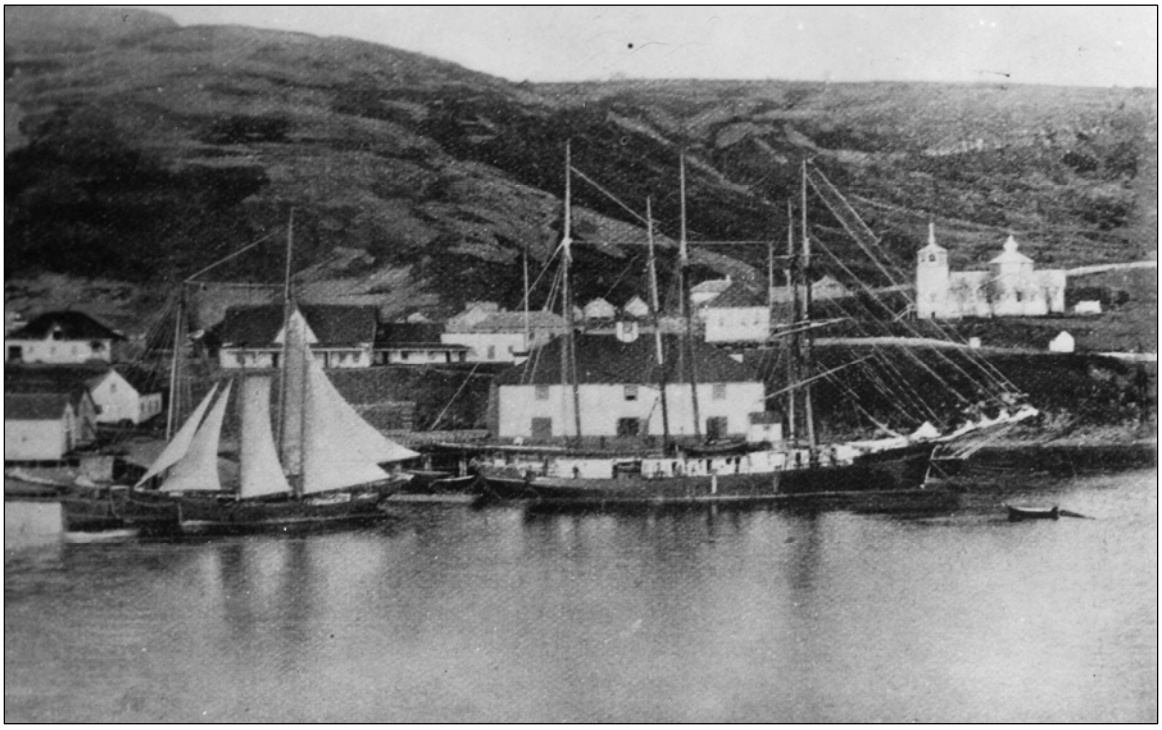
Exploring the Russian-American Company Shipwreck *Kad'yak*



Frank J. Cantelas, Principal Investigator
Timothy J. Runyan, Co-Principal Investigator
Evguenia Anichtchenko and Jason Rogers
Program in Maritime Studies
East Carolina University

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Prepared by:
Frank J. Cantelas, Principal Investigator,
Timothy J. Runyan, Co-Principal Investigator,
Evguenia Anichtchenko and Jason Rogers
Maritime Studies Program
East Carolina University

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Artifact 001, Ship's wheel hub with name *Kad'yak* spelled in Cyrillic, КОДЯКЪ. Photo by Tane Casserley

EXECUTIVE SUMMARY

In the summer of 2003, a group of Alaskan researchers and divers discovered the wreck of the three masted bark *Kad'yak*. The vessel belonged to the Russian-American Company, and was lost in 1860, just seven years before the United States purchased Alaska from Russia. The *Kad'yak* is the only known shipwreck from the Russian period in Alaska. The discovery came after more than two decades of sporadic searching by several groups and individuals. East Carolina University's Maritime Studies Program received a grant from the National Oceanic and Atmospheric Administration's Office of Ocean Exploration to conduct an archaeological survey and assessment of the shipwreck. The fieldwork was conducted in July 2004. This report presents the results of that investigation and discusses efforts at public outreach and education.

The *Kad'yak* is located in Icon Bay on Spruce Island just north of Kodiak Island. Investigators spent two weeks documenting the site, creating a site map, and completing extensive photography and video recording. Fieldwork was concentrated in the area discovered in 2003 that comprises most to the shipwreck remains. Near the end of the project a second portion of the ship was discovered and briefly recorded. One artifact, believed to be the hub of the ship's wheel, contained the vessel's name confirming the identity of the site. Analysis of collected data incorporated historical descriptions of *Kad'yak*'s outfit, events surrounding the vessel's loss, and a comparative study of artifact material.

A second aspect of the project included public outreach and development of curriculum materials for the Kodiak Island Borough Public School System. Balika Haakanson, a public school teacher in Kodiak, created lesson plans in science, civics, and history using the *Kad'yak* as the central topic. Public presentations of the project were given in Kodiak and the nearby Native Alaskan Village of Ouzinkie along with interviews on public radio stations in Alaska and National Pubic Radio. The project received extensive media coverage from local, state, and national newspapers including the New York Times. Papers were presented at the annual conference of the Society for Historical Archaeology in York, England, the Alaska Anthropological Association in Anchorage, and the Museums Alaska-Alaska Historical Society Conference in Kodiak.

DEDICATION

This report is dedicated to Captain Gary Edwards and the crew of the *Big Valley*

Lost in the Bering Sea, 15 January 2005

In their memory may there only be beautiful things

ACKNOWLEDGEMENTS

The *Kad'yak* Project was undertaken at the end of a long logistical line that stretched from North Carolina to Alaska. Along the way many people helped to make this tenuous connection possible.

Funding for this project came from the National Oceanic and Atmospheric Administration's Office of Ocean Exploration (NOAA OE) and the National Science Foundation (NSF). Lieutenant Jeremy Weirich and Captain Craig McLean at OE remained very encouraging throughout the grant process. Anna Kerttula, the Arctic Social Sciences Program Director for NSF's Office of Polar Programs, helped steer us through the process of applying for a Small Grant for Exploratory Research. She also offered the support of VECO Polar Resources, NSF's Polar logistical contractor which was critical to chartering the *Big Valley*, our dive platform. VECO's Marin Kuizenga and Diana Garcia-Lavigne looked after all our requests for support and came through even during last minute crises.

This project never would have occurred without the perseverance of Dr. Bradley Stevens, a crab biologist at NOAA's Kodiak Fisheries Research Center. Dr. Stevens' research and work with anthropologist and historian Dr. Lydia Black (University of Alaska Fairbanks) and researcher Katherine Arndt (Rasmuson Library, University of Alaska Fairbanks) led to the discovery of the *Kad'yak* in 2003. He gladly worked with us throughout the funding process, drumming up local support in Kodiak, among the Native Alaskan community, and several museums. He also worked very hard to set up logistical arrangements for the project prior to our arrival, something we could not do very well from North Carolina.

The Ouzinkie Native Corporation and the Ouzinkie Tribal Council gave support. Nicholas Pestrikoff made our visit and presentation in Ouzinkie Village enjoyable and he led a very informative tour of the village. The opportunity to discuss the Ouzinkie oral tradition with villagers inspired us all.

The museum community in Kodiak came together to support this project and is working to secure funding for future research on the site. Judy Bittner, Chief of the Alaska Office of History and Archaeology and State Historic Preservation Officer (SHPO), supported our efforts and those of the Kodiak museum community. Those closely involved in the past and present include Stacey Becklund, Katie Parker, and Mary Monroe with the Baranov Museum and Kodiak Historical Society, Sven Haakanson, Executive Director of the Alutiiq Museum and Archaeological Repository, and Sue Jeffery, President of the Kodiak Maritime Museum.

NOAA Ocean Exploration allocates ten percent of its budget towards education initiatives and we used this model to develop an educational component for the project. Balika Haakanson, a teacher in the Kodiak Island Borough School District, developed science and social studies curricula, including fifteen lesson plans, for grades 3 and 4. These materials have been distributed to the Kodiak schools and her work is greatly appreciated. John Adams, another Kodiak school teacher, assisted in the project providing research support.

One of the most pleasant acquaintances we initially made in Kodiak was Gary Edwards, the captain of the fishing vessel *Big Valley*. *Big Valley* served as the project's base of operations, taking us to the site each day and housing most of the research team. Gary was a wonderful host along with first mate Bryce Kidd and his wife Jessy, the ship's cook. Many enjoyable meals were taken at the galley table with good company and conversation. Tragically, Gary was lost when the *Big Valley* sank in the Bering Sea on January 15, 2005, the opening day of opilio crab season.

Volunteers were essential to completing the fieldwork. Some were divers and others helped with the activities on the boat. Brad Stevens, Pete Cummiskey, and Scott Van Sant from the Kodiak Fisheries Research Center, Alaska State Archaeologist Dave McMahan, and Larry Musarra, Stefan Quinth, Mark Blakeslee, and Sean Weems, all braved the frigid summer waters. Mike Yarborough, Mike Burwell, Mary Monroe, and Laurie Runyan pitched in on deck to keep the divers organized and comfortable. Mike Yarborough was involved in the search for the *Kad'yak* for over two decades and brought many insights to the project. Mike Burwell gave freely of his extensive knowledge on Alaska's shipwrecks and maritime history. Verlin and Sandy Pherson at Scuba Do and Lon White at Pacific Diving Services filled our air tanks and provided extra diving gear to replace that lost or forgotten.

The Alaska Office of History and Archaeology encouraged our early involvement. State Archaeologist Dave McMahan, State Historic Preservation Officer Judy Bittner, and State Historian Jo Antonson, provided on-going support and issued a permit for work on the *Kad'yak* site. Dave McMahan participated in field activities and conserved many of the artifacts recovered from the *Kad'yak*. His insights on local communities and Alaskan archaeology helped steer the project to completion and he continues to provide excellent advice on the project's future direction. The office completed the *Kad'yak*'s nomination to the National Register of Historic Places where it was listed in July 2004. Their sponsorship of a workshop on submerged cultural resources for state and federal officials across several agencies in February 2004 was a first in Alaska. The Anchorage Museum of History and Art hosted public presentations where we heightened public understanding of the significance of shipwrecks, especially in Alaska. Following the activities in Anchorage we traveled to Kodiak accompanied by Jeff Gray (NOAA Thunder Bay National Marine Sanctuary), Evguenia Anichtchenko (ECU), and Lt. Jeremy Weirich to begin making logistical arrangements. We also had the opportunity to make a reconnaissance dive on the *Kad'yak* in cold rough weather.

The NOAA Maritime Heritage Program provided the services of Tane Casserley who did the underwater photography and video documentation. John Broadwater, director of the Maritime Heritage Program, deserves many thanks to for allowing Tane to participate.

Lieutenant Jeremy Weirich of NOAA's Office of Ocean Exploration, arranged to have the NOAA vessel *Rainier* complete a multi-beam sonar survey of Icon Bay covering the wreck site of the *Kad'yak*. This survey provided a detailed bathymetric map of the bottom that allowed us to overlay the site map and examine the relationships between the shipwreck and reefs scattered through the bay. Executive Officer Dave Neander and Amy Billiger of the *Rainier* took the time to meet with us to discuss the location of the site and the type of data we needed.

We thank ECU's Office of Sponsored Programs, especially John Garland, Scott Stubbings and Brian Farmer. Students Amy Leuchtmann, Brian Diveley, Matt DeFelice, and Sami Seeb helped with the report and artifact illustration. Maritime student Evguenia Anichtchenko, a native of St. Petersburg, Russia, provided the necessary knowledge of the Russian language to explore sources, especially the Russian-American Company records in the Library of Congress as well as those in Russia and Germany. Her travel was supported by the ECU Division of Research and Graduate Studies. Her husband and ECU Maritime Studies graduate, Jason Rogers, maintained his composure throughout the whole project while diving in a wetsuit. Steve Sellers, director of the Office of Diving and Water Safety, served as the diving safety officer and brought us all back alive.

Frank Cantelas and Timothy Runyan

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INTRODUCTION

The Russian-American Company bark *Kad'yak* was built in Lübeck, Germany in 1851 and sailed around Cape Horn to serve as a trading ship in Alaska and the North Pacific. She was part of the Russian-American Company fleet of sail and steam vessels for eight years. After loading a cargo of ice bound for California, *Kad'yak* left Woody Island, near Kodiak, on March 31, 1860 and struck a submerged rock. Although holed, she remained afloat on her side for three days drifting with the wind to Icon Bay only six miles from town. Legend says she sank upright with the mast and spars forming the shape of a cross in view of Father Herman's Chapel on Spruce Island. Divine wrath was identified by some as the cause of the sinking because the Captain, Illarion Arkhimandritov, had failed to fulfill his pledge to venerate the relics of Father Herman at the chapel on Spruce Island before leaving Kodiak. No lives were lost, but the cargo and personal effects of the captain and crew went down with the ship. The story of the vessel sinking in Icon Bay is well known in the local community, but *Kad'yak* remained undiscovered for 143 years.

Several recent attempts were made to find *Kad'yak,* but all were unsuccessful until July 2003. NOAA Fisheries Biologist Bradley Stevens spent considerable time investigating historic descriptions of the vessel's loss and was finally able to accurately plot the bark's location using a compass bearing to the mast recorded by Captain Arkhimandritov. Using this new information Stevens assembled a group of volunteers and found a shipwreck that was later confirmed by the ECU investigation to be the *Kad'yak*.

Stevens had contacted Dr. Timothy Runyan, Director of the Maritime Studies Program at East Carolina University (ECU), about possible involvement in the research in 2002. A discussion followed with others including the Alaska Office of History and Archaeology. State Archaeologist David McMahan offered his support and participation. As a result, Frank Cantelas and Runyan applied for a NOAA Ocean Exploration grant to survey Icon Bay in summer 2003 in order to locate the *Kad'yak*. Funding for the project was not approved. Stevens continued his research and organized a search of Icon Bay in 2003 which resulted in the discovery of a shipwreck almost certain to be the *Kad'yak*.

Cantelas and Runyan again applied for an Ocean Exploration grant, this time to conduct an archaeological survey to identify the shipwreck and assess its condition. A permit to explore the site was issued by the State Office of History and Archaeology. This proposal was funded, but at less than the amount requested due to budget restrictions. The grant provided a base to secure support from other sources. The National Science Foundation provided a small grant but more importantly offered logistical support through its contractor VECO Polar Resources. This support enabled the investigators to charter the F/V *Big Valley* to house the research team and serve as a dive platform. Several other organizations also supported the project including the State of Alaska Office of History and Archaeology, NOAA's Kodiak Fisheries Research Center, Baranov Museum and Kodiak Historical Society, Alutiiq Museum and Archaeological Repository, Kodiak Maritime Museum, the Ouzinkie Native Corporation and Tribal Council, and NOAA's Maritime Heritage Program.

Ownership of the *Kad'yak* by the State of Alaska is undisputed. The 1987 Abandoned Shipwreck Act gives states ownership of all shipwrecks embedded in bottomlands within the three mile limit. The vessel is clearly imbedded and falls within state jurisdiction. Any historic claims of ownership were ended when the 1917 Bolshevik Revolution overthrew the Czarist Russian government, terminating any claims to the *Kad'yak*. To conduct this investigation the State of Alaska issued Field Archaeology Permit 2003-22 for archaeological survey, testing, excavation, and artifact removal from the *Kad'yak* Shipwreck Site (KOD-923).

A reconnaissance dive was made on the site in February 2004 by the Principal Investigator Frank Cantelas and co-Principal Investigator Timothy Runyan to aid in developing a research methodology. At that time site conditions were observed along with the ballast pile, anchors and windlass. A research team of archaeologists and volunteers returned to investigate the site from 11 to 23 July, 2004. Researchers completed a pre-disturbance survey generating a site map, extensive photographic and video documentation, and recovery of diagnostic artifacts that verified the shipwreck's identity as *Kad'yak*.

ENVIRONMENTAL SETTING

Spruce Island is part of the Kodiak Island group bordering the northwest margin of the Gulf of Alaska. Oriented southwest to northeast, the island group has a total area of 4,900 square mi. Kodiak, with an area of 3,588 square miles, is the largest island, and there are at least fifteen islands in the group with an area greater than 5 square miles. To the west, the island group is separated from the Alaska Peninsula by the Shelikof Strait, which is 20 miles across at the narrowest point. The Kenai Peninsula lies 40 miles to the north across the entrances to Cook Inlet.

Figure 1. Location of Kodiak Island

Topographically, the islands are characterized by heavily contoured coastlines and relatively high mountains in the interior. The terrain is steep and rugged. There are many peaks on Kodiak Island over 3,000 ft. in elevation, and at least two peaks reach 4,500 ft. The mountains rise abruptly from the coast, trapping moisture from the humid northward moving North Pacific air mass. Annual precipitation in Kodiak is relatively high at 68 in., and streams are short and fast-flowing. The features of the deeply contoured coastline are the result of heavy glaciation during the last ice age and they extend well below sea level.

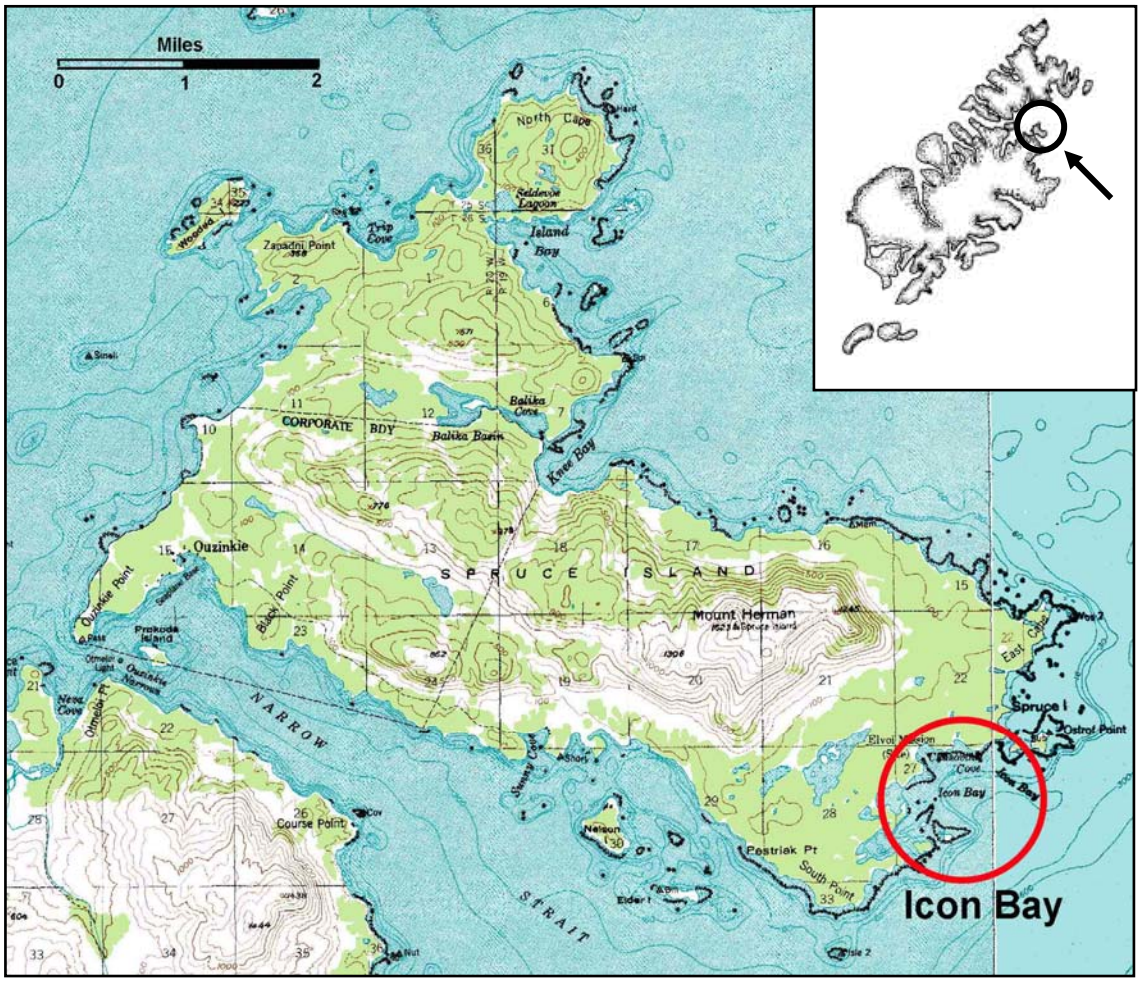


Figure 2. Spruce Island, Alaska (USGS Quadrangle: Kodiak (D-1) NW, Alaska, Provisional Edition 1987 and Kodiak (D-2) NE, Alaska, Provisional Edition 1987

It is likely that Quaternary glaciers from Kodiak merged with those from the Alaska Peninsula, completely filling the Shelikof Strait on the west. Large sea valleys of glacial origin extend eastward to the edge of the continental shelf (Sharma 1979).

