of the harbor proper is a large anchorage area protected by the reef. The harbor is entered through breaks in the reef by five principal channels with depths of 13 to 30 feet, and several minor channels. No bridges cross the ship channels at this port. The inner harbor is shown on Chart 576.

**Prominent features.**—When standing along the Florida Keys about 6 miles off, the three radio towers—each 300 feet high and north of **Fort Taylor,** the hotel cupola, and the Naval Hospital cupola, are landmarks easy to identify. Numerous tanks, lookout

towers, and masts are prominent but too close together to be readily identified or distinguished. Key West Light is not conspicuous. Sand Key Light will be seen about 7 miles southwestward of Key West Light.

**Eastern Triangle Light,** shown from a black tank house on a red triangular, pyramidal skeleton structure on piles, midway between the entrance buoys of the Main Ship Channel and Key West Light, can be readily distinguished from outside the reefs.

**Key West Light,** near the west end of Key West Island, shown from a buff conical tower with a green lantern, is 91 feet above water and visible 15 miles.

**Northwest Passage Unused Lighthouse** is a gray two-story abandoned house on pile foundation, standing in 4 feet of water, 2 miles south of the entrance to Northwest Channel. The light has been discontinued, the lantern removed, but this house makes a good landmark in approaching the outer entrance to Northwest Channel.

**Smith Shoal Light** (Chart 1252), shown from a black tank on a white hexagonal, pyramidal skeleton tower on piles 4 miles off the northwest entrance to Northwest Channel, is 47 feet above the water, visible for 12 miles. An unmarked 15-foot shoal is 3.3 miles westward of Smith Shoal.

For a description of Sand Key Light see page 361.

**Channels** (Chart 584).—There are several channel approaches to the harbor, leading between the reefs and coral banks which surround it. They have been examined with a wire drag and the dangers are shown on the chart. Main Ship Channel and Northwest Channel are principally used and, in conjunction, furnish a direct route across the reef for vessels drawing up to 17 feet.

**Southeast Channel** is marked by buoys and at night by the easterly edge of a red sector in Key West Light. It leads over lumpy bottom with 14 to 18 feet over the coral heads, and it is not recommended for vessels of over 13 feet draft. The course through the channel is **321°** for Key West Light.

**Main Ship Channel** has been improved by a Federal project which provides for removal of coral heads and reefs from the main ship channel and anchorage to give a clear depth of 30 feet at mean low water and a channel width of 300 feet.

The United States Navy in December 1942—July 1943, dredged a channel 30 feet deep, 300 feet wide, and 9,000 feet long to extend the Main Ship Channel to the Naval Operating Base, and dredged a turning basin at that point 1,200 feet wide, 1,500 feet long, and 30 feet deep.

In December 1947, the controlling depth was 30 feet to and including the turning basin, a 10-sided area varying from 300 feet in width to a maximum width of 1,200 feet and a length of 1,500 feet. Deep-draft vessels use this channel.

**Southwest Channel** is a convenient approach from southwestward. It has a navigable depth of 17 feet if closely followed, and is marked by several buoys. Vessels of 16-foot draft can make one course nearly to the anchorage by heading for Key West Light, bearing 055° in the daytime, and by standing on the edge of a red sector of that light at night. The deepest draft of the vessels using this channel is 16 feet. Strangers should not attempt it at night.

**West Channel** is a passage leading westward from Key West between the outer reefs and the keys. The channel is deep and is fairly well marked. Small boats bound toward the Dry Tortugas use it.

**Northwest Channel** has been improved by a Federal project which provides for a northwest entrance channel 17 feet deep at mean low water and of sufficient width for

navigation, to be obtained by construction of a stone jetty on each side of the entrance and by dredging removing the middle ground to the extent of enlarging the channel opposite the wharves to a width of 800 feet and a depth of 26 feet at mean low water.

In December 1947, the controlling depth of the channel was 17 feet on the entrance range. This channel affords a passage between the Gulf of Mexico and Key West Harbor. The channel is well marked except that the inner range is hard to identify from the northward until within about a mile of the front light. This range bears 139°.

**Calda Channel** extends northward from Man of War Harbor and forms a passage with a controlling depth of 4½ feet in December 1947 to the Gulf of Mexico. Narrow and irregular, the channel is marked by daybeacons and a light at the outer entrance. Vessels over 4-foot draft should not attempt this channel. It should be used only by those with local knowledge and in periods of good visibility.

**Pilots.**—Pilotage is compulsory for vessels in foreign trade and for other vessels except when there is a pilot on board, licensed by the Federal Government. Pilotage is optional for vessels drawing 6 feet or less, if such craft are enrolled in coastwise trade. Vessels carrying United States mails pay one-half pilot rates. Pilots can always be obtained by signal from outside the reefs. Fast boats carry pilots out to waiting ships in 20 minutes. Vessels may be piloted in at night. The usual procedure is to radio ahead for a pilot. Pilots for Hawk Channel are local fishermen available at Key West.

**Special service by pilot boat.**—Vessels frequently find it convenient to make use of a special service performed by the pilot boat at Key West. If requested by radio or telegraph, the pilot boat will meet vessels at the bar buoy, main channel, to deliver orders or provisions or take off sick men for hospitalization at Key West. Half pilot rate, day or night, is charged for this service.

Following are extracts from the pilotage rules and regulations:

The master of any vessel entering the port of Key West who does not accept the services of a pilot shall be compelled to pay the full legal rates of pilotage, provided the vessel be spoken outside the following limits:

If she be entering by main ship channel she must be spoken outside the western head buoy or No. 1. If by Hawk Channel, she must be spoken east of midchannel buoy, intersecting Southeast Channel and Hawk Channel, Key West Light bearing NW. ¼ N.

If entering by Southwest Channel or Sand Key, she shall be spoken southwest of a line of No. 7 black buoy and No. 8 red buoy in Southwest Channel. If entering Northwest Channel, she must be spoken outside of No. 1 or bar buoy. If entering by Southeast Channel, she must be spoken outside of No. 4 red buoy, Sand Key bearing SW. by W. ¾ W.

Should a vessel entering the port of Key West without being spoken by a licensed pilot outside the foregoing limits, the first pilot speaking her thereafter shall be entitled to full outward pilotage.

Any pilot detained on board of any vessel by the master or quarantine officer shall receive for each and every day's services the sum of $5 per day over and above his pilotage.

All fees and rates of pilotage on vessels entering or leaving this port shall be due 24 hours previous to clearing from customhouse and are recoverable before any justice of the peace or other courts having competent jurisdiction in this county.

| **Pilotage rates are as follows:** | *Per foot* |
|---|---|
| 6 feet draft or less | $2 |
| 6 to 10 feet draft | 3 |
| 10 to 14 feet draft | 4 |
| 14 to 20 feet draft | 5 |
| Over 20 feet draft | 6 |
| **Rates for moving, docking, shifting, or taking from docks are as follows:** | |
| 14 feet draft or less | $10 |
| Over 14 feet draft | 20 |

**Towboats.**—Key West is the regular station for a large salvage tug. General equipment for heavy salvage work is available.

**Quarantine.**—Vessels subject to inspection by the quarantine officer are boarded off Fort Taylor, and no vessel is permitted to pass above this point before obtaining pratique. The quarantine anchorage is in Man of War Harbor if size and draft of vessel permits. Larger ships anchor in the outer harbor.

**Customs.**—Key West is a customs port of entry where marine documents are issued.

**Immigration.**—Immigration officials are stationed at Key West for the inspection of passengers and crews of vessels in the foreign trade.

**The United States Public Health Service** maintains a third class relief station at Key West. Two privately-owned hospitals and a naval hospital are in the city. The nearest marine hospital is at Savannah or New Orleans.

**Anchorages.**—Best anchorage is in the inner or **Man of War Harbor** where the depth is 19 to 26 feet. This anchorage, which is the usual quarantine anchorage, is northward of the city between the coral banks on the west and Fleming Key on the east and affords protection against heavy seas. Vessels can anchor anywhere off the city northward of Fort Taylor, or in Northwest Channel abreast of the city in 20 to 30 feet, taking care, however, to avoid getting too close to the reefs which in some spots rise abruptly at the edge of the channels.

An anchorage with fair holding ground in 26 to 43 feet lies from 2 to 5 miles southwest of Fort Taylor. This area on the line of Southwest Channel, about a mile wide, is within the limits of the buoys on Southwest Channel.

**Small-craft anchorages.**—Small craft generally anchor in **Key West Bight,** or **Garrison Bight,** on the northwest and northeast side of the city respectively.

**Harbor regulations.**—The harbor master has direct supervision of the port, of anchoring and mooring all vessels, and collection of port dues. A speed limit of 10 miles per hour has been fixed in the Main Ship Channel from Key West Entrance lighted whistle buoy to the inner harbor. All vessels must observe this limit.

**Tides.**—The mean rise and fall of tide is about 1¼ feet. Daily predictions of the times and heights of high and low waters will be found in the *Tide Tables, Atlantic Ocean*.

**Currents.**—The tidal currents in Key West Harbor and Northwest Channel set fair with the channels, and the times of maximum current at these places are nearly simultaneous, the strength of the flood (north flowing) occurring about 2½ hours before high water, and the ebb about 2 hours before low water, at Key West. Slack water occurs about ½ and 2 hours respectively, after high and low water at Key West. Average velocity at strength of both flood and ebb is about 1 knot between Whitehead Spit and Kingfish Shoals, 1½ knots in Man of War Harbor and its entrance, and 1½ knots in Northwest Channel abreast of Middle Ground. These normal conditions are greatly modified by winds.

**Directions, Key West Harbor.**—The approaches to Key West Harbor have been examined by means of a wire drag and the dangers are shown on the chart.

Key West Entrance lighted whistle buoy is moored in about 91 feet of water on the Main Ship Channel Range, 5.2 miles, 176° from the front range light. Main Entrance lighted bell buoy 1 in 26 feet of water marks the westerly side of the channel. A wreck with unknown depth over it lies to westward of the whistle buoy.

Key West Main Ship Channel Range marks the axis of the channel up to Eastern

Triangle Light. The front light of the range is mounted on a white skeleton structure, solid daymark, on the inshore end of the causeway leading to Fort Taylor. The rear light of the range is mounted on a white iron mast near the southeast corner of the Navy coal shed, white stripe down roof and side of shed.

For courses and distances, Main Ship Channel, see Chapter 3.

Northwest Channel has been examined by means of a wire drag and dangers are charted. The following courses lead in a least depth of 17½ feet: From a position about 0.3 mile east of Smith Shoal Light, steer **171°** to a position about 200 yards west of Northwest Channel Entrance lighted bell buoy 1.

For courses and distances, Northwest Channel, see Chapter 3.

**Terminal facilities.**—Depth at the piers and wharves ranges from 10 to 30 feet, according to locality. Three privately owned docks or piers are used for general freight and have a berthing space of about 2,000 feet. In addition there are three Government-owned piers with a berthing space of about 2,000 feet, and a few small privately owned docks. There are facilities for storage of oils and general cargo, and three piers have transfer sheds.

**Supplies.**—Gasoline, fuel oil, and so forth, are procurable. Key West depended entirely on rainwater for its water supply, but now an 18-inch pressure line brings fresh water from the mainland. The usual charge for fresh water is 1 cent per gallon. Provisions and some ship chandlery are available. Since Key West is less than an hour's run off the main route for ships passing around the south end of Florida, it is a convenient place of call for fuel and provisions. Arrangements can be made locally for delivery of supplies and provisions to vessels in the Gulf Stream. See "Special Service by Pilot Boat," on page 358.

**Salvage and wrecking gear.**—A large salvage tug and general equipment for heavy salvage work are available.

**Repairs.**—Two small repair yards are located in Key West Bight. The larger yard has a marine railway capable of hauling out boats up to 60-foot length and 5½-foot draft for general repairs.

**Commerce.**—Key West on Key West Island, near the western end of the Florida Keys, is the only city of any size on the west and north shores of the Straits of Florida southward of Miami. Before the 1935 hurricane it was the terminus of the Florida East Coast Railway.

The city was once of considerable importance but this has fallen off in recent years. It now is a winter resort and site of a large United States Navy submarine base. Commerce consists mainly of crude and refined oils. An auto ferry was scheduled to begin operations between Key West and Habana, March 1, 1948, and a barge line was also scheduled to run to Miami in 1948.

A small cigar manufacturing and sponge industry exist at Key West.

**Communications.**—The Overseas Highway connects with Miami and points north. Air service connects with Miami.

**Winds.**—The prevailing winds are easterly, the strongest north in winter and easterly during the hurricane months. See also the meteorological tables in the Appendix.

**Storm warnings** are displayed day and night from the Weather Bureau at the submarine base and, by day only, from William Curry's Sons Building, and from the Lumley and Roberts Building. The Coast Guard broadcasts weather reports upon request and during storms. Use 2670 or 2704 kc.

# Key West to Rebecca Shoal

Chart 1252

Westward of Key West is a succession of shoals, reefs, and keys, mostly of a coral formation and very irregular in outline. The keys are low, small in extent, and, except for the Dry Tortugas, largely covered with a dense growth of mangrove. Fresh water in limited quantities is found on Marquesas Keys and some rain water is caught and stored at Dry Tortugas.

**Sand Key Light,** shown from a brown square, pyramidal skeleton structure on pile foundation, enclosing square dwelling and stair cylinder, is 109 feet above water and visible 16 miles.

About 5½ miles south of the main chain of keys and reefs, and extending westward from Sand Key Light for a distance of 40 miles or more, is a line of reefs, shoals, and generally broken ground which rises abruptly from the deep water of the Straits of Florida. Satan Shoal, Vestal Shoal, Coalbin Rock, Cosgrove Shoal, Marquesas Rock, and a 17-foot spot 2¼ miles westward of Marquesas Rock are the most dangerous of those known at present. This line of reefs is marked by several buoys and a daybeacon.

As a measure of safety, when standing westward of Key West and bound into the Gulf of Mexico, vessels of the deepest draft should avoid this broken ground, including the areas with depths less than 10 or 12 fathoms lying southward and westward of Rebecca Shoal and Dry Tortugas. A course which leads 1 to 2 miles south of the buoys, 12 miles south of Rebecca Shoal Light, and 8 miles south of Dry Tortugas Light on Loggerhead Key is as close as this broken ground should be approached when skirting it. The hand lead cannot be depended upon to insure clearing the dangers.

The **currents** near the edge of the bank in this locality are variable, being influenced by the winds, by differences of barometric pressure in the Gulf and outside, and by the tides. The tidal currents are strong through the passages westward of Rebecca Shoal, a velocity of 1½ knots north and south having been observed in the passage. The tidal current on and off the edge of the reef should also be taken into consideration by vessels in these waters.

On the eastern side of the Gulf of Mexico, for a distance of possibly 100 miles outside the 100-fathom curve, southeasterly currents prevail and velocities as high as 2.5 knots have been reported. Gulf Stream investigations indicate that the strongest current into the Straits of Florida is found near the 1,000-fathom curve westward of Dry Tortugas, and that velocities of 1.5 to 2 knots are frequent in that locality. Approaching Dry Tortugas from the Gulf should, therefore, be regarded as a difficult run, as a vessel will overrun her log, and observations are the principal guide. Currents may be expected at all times, but variations occur both in direction and velocity, due to the season of the year and the winds. Approaching the passage westward of Rebecca Shoal from northward, a number of vessels have stranded on New Ground, indicating an easterly set.

For about 11 miles westward of Key West Harbor is an extensive shoal area with a number of small scattered keys on it. White sand beaches make the three southernmost keys easily distinguishable from the southward.

Small craft may find passages across this shoal area but the channels are not marked.

789063°—48——22

Several small mangrove-covered keys dot the area. They are **Mule, Crawfish, Archer, Cottrell, Big Mullet, Little Mullet, Barracouta, Joe Ingram, Man, Woman, Ballast,** and **Boca Grande Keys.**

**Western Dry Rocks,** about 3 miles west of Sand Key Light, are marked by Western Dry Rocks Daybeacon K, a brown square daymark on a pile.

**Satan Shoal** and **Vestal Shoal** and a 17-foot shoal are marked by buoys on their seaward side.

Southwest Channel and West Channel are described under Key West Harbor.

**Boca Grande Channel,** about 15 miles westward of Key West, between Boca Grande Key and Marquesas Keys, affords a short cut across the shoals from the Straits of Florida to the Gulf of Mexico; but it is seldom used as the Northwest Channel from Key West has deeper water, is better marked, and cuts off more distance for vessels coming from or bound to points northward or eastward. Boca Grande Channel is good for a depth of about 11 feet and is marked by channel buoys. It is used only by local boats of about 6 feet or less draft. A **002°** course will lead through the marked channel. A wreck, about 1.7 miles northwest of buoy 1, bares 20 feet at low water.

A good anchorage for small boats drawing less than 5 feet is 0.8 mile northeastward of Boca Grande Key.

**Coalbin Rock buoy** marks the seaward edge of Coalbin Rock.

**Cosgrove Shoal Light,** shown from a black tank house on a red hexagonal, pyramidal skeleton tower on piles, is 49 feet above water and visible 12 miles.

**Marquesas Rock buoy** marks the south edge of the rock of the same name.

**Marquesas Keys** are a number of keys, roughly circular in outline, lying westward of Boca Grande Channel; they are about 4 miles long and 3 miles broad and surrounded by an extensive shoal area. The northernmost key is the largest and has a strip of sandy beach free of mangrove.

A good anchorage, **Mooney Harbor,** for small boats drawing 4 feet or less, is inside the keys by approaching the opening between **Mooney Harbor Key** and **Gull Keys** from a south by east direction, passing well to eastward of the coral heads at low tide 1 mile south of the opening. Other small-boat harbors are reported at the eastern end and in the northwest corner of the keys.

**Ellis Rock,** 4 miles northwest of Marquesas Keys, is marked by a daybeacon.

Four miles west of Marquesas Keys is a wreck above water used as a bombing target.

Extending in a westerly direction for a distance of 18 miles from Marquesas Keys is an extensive shoal, the western part of which is known as **The Quicksands.** The general width of the shoal between the 18-foot curves is about 4½ miles, with depths of only 2 to 6 feet over it in spots. The target near the eastern end of The Quicksands is a steel drum on a pile, 3 feet above the water. At the western end of The Quicksands is **Halfmoon Shoal,** with a least depth of 10 feet on it. A buoy marks the location of a wreck.

About 5 miles north of The Quicksands is **New Ground,** a narrow ridge 5½ miles long in a general east and west direction, 0.4 mile wide, and with a least depth of 4 feet. Its western extremity is marked by **New Ground Rocks** lighted whistle buoy. On the northern side of New Ground the water shoals abruptly, and vessels should keep in not less than 13 fathoms to insure clearing the shoal.

On the southern side of New Ground, and between it and The Quicksands, is a natural channel, 2.2 miles wide, with depths of 29 to 41 feet. Spots having 20 feet over

them are found 7 miles eastward of New Ground, and the bottom inside of the 10-fathom curve is generally broken. This channel is used by the Coast Guard supply vessel which makes a weekly trip from Key West to Dry Tortugas; however, this route is not recommended for use by strangers.

Between Halfmoon Shoal and Rebecca Shoal is a channel used by steamers with local knowledge drawing as much as 18 feet, but it is not recommended for a stranger because of the broken nature of the bottom and the currents. Within a radius of 2.7 miles from the buoy on Halfmoon Shoal, between southeast and west of it, are a number of spots, with least found depths of 20 to 22 feet, rising abruptly from depths of 6 to 7 fathoms.

Another spot, **Isaac Shoal,** nearly 2 miles southeast from Rebecca Shoal has a least depth of 14 feet. The shoals are of the nature of coral heads, rising very abruptly from the deep water surrounding them, and there are probably other shoals not found by the survey. It is also probable that there are less depths than found by the survey on the charted shoals.

**Currents.**—In the channel between Halfmoon Shoal and Rebecca Shoal slack water before the flood (northerly) occurs about 2 hours after the time of low water at Key West, and slack water before the ebb (southerly) occurs about 2 hours after the time of high water at Key West. The average velocity of the current at strength is 0.8 knot. The times of slack water and the velocity of the current are considerably influenced by the winds.

**Rebecca Shoal,** a coral bank quite small in extent and with a least depth of 11 feet over it, lies about 7 miles westward of Halfmoon Shoal.

**Rebecca Shoal Light** is a white dwelling on a brown pile foundation on the southerly edge of the shoal, 66 feet above the water and visible 14 miles. A red sector covers Isaac and Halfmoon Shoals and The Quicksands.

## Rebecca Shoal to Dry Tortugas

### Chart 1351

So far as is now known the passage between Rebecca Shoal and Dry Tortugas is clear. The lower part of the passage, south of a line from Rebecca Shoal Light to Tortugas Harbor Unused Lighthouse and west of a line extending north-northeast and south-southwest, and passing 1 mile west of Rebecca Shoal Light, has been examined by wire drag. Included in the dragged area are the three 10-fathom spots on a line about 9 miles south of the northern limit of the drag work. Until more detailed surveys have been made in the remainder of this locality, vessels of the deepest draft should use this passage with great caution, as there are probably undiscovered spots with less depths than those now charted. A vessel is reported to have struck an obstruction 2 miles 285° from Rebecca Shoal Light. No obstruction was found here with the drag set to a depth of 33 feet or over. A vessel is also reported to have struck an obstruction with about 18 feet over it 11 miles 147° from Rebecca Shoal Light.

**Rebecca Shoal Channel** immediately to the westward of Rebecca Shoal Light is

frequently used by vessels bound from the Straits of Florida to points on the west coast of Florida. But in accordance with the above comment relative to shoals in this area, this passage should be used with caution and vessels should continue about 15 miles past the lighted bell buoy marking a 28-foot spot about 8 miles south of Halfmoon Shoal before heading to the northward. This passage is well lighted.

Vessels bound for Mobile, New Orleans, and other Gulf ports pass to the westward of Dry Tortugas.

**Dry Tortugas (Chart 585)** is a group of small sandy reefs and keys about 10 miles long in a northeast and southwest direction and about 5 miles wide, 58 miles westward of Key West. **Pulaski Shoal,** the northeastern end of this group, is 12 miles northwestward of Rebecca Shoal and is marked by **Pulaski Shoal Light** on the east side of the shoal. This light is shown from a black hexagonal, pyramidal skeleton tower on piles, 49 feet above the water, visible 12 miles. The keys are irregular in form, and in general rise abruptly from deep water, with fairly good channels between them. As the keys are low and covered by thick growth of mangrove, with only seven of them showing above high water, they are not readily distinguished; but Fort Jefferson and Tortugas Harbor Unused Lighthouse on Garden Key, and Dry Tortugas Light on Loggerhead Key, are good landmarks. On a clear day they may be seen at a distance of 10 to 12 miles, Garden Key having the appearance of a bare rocky island.

The keys in this area are continually changing size and shape. Caution should be exercised when navigating in the vicinity.

When approaching Dry Tortugas from eastward or southeastward, the lead is of little use to give warning of danger, as 10 to 15 fathoms is found close to the reefs in many places. The shoal extending south of **Middle Key** can be cleared by keeping south of Dry Tortugas Light and the unused lighthouse on Garden Key in range. Entrance East Side buoy is on this range. Approaching from northwestward or southwestward, the water shoals more gradually; but in thick weather a depth of 10 fathoms is as close as any vessel should approach, unless sure of her position. Avoid the shoals near **East Key** and **Hospital Key.**

**Tortugas Harbor Unused Lighthouse** on Garden Key is a black, hexagonal, pyramidal tower, 67 feet high.

**Dry Tortugas Light,** on **Loggerhead Key,** is a conical tower, lower half white, upper half black, 151 feet above the water and visible 19 miles. A radiobeacon is at the light.

Two buoyed channels, Southeast and Southwest Channel, lead to the anchorages among the reefs, and on a clear day no difficulty need be experienced by a medium-draft vessel in entering, as the shoals are readily distinguishable by the difference in color of the water. All of the channels, except that part of Southwest Channel southward and westward of Tortugas Starboard Outer buoy, have been closely developed by survey with lead, but have not been dragged to develop the least depths. The bottom is so rocky and broken and the rocky heads are so small in extent that vessels should exercise the greatest caution, even in the buoyed channels, where the depths are not more than about 10 or 12 feet greater than the draft.

**Southeast Channel** leads between the reefs making off eastward from **Long** and **Bush Keys** and those making off westward from East, Middle, and Hospital Keys. This channel has depths of 30 feet or more, but it should be used with caution by vessels drawing over 18 feet.

**Southwest Channel** leads between the reefs making off southwestward and west-

ward from Garden Key and **Bird Key Bank** and those extending southwestward from Loggerhead Key. The least found depth on the usual course is 6 fathoms, but it has not been closely developed outside of Tortugas Starboard Outer buoy. Tortugas Outside lighted whistle buoy marks the entrance to the channel.

**Northwest Channel** has been abandoned and is unmarked.

**Anchorages** are numerous among the reefs where vessels can find shelter from heavy seas according to circumstances. The anchorage affording best shelter, although somewhat open to the northward, is northward and northwestward of Garden Key. It has good holding ground, and the depths range from 8 to 10 fathoms. Excellent anchorage for small vessels and boats is found in the deep water of **Bird Key Harbor,** close eastward of Bird Key Bank, and in **Tortugas Harbor,** the narrow channel leading to the wharf at Fort Jefferson through the reefs that surround Garden Key. Both entrance channels are from the northward and are well marked. The entrance to Bird Key Harbor is narrow and care is required to avoid the shoals on either side. These anchorages are used principally by the fishermen who frequent these waters.

**Fort Jefferson** is a National Monument on **Garden Key** maintained by the National Park Service. Two of the three wharves on the eastern side are in ruins. The third wharf, near the center of the east side, is in good condition. In 1947, three families lived on Garden Key.