The Gulf of Alaska, south of the island group, is the northeastern extent of the Pacific Ocean. Within the gulf, the Alaska Current moves counterclockwise, providing the main oceanic circulation along the northern margin. As the current passes Kodiak Island, flowing to the southwest, it narrows and becomes more intense, eventually forming the Alaska Current along the Alaska Peninsula and the Aleutian Islands. Fastest current speed is estimated at 25-50 cm/sec. Surface water temperature ranges from <3.5 C° in winter to 10°C in summer (Sharma 1979:223).

Geologically, the islands are an extension of the Kenai Mountains of the Kenai Peninsula to the north, from which they are separated by 40 mi. of open sea. The island group consists mainly of Upper Cretaceous rocks of the Mesozoic era with some localized igneous granite extrusions. This granite 'backbone' is generally found only on Kodiak and Afognak Islands (Capps 1937).

The Kodiak archipelago is located on the margin of a very active tectonic boundary of two continental plates; the Pacific and the North American Plates. There are a significant number of active volcanoes along the mainland coast, particularly on the north side of Cook Inlet, but none on Kodiak Island itself. Fairly regular volcanic and seismic activity is due to tectonic subduction of the Pacific Plate beneath the North American Plate along the Aleutian trench. In the spring of 1912 the Katmai volcano, 95 mi. to the west on the Alaska Peninsula, erupted violently. Large parts of Kodiak were covered with volcanic ash, and several settlements were rendered temporarily uninhabitable. In the areas of deepest ash fall, a large amount of volcanic debris was carried by streams and rivers to the coastal bays. In some cases this led to significant change in depth, as the heads of shallow bays were filled with ash. For example, the 1937 survey of Kodiak Island by the US Department of the Interior shows the head of Viekhoda Bay exposed at low tide, where pre-eruption coastal charts show a depth of 4 fathoms (Capps 1937:170- 71).

The Alaska earthquake of March 1964 centered in Prince William Sound, shook Kodiak Island with an 8.4 magnitude earthquake, which significantly altered the depth of the seafloor in the immediate vicinity. Vertical displacement, both upward and downward, was widespread. The axis of subsidence, as calculated by the US Geological Survey, runs in a northeast direction across the western end of Spruce Island. Calculated subsidence for the immediate vicinity is in the range of 4 to 6 ft. The range of displacement is presumed to extend to the outer edge of the continental shelf.

The most serious consequence of the earthquake, however, was the series of destructive seismic tsunamis that followed. At least seven large-amplitude seismic sea waves slammed into the southeast shores, with run-up heights of up to 40 ft. above normal tide level. High-velocity currents accompanied the waves, causing intense erosion and redistribution of loose shore and shallow sea-f1oor deposits. Most of the material

damage on the island resulted from the sea waves (Plafker and Kachadoorian 1969:D1-D25)

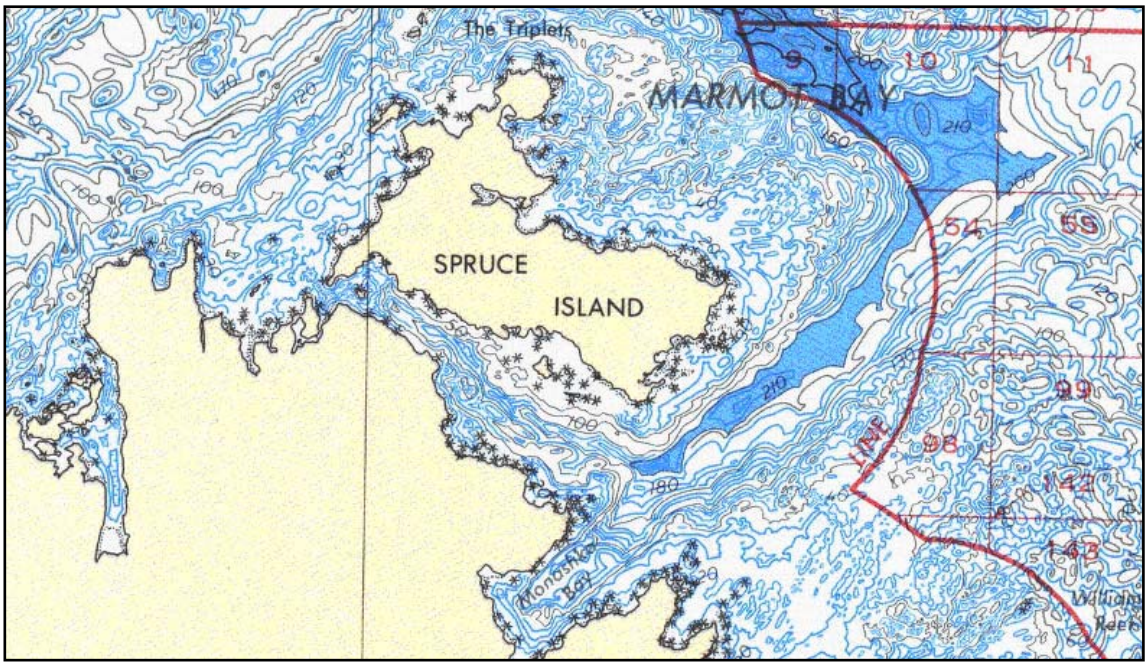


Figure 3. The bathymetry of the area around Spruce Island illustrates the vertical relief of the bottom in surrounding waters (NOAA Bathymetric Map, Kodiak NOS No. 5-6, 1985).

Spruce Island

Spruce Island lies off the northeast coast of Kodiak Island, separated by less than a mile across Narrow Strait. Afognak Island, the second largest island in the Kodiak group, lies 10 mi. due north across Marmot Bay. Spruce Island measures roughly 7 mi. long and 4 mi. wide, with an area of 17 square mi. It is roughly 11 mi. by sea from the Icon Bay to the town of Kodiak. The highest point on Spruce Island is Mt. Herman at 1,623 ft., near the eastern end and just a short distance from Icon Bay. Icon Bay, popularly known as Monk's Lagoon and the site of the *Kad'yak*'s wreckage, is located on the southeast end of Spruce Island. The village of Ouzinkie is situated 5.5 mi. northwest.

Geologically, Spruce Island, like most of the Kodiak group, consists mainly of Upper Cretaceous rocks (slate, argillite, greywacke, and conglomerate, generally highly metamorphosed). As with the rest of the group, the terrain is highly glaciated. Glacial deposits are ubiquitous, and near the village of Ouzinkie there are exposures of 20 to 30 feet of glacial till, composed of scattered boulders and rock fragments in a matrix of sticky blue clay (Capps 1937:167).

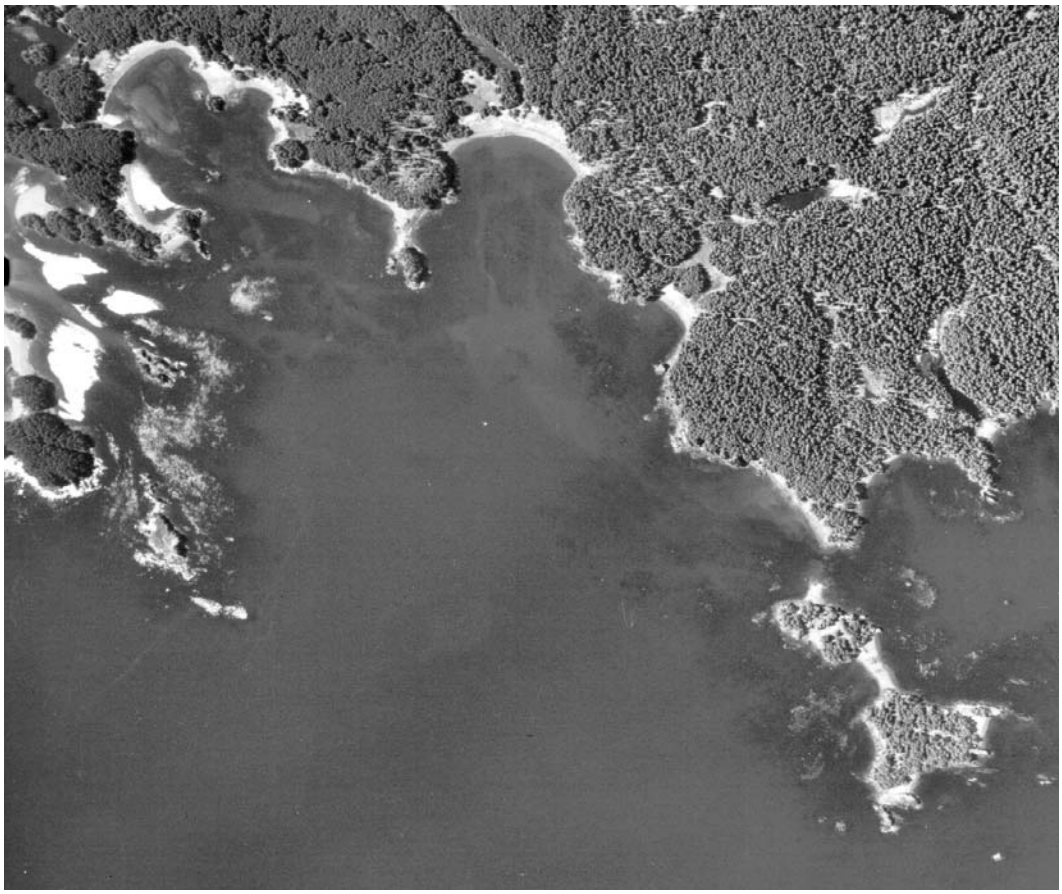


Figure 4. This 1971 aerial photograph shows the head of Icon Bay

Icon Bay faces the Gulf of Alaska and is characterized by rocky headlands, gravel beaches, and numerous small islands. The location is historically significant to Alaska and particularly for the local communities. St. Herman, who is discussed in the history chapter, was a Russian Orthodox missionary who worked among the Native American communities and made his home near the shores of Icon Bay. Today, Russian Orthodox monks maintain his chapel and a hostel on Icon Bay for the devout to visit and worship. Visitors, who come by boat, land on the beach and walk along trails to see the chapel and other places.

The NOAA ship *Rainier* conducted a bathymetric survey of Icon Bay on July 28, 2004, using a Reson SeaBat 8125 multibeam sonar with a resolution of 0.25 m. Data generated by the survey provides a graphic depiction of the bottom of Icon Bay (Figure 5). The floor of the bay slopes steeply to the southeast to a trench (Figure 3) that exceeds

200 meters. The bottom is very irregular with numerous rock outcrops often breaking the surface as rocky shoals. Between the outcrops the bottom is covered with course sand. The wreck is located on the sand bottom with debris scattered on one of the rock outcrops. Water depth over the site ranges from 75 to 84 feet depending on the tide.

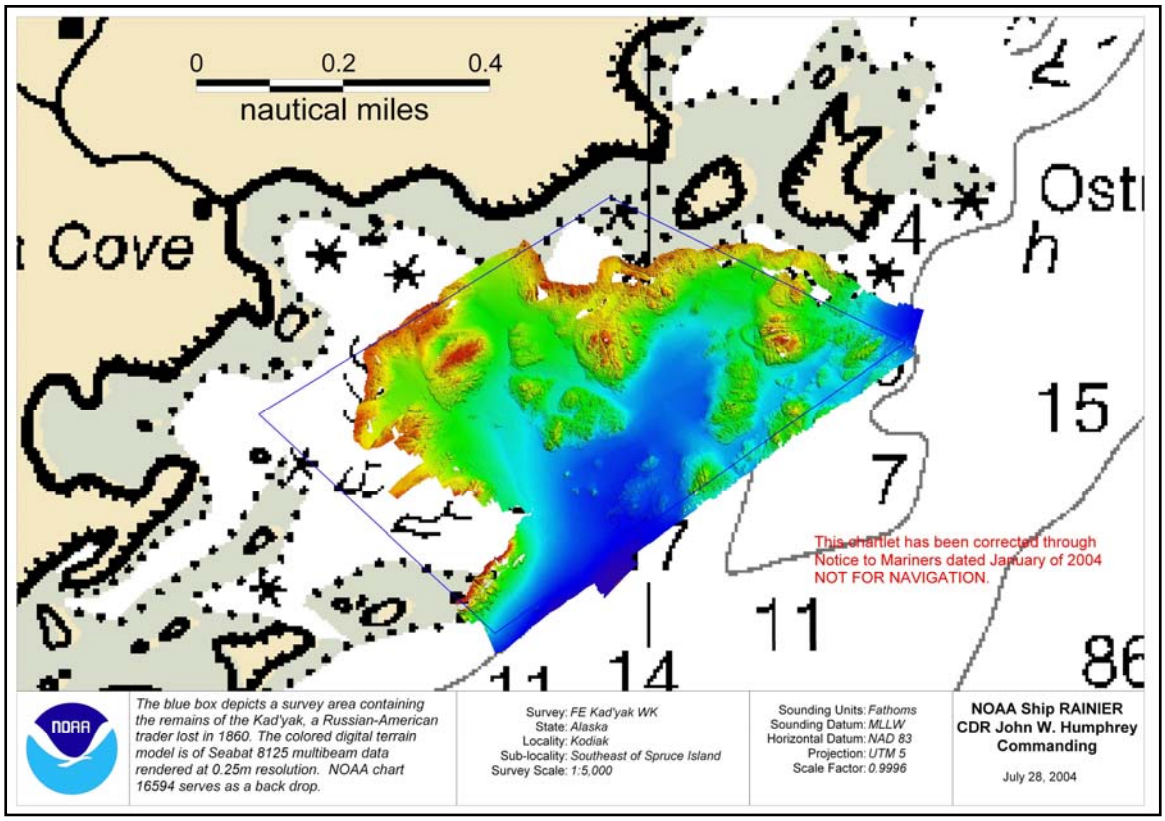


Figure 5. Bathymetric survey of Icon Bay completed on July 28, 2004 by the NOAA ship *Rainier*.

HISTORICAL BACKGROUND

Introduction

Russian hunters and traders sailing eastward from the Pacific coast of Siberia in the mid-eighteenth century landed on the shores of North America, in present-day Alaska. Motivated primarily by the trade in sea-otter furs they pushed ever eastwards, and soon encountered local populations of Native Americans. The first permanent Russian settlement in the New World was established in 1783 on Kad'iak (Kodiak) Island. By the end of the century, Russians had organized the Russian-American Company, a large-scale commercial enterprise to exploit the local resources. For the next seven decades the Russian presence in the American North Pacific strongly influenced the cultural and historical development of the region.

From the first fur-hunting expeditions in the middle of the eighteenth century until the sale of Alaska to the United States in 1867, the success of Russian colonization depended on the colonial fleet. Ships delivered supplies and people from Russia and Europe, provisioned the colonies with food stocks from California and the Hawaiian Islands, carried on colonial trade and communication between the settlements of Russian America, and defended the coast. Throughout its history, the Russian-American Company owned about one hundred ships. The fate of each of them portrays the socio-economic development of the colonies and the story of the people of Russian America. The bark *Kad'yak* was purchased in the 1851, only sixteen years before the transfer of Alaska to the United States. The career of this vessel demonstrates both the continuity of the company's strategies and attempts to find new commercial avenues to replace the declining fur trade (Black 2004). The legend of the *Kad'yak*'s sinking also shows how the religious practices of pre-contact Alaska merged with Russian Orthodoxy.

Round-the-world ships

To maintain the number of ships necessary for the colonies' operation, the company employed a number of strategies. The first ships of the Russian North Pacific explorers were built on the Siberian coast, at Okhotsk and Kamchatka settlements. In 1792, the Russians founded the first shipyard in Alaska, at Resurrection Bay, where three

ships were launched by 1793. The company later built ships in Yakutat, Sitka (Novo-Arkhangelsk) and the Californian outpost of Fort Ross. Shipbuilding proved to be a difficult task in Alaska, where both necessary naval stores and qualified specialists were in short supply (Andrews 1934:4). Although considerations of political prestige pressured the Russian-American Company to continue shipbuilding, foreign-made ships came to play an important role in the colonial fleet. In the North Pacific, the main sources of ships were American and British fur-traders who competed with Russians for the region's maritime resources. The Russians felt the purchase of ships from their rivals both fortified the company's fleet and reduced the competition (Tikhmenev 1979:158).

The first Russian round-the-world voyage in 1804, opened a new avenue for the company's acquisition of ships. The main motivation of this round-the-world voyage was

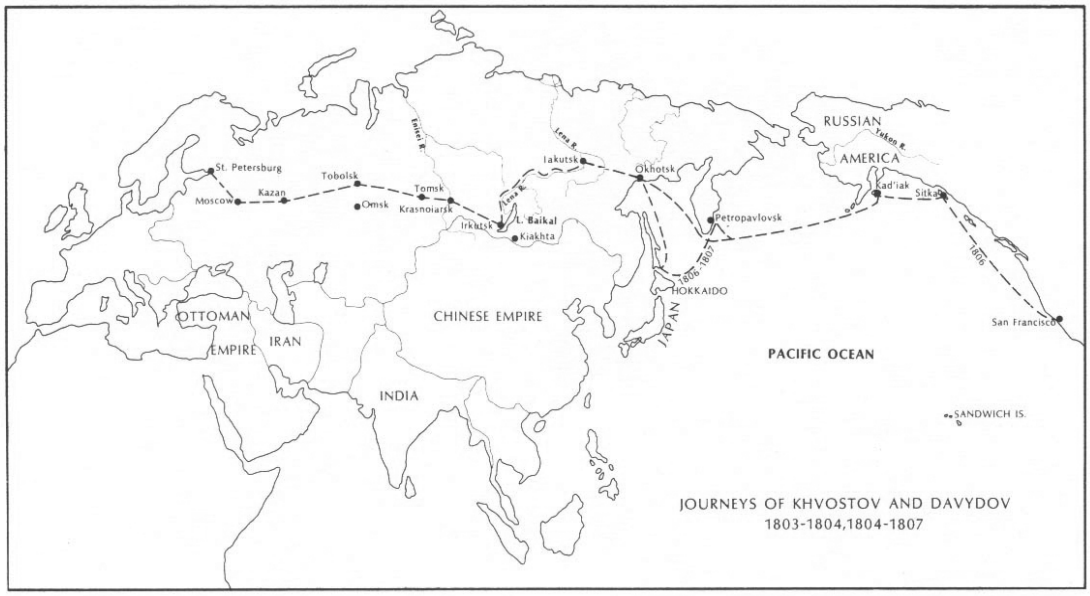


Figure 6. Overland journey of Khvostov and Davydov from St. Petersburg to Okhotsk (Davydov 1977: n.p.n.)

the need to establish an efficient line of supply and communication between the colonies and the industrial and political centers of European Russia. Until 1804, the only route from St. Petersburg to Okhotsk and Kamchatka was overland across Eurasia. This was a long and dangerous journey: in 1803 it took two naval officers, Khvostov and Davydov, five months to travel from St. Petersburg to Okhotsk with just personal luggage (Davydov 1977: n. p.). For horse caravans loaded with cannons and anchors, the journey from European Russia to the company's outposts on the Siberian coast lasted over a year

Figure 7. The bark *Alma*, built in 1846 by H. J. A. Meyer in Lübeck (Pietsch 1982:64).

and much of the cargo never reached the colonies, perishing in the impassable tundra and marshes (Tikhmenev 1978:69).