**Supplies.**—No provisions, fuel, or fresh water are available at Dry Tortugas.

For 10 miles westward of Dry Tortugas the bottom is broken and irregular, and consists of coral rock with patches of sand and broken shell. The shoalest part of this area, known as **Tortugas Bank,** 7 miles west of Loggerhead Key, has a least found depth of 38 feet, but it has not been closely developed. Depths of less than 10 fathoms are found for a distance of 2.5 miles in all directions. Between Tortugas Bank and Dry Tortugas the depths range from 10 to 19 fathoms. Tortugas Bank should be avoided by deep-draft vessels, especially during heavy weather.

There are no **pilots** at Dry Tortugas. Local fishermen at Key West will pilot vessels between Key West and Dry Tortugas.

**Currents.**—Current observations taken between Loggerhead Key and **White Shoal** indicate that the current changes from southward to northward about one-quarter hour after low water at Key West, and from northward to southward about one-quarter hour after high water at Key West. Velocities at strength of current approximate 1½ knots. The velocities as well as the times of slack water are considerably influenced by the winds.

# Intracoastal Waterway, Miami to Key West

Charts 848, 849, 3261

The Intracoastal Waterway route from Miami to Key West passes through Biscayne Bay, Card, Little Card, Barnes, Blackwater, and Buttonwood Sounds and Florida Bay to Bethel Bank, thence by the following routes: Through Moser Channel and Hawk Channel along the Atlantic side of the keys, or through Big Spanish Channel

and along the Gulf of Mexico side of the keys, or through Big Spanish Channel to a marked channel between the lower keys.

A Federal project for improving the waterway provides for a channel 7 feet deep over a width of 90 feet through the various sounds and between the lower keys.

In December 1947, work had been done only as far as the south end of Cross Bank in Florida Bay; the controlling depth was 6 feet to the north end of the cut and 5½ feet in that cut. Between Cross Bank and Big Spanish Channel the controlling depth was 5½ feet through the natural channels and cuts across the banks. Beyond Big Spanish Channel the depth in the channel was less than 1 foot.

The optional route from the Intracoastal Waterway through Moser and Hawk Channels had a ruling depth of 7 feet in December 1947.

The optional route from the waterway through Big Spanish Channel and the Gulf of Mexico had a ruling depth of 5 feet in December 1947.

The routes are well marked by lights and daybeacons in hazardous spots. In some sections compass courses must be steered as the aids are difficult to distinguish from a distance.

In order to proceed to Hawk Channel, masted vessels unable to pass under the highway trestles must use one of three drawbridge openings in U. S. Highway 1. These drawbridges are at Indian Key Channel, Channel Five, and Moser Channel. Of these the first is used occasionally, the second frequently, and the last most frequently. Vessels find it advantageous to remain in the shelter of the keys as long as possible when sailing along the waterway. See detailed description following.

In the lower part of Biscayne Bay and in the bays and sounds southward, the water is so clear that the bottom can be seen at considerable depths on calm days. On windy days, however, the water becomes milky and opaque.

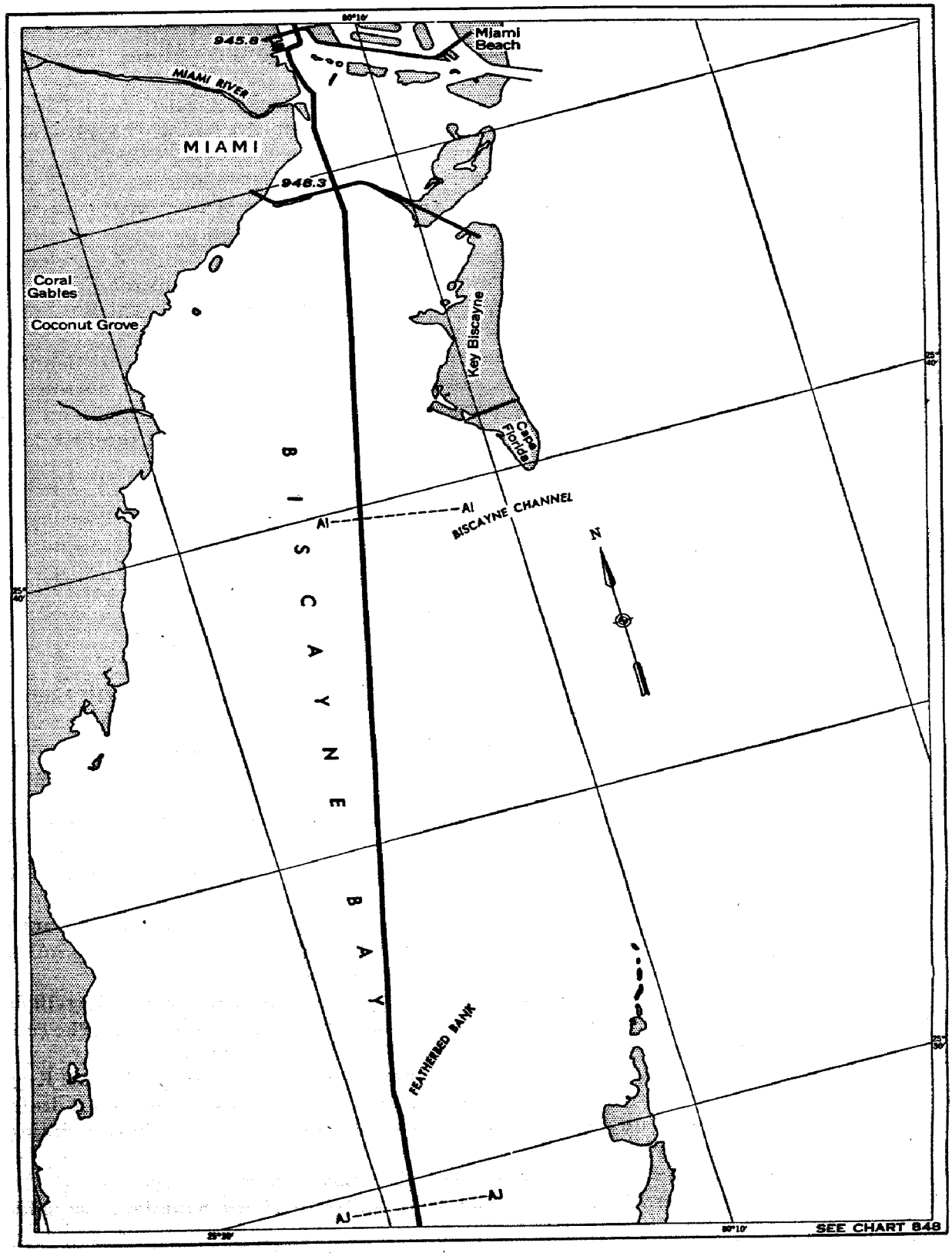
Between Card Sound and Big Spanish Channel, vessels may anchor anywhere outside the channel. Anchorage in the lee of some of the small keys may be desirable under certain wind conditions. In places where the bottom appears to be soft a light anchor may drag due to a hard bottom immediately below the soft layer of sand. Caution must be observed to insure that the anchor is holding.

## Miami to Featherbed Bank

### Chart 848

The Intracoastal Waterway follows the Miami South Channel through the **Rickenbacker Causeway,** *Mile 948.3,* to the lower part of Biscayne Bay. The bascule draw of the causeway bridge has a horizontal clearance of 80 feet and vertical clearance, closed, of 23 feet at high water. This section of the channel is marked from southward. Just south of the municipal piers in Miami vessels should pass between the black beacon and black buoy. See Chart 547.

About 2.3 miles southward of the causeway the channel to **Dinner Key** anchorage at **Coconut Grove** leads westward. This channel, marked by a light and finger daybeacons, had a controlling depth of 6 feet in December 1947. Plans have been devel-


80°10'
945.8
Miami Beach
MIAMI RIVER
MIAMI
946.3
Coral Gables
Coconut Grove
Key Biscayne
Cape Florida
BISCAYNE BAY
AI
AI
BISCAYNE CHANNEL
N
25°40'
FEATHERBED BANK
AJ
AJ
25°30'
80°10'
SEE CHART 848

oped for a yachting center at Dinner Key. The repair yard has a marine railway capable of hauling boats of 150-foot length, 10-foot draft, and 1,500 tons. Gasoline, Diesel oil, water, and ice are available.

A channel leading westward to a mooring area is 0.6 mile southward of the Dinner Key Channel. In December 1947, it had a controlling depth of 7 feet in the outer section and 4 feet in the inner section. An unlighted range marks the outer end. The front daymark is a white diamond and the rear a white triangle under a white circle.

Entroda Channel, 0.4 mile northeastward of Coral Gables Waterway, is marked by privately maintained daybeacons.

The **Coral Gables Waterway** is a dredged channel about 3.5 miles south of the causeway. The waterway is deep and since there are no docks, craft tie up to the banks.

Two channels cross **Featherbed Bank,** *Mile 962.8*. The western one, which is more frequently used, is marked by lighted buoys and daybeacons. The eastern is marked by a light and two daybeacons. In December 1947, the western and eastern channels had controlling depths of 7 feet and 6 feet, respectively. A pile daybeacon northeastward of Featherbed Bank is not easily seen at a distance. The square stone house on the fifth key north of **Sands Key,** and the tower resembling a lighthouse on the first key north of Sands Key, are good landmarks.

## Featherbed Bank to Buttonwood Sound

Chart 849

The **Homestead** Bay Front Park and Yacht Basin, at the entrance to **North Canal,** is entered just south of **Convoy Point.** The only mark at the entrance is a short jetty on the north side of the channel. Boats of 5½-foot draft can enter at high water with local knowledge. Gasoline and water are available at the basin. Slips for 40-foot boats are available.

**Caesar Creek,** between **Elliott Key** and **Old Rhodes Key,** connects the Intracoastal Waterway in **Biscayne Bay** with Hawk Channel. Caesar Creek had a ruling depth of 5½ feet in December 1947. It is privately marked across the shoals northwestward of **Adams Key.**

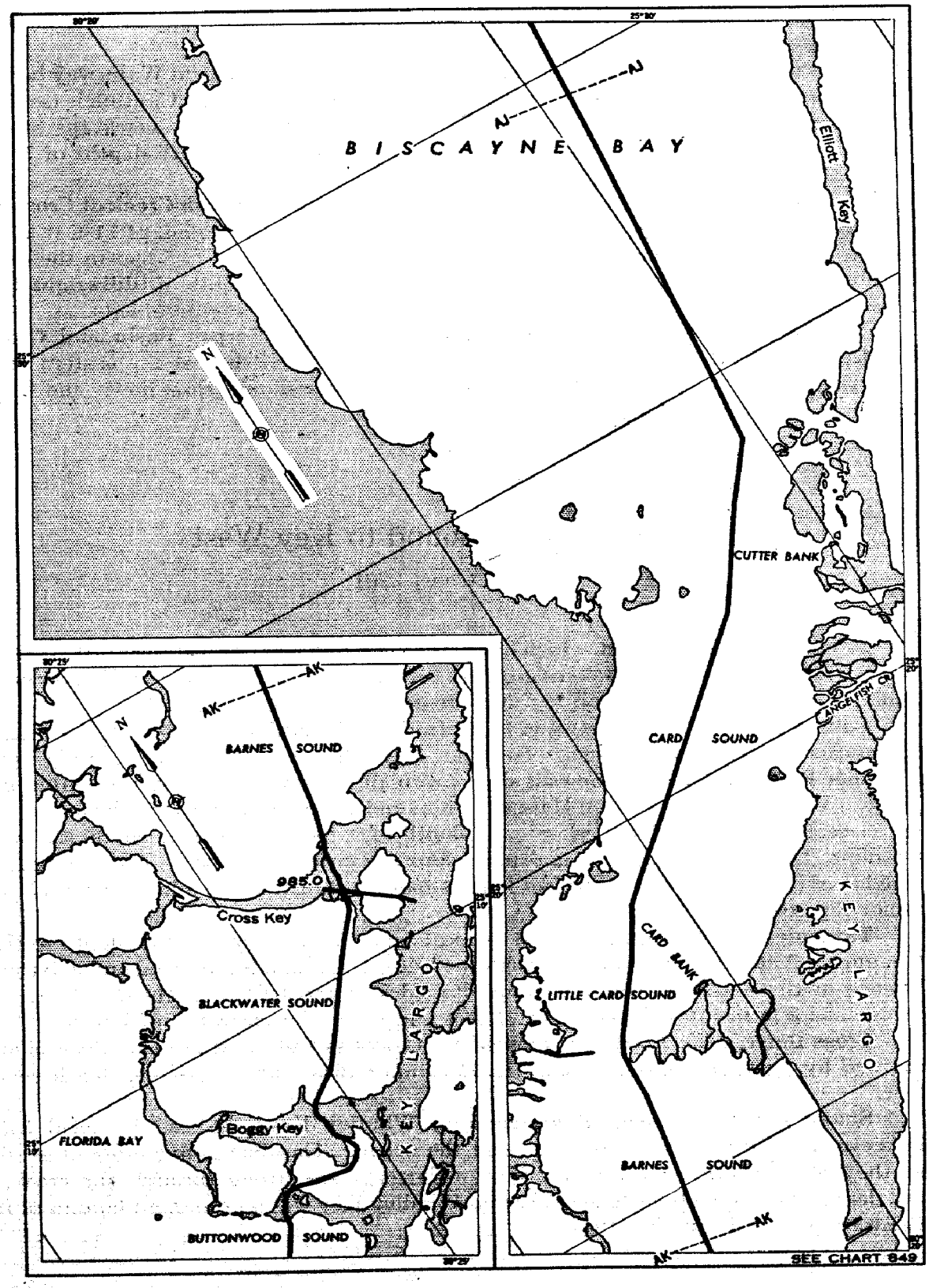
The Intracoastal Waterway passes through a straight dredged cut in **Cutter Bank,** *Mile 971.0*, which separates Biscayne Bay and Card Sound. **Card Sound** is about 5 miles long, 2.7 miles wide, and has depths of 7 to 12 feet in the center.

**Angelfish Creek,** between **Palo Alto Key** on the north and **Key Largo** and **Angelfish Key** on the south, connects Card Sound with Hawk Channel. In December 1947, the ruling depth in the marked channel was 5 feet in the Card Sound entrance.

Gasoline, Diesel oil, lubricating oil, fresh water, and ice are procurable at Key Largo Club. A private marine railway can haul boats 60 feet long and up to 6-foot draft for minor hull and engine repairs; however, strangers ordinarily do not use these facilities except in case of emergency.

Vessels can find a good anchorage northeast of **Pumpkin Key** in 9 feet.

The channel across **Card Bank,** separating Card and **Little Card Sounds,** is straight


BISCAYNE BAY
Elliott Key
CUTTER BANK
CARD SOUND
ANGELFISH CR.
CARD BANK
LITTLE CARD SOUND
KEY LARGO
BARNES SOUND
AK
N
BARNES SOUND
985.0
Cross Key
BLACKWATER SOUND
FLORIDA BAY
Boggy Key
BUTTONWOOD SOUND
KEY LARGO
SEE CHART 849

and marked by lights and daybeacons. Little Card Sound has depths of 7 to 9 feet in the center.

In its section opposite **Barnes Point,** *Mile 979.0,* the Intracoastal Waterway between Little Card Sound and **Barnes Sound** curves and then straightens. Caution is necessary in the curved portion which is unmarked. Lights and daybeacons mark the straight section. Barnes Sound is about 6 miles long and 3 miles wide, with depths of 7 to 10 feet in the center.

The bascule highway drawbridge at *Mile 985.0,* crossing **Jewfish Creek** at **Cross Key,** has a horizontal clearance of 77 feet and a vertical clearance, closed, of 11 feet at high water. **Blackwater Sound,** about 3 miles square, has depths of 7 to 8 feet in the center. Gasoline and water are available at two wharves in the cove south of **Stillwright Point.** The northeasterly wharf has a light chain-hoist for hauling out small boats.

The channel through **Dusenbury Creek** at **Boggy Key, Tarpon Basin,** and **Grouper Creek** is curved, having deeper water closer to the south bank at the eastern end of Grouper Creek. Where visibility is restricted, vessels should slow down and blow a warning blast on the whistle.

## Buttonwood Sound to Key West

Chart 3261

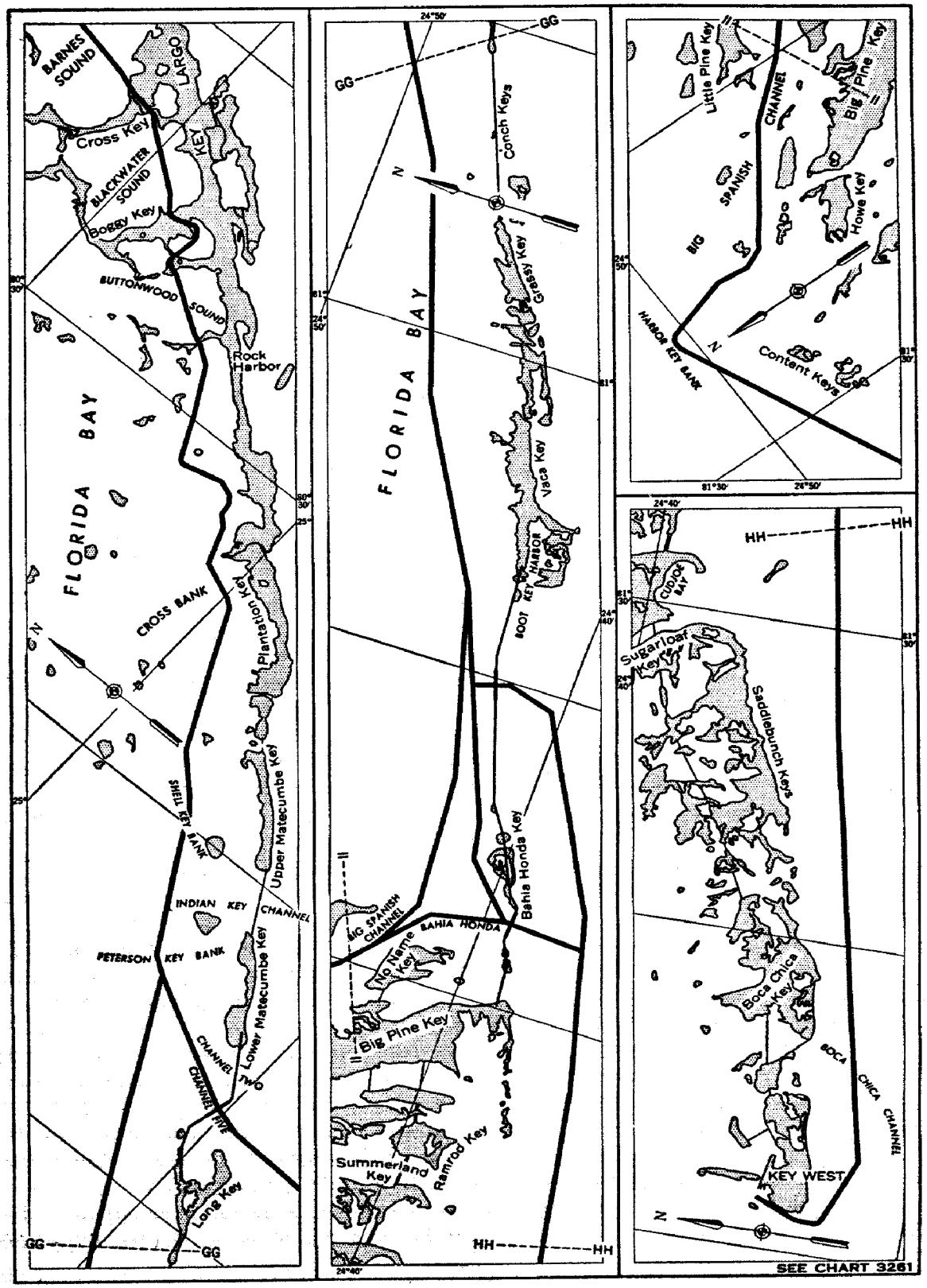
From **Buttonwood Sound,** which has depths of 6 to 8 feet, the Intracoastal Waterway enters **Florida Bay** through **Baker Cut,** *Mile 993.0.* The route across Florida Bay crosses many bars, is well marked, and the aids are generally close together.

**Community Harbor,** the bayside water front of **Tavernier,** *Mile 998.9,* is a bight on the southerly end of Key Largo. To enter, leave the waterway route 0.4 mile west of **Hammer Point,** steering for the east side of a small mangrove island in the center of the bight. When on a line between Hammer Point and a fish house, steer for the house, passing close to and west of the island. A depth of 4 feet can be carried to the wharf. Gasoline, Diesel oil, water, ice, and provisions are procurable here. A marine railway capable of hauling out a boat 40 feet long, 4-foot draft, can be used in an emergency for minor repairs.

**Tavernier Creek,** frequently used by local fishing craft, offers a 3-foot depth to Hawk Channel. A strong current sets through the bridge. At maximum flood and ebb the difference in the height of water on opposite sides of the bridge is about 1 foot. The bridge has a horizontal clearance of 24 feet and a vertical clearance of 7 feet.

**Cross Bank,** *Mile 1,001.0,* is crossed by **Cowpens Cut,** a straight dredged channel marked by lights and daybeacons. In December 1947, the controlling depth was 5½ feet.

**Snake Creek,** between **Plantation** and **Windley Keys,** is used by local fishing boats as a passage between the bay and the ocean. Gasoline is available at a wharf at the ocean entrance on Windley Key. Currents are strong through the creek. A tall derrick mast on a limestone quarry on Windley Key was a prominent landmark from the waterway in December 1947.


BARNES SOUND
LARGO
KEY
Cross Key
BLACKWATER SOUND
Boggy Key
BUTTONWOOD SOUND
Rock Harbor
FLORIDA BAY
CROSS BANK
Plantation Key
Upper Matecumbe Key
SHELL KEY BANK
INDIAN KEY CHANNEL
PETERSON KEY BANK
Lower Matecumbe Key
CHANNEL TWO
CHANNEL FIVE
Long Key
GG
Conch Keys
Grassy Key
Vaca Key
BOOT KEY HARBOR
Bahia Honda Key
BIG SPANISH CHANNEL
BAHIA HONDA
No Name Key
Big Pine Key
Summerland Key
Ramrod Key
HH
Little Pine Key
Big Pine Key
BIG SPANISH CHANNEL
Howe Key
HARBOR KEY BANK
Content Keys
CUDJOE BAY
Sugarloaf Key
Saddlebunch Keys
Boca Chica Key
BOCA CHICA CHANNEL
KEY WEST
SEE CHART 3261

**Windley Harbor** is a good but little-used refuge, and is well protected from all directions. The main channel is west of **Wilson Key.** Gasoline can be obtained at a wharf on the ocean side of the bridge on the **Upper Matecumbe Key** shore.

**Little Basin,** a land-locked harbor on the northwest side and at about the center of Upper Matecumbe Key, has a channel 4 feet deep dredged close inshore from the bight to the northeastward. A marine railway capable of hauling out boats of 50 feet in length, 4-foot draft is available here; hull and engine repairs can be made at a machine shop. Gasoline, Diesel oil, and water are obtainable at the dock and provisions are obtainable in the settlement.

On Upper Matecumbe Key the post office, telephone exchange, and telegraph station are known as **Islamorada,** *Mile 1,006.9.* The bus stop is known as **Matecumbe.** The **Florida Key Memorial** is about in the middle of the Island. At the southwestern end of Upper Matecumbe Key is a fishing lodge where gasoline, lubricating oil, and water are obtainable.

**Shell Key Channel** and **Race Channel** are used by small sport fishing craft capable of passing under the highway trestle. These channels join to form **Teatable Key Channel** connecting the Intracoastal Waterway and Hawk Channel.

At *Mile 1,008.0,* the waterway passes through **Steamboat Channel,** a dredged cut through **Shell Key Bank.**

**Indian Key Channel,** *Mile 1,011.0,* is connected to the Intracoastal Waterway by **Lignumvitae Channel** and an unnamed channel north and east of **Lignumvitae Key.** The ruling depth in these channels is 6 feet. Indian Key Channel is crossed by a bascule drawbridge having a horizontal clearance of 40 feet and a vertical clearance, closed, of 8 feet at high water.

**Peterson Key Bank,** at *Mile 1,012.0,* is crossed by **Bowlegs Cut.** From this dredged cut traffic may go through Channel Five to Hawk Channel. See description of this channel below.

At the northern end of **Lower Matecumbe Key** gasoline and fresh water are available.

The entrance to **Matecumbe Harbor** is marked by a light; the remainder of the channel is privately marked. In December 1947, the controlling depth was 5 feet in the entrance and deeper inside. Gasoline, Diesel oil, fresh water, and provisions can be obtained at the former ferry slip.

**Channel Two** with a controlling depth of 10 feet is a pass under the highway trestle. The trestle has a horizontal clearance of 35 feet and a vertical clearance of 11 feet at high water.

**Craig** is a small settlement built at the turn of the highway between Channel Two and Channel Five. The channel leading to the piers is privately marked with finger daybeacons and a lighted range. Gasoline, Diesel oil, lubricating oil, water, and provisions are available here. Craig has a post office at *Mile 1,015.6.*

**Channel Five,** *Mile 1,016.7,* is one of the main routes by which boats can reach Hawk Channel. The highway bascule drawbridge has a horizontal clearance of 50 feet and a vertical clearance, closed, of 8½ feet at high water. With local knowledge a draft of 9 feet can be taken through Channel Five. A strong current sometimes sets through this channel. Vessels with drafts up to 6 feet can follow the marked route leading westward and northwestward and passing off Cape Sable to the Gulf of Mexico.

**Jewfish Key** is marked by a two-story gray stone building having a cupola and a one-story white building with a thin square signboard elevated about the height of another

story. **Conch Keys,** about 2.4 miles west of the west end of **Long Key** are marked by a water tank. At the wharf gasoline and water are obtainable. The channel from deep water is marked by private beacons.