The first Russian circumnavigation resulted from the vision and labor of a Russian Imperial Navy officer, Johann-Anton von Kruzenshtern, who during his volunteer service in the British navy was impressed by the English maritime trade with the East Indies and China (Barratt 1981:109). Upon his return to St. Petersburg in 1799, he proposed a voyage from St. Petersburg to Alaska. Both The Russian-American Company and the state supported his idea. While the company's administrators considered ocean shipping a cheaper and more reliable mode of transportation, the crown saw the round-the-world voyages as a convenient way to show the Russian Imperial flag in foreign regions and to enhance Russia's reputation as a maritime power. As no ships suitable for the expedition were found in Russia, the company purchased two vessels in London and christened them *Neva* and the *Nadezhda* (Kruzenshtern 1809:2-3). During the period from June of 1803 until July 1806 these ships carried out the first Russian round-the-world expedition, performing a number of tasks, ranging from the first attempted Russian mission to Japan to various geographical, hydrographical, astronomical and ethnological observations. The expedition's results satisfied both the company's board of directors and the Russian government, and over the next sixty years, round-the-world expeditions influenced the life of the Russian colonies in America, and provided a source of ships for the Russian-American Company fleet.

All of the ships purchased by the Russian-American Company for round-the-world voyages were of foreign provenance, originating from the shipyards of England, Finland, the United States and Germany. In the second half of the nineteenth century, the German port of Hamburg began to play an especially important role in the supply of "manufactured goods and certain supplies for the Russian colonies" (Tikhmenev 1978:328). Both Hamburg and nearby Lübeck presented an affordable source of suitable ships in addition to low prices for supplies. Arvid Etholen, the former governor of the colonies and later member of the Russian-American Company board of directors, visited Hamburg in 1851 and commissioned Johann Christian Friedrich Schtitt to purchase local goods and ships for the Russian-American Company (Russian-American Company 1852:10). Schtitt helped purchase three vessels in Hamburg and two in Lübeck within the next five years.

The *Kad'yak*

The first of these ships was the *Kad'yak*, a wooden three-masted bark built by Hans Jacob Albrecht Meyer in the shipyard of Lübeck, Germany in 1851 (Archiv der Hansestadt Lübeck, Lastadie 1851: N 16). Hans Jacob Meyer came from a family of

Figure 8. Portrait of Johan Hinrich Meyer, founder of the Meyer shipyards and the father of the *Kad'yak*'s shipwright (Pietsch 1982:96).

shipbuilders. His father, Johann Hinrich Meyer opened his shipyards in Lübeck in the end of the eighteenth century (Pietsch 1982:64). Hans Jacob entered this career as well, becoming a shipbuilder in 1825 (Archiv der Hansestadt Lübeck, Kanzlei 1851-1852: 225, N83). He specialized in wooden sailing ships, particularly barks (*Coriolan, Sir Isaac Newton, Emma Mathilde, Sir Robert Peel,* and *Franklin*), but was also known for his steamship *Gauthiod*, which operated in Stockholm, Sweden (Pietsch 1982:28). When Meyer received the commission to build the ship for the Russian-American Company, he was well established in the field. Several of his ships were employed as regular traders between Hamburg and New York. The bark *Sir Isaac Newton*, built in 1839, for example, sailed this route for 24 years, and in 1849-1850, surprisingly, under the Russian flag (Kresse 1969: 207).

On July 19, 1851 Johann Christian Friedrich Schtitt, the Russian- American Company agent in Hamburg, witnessed the inspection of the newly built ship and signed the certificate of purchase. According to the document, the wooden bark christened the *Kad'yak* had a capacity of 238 ¼ kommerzlast (about 477 tons). The hull was sheathed in copper to repel barnacles and wood-eating shipworms (Archiv der Hansestadt Lübeck:1851-1852, n.p.n.). The dimensions of the hull were not provided, but they were probably similar to the dimensions of the ship *Sir Robert Peel*, built by H. J. A. Meyer for the Hamburg ship owner Robert M. Sloman a year later. The *Sir Robert Peel* was

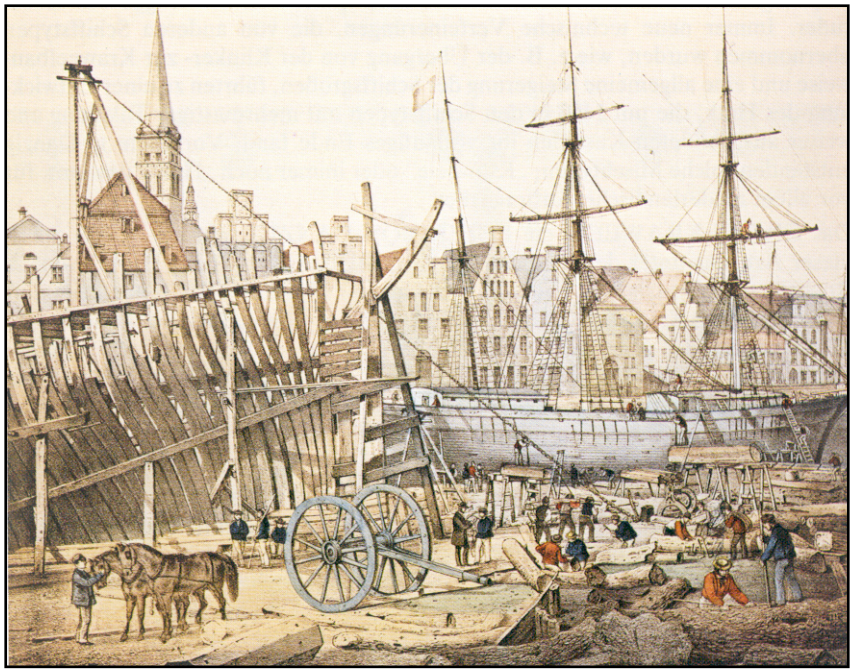


Figure 9.Shipyard in Lastadie, Lübeck. Lithography, 1870 (Pietsch 1982: 26).

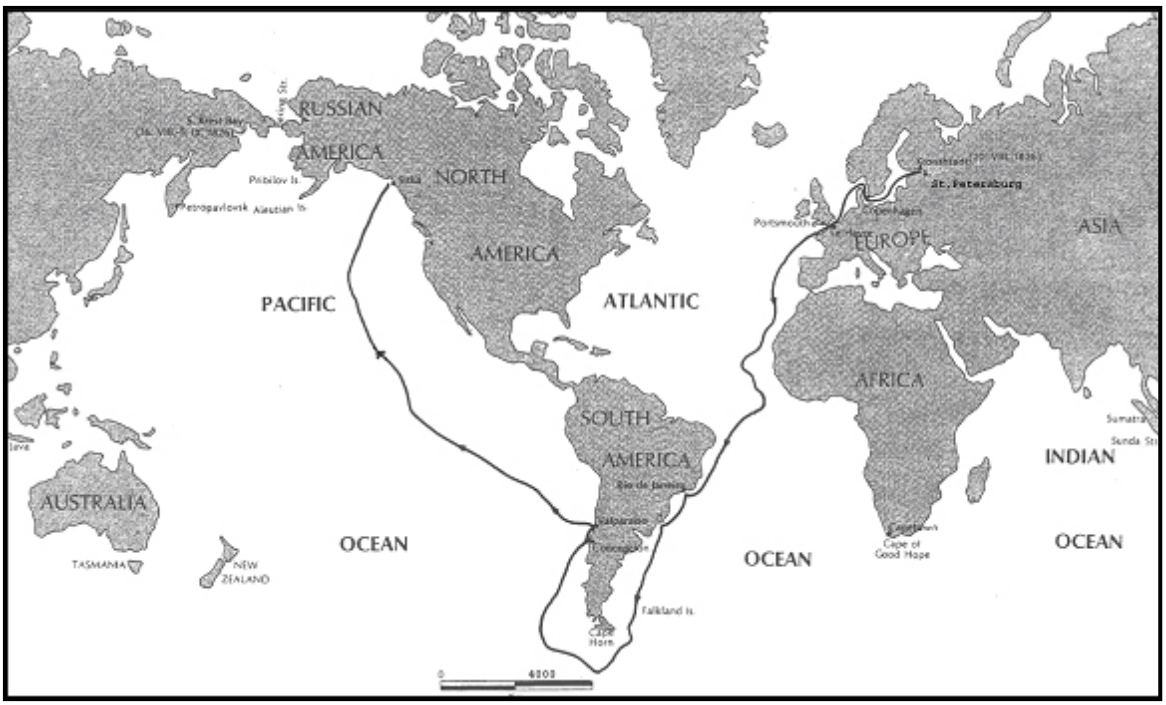


Figure 10. The *Kad'yak*'s voyage from Kronshtadt to Novo-Arkhangelsk (Sitka).

estimated to have a 250 kommerzlast capacity and was 40.3 m. long, 9 m. wide, and 6 m. deep (130 x 28.8 x 19.2 ft.) (Kresse 1969:209).

The same day the documents were signed, the *Kad'yak* left Lübeck for the Russian port of Kronstadt under the command of Captain Bahr, where the ship was fitted and loaded for the voyage to Russian America (Lübeckische Anzeiegen 167, 18 Juli 1851: n. p.).

No details are known about the ship's cargo on this voyage. Similar to other round-the-world ships, she was probably loaded with provisions such as grain and sugar, and bulky items that colonies could not produce themselves including textiles, metal items, anchors, tools, glass and earthenware utensils (Gibson 1976:82). Most of the *Kad'yak*'s passengers were new employees of the Russian-American Company: navigators, medical personnel and ordinary workers recruited in Western Russia and Northern Europe. On August 7, 1851 the *Kad'yak*, once again commanded by Captain Bahr, left the Baltic port of Kronshtadt for Alaska.

After stops in Copenhagen and Hamburg (Furuhelm 1852:110), the ship’s course was set for Cape Horn. The voyage proceeded uneventfully until the *Kad'yak* called at the port of Valparaiso, Chile, where five workers intended for the service of the Russian-

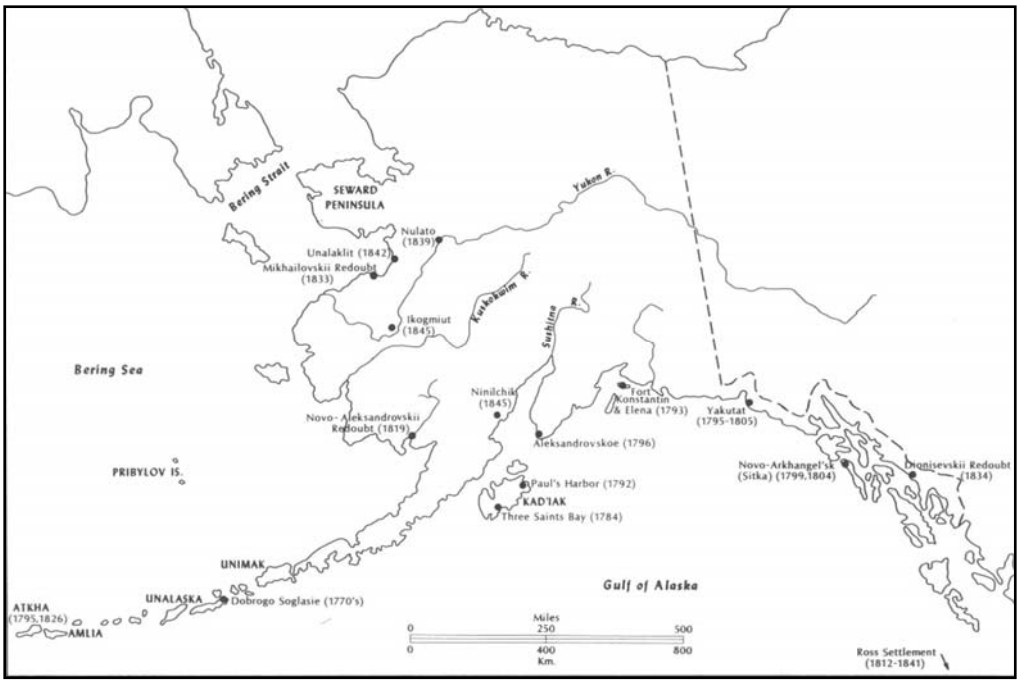


Figure 11. Principal Russian establishments in Alaska (Teben'kov 1852: 22)

American Company jumped the ship "and could not be found by any means" (Furuhelm 1852:111-111 verso). On May 7, 1852, after a nine-month voyage, the *Kad'yak* dropped anchor at Novo-Archangelsk (Sitka). The entire ocean-going fleet in the service of the Russian-American Company at the time consisted of ten vessels, assuring the *Kad'yak* a prominent position in the company's life and commerce.

Many things had changed in Alaska since the Russian-American Company's incorporation in 1799. By 1852, the colonies had over a dozen settlements spread along the coast from Norton Sound to the Alexander Archipelago. The new Siberian port of Aian became the company's main base on the Russian east coast, replacing the rather inconvenient Okhotsk. The Russians' relationship with the Alaskan Natives became more peaceful, and many Aleuts and the Tlingits were now contracted workers for the company. The Russian Orthodox Church became firmly rooted in Russian America. In Novo-Arkhangelsk, the company opened schools for both boys and girls, and a hospital. The company even introduced a retirement plan for the aged employees who worked in Russian America over a certain period. The colonies grew and acquired some social sophistication, yet the provisioning, trade and communications remained the main

concerns of the company's authorities. The shipping routes reflect the company's strategies in addressing these concerns.

The fur trade remained the main economic premise of the company's existence in 1852. On average, a ship sailed once a year to collect pelts along the coast of Russian Alaska. The furs were then brought to Sitka, where they were shipped either to the Siberian ports of Russia, or to St. Petersburg on the return voyages of the round-the-world ships. Supplies and people were the main cargo of the company's ships en route from Russia to Alaska.

The delivery of all necessary supplies from the mother country was an expensive, time-consuming, and risky undertaking. Much of the food stock spoiled, and the cost of transportation made the company increase the selling prices of goods brought from Russia up to 50 per cent over their initial value (Gibson 1976:87). In order to feed the colonies, the company tried a number of strategies, including an agreement with the Hudson's Bay Company (Tikhmenev 1978:236), and trade in California and Hawaii, where grain, beef and sugar were purchased in exchange for furs and occasionally timber. With the decrease of the population of fur-bearing animals and the collapse of several important fur markets, the company also tried to trade in salted fish and tallow candles.

Inter-colonial voyages were the predominant activity of the Russian-American Company fleet. They ensured both the distribution of supplies from Novo-Arkhangelsk to other settlements of Russian America, and communication between the remote parts of the colonies. Among these voyages, the most frequent were between Kodiak and Sitka, the two largest Russian settlements in Alaska. Scientific exploration and charting of the colonial waters and coasts constituted another important task carried out by ships of the Russian-American Company.

During her eight years in the service of the company, the *Kad'yak* took part in a wide array of the company's activities. Soon after her arrival, the ship departed for Aian, a Russian port on the Sea of Okhotsk, in order to deliver the cargo she carried for this city from St. Petersburg (Records of Russian-American Company 1852: N257), and to assist settlers returning to Russia (Russian-American Company 1853:16). Many of the company's employees came to America on limited term contracts hoping to earn enough money to improve their lives upon their return to the homeland. Not all of them were able

to handle the hardship of living in Alaska. The name of one home-bound passenger of the *Kad'yak*, for example, is saved for posterity by the peculiar note written by a doctor of the local hospital:

> "Alexander Kazantsev, native to Tyumen, who arrived to the colonies last year, became sick with severe melancholy compounded with longing for home. Since there is a positive lack of any means to cure this disease here, we recommend sending him back to Tyumen, where the sight of his motherland may have a salutary influence on the patient. And as I find his presence not only useless, but also burdensome for the Company, I suggest that the New Archangel office consider sending him to Aian on board the bark Kadiak at no charge" (Records of Russian-American Company 1852: N 292).

The Chief of the Port at Sitka, Johan Furuhjelm, took the *Kad'yak* on a trading voyage to California and the Sandwich Islands (Hawaii) in early 1853, returning on May 1 (Pierce 1972:21). After the voyage the ship's hull and sheathing underwent some repair (Russian-American Company 1854:23). The letters exchanged regarding these repairs provides some information about the *Kad'yak*'s construction, such as the presence of deck cabins. According to a letter of the acting chief manager A.I. Rudakov to the Main Office, written November 13, 1853, "the cabin on the ship *Kad'yak* turned out to be entirely unreliable at sea; therefore, it was necessary to remove it and move cabins below deck, which is now being done" (Arndt and Pierce 2003: 236, Records of the Russian-American Company 1853: 216-221).

Starting in June of 1853 until the final voyage in 1860, the career of the ship is covered in considerable detail by the eight surviving logbooks, which also provide many details about the ship (Records of the Russian-American Company 1853-1859: n. p.). The complement of the *Kad'yak* varied in size from twenty-five to thirty people and included a captain, two officers, one supercargo, two boatswains, thirteen sailors, six to eight hands, usually Native Americans, of whom Tlingits were considered the most capable, and occasionally some cabin boys. The ship was provisioned according to the number of crew, which probably indicates that the passengers were expected to take care of their food themselves. On each voyage, the vessel carried a quantity of firewood, used for both heating and cooking. The *Kad'yak* was equipped with two chronometers, compasses and several rowing boats. Four to six cast iron cannons were carried aboard

during some voyages. The vessel drew 14 feet of water, and had an average speed of about four and a half knots.

The cargo and the number of passengers varied greatly depending on the destination. On the inter-colony voyages (June 19-September 28, 1853 and July 20 - September 25,1854), the ship followed the route New Archangel-Unalaska-St. Michael Redoubt- Unalaska -New Archangel, and carried timber, various food supplies and up to fifteen passengers. Company officials on business trips, workers following to their service destinations, seminary students anxious to be reunited with their families during the school break, Russians returning to their homeland, a Lutheran pastor visiting the believers in remote Alaskan outposts, a homebound San Francisco merchant, and traveling Native Americans ventured into the North Pacific aboard the *Kad'yak*.

The first captain of the *Kad'yak*, Vasilii Gerasimovich Pavlov, was a rather prominent figure in the Russian-American Company. Born in St. Petersburg around 1808, he first came to Sitka in 1839 as a hired navigator. His professional skills ensured his rapid promotion. In 1843 he became a company skipper. Over the next decade he served as a captain of company ships, making voyages to the various settlements of Russian America and to San Francisco (Pierce 1990:393-394). Pavlov commanded the *Kad'yak* until March 1857. The transfer of the ship's command to captain Hennan Debur in late 1857 was occasioned by Pavlov's departure from the colonies. Eventually Pavlov returned to Alaska and became a manager of the Kodiak office. The social events held in his house (now the Baranov Museum and the Kodiak Historical Society headquarters), constituted the only entertainment the city had to offer to the US Army officers stationed there. Curiously, the last captain of the *Kad'yak*, Illarion Arkhimandritov, was an older brother of Pavlov' s wife.

Ice trade

Beginning in 1853, the *Kad'yak*'s main destination was San Francisco, where the Russian-American Company purchased most of its food supplies, and where a new commercial opportunity arose in 1852. In this year the *Bacchus*, a vessel belonging to the Bostonian Ice Company, arrived in Sitka and her captain purchased two hundred fifty tons of ice at the attractive price (for a seller) of seventy-five dollars per ton (Tikhmenev

1978:335). The ice was intended for San Francisco, where it was required for food refrigeration and other needs of the ever-increasing Gold Rush population. Before 1852 all the ice shipped to San Francisco had been carried around Cape Horn. The transport of ice from Alaska was significantly more cost-efficient. A San Francisco banker named Sanders saw the profitability of this new market, and formed the American-Russian Commercial Company to exploit this new opportunity.

According to the three-year agreement between the Russian-American Company and the American-Russian Commercial Company, the latter was to purchase 1,200 tons of ice annually for the fixed price of 20 to 25 piasters per ton. The American-Russian Commercial Company was also financially responsible for the construction of the ice-house in Sitka and for building a railway from this ice-house to the shore, where the ice was loaded aboard ships (Russian-American Company 1853:23-24). An employee of the Russian-American Company, Petr Stepanovich Kostramitinov, a former manager of Fort Ross, was appointed special agent of the company in San Francisco (Pierce 1990:259-262). In 1854, Sanders traveled to St. Petersburg, where after negotiations with the main office of the Russian-American Company, the agreement was extended for twenty years and included not only ice, but coal, timber and fish. According to one of the articles of the agreement, if both parties agree, ice could be transported on Russian-American Company ships for an additional price (Russian-American Company 1856: 16-17).

The rapid expansion of the Russian ice trade in San Francisco was challenged in 1855 from an unexpected direction. The newly formed North-West Ice Company, which supplied ice from the part of the Russian colonies leased to the Hudson's Bay Company, broke the Russian monopoly on ice in California and pushed the prices down. To overcome this mutually unfavorable situation, the ice companies signed an agreement effective from June 1, 1855. Now the newly formed American-Russian Trading Company transported all ice from Alaska. Three thousand tons were designated for California and were sold to the North-West Ice Company for a fixed price of $45 per ton. The American-Russian Commercial Company agreed to cease all its independent commerce in California, and instead received rights for an exclusive concession "in other countries of Pacific Ocean" (Russian-American Company 1856:20-21). The company's

documents attest that attempts were made to establish the ice trade with Hong Kong and China (Kostromitinov 1858:n.p.).

In 1863, after the contract with North-West Ice Company expired, the Russian-American Company signed a new contract with the American-Russian Commercial Company, according to which the Russians promised to supply 3,000 tons of ice annually at $7 per ton if purchased in Sitka or Kodiak, or $25 and more if delivered to California and Mexico (Keithahn 1969: 176). Although the price went down, the Alaska ice trade remained a profitable business which continued to bloom after the Alaska purchase. The American-Russian Commercial Company continued to deliver ice to California until 1879, when it was finally forced out of business by the advent of artificial ice (Keithahn 1969:185).

Ice was collected initially from Swan Lake, located several kilometers north of Novo- Archangelsk, but the mild winter and rains of southeast Alaska often interfered with Company commercial planning, and Kodiak became an alternative place for ice supply. Here ice was harvested from Icehouse Lake on nearby Woody (Lesnoi) Island. The Russians built a dam 16 ft. high to increase the depth and area of the lake, which made it 22 ft. deep, 2200 ft. long and 700 ft. wide. According to the U.S. Coast Survey's George Davidson, "the ice crop comes to maturity by December; the cutting commencing when there is 12 inches thick of clear, solid ice, and ending in February when it has generally increased to 18 inches" (Davidson 1867:246-247; Keithhahn 1945:179)

A considerable amount of infrastructure was required to support the ice industry. By 1859, two icehouses with a combined capacity of 5,000 tons, a water driven sawmill, roads and a dock were constructed under the supervision of the American builder McPherson (Russian-American Company 1859:44). The main purpose of the sawmill was to make sawdust, used for packing ice, and for insulation between the walls of the ice houses. When sawdust production was inadequate, moss was used for ice house insulation.

Between the icehouses and the lake there was a road 1,320 feet long, with rails for sliding the ice and walkways on both sides for the workers (Russian-American Company 1859:56-57). A blacksmith shop facilitated the works, while barracks provided accommodation for workers, the majority of whom were Aleuts (Whymper 1868:104-

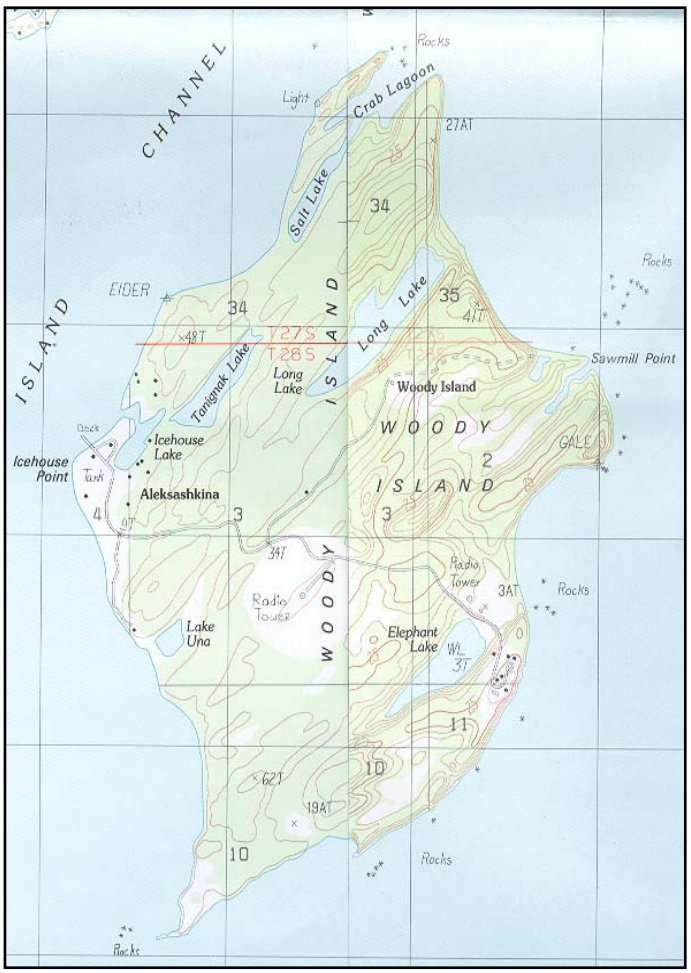


Figure 12. Icehouse Lake is situated on the western side of Woody Island. The pier nearby probably corresponds with the location of the pier built by the Russian-American Company for loading ice on ships (USGS Quadrangles: Kodiak (D-2) SE, Alaska, Provisional edition 1987 and Kodiak (D-1) SW Alaska, Provisional Edition 1987).

105). According to the report of Chief Manager Voevodsky, the most difficult task was building the docks, mainly because of the exposed location of the anchorage and bad weather:

> when the work was almost finished, the main poles of the docks, filled with ballast were eaten by the worms and the docks went 8 feet down. During the entire summer of the last year (1858) and the spring of this one (1859), it was necessary to use significant amount of the materials and workers to strengthen the docks with new poles and fastenings, which was successfully achieved. Last year (1858), being tied at these docks, the English ship *Karntine* (1,200 tons) and our ship *Kad'yak*, experienced strong winds, but remained out of any danger, and according to the reports of the lieutenant Verman and the explanations of the builder MacPherson, I am confident that the loading of the ships at these docks is

completely safe and very convenient (Russian-American Company 1860:112-114).

The first record of the *Kad'yak*'s involvement in the ice trade is the log of her voyage to California between January and March of 1857, when she brought 300 tons of ice to the port of San Francisco (Russian-American Company 1858:25). Following that voyage, trips to the Bay Area became her annual routine. The main cargo was ice, but occasionally she would bring to California furs, timber, salted fish and tallow candles. On her return voyage she carried flour, corn beef and other provisions. The *Kad'yak* logs for 1857-1859, indicate that during this period she visited the port of San Francisco six times. In 1858 and 1859, she was likely the only Russian-American Company vessel carrying ice to San Francisco. Despite the fact that 20% of the perishable cargo melted during the trip, prices fell to six dollars per ton. Trade in ice was still considered to be a profitable undertaking for the company in 1859 (Records of Russian-American Company 1860: N298).

The voyage to San Francisco via Kodiak usually took about four months. About twenty days after the Company steamer *Nikolai I* towed *Kad'yak* out of Sitka harbor, the bark would drop her anchor at St. Paul' s Harbor on Kodiak. Several days were reserved for unloading the cargo for the local settlement and loading ice on the nearby Woody (Lesnoi) Island. Perhaps due to the favorable winds and currents, the voyage from Kodiak to San Francisco as a rule took only about five weeks. The ship was received by the California agent of the company, who was responsible for unloading cargo, provisioning the crew and bringing aboard goods for delivery to Alaska.

Last voyage

The winter of 1860 was hard for the inhabitants of Sitka. Duke Maskutov reported that rain did not stop for two months, completely melting the ice on the lake. "In addition to this unpleasantness," an epidemic flu interrupted the port's normal functioning. The daily toll of the sick was up to 300 people (Records of Russian-American Company 1860: N21). All this resulted in a delay for the *Kad'yak* and an alteration of her route. Instead of going directly to San Francisco, she was to call at Kodiak Island and load ice, which was not available in Sitka at that time. According to the agreement between the

Chief Manager and Kostramitinov concluded earlier the same year, the latter would have the ship during the entire summer of 1860 under the condition that he provision her and pay the crew's salary (Records of Russian-American Company 1860: N92, 21).

Loaded with timber for construction of a new icehouse on Woody Island, the bark left Sitka for the final time on February 27, 1860. It was the *Kad'yak*'s first voyage under Captain Illarion Arkhimandritov. Arkhimandritov was among the most experienced captains of the Russian-American Company. A son of the Russian company employee Ivan Arkhimandritov and his Aleut wife Natalia, Illarion was born in Alaska on St. George Island. In 1832, he enrolled in the School of Merchant Seafaring in St Petersburg. Upon his return to Alaska, he was hired as a navigator (Pierce 1990:10). His name first attracted the attention of the company's authorities both in Sitka and St. Petersburg in 1842. That year the ship *Naslednik Alexander*, on which Arkhimandritov served as a navigator, encountered a severe storm. After both the captain and the first mate perished, Arkhimandritov assumed command and saved the ship. His brave action earned him the Order of St. Anna (Tikhmenev 1978:363-364). During his two decades of company service, Arkhimandritov not only commanded ships, but also took an active role in charting the coasts of Russian America. His maps of Cook Inlet, Kodiak Island, and many other areas were published in Teben'kov's *Atlas of the Northwest Coasts of America* (1852).

The voyage began smoothly. Following safe arrival at Kodiak Island three weeks later, the ship took on board a cargo of 356 tons of ice for San Francisco, and put to sea from Woody Island on March 30. The perfect weather and favorable winds gave no indication of the misfortune that awaited the *Kad'yak* shortly after her departure. Almost within sight of the port the vessel hit an uncharted submerged rock (Records of Russian-American Company 1860: June 22, N9). The dispatch from Novo-Arkhangelsk from December 22, 1860 described the disaster:

> During the navigation of 1860 the Russian-American Company bark *Kad'yak* under the command of the Russian skipper Arkhimandritov was sent from Novo-Arkhangelsk to Kodiak for the cargo of ice for San Francisco. Leaving the St. Paul harbor under the benevolent circumstances, the bark took the direct, or NE route to the sea, and being SW 30° [according to] the right compass from the "Vasilievskaia polivnaia banka," at the distance of 1 1/4 Italian mile touched the

> bottom moving with the speed of 4 knots, and without stopping immediately found itself again with 15 sazhen (90 ft) under the keel. The leak appeared immediately in the hull and in 20 minutes the ship, filled with the water, laid on its side, and submerged to the level of the water. The crew of the *Kad'yak*, which consisted of twenty- five people, saved itself on two boats, taking nothing with themselves. After this the bark was carried by the free waves in view of the inhabitants of Kodiak for three days, but the St. Paul harbor lacked both manpower and means to tow the perishing ship to the nearest coast, and it finally went down to the bottom 1/2 mile from the Spruce Island in the depth of 12 sazhen (68 ft) with all its cargo, crew's personal belongings and full ammunition. As it was mentioned above, this unexpected loss occurred from the collision at 4 knots with the unknown submerged sharply pointed rock, which at low tied lays at the depth of 10 ft. It is strange, that the inhabitants of Kodiak until now did not notice that the water breaks above this rock, and some maps even show the channel in this very location. Maybe this rock grew just recently. Although I think that in our colonial seas there are many such new rocks. If the bigger ships sailed more often, they would show to us where the passage is clear and there is not; but from such discoveries let God protect me! (Morskoi Sbornik 1861:204-205)

The official description of the wrecking in the annual report of the company states that the *Kad'yak* left from Woody Island, not from Kodiak Island. According to the report, the ship was holed in the bow, and consequently began to go down stem first. Captain Arkhimandritov stayed aboard until the very last moment, and even when the ship lay on its side he remained close by on the boat, looking for ways to save as much as possible from the ship (Russian-American Company 1860:53-56). The loss of the ship, appraised at 18,386 silver rubles, was a major loss for the company. The insurance paid by the American-Russian Commercial Company for the ice was the only, and very partial, recompense (Russian-American Company 1861:56). Even the official, reserved tone of the company manager's letter sent in response to Arkhimandritov's report about the ship's wrecking reveals how furious the authorities were:

> After the careful examination of your report of June 5, 1860, I still can not see that you have applied any efforts to tow the bark to the favorable coast, using the fair currents and calm of March 31 and April 1, that seems to me have been possible to accomplish, taking into consideration that the port had four launches, three row-boats and 35 baidaras. I also do not see, why did not you try to anchor the bark at the reef at Spruce Island, where she was sitting at low tide, from which location without any doubt it would be possible to move her towards the coast at the time of high tide. I suggest that you provide me with a more detailed report in order to bring appropriate clarity to the above-mentioned matter (Records of the Russian-American Company 1860: June N 2).

Whether the further report removed the shade of guilt from the captain, or the excellent record of his previous service was taken into consideration, Arkhimandritov was never officially charged for the loss of the *Kad'yak*. Legend, however, attributes the disaster directly to him, pointing out not the weakness of his navigational skills, but of his piety. According to this popular account, Arkhimandritov neglected his promise to the wife of the Chief Administrator Voevodskii, to hold a memorial service in the chapel of Farther Herman on Spruce Island every year when he made his first trip to Kodiak (Golovin 1983:126-127).

Father Herman, later canonized as the only saint of the Russian Orthodox Church in Alaska, arrived on Kodiak Island at the end of 1794. As a member of the missionary team he participated in evangelizing and educating the Alaskan natives. Some time between 1808 and 1818, Father Herman chose Spruce Island as his home. He was much respected by the local Aleuts, on whose behalf he frequently interceded before the authorities. He organized an orphanage for local children and built a little chapel not far from his dwelling to accommodate the spiritual needs of his newly converted flock. Local tradition attributed to him many miracles. According to one of them, after an earthquake the island began flooding from steadily rising water. In fear of perishing, the inhabitants ran to the monk pleading for his help. Father Herman took an icon of the Mother of God, placed it on the sand of the nearby bay and began to pray. He then told to the people not to fear for the water would not go further than the place where the icon stood. The sea reached that point and went no further. With the fulfillment of this prophecy, the bay received the name it still bears today, Icon Bay (Golder 2004:33-34). It was in this very bay that the *Kad'yak* sank after drifting for three days.

The top of the ship's mast and a spar protruded above the water forming the sign of the cross, visible from the chapel on Spruce Island, as if the ship herself was performing the homage neglected by her captain. Nor was this the last of Arkhimandritov's misfortunes. Just a year later, he grounded another company ship, the *Tsaritsa*, while taking her to the open sea from the port of Novo-Arkhangelsk. Furujujelm, the Chief Manager of the company at the time, was so affected by all of this, that despite his Lutheran confession, he "resolved to give an icon to the chapel on Elovoi

Island" (Golovin 1983: 127). One will not, however, find the legend of the *Kad'yak* in the official life of St. Herman. Although the circumstances of the *Kad'yak* sinking were indeed miraculous, they did not fit comfortably with the image of a benevolent and forgiving holy man.

Figure 13. A modern Icon of St. Herman

Arkhimandritov himself probably believed in a connection between his sudden bad luck and his broken promise, for in 1869 he donated an icon of St. Nicholas, the patron of all sailors, in a silver riza to the chapel on Spruce Island (Arkhimandritov 1869:n.p.n.). The elders of Ouzinkie village still remember this "big, dark icon," which according to them decorated the chapel at Icon Bay until its mysterious disappearance sometime in the 1980's (Nicholas Pestrikoff 2004, per. comm.).

These devotional gestures were not the company's only attempts to improve navigation around Kodiak Island. Almost immediately after receiving a detailed report from Arkhimandritov, the company's Chief Manager wrote to his agent in San Francisco, asking him to place an ad with the bearings of this newly discovered navigational hazard in the San Francisco newspapers (Records of Russian-American Company 1860:N19). Moreover, anticipating arrivals of several company freight ships, including the brig *Shelikof*, orders were given to keep a baidarka immediately next to the rock to warn all approaching vessels. Eventually red and blue buoys were placed near the hazard, which together with the lighthouse at the top of the Baranov Castle in Sitka, were the only aids to navigation in Russian America (Gibbs 1997:30). The company's efforts yielded a long-lasting result, as modern detailed charts of the coast show Kodiak Rock, described in the *Coast Pilot* as an obstruction covered with 4.5 ft. of water and located

"about halfway between Long Island and Williams Reef" (National Oceanic and Atmospheric Administration 2005:251).

In another effort to improve local navigation, the company manager appointed Captain Arkhimandritov to chart the coast of Spruce Island. Using three baidarkas and the help of six Aleuts, Arkhimandritov successfully accomplished this mission in the summer of 1860. The bearing he provided for the protruding mast of the *Kad'yak* is the last appearance the ship makes in the records of the Russian-American Company (Arkhimandritov 1860:n.p.). The same bearing was used to help locate the sunken *Kad'yak* in July 2003, opening a new page in the history of the vessel.

PREVIOUS INVESTIGATIONS

The *Kad'yak*'s discovery was the culmination of years of work by different researchers. Research initially began in 1979, prompted by a reference to the ship and it's sinking in Tikhmenev's *History of the Russian-American Company* (1978). Providing that the *Kad'yak* was the only Russian-American Company ship to sink virtually intact, and that the location of wrecking was fairly accurately described, there was a reasonable chance the vessel could be found and identified. Assessing the potential for shipwreck archaeology in Alaskan waters, the well-known historian of Russian America, Richard Pierce, wrote: "information is lacking on the location, circumstances, and even the dates of many of the wrecks. And even where the site can be ascertained, it is usually unlikely - except possibly for the *Kad'yak*, that anything will now be found" (Pierce 1983:68). Using Tikhmenev's publication, Alaskan archaeologist Michael Yarborough began to collect information regarding this vessel, contacting archivists and historians of Russian America. The ship's logs covering the period from July 1853 to December 1859, and the wreck report dispatched from Kodiak to Sitka preserved among the Russian-American Company documents in the National Archives, provided the initial information for the

Figure 14. Anchor discovered in July 2003. Photo by Bradley Stevens.

search (Yarborough 1983:1-2). In April of 1980, a team led by Anchorage photojournalist Dennis Cowals and including divers Marc Waszkiewicz of Ketchikan, Randy Hahn of Anchorage, and Monte McPherson of Palmer, undertook the first search for the *Kad'yak*

(Anonymous 1980:63). The searchers built a metal-framed vehicle to tow divers through the water, but the tow cable broke and the device was lost. The search continued with divers doing a swimming survey which was unsuccessful. Due to medical reasons, Yarborough was unable to participate in the project (Evguenia Anichtchenko 2005, per. comm.).

Further historical research brought Yarborough's attention to another document, a hydrographic survey of the Kodiak area conducted by Illarion Arkhimandritov, the *Kad'yak*'s last captain. The bearing he took to the vessel's mast protruding from the waters of Icon Bay while charting the coast of Spruce Island provided new information regarding the location of the shipwreck. Dr. Katherine Arndt of the University of Alaska subsequently translated a part of this survey, and a new attempt to find the *Kad'yak* took place in May of 1983. The second search was made possible with the help of the Kodiak Historical Society, the Kodiak Russian Orthodox Church, divers of the Kodiak police and fire departments, and the Alaska Sport Divers Association (Yarborough 1983:4). This attempt also failed to locate the vessel's remains.

In 1991, Michael Yarborough sent Dr. Arndt's translations to Dr. Bradley Stevens of the National Marine Fisheries Service, in Kodiak. "Dr. Stevens was fascinated by the story of the *Kad'yak*, and made two preliminary explorations. In 1992, he explored the outer part of Icon Bay with a 2-person submersible; while no wreckage was found, he did learn that the bay bottom was mostly sand and gravel, the water visibility was relatively clear, and that the bay was surrounded by rocky reefs which probably prevented the vessel from being washed out to deeper water. All of these findings encouraged a larger scale search" (Bradley Stevens 2005, elec. comm.). He again explored the waters near Spruce Island with a remotely operated vehicle in 2001, but did not find any wreckage.