At *Mile 1,023.5* the waterway passes through **Channel Key Pass,** marked by a light and daybeacons, in **Channel Key Banks.**

**Storm warnings** by day only are displayed at **Grassy Key.**

**Marathon,** *Mile 1035.6*, a town on **Vaca Key,** 4 miles eastward of Moser Channel, is a fishing settlement. Several fish wharves have 6 feet of water at their faces. At the marine basin on the north side gasoline, Diesel oil, water, and ice can be had. Provisions are available in the town. A marine lift in Boot Key Harbor is described on page 354.

**Knight Key Channel** passes under the highway trestle close westward of **Knight Key.** The controlling depth is about 8 feet and the trestle has a vertical clearance of 18 feet at high water.

**Bethel Bank,** at *Mile 1,036.2*, is a junction point in the Intracoastal Waterway, where vessels follow the southern route for Moser Channel and Bahia Honda Channel, and the northern route for Big Spanish Channel and the shallow channel among the keys. The mileage from Norfolk is measured accordingly along the appropriate route.

**Paloma (Pigeon) Key,** on the east side of Moser Channel, is marked by a group of white houses. The viaduct passes high overhead over the key.

**Moser Channel,** connecting Florida Bay and Hawk Channel at *Mile 1,039.5*, is the last channel crossed by a drawbridge. This swing span has a horizontal clearance of 107.5 feet and a vertical clearance, closed, of 23 feet at high water. The channel is shoal on either side but vessels of 7- to 8-foot draft use this pass. Strong currents may be encountered, hence caution is advised. See page 354 for description of the remainder of the route via Hawk Channel, a distance of 40 miles to the turning basin at the head of main ship channel, Key West.

**Bahia Honda Channel,** *Mile 1,046.2*, passing under this bridge is the deepest channel between Florida Bay and the Straits of Florida.

The truss bridge between **Bahia Honda Key** and **West Somerland Key** over this channel is a conspicuous landmark having a white concrete road about 75 feet above the water at the highest point, supported by black trusses. The horizontal clearance is 232 feet and vertical clearance 20 feet at high water.

A dredged channel to **No Name Key** with controlling depth of 4 feet and marked by private pointer daybeacons leads from the deeper waters of Big Spanish Channel and parallels the ferry causeway to the turning basin off the dock.

The old ferry slip on No Name Key is in ruins. At the wharf just north of it gasoline, lubricating oil, water, telephone service, restaurant, and overnight cabins, and provisions are available. About 1.6 miles northeast of the wharf at No Name Key the route through the keys leaves Big Spanish Channel just south of **Porpoise Key** at *Mile 1,048.3*. This will be the final route of the Intracoastal Waterway when completed. In December 1947, the depth was less than 1 foot.

**Big Spanish Channel** is well marked and not difficult to navigate except in the shoal area south of **Big Spanish Key.** A draft of 5½ feet was carried across the shoal during a calm sea in December 1947. Northward of Big Spanish Key, the color of the water is a good indication of the channel location.

From a position about 200 yards northward of **Harbor Key Bank Light,** *Mile 1,057.2*, make good a course of **246°** for 28 miles to the lighted bell buoy at the entrance to Key

West Northwest Channel. Use Chart 1251. This course is in deep water after passing **Content Keys.** Vessels should not attempt to take a course closer to the keys as landmarks are difficult to identify and the bottom inside the 20-foot contour rises abruptly.

When approaching Northwest Channel, Northwest Passage Unused Lighthouse, shown on Chart 1251, is conspicuous. See description on page 357.

The distance via Big Spanish Channel from *Mile 1,039.5* at Moser Channel to Key West is 54 miles or 14 miles longer than via Hawk Channel.

**Key West,** *Mile 1,078.1* by way of Hawk Channel, is described in the previous section.

**Johnston Key Channel,** 11 miles westward of Harbor Key Bank Light, passes between **Johnston Key** and **Sawyer Key** and forms a connection between the Gulf of Mexico and the shallow-draft boat channel among the keys from Big Spanish Channel to Key West. Johnston Channel is not marked, very shallow, and the entrance from the Gulf is difficult to see and follow except at low tide.

**Jewfish Channel,** 6 miles eastward of Calda Channel, leads to **Jewfish Basin,** eastward of **Lower Harbor Keys.** The channel is not marked but is used by sport-fishing craft. The anchorage affords fair shelter in a moderate blow but is too exposed for hurricane anchorage. It is reported that a creek in the southeastern key of Lower Harbor Keys is a good hurricane anchorage; however, this must be reached by entering **West Harbor Key Channel,** another unmarked channel.

# Appendix

## Coast and Geodetic Survey

### Coast Pilots

Atlantic Coast:
- Section A, St. Croix River to Cape Cod, 1941.
- Section B, Cape Cod to Sandy Hook, 1940.
- Section C, Sandy Hook to Cape Henry, 1947.
- Section D, Cape Henry to Key West, 1948.
- Gulf Coast, Key West to Rio Grande, 1936.
- Puerto Rico and Virgin Islands, 1939.

Pacific Coast:
- California, Oregon, and Washington, 1942.

Alaska:
- Part I, Dixon Entrance to Yakutat Bay, 1943.
- Part II, Yakutat Bay to Arctic Ocean, including the Aleutian Islands, 1947.

Hawaiian Islands, 1933:

Philippine Islands:
- Part I, Luzon, Mindoro, and Visayas, 1939.
- Part II, Palawan, Mindanao, and Sulu Archipelago, 1939.

Distances Between United States Ports, 1938.

### District Offices

Northeastern District: Tenth Floor, Customhouse, Boston 9, Mass.
Eastern District: 602 Federal Office Building, 90 Church Street, New York, N. Y.
Southeastern District: 418 United States Post Office Building, Norfolk 10, Va.
Southern District: 314 Customhouse, 423 Canal Street, New Orleans 16, La.
Caribbean District: Post Office Box 3067, Santurce, San Juan, P. R.
Southwestern District: 1426 Post Office and Courthouse, Los Angeles 12, Calif.
Western District: 114 Customhouse, San Francisco 26, Calif.
Midwestern District: 502 Panama Building, 534 Southwest Third Avenue, Portland 4, Oreg.

Northwestern District: 705 Federal Office Building, Seattle 4, Wash.
Pacific District: 244 Federal Office Building, Honolulu, T. H.

## 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.

VIRGINIA:

Newport News: *†E. Smola Co., 134 Twenty-fifth Street.

Norfolk: Coast and Geodetic Survey District Office, Room 418, United States Post Office Building.

*†W. T. Brownley, 121 Randolph Street.

*†Henry Eagleton Co., 224 East Plume Street.

Paxton Co., 64–66 Commercial Place.

*E. Smola Co., 407 Adams Building.

Virginia Marina, Inc., 1601 West Ocean View Avenue.

NORTH CAROLINA:

Elizabeth City: P. W. Melick Co., 111 South Water Street.

Morehead City: Dee Gee's Shop, D. G. Bell, Jr.

Wilmington: *C. D. Moffit & Co., Rooms 207–208, C. D. Moffit's Marine Wireless Building.

SOUTH CAROLINA:

Charleston: *Capt. Chester Taylor, 17 State Street.

*†The Hammond Book Store, 10 Broad Street.

GEORGIA:

Brunswick: Brunswick Marine Construction Corp.

Savannah: John D. Robinson Co., 11 West Bay Street.

FLORIDA:

Fort Lauderdale: H. C. Holden Co., 597–599 South Andrews Avenue at Sixth Street.

Herald Boat Co., 548 South Federal Highway.

Fort Pierce: Hortons, Inc.

Jacksonville: *†The H. and W. B. Drew Co., 22–30 West Bay Street.

Key West: Island City Book Store, 222 Duval Street.

Miami: *†Frank T. Bridge Co., 5 East Flagler Street.

*†Hopkins-Carter Hardware Co., 135–139 South Miami Avenue.

*Caribbean Chart and Manual Service, 301 Aviation Building, 3240 Northwest Twenty-seventh Avenue.

*Phillips Hardware Co., 326 Northwest Eighth Avenue.

West Palm Beach: *Hopkins Marine Hardware Co., 711 North Dixie.

Palm Beach Mercantile Co.

## Monthly Mean Surface Water Temperatures

| Place | January | February | March | April | May | June | July | August | September | October | November | December | Mean |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | °F. | °F. | °F. | °F. | °F. | °F. | °F. | °F. | °F. | °F. | °F. | °F. | °F. |
| Old Point Comfort, Va. (2 years) | 38.2 | 40.9 | 48.8 | 57.5 | 68.2 | 75.4 | 78.6 | 78.2 | 76.1 | 64.3 | 54.8 | 41.5 | 60.2 |
| Diamond Shoal Lightship (5 years) | 61.8 | 60.0 | 58.6 | 62.1 | 70.0 | 76.0 | 79.1 | 80.4 | 78.3 | 73.7 | 66.8 | 64.4 | 69.3 |
| Southport, N. C. (2 years) | 50.6 | 48.0 | 53.0 | 63.8 | 72.9 | 78.6 | 80.6 | 81.8 | 78.4 | 71.4 | 63.0 | 54.4 | 66.4 |
| Charleston, S. C. (26 years) | 51.7 | 52.3 | 57.4 | 65.8 | 73.7 | 80.6 | 83.2 | 83.3 | 80.2 | 71.6 | 62.1 | 53.4 | 67.9 |
| Fort Pulaski, Savannah River, Ga. (8 years) | 51.0 | 51.6 | 58.2 | 66.6 | 74.2 | 81.4 | 83.2 | 83.2 | 80.4 | 72.3 | 63.6 | 53.5 | 68.3 |
| Fernandina, Fla. (4 years) | 58.5 | 57.6 | 63.0 | 70.9 | 75.6 | 81.4 | 82.3 | 83.1 | 81.9 | 73.9 | 67.4 | 57.1 | 71.1 |
| Mayport, Fla. (4 years) | 60.0 | 58.3 | 63.2 | 70.9 | 75.4 | 80.5 | 82.4 | 83.4 | 82.2 | 74.6 | 68.8 | 59.1 | 71.6 |
| Daytona Beach (Ocean), Fla. (13 years) | 61.1 | 61.4 | 64.1 | 70.3 | 75.6 | 78.6 | 79.0 | 78.4 | 81.8 | 76.4 | 71.0 | 64.6 | 71.9 |
| Daytona Beach (Halifax River), Fla. (2 years) | 64.6 | 60.4 | 68.1 | 77.7 | 81.7 | 84.6 | 86.2 | 87.4 | 84.3 | 78.2 | 73.4 | 66.4 | 76.1 |
| Eau Gallie Beach, Fla. (2 years) | 67.4 | 62.6 | 65.8 | 72.0 | 74.1 | 77.9 | 78.1 | 78.4 | 82.0 | 77.8 | 75.3 | 69.1 | 73.4 |
| Miami Beach, Fla. (8 years) | 70.7 | 70.5 | 72.7 | 77.3 | 80.0 | 84.1 | 85.6 | 86.0 | 84.0 | 79.6 | 75.5 | 72.8 | 78.2 |
| Key West, Fla. (17 years) | 71.7 | 72.5 | 74.4 | 78.8 | 82.4 | 85.2 | 86.9 | 86.9 | 85.5 | 81.5 | 75.8 | 72.4 | 79.5 |

The monthly means of surface water temperature may vary somewhat from year to year and therefore means from different series are not strictly comparable. For temperature data in greater detail, write to the Director, U. S. Coast and Geodetic Survey, Washington 25, D. C., for publication TW-1, *Surface Water Temperatures, Atlantic and Gulf Coasts.*

## Monthly Mean Sea Water Densities

Reduced to 15° C. (59° F.)

| Place | January | February | March | April | May | June | July | August | September | October | November | December | Mean |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Old Point Comfort, Va. (2 years) | 1.0151 | 1.0152 | 1.0126 | 1.0138 | 1.0144 | 1.0144 | 1.0151 | 1.0156 | 1.0155 | 1.0152 | 1.0162 | 1.0164 | 1.0150 |
| Diamond Shoal Lightship (5 years) | 1.0262 | 1.0258 | 1.0256 | 1.0259 | 1.0264 | 1.0265 | 1.0264 | 1.0265 | 1.0257 | 1.0254 | 1.0256 | 1.0259 | 1.0260 |
| Southport, N. C. (2 years) | 1.0122 | 1.0116 | 1.0133 | 1.0122 | 1.0146 | 1.0175 | 1.0130 | 1.0147 | 1.0142 | 1.0146 | 1.0142 | 1.0156 | 1.0140 |
| Charleston, S. C.* (6 years) | 1.0139 | 1.0125 | 1.0110 | 1.0106 | 1.0106 | 1.0117 | 1.0124 | 1.0129 | 1.0134 | 1.0138 | 1.0136 | 1.0131 | 1.0125 |
| Fort Pulaski, Savannah River, Ga. (8 years) | 1.0098 | 1.0096 | 1.0072 | 1.0079 | 1.0105 | 1.0128 | 1.0133 | 1.0136 | 1.0136 | 1.0143 | 1.0137 | 1.0128 | 1.0116 |
| Fernandina, Fla. (4 years) | 1.0207 | 1.0206 | 1.0211 | 1.0215 | 1.0228 | 1.0232 | 1.0216 | 1.0202 | 1.0197 | 1.0179 | 1.0189 | 1.0202 | 1.0207 |
| Mayport, Fla. (3 years) | 1.0160 | 1.0164 | 1.0169 | 1.0182 | 1.0189 | 1.0203 | 1.0132 | 1.0117 | 1.0112 | 1.0120 | 1.0130 | 1.0150 | 1.0152 |
| Daytona Beach (Ocean), Fla. (13 years) | 1.0256 | 1.0258 | 1.0262 | 1.0264 | 1.0269 | 1.0270 | 1.0269 | 1.0269 | 1.0265 | 1.0254 | 1.0255 | 1.0253 | 1.0262 |
| Daytona Beach (Halifax River), Fla. (2 years) | 1.0166 | 1.0142 | 1.0100 | 1.0098 | 1.0136 | 1.0150 | 1.0088 | 1.0061 | 1.0067 | 1.0076 | 1.0105 | 1.0150 | 1.0112 |
| Miami Beach, Fla. (8 years) | 1.0265 | 1.0266 | 1.0268 | 1.0270 | 1.0270 | 1.0270 | 1.0268 | 1.0268 | 1.0261 | 1.0259 | 1.0262 | 1.0263 | 1.0266 |
| Key West, Fla. (17 years) | 1.0267 | 1.0268 | 1.0271 | 1.0273 | 1.0274 | 1.0272 | 1.0272 | 1.0271 | 1.0268 | 1.0264 | 1.0269 | 1.0268 | 1.0270 |

*Means of the 6 years (1942-47) during which fresh water has been diverted from Santee River to Charleston Harbor via Cooper River.

The monthly means of sea water density may vary somewhat from year to year and therefore means from different series are not strictly comparable. For density data in greater detail, write to the Director, U. S. Coast and Geodetic Survey, Washington 25, D. C., for publication DW-1, *Density of Sea Water, Atlantic and Gulf Coasts.* A table for converting density to salinity is included in that publication.

# Distance Table

DISTANCES ARE GIVEN IN NAUTICAL MILES

| From— To— | New York (The Battery) | Philadelphia (Allegheny Ave.) | Baltimore (Lazaretto Point) | Norfolk | Diamond Shoal Lightship | Lookout Bight | Morehead City | Southport | Wilmington, N. C. | Georgetown | Charleston | Beaufort, S. C. | Savannah | Brunswick | Fernandina | Mayport | Jacksonville (F. E. C. Ry. Bridge) | St. Augustine | Fort Pierce | Stuart | Jupiter Inlet Light (6 miles off southbound) (15 miles off northbound) | Port of Palm Beach | Port Everglades | Miami | Key West | Dry Tortugas Light bearing 045° distant 11.4 miles |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| New York | ------ | [4] 242 | [4] 410 | [4] 290 | [4] 345 | [1] 440 | [1] 448 | [1] 541 | [1] 562 | [1] 594 | [1] 637 | [1] 693 | [1] 708 | [1] 757 | [1] 763 | [1] 776 | [1] 797 | [1] 794 | [1] 934 | [1] 956 | [2] 904 | [2] 916 | [2] 958 | [2] 981 | [2] 1,121 | [2] 1,186 |
| Philadelphia | [4] 242 | ------ | [4] 383 | [4] 262 | [4] 321 | [1] 415 | [1] 423 | [1] 516 | [1] 537 | [1] 569 | [1] 615 | [1] 668 | [1] 683 | [1] 732 | [1] 738 | [1] 752 | [1] 772 | [1] 770 | [1] 909 | [1] 932 | [2] 879 | [2] 892 | [2] 933 | [2] 956 | [2] 1,096 | [2] 1,161 |
| Baltimore | [4] 410 | [4] 383 | ------ | [4] 180 | [4] 265 | [1] 360 | [1] 367 | [1] 460 | [1] 481 | [1] 514 | [1] 559 | [1] 613 | [1] 628 | [1] 677 | [1] 683 | [1] 696 | [1] 717 | [1] 714 | [1] 854 | [1] 876 | [2] 824 | [2] 836 | [2] 878 | [2] 901 | [2] 1,040 | [2] 1,105 |
| Norfolk | [4] 290 | [4] 262 | [4] 180 | ------ | [4] 144 | [1] 239 | [1] 246 | [1] 339 | [1] 360 | [1] 392 | [1] 438 | [1] 491 | [1] 506 | [1] 555 | [1] 561 | [1] 575 | [1] 595 | [1] 593 | [1] 732 | [1] 754 | [2] 702 | [2] 714 | [2] 756 | [2] 779 | [2] 919 | [2] 984 |
| Diamond Shoal Lightship | [4] 345 | [4] 321 | [4] 265 | [4] 144 | ------ | [1] 95 | [1] 102 | [1] 195 | [1] 216 | [1] 248 | [1] 294 | [1] 348 | [1] 362 | [1] 412 | [1] 418 | [1] 431 | [1] 452 | [1] 449 | [1] 589 | [1] 611 | [2] 559 | [2] 571 | [2] 613 | [2] 636 | [2] 775 | [2] 840 |
| Lookout Bight | [1] 440 | [1] 415 | [1] 360 | [1] 239 | [1] 95 | ------ | [4] 12 | [4] 130 | [4] 150 | [4] 183 | [4] 228 | [4] 282 | [4] 297 | [4] 346 | [4] 352 | [4] 365 | [4] 386 | [4] 383 | [4] 523 | [4] 545 | [4] 550 | [4] 563 | [4] 604 | [4] 627 | [4] 767 | [4] 832 |
| Morehead City | [1] 448 | [1] 423 | [1] 367 | [1] 246 | [1] 102 | [4] 12 | ------ | [4] 132 | [4] 152 | [4] 185 | [4] 230 | [4] 284 | [4] 299 | [4] 348 | [4] 354 | [4] 367 | [4] 388 | [4] 385 | [4] 525 | [4] 547 | [4] 552 | [4] 564 | [4] 606 | [4] 629 | [4] 769 | [4] 834 |
| Southport | [1] 541 | [1] 516 | [1] 460 | [1] 339 | [1] 195 | [4] 130 | [4] 132 | ------ | [4] 21 | [4] 87 | [4] 141 | [4] 195 | [4] 210 | [4] 261 | [4] 267 | [4] 280 | [4] 301 | [4] 298 | [4] 438 | [4] 460 | [4] 465 | [4] 478 | [4] 520 | [4] 542 | [4] 682 | [4] 747 |
| Wilmington, N. C. | [1] 562 | [1] 537 | [1] 481 | [1] 360 | [1] 216 | [4] 150 | [4] 152 | [4] 21 | ------ | [4] 108 | [4] 162 | [4] 216 | [4] 231 | [4] 282 | [4] 288 | [4] 301 | [4] 322 | [4] 319 | [4] 459 | [4] 481 | [4] 486 | [4] 499 | [4] 540 | [4] 563 | [4] 703 | [4] 768 |
| Georgetown | [1] 594 | [1] 569 | [1] 514 | [1] 392 | [1] 248 | [4] 183 | [4] 185 | [4] 87 | [4] 108 | ------ | [4] 87 | [4] 157 | [4] 172 | [4] 223 | [4] 229 | [4] 242 | [4] 262 | [4] 260 | [4] 400 | [4] 422 | [4] 427 | [4] 439 | [4] 481 | [4] 504 | [4] 644 | [4] 708 |
| Charleston | [1] 637 | [1] 615 | [1] 559 | [1] 438 | [1] 294 | [4] 228 | [4] 230 | [4] 141 | [4] 162 | [4] 87 | ------ | [4] 99 | [4] 114 | [4] 168 | [4] 175 | [4] 190 | [4] 210 | [4] 209 | [4] 348 | [4] 371 | [4] 376 | [4] 388 | [4] 430 | [4] 453 | [4] 592 | [4] 657 |
| Beaufort, S. C. | [1] 706 | [1] 681 | [1] 626 | [1] 504 | [1] 361 | [4] 285 | [4] 287 | [4] 195 | [4] 216 | [4] 157 | [4] 99 | ------ | [4] 59 | [4] 118 | [4] 126 | [4] 141 | [4] 161 | [4] 162 | [4] 308 | [4] 329 | [4] 335 | [4] 347 | [4] 389 | [4] 412 | [4] 552 | [4] 616 |
| Savannah | [1] 721 | [1] 696 | [1] 641 | [1] 519 | [1] 376 | [4] 300 | [4] 302 | [4] 210 | [4] 231 | [4] 172 | [4] 114 | [4] 59 | ------ | [4] 112 | [4] 119 | [4] 135 | [4] 155 | [4] 156 | [4] 303 | [4] 325 | [4] 330 | [4] 343 | [4] 385 | [4] 408 | [4] 547 | [4] 612 |
| Brunswick | [1] 767 | [1] 742 | [1] 687 | [1] 565 | [1] 422 | [4] 347 | [4] 349 | [4] 261 | [4] 282 | [4] 223 | [4] 168 | [4] 118 | [4] 112 | ------ | [4] 52 | [4] 69 | [4] 90 | [4] 90 | [4] 247 | [4] 269 | [4] 274 | [4] 286 | [4] 328 | [4] 351 | [4] 491 | [4] 556 |
| Fernandina | [1] 772 | [1] 747 | [1] 691 | [1] 570 | [1] 426 | [4] 352 | [4] 354 | [4] 267 | [4] 288 | [4] 229 | [4] 175 | [4] 126 | [4] 119 | [4] 52 | ------ | [4] 39 | [4] 59 | [4] 60 | [4] 221 | [4] 243 | [4] 248 | [4] 260 | [4] 302 | [4] 325 | [4] 465 | [4] 529 |
| Mayport | [1] 781 | [1] 756 | [1] 701 | [1] 579 | [1] 436 | [4] 362 | [4] 364 | [4] 280 | [4] 300 | [4] 241 | [4] 190 | [4] 141 | [4] 135 | [4] 69 | [4] 39 | ------ | [4] 20 | [4] 41 | [4] 202 | [4] 225 | [4] 230 | [4] 242 | [4] 284 | [4] 307 | [4] 446 | [4] 511 |
| Jacksonville | [1] 801 | [1] 776 | [1] 721 | [1] 599 | [1] 456 | [4] 383 | [4] 385 | [4] 300 | [4] 321 | [4] 262 | [4] 210 | [4] 161 | [4] 155 | [4] 90 | [4] 59 | [4] 20 | ------ | [4] 61 | [4] 223 | [4] 245 | [4] 250 | [4] 262 | [4] 304 | [4] 327 | [4] 467 | [4] 532 |
| St. Augustine | [1] 793 | [1] 768 | [1] 712 | [1] 591 | [1] 447 | [4] 376 | [4] 378 | [4] 296 | [4] 316 | [4] 257 | [4] 209 | [4] 162 | [4] 156 | [4] 90 | [4] 60 | [4] 41 | [4] 61 | ------ | [4] 173 | [4] 195 | [4] 200 | [4] 213 | [4] 255 | [4] 278 | [4] 417 | [4] 482 |
| Fort Pierce | [1] 898 | [1] 874 | [1] 818 | [1] 696 | [1] 553 | [4] 485 | [4] 487 | [4] 413 | [4] 434 | [4] 379 | [4] 343 | [4] 320 | [4] 319 | [4] 260 | [4] 236 | [4] 219 | [4] 240 | [4] 192 | ------ | [4] 31 | [4] 39 | [4] 51 | [4] 93 | [4] 116 | [4] 256 | [4] 320 |
| Stuart | [1] 918 | [1] 894 | [1] 838 | [1] 717 | [1] 573 | [4] 505 | [4] 507 | [4] 433 | [4] 454 | [4] 399 | [4] 363 | [4] 340 | [4] 339 | [4] 280 | [4] 257 | [4] 239 | [4] 260 | [4] 212 | [4] 31 | ------ | [4] 25 | [4] 37 | [4] 79 | [4] 102 | [4] 241 | [4] 306 |
| Jupiter Inlet Light | [1] 921 | [1] 896 | [1] 840 | [1] 719 | [1] 575 | [1] 507 | [1] 510 | [1] 435 | [1] 456 | [1] 402 | [1] 365 | [1] 342 | [1] 341 | [1] 283 | [1] 259 | [1] 242 | [1] 262 | [1] 215 | [4] 44 | [4] 31 | ------ | [4] 12 | [4] 54 | [4] 77 | [4] 217 | [4] 281 |
| Port of Palm Beach | [1] 938 | [1] 913 | [1] 858 | [1] 736 | [1] 593 | [1] 525 | [1] 527 | [1] 453 | [1] 476 | [1] 419 | [1] 383 | [1] 360 | [1] 358 | [1] 300 | [1] 276 | [1] 259 | [1] 279 | [1] 232 | [4] 51 | [4] 35 | [4] 17 | ------ | [4] 46 | [4] 68 | [4] 208 | [4] 273 |
| Port Everglades | [1] 976 | [1] 952 | [1] 896 | [1] 774 | [1] 631 | [1] 563 | [1] 565 | [1] 491 | [1] 512 | [1] 357 | [1] 421 | [1] 398 | [1] 397 | [1] 338 | [1] 314 | [1] 297 | [1] 318 | [1] 270 | [1] 100 | [1] 86 | [1] 56 | [4] 46 | ------ | [4] 28 | [4] 167 | [4] 232 |
| Miami | [1] 999 | [1] 974 | [1] 919 | [1] 797 | [1] 654 | [1] 586 | [1] 588 | [1] 514 | [1] 534 | [1] 480 | [1] 444 | [1] 420 | [1] 419 | [1] 361 | [1] 337 | [1] 320 | [1] 340 | [1] 293 | [1] 123 | [1] 109 | [1] 78 | [4] 68 | [4] 28 | ------ | [4] 152 | [4] 216 |
| Key West | [2] 1,147 | [2] 1,122 | [2] 1,067 | [1] 945 | [1] 802 | [1] 734 | [1] 736 | [1] 661 | [1] 682 | [1] 628 | [1] 591 | [1] 568 | [1] 567 | [1] 509 | [1] 485 | [1] 468 | [1] 488 | [1] 441 | [1] 271 | [1] 257 | [1] 226 | [1] 218 | [1] 178 | [1] 164 | ------ | [4] 79 |
| Dry Tortugas | [2] 1,212 | [2] 1,188 | [2] 1,132 | [2] 1,010 | [1] 867 | [1] 799 | [1] 801 | [1] 727 | [1] 748 | [1] 693 | [1] 657 | [1] 634 | [1] 633 | [1] 574 | [1] 550 | [1] 533 | [1] 554 | [1] 506 | [1] 336 | [1] 322 | [1] 292 | [1] 283 | [1] 244 | [1] 230 | [1] 84 | ------ |

[1] Distances for ports between Diamond Shoal and Jupiter Inlet are westward of the Gulf Stream.
[2] Distances from Diamond Shoal to ports south of Jupiter Inlet are eastward of the Gulf Stream.
[3] Distances from Jupiter Inlet to Diamond Shoal follow the Gulf Stream.
[4] All other routes.