"The information contained in Captain Arkhimandritov's survey of Spruce Island was enticing, but incomplete. Most notably, his references to local landmarks were difficult to interpret, as they did not match up with currently used names. In addition, his method of recording sailing directions was unusual. Captain Arkhimandritov did not write his bearings using 360 degree notation, but used quadrants instead. For example, one of his first bearings, from the southeast end of Spruce Island to the right promontory of Monashkina (Monashka) Bay, is SW 5." In order to interpret this bearing, three

assumptions were made by Dr. Stevens: 1) "5 degrees SW", implies a bearing away from the cardinal directions of N or S, i.e., 5 degrees W of S (185 º magnetic); 2) All bearings were magnetic and must be corrected to true; 3) magnetic variation was 22 º, equal to the difference between his stated bearing (185 º) and the true bearing to Monashka Cape (207°). However, one of his bearings to Melnichnya Cape (Miller Point) is SE 45. This is a critical bearing, but the adjusted bearing of 157 º is almost a direct shot to Spruce Cape, rather than to the cape now known as Miller Point, at a bearing of 168, or SE 33. Spruce Cape was identified in the Teben'kov Atlas of 1852, so has been associated with the local landmark since at least that time. If Arkhimandritov's bearing to Miller Point was inaccurately adjusted, or if he identified the cape erroneously, the remainder of his bearings would be un-interpretable" (Bradley Stevens 2005, elec. comm.).

In July 2003, Dr. Stevens met and interviewed Dr. Lydia Black, a noted historian of Russian America. At that time, she provided him with a copy of a navigational survey completed by Captain Arkhimandritov in 1848 that showed "Melnichnyi cape" at the position now occupied by Spruce Cape. This information suggested that Arkhimandritov knew Spruce Cape by a different name, and that Dr. Stevens' interpretation of the

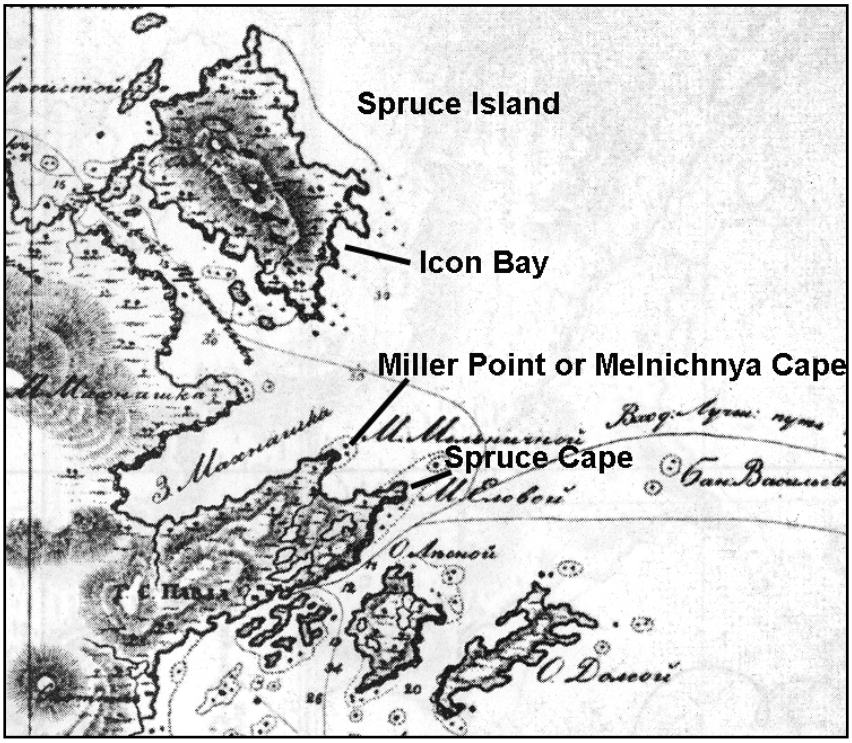


Figure 15. Teben'kov's Atlas (1852) shows the modern location of Miller Point and Spruce Cape. Arkhimandritov misidentified Spruce Cape as "Melnichnyi cape" in his coastal survey. This led to confusion when Dr. Stevens tried to interpret Arkhimandritov's bearing to the *Kad'yak*'s mast.

Figure 16. Diver Bill Donaldson hovers over a cannon discovered in July 2003. Photo by Bradley Stevens.

bearings was correct. Application of similar corrections to the remaining bearings finally allowed an accurate interpretation of the bearings from Captain Arkhimandritov's hydrographic survey, leading to the final bearing to the mast of the *Kad'yak*. With this new evidence, Dr. Stevens organized a group of volunteer divers to search for the *Kad'yak* site in late July 2003, with support from the Kodiak Historical Society. Participants included Bradley Stevens, Dave McMahan, Bill Donaldson, Steve Lloyd, Josh Lewis, Stacey Becklund, Stefan Quinth, and Ola Angervall. Using a magnetometer and searching with scuba divers, wreckage was located. Divers saw several anchors, cannon, the ballast pile, and recovered several drift pins and hull sheathing to help identify the vessel (Bradley Stevens 2005, per. comm.).

A conflict developed among two members of the group who wanted to claim ownership of the site. This controversy quickly ended when the state of Alaska asserted authority under the Abandoned Shipwreck Act of 1987 which gives ownership to states of all embedded and abandoned vessels within state territorial waters out to three miles.

Timothy Runyan, Director of the Maritime Studies Program at ECU, became aware of the shipwreck through correspondence with Bradley Stevens. This eventually

led to a commitment to find funding for research on the site. Working through the Alaska Department of Natural Resources, Office of History and Archaeology, East Carolina University obtained archaeology permit #2003-22 allowing for archaeological survey, testing, excavation, and artifact removal. All artifacts remain the property of the State of Alaska. With grants from the NOAA Office of Ocean Exploration and the National Science Foundation the current investigation was planned for July 2004. At the same time the Office of History and Archaeology submitted a nomination to place the *Kad'yak* on the National Register of Historic Places. The Keeper of the Register approved the nomination and on July 14, 2004 placed the *Kad'yak* on the Register.

Concurrent with plans to investigate the shipwreck Evguenia Anichtchenko, a student in ECU's Maritime Studies Program, traveled to Europe in September 2003 to research the history of the *Kad'yak* and the Russian-American Company. She located construction documents for the *Kad'yak* and her sister ships in Lübeck, Germany in the records of the Hans Jacob Albrecht Meyer Shipyard. These and other documents uncovered in the Russian Naval Archives in St. Petersburg provided detailed information on the *Kad'yak*.

In preparation for the 2004 field season a team of archaeologists from ECU and NOAA dived the wreck site in February 2004. They traveled to Kodiak from Anchorage where they had participated in the state's first shipwreck management workshop. Among the workshop participants were Jeff Gray (NOAA), Lt. Jeremy Weirich (NOAA), John Jensen (private consultant), Michelle Aubrey (National Park Service), Barbara Voulgaris (Naval Historical Center), Timothy Runyan (ECU), Frank Cantelas (ECU), Evguenia Anichtchenko (ECU), David McMahan (State of Alaska), and Bradley Stevens (NOAA). After the workshop Gray, Weirich, Anichtchenko, Stevens, Runyan, and Cantelas traveled to Kodiak to examine the wreck site. A number of critical observations were made that aided in the development of a research design. The site appeared to be the remains of a mid-nineteenth century shipwreck. Materials examined included muzzle-loading cannon, two anchors, part of a windlass, and the remains of the lower hull covered by a ballast pile. The observations made on the site visit are presented in detail in the research design chapter.

RESEARCH DESIGN

Prior to the 2004 investigation there was good evidence to suggest that the shipwreck found in Icon Bay in 2003 was the *Kad'yak*, yet there was no conclusive proof. A research design was created to guide the field investigation using available information with the goal of identifying the shipwreck. Integral to the research design is a series of questions or hypotheses formed using historical accounts of the *Kad'yak* and direct observations made during a dive on the site in February 2004 by a team of archaeologists from ECU and NOAA. The validity of the hypotheses can be tested based on the findings of the archaeological investigation. The field investigations were guided by a series of objectives designed to gather the proper information to address the hypotheses.

Historic sources

Vessel history provides information on construction, use, repairs and loss that may be reflected in the archaeological record. The *Kad'yak* was built in Lübeck, Germany by Hans Jacob Albrecht Meyer's shipyard in 1851. The three-masted vessel was bark rigged, copper sheathed, and measured approximately 132 ft. in length, 28.8 ft. in beam with a 19.2 ft. depth of hold (Archiv der Hansestadt Lübeck:1851-1852, n.p.n.). She arrived at Novo-Archangelsk (Sitka) on May 7, 1852. During her tenure in the North Pacific, *Kad'yak* was repaired and modified as revealed in the correspondence of the Russian-American Company. In the years 1852, 1853, 1857, and 1859 the vessel was hauled out of the water to repair the bottom and the copper sheathing. New masts and spars were installed in 1857. At various times the vessel carried 4 to 6 cast iron cannon (Records of the Russian-American Company 1853-1859).

On her final voyage, the *Kad'yak,* under the command of Illarion Arkhimandritov, was transporting a cargo of ice from Kodiak to San Francisco. On putting to sea from Woody Island near Kodiak on March 30, the vessel hit an uncharted submerged rock. Within 20 minutes she heeled over on her side submerged to the level of the water. The crew of 25, including Captain Illarion Arkhimandritov, abandoned ship and reportedly took nothing with them. The *Kad'yak*, kept afloat for three days by her cargo of ice,

drifted towards Spruce Island and sank in Icon Bay on April 2, 1860. The mast of the ship protruded above the water and was visible from the coast of Spruce Island.

Several months later, Captain Arkhimandritov was commissioned to chart the coast of Spruce Island. His notes with a compass bearing to the protruding mast of the *Kad'yak* were instrumental in locating the vessel in 2003. To date, no records have been found recording the loss of a vessel of similar size in Icon Bay.

February 2004 reconnaissance dive

On a brief reconnaissance dive made by the investigators in February 2004, the shipwreck in Icon Bay appeared to be the remains of a mid-nineteenth century vessel. Materials examined included muzzle loading cannon, two anchors, part of a windlass and the remains of the lower hull covered by a ballast pile. An intact section of the wooden lower hull consisted of floor timbers partially covered by sand and ballast. Drift pins made of a copper alloy were used as fasteners. The outer extent of the hull remains were covered in sand and their limit could not be determined. Several drift pins and fragments of hull sheathing recovered during the previous summer were examined in the state archaeology lab. The pins appear to be copper alloy and the hull sheathing is yellow in color like Muntz metal. This conforms to the historical account of the *Kad'yak* having a copper sheathed hull.

The ballast pile consisted of concreted rock rising one to two feet above the lower hull. The rock appeared to be rounded stream cobbles mixed with a variety of artifacts securely embedded. Two anchors were observed in close proximity to one another. Although they were not measured they appeared to be wooden stock Admiralty pattern anchors and range 4 to 7 feet in length. The wooden stocks have deteriorated and disappeared. The remains of a windlass were also found near the anchors suggesting that this area is the vessel's bow. The windlass fragment appears to be the chain lift made from cast iron. It is a short cylinder with an octagonal- shaped hole through the center to fit around the barrel of a windlass. The outer surface is formed to fit chain links in order to provide purchase when raising the anchor. A pile of chain lay next to the chain lift with links approximately 4" long. Other artifacts observed on the site include two muzzle loading cannon. They have short barrels but were not identified.

Summary

The site is a wooden shipwreck partially buried under the sand. The vessel was armed with cannon and has no engine which suggests it was powered by sail. Copper sheathing and fasteners give a post 1770 construction date. Following the British Navy's experiments with copper sheathing in the 1760's, sheathing was slowly adopted by the maritime community. Use of the material was widespread by the nineteenth century, especially after the development of Muntz metal, a cheaper copper alloy, in 1832 (Staniforth 1985:27).

Improvements in industrial manufacturing in the nineteenth century were reflected by improvements in anchoring tackle for ships. Anchor shanks became shorter and the crowns became heavier and rounded. Admiralty pattern anchors developed by the British became a popular style about 1840 and their use was widespread. Prior to the nineteenth century most vessels employed hemp line for anchor cable. Chain cable came into general use during the second quarter of the nineteenth century. The shipwreck in Icon Bay is outfitted with chain cable and her anchors appear to be admiralty pattern or a similar short stock design (Cotsell 1856: 15).

In combination, these features suggest a mid-nineteenth century date for the shipwreck. This corresponds with historical evidence of the *Kad'yak*'s loss in Icon Bay making the *Kad'yak* the most likely identity of the shipwreck.

Research hypotheses

A series of hypotheses were developed to guide field research. Each hypothesis is presented along with possible archaeological evidence that would support its validity. The focus of these hypotheses is to establish the vessel's relationship to the Russian American Company and ultimately identify it as the *Kad'yak*.

1) Is this a mid-nineteenth century vessel?
    A) The hypothesis would be nullified if vessel construction includes techniques and materials that postdate or predate the mid-nineteenth century.

B) Evidence of industrialized shipbuilding practices.
   1) Standardized scantlings
   2) Copper hull sheathing
   3) Machine made fasteners
   4) Use of roves or clinch rings on fasteners
C) Artifacts from mid-nineteenth century
   1) No artifacts manufactured post 1860

2) Is this a northern European built ship?
   Analysis of the wood can identify the types of trees used in construction. The growing range of these trees may indicate in what region of the world the vessel was built.
   A) Not accounting for repairs, the majority of wood species used in construction will have European origins
   B) Non-native European wood species indicates construction outside Europe and means this is not the *Kad'yak*

3) Is this a Russian-American Company vessel?
   Dating the vessel can place it within the Russian colonial period, but not verify ownership. If it contains materials found on Russian-American Company vessels this would provide circumstantial evidence of ownership or company use.
   A) Any evidence indicating ownership by someone else would nullify this hypothesis.
   B) Presence of a packing seal, metal, or any other item marked with the Russian-American Company name or symbol would support ownership by the Company.

4) Is this the *Kad'yak*?
   A) The presence of artifacts marked with the name *Kad'yak* would confirm the site's identity.

B) Discovery of *Kad'yak*'s two chronometers, marked N739 and N803, would positively identify the site (Records of the Russian-American Company 1853-1859).

C) The *Kad'yak* was a bark-rigged ocean-going vessel with a tonnage of 238 ¼ kommerzlast which converts to 477 tons. A German vessel of this tonnage would measure approximately 130 ft. in length and 29 ft. in beam (Kresse 1969: 209). If the shipwreck has similar dimensions it would support the identity of the *Kad'yak*.

D) *Kad'yak* often carried 4 to 6 cast iron guns. The presence of no more than 6 guns would support the hypothesis. The hypothesis would be further supported if the guns were made in a Russian style or had Russian markings.

E) The presence of artifacts marked with the names of known crew members would confirm the site's identity.

F) On her last voyage *Kad'yak* took on a load of ice for San Francisco. The presence of tools and features for handling ice would support the hypothesis.

G) Further supporting evidence would be modification in the ship's structure to accommodate a cargo of ice. These modifications may include bulkheads in the fore and aft ends of the cargo hold and an elevated floor above the ceiling and keelson.

Objectives completed during the 2004 field season

Completing the major project objectives made it possible to gather the data necessary to address the research hypotheses.

1. After identifying the general layout of the site two permanent datum were established and a baseline set along the longitudinal axis of the site.

2. The site was subdivided into mapping grids and trilateration and offset measurements used to map artifacts and features.

3. Large diagnostic features and artifacts were drawn separately with attention to recording details.

4. All major features of the site were documented using digital video and digital still cameras.

5. As work progressed mapping data was transferred to a site map and any discrepancies resolved.

6. Wood samples were taken from major components of the surviving hull.

7. Eleven diagnostic artifacts were recovered. Selection was made in consultation with the staff of the Alaska Department of Natural Resources, Office of History and Archaeology. The material was identified, mapped, and photographed before removal and conservation. Selection criteria included:

Threat of loss if left on the site
Value as a diagnostic artifact
The cost and complexity of conservation treatment

8. Major features on the site were marked with a buoy and a position obtained with GPS.

9. A Kodiak Public School teacher developed lesson plans as part of the public outreach component of the project.

METHODOLOGY

Field methodology

This investigation constitutes the first archaeological documentation of the *Kad'yak* and was limited to a non-disturbance survey to determine the nature of the site and to assess the physical condition of the remains. Field methodology specifically minimized impact. With the exception of cleaning sand away from exposed timbers by hand-fanning no excavation was undertaken.

The site is divided into Areas 1 and 2. Area 1, the portion of the *Kad'yak* first discovered, contains wooden hull remains, ballast stone, anchors, cannons, and small artifacts. Area 2 is a linear debris field located northeast of Area 1 that was found at the end of the field investigation. Because this outlying area was initially unknown most of the field activities were concentrated in Area 1.

In order to document Area 1 two site datum were established so that a baseline anchored to each datum was aligned along the approximate longitudinal axis of the vessel. Considering the rock substrate and the vertical relief on the site, datum stakes were not set in the bottom. Instead, small tripods made from reinforcing rod were welded together and placed on the bottom. The baseline, made from Kevlar to minimize stretching, was placed between the tripods and tightened. The tripods proved very stable and were left in place at the end of the project. Near the end of the project, datum points in Areas 1 and 2 were buoyed and a position recorded with a GPS.

The reference grid for mapping used the graduated baseline with offset measurements to the north and south (ex. baseline 120 ft. north 7 ft.). The site was mapped using trilateration and offsets with measurements in feet and tenths of feet. Measurements were taken with fiberglass tapes and recorded on Mylar sheets using a number 2 pencil. Mapping data was transferred to a large site map and examined for inconsistencies. Problems were addressed by reexamining the area in question a second time. Individual detailed drawings were made of large artifacts such as the anchors and windlass.

A dedicated photographer recorded the daily activities on the boat and underwater. All features of the site in Area 1 were recorded in detail including hull

structure, ballast pile and artifacts using a Nikon D-100 6-megapixel digital camera, with a 12-24mm wide angle lens in an underwater housing. The photographer also used a Sony VX-2100 three chip digital video camera with 50-watt HID lights for illumination. This equipment worked well, but camera problems plagued the photographer on the one day allotted to examine Area 2. The quality and amount of photographic documentation in this area was minimal.

Two remote operated vehicles (ROV) were available to survey surrounding areas for additional wreckage. Survey of the surrounding areas was a goal of the project but met with limited success. ECU provided a small ROV built by Nova Ray, Inc. but this unit flooded during its initial trials and had to be removed from the water. On the last day of the project a Phantom HD-2 ROV was used to help explore Area 2 along with visual surveys made by divers. The ROV collected video during the exploration which identified a number of artifacts that were inspected by divers. This system augmented the diver's visual survey and covered a greater area than using divers alone.

Area 2, investigated on the last day of field work, only received preliminary documentation in the form of sketch maps, photographs, and video. A 300 ft. measuring tape was stretched from the eastern site datum in a northeast direction on a magnetic bearing of 58°. This bearing roughly follows the base of the northern rock outcrop. Artifacts and features were recorded in relation to the tape.

The fishing vessel *Big Valley*, home ported in Kodiak and captained by Gary Edwards and crewed by mate Bryce Kidd and cook Jessy Kidd, functioned as the work

Figure 17. F/V *Big Valley*. Photo by Timothy Runyan

platform. At 92 feet, *Big Valley* provided work space on the stern for diving, an area to draft maps and draw artifacts, and served as living quarters for most of the field crew. Travel between Dog Bay, Kodiak's harbor for large commercial boats, and Icon Bay took about one hour.

Diving operations took place from the stern of the *Big Valley* which anchored near the site. Divers wore dry suits for protection in the 47°F water except for two members who wore wet suits. Tanks were filled with air at dive shops in Kodiak and divers made two 25-minute dives per day. Water depth was approximately 80 ft. depending on specific location and tide.

Artifact recording and conservation methodology

Eleven artifacts were selected for recovery based on their diagnostic value, the threat of loss if left on the site, and the cost and complexity of conservation treatment. Most of these artifacts are made of copper alloy but also include two wooden artifacts and one composite made of wood and copper alloy. Once identified for recovery, each artifact was photographed *in situ*, its provenience recorded, carefully wrapped for protection, and transported to the surface. It was then placed in fresh water storage at the Kodiak Fisheries Research Center. Before the artifacts were shipped to the Alaska Department of Natural Resources, Office of History and Archaeology, Archaeology Laboratory in Anchorage for conservation, they were photographed and drawn to scale. Upon arrival at the state archaeology lab all of the artifacts were placed in fresh tap water to begin the desalinization process.