# Corps of Engineers Districts

**Norfolk District:** Office—Foot of Front Street.

The Norfolk District includes the southern part of Chesapeake Bay, the Virginia portion of the Intracoastal Waterway between Norfolk, Va., and Beaufort Inlet, N. C., and the portion of the waterway from Norfolk to the sounds of North Carolina north of Albemarle Sound.

**Wilmington, N. C., District:** Office—Room 308, Customhouse.

The Wilmington District includes the drainage basins tributary to the Atlantic Ocean from the southern boundary of Virginia to Shallotte River, with certain exceptions. This district also includes the Intracoastal Waterway from the northern boundary of North Carolina to Little River, S. C., and to the sounds of North Carolina, south of the north shore of Albemarle Sound.

**Charleston, S. C., District:** Office—Room 33, Customhouse.

The Charleston District includes the drainage basins tributary to the Atlantic Ocean between Little River and the Beaufort-St. Helena Bridge at Beaufort, S. C. It includes the Intracoastal Waterway in the same reach.

**Savannah, Ga., District:** Office—Second floor, Post Office Building.

The Savannah District includes the drainage basins tributary to the Atlantic Ocean between the Beaufort-St. Helena Bridge at Beaufort, S. C., and the harbor at Fernandina, Fla., inclusive. It includes the Intracoastal Waterway between these points.

**Jacksonville, Fla., District:** Office—575 Riverside Avenue. Also sub-offices at Miami Beach and Clewiston.

The Jacksonville District includes the watersheds tributary to the Atlantic Ocean and the Gulf of Mexico from the harbor at Fernandina, Fla., exclusive, to and including the Ancilla River. It includes the sections of the Intracoastal Waterway from Fernandina to Key West; the waterway across southern Florida via St. Lucie River and Canal, Lake Okeechobee, and the Caloosahatchee Canal and River; and the section of the Intracoastal Waterway from Caloosahatchee River to Anclote River, Fla.

# Branch Hydrographic Offices

Norfolk, Room 213, Customhouse.
Savannah, First Floor, Customhouse.

# Coast Guard

**District Commanders:**

Norfolk, Box 540, New Post Office Building, Norfolk 1, Va.
Miami, P. O. Box 378, Coconut Grove Station.

789003°—48——23

**Officers in Charge, Marine Inspection:**

Norfolk, 204 Customhouse, Norfolk 1, Va.
Charleston, 32 Customhouse, Charleston 3, S. C.
Savannah, 205 Customhouse, Savannah 12, Ga.
Jacksonville, 210 Federal Building, Jacksonville 1, Fla.
Miami, 501 Professional Building, Miami 32, Fla.

**Buoy Depots:**

Portsmouth, Va.
Elizabeth City, N. C.
Washington, N. C.
Charleston, S. C.
Key West, Fla.

**Air Stations:**

Charleston, S. C.
Miami, Fla.

## Lifeboat Stations, Norfolk to Key West

| Number for aviation purposes only | Name of station | State | Location |
|---|---|---|---|
| 161 | Little Creek | Virginia | 1.2 miles south of entrance to Little Creek. |
| 162 | Virginia Beach | do | Beach front, 5⅜ miles south of Cape Henry Light. |
| 164 | Little Island | do | Beach front, opposite North Bay. |
| 166 | Wash Woods | North Carolina | Beach front opposite south end of Knotts Island. |
| 170 | Caffeys Inlet | do | Beach front about 11 miles south of Currituck Beach Light. |
| 173 | Kill Devil Hills | do | Beach front opposite Collington Island. |
| 174 | Nags Head | do | Beach front at Nags Head, 8¼ miles north of Bodie Island Light. |
| 176 | Oregon Inlet | do | Beach, 1⅜ miles south of Oregon Inlet. |
| 179 | Chicamacomico | do | Beach, 4½ miles south of New Inlet. |
| 181 | Little Kinnakeet | do | Beach, about 4 miles south of Gull Island. |
| 183 | Cape Hatteras | do | 1 mile south of Cape Hatteras Light. |
| 186 | Hatteras Inlet | do | About 1 mile west of inlet on Ocracoke Island. |
| 187 | Ocracoke | do | About ½ mile north of light and 3¼ miles north-northeast of Ocracoke Inlet. |
| 189 | Atlantic | do | Core Bank, opposite Atlantic. |
| 190 | Cape Lookout | do | 1½ miles south of light. |
| 191 | Fort Macon | do | East end of Bogue Banks on Beaufort entrance. |
| 192 | Swansboro | do | ½ mile east of Bogue Inlet on west end of Bogue Banks. |
| 194 | Oak Island | do | At south end of dredged cut at mouth of Elizabeth River. |
| 196 | Sullivans Island | South Carolina | On beach of Sullivans Island near north end of harbor entrance jetty. |
| 198 | St. Simons Island | Georgia | On beach near south end of island. |
| 203 | Ponce de Leon Inlet | Florida | Inside and south of inlet about 1.2 miles southeast by south from light. |
| 206 | Fort Pierce | do | South side of inlet entrance. |
| 208 | Lake Worth Inlet | do | South side of Peanut Island. |

# Customs Districts and Ports of Entry

[The first port named in the following list is the headquarters port]

*Indicates customs ports authorized to issue marine documents

| Name of district | Limits of district | Ports of entry |
|---|---|---|
| Virginia | State of Virginia | *Norfolk and Portsmouth, Main and Granby Sts., Norfolk.<br>Newport News, 25th St. and West Ave. (including the waters and shores of Hampton Roads). |
| North Carolina | State of North Carolina | *Wilmington, Water St. between Princess and Market Sts. (including townships of Northwest, Wilmington, and Cape Fear).<br>*Beaufort.<br>Durham.<br>*Elizabeth City.<br>Gastonia.<br>Morehead City.<br>Reidsville.<br>(Marine documents are issued at Washington, N. C., though it is not a port of entry.)<br>Winston-Salem. |
| South Carolina | State of South Carolina | *Charleston, Customhouse, foot of Market St.<br>*Georgetown. |
| Georgia | State of Georgia, except the north shore of St. Marys River and the city of St. Marys, Ga. | *Savannah, Customhouse, Bull and Bay Sts.<br>Atlanta.<br>*Brunswick, Post Office Bldg. at Gloucester St. |
| Florida | State of Florida and the north bank of the St. Marys River and the city of St. Marys, Ga. | *Fernandina, Post Office Bldg., Center and 4th Sts. (including St. Marys, Ga.).<br>*Jacksonville, Courthouse and Post Office Bldg., Monroe St. between Julia and Pearl Sts.<br>*Key West, Federal Bldg., Caroline and Simonton Sts.<br>*Miami, Federal Bldg., NE. 1st Ave., between 3d and 4th Sts.<br>Port Everglades, Customhouse.<br>*St. Augustine.<br>West Palm Beach, Post Office Bldg. |

# Public Health Service

**Quarantine Stations:**

Virginia:

Newport News, Fort Monroe. Supervision of quarantine and immigration from Hampton Roads to Morehead City, N. C.

South Carolina:

Charleston, Fort Johnson, James Island. Supervision of quarantine from Wilmington, N. C. to Savannah, Ga.

Florida:

Jacksonville, 403 Federal Building, Monroe Street between Julia and Pearl Streets. Supervision of quarantine and immigration from Brunswick, Ga., to St. Augustine, Fla.

Miami, Fisher Island. Supervision of quarantine and immigration from Fort Pierce to Key West, Fla.

Additional ports of entry at which quarantine inspection and/or medical examination of aliens is performed.

Brunswick, Ga. (Under supervision of Jacksonville, Fla.)
Fernandina, Fla. (Cumberland Sound). (Under supervision of Jacksonville, Fla.)
Fort Lauderdale, Fla. (Port Everglades). (Under supervision of Miami, Fla.)
Fort Pierce, Fla. (Under supervision of Miami, Fla.)
Georgetown, S. C. (Under supervision of Charleston, S. C.)
Key West, Fla. (Under supervision of Miami, Fla.)
Morehead City, N. C. (Under supervision of Fort Monroe, Va.)
Newport News, Va., 118 Twenty-sixth Street. (Under supervision of Fort Monroe, Va.)
Southport, N. C. (Substation of Charleston, S. C.)
West Palm Beach, Fla. (Under supervision of Miami, Fla.)
Wilmington, N. C. (Under supervision of Charleston, S. C.)

**Marine Hospitals:**

Norfolk 9, Va., Hampton Boulevard, Larchmont.
Out-patient office, Federal Building, Norfolk 10, Va.
Savannah, Ga., York and Abercorn Streets.

**Second-Class Relief Stations:**

Charleston 3, S. C., Customhouse.
Miami 3, Fla., 365 Federal Building.

**Third-Class Relief Stations:**

Beaufort, N. C., Potter Building.
Brunswick, Ga., 1501½ Newcastle Street.
Edenton, N. C.
Elizabeth City, N. C., 224 Carolina Building.
Jacksonville 1, Fla., 403 Federal Building.
Key West, Fla., 620 Southard Street.
Morehead City, N. C.
New Bern, N. C., 81 Pollock Street.
Newport News, Va., 2903 West Avenue.
Southport, N. C., Morrison Building.
Washington, N. C., 109 South Market Street.
Wilmington, N. C., 203 Murchison Building.

# Immigration and Naturalization Offices

VIRGINIA:

Norfolk, Post Office and Courthouse Building.

NORTH CAROLINA:

Wilmington, Post Office Building.

SOUTH CAROLINA:
Charleston, Customhouse.
GEORGIA:
Savannah, Customhouse at Bull and Bay Streets.
FLORIDA:
Jacksonville, Fourth Floor, United States Courthouse and Post Office Building.
Key West, Federal Building, Corner Caroline and Simonton Streets.
Miami, Federal Building.
West Palm Beach, Guaranty Building.
Port Everglades, Customhouse.

# Federal Communications Commission

**District Offices:**
Norfolk, Va., Room 402, New Post Office Building.
Savannah, Ga., Post Office Box 77, 214–218 Post Office Building.
Miami, Fla., Post Office Box 150, 312 Federal Building.

# Fish and Wildlife Service

**Enforcement agents:**
Daytona Beach, Fla., P. O. Box 1366.
Ocracoke, N. C., P. O. Box 37.
Washington, N. C., P. O. Box 674.
**National Wildlife Refuges:**
VIRGINIA:
Back Bay, Pungo.
NORTH CAROLINA:
Mattamuskeet, New Holland.
Swanquarter, New Holland.
Pea Island, Manteo.
SOUTH CAROLINA:
Cape Romain, McClellanville.
Santee, Summerton.
GEORGIA:
Okefenokee, Box 117, Waycross.
Savannah, Route 1, Port Wentworth.
Blackbeard Island, Route 1, Port Wentworth.
FLORIDA:
Everglades, P. O. Box 226, Coconut Grove.
Great White Heron, P. O. Box 226, Coconut Grove.
Key West, P. O. Box 226, Coconut Grove.

# Yacht Clubs

Angler's Yacht Club, New Smyrna, Fla.
Beaufort Yacht Club, Beaufort, S. C.
Biscayne Bay Yacht Club, Coconut Grove, Fla.
Caribbean Club, Blackwater Sound, Fla.
Carolina Yacht Club, Wrightsville Beach, N. C.
Carolina Yacht Club, Charleston, S. C.
Charleston Yacht Club, Charleston, S. C.
Coconut Grove Sailing Club, Coconut Grove, Fla.
Coral Ridge Yacht Club, Fort Lauderdale, Fla.
Eastern Carolina Yacht Club, New Bern, S. C.
Eau Gallie Yacht Club, Eau Gallie, Fla.
Fisherman's Yacht Club, Miami, Fla.
Flamingo Yacht Club, Miami Beach, Fla.
Florida Yacht Club, Jacksonville, Fla.
Fort Pierce Yacht Club, Fort Pierce, Fla.
Frederica Yacht Club, St. Simons Island, Ga.
Halifax River Yacht Club, Daytona Beach, Fla.
Hampton Yacht Club, Hampton, Va.
Hollywood Yacht Club, Hollywood, Fla.
Indian River Yacht Club, Cocoa, Fla.
Jacksonville Beaches Yacht and Fishing Club, Jacksonville Beach, Fla.
Key West Yacht Club, Key West, Fla.
Lake Beresford Yacht Club, Volusia County, Fla.
Lauderdale Yacht Club, Fort Lauderdale, Fla.
Marine Association of Miami, Miami, Fla.
Miami Yacht Club, Miami, Fla.
Morehead City Boating Club, Morehead City, N. C.
Newport News Yacht Club, Newport News, Va.
Norfolk Boat Club, Norfolk, Va.
Norfolk Yacht and Country Club, Norfolk, Va.
Palm Beach Yacht Club, West Palm Beach, Fla.
Pan-American Yacht Club, Miami, Fla.
Pasquotank River Yacht Club, Elizabeth City, N. C.
Quarter Deck Club, Miami, Fla.
Rod and Reel Club (Fleet Division), Miami, Fla.
St. Lucie River Yacht Club, Stuart, Fla.
Sailfish Club of Florida, Palm Beach, Fla.
Savannah Yacht Club, Wilmington Island, Ga.
Sea Island Yacht Club, St. Simons Island, Ga.
Seminole Canoe and Yacht Club, Ortega River, Fla.
Smyrna Yacht Club, New Smyrna, Fla.
Vero Beach Yacht Club, Vero Beach, Fla.

# Weather Bureau

## Offices

Barometers may be compared with standards at these offices:

Norfolk, Va., Post Office and Federal Courthouse.
Wilmington, N. C., Customhouse, Water Street.
Charleston, S. C., Customhouse, 200 East Bay Street.
Savannah, Ga., Post Office and Courthouse Building.
Jacksonville, Fla., Post Office Building.
Miami, Fla., Congress Building, 111 Northeast Second Avenue.
Key West, Fla., Weather Bureau Building, Eaton and Front Streets.

# Storm Warning Display Stations

Stations marked by an * display signals both day and night. Stations marked by a † display signals only at night.

VIRGINIA:
- *Cape Henry, Weather Bureau Building.
- Chesapeake Bay, Chesapeake Lightship.

NORTH CAROLINA:
- *Beaufort.
- *Coinjock, Coast Guard Depot.
- Columbia.
- Diamond Shoals, Diamond Shoals Lightship.
- *Edenton.
- *Elizabeth City.
- Frying Pan Shoals, Frying Pan Shoals Lightship.
- *Hatteras, Weather Bureau Building.
- Hertford (no displays; warnings distributed locally).
- *Manteo Courthouse.
- *Morehead City.
- New Bern (no displays; warnings distributed locally).
- *Southport.
- *Washington.
- *Wilmington, Customhouse.

SOUTH CAROLINA:
- Charleston, Customhouse.
- *Charleston, Coast Guard Repair Base.
- *Georgetown.
- Myrtle Beach.
- *Port Royal.
- *Sullivans Island Lifeboat Station, Moultrieville.

GEORGIA:
- *Brunswick.
- Saint Simons Island Lifeboat Station.
- *Savannah, Post Office Building.
- *Savannah Beach, Fort Screven, Tybee Island.
- Savannah Lightship.

FLORIDA:
- Alligator Reef Light.
- American Shoals Light
- Carysfort Reef Light.

FLORIDA—Continued
- Daytona Beach, Yacht Club.
- Dry Tortugas Light.
- Eau Gallie, Yacht Basin.
- †Fernandina, Post Office.
- Fort Pierce (no displays; warnings distributed locally).
- Fort Pierce Lifeboat Station.
- Fowey Rocks Light.
- Grassy Key.
- †Green Cove Springs, Naval Air Station.
- Jupiter Inlet Light.
- Key West, William Curry's Sons Building.
- Key West, Lumley and Roberts Hardware Building.
- Key West, Submarine Base.
- *Key West, Weather Bureau Building.
- Lake Okeechobee Area (no displays; warnings distributed locally during hurricane season).
  - Belle Glade.
  - Canal Point.
  - Clewiston.
  - Moorehaven.
  - Okeechobee.
  - Pahokee.
- Lake Worth Inlet Lifeboat Station.
- Marathon.
- Melbourne (no displays; warnings distributed locally).
- Miami, Yacht Basin.
- New Smyrna, City Docks.
- Port Everglades.
- St. Johns Lightship.
- Sombrero Key Light.
- Stuart.
- Tavernier.
- Titusville (no displays; warnings distributed locally).
- Vero Beach (no displays; warnings distributed locally).
- West Palm Beach, Post Office Building.

**Weather broadcasts by commercial 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 are broadcast on regular schedule by Weather Bureau personnel.

| City | Station | Frequency | Power | Daily | Sunday | Holidays | States for which forecasts are given |
|---|---|---|---|---|---|---|---|
| Key West | WKWF | 1600 | 1,000 | 0745 | 0800 | 0745 | Florida and offshore. |
| | | | | 1230 | 1150 | 1230 | Do. |
| | | | | *1830 | None | *1830 | Florida and offshore (*none Saturday). |
| Miami | WGBS | 710 | 10,000 | 0645 | None | None | Florida, Georgia, South Carolina, and offshore. |
| | | | | 1235 | None | None | Florida and offshore. |
| | WKAT | 1360 | 1,000 | 0710 | None | None | Florida, Georgia, South Carolina and offshore. |
| | | | | 1300 | None | None | Florida and offshore. |
| | | | | 0645 | None | None | Florida, Georgia, South Carolina and offshore. |
| | WQAM | 560 | 5,000 | 1130 | None | None | Florida and offshore. |
| Savannah | WTOC | 1290 | 5,000 | 0825 | None | 0825 | Georgia and South Carolina. |
| | WDAR | 1400 | 250 | 1245 | None | 1245 | Florida, Georgia, and South Carolina. |

**Radiotelephone broadcasts by United States Coast Guard:** Regular broadcasts, including weather forecasts, local Notice to Mariners, and hydrographic information, are transmitted by radiophone in plain language on 2698 kc., preceded by a preliminary announcement on 2670 kc., as follows:

| | | | |
|---|---|---|---|
| Norfolk, Va | NMN* | 0020 | 1220 |
| Fort Macon, N. C | NMN37 | | 1200 |
| Charleston, S. C | NMB* | 1120 | 2320 |
| Mayport, Fla | NMV* | 0120 | 1320 |
| Miami, Fla | NMA* | 1150 | 2350 |
| Key West, Fla | NOK* | 1130 | 2330 |

Emergency broadcasts, including storm warnings, advisories, and urgent information, are transmitted immediately upon receipt and at 2-hour intervals thereafter on each even hour (*odd hour) for a period of 6 hours unless the information is canceled or superseded.

All radio telephone broadcasts will be made once through at good writing speed.

# Meteorological Tables

## COMPILED BY THE UNITED STATES WEATHER BUREAU

## Cape Henry, Va.—Position: Latitude 36°56′ N., Longitude 76°00′ W.—Altitude: 16 feet

| Month | Pressure reduced to sea level (inches) | | | Air temperature (° F.) | | | | | Mean humidity (percent) [1] | Mean cloud amount (percent) | Possible sunshine (percent of hours) | Precipitation | | | Mean number of days with— | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Extremes | | Mean | | | Extremes | | | | | Amount (inches) | | | | | | | | |
| | Mean | Highest | Lowest | Daily | Maximum | Minimum | Maximum | Minimum | | | | Mean | Maximum in 24 hours | Snowfall | Precipitation 0.01 inch or more | Snow | Heavy fog [2] | Thunderstorms | Poor visibility [3] | Gales [4] |
| January | 30.12 | 30.93 | 28.93 | 41.2 | 48.5 | 34.0 | 79 | 6 | 78 | 62 | 50 | 3.23 | 2.65 | 2.1 | 11 | 2 | 3 | (*) | 1 | 4 |
| February | 30.07 | 30.92 | 29.03 | 41.4 | 49.0 | 34.0 | 84 | 5 | 77 | 56 | 56 | 3.33 | 4.23 | 2.3 | 10 | 2 | 4 | (*) | (*) | 5 |
| March | 30.03 | 30.83 | 28.32 | 47.6 | 55.8 | 39.7 | 90 | 12 | 75 | 54 | 60 | 3.89 | 2.92 | 1.1 | 12 | 1 | 3 | 1 | (*) | 5 |
| April | 30.01 | 30.68 | 28.95 | 55.3 | 63.4 | 47.3 | 97 | 26 | 74 | 50 | 64 | 3.38 | 5.01 | T | 10 | (*) | 2 | 2 | (*) | 4 |
| May | 29.99 | 30.59 | 29.19 | 65.1 | 72.9 | 57.4 | 98 | 41 | 76 | 50 | 68 | 3.48 | 3.17 | 0 | 11 | 0 | 3 | 4 | (*) | 2 |
| June | 29.98 | 30.42 | 29.39 | 73.4 | 80.8 | 66.0 | 104 | 48 | 78 | 52 | 68 | 3.98 | 3.97 | 0 | 10 | 0 | 1 | 6 | (*) | 2 |
| July | 30.00 | 30.37 | 29.44 | 77.5 | 84.8 | 70.4 | 102 | 55 | 80 | 52 | 66 | 5.32 | 5.76 | 0 | 11 | 0 | 1 | 7 | (*) | 1 |
| August | 30.01 | 30.38 | 28.67 | 76.8 | 83.2 | 70.1 | 103 | 57 | 80 | 50 | 67 | 4.61 | 6.04 | 0 | 11 | 0 | (*) | 5 | (*) | 1 |
| September | 30.06 | 30.50 | 28.86 | 72.4 | 78.7 | 66.4 | 99 | 47 | 80 | 50 | 63 | 3.44 | 7.18 | 0 | 8 | 0 | 1 | 2 | (*) | 2 |
| October | 30.08 | 30.62 | 29.34 | 62.4 | 69.0 | 55.9 | 95 | 35 | 77 | 44 | 68 | 2.94 | 3.76 | 0 | 7 | 0 | 1 | 1 | (*) | 4 |
| November | 30.11 | 30.79 | 29.24 | 51.3 | 59.0 | 45.3 | 86 | 19 | 75 | 48 | 61 | 2.51 | 4.60 | T | 8 | (*) | 2 | (*) | 1 | 5 |
| December | 30.11 | 30.82 | 28.92 | 42.9 | 50.6 | 36.6 | 78 | 7 | 77 | 58 | 52 | 3.25 | 3.17 | 1.6 | 10 | 1 | 3 | (*) | 1 | 5 |
| Mean | 30.05 | ---- | ---- | 58.9 | 66.3 | 51.9 | ---- | ---- | 77 | 52 | 62 | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- |
| Total | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | 43.36 | ---- | 7.1 | 119 | 6 | 24 | 28 | 3 | 40 |
| Extreme | ---- | 30.93 | 28.32 | ---- | ---- | ---- | 104 | 5 | ---- | ---- | ---- | ---- | 7.18 | ---- | ---- | ---- | ---- | ---- | ---- | ---- |
| Number of years record | 45 | 45 | 37 | 73 | 73 | 73 | 73 | 73 | 25 | 36 | 21 | 73 | 73 | 55 | 73 | 55 | 55 | 73 | 8 | 70 |

| Month | Wind | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Direction (percentage of observations) | | | | | | | | | | | | | | | | | | | | Speed (knots) | |
| | N. | NNE. | NE. | ENE. | E. | ESE. | SE. | SSE. | S. | SSW. | SW. | WSW. | W. | WNW. | NW. | NNW. | Calm | | | | Mean | Maximum [5] |
| January | 16 | --- | 18 | --- | 5 | --- | 8 | --- | 13 | --- | 20 | --- | 7 | --- | 13 | --- | (*) | | | | 12.1 | 55.6 |
| February | 21 | --- | 14 | --- | 5 | --- | 10 | --- | 11 | --- | 19 | --- | 7 | --- | 13 | --- | (*) | | | | 12.4 | 49.5 |
| March | 16 | --- | 10 | --- | 6 | --- | 12 | --- | 15 | --- | 22 | --- | 8 | --- | 11 | --- | 0 | | | | 12.7 | 52.1 |
| April | 11 | --- | 13 | --- | 9 | --- | 19 | --- | 14 | --- | 18 | --- | 6 | --- | 10 | --- | (*) | | | | 12.0 | 69.5 |
| May | 10 | --- | 14 | --- | 8 | --- | 18 | --- | 18 | --- | 20 | --- | 7 | --- | 5 | --- | (*) | | | | 10.4 | 40.8 |
| June | 8 | --- | 8 | --- | 6 | --- | 18 | --- | 21 | --- | 23 | --- | 8 | --- | 7 | --- | 1 | | | | 9.7 | 46.9 |
| July | 5 | --- | 9 | --- | 7 | --- | 13 | --- | 21 | --- | 29 | --- | 9 | --- | 6 | --- | 1 | | | | 8.8 | 51.2 |
| August | 6 | --- | 15 | --- | 12 | --- | 13 | --- | 18 | --- | 24 | --- | 6 | --- | 5 | --- | 1 | | | | 9.2 | 59.0 |
| September | 10 | --- | 29 | --- | 13 | --- | 14 | --- | 15 | --- | 20 | --- | 5 | --- | 4 | --- | (*) | | | | 11.0 | 73.8 |
| October | 18 | --- | 18 | --- | 8 | --- | 12 | --- | 11 | --- | 17 | --- | 6 | --- | 9 | --- | 1 | | | | 12.1 | 56.4 |
| November | 15 | --- | 17 | --- | 4 | --- | 10 | --- | 16 | --- | 19 | --- | 6 | --- | 12 | --- | 1 | | | | 12.3 | 48.6 |
| December | 21 | --- | 13 | --- | 5 | --- | 5 | --- | 11 | --- | 22 | --- | 9 | --- | 13 | --- | 1 | | | | 12.1 | 49.5 |
| Mean | 13 | --- | 15 | --- | 7 | --- | 13 | --- | 15 | --- | 21 | --- | 7 | --- | 9 | --- | (*) | | | | 11.2 | ---- |
| Total | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | | | ---- | 73.8 |
| Extreme | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | | | ---- | |
| Number of years record | 10 | --- | 10 | --- | 10 | --- | 10 | --- | 10 | --- | 10 | --- | 10 | --- | 10 | --- | 10 | | | | 73 | 73 |

[1] Mean of 0730, 1930 observations.
[2] Visibility <550 yards.
[3] Visibility ≦⅛ mile (0730 observation).
[4] Winds ≧27 knots.
[5] Measured.
T Trace (less than 0.05 inch snow or 0.005 inch rain).
*Less than 0.5.

## Charleston, S. C.—Position: Latitude 32°47′ N., Longitude 79°56′ W.—Altitude: 9 feet

| Month | Pressure reduced to sea level (inches) | | | Air temperature (° F.) | | | | | Mean humidity (percent) [1] | Mean cloud amount (percent) | Possible sunshine (percent of hours) | Precipitation | | | Mean number of days with— | | | | | | Wind | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Extremes | | Mean | | | Extremes | | | | | Amount (inches) | | | | | | | | | Direction (percentage of observations) | | | | | | | | | | | | | | | | | | Speed (knots) | |
| | Mean | Highest | Lowest | Daily | Maximum | Minimum | Maximum | Minimum | | | | Mean | Maximum in 24 hours | Snowfall | Precipitation 0.01 inch or more | Snow | Heavy fog [2] | Thunderstorms | Poor visibility [3] | Gales [4] | N. | NNE. | NE. | ENE. | E. | ESE. | SE. | SSE. | S. | SSW. | SW. | WSW. | W. | WNW. | NW. | NNW. | Calm | Mean | Maximum [5] |
| January | 30.16 | 30.83 | 29.17 | 49.9 | 58.1 | 43.0 | 82 | 10 | 74 | 51 | 58 | 3.02 | 3.98 | T | 9 | (*) | 3 | 1 | 1 | (*) | 10 | 7 | 6 | 2 | 4 | 1 | 3 | 3 | 7 | 7 | 7 | 4 | 7 | 4 | 6 | 3 | 19 | 8.9 | 34.7 |
| February | 30.12 | 30.75 | 29.20 | 52.4 | 59.6 | 44.4 | 82 | 7 | 73 | 56 | 59 | 2.98 | 4.77 | 0.2 | 9 | (*) | 2 | 2 | 1 | 0 | 10 | 8 | 7 | 3 | 4 | 2 | 3 | 2 | 5 | 9 | 6 | 4 | 8 | 4 | 7 | 4 | 14 | 9.6 | 38.2 |
| March | 30.08 | 30.71 | 28.78 | 57.4 | 65.7 | 50.3 | 94 | 24 | 71 | 55 | 65 | 3.02 | 4.07 | T | 9 | 0 | 2 | 2 | 1 | 1 | 7 | 4 | 4 | 2 | 3 | 2 | 5 | 5 | 12 | 10 | 6 | 6 | 6 | 4 | 5 | 3 | 16 | 9.9 | 38.2 |
| April | 30.04 | 30.58 | 29.29 | 64.5 | 72.3 | 57.2 | 93 | 32 | 69 | 46 | 72 | 2.53 | 8.30 | 0 | 7 | 0 | 1 | 3 | (*) | (*) | 5 | 4 | 4 | 3 | 5 | 3 | 6 | 5 | 12 | 9 | 7 | 5 | 6 | 4 | 4 | 2 | 16 | 9.8 | 45.2 |
| May | 30.01 | 30.49 | 29.22 | 72.7 | 79.8 | 67.2 | 99 | 45 | 71 | 41 | 73 | 3.00 | 5.88 | 0 | 8 | 0 | 0 | 6 | 1 | 1 | 6 | 5 | 6 | 4 | 6 | 4 | 7 | 6 | 11 | 5 | 5 | 3 | 4 | 2 | 3 | 2 | 21 | 9.2 | 46.0 |
| June | 30.01 | 30.38 | 29.31 | 78.9 | 85.6 | 72.5 | 104 | 49 | 73 | 52 | 69 | 4.59 | 6.01 | 0 | 11 | 0 | 0 | 10 | 0 | 1 | 5 | 2 | 3 | 1 | 5 | 2 | 9 | 8 | 15 | 8 | 8 | 4 | 3 | 2 | 2 | 1 | 22 | 8.8 | 39.9 |
| July | 30.03 | 30.36 | 29.02 | 81.4 | 88.0 | 75.0 | 104 | 61 | 75 | 54 | 65 | 6.89 | 7.58 | 0 | 13 | 0 | 0 | 13 | 0 | 1 | 4 | 2 | 2 | 1 | 3 | 2 | 7 | 8 | 13 | 9 | 12 | 7 | 4 | 1 | 2 | 1 | 22 | 8.2 | 43.4 |
| August | 30.02 | 30.33 | 29.33 | 81.0 | 87.2 | 74.5 | 102 | 62 | 77 | 54 | 66 | 6.53 | 8.55 | 0 | 13 | 0 | 0 | 12 | (*) | (*) | 5 | 3 | 4 | 3 | 7 | 4 | 7 | 5 | 8 | 6 | 7 | 4 | 3 | 2 | 3 | 1 | 28 | 8.1 | 70.3 |
| September | 30.04 | 30.43 | 29.27 | 76.6 | 83.1 | 70.7 | 100 | 49 | 77 | 50 | 68 | 4.53 | 10.57 | 0 | 10 | 0 | 1 | 5 | 1 | 1 | 8 | 7 | 9 | 2 | 7 | 3 | 7 | 2 | 6 | 2 | 5 | 2 | 3 | 2 | 4 | 3 | 28 | 8.9 | 49.5 |
| October | 30.06 | 30.59 | 28.91 | 67.8 | 74.9 | 60.8 | 95 | 37 | 72 | 39 | 69 | 3.27 | 9.55 | 0 | 6 | 0 | 1 | 1 | 1 | (*) | 12 | 9 | 13 | 4 | 6 | 2 | 6 | 1 | 4 | 2 | 4 | 2 | 4 | 2 | 5 | 2 | 22 | 9.3 | 52.1 |
| November | 30.12 | 30.70 | 29.14 | 58.1 | 66.4 | 50.5 | 83 | 23 | 71 | 41 | 69 | 2.14 | 5.84 | 0 | 7 | 0 | 2 | 1 | 1 | (*) | 13 | 8 | 9 | 2 | 4 | 1 | 5 | 2 | 5 | 2 | 6 | 3 | 6 | 3 | 7 | 4 | 20 | 8.7 | 37.3 |
| December | 30.15 | 30.74 | 29.28 | 51.7 | 59.2 | 44.1 | 81 | 12 | 74 | 48 | 56 | 2.72 | 3.46 | 0.1 | 9 | (*) | 2 | (*) | 1 | (*) | 11 | 7 | 8 | 2 | 3 | 1 | 3 | 2 | 5 | 4 | 8 | 4 | 7 | 4 | 8 | 4 | 19 | 8.9 | 34.7 |
| Mean | 30.07 | | | 66.0 | 73.3 | 59.2 | | | 73 | 49 | 66 | | | | | | | | | | 8 | 6 | 6 | 2 | 5 | 2 | 6 | 4 | 8 | 6 | 7 | 4 | 5 | 3 | 5 | 2 | 21 | 9.0 | |
| Total | | | | | | | | | | | | 45.22 | | 0.3 | 111 | (*) | 14 | 56 | 8 | 5 | | | | | | | | | | | | | | | | | | | | |
| Extreme | | 30.83 | 28.78 | | | | 104 | 7 | | | | | 10.57 | | | | | | | | | | | | | | | | | | | | | | | | | | 70.3 |
| Number of years record | 51 | 69 | 69 | 49 | 73 | 73 | 76 | 76 | 21 | 8 | 50 | 53 | 76 | 56 | 76 | 56 | 54 | 56 | 8 | 10 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 50 | 76 |

[1] Mean of 0800, 2000 observations.
[2] Visibility < 550 yards.
[3] Visibility ≦ ½ mile (0730 observation).
[4] Winds ≧ 27 knots.
[5] Measured.
T Trace (less than 0.05 inch snow or 0.005 inch rain).
*Less than 0.5.

# Hatteras, N. C.—Position: Latitude 35°15′ N., Longitude 75°40′ W.—Altitude: 7 feet

| Month | Pressure reduced to sea level (inches) | | | Air temperature (° F.) | | | | | Mean humidity (percent) [1] | Mean cloud amount (percent) | Possible sunshine (percent of hours) | Precipitation | | | Mean number of days with— | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Extremes | | Mean | | | Extremes | | | | | Amount (inches) | | | | | | | | |
| | Mean | Highest | Lowest | Daily | Maximum | Minimum | Maximum | Minimum | | | | Mean | Maximum in 24 hours | Snowfall | Precipitation 0.01 inch or more | Snow | Heavy fog [2] | Thunderstorms | Poor visibility [3] | Gales [4] |
| January | 30.12 | 30.85 | 29.06 | 46.6 | 52.9 | 40.3 | 74 | 11 | 84 | 57 | ---- | 4.27 | 3.44 | 0.4 | 12 | (*) | 2 | 1 | (*) | 6 |
| February | 30.08 | 30.84 | 29.10 | 46.4 | 52.9 | 40.0 | 73 | 11 | 82 | 56 | ---- | 4.14 | 4.34 | 0.3 | 11 | (*) | 2 | 1 | (*) | 6 |
| March | 30.05 | 30.75 | 28.64 | 51.8 | 58.2 | 45.4 | 82 | 24 | 81 | 53 | ---- | 4.34 | 3.28 | T | 11 | (*) | 1 | 2 | 1 | 7 |
| April | 30.02 | 30.66 | 29.10 | 58.7 | 64.8 | 52.6 | 85 | 31 | 80 | 47 | ---- | 3.62 | 4.49 | T | 10 | 0 | 1 | 3 | (*) | 5 |
| May | 30.00 | 30.52 | 29.20 | 67.7 | 73.3 | 62.1 | 88 | 43 | 81 | 46 | ---- | 3.78 | 7.44 | 0 | 9 | 0 | (*) | 5 | 0 | 2 |
| June | 30.00 | 30.44 | 29.19 | 74.6 | 79.7 | 69.6 | 95 | 53 | 83 | 50 | ---- | 4.18 | 6.81 | 0 | 10 | 0 | (*) | 6 | 0 | 1 |
| July | 30.02 | 30.38 | 29.33 | 78.1 | 83.1 | 73.1 | 95 | 60 | 84 | 55 | ---- | 5.70 | 7.72 | 0 | 12 | 0 | (*) | 8 | 0 | 1 |
| August | 30.02 | 30.35 | 28.62 | 78.2 | 83.1 | 73.2 | 92 | 60 | 82 | 47 | ---- | 5.71 | 5.50 | 0 | 12 | 0 | 0 | 6 | 0 | 1 |
| September | 30.05 | 30.48 | 27.97 | 74.8 | 79.6 | 69.9 | 92 | 50 | 82 | 53 | ---- | 5.50 | 11.99 | 0 | 9 | 0 | (*) | 3 | (*) | 2 |
| October | 30.06 | 30.56 | 29.33 | 65.7 | 70.8 | 60.6 | 90 | 41 | 82 | 48 | ---- | 4.79 | 12.46 | 0 | 8 | 0 | (*) | 1 | (*) | 3 |
| November | 30.11 | 30.77 | 29.09 | 56.2 | 62.0 | 50.5 | 79 | 26 | 82 | 47 | ---- | 3.66 | 6.16 | T | 9 | 0 | 1 | 1 | 0 | 4 |
| December | 30.11 | 30.78 | 29.15 | 48.6 | 54.7 | 42.5 | 75 | 8 | 84 | 56 | ---- | 4.79 | 4.06 | 0.5 | 11 | 0 | 1 | 1 | (*) | 6 |
| Mean | 30.05 | ---- | ---- | 62.2 | 67.9 | 56.6 | ---- | ---- | 82 | 51 | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- |
| Total | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | 54.48 | ---- | 1.2 | 124 | (*) | 8 | 38 | 1 | 44 |
| Extreme | ---- | 30.86 | 27.97 | ---- | ---- | ---- | 95 | 8 | ---- | ---- | ---- | ---- | 12.46 | ---- | ---- | ---- | ---- | ---- | ---- | ---- |
| Number of years record | 55 | 55 | 55 | 71 | 64 | 64 | 71 | 71 | 54 | 11 | ---- | 71 | 54 | 53 | 71 | 10 | 48 | 48 | 8 | 27 |

| Month | Wind | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Direction (percentage of observations) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | Speed (knots) | |
| | N. | NNE. | NE. | ENE. | E. | ESE. | SE. | SSE. | S. | SSW. | SW. | WSW. | W. | WNW. | NW. | NNW. | Calm | | | | | | | | | | | | | | | | | | | | | | | | Mean | Maximum [5] |
| January | 25 | --- | 18 | --- | 3 | --- | 3 | --- | 5 | --- | 19 | --- | 13 | --- | 14 | --- | (*) | | | | | | | | | | | | | | | | | | | | | | | | 12.6 | 57.3 |
| February | 26 | --- | 23 | --- | 2 | --- | 3 | --- | 4 | --- | 20 | --- | 9 | --- | 13 | --- | 0 | | | | | | | | | | | | | | | | | | | | | | | | 12.9 | 46.0 |
| March | 16 | --- | 15 | --- | 4 | --- | 5 | --- | 10 | --- | 25 | --- | 12 | --- | 12 | --- | 1 | | | | | | | | | | | | | | | | | | | | | | | | 12.9 | 49.5 |
| April | 11 | --- | 22 | --- | 10 | --- | 6 | --- | 8 | --- | 27 | --- | 9 | --- | 7 | --- | (*) | | | | | | | | | | | | | | | | | | | | | | | | 12.2 | 51.2 |
| May | 7 | --- | 26 | --- | 7 | --- | 5 | --- | 10 | --- | 31 | --- | 9 | --- | 5 | --- | 0 | | | | | | | | | | | | | | | | | | | | | | | | 11.0 | 43.4 |
| June | 8 | --- | 12 | --- | 8 | --- | 6 | --- | 14 | --- | 38 | --- | 11 | --- | 3 | --- | 0 | | | | | | | | | | | | | | | | | | | | | | | | 10.3 | 43.4 |
| July | 5 | --- | 12 | --- | 6 | --- | 6 | --- | 12 | --- | 46 | --- | 9 | --- | 4 | --- | 0 | | | | | | | | | | | | | | | | | | | | | | | | 10.2 | 56.4 |
| August | 7 | --- | 21 | --- | 10 | --- | 6 | --- | 10 | --- | 32 | --- | 9 | --- | 5 | --- | (*) | | | | | | | | | | | | | | | | | | | | | | | | 9.6 | 69.5 |
| September | 6 | --- | 31 | --- | 10 | --- | 7 | --- | 9 | --- | 21 | --- | 10 | --- | 6 | --- | (*) | | | | | | | | | | | | | | | | | | | | | | | | 10.4 | 78.2 |
| October | 23 | --- | 29 | --- | 6 | --- | 6 | --- | 5 | --- | 10 | --- | 9 | --- | 11 | --- | 1 | | | | | | | | | | | | | | | | | | | | | | | | 11.2 | 45.2 |
| November | 26 | --- | 22 | --- | 3 | --- | 5 | --- | 8 | --- | 11 | --- | 10 | --- | 14 | --- | 1 | | | | | | | | | | | | | | | | | | | | | | | | 11.8 | 46.0 |
| December | 30 | --- | 17 | --- | 2 | --- | 4 | --- | 3 | --- | 14 | --- | 16 | --- | 14 | --- | (*) | | | | | | | | | | | | | | | | | | | | | | | | 12.5 | 44.3 |
| Mean | 16 | --- | 21 | --- | 6 | --- | 5 | --- | 8 | --- | 25 | --- | 10 | --- | 9 | --- | (*) | | | | | | | | | | | | | | | | | | | | | | | | 11.5 | ---- |
| Total | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | | | | | | | | | | | | | | | | | | | | | | | ---- | ---- |
| Extreme | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | | | | | | | | | | | | | | | | | | | | | | | ---- | 78.2 |
| Number of years record | 10 | --- | 10 | --- | 10 | --- | 10 | --- | 10 | --- | 10 | --- | 10 | --- | 10 | --- | 10 | | | | | | | | | | | | | | | | | | | | | | | | 41 | 54 |

[1] Mean of 0730, 1930 observations.
[2] Visibility < 550 yards.
[3] Visibility ≦ ½ mile (0730 observation).
[4] Winds ≧ 27 knots.
[5] Measured.
T = Trace (less than 0.05 inch snow or 0.005 inch rain).
*Less than 0.5.

# Jacksonville, Fla.—Position: Latitude 30°20′ N., Longitude 81°39′ W.—Altitude: 18.3 feet

| Month | Pressure reduced to sea level (inches) | | | Air temperature (° F.) | | | | | Mean humidity (percent) [1] | Mean cloud amount (percent) | Possible sunshine (percent of hours) | Precipitation | | | Mean number of days with— | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Extremes | | Mean | | | Extremes | | | | | Amount (inches) | | | | | | | | |
| | Mean | Highest | Lowest | Daily | Maximum | Minimum | Maximum | Minimum | | | | Mean | Maximum in 24 hours | Snowfall | Precipitation 0.01 inch or more | Snow | Heavy fog [2] | Thunderstorms | Poor visibility [3] | Gales [4] |
| January | 30.15 | 30.67 | 29.35 | 55.4 | 64.1 | 46.7 | 84 | 15 | 76 | 49 | 57 | 2.80 | 3.09 | T | 8 | 0 | 3 | 1 | 1 | 1 |
| February | 30.12 | 30.63 | 29.29 | 58.0 | 66.9 | 49.1 | 86 | 10 | 72 | 51 | 59 | 2.97 | 4.16 | T | 8 | 0 | 2 | 2 | 1 | 1 |
| March | 30.07 | 30.64 | 29.05 | 62.6 | 71.6 | 53.6 | 91 | 25 | 71 | 52 | 67 | 2.91 | 4.47 | 0 | 8 | 0 | 1 | 3 | (*) | 2 |
| April | 30.04 | 30.46 | 29.32 | 68.7 | 77.5 | 59.9 | 92 | 34 | 70 | 50 | 72 | 2.38 | 4.81 | 0 | 7 | 0 | (*) | 4 | 1 | 1 |
| May | 30.00 | 30.41 | 29.55 | 75.0 | 83.5 | 66.5 | 99 | 46 | 70 | 46 | 71 | 4.02 | 9.06 | 0 | 9 | 0 | (*) | 8 | (*) | (*) |
| June | 30.01 | 30.28 | 29.53 | 79.9 | 87.9 | 71.9 | 101 | 54 | 75 | 59 | 64 | 5.33 | 7.66 | 0 | 13 | 0 | (*) | 13 | 0 | 1 |
| July | 30.04 | 30.29 | 29.25 | 82.1 | 90.2 | 74.0 | 104 | 65 | 77 | 61 | 62 | 6.71 | 5.00 | 0 | 16 | 0 | (*) | 18 | 0 | 1 |
| August | 30.02 | 30.28 | 29.04 | 81.7 | 89.5 | 73.9 | 101 | 64 | 80 | 62 | 64 | 5.81 | 6.18 | 0 | 15 | 0 | (*) | 16 | (*) | 1 |
| September | 30.01 | 30.32 | 28.90 | 78.3 | 85.4 | 71.2 | 99 | 49 | 80 | 60 | 61 | 7.35 | 9.86 | 0 | 13 | 0 | (*) | 8 | (*) | 1 |
| October | 30.03 | 30.49 | 28.96 | 71.1 | 78.5 | 63.7 | 95 | 37 | 78 | 44 | 60 | 4.46 | 9.62 | 0 | 9 | 0 | 1 | 2 | 1 | 1 |
| November | 30.11 | 30.57 | 29.35 | 62.2 | 70.6 | 53.8 | 86 | 25 | 78 | 49 | 62 | 1.98 | 3.75 | 0 | 7 | 0 | 1 | 1 | 1 | (*) |
| December | 30.14 | 30.61 | 29.45 | 56.3 | 65.0 | 47.6 | 83 | 14 | 79 | 53 | 53 | 3.02 | 4.97 | 0 | 8 | 0 | 3 | 1 | 3 | (*) |
| Mean | 30.06 | | | 69.3 | 77.6 | 61.0 | | | 76 | 53 | 63 | | | | | | | | | |
| Total | | | | | | | | | | | | 49.74 | | T | 121 | 0 | 11 | 77 | 8 | 10 |
| Extreme | | 30.67 | 28.90 | | | | 104 | 10 | | | | | 9.86 | | | | | | | |
| Number of years record | 75 | 75 | 75 | 46 | 46 | 46 | 75 | 75 | 10 | 8 | 49 | 50 | 75 | 8 | 75 | 75 | 56 | 56 | 8 | 10 |

| Month | Wind | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Direction (percentage of observations) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | N. | NNE. | NE. | ENE. | E. | ESE. | SE. | SSE. | S. | SSW. | SW. | WSW. | W. | WNW. | NW. | NNW. | Calm | Speed (knots) Mean | Speed (knots) Maximum [5] |
| January | 8 | 6 | 9 | 2 | 4 | 1 | 8 | 2 | 8 | 3 | 6 | 3 | 5 | 4 | 10 | 4 | 17 | 7.8 | 39.9 |
| February | 9 | 6 | 11 | 2 | 3 | 1 | 5 | 2 | 7 | 4 | 7 | 4 | 5 | 4 | 11 | 5 | 14 | 8.2 | 50.4 |
| March | 5 | 4 | 6 | 2 | 4 | 3 | 9 | 3 | 7 | 4 | 9 | 5 | 7 | 6 | 10 | 4 | 12 | 8.4 | 50.4 |
| April | 3 | 2 | 8 | 3 | 6 | 3 | 9 | 3 | 6 | 4 | 11 | 6 | 7 | 4 | 10 | 2 | 13 | 8.2 | 39.9 |
| May | 4 | 2 | 8 | 5 | 9 | 5 | 12 | 4 | 6 | 4 | 9 | 3 | 5 | 2 | 5 | 2 | 15 | 7.7 | 43.4 |
| June | 2 | 2 | 5 | 2 | 5 | 4 | 13 | 5 | 10 | 5 | 15 | 4 | 5 | 2 | 4 | 1 | 16 | 7.5 | 46.9 |
| July | 2 | 1 | 4 | 2 | 5 | 4 | 11 | 4 | 8 | 7 | 17 | 6 | 6 | 2 | 4 | 1 | 16 | 7.3 | 40.8 |
| August | 4 | 1 | 7 | 3 | 6 | 4 | 13 | 4 | 8 | 3 | 12 | 3 | 4 | 1 | 4 | 1 | 22 | 7.0 | 38.2 |
| September | 8 | 3 | 12 | 4 | 11 | 4 | 8 | 2 | 5 | 2 | 6 | 2 | 3 | 1 | 7 | 2 | 20 | 7.3 | 46.9 |
| October | 13 | 7 | 17 | 4 | 8 | 2 | 4 | 1 | 3 | 1 | 3 | 1 | 4 | 2 | 10 | 6 | 14 | 7.9 | 49.5 |
| November | 12 | 7 | 11 | 2 | 6 | 2 | 4 | 1 | 3 | 1 | 4 | 2 | 4 | 4 | 16 | 7 | 14 | 7.6 | 38.2 |
| December | 10 | 5 | 9 | 1 | 3 | 1 | 5 | 1 | 6 | 3 | 6 | 3 | 6 | 4 | 12 | 5 | 20 | 7.6 | 37.3 |
| Mean | 7 | 4 | 9 | 3 | 6 | 3 | 9 | 3 | 6 | 3 | 9 | 3 | 5 | 3 | 8 | 3 | 16 | 7.7 | |
| Total | | | | | | | | | | | | | | | | | | | |
| Extreme | | | | | | | | | | | | | | | | | | | 50.4 |
| Number of years record | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 75 | 75 |

[1] Mean of 0130, 0730, 1330, 1930 observations.
[2] Visibility < 550 yards.
[3] Visibility ≦ ½ mile (0730 observation).
[4] Winds ≧ 27 knots.
[5] Measured.
T = Trace (less than 0.05 inch snow or 0.005 inch rain).
* Less than 0.5.