Conservation of artifacts from a submerged environment is required to stabilize the material and prevent deterioration during long-term curation. The treatment of material types, whether, wood, iron, copper, or something else, must be tailored to the artifact and can often be a complex, costly process. Conservation cost and complexity were factors in determining the type of material recovered from the *Kad'yak*. Copper alloy artifacts are often very well preserved in saltwater and treatment is relatively simple compared to other material types.

All of the copper alloy artifacts received the same treatment. They were soaked in tap water and a 5% sodium sesquicarbonate to remove chlorides. When chloride levels

reached less than 10ppm the artifacts were dewatered in acetone for 24 hours. A 3% benzotriazole (BTA) solution in ethanol was brushed on and air dried for 24 hours to create a moisture barrier followed by an application of Krylon clear acrylic to seal the surface. Electrolytic reduction was used as needed to remove concretion before treatment to remove chlorides.

Two artifacts were treated with the polymer passivation process to conserve wood. One of these artifacts is a composite copper alloy and wood object and the other one is entirely wood. In this process the artifact is desalinated in distilled water then dehydrated in a bath of acetone. It is then impregnated with silicone oil by soaking for several weeks. This is followed by adding a catalyst to finish the wood treatment. The composite artifact (Artifact 001) was sent to the Conservation Laboratory at Texas A&M University in College Station, Texas for treatment that is expected to be completed in fall 2006. The copper alloy on this artifact will be treated after the wood conservation is completed employing the same processes used on the other copper alloy material.

One wood artifact (012) was soaked in tap water for several weeks then air-dried. Appendix III details the treatment used on the artifacts conserved at the Alaska State Archaeology Laboratory.

The *Kad'yak* is embedded in state bottom lands and is owned by the State of Alaska. This includes all artifacts recovered from the site. Following treatment and stabilization the artifacts were placed in a temperature and humidity controlled environment for storage and accessioned into the Alaska State Museum system.

FINDINGS

The *Kad'yak* site is dispersed over two areas designated Area 1 and 2 located between two rock outcrops (Figure 18 and 44). Area 1 represents the main site and contains most of the archaeological material observed during this investigation. Area 2 lies roughly 130 feet northeast of Area 1 and continues for a distance of over 150 feet. Artifacts in this area represent the vessel's stern.

Area 1 General description

Area 1 was the portion of the site discovered in the search to find the *Kad'yak* in 2003. The iron cannon and anchors located in this area likely caused the magnetometer anomalies that first indicated the site. When investigations began in 2004, Area 1 (Figure 19), as the only known portion of the site, became the primary focus of fieldwork. The largest feature is a sizeable stone ballast pile lying atop an area of exposed wooden hull in the eastern end of the area. The remains of the lower hull extend west beyond the ballast pile and are buried under the sand bottom. A davit and a large iron concretion are located on the north side of the ballast pile. Further west, beyond the lower hull are the windlass and three anchors. Numerous large and small artifacts are scattered around the area but most are concentrated near the ballast pile. The general east-west distribution of artifact material suggests that the vessel came to rest in this orientation.

Ballast

The ballast pile has an elongated east-west orientation. The eastern end lies on the rocky substrate in the narrow gap between the north and south rock outcrops adjacent to the site. Ballast rock in this area intermixes with the local substrate making the margin of the ballast pile indistinct. This intermixing seems to be caused by surge created by water moving through the narrow gap between the rock outcrops. Further west the ballast pile narrows and becomes more distinct. It measures roughly 23 feet long, 14 feet wide, and rises approximately 2-3 feet above the sand and gravel seafloor on the west end. The ballast stones are large rounded river cobbles ranging in size from approximately 0.5 to 2.0 feet in diameter. They are cemented together by marine concretion.

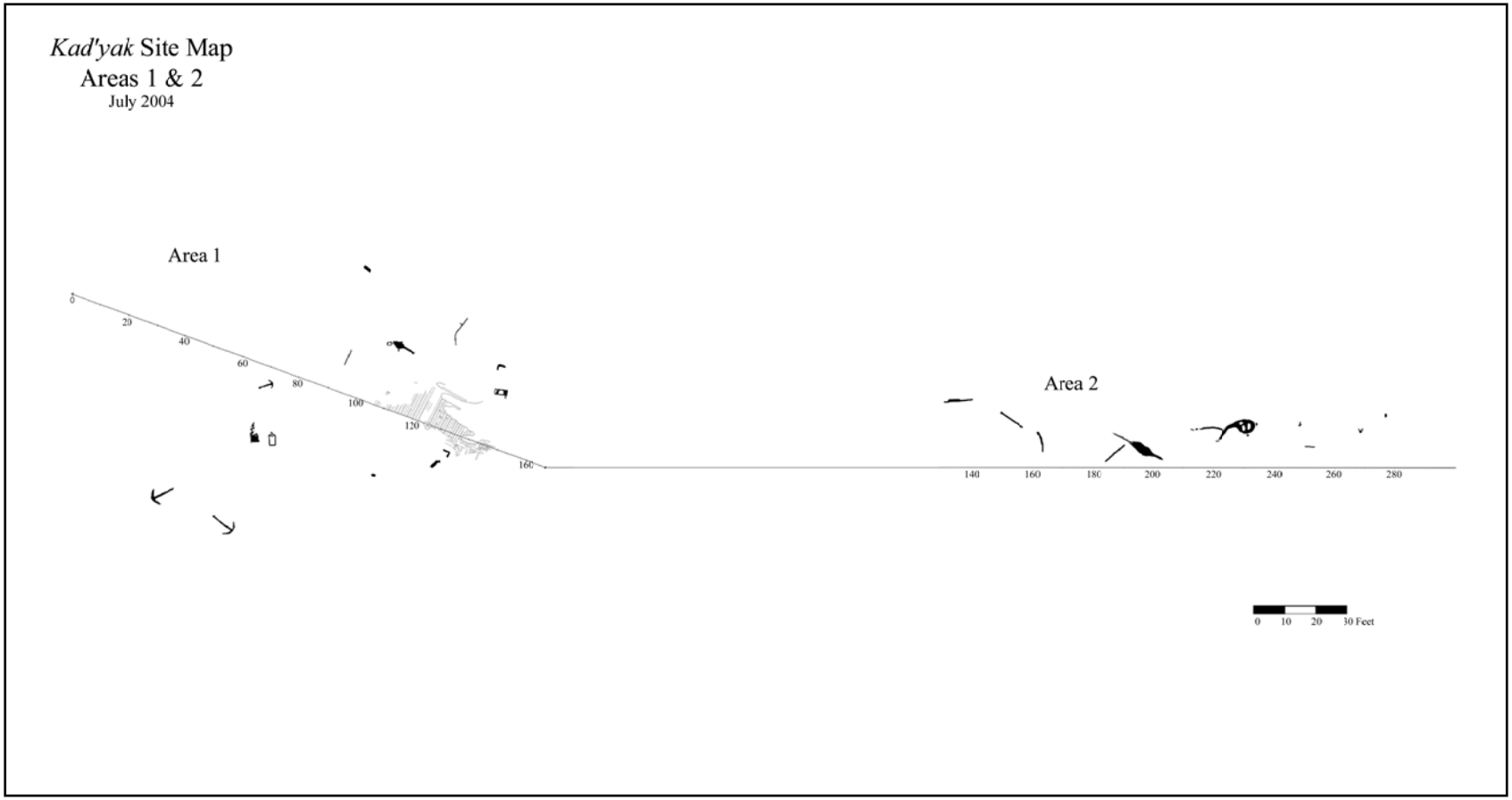


Figure 18. *Kad'yak* Site Map showing Areas 1 and 2.

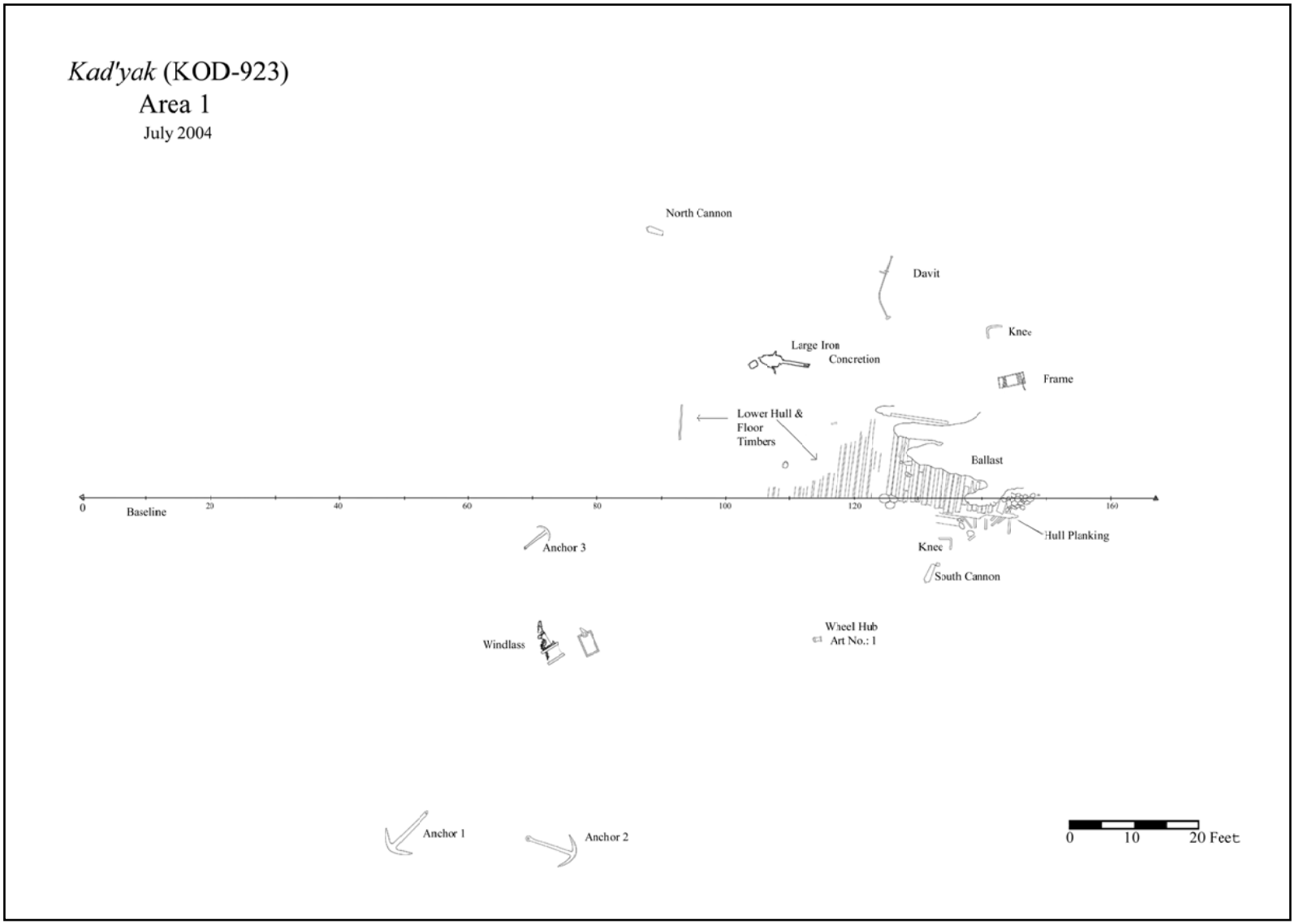


Figure 19. Area 1 Site Map

There are numerous artifacts and concretions among the ballast stones and immediately adjacent to the area. A large concretion of cultural material was found on the north side of the ballast pile. A rectangular copper alloy frame or grating and an iron knee are the largest objects. Small artifacts include a copper alloy valve (Artifact 006) and two unidentified copper alloy objects (Artifacts 004 and 005). Concreted into the body of the ballast pile itself are several lengths of copper alloy tubing and sheeting (perhaps outer hull sheathing), and a short leather strap. Copper alloy drift pins and fasteners are scattered throughout the area

Hull

A portion of the *Kad'yak*'s lower hull extends from under the ballast pile westward, marked by rows of copper alloy drift pins, where it is covered by progressively deeper sand. The sand covering is thin near the ballast pile allowing close examination. The maximum dimensions of the observed hull section were 53 ft. longitudinally (93 to 146 ft. on the baseline) and roughly 14 ft. across. This is an estimated dimension based on observed remains. With most of the hull section buried under sand and ballast it is likely that the full extent of the remaining hull is much larger. No hull timbers are visible on the northeast side of the ballast pile where the rocky substrate displaces the sand.

The top surfaces of the doubled frames are badly eroded suggesting that they are completely exposed from time to time. Because of the extreme deterioration the molded dimension of the frames were estimated by measuring the height of drift pins used to fasten the frame. This measurement gives a molded frame dimension of 1.0 ft. The sided dimension is 0.75 ft. Frames sets are 1.5 ft. wide with a spacing of 0.4 to 0.5 ft. Iron spacers were found in some of the frame sets but no discernable pattern was noted.

The southern edge of the hull section contains a break that allowed the examination of a small area of the outer hull planking. One exposed hull plank measured 1.0 ft. wide and 0.2 ft. thick. Below the hull planking on the vessel's exterior side appeared to be a layer of dunnage.

Kad'yak was historically known to have a copper sheathed hull and copper alloy sheathing fragments were found on the site. Analysis confirms that the sheathing is

Muntz metal, a copper alloy of 60% copper and 40% zinc, which is much more durable than pure copper and cost considerably less. A sample of the sheathing is composed of 62% copper and 38% zinc (Kory Cooper 2004, elec. comm., Appendix II). Muntz metal came into widespread use by the 1840s and 1850s (Staniforth 1985: 27).

Hanging and lodging knees were used widely in ship building so it is likely that the *Kad'yak* contained a large number of knees used to support and reinforce the deck and other structural elements. Two iron knees made of iron were observed but no wooden knees were found. They appear very similar in form with the legs of each knee measuring 2 ft. It does not appear that iron knees were used extensively on the *Kad'yak* for construction. Instead, the presence of only two iron knees suggests that they may represent some special use.

Dunnage was found under the hull planking in the general area of baseline 140 ft. consisting of small twigs and branches along with a number of small wooden artifacts (see Artifacts 011 and 012). The dunnage was probably used as packing and insulating material for the ice cargo.

Windlass

A cluster of large artifacts including three anchors and part of the windlass is located west of the ballast pile. The close association of these artifacts suggests that this is the vessel's bow. This is supported by the orientation of the lower hull section whose frames lie perpendicular to the longitudinal axis of the hull and the rudder hardware found in Area 2 to the northeast which would be the opposite end of the vessel.

The windlass appears to have been constructed of iron and wood, but only iron portions remain (Figure 20). The largest piece is the chain lift or wildcat used for lifting the anchor chain. This cylindrical barrel-shaped object is 2.2 feet wide and 2.9 feet in diameter. The exterior of the cylinder is concave with a series of slots or impressions around the center that provide a positive lock on the anchor chain for lifting. The interior of the cylinder is octagonal in shape, 1.55 feet across, to fit around the wooden windlass barrel. Iron impregnated portions of the barrel are still attached to the wildcat. Two fragments of a square iron bar, measuring 0.25 to 0.3 feet in section are located near each end of the wildcat. This bar is disarticulated but appears to be part of the windlass.

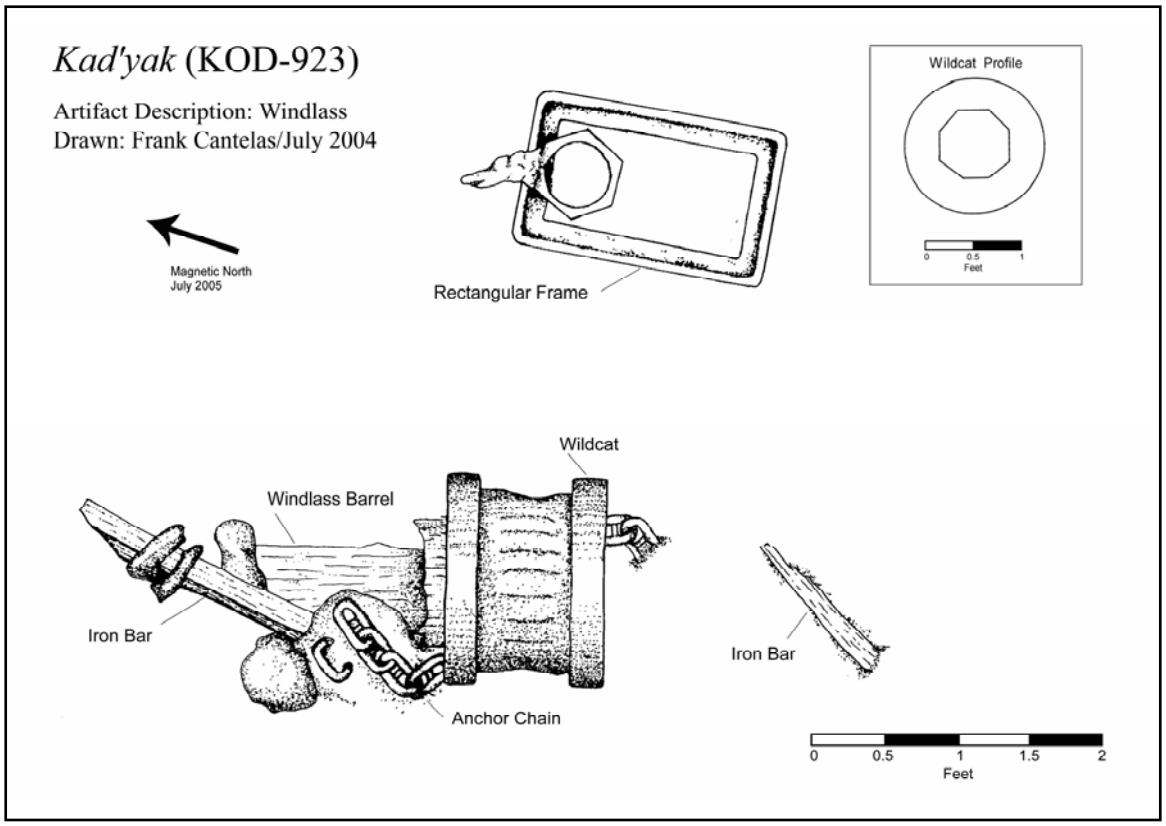


Figure 20. Material associated with the windlass.

Anchor chain is concreted to the wildcat and extends into the sand on each end. The heavily concreted chain measures roughly 0.7 by 0.4 feet. There is no associated steam machinery, suggesting that this was a manually operated windlass.

Frame

A rectangular iron frame is located four feet east (aft) of the windlass (Figure 20). The outside dimension is 3.5 ft. by 2.2 ft. and the inside dimension is 3.0 ft. by 1.7 ft. A small lip is present around the outside edge and the maximum thickness of the frame is 2.4 in. The location of the frame near the bow suggests that it is a hatch combing or a portion of a hatch combing, possibly for the forecastle or forepeak. This is not likely since hatches of the period were larger and built from wood.