# Jupiter Inlet, Fla.—Position: Latitude 26°57′ N., Longitude 80°07′ W.—Altitude: 21 feet

| Month | Pressure reduced to sea level (inches) | | | Air temperature (° F.) | | | | | Mean humidity (percent) | Mean cloud amount (percent) | Possible sunshine (percent of hours) | Precipitation | | | Mean number of days with— | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Extremes | | Mean | | | Extremes | | | | | Amount (inches) | | | | | | | | |
| | Mean | Highest | Lowest | Daily | Maximum | Minimum | Maximum | Minimum | | | | Mean | Maximum in 24 hours | Snowfall | Precipitation 0.01 inch or more | Snow | Heavy fog | Thunderstorms | Poor visibility | Gales [1] |
| January | 30.10 | 30.48 | 29.66 | 66.0 | 73.6 | 58.3 | 87 | 24 | 81 | 49 | 60 | 3.53 | 6.38 | ---- | 10 | ---- | (*) | ---- | ---- | (*) |
| February | 30.08 | 30.45 | 29.54 | 66.6 | 74.3 | 58.9 | 88 | 27 | 81 | 48 | 62 | 2.42 | 3.62 | ---- | 8 | ---- | (*) | ---- | ---- | (*) |
| March | 30.05 | 30.39 | 29.56 | 69.8 | 77.3 | 62.2 | 90 | 33 | 80 | 41 | 67 | 3.23 | 4.97 | ---- | 7 | ---- | (*) | ---- | ---- | (*) |
| April | 30.04 | 30.34 | 29.61 | 72.6 | 79.8 | 65.5 | 92 | 39 | 76 | 42 | 73 | 2.82 | 4.25 | ---- | 8 | ---- | (*) | ---- | ---- | (*) |
| May | 29.98 | 30.28 | 29.64 | 76.4 | 83.3 | 69.4 | 94 | 52 | 78 | 46 | 67 | 4.77 | 8.76 | ---- | 10 | ---- | (*) | ---- | ---- | (*) |
| June | 30.01 | 30.25 | 29.63 | 79.2 | 85.8 | 72.6 | 99 | 60 | 82 | 55 | 60 | 6.37 | 9.26 | ---- | 14 | ---- | (*) | ---- | ---- | (*) |
| July | 30.03 | 30.25 | 29.76 | 80.9 | 87.4 | 74.4 | 99 | 67 | 82 | 49 | 64 | 5.79 | 3.40 | ---- | 15 | ---- | 0 | ---- | ---- | (*) |
| August | 30.00 | 30.19 | 29.20 | 81.6 | 88.3 | 74.8 | 96 | 68 | 82 | 48 | 64 | 6.26 | 4.92 | ---- | 15 | ---- | 0 | ---- | ---- | (*) |
| September | 29.96 | 30.16 | 29.30 | 80.4 | 86.6 | 74.3 | 94 | 61 | 82 | 55 | 62 | 8.85 | 6.67 | ---- | 16 | ---- | 0 | ---- | ---- | (*) |
| October | 29.96 | 30.30 | 29.18 | 76.8 | 82.7 | 70.8 | 96 | 48 | 80 | 54 | 53 | 10.43 | 13.18 | ---- | 14 | ---- | (*) | ---- | ---- | 1 |
| November | 30.05 | 30.32 | 29.71 | 71.6 | 77.9 | 65.2 | 87 | 36 | 80 | 49 | 61 | 3.14 | 5.06 | ---- | 9 | ---- | (*) | ---- | ---- | 0 |
| December | 30.10 | 30.48 | 29.63 | 67.1 | 74.3 | 59.9 | 86 | 24 | 81 | 50 | 57 | 2.38 | 5.75 | ---- | 8 | ---- | (*) | ---- | ---- | 0 |
| Mean | 30.03 | ---- | ---- | 74.1 | 80.9 | 67.2 | ---- | ---- | 80 | 49 | 62 | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- |
| Total | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | 59.99 | ---- | ---- | 134 | ---- | (*) | ---- | ---- | (*) |
| Extreme | ---- | 30.48 | 29.18 | ---- | ---- | ---- | 99 | 24 | ---- | ---- | ---- | ---- | 13.18 | ---- | ---- | ---- | ---- | ---- | ---- | ---- |
| Number of years record | ---- | ---- | ---- | 31 | 31 | 31 | 31 | 32 | 23 | ---- | 23 | 31 | ---- | ---- | 31 | ---- | ---- | ---- | ---- | ---- |

| Month | Wind | | | | | | | | | | | | | | | | | | Wind | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Direction (percentage of observations) | | | | | | | | | | | | | | | | | | Speed (knots) | |
| | N. | NNE. | NE. | ENE. | E. | ESE. | SE. | SSE. | S. | SSW. | SW. | WSW. | W. | WNW. | NW. | NNW. | Calm | | Mean | Maximum [2] |
| January | 13 | ---- | 8 | ---- | 13 | ---- | 14 | ---- | 8 | ---- | 10 | ---- | 10 | ---- | 24 | ---- | 0 | | 9.2 | 32 |
| February | 18 | ---- | 7 | ---- | 7 | ---- | 14 | ---- | 12 | ---- | 14 | ---- | 7 | ---- | 21 | ---- | 0 | | 9.3 | 36 |
| March | 11 | ---- | 8 | ---- | 16 | ---- | 18 | ---- | 14 | ---- | 10 | ---- | 10 | ---- | 13 | ---- | 0 | | 9.6 | 33 |
| April | 8 | ---- | 10 | ---- | 12 | ---- | 17 | ---- | 13 | ---- | 15 | ---- | 13 | ---- | 12 | ---- | 0 | | 9.6 | 42 |
| May | 5 | ---- | 11 | ---- | 18 | ---- | 22 | ---- | 15 | ---- | 15 | ---- | 11 | ---- | 3 | ---- | 0 | | 8.9 | 35 |
| June | 3 | ---- | 8 | ---- | 17 | ---- | 23 | ---- | 17 | ---- | 15 | ---- | 12 | ---- | 5 | ---- | 0 | | 8.0 | 35 |
| July | 5 | ---- | 3 | ---- | 12 | ---- | 26 | ---- | 16 | ---- | 21 | ---- | 11 | ---- | 6 | ---- | 0 | | 7.6 | 28 |
| August | 3 | ---- | 5 | ---- | 13 | ---- | 24 | ---- | 13 | ---- | 24 | ---- | 13 | ---- | 5 | ---- | 0 | | 7.6 | 42 |
| September | 8 | ---- | 16 | ---- | 23 | ---- | 23 | ---- | 10 | ---- | 8 | ---- | 7 | ---- | 5 | ---- | 0 | | 8.2 | 55 |
| October | 13 | ---- | 29 | ---- | 21 | ---- | 10 | ---- | 6 | ---- | 6 | ---- | 5 | ---- | 10 | ---- | 0 | | 9.9 | 50 |
| November | 13 | ---- | 14 | ---- | 20 | ---- | 12 | ---- | 3 | ---- | 7 | ---- | 8 | ---- | 23 | ---- | 0 | | 9.5 | 30 |
| December | 15 | ---- | 8 | ---- | 13 | ---- | 13 | ---- | 6 | ---- | 10 | ---- | 11 | ---- | 24 | ---- | 0 | | 9.1 | 28 |
| Mean | 10 | ---- | 10 | ---- | 15 | ---- | 18 | ---- | 11 | ---- | 13 | ---- | 10 | ---- | 13 | ---- | 0 | | 8.9 | ---- |
| Total | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | | ---- | ---- |
| Extreme | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | | ---- | 55 |
| Number of years record | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | | 23 | ---- |

[1] Winds ≧ 27 knots.
[2] Measured.
T=Trace (less than 0.05 inch snow or 0.005 inch rain).
*Less than 0.5.

# Key West, Fla.—Position: Latitude 24°33′ N., Longitude 81°48′ W.—Altitude: 5 feet

| Month | Pressure reduced to sea level (inches) | | | Air temperature (° F.) | | | | | Mean humidity (percent) [1] | Mean cloud amount (percent) | Possible sunshine (percent of hours) | Precipitation | | | Mean number of days with— | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Extremes | | Mean | | | Extremes | | | | | Amount (inches) | | | | | | | | |
| | Mean | Highest | Lowest | Daily | Maximum | Minimum | Maximum | Minimum | | | | Mean | Maximum in 24 hours | Snowfall | Precipitation 0.01 inch or more | Snow | Heavy fog [2] | Thunderstorms | Poor visibility [3] | Gales [4] |
| January | 30.10 | 30.50 | 29.71 | 69.5 | 74.5 | 65.2 | 85 | 43 | 79 | 43 | 67 | 1.96 | 3.97 | 0 | 7 | 0 | (*) | 1 | 0 | (*) |
| February | 30.08 | 30.47 | 29.60 | 70.5 | 75.8 | 65.9 | 85 | 44 | 77 | 37 | 75 | 1.34 | 2.99 | 0 | 6 | 0 | (*) | 1 | 0 | (*) |
| March | 30.05 | 30.47 | 29.48 | 72.6 | 78.0 | 68.1 | 88 | 49 | 77 | 35 | 78 | 1.39 | 4.52 | 0 | 5 | 0 | 0 | 2 | 0 | 1 |
| April | 30.01 | 30.37 | 29.63 | 75.7 | 81.0 | 71.2 | 89 | 56 | 75 | 36 | 78 | 1.29 | 7.95 | 0 | 5 | 0 | 0 | 2 | 0 | (*) |
| May | 29.97 | 30.25 | 29.67 | 79.1 | 84.2 | 74.4 | 92 | 64 | 73 | 44 | 72 | 3.54 | 5.83 | 0 | 8 | 0 | 0 | 4 | 0 | (*) |
| June | 29.99 | 30.26 | 29.62 | 81.9 | 87.1 | 77.2 | 93 | 65 | 77 | 53 | 68 | 4.24 | 5.48 | 0 | 11 | 0 | 0 | 8 | 0 | (*) |
| July | 30.03 | 30.24 | 29.77 | 83.5 | 88.7 | 78.4 | 94 | 69 | 75 | 50 | 69 | 3.28 | 7.46 | 0 | 12 | 0 | 0 | 11 | 0 | (*) |
| August | 29.99 | 30.22 | 29.62 | 83.5 | 89.0 | 78.4 | 93 | 68 | 75 | 51 | 69 | 4.51 | 8.32 | 0 | 14 | 0 | 0 | 12 | 0 | (*) |
| September | 29.94 | 30.17 | 29.83 | 82.2 | 87.6 | 77.3 | 93 | 69 | 78 | 54 | 66 | 6.70 | 11.95 | 0 | 16 | 0 | 0 | 10 | 0 | (*) |
| October | 29.94 | 30.28 | 28.47 | 79.1 | 83.4 | 74.6 | 91 | 59 | 78 | 48 | 66 | 6.00 | 13.54 | 0 | 13 | 0 | 0 | 4 | 0 | (*) |
| November | 30.03 | 30.45 | 29.60 | 74.3 | 78.5 | 70.1 | 88 | 51 | 78 | 42 | 68 | 2.19 | 8.86 | 0 | 8 | 0 | 0 | 1 | 0 | (*) |
| December | 30.08 | 30.52 | 29.62 | 70.3 | 75.1 | 66.2 | 86 | 45 | 80 | 43 | 68 | 1.67 | 3.93 | 0 | 7 | 0 | (*) | 1 | (*) | (*) |
| Mean | 30.02 | | | 76.8 | 81.9 | 72.3 | | | 77 | 44 | 70 | | | | | | | | | |
| Total | | | | | | | | | | | | 38.11 | | 0 | 112 | 0 | (*) | 57 | (*) | 1 |
| Extreme | | 30.52 | 28.47 | | | | 94 | 43 | | | | | 13.54 | | | | | | | |
| Number of years record | 69 | 69 | 69 | 46 | 72 | 72 | 50 | 50 | 6 | 44 | 31 | 50 | 74 | 74 | 74 | 74 | 61 | 61 | 8 | 44 |

| Month | Wind | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Direction (percentage of observations) | | | | | | | | | | | | | | | | | | | | Speed (knots) | |
| | N. | NNE. | NE. | ENE. | E. | ESE. | SE. | SSE. | S. | SSW. | SW. | WSW. | W. | WNW. | NW. | NNW. | Calm | | | | Mean | Maximum [5] |
| January | 16 | --- | 24 | --- | 32 | --- | 15 | --- | 4 | --- | 2 | --- | 1 | --- | 5 | --- | 1 | | | | 9.2 | 39.9 |
| February | 18 | --- | 21 | --- | 23 | --- | 19 | --- | 8 | --- | 2 | --- | 2 | --- | 7 | --- | (*) | | | | 9.3 | 38.2 |
| March | 17 | --- | 15 | --- | 28 | --- | 18 | --- | 7 | --- | 2 | --- | 3 | --- | 9 | --- | 1 | | | | 9.4 | 39.9 |
| April | 15 | --- | 13 | --- | 30 | --- | 20 | --- | 8 | --- | 2 | --- | 3 | --- | 8 | --- | 1 | | | | 9.1 | 39.1 |
| May | 10 | --- | 9 | --- | 39 | --- | 21 | --- | 7 | --- | 2 | --- | 3 | --- | 8 | --- | 1 | | | | 8.3 | 37.3 |
| June | 6 | --- | 7 | --- | 33 | --- | 23 | --- | 12 | --- | 7 | --- | 5 | --- | 6 | --- | 1 | | | | 7.6 | 34.7 |
| July | 4 | --- | 6 | --- | 40 | --- | 29 | --- | 11 | --- | 4 | --- | 3 | --- | 2 | --- | 1 | | | | 7.3 | 35.6 |
| August | 4 | --- | 8 | --- | 45 | --- | 23 | --- | 8 | --- | 4 | --- | 3 | --- | 4 | --- | 1 | | | | 7.2 | 34.7 |
| September | 7 | --- | 11 | --- | 44 | --- | 17 | --- | 7 | --- | 5 | --- | 4 | --- | 3 | --- | 2 | | | | 7.7 | 72.9 |
| October | 10 | --- | 35 | --- | 33 | --- | 9 | --- | 4 | --- | 1 | --- | 2 | --- | 5 | --- | 1 | | | | 9.2 | 66.0 |
| November | 22 | --- | 40 | --- | 23 | --- | 7 | --- | 2 | --- | 1 | --- | 2 | --- | 3 | --- | (*) | | | | 9.6 | 35.6 |
| December | 20 | --- | 38 | --- | 22 | --- | 10 | --- | 3 | --- | 1 | --- | 2 | --- | 3 | --- | 1 | | | | 9.1 | 38.2 |
| Mean | 12 | --- | 19 | --- | 33 | --- | 17 | --- | 7 | --- | 3 | --- | 3 | --- | 5 | --- | 1 | | | | 8.6 | ----- |
| Total | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | | | ----- | ----- |
| Extreme | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | | | ----- | 72.9 |
| Number of years record | 10 | --- | 10 | --- | 10 | --- | 10 | --- | 10 | --- | 10 | --- | 10 | --- | 10 | --- | 10 | | | | 74 | 74 |

[1] Mean of 0130, 0730, 1330, 1930 observations.
[2] Visibility < 550 yards.
[3] Visibility ≦ ½ mile (0730 observation).
[4] Winds ≧ 27 knots.
[5] Measured.
T=Trace (less than 0.05 inch snow or 0.005 inch rain).
*Less than 0.5.

# Miami, Fla.—Position: Latitude 25°47′ N., Longitude 80°11′ W.—Altitude: 12 feet

| Month | Pressure reduced to sea level (inches) | | | Air temperature (° F.) | | | | | Mean humidity (percent) [1] | Mean cloud amount (percent) | Possible sunshine (percent of hours) | Precipitation | | | Mean number of days with— | | | | | | Wind | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Extremes | | Mean | | | Extremes | | | | | Amount (inches) | | | | | | | | | Direction (percentage of observations) | | | | | | | | | | | | | | | | | | | Speed (knots) | |
| | Mean | Highest | Lowest | Daily | Maximum | Minimum | Maximum | Minimum | | | | Mean | Maximum in 24 hours | Snowfall | Precipitation 0.01 inch or more | Snow | Heavy fog [2] | Thunderstorms | Poor visibility [3] | Gales [4] | N. | NNE. | NE. | ENE. | E. | ESE. | SE. | SSE. | S. | SSW. | SW. | WSW. | W. | WNW. | NW. | NNW. | Calm | Mean | Maximum [5] |
| January | 30.12 | 30.48 | 29.68 | 67.7 | 74.5 | 60.7 | 85 | 29 | 78 | 53 | 65 | 2.66 | 6.69 | 0 | 8 | 0 | 1 | 1 | (*) | (*) | 11 | 1 | 4 | 3 | 22 | 7 | 13 | 2 | 5 | 0 | 2 | 1 | 3 | 1 | 8 | 4 | 13 | 8.8 | 34.7 |
| February | 30.09 | 30.46 | 29.30 | 68.1 | 75.3 | 60.9 | 88 | 27 | 76 | 47 | 71 | 2.03 | 3.62 | 0 | 6 | 0 | (*) | 1 | (*) | (*) | 10 | 2 | 6 | 4 | 15 | 5 | 9 | 5 | 7 | 2 | 4 | 1 | 4 | 2 | 9 | 4 | 11 | 8.9 | 33.0 |
| March | 30.07 | 30.40 | 29.35 | 71.1 | 77.9 | 64.3 | 92 | 34 | 74 | 48 | 72 | 2.56 | 9.04 | 0 | 7 | 0 | (*) | 2 | (*) | (*) | 10 | 1 | 5 | 4 | 19 | 7 | 13 | 4 | 6 | 1 | 3 | 1 | 5 | 1 | 5 | 2 | 13 | 9.2 | 39.1 |
| April | 30.04 | 30.34 | 29.61 | 73.9 | 80.5 | 67.3 | 93 | 45 | 72 | 50 | 73 | 3.32 | 8.58 | 0 | 7 | 0 | (*) | 4 | 0 | (*) | 7 | 1 | 6 | 6 | 17 | 5 | 12 | 6 | 7 | 1 | 4 | 2 | 4 | 1 | 5 | 2 | 14 | 9.1 | 34.7 |
| May | 30.00 | 30.24 | 29.63 | 77.4 | 83.5 | 71.2 | 94 | 50 | 74 | 56 | 67 | 6.57 | 9.36 | 0 | 11 | 0 | 0 | 8 | 0 | (*) | 5 | 1 | 5 | 8 | 24 | 7 | 11 | 4 | 5 | 1 | 3 | 2 | 4 | 1 | 2 | 1 | 16 | 8.4 | 32.1 |
| June | 30.02 | 30.17 | 29.55 | 80.3 | 86.2 | 74.5 | 94 | 61 | 76 | 64 | 61 | 7.07 | 7.39 | 0 | 13 | 0 | 0 | 11 | 0 | (*) | 5 | 1 | 6 | 5 | 18 | 8 | 13 | 4 | 5 | 1 | 4 | 1 | 4 | 1 | 3 | 1 | 20 | 7.6 | 38.2 |
| July | 30.06 | 30.24 | 29.46 | 81.7 | 87.6 | 75.8 | 96 | 66 | 76 | 61 | 66 | 5.93 | 4.90 | 0 | 15 | 0 | 0 | 14 | 0 | (*) | 3 | 1 | 4 | 3 | 22 | 9 | 12 | 4 | 7 | 2 | 5 | 2 | 2 | 1 | 1 | 1 | 21 | 7.2 | 38.2 |
| August | 30.03 | 30.23 | 29.56 | 82.1 | 88.1 | 76.2 | 96 | 67 | 76 | 59 | 67 | 6.20 | 10.24 | 0 | 15 | 0 | 0 | 13 | 0 | (*) | 5 | 1 | 6 | 6 | 24 | 11 | 11 | 2 | 4 | (*) | 2 | (*) | 2 | (*) | 2 | 1 | 23 | 7.3 | 36.5 |
| September | 29.97 | 30.15 | 27.58 | 81.0 | 86.8 | 75.3 | 95 | 62 | 78 | 63 | 62 | 8.92 | 10.58 | 0 | 18 | 0 | (*) | 8 | 0 | (*) | 6 | 1 | 9 | 7 | 24 | 5 | 7 | 3 | 5 | 1 | 2 | 1 | 2 | 1 | 3 | 1 | 22 | 7.8 | 106.8 |
| October | 29.97 | 30.21 | 29.09 | 77.6 | 83.3 | 72.1 | 93 | 52 | 78 | 58 | 63 | 8.66 | 9.53 | 0 | 15 | 0 | (*) | 4 | (*) | (*) | 10 | 2 | 12 | 14 | 18 | 4 | 7 | 1 | 3 | (*) | 2 | 1 | 2 | 1 | 5 | 4 | 14 | 8.7 | 56.4 |
| November | 30.06 | 30.28 | 28.70 | 72.5 | 78.4 | 66.4 | 88 | 36 | 74 | 54 | 63 | 2.79 | 15.10 | 0 | 10 | 0 | (*) | 2 | 0 | (*) | 20 | 3 | 9 | 10 | 14 | 5 | 5 | 1 | 2 | (*) | 1 | (*) | 2 | 1 | 8 | 8 | 11 | 9.6 | 65.1 |
| December | 30.10 | 30.37 | 29.51 | 68.8 | 75.5 | 62.2 | 91 | 30 | 78 | 54 | 64 | 1.93 | 5.31 | 0 | 8 | 0 | (*) | 1 | 1 | (*) | 17 | 2 | 7 | 6 | 16 | 5 | 5 | 2 | 4 | 1 | 3 | 1 | 2 | 1 | 9 | 6 | 13 | 8.5 | 38.2 |
| Mean | 30.04 | | | 75.2 | 81.5 | 68.9 | | | 76 | 56 | 66 | | | | | | | | | | 9 | 1 | 7 | 6 | 20 | 6 | 10 | 3 | 5 | 1 | 3 | 1 | 3 | 1 | 5 | 3 | 16 | 8.4 | |
| Total | | | | | | | | | | | | 58.64 | | 0 | 133 | 0 | 1 | 69 | 1 | (*) | | | | | | | | | | | | | | | | | | | | |
| Extreme | | 30.48 | 27.58 | | | | 96 | 27 | | | | | 15.10 | | | | | | | | | | | | | | | | | | | | | | | | | | | 106.8 |
| Number of years record | 37 | 37 | 37 | 50 | 50 | 50 | 50 | 50 | 35 | 36 | 36 | 62 | 36 | 62 | 36 | 36 | 36 | 36 | 8 | 36 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 36 | 36 |

[1] Mean of 0730, 1930 observations.
[2] Visibility < 550 yards.
[3] Visibility ≦ ⅛ mile (0730 observation).
[4] Winds ≧ 27 knots.
[5] Measured.
T = Trace (less than 0.05 inch snow or 0.005 inch rain).
*Less than 0.5.