Anchors

Three wrought iron anchors mark the western end of the site in the vicinity of the windlass (Figure 21). Two appear to be bower anchors and one a kedge anchor. All the

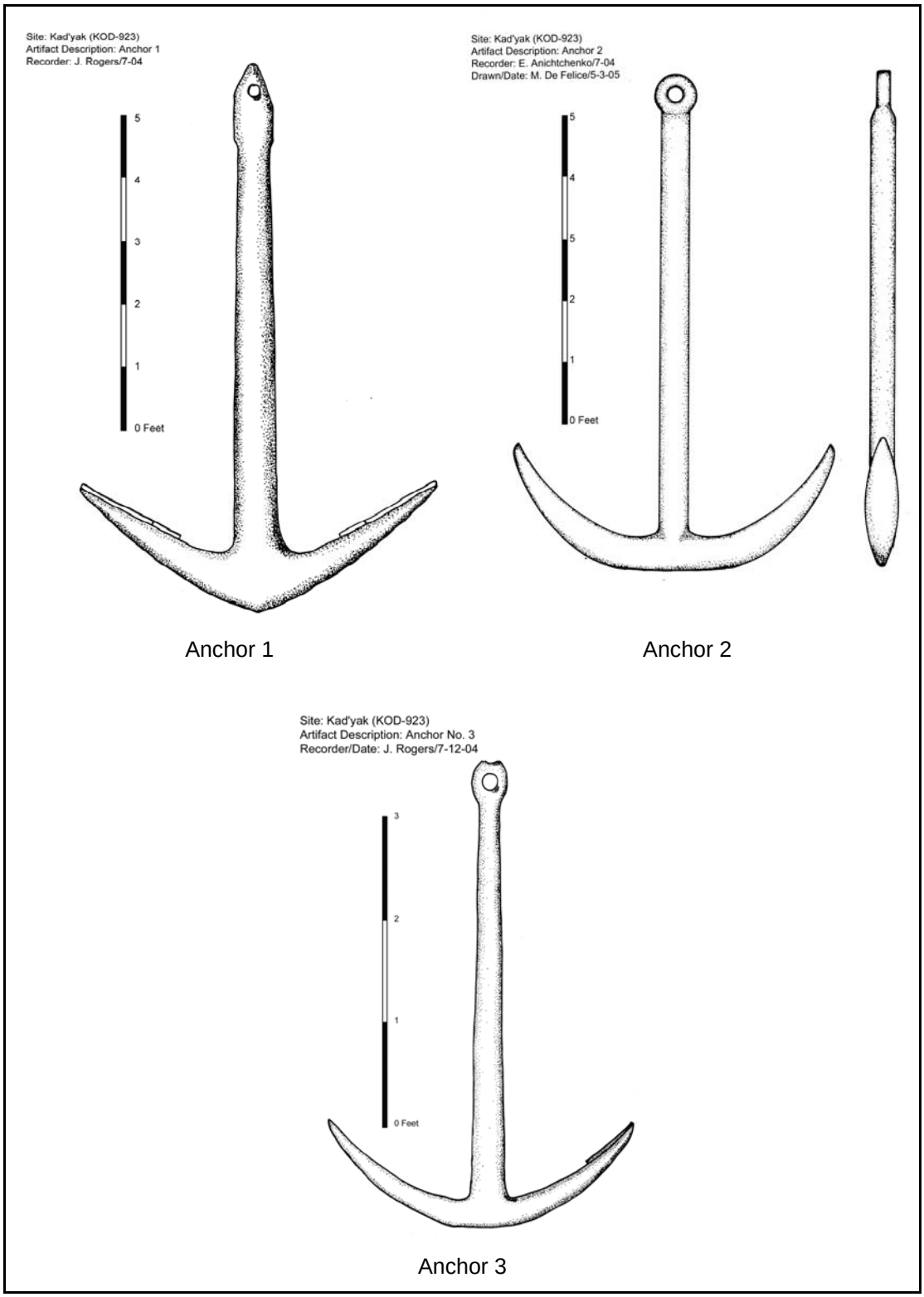


Figure 21. Anchors 1, 2, and 3.

anchors fall south of the baseline and likely indicate the location of the vessel's bow. Anchor 1 measures 8.75 ft. along the shank and 5.5 ft. across the arms. The ring is missing from the hole at the top of the shank and the wooden stock is gone. The arms intersect the shank at an angle of approximately 35 degrees. This anchor is similar to Richard Pering's design in 1813 (Curryer 1999:76).

Anchor 2 is slightly smaller measuring 8.05 ft. along the shank and 5.2 ft. across the arms. This anchor is also missing its ring and wooden stock. The arms are rounded and the crown slightly flattened. This appears to be a slightly later style anchor based on designs adapted about 1840, which utilized curved arms (Cotsell 1856:15). The palms of this anchor have completely deteriorated.

Anchor 3 probably served as a kedge and measures 4.6 ft. along the shank and 2.9 ft. across the palms. One palm is missing along with the anchor ring and wooden stock. This anchor is also similar to the 1840 Admiralty pattern anchor with a rounded crown.

Bilge pump

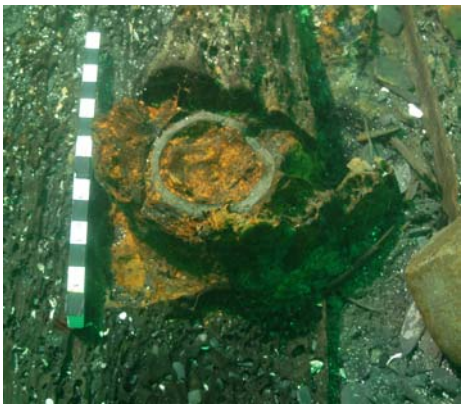
The remains of the bilge pump indicate that the *Kad'yak* was fitted with a common suction pump. The bilge pump served to remove water from the vessel's bilge and is a key safety component on all vessels. Bilge pumps in the mid-nineteenth century had a pump tube connecting the water intake located in the bilge to a hand operated lever on the deck. The lever moved a piston with a one-way valve up and down with water entering at the bottom of the tube and expelled at the top. Two parts of the bilge pump were found on the *Kad'yak*; the pump box in the bilge and the top pump tube.

The wooden pump box (Figure 22C) remains intact in the lower bilge and is located along the baseline at 128.4 ft. and 3.6 ft. north. It is built into a gap between a floor timber and a futtock that measures 0.5 ft. wide. Heavy concretion and iron staining is evident on top along with a grey metal ring 4.8 in. in outside diameter (wall thickness is approximately 0.36 in. and inside diameter 4.0 in.). The identity of the gray metal was not determined but could be lead or cast iron. Although not identified this object may be a fragment of the pump's piston.

The upper end of the pump on the deck was fitted with a tube made of copper alloy and lead. The pump's top tube (Artifact 003) was found far from the main site area (90 ft. on the baseline and 130 ft. south). This artifact was found on the reconnaissance dive in February 2004 and relocated in July 2004. It was lying on the bottom, not embedded, and must have been moved by currents or bottom surge. The tube measures 24 in. long with a 4.8 in. diameter and is composed of several pieces. The central main tube, made of copper alloy, is formed into a cylinder and joined with a rolled seam along

A

B



C

A. The wooden insert near the lower end of the pump tube.
B. A side view of the of the pump tube shows the lead flange on one end and the tapered end soldered on the other end.
C. Remains of the pump box installed in the bilge

Figure 22. Components of the bilge pump found on the *Kad'yak*.

one side. The top end is attached to a thick lead flange. The bottom has a tapering copper alloy end soldered to the main tube with lead. The lower end has a tapered lead fitting (Figure 22A). A wooden insert is placed inside the lower end of the tube where the tapered extension is soldered on. This may provide some reinforcement to the joint.

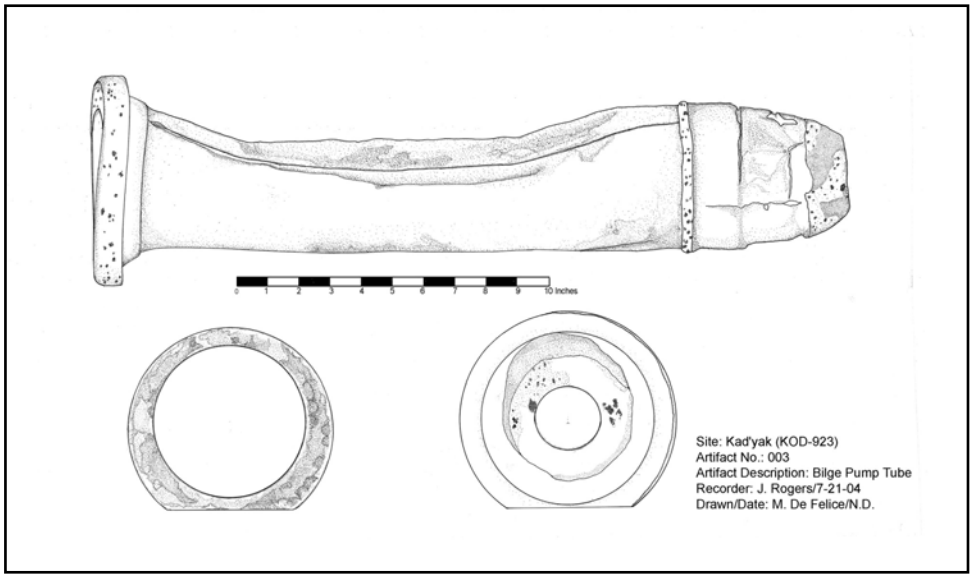


Figure 23. Bilge pump tube (Artifact 003).

The wood was examined following conservation and it appeared to have an oblong hole passing through the center. The shape of the hole is explained by how the pump functions. The piston in the pump is operated by a hand lever that moves up and down. The piston and the hand lever are connected by the pump spear, a metal rod, which pivots slightly back and forth as the pump is operated. This back and forth motion accounts for the oblong hole observed in the wood.

Cannon

Two small cannon were found on site and designated south cannon and north cannon because they are located north and south of the baseline. The north cannon (Figure 24) is located 41 ft. north at baseline 89 ft. The cast iron gun measures three feet long and 0.85 ft. in diameter across the breech. The trunions are centered on the barrel, taper slightly, and are 3 in. in diameter at the base. A low ring encircles the barrel just below the muzzle and the muzzle form is straight. The diameter of the bore is approximately 3.6 in. which conforms to a 6-pound gun.

The south cannon is located 11 ft. south at baseline 132 ft. This gun is located 7 ft. south of the hull section. It is also made from cast iron but the muzzle is broken off. Reconstructed it would measure approximately four feet in length and 0.9 ft. in diameter

at the breech. The trunnions are positioned slightly below the center of the barrel and are well worn. The barrel has heavy concretion and an accurate bore diameter could not be taken to determine the size of the gun.

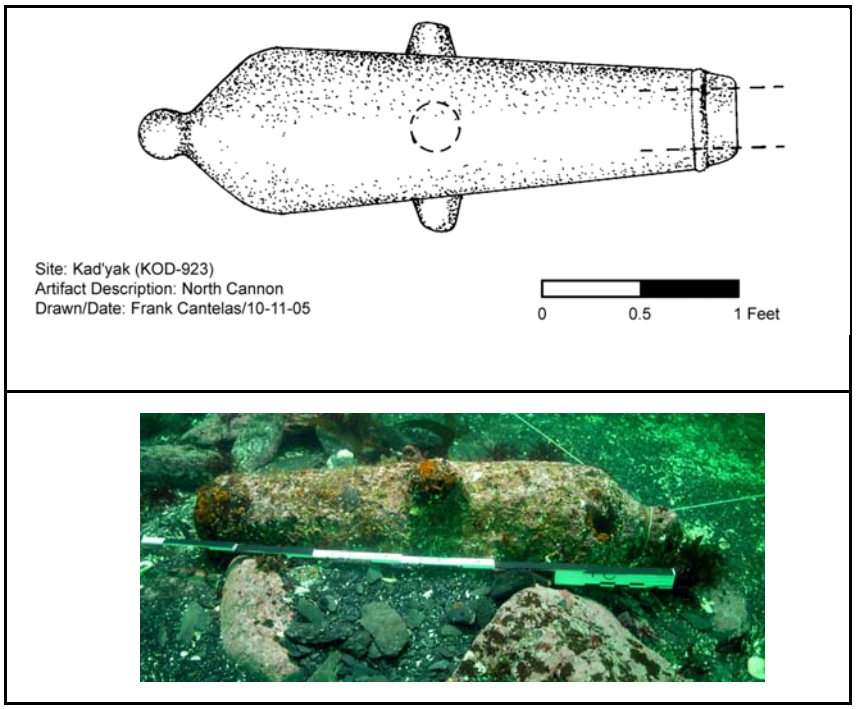


Figure 24. Drawing and photograph of the North Cannon.

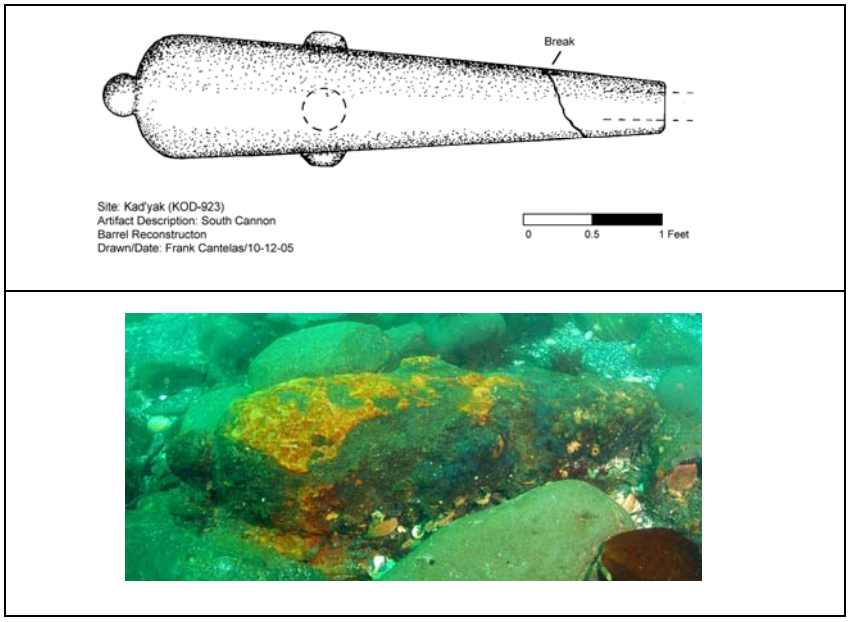


Figure 25. Drawing and photograph of the South Cannon. The broken barrel is reconstructed in the drawing.

Frame

A grate or frame with slats, measuring 4.15 ft. by 1.8 ft., is located on the north edge of the ballast pile at baseline 124 ft. and 30 ft. north. The frame pieces are rectangular in cross section and fastened at the corners in a mortise and tenon arrangement. The slats are rounded, spaced 1.32 in. apart, and secured to the frame with a tenon on each end. Only eight of the possible 24 slats are still present and the entire frame is badly deformed or bent. The purpose of this grate is not known but it could have served as a skylight cover. When the cabins on the *Kad'yak*

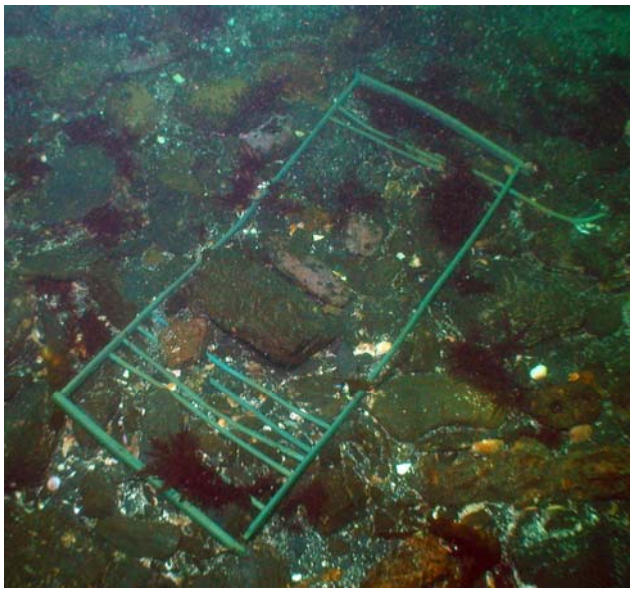


Figure 26. The frame is missing many slats.

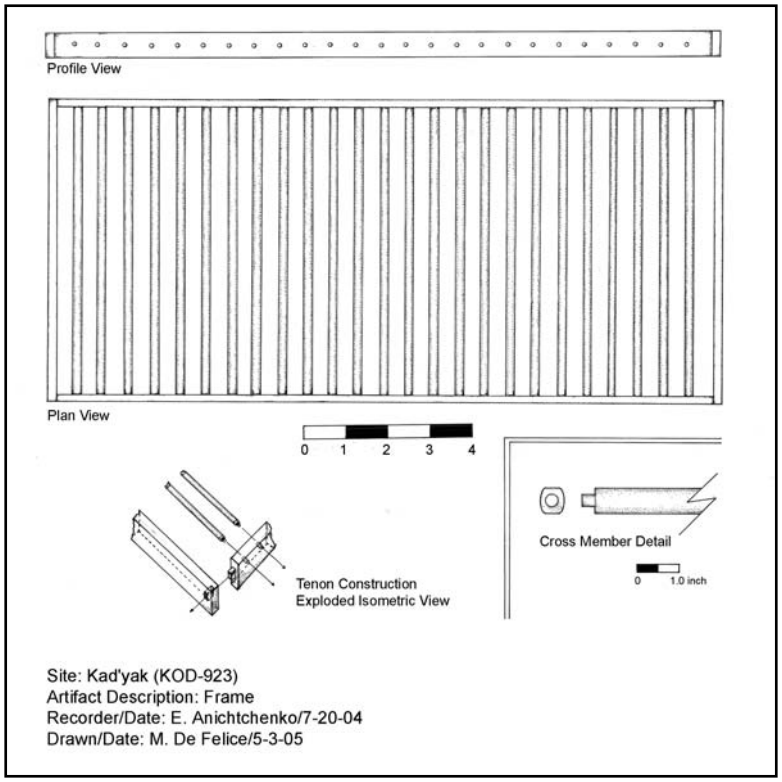


Figure 27. Frame reconstruction.

were moved below deck, skylights were probably used for interior lighting. Given the extreme weather conditions in the north Pacific some sort of grate may have been installed over the skylights to protect the glass.

Davit

A single boat davit is located at baseline 124 ft. and 30 ft. north. It is made from iron, measures 9 ft. high, or 11.2 ft. along the curve, and is roughly 0.2 ft. in diameter. Mounting hardware is fixed to the lower end.

Figure 28. Boat davit laying on the bottom.

Iron Concretion

The contents of a large iron concretion may contain machinery or ship fittings. No boiler has been found on the site so it is not very likely to be steam machinery but instead hand operated machinery. It is located at baseline 108 ft. and 21 ft. north.

Artifact 001 Wheel Hub

This composite artifact is made from wood and copper alloy. It consists of a wooden cylinder with a copper alloy band around one end and a copper alloy cap over the

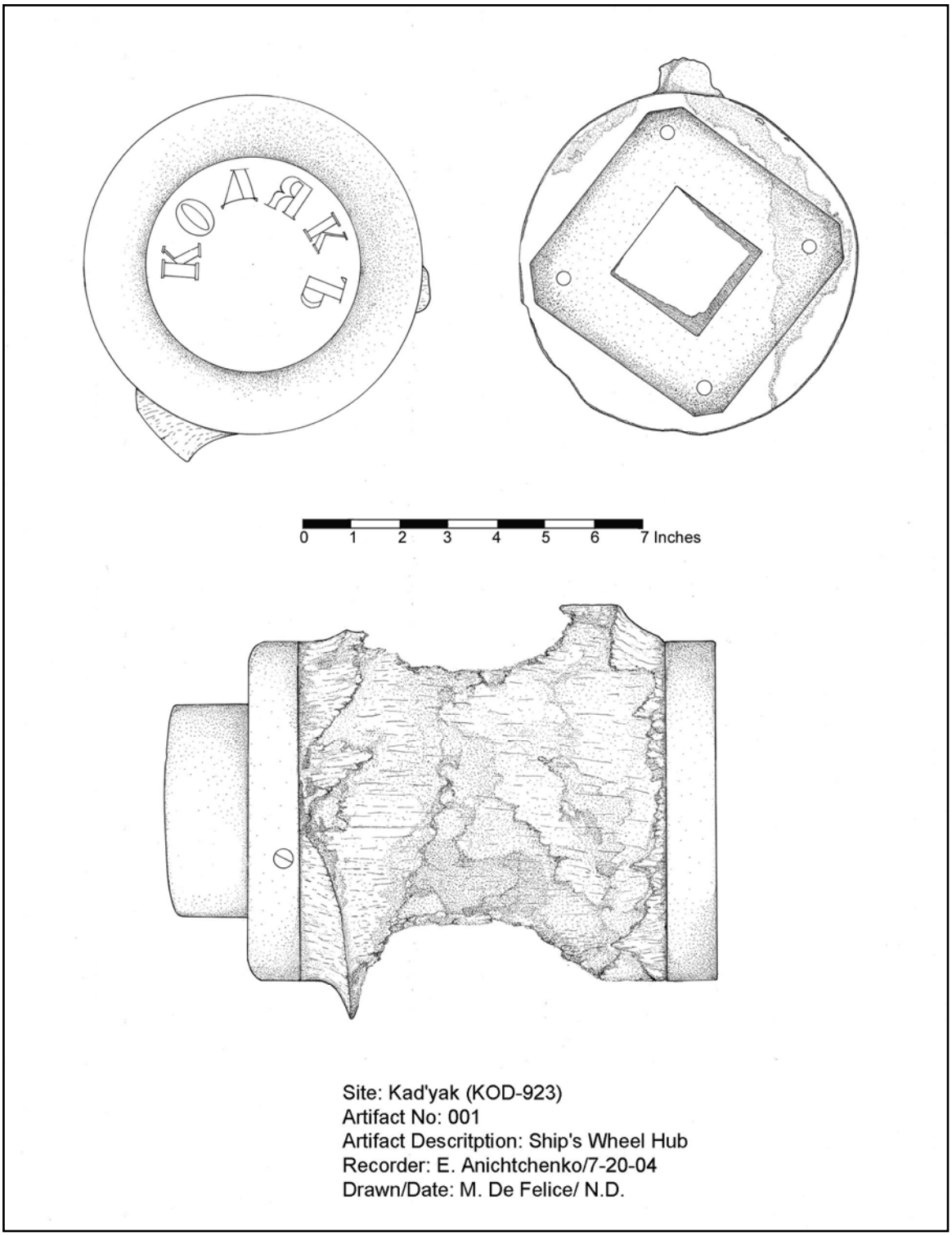


Figure 29. Ship's wheel hub (001).

opposite end. A square-shaped opening passes through the center of the cylinder. Wrought iron fragments adhere to the surface of the opening indicating that a square wrought iron shaft once passed through the cylinder. The cap has a pronounced boss in the center with the name *Kad'yak* spelled in Cyrillic letters across the top of the boss. These letters have been etched or hammered into the surface. The cap and lower base ring are secured to the wooden shaft with copper alloy screws. The lower base is a flat surface with a square mortised out of the wood to accept a flange or mounting plate. Small holes in each of the four corners indicate the flange was secured with screws. The overall length of the cylinder is 11.3 in. with a 7.0 in. diameter across the cap. A simple scratch test of the wood on the lower end revealed very hard material like *Lignum vitae*. The wood type has not been identified. Classification of this artifact as the hub of the ship's wheel is based on a comparison of similar artifacts and historical photographs. Alternatively, it could be a capstan hub or wildcat. The undamaged brass cap, however, suggests it did not see the heavy use usually associated with a capstan or windlass.