# Norfolk, Va.—Position: Latitude 36°51′ N., Longitude 76°17′ W.—Altitude: 11 feet

| Month | Pressure reduced to sea level (inches) | | | Air temperature (° F.) | | | | | Mean humidity (percent) [1] | Mean cloud amount (percent) | Possible sunshine (percent of hours) | Precipitation | | | Mean number of days with— | | | | | | Wind | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Extremes | | Mean | | | Extremes | | | | | Amount (inches) | | | | | | | | | Direction (percentage of observations) | | | | | | | | | | | | | | | | | | Speed (knots) | |
| | Mean | Highest | Lowest | Daily | Maximum | Minimum | Maximum | Minimum | | | | Mean | Maximum in 24 hours | Snowfall | Precipitation 0.01 inch or more | Snow | Heavy fog [2] | Thunderstorms | Poor visibility [3] | Gales [4] | N. | NNE. | NE. | ENE. | E. | ESE. | SE. | SSE. | S. | SSW. | SW. | WSW. | W. | WNW. | NW. | NNW. | Calm | Mean | Maximum [5] |
| January | 30.14 | 30.95 | 28.88 | 41.7 | 49.3 | 33.9 | 80 | 5 | 75 | 56 | 50 | 3.18 | 4.07 | 2.5 | 11 | 2 | 2 | (*) | (*) | 3 | 17 | --- | 17 | --- | 6 | --- | 5 | --- | 13 | --- | 15 | --- | 15 | --- | 12 | --- | (*) | 10.6 | 45.2 |
| February | 30.09 | 30.96 | 29.04 | 42.4 | 50.5 | 34.2 | 82 | 2 | 73 | 52 | 57 | 3.38 | 3.45 | 2.7 | 11 | 2 | 2 | 1 | (*) | 2 | 16 | --- | 16 | --- | 7 | --- | 7 | --- | 14 | --- | 14 | --- | 13 | --- | 13 | --- | (*) | 10.8 | 42.5 |
| March | 30.06 | 30.91 | 28.35 | 48.9 | 57.8 | 40.2 | 92 | 14 | 73 | 51 | 60 | 3.78 | 2.78 | 1.7 | 12 | 1 | 1 | 2 | 0 | 4 | 13 | --- | 16 | --- | 8 | --- | 9 | --- | 16 | --- | 15 | --- | 12 | --- | 11 | --- | (*) | 11.5 | 49.5 |
| April | 30.02 | 30.71 | 29.02 | 57.1 | 66.1 | 48.1 | 95 | 23 | 70 | 48 | 63 | 3.33 | 5.19 | T | 10 | (*) | 1 | 3 | (*) | 2 | 10 | --- | 17 | --- | 9 | --- | 11 | --- | 17 | --- | 15 | --- | 11 | --- | 10 | --- | (*) | 10.9 | 45.2 |
| May | 30.00 | 30.59 | 29.23 | 66.7 | 75.6 | 57.8 | 98 | 38 | 74 | 48 | 66 | 3.71 | 3.78 | 0 | 11 | 0 | 1 | 5 | 0 | 1 | 8 | --- | 16 | --- | 11 | --- | 11 | --- | 19 | --- | 18 | --- | 11 | --- | 6 | --- | (*) | 9.8 | 49.5 |
| June | 30.00 | 30.46 | 29.39 | 74.8 | 83.3 | 66.2 | 102 | 49 | 76 | 49 | 65 | 4.24 | 5.97 | 0 | 11 | 0 | 1 | 7 | 0 | 2 | 7 | --- | 12 | --- | 10 | --- | 10 | --- | 21 | --- | 21 | --- | 12 | --- | 7 | --- | (*) | 9.0 | 51.2 |
| July | 30.01 | 30.38 | 29.46 | 78.5 | 86.7 | 70.5 | 104 | 57 | 78 | 50 | 65 | 5.82 | 5.00 | 0 | 13 | 0 | (*) | 9 | 0 | 2 | 5 | --- | 12 | --- | 10 | --- | 10 | --- | 24 | --- | 22 | --- | 12 | --- | 5 | --- | (*) | 8.6 | 46.0 |
| August | 30.02 | 30.41 | 29.37 | 77.4 | 84.8 | 70.1 | 105 | 56 | 80 | 50 | 66 | 5.28 | 6.84 | 0 | 12 | 0 | (*) | 7 | (*) | 1 | 7 | --- | 18 | --- | 12 | --- | 9 | --- | 19 | --- | 20 | --- | 10 | --- | 5 | --- | (*) | 8.5 | 54.7 |
| September | 30.08 | 30.56 | 29.07 | 72.4 | 79.6 | 65.5 | 100 | 40 | 80 | 46 | 63 | 3.79 | 4.36 | 0 | 8 | 0 | 1 | 2 | (*) | 1 | 10 | --- | 22 | --- | 15 | --- | 10 | --- | 17 | --- | 13 | --- | 8 | --- | 5 | --- | (*) | 8.9 | 48.6 |
| October | 30.11 | 30.64 | 29.35 | 62.1 | 69.7 | 54.8 | 94 | 31 | 78 | 44 | 65 | 3.07 | 6.29 | T | 8 | (*) | 2 | 1 | (*) | 1 | 16 | --- | 19 | --- | 10 | --- | 8 | --- | 15 | --- | 13 | --- | 11 | --- | 8 | --- | (*) | 9.5 | 40.8 |
| November | 30.12 | 30.72 | 29.15 | 51.9 | 59.6 | 44.4 | 82 | 17 | 74 | 46 | 61 | 2.46 | 5.48 | 0.2 | 8 | (*) | 2 | (*) | 1 | 1 | 19 | --- | 16 | --- | 6 | --- | 6 | --- | 16 | --- | 14 | --- | 12 | --- | 11 | --- | (*) | 10.1 | 39.9 |
| December | 30.12 | 30.85 | 29.03 | 43.4 | 50.9 | 36.2 | 76 | 5 | 75 | 54 | 50 | 3.21 | 2.52 | 2.0 | 10 | 1 | 2 | (*) | 1 | 2 | 19 | --- | 16 | --- | 6 | --- | 4 | --- | 12 | --- | 16 | --- | 16 | --- | 11 | --- | (*) | 10.2 | 49.5 |
| Mean | 30.07 | ------ | ------ | 59.8 | 67.8 | 51.8 | ---- | ---- | 76 | 50 | 61 | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | 12 | --- | 16 | --- | 9 | --- | 8 | --- | 17 | --- | 17 | --- | 12 | --- | 9 | --- | (*) | 9.9 | ------ |
| Total | ------ | ------ | ------ | ------ | ------ | ------ | ---- | ---- | ---- | ---- | ---- | 45.25 | ------ | 9.1 | 125 | 6 | 15 | 37 | 2 | 22 | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | ------ | ------ |
| Extreme | ------ | 30.96 | 28.35 | ------ | ------ | ------ | 105 | 2 | ---- | ---- | ---- | ------ | 6.84 | ------ | ------ | ------ | ------ | ------ | ------ | ------ | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | ------ | 54.7 |
| Number of years record | 49 | 49 | 49 | 76 | 72 | 72 | 76 | 76 | 59 | 40 | 47 | 76 | 76 | 76 | 76 | 56 | 54 | 62 | 8 | 34 | 29 | --- | 29 | --- | 29 | --- | 29 | --- | 29 | --- | 29 | --- | 29 | --- | 29 | --- | 29 | 34 | 76 |

[1] Mean of 0730, 1930 observations.
[2] Visibility < 550 yards.
[3] Visibility ≦ ⅛ mile (0730 observation).
[4] Winds ≧ 27 knots.
[5] Measured.
T = Trace (less than 0.05 inch snow or 0.005 inch rain).
* Less than 0.5.

# Savannah, Ga.—Position: Latitude 32°01′ N., Longitude 81°08′ W.—Altitude: 53 feet

| Month | Pressure reduced to sea level (inches) | | | Air temperature (° F.) | | | | | Mean humidity (percent) [1] | Mean cloud amount (percent) | Possible sunshine (percent of hours) | Precipitation | | | Mean number of days with— | | | | | | Wind | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Extremes | | Mean | | | Extremes | | | | | Amount (inches) | | | | | | | | | Direction (percentage of observations) | | | | | | | | | | | | | | | | | | Speed (knots) | |
| | Mean | Highest | Lowest | Daily | Maximum | Minimum | Maximum | Minimum | | | | Mean | Maximum in 24 hours | Snowfall | Precipitation 0.01 inch or more | Snow | Heavy fog [2] | Thunderstorms | Poor visibility [3] | Gales [4] | N. | NNE. | NE. | ENE. | E. | ESE. | SE. | SSE. | S. | SSW. | SW. | WSW. | W. | WNW. | NW. | NNW. | Calm | Mean | Maximum [5] |
| January | 30.15 | 30.75 | 29.23 | 52.1 | 60.9 | 43.5 | 82 | 12 | 76 | 51 | 53 | 2.77 | 3.48 | T | 9 | (*) | 3 | 1 | 1 | 1 | 7 | 4 | 9 | 3 | 5 | 1 | 4 | 5 | 10 | 4 | 9 | 2 | 8 | 4 | 10 | 2 | 13 | 8.2 | 40.8 |
| February | 30.10 | 30.71 | 29.26 | 53.7 | 62.7 | 45.0 | 84 | 8 | 76 | 54 | 54 | 3.29 | 3.35 | T | 9 | (*) | 2 | 1 | 1 | 1 | 7 | 5 | 11 | 4 | 6 | 2 | 4 | 3 | 9 | 3 | 10 | 2 | 7 | 5 | 12 | 2 | 8 | 8.7 | 42.5 |
| March | 30.05 | 30.71 | 28.86 | 59.8 | 68.9 | 50.4 | 94 | 24 | 75 | 50 | 62 | 3.21 | 3.34 | T | 9 | (*) | 1 | 2 | (*) | 3 | 3 | 2 | 5 | 4 | 4 | 2 | 6 | 7 | 12 | 4 | 12 | 3 | 9 | 5 | 9 | 2 | 11 | 9.1 | 44.3 |
| April | 30.01 | 30.52 | 29.27 | 66.1 | 75.2 | 57.2 | 94 | 33 | 74 | 45 | 66 | 2.76 | 6.12 | 0 | 7 | 0 | 1 | 3 | (*) | 1 | 3 | 2 | 4 | 3 | 5 | 3 | 8 | 7 | 13 | 5 | 12 | 3 | 8 | 4 | 7 | 1 | 12 | 8.8 | 39.9 |
| May | 29.98 | 30.46 | 29.17 | 73.5 | 82.3 | 64.9 | 101 | 44 | 75 | 42 | 68 | 3.01 | 5.65 | 0 | 9 | 0 | 1 | 5 | (*) | 1 | 3 | 2 | 6 | 6 | 7 | 2 | 9 | 6 | 12 | 4 | 9 | 2 | 5 | 3 | 5 | 1 | 18 | 8.0 | 49.5 |
| June | 29.99 | 30.32 | 29.54 | 79.3 | 88.0 | 68.1 | 103 | 49 | 78 | 56 | 64 | 5.43 | 6.10 | 0 | 12 | 0 | (*) | 8 | (*) | 1 | 3 | 1 | 4 | 2 | 4 | 3 | 10 | 7 | 14 | 5 | 17 | 3 | 6 | 1 | 3 | 1 | 16 | 7.3 | 50.4 |
| July | 30.01 | 30.34 | 29.61 | 81.6 | 89.8 | 73.4 | 105 | 61 | 82 | 58 | 60 | 6.33 | 6.43 | 0 | 14 | 0 | (*) | 12 | 0 | 1 | 3 | 1 | 2 | 1 | 3 | 2 | 9 | 6 | 10 | 5 | 22 | 5 | 9 | 3 | 3 | 1 | 15 | 6.9 | 38.2 |
| August | 29.99 | 30.30 | 28.81 | 80.9 | 88.8 | 73.0 | 102 | 60 | 84 | 58 | 59 | 7.19 | 8.57 | 0 | 14 | 0 | (*) | 11 | (*) | 1 | 6 | 2 | 6 | 2 | 6 | 4 | 10 | 4 | 11 | 3 | 13 | 2 | 6 | 1 | 3 | 1 | 20 | 6.6 | 61.7 |
| September | 30.01 | 30.39 | 28.92 | 77.1 | 84.8 | 64.6 | 102 | 46 | 86 | 52 | 59 | 5.71 | 11.44 | 0 | 10 | 0 | 1 | 5 | 1 | (*) | 10 | 5 | 11 | 3 | 8 | 2 | 9 | 2 | 7 | 2 | 8 | 2 | 4 | 1 | 4 | 1 | 21 | 6.9 | 52.1 |
| October | 30.04 | 30.54 | 29.13 | 68.0 | 76.5 | 59.7 | 94 | 34 | 82 | 39 | 63 | 2.90 | 7.85 | 0 | 7 | 0 | 1 | 1 | 2 | (*) | 13 | 6 | 17 | 6 | 8 | 2 | 4 | 2 | 4 | 1 | 5 | 1 | 5 | 3 | 6 | 2 | 15 | 6.6 | 49.5 |
| November | 30.12 | 30.68 | 29.19 | 59.0 | 68.1 | 50.0 | 85 | 22 | 79 | 44 | 63 | 2.01 | 4.15 | T | 6 | (*) | 2 | (*) | 1 | 1 | 11 | 7 | 12 | 4 | 6 | 1 | 5 | 2 | 4 | 1 | 8 | 2 | 6 | 3 | 10 | 3 | 15 | 6.6 | 44.3 |
| December | 30.13 | 30.72 | 29.38 | 52.9 | 61.6 | 44.0 | 82 | 12 | 79 | 49 | 52 | 2.75 | 3.93 | T | 9 | (*) | 2 | (*) | 1 | (*) | 10 | 5 | 11 | 3 | 4 | 1 | 4 | 3 | 5 | 1 | 9 | 3 | 9 | 4 | 11 | 2 | 15 | 8.0 | 38.2 |
| Mean | 30.05 | ---- | ---- | 67.0 | 75.6 | 58.5 | ---- | ---- | 79 | 50 | 61 | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | 7 | 4 | 8 | 4 | 6 | 2 | 7 | 4 | 9 | 3 | 10 | 2 | 7 | 3 | 7 | 2 | | 157.6 | ---- |
| Total | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | 47.36 | ---- | T | 115 | (*) | 14 | 49 | 7 | 11 | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- |
| Extreme | ---- | 30.75 | 28.81 | ---- | ---- | ---- | 105 | 8 | ---- | ---- | ---- | ---- | 11.44 | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | 61.7 |
| Number of years record | 58 | 74 | 74 | 69 | 72 | 72 | 75 | 75 | 57 | 8 | 55 | 72 | 75 | 55 | 75 | 75 | 70 | 70 | 8 | 10 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 74 | 75 |

[1] Mean of 0700, 1900 observations.
[2] Visibility < 550 yards.
[3] Visibility ≦ ⅛ mile (0730 observation).
[4] Winds ≧ 27 knots.
[5] Measured.
T = Trace (less than 0.05 inch snow or 0.005 inch rain).
* Less than 0.5.

# Wilmington, N. C.—Position: Latitude 34°14′ N., Longitude 77°57′ W.—Altitude: 72 feet

| Month | Pressure reduced to sea level (inches) | | | Air temperature (° F.) | | | | | Mean humidity (percent) [1] | Mean cloud amount (percent) | Possible sunshine (percent of hours) | Precipitation | | | Mean number of days with— | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Extremes | | Mean | | | Extremes | | | | | Amount (inches) | | | | | | | | |
| | Mean | Highest | Lowest | Daily | Maximum | Minimum | Maximum | Minimum | | | | Mean | Maximum in 24 hours | Snowfall | Precipitation 0.01 inch or more | Snow | Heavy fog [2] | Thunderstorms | Poor visibility [3] | Gales [4] |
| January | 30.14 | 30.91 | 29.18 | 47.4 | 56.5 | 38.5 | 80 | 9 | 72 | 54 | 57 | 3.20 | 4.56 | 0.4 | 10 | (*) | 2 | (*) | 1 | 1 |
| February | 30.10 | 30.85 | 29.07 | 48.7 | 57.8 | 39.5 | 81 | 5 | 70 | 53 | 59 | 3.42 | 3.23 | 0.8 | 10 | (*) | 1 | 1 | 1 | 1 |
| March | 30.06 | 30.77 | 28.65 | 54.8 | 64.1 | 45.5 | 94 | 19 | 72 | 49 | 65 | 3.37 | 5.26 | 0.1 | 10 | (*) | 1 | 2 | 1 | 1 |
| April | 30.01 | 30.63 | 29.21 | 61.8 | 70.8 | 52.5 | 93 | 28 | 69 | 46 | 69 | 2.74 | 3.24 | T | 9 | 0 | (*) | 3 | (*) | (*) |
| May | 29.99 | 30.54 | 29.39 | 70.0 | 78.5 | 61.3 | 97 | 38 | 74 | 48 | 71 | 3.51 | 2.90 | 0 | 9 | 0 | (*) | 5 | (*) | (*) |
| June | 29.99 | 30.41 | 29.41 | 76.7 | 84.6 | 68.6 | 100 | 51 | 78 | 53 | 69 | 5.01 | 7.69 | 0 | 11 | 0 | (*) | 8 | (*) | 0 |
| July | 30.01 | 30.35 | 29.14 | 79.6 | 87.0 | 72.0 | 103 | 54 | 80 | 54 | 65 | 6.98 | 7.33 | 0 | 14 | 0 | (*) | 10 | (*) | (*) |
| August | 30.00 | 30.33 | 29.45 | 78.7 | 86.2 | 71.1 | 101 | 56 | 79 | 52 | 66 | 6.62 | 8.04 | 0 | 14 | 0 | (*) | 8 | (*) | 0 |
| September | 30.04 | 30.48 | 29.19 | 74.4 | 82.4 | 66.5 | 100 | 42 | 78 | 52 | 68 | 5.14 | 9.52 | 0 | 10 | 0 | 1 | 4 | (*) | (*) |
| October | 30.06 | 30.67 | 29.09 | 64.7 | 73.8 | 55.6 | 93 | 31 | 76 | 40 | 70 | 3.18 | 5.31 | 0 | 7 | 0 | 2 | 1 | 1 | 0 |
| November | 30.11 | 30.80 | 28.88 | 55.2 | 64.9 | 45.8 | 83 | 20 | 72 | 44 | 68 | 2.17 | 4.42 | T | 7 | (*) | 2 | (*) | 1 | 1 |
| December | 30.13 | 30.76 | 29.18 | 48.4 | 57.6 | 39.4 | 80 | 6 | 74 | 54 | 57 | 3.13 | 4.14 | 0.3 | 10 | (*) | 2 | (*) | 1 | (*) |
| Mean | 30.05 | | | 63.4 | 72.0 | 54.7 | | | 74 | 50 | 65 | | | | | | | | | |
| Total | | | | | | | | | | | | 48.47 | | 1.6 | 121 | (*) | 14 | 42 | 6 | 4 |
| Extreme | | 30.91 | 28.65 | | | | 103 | 5 | | | | | 9.52 | | | | | | | |
| Number of years record | 56 | 77 | 77 | 75 | 72 | 72 | 75 | 75 | 7 | 10 | 52 | 75 | 75 | 75 | 75 | 75 | 75 | 75 | 8 | 10 |

| Month | Wind | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Direction (percentage of observations) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | Speed (knots) | |
| | N. | NNE. | NE. | ENE. | E. | ESE. | SE. | SSE. | S. | SSW. | SW. | WSW. | W. | WNW. | NW. | NNW. | Calm | | | |
| January | 19 | --- | 18 | --- | 7 | --- | 2 | --- | 13 | --- | 17 | --- | 12 | --- | 11 | --- | 1 | 8.1 | 33.9 |
| February | 24 | --- | 15 | --- | 8 | --- | 4 | --- | 10 | --- | 18 | --- | 10 | --- | 11 | --- | (*) | 8.8 | 35.6 |
| March | 12 | --- | 13 | --- | 8 | --- | 5 | --- | 15 | --- | 22 | --- | 15 | --- | 10 | --- | (*) | 9.5 | 46.0 |
| April | 10 | --- | 12 | --- | 12 | --- | 6 | --- | 14 | --- | 23 | --- | 12 | --- | 10 | --- | 1 | 9.2 | 40.8 |
| May | 9 | --- | 15 | --- | 10 | --- | 7 | --- | 14 | --- | 24 | --- | 13 | --- | 8 | --- | (*) | 8.2 | 35.6 |
| June | 9 | --- | 8 | --- | 7 | --- | 6 | --- | 16 | --- | 30 | --- | 16 | --- | 8 | --- | 0 | 7.8 | 32.1 |
| July | 6 | --- | 10 | --- | 8 | --- | 6 | --- | 12 | --- | 35 | --- | 16 | --- | 7 | --- | (*) | 7.6 | 34.7 |
| August | 12 | --- | 16 | --- | 8 | --- | 7 | --- | 12 | --- | 26 | --- | 13 | --- | 6 | --- | (*) | 6.9 | 46.0 |
| September | 15 | --- | 24 | --- | 9 | --- | 7 | --- | 13 | --- | 14 | --- | 10 | --- | 7 | --- | 1 | 6.9 | 56.4 |
| October | 25 | --- | 29 | --- | 7 | --- | 4 | --- | 7 | --- | 10 | --- | 9 | --- | 8 | --- | 1 | 6.9 | 40.8 |
| November | 23 | --- | 21 | --- | 5 | --- | 4 | --- | 10 | --- | 17 | --- | 9 | --- | 9 | --- | 2 | 7.5 | 33.0 |
| December | 19 | --- | 21 | --- | 5 | --- | 4 | --- | 9 | --- | 18 | --- | 11 | --- | 12 | --- | 1 | 7.6 | 34.7 |
| Mean | 15 | --- | 17 | --- | 8 | --- | 5 | --- | 13 | --- | 21 | --- | 12 | --- | 9 | --- | (*) | 7.9 | ----- |
| Total | | | | | | | | | | | | | | | | | | | |
| Extreme | | | | | | | | | | | | | | | | | | | 56.4 |
| Number of years record | 10 | --- | 10 | --- | 10 | --- | 10 | --- | 10 | --- | 10 | --- | 10 | --- | 10 | --- | 10 | 14 | 75 |

[1] Mean of four observations daily.
[2] Visibility < 550 yards.
[3] Visibility ≦ ½ mile (0730 observation).
[4] Winds ≧ 27 knots.
[5] Measured.
T=Trace (less than 0.05 inch snow or 0.005 inch rain).
*Less than 0.5.

789003°—48——24

## Ocean Area No. 1—Position: Latitude 25°–30° N., Longitude 80°–85° W., Greenwich Noon Observations—Years Covered 1879–1934

| Month | Number of observations surveyed | Wind: Mean velocity (knots) | Wind: Percentages of observations from— N. | NE. | E. | SE. | S. | SW. | W. | NW. | Calm | Weather: Percentages of observations recording— Haze | Mist | Fog (heavy or dense) | Drizzle | Rain | Snow | Showers | Thunderstorms | Light to moderate squalls | Heavy squalls | Gales (force 8 or over) | Exceptional visibility | Mean cloud amount (percent) | Average air temperature | Average sea surface temperature |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| January | 2,743 | 11.1 | 15 | 18 | 22 | 15 | 7 | 4 | 5 | 13 | 1 | 3 | 1 | 0 | 1 | 3 | 0 | 3 | 0 | 2 | 0 | 2 | 9 | 49 | 69.3 | 73.2 |
| February | 2,442 | 10.6 | 13 | 16 | 18 | 18 | 11 | 5 | 4 | 14 | 1 | 6 | 1 | 0 | 0 | 2 | 0 | 2 | 0 | 2 | 0 | 1 | 11 | 44 | 69.2 | 72.7 |
| March | 2,628 | 10.2 | 10 | 13 | 20 | 21 | 11 | 5 | 5 | 13 | 2 | 7 | 1 | 0 | 1 | 2 | 0 | 1 | 1 | 1 | 0 | 1 | 10 | 43 | 70.9 | 73.2 |
| April | 2,461 | 9.7 | 10 | 16 | 24 | 20 | 9 | 4 | 5 | 10 | 2 | 5 | 1 | 0 | 1 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 12 | 40 | 74.0 | 75.2 |
| May | 2,400 | 8.0 | 7 | 15 | 26 | 21 | 10 | 6 | 5 | 7 | 3 | 5 | 1 | 0 | 0 | 2 | 0 | 2 | 1 | 2 | 0 | 1 | 14 | 41 | 77.5 | 77.8 |
| June | 2,575 | 6.8 | 4 | 12 | 23 | 25 | 14 | 8 | 5 | 4 | 5 | 2 | 0 | 0 | 0 | 3 | 0 | 3 | 1 | 2 | 0 | 1 | 13 | 43 | 80.6 | 80.8 |
| July | 2,585 | 6.5 | 4 | 8 | 25 | 25 | 15 | 8 | 5 | 4 | 6 | 2 | 0 | 0 | 0 | 2 | 0 | 4 | 1 | 3 | 0 | 0 | 14 | 41 | 82.3 | 82.6 |
| August | 2,559 | 6.8 | 5 | 12 | 26 | 23 | 14 | 8 | 4 | 4 | 4 | 2 | 0 | 0 | 0 | 3 | 0 | 5 | 2 | 4 | 0 | 1 | 14 | 43 | 82.6 | 83.4 |
| September | 2,561 | 8.4 | 7 | 20 | 30 | 17 | 9 | 5 | 4 | 4 | 4 | 2 | 0 | 0 | 0 | 3 | 0 | 5 | 1 | 5 | 0 | 1 | 13 | 45 | 81.9 | 82.7 |
| October | 2,982 | 10.6 | 13 | 29 | 24 | 11 | 5 | 4 | 4 | 8 | 2 | 2 | 1 | 0 | 1 | 4 | 0 | 4 | 0 | 4 | 0 | 2 | 13 | 49 | 78.5 | 80.5 |
| November | 2,773 | 12.0 | 16 | 29 | 23 | 9 | 4 | 3 | 3 | 12 | 1 | 3 | 0 | 0 | 0 | 3 | 0 | 2 | 0 | 3 | 0 | 1 | 11 | 47 | 74.0 | 77.5 |
| December | 2,768 | 11.1 | 15 | 20 | 22 | 15 | 6 | 4 | 5 | 12 | 1 | 3 | 0 | 0 | 0 | 2 | 0 | 2 | 0 | 1 | 0 | 1 | 11 | 47 | 70.9 | 75.0 |
| Mean | | 9.3 | 10 | 17 | 24 | 18 | 10 | 5 | 4 | 9 | 3 | 4 | 1 | 0 | (*) | 2 | 0 | 3 | 1 | 2 | 0 | 1 | 12 | 44 | 76.0 | 77.9 |
| Total | 31,477 | | | | | | | | | | | | | | | | | | | | | | | | | |

*Less than 0.5 percent.

## Ocean Area No. 2—Position: Latitude 30°–35° N., Longitude 75°–80° W., Greenwich Noon Observations—Years Covered 1878–1934

| Month | Number of observations surveyed | Wind | | | | | | | | | | Weather | | | | | | | | | | | | Mean cloud amount (percent) | 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 | Haze | Mist | Fog (heavy or dense) | Drizzle | Rain | Snow | Showers | Thunderstorms | Light to moderate squalls | Heavy squalls | Gales (force 8 or over) | Exceptional visibility | | | |
| January | 6,330 | 15.5 | 17 | 12 | 8 | 7 | 9 | 12 | 16 | 18 | 1 | 4 | 1 | 0 | 1 | 5 | 0 | 3 | 0 | 3 | 0 | 7 | 7 | 62 | 62.4 | 71.0 |
| February | 5,891 | 15.5 | 15 | 12 | 7 | 8 | 11 | 13 | 15 | 18 | 1 | 5 | 1 | 0 | 1 | 7 | 0 | 3 | 1 | 5 | 0 | 7 | 7 | 61 | 62.1 | 70.2 |
| March | 6,475 | 15.0 | 15 | 12 | 7 | 9 | 11 | 12 | 14 | 19 | 1 | 6 | 1 | 0 | 1 | 5 | 0 | 3 | 1 | 4 | 0 | 6 | 7 | 56 | 63.7 | 70.7 |
| April | 6,331 | 13.5 | 14 | 15 | 10 | 9 | 11 | 14 | 12 | 13 | 2 | 5 | 1 | 0 | 1 | 3 | 0 | 2 | 1 | 3 | 0 | 3 | 8 | 49 | 68.4 | 72.6 |
| May | 6,159 | 10.6 | 10 | 15 | 11 | 11 | 13 | 18 | 11 | 9 | 2 | 6 | 1 | 0 | 0 | 5 | 0 | 3 | 1 | 3 | 0 | 1 | 10 | 47 | 73.9 | 75.8 |
| June | 6,291 | 9.7 | 7 | 13 | 9 | 10 | 17 | 25 | 11 | 6 | 2 | 4 | 0 | 0 | 1 | 6 | 0 | 4 | 1 | 4 | 0 | 1 | 10 | 49 | 78.0 | 78.9 |
| July | 6,456 | 9.7 | 5 | 9 | 8 | 10 | 18 | 32 | 12 | 4 | 2 | 3 | 0 | 0 | 0 | 6 | 0 | 5 | 2 | 5 | 0 | 1 | 10 | 51 | 80.6 | 81.3 |
| August | 6,325 | 9.3 | 8 | 14 | 9 | 10 | 12 | 26 | 12 | 6 | 3 | 3 | 0 | 0 | 0 | 6 | 0 | 5 | 2 | 5 | 0 | 1 | 11 | 54 | 80.8 | 82.1 |
| September | 6,377 | 10.6 | 13 | 26 | 17 | 9 | 9 | 11 | 7 | 6 | 2 | 3 | 1 | 0 | 1 | 6 | 0 | 4 | 1 | 5 | 0 | 2 | 10 | 51 | 79.2 | 81.4 |
| October | 7,462 | 13.5 | 19 | 27 | 14 | 8 | 6 | 6 | 7 | 12 | 1 | 2 | 1 | 0 | 1 | 6 | 0 | 3 | 1 | 5 | 0 | 5 | 10 | 53 | 73.8 | 78.5 |
| November | 7,121 | 14.0 | 18 | 18 | 11 | 9 | 6 | 8 | 12 | 17 | 1 | 3 | 1 | 0 | 1 | 5 | 0 | 3 | 1 | 3 | 0 | 4 | 10 | 52 | 67.7 | 75.4 |
| December | 6,840 | 14.5 | 18 | 14 | 7 | 8 | 9 | 11 | 14 | 18 | 1 | 3 | 1 | 0 | 1 | 6 | 0 | 3 | 0 | 4 | 0 | 5 | 9 | 57 | 64.2 | 72.8 |
| Mean | | 12.6 | 13 | 15 | 10 | 9 | 11 | 16 | 12 | 12 | 2 | 4 | 1 | 0 | 1 | 6 | 0 | 3 | 1 | 4 | 0 | 4 | 9 | 54 | 71.2 | 75.9 |
| Total | 78,058 | | | | | | | | | | | | | | | | | | | | | | | | | |

## Ocean Area No. 3—Position: Latitude 30° - 35° N., Longitude 80° - 85° W., Greenwich Noon Observations—Years Covered 1883-1933

| Month | Number of observations surveyed | Wind: Mean velocity (knots) | Wind: Percentages of observations from— N. | NE. | E. | SE. | S. | SW. | W. | NW. | Calm | Weather: Percentages of observations recording— Haze | Mist | Fog (heavy or dense) | Drizzle | Rain | Snow | Showers | Thunderstorms | Light to moderate squalls | Heavy squalls | Gales (force 8 or over) | Exceptional visibility | Mean cloud amount (percent) | Average air temperature | Average sea surface temperature |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| January | 404 | 9.7 | 16 | 12 | 6 | 9 | 10 | 12 | 13 | 17 | 5 | 9 | 5 | 0 | 2 | 2 | 0 | 1 | 0 | 2 | 0 | 2 | 5 | 47 | 57.9 | 62.9 |
| February | 376 | 11.1 | 15 | 10 | 5 | 7 | 17 | 15 | 14 | 14 | 3 | 12 | 5 | 0 | 2 | 5 | 0 | 1 | 1 | 5 | 0 | 4 | 6 | 54 | 59.8 | 63.2 |
| March | 372 | 10.2 | 11 | 11 | 5 | 10 | 16 | 14 | 11 | 18 | 4 | 15 | 4 | 0 | 1 | 3 | 0 | 2 | 0 | 1 | 0 | 2 | 8 | 47 | 62.7 | 64.8 |
| April | 293 | 9.7 | 11 | 15 | 9 | 8 | 16 | 15 | 13 | 11 | 2 | 13 | 2 | 0 | 1 | 3 | 0 | 1 | 0 | 2 | 0 | 2 | 5 | 43 | 67.6 | 67.9 |
| May | 303 | 8.0 | 8 | 15 | 8 | 12 | 18 | 20 | 8 | 7 | 4 | 9 | 3 | 0 | 0 | 2 | 0 | 2 | 0 | 2 | 0 | 1 | 6 | 38 | 74.2 | 73.6 |
| June | 293 | 8.0 | 4 | 7 | 8 | 19 | 25 | 19 | 13 | 3 | 2 | 7 | 1 | 0 | 0 | 1 | 0 | 3 | 0 | 2 | 0 | 0 | 9 | 44 | 78.6 | 77.9 |
| July | 286 | 8.0 | 2 | 6 | 8 | 9 | 27 | 28 | 10 | 6 | 4 | 5 | 1 | 0 | 0 | 2 | 0 | 2 | 0 | 2 | 0 | 1 | 10 | 41 | 80.5 | 80.5 |
| August | 327 | 7.6 | 8 | 9 | 8 | 12 | 16 | 27 | 12 | 4 | 4 | 3 | 2 | 0 | 0 | 3 | 0 | 2 | 0 | 2 | 0 | 0 | 11 | 43 | 80.6 | 80.9 |
| September | 346 | 9.7 | 12 | 24 | 14 | 11 | 14 | 9 | 7 | 5 | 4 | 3 | 1 | 0 | 1 | 4 | 1 | 4 | 1 | 5 | 0 | 2 | 9 | 48 | 79.3 | 80.4 |
| October | 379 | 12.0 | 18 | 26 | 13 | 7 | 7 | 9 | 7 | 11 | 2 | 6 | 1 | 0 | 1 | 3 | 0 | 4 | 0 | 4 | 1 | 3 | 8 | 48 | 73.7 | 76.8 |
| November | 370 | 11.6 | 21 | 16 | 11 | 7 | 8 | 8 | 12 | 14 | 3 | 4 | 2 | 0 | 1 | 3 | 0 | 2 | 0 | 2 | 0 | 3 | 8 | 46 | 67.6 | 71.9 |
| December | 368 | 10.6 | 19 | 15 | 7 | 7 | 10 | 13 | 11 | 15 | 3 | 4 | 3 | 0 | 2 | 2 | 0 | 1 | 0 | 2 | 0 | 3 | 8 | 53 | 62.5 | 67.9 |
| Mean | | 9.7 | 12 | 14 | 9 | 10 | 15 | 16 | 11 | 10 | 3 | 8 | 2 | 0 | 1 | 3 | (*) | 2 | (*) | 3 | (*) | 2 | 8 | 46 | 70.4 | 72.4 |
| Total | 4,117 | | | | | | | | | | | | | | | | | | | | | | | | | |

*Less than 0.5 percent.

## Ocean Area No. 4—Position: Latitude 35°–40° N., Longitude 75°–80° W., Greenwich Noon Observations—Years Covered 1879–1935

| Month | Number of observations surveyed | Wind: Mean velocity (knots) | Wind: Percentages of observations from— N. | NE. | E. | SE. | S. | SW. | W. | NW. | Calm | Weather: Percentages of observations recording— Haze | Mist | Fog (heavy or dense) | Drizzle | Rain | Snow | Showers | Thunderstorms | Light to moderate squalls | Heavy squalls | Gales (force 8 or over) | Exceptional visibility | Mean cloud amount (percent) | Average air temperature | Average sea surface temperature |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| January | 2,287 | 12.0 | 20 | 12 | 5 | 5 | 9 | 15 | 12 | 19 | 3 | 9 | 5 | 0 | 2 | 5 | 1 | 1 | 0 | 2 | 0 | 6 | 5 | 57 | 47.5 | 49.9 |
| February | 2,085 | 12.5 | 21 | 12 | 6 | 6 | 8 | 13 | 12 | 19 | 3 | 10 | 3 | 0 | 2 | 6 | 2 | 1 | 0 | 2 | 0 | 5 | 4 | 56 | 45.1 | 48.2 |
| March | 2,331 | 12.5 | 19 | 13 | 6 | 6 | 13 | 13 | 10 | 18 | 2 | 12 | 4 | 0 | 2 | 5 | 1 | 1 | 0 | 2 | 0 | 6 | 3 | 52 | 48.6 | 50.1 |
| April | 2,282 | 9.7 | 15 | 13 | 6 | 7 | 12 | 15 | 11 | 14 | 4 | 13 | 4 | 0 | 2 | 4 | 0 | 1 | 0 | 1 | 0 | 2 | 4 | 48 | 54.8 | 54.5 |
| May | 2,170 | 8.9 | 16 | 14 | 8 | 9 | 16 | 15 | 9 | 9 | 4 | 14 | 3 | 0 | 1 | 4 | 0 | 2 | 1 | 2 | 0 | 1 | 4 | 48 | 63.8 | 61.8 |
| June | 2,271 | 7.6 | 12 | 14 | 6 | 6 | 17 | 21 | 10 | 8 | 6 | 12 | 3 | 0 | 2 | 4 | 0 | 2 | 0 | 1 | 0 | 1 | 4 | 47 | 71.2 | 70.0 |
| July | 2,090 | 7.6 | 10 | 10 | 7 | 9 | 18 | 25 | 9 | 7 | 5 | 10 | 2 | 0 | 1 | 4 | 0 | 2 | 1 | 2 | 0 | 1 | 7 | 50 | 76.1 | 75.0 |
| August | 2,222 | 8.0 | 13 | 16 | 8 | 7 | 13 | 22 | 10 | 7 | 4 | 8 | 2 | 0 | 1 | 4 | 0 | 2 | 1 | 2 | 0 | 1 | 7 | 47 | 76.7 | 76.6 |
| September | 2,184 | 9.3 | 18 | 23 | 10 | 7 | 9 | 13 | 8 | 8 | 4 | 9 | 2 | 0 | 1 | 3 | 0 | 2 | 0 | 2 | 0 | 2 | 6 | 46 | 73.6 | 74.1 |
| October | 2,410 | 11.1 | 25 | 20 | 8 | 6 | 6 | 9 | 7 | 15 | 4 | 7 | 5 | 0 | 1 | 3 | 0 | 1 | 0 | 2 | 0 | 3 | 7 | 45 | 64.4 | 67.9 |
| November | 2,300 | 11.6 | 21 | 13 | 5 | 5 | 8 | 11 | 12 | 21 | 4 | 7 | 3 | 0 | 1 | 3 | 0 | 1 | 0 | 2 | 0 | 4 | 6 | 51 | 55.7 | 61.2 |
| December | 2,462 | 11.6 | 22 | 10 | 4 | 5 | 9 | 13 | 13 | 20 | 4 | 7 | 3 | 0 | 1 | 5 | 1 | 1 | 0 | 2 | 0 | 4 | 5 | 56 | 50.0 | 54.1 |
| Mean | | 10.2 | 18 | 14 | 7 | 6 | 12 | 15 | 10 | 14 | 4 | 10 | 3 | 0 | 1 | 4 | (*) | 1 | (*) | 2 | 0 | 3 | 5 | 50 | 60.6 | 62.0 |
| Total | 27,094 | | | | | | | | | | | | | | | | | | | | | | | | | |

* Less than 0.5 percent.

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| ° ′ | Points | ° ′ | Points | ° ′ | Points | ° ′ | Points |
|---|---|---|---|---|---|---|---|
| 0 00 | N | 90 00 | E | 180 00 | S | 270 00 | W |
| 1 24 | | 91 24 | | 181 24 | | 271 24 | |
| 2 49 | N ¼ E | 92 49 | E ¼ S | 182 49 | S ¼ W | 272 49 | W ¼ N |
| 4 13 | | 94 13 | | 184 13 | | 274 13 | |
| 5 38 | N ½ E | 95 38 | E ½ S | 185 38 | S ½ W | 275 38 | W ½ N |
| 7 02 | | 97 02 | | 187 02 | | 277 02 | |
| 8 26 | N ¾ E | 98 26 | E ¾ S | 188 26 | S ¾ W | 278 26 | W ¾ N |
| 9 51 | | 99 51 | | 189 51 | | 279 51 | |
| 11 15 | N x E | 101 15 | E x S | 191 15 | S x W | 281 15 | W x N |
| 12 39 | | 102 39 | | 192 39 | | 282 39 | |
| 14 04 | N x E ¼ E | 104 04 | ESE ¾ E | 194 04 | S x W ¼ W | 284 04 | WNW ¾ W |
| 15 28 | | 105 28 | | 195 28 | | 285 28 | |
| 16 53 | N x E ½ E | 106 53 | ESE ½ E | 196 53 | S x W ½ W | 286 53 | WNW ½ W |
| 18 17 | | 108 17 | | 198 17 | | 288 17 | |
| 19 41 | N x E ¾ E | 109 41 | ESE ¼ E | 199 41 | S x W ¾ W | 289 41 | WNW ¼ W |
| 21 06 | | 111 06 | | 201 06 | | 291 06 | |
| 22 30 | NNE | 112 30 | ESE | 202 30 | SSW | 292 30 | WNW |
| 23 54 | | 113 54 | | 203 54 | | 293 54 | |
| 25 19 | NNE ¼ E | 115 19 | SE x E ¾ E | 205 19 | SSW ¼ W | 295 19 | NW x W ¾ W |
| 26 43 | | 116 43 | | 206 43 | | 296 43 | |
| 28 08 | NNE ½ E | 118 08 | SE x E ½ E | 208 08 | SSW ½ W | 298 08 | NW x W ½ W |
| 29 32 | | 119 32 | | 209 32 | | 299 32 | |
| 30 56 | NNE ¾ E | 120 56 | SE x E ¼ E | 210 56 | SSW ¾ W | 300 56 | NW x W ¼ W |
| 32 21 | | 122 21 | | 212 21 | | 302 21 | |
| 33 45 | NE x N | 123 45 | SE x E | 213 45 | SW x S | 303 45 | NW x W |
| 35 09 | | 125 09 | | 215 09 | | 305 09 | |
| 36 34 | NE ¾ N | 126 34 | SE ¾ E | 216 34 | SW ¾ S | 306 34 | NW ¾ W |
| 37 58 | | 127 58 | | 217 58 | | 307 58 | |
| 39 23 | NE ½ N | 129 23 | SE ½ E | 219 23 | SW ½ S | 309 23 | NW ½ W |
| 40 47 | | 130 47 | | 220 47 | | 310 47 | |
| 42 11 | NE ¼ N | 132 11 | SE ¼ E | 222 11 | SW ¼ S | 312 11 | NW ¼ W |
| 43 36 | | 133 36 | | 223 36 | | 313 36 | |
| 45 00 | NE | 135 00 | SE | 225 00 | SW | 315 00 | NW |
| 46 24 | | 136 24 | | 226 24 | | 316 24 | |
| 47 49 | NE ¼ E | 137 49 | SE ¼ S | 227 49 | SW ¼ W | 317 49 | NW ¼ N |
| 49 13 | | 139 13 | | 229 13 | | 319 13 | |
| 50 38 | NE ½ E | 140 38 | SE ½ S | 230 38 | SW ½ W | 320 38 | NW ½ N |
| 52 02 | | 142 02 | | 232 02 | | 322 02 | |
| 53 26 | NE ¾ E | 143 26 | SE ¾ S | 233 26 | SW ¾ W | 323 26 | NW ¾ N |
| 54 51 | | 144 51 | | 234 51 | | 324 51 | |
| 56 15 | NE x E | 146 15 | SE x S | 236 15 | SW x W | 326 15 | NW x N |
| 57 39 | | 147 39 | | 237 39 | | 327 39 | |
| 59 04 | NE x E ¼ E | 149 04 | SSE ¾ E | 239 04 | SW x W ¼ W | 329 04 | NNW ¾ W |
| 60 28 | | 150 28 | | 240 28 | | 330 28 | |
| 61 53 | NE x E ½ E | 151 53 | SSE ½ E | 241 53 | SW x W ½ W | 331 53 | NNW ½ W |
| 63 17 | | 153 17 | | 243 17 | | 333 17 | |
| 64 41 | NE x E ¾ E | 154 41 | SSE ¼ E | 244 41 | SW x W ¾ W | 334 41 | NNW ¼ W |
| 66 06 | | 156 06 | | 246 06 | | 336 06 | |
| 67 30 | ENE | 157 30 | SSE | 247 30 | WSW | 337 30 | NNW |
| 68 54 | | 158 54 | | 248 54 | | 338 54 | |
| 70 19 | ENE ¼ E | 160 19 | S x E ¾ E | 250 19 | WSW ¼ W | 340 19 | N x W ¾ W |
| 71 43 | | 161 43 | | 251 43 | | 341 43 | |
| 73 08 | ENE ½ E | 163 08 | S x E ½ E | 253 08 | WSW ½ W | 343 08 | N x W ½ W |
| 74 32 | | 164 32 | | 254 32 | | 344 32 | |
| 75 56 | ENE ¾ E | 165 56 | S x E ¼ E | 255 56 | WSW ¾ W | 345 56 | N x W ¼ W |
| 77 21 | | 167 21 | | 257 21 | | 347 21 | |
| 78 45 | E x N | 168 45 | S x E | 258 45 | W x S | 348 45 | N x W |
| 80 09 | | 170 09 | | 260 09 | | 350 09 | |
| 81 34 | E ¾ N | 171 34 | S ¾ E | 261 34 | W ¾ S | 351 34 | N ¾ W |
| 82 58 | | 172 58 | | 262 58 | | 352 58 | |
| 84 23 | E ½ N | 174 23 | S ½ E | 264 23 | W ½ S | 354 23 | N ½ W |
| 85 47 | | 175 47 | | 265 47 | | 355 47 | |
| 87 11 | E ¼ N | 177 11 | S ¼ E | 267 11 | W ¼ S | 357 11 | N ¼ W |
| 88 36 | | 178 36 | | 268 36 | | 358 36 | |

## Distance of Visibility of Objects at Sea

| Height, feet | Nautical miles | Statute miles | Height, feet | Nautical miles | Statute miles | Height, feet | Nautical miles | Statute miles |
|---|---|---|---|---|---|---|---|---|
| 1 | 1. 1 | 1. 3 | 100 | 11. 5 | 13. 2 | 760 | 31. 6 | 36. 4 |
| 2 | 1. 7 | 1. 9 | 105 | 11. 7 | 13. 5 | 780 | 32. 0 | 36. 9 |
| 3 | 2. 0 | 2. 3 | 110 | 12. 0 | 13. 8 | 800 | 32. 4 | 37. 3 |
| 4 | 2. 3 | 2. 6 | 115 | 12. 3 | 14. 1 | 820 | 32. 8 | 37. 8 |
| 5 | 2. 5 | 2. 9 | 120 | 12. 6 | 14. 5 | 840 | 33. 2 | 38. 3 |
| 6 | 2. 8 | 3. 2 | 125 | 12. 9 | 14. 8 | 860 | 33. 6 | 38. 7 |
| 7 | 2. 9 | 3. 5 | 130 | 13. 1 | 15. 1 | 880 | 34. 0 | 39. 2 |
| 8 | 3. 1 | 3. 7 | 135 | 13. 3 | 15. 3 | 900 | 34. 4 | 39. 6 |
| 9 | 3. 5 | 4. 0 | 140 | 13. 6 | 15. 6 | 920 | 34. 7 | 40. 0 |
| 10 | 3. 6 | 4. 2 | 145 | 13. 8 | 15. 9 | 940 | 35. 2 | 40. 5 |
| 11 | 3. 8 | 4. 4 | 150 | 14. 1 | 16. 2 | 960 | 35. 5 | 40. 9 |
| 12 | 4. 0 | 4. 6 | 160 | 14. 5 | 16. 7 | 980 | 35. 9 | 41. 3 |
| 13 | 4. 2 | 4. 8 | 170 | 14. 9 | 17. 2 | 1, 000 | 36. 2 | 41. 7 |
| 14 | 4. 3 | 4. 9 | 180 | 15. 4 | 17. 7 | 1, 100 | 38. 0 | 43. 8 |
| 15 | 4. 4 | 5. 1 | 190 | 15. 8 | 18. 2 | 1, 200 | 39. 6 | 45. 6 |
| 16 | 4. 6 | 5. 3 | 200 | 16. 2 | 18. 7 | 1, 300 | 41. 3 | 47. 6 |
| 17 | 4. 7 | 5. 4 | 210 | 16. 6 | 19. 1 | 1, 400 | 42. 9 | 49. 4 |
| 18 | 4. 9 | 5. 6 | 220 | 17. 0 | 19. 6 | 1, 500 | 44. 4 | 51. 1 |
| 19 | 5. 0 | 5. 8 | 230 | 17. 4 | 20. 0 | 1, 600 | 45. 8 | 52. 8 |
| 20 | 5. 1 | 5. 9 | 240 | 17. 7 | 20. 4 | 1, 700 | 47. 2 | 54. 4 |
| 21 | 5. 3 | 6. 1 | 250 | 18. 2 | 20. 9 | 1, 800 | 48. 6 | 56. 0 |
| 22 | 5. 4 | 6. 2 | 260 | 18. 5 | 21. 3 | 1, 900 | 49. 9 | 57. 5 |
| 23 | 5. 5 | 6. 3 | 270 | 18. 9 | 21. 7 | 2, 000 | 51. 2 | 59. 0 |
| 24 | 5. 6 | 6. 5 | 280 | 19. 2 | 22. 1 | 2, 100 | 52. 5 | 60. 5 |
| 25 | 5. 7 | 6. 6 | 290 | 19. 6 | 22. 5 | 2, 200 | 53. 8 | 61. 9 |
| 26 | 5. 8 | 6. 7 | 300 | 19. 9 | 22. 9 | 2, 300 | 55. 0 | 63. 3 |
| 27 | 6. 0 | 6. 9 | 310 | 20. 1 | 23. 2 | 2, 400 | 56. 2 | 64. 7 |
| 28 | 6. 1 | 7. 0 | 320 | 20. 5 | 23. 6 | 2, 500 | 57. 3 | 66. 0 |
| 29 | 6. 2 | 7. 1 | 330 | 20. 8 | 24. 0 | 2, 600 | 58. 5 | 67. 3 |
| 30 | 6. 3 | 7. 2 | 340 | 21. 1 | 24. 3 | 2, 700 | 59. 6 | 68. 6 |
| 31 | 6. 4 | 7. 3 | 350 | 21. 5 | 24. 7 | 2, 800 | 60. 6 | 69. 8 |
| 32 | 6. 5 | 7. 5 | 360 | 21. 7 | 25. 0 | 2, 900 | 61. 8 | 71. 1 |
| 33 | 6. 6 | 7. 6 | 370 | 22. 1 | 25. 4 | 3, 000 | 62. 8 | 72. 3 |
| 34 | 6. 7 | 7. 7 | 380 | 22. 3 | 25. 7 | 3, 100 | 63. 8 | 73. 5 |
| 35 | 6. 8 | 7. 8 | 390 | 22. 7 | 26. 1 | 3, 200 | 64. 9 | 74. 7 |
| 36 | 6. 9 | 7. 9 | 400 | 22. 9 | 26. 4 | 3, 300 | 65. 9 | 75. 9 |
| 37 | 6. 9 | 8. 0 | 410 | 23. 2 | 26. 7 | 3, 400 | 66. 9 | 77. 0 |
| 38 | 7. 0 | 8. 1 | 420 | 23. 5 | 27. 1 | 3, 500 | 67. 8 | 78. 1 |
| 39 | 7. 1 | 8. 2 | 430 | 23. 8 | 27. 4 | 3, 600 | 68. 6 | 79. 2 |
| 40 | 7. 2 | 8. 3 | 440 | 24. 1 | 27. 7 | 3, 700 | 69. 7 | 80. 3 |
| 41 | 7. 3 | 8. 4 | 450 | 24. 3 | 28. 0 | 3, 800 | 70. 7 | 81. 4 |
| 42 | 7. 4 | 8. 5 | 460 | 24. 6 | 28. 3 | 3, 900 | 71. 6 | 82. 4 |
| 43 | 7. 5 | 8. 7 | 470 | 24. 8 | 28. 6 | 4, 000 | 72. 5 | 83. 5 |
| 44 | 7. 6 | 8. 8 | 480 | 25. 1 | 28. 9 | 4, 100 | 73. 4 | 84. 5 |
| 45 | 7. 7 | 8. 9 | 490 | 25. 4 | 29. 2 | 4, 200 | 74. 3 | 85. 6 |
| 46 | 7. 8 | 9. 0 | 500 | 25. 6 | 29. 5 | 4, 300 | 75. 2 | 86. 6 |
| 47 | 7. 9 | 9. 0 | 520 | 26. 1 | 30. 1 | 4, 400 | 76. 1 | 87. 6 |
| 48 | 7. 9 | 9. 1 | 540 | 26. 7 | 30. 7 | 4, 500 | 76. 9 | 88. 5 |
| 49 | 8. 0 | 9. 2 | 560 | 27. 1 | 31. 2 | 4, 600 | 77. 7 | 89. 5 |
| 50 | 8. 1 | 9. 3 | 580 | 27. 6 | 31. 8 | 4, 700 | 78. 6 | 90. 5 |
| 55 | 8. 5 | 9. 8 | 600 | 28. 0 | 32. 3 | 4, 800 | 79. 4 | 91. 4 |
| 60 | 8. 9 | 10. 2 | 620 | 28. 6 | 32. 9 | 4, 900 | 80. 2 | 92. 4 |
| 65 | 9. 2 | 10. 6 | 640 | 29. 0 | 33. 4 | 5, 000 | 81. 0 | 93. 3 |
| 70 | 9. 6 | 11. 0 | 660 | 29. 4 | 33. 9 | 6, 000 | 88. 8 | 102. 2 |
| 75 | 9. 9 | 11. 4 | 680 | 29. 9 | 34. 4 | 7, 000 | 96. 0 | 110. 5 |
| 80 | 10. 3 | 11. 8 | 700 | 30. 3 | 34. 9 | 8, 000 | 102. 6 | 118. 1 |
| 85 | 10. 6 | 12. 2 | 720 | 30. 7 | 35. 4 | 9, 000 | 108. 7 | 125. 2 |
| 90 | 10. 9 | 12. 5 | 740 | 31. 1 | 35. 9 | 10, 000 | 114. 6 | 132. 0 |
| 95 | 11. 2 | 12. 9 | | | | | | |