Figure 30. This boss is from the *Macquarie* (ex-*Melbourne*) covered the hub of the ship's wheel, circa 1888 (National Maritime Museum, London, Green Blackwall Collection. **http://www.nmm.ac.uk/collections/greenblackwall/viewObject.cfm?ID=EQS0492**).

Figure 31. Captain William Lamey standing at the wheel of the ketch *Hobah* in 1940. Note that the steering shaft enters the wheel from the back side and the front is covered by a boss (Greenhill 1988: 121).

Artifacts 002 Drift Pin

This copper alloy drift pin is broken and only the head remains. Length is 2.3 in. and diameter is 0.6 in. The head has been peened over. This artifact was found at 140 ft. on the baseline. After recording, it was returned to the site.

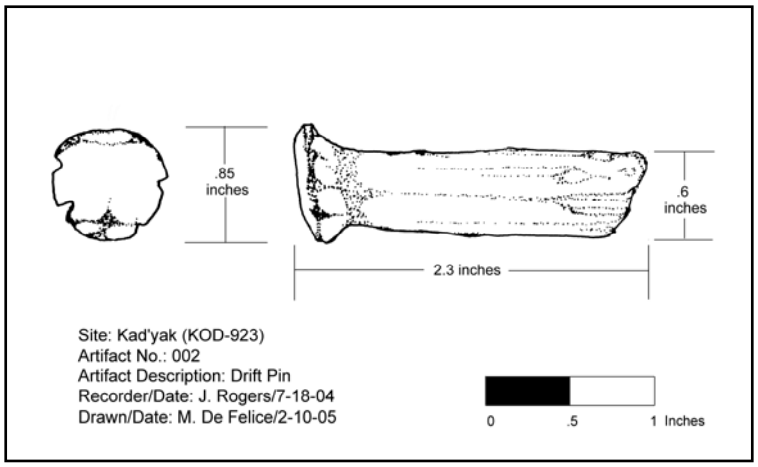


Figure32. Drift pin (Artifact 002).

Artifact 004 Unidentified

This copper alloy artifact has not been identified but may be a finial. It has a spherical head (0.5 in. diameter) attached to a shaft 1.01 in. long. There is a circular flange around the lower end of the shaft. This artifact was found at baseline 142 ft and 20 ft. north.

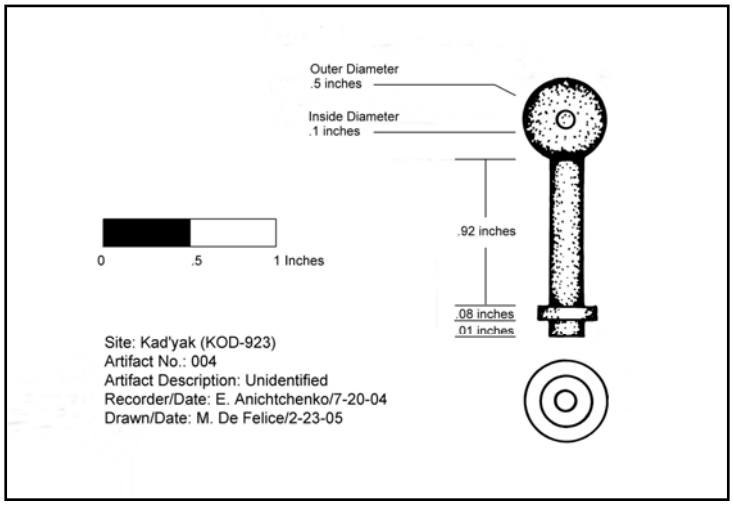


Figure33. Unidentified Object (Artifact 004)

Artifact 005 Unidentified

Cast in copper alloy, this object is 8.3 in. long, 4.2 in. high, and 0.9 in. thick. The object has a hook shape with a rectangular base. It appears that this object was originally symmetrical with a "hook" extending from each side of the base. Two broken attachment points on the base opposite the intact hook suggests that a similar "hook" has been broken off. The surface on one side of the object has numerous holes resulting from the casting process which failed to fill all the voids in the mold. The remaining hook is twisted slightly out of shape. A small removable piece is attached to the tip of the hook with a metal pin. The function of this object is not known but the casting is very robust. The hook is slightly twisted out of shape when viewed from above. It was found at baseline 168 ft. and 4 ft. north. This is an area of exposed rock between the two rock outcrops north and south of the site and east of the ballast pile.

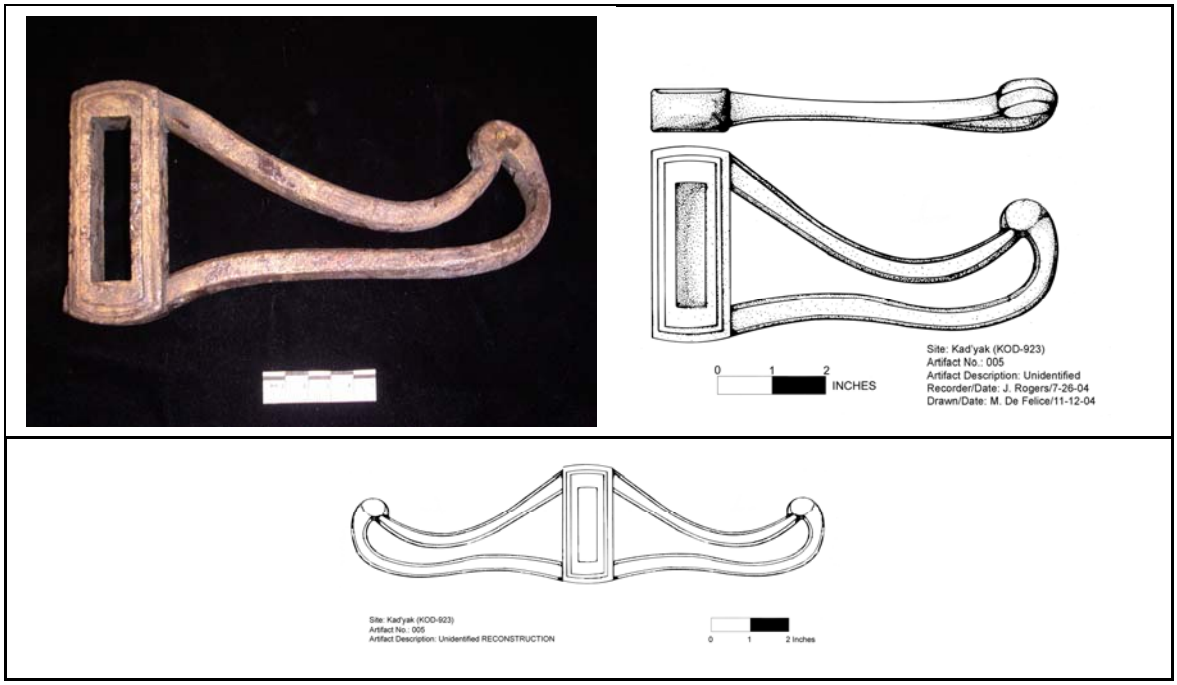


Figure 34. The photograph of Artifact 005 was taken after conservation treatment. The drawing shows a slight twist in the top view which seems to be damage. The lower drawing is a theoretical reconstruction based on broken attachment points that indicate a second "hook" was attached to the rectangular base and was subsequently broken off (Photo by Dave McMahan).

Artifact 006 Valve

A copper alloy valve was found at baseline 142.5 ft. and 25 ft. north. This simple valve was found with the handle aligned to the direction of the pipe, which is the open position. A lead pipe fragment is attached with solder to one end. The other end also appears to have a small lead pipe fragment attached. This seems to be an in-line valve for a pipe carrying liquid.

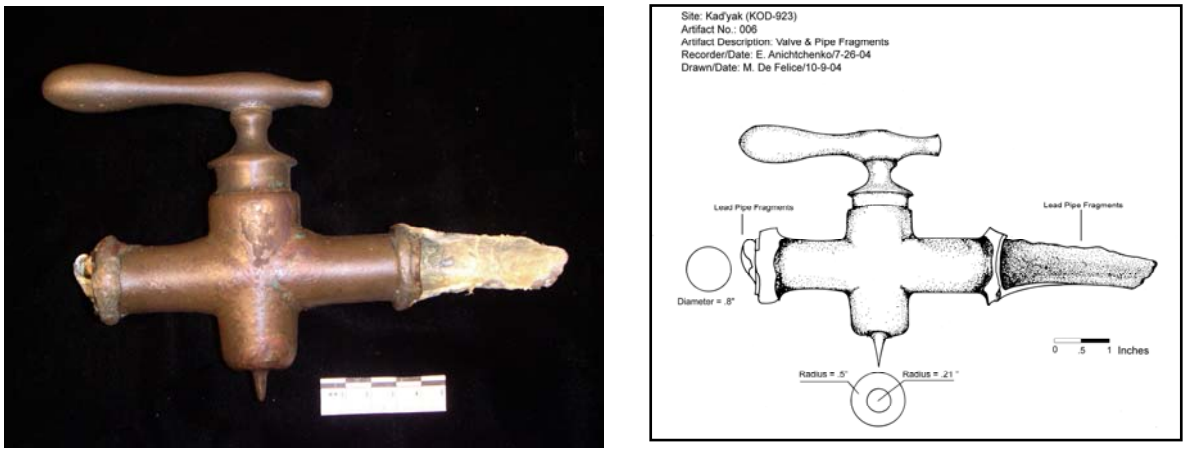


Figure35. Artifact 006 Copper alloy valve and lead pipe, drawing and photograph (Photo by Dave McMahan).

Artifact 011 Stave

This artifact is made of wood from the white oak group and is from a staved container (see Appendix I). It measures 15.1 in. long, 2.9 in. wide, 0.75 in. thick, and is broken on one end. The stave is cupped in cross section and has beveled sides to fit with adjoining staves. Two rust stains on the exterior surface, each 1.5 in. wide, mark the

Figure 36. Exterior side of stave (Artifact 011) (Photo by Dave McMahan).

locations of the hoops used to hold the container together. This stave likely came from a bucket or other type of open-ended container. The intact end does not have a croze groove on the interior side which is indicative of a barrel stave. This piece came from under a hull plank at baseline 140 ft. and 3 ft. south.

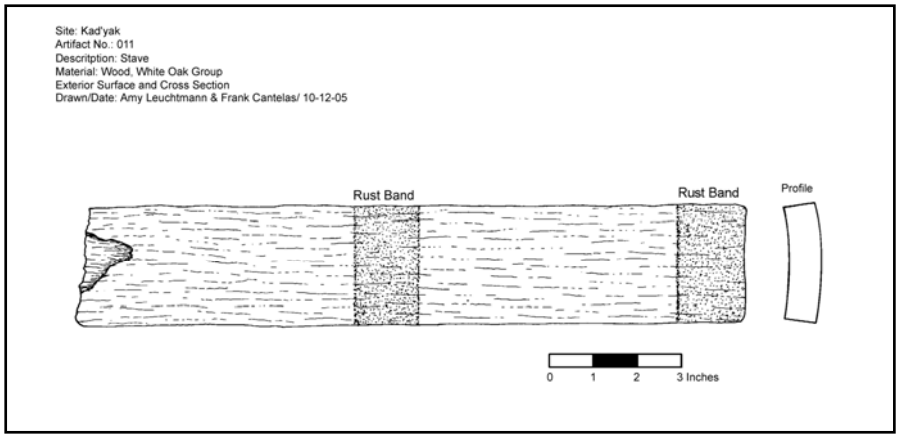


Figure 37. In this drawing rust stains mark the location of the metal bands used to secure the staved container.

Artifact 012 Firewood

Artifact 012 is a small tree branch found among the dunnage under the hull plank at baseline 140 ft. and 3 ft. south and near Artifact 011. One end of the branch has chop marks from a hand tool such as an axe or hatchet. The wood is western hemlock (see Appendix I). It measures 17 in. long and 3 in. in diameter. Identification as firewood is conjectural based on appearance and log entries that list firewood among the materials carried on the *Kad'yak*.

Figure 38. Chop marks appear on the end of the wood (Artifact 012). Photo by Dave McMahan.

Area 2 General description

Another portion of the shipwreck, designated Area 2, was discovered 130 ft. northeast of the main site area, along the north rock outcrop that borders the site (Figure 39). Large and small artifacts are scattered across the face of the rock outcrop and in the sand along the base creating a linear debris field. This material stretches more than 150 ft. and was recorded using a 300 ft. reference tape. Most of the artifacts are not diagnostic, but two gudgeons and one pintle found at the extreme end of the debris field indicate at least a portion of the stern came to rest here. Survey and recording of this area was limited to one day. As a result only a rough assessment of the area was made along with general maps of the artifact distribution. More material was observed than documented and documentation was limited to larger or diagnostic artifacts on the face of the rock outcrop.

Moving east along the reference tape a number of iron pipes were noted between 130 and 190 ft. All were deteriorated and heavily concreted. The function of these pipes is not known. Chain stretches along the rock face from 185 to 205 ft. with a large concretion attached to the central portion. Another section of chain starts at 212 ft. and is attached to a second large concretion centered at 230 ft. This concretion has a rough circular shape on one end approximately 4 ft. across with an arm extending from one side. The mass measures 10.2 ft. long with the arm 0.2 ft. thick.

From this point on there are many copper alloy drift pins scattered across the bottom along with hardware to mount the rudder; two gudgeons and a pintle. Together the gudgeon and pintle act as a hinge for the rudder. The gudgeon is mounted on the stern post and the pintle is on the rudder. The rudder is shipped to the stern post by hanging it on the gudgeons. An unidentified oval copper alloy fitting was found in this area broken into three pieces. It measured 1.45 ft. long, .85 ft wide and 0.6 ft. thick with an oval hole through the center. Observers noted that wreckage continued up the outcrop as far as they could see.

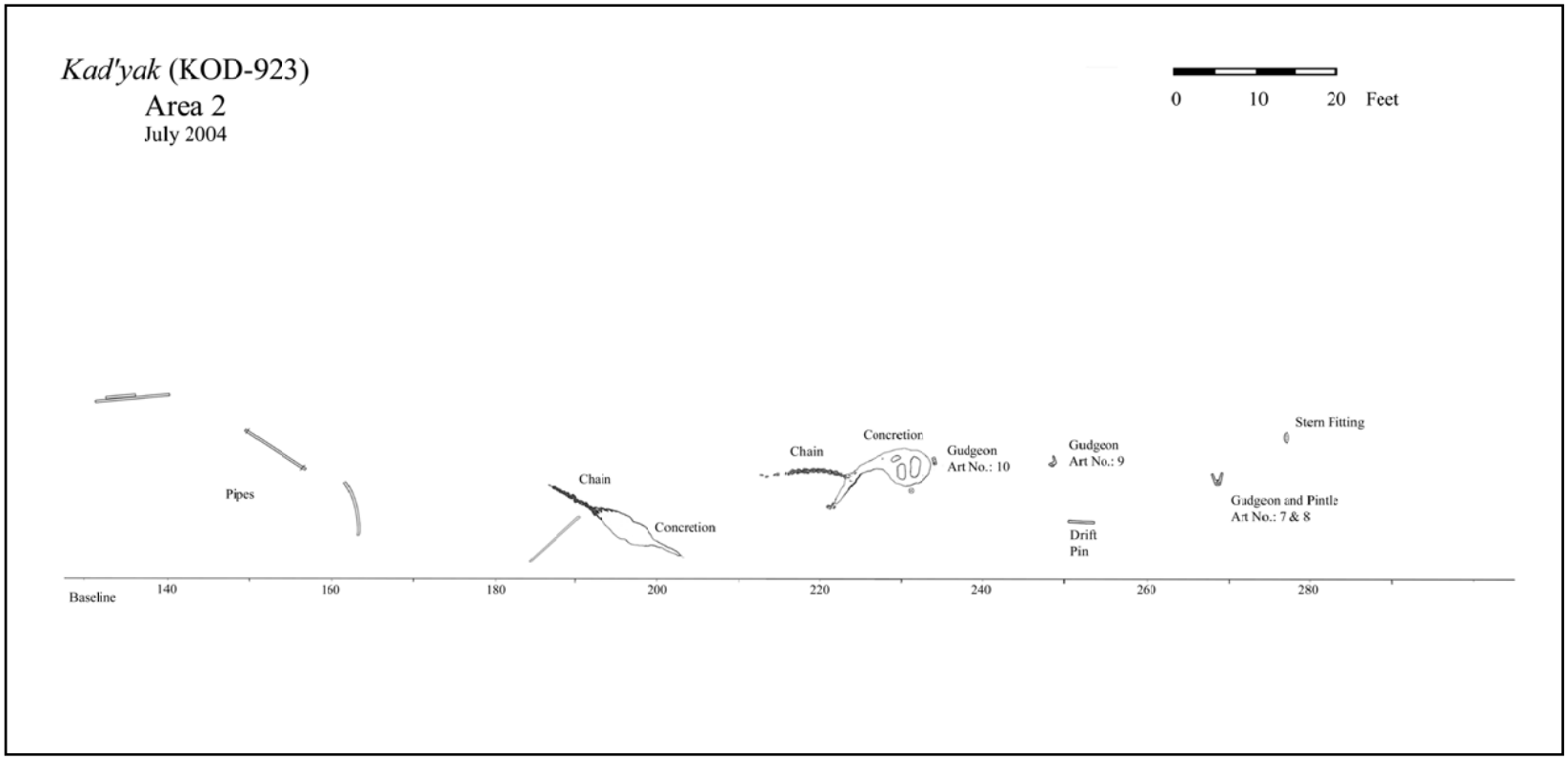


Figure 39. Area 2 Site Map.

Area 2 Small artifacts

Artifact 007 Pintle

The copper alloy pintle was found articulated, or inserted into a gudgeon (artifact 008). The shaft of the pin is 5.7 in. long with a 2.4 in. diameter at the base. Shaft diameter thins to 2.2 in. just above the base. The head of the pintle is V-shaped (an angle of 108°), 3.1 in. wide, and 2 in. thick. The straps are broken off each side. It is possible that the rudder was torn off the stern breaking the straps and leaving the pintle inside the gudgeon mounted on the stern post. Later as the wood of the stern post disintegrated the assembly came to rest on the bottom still articulated.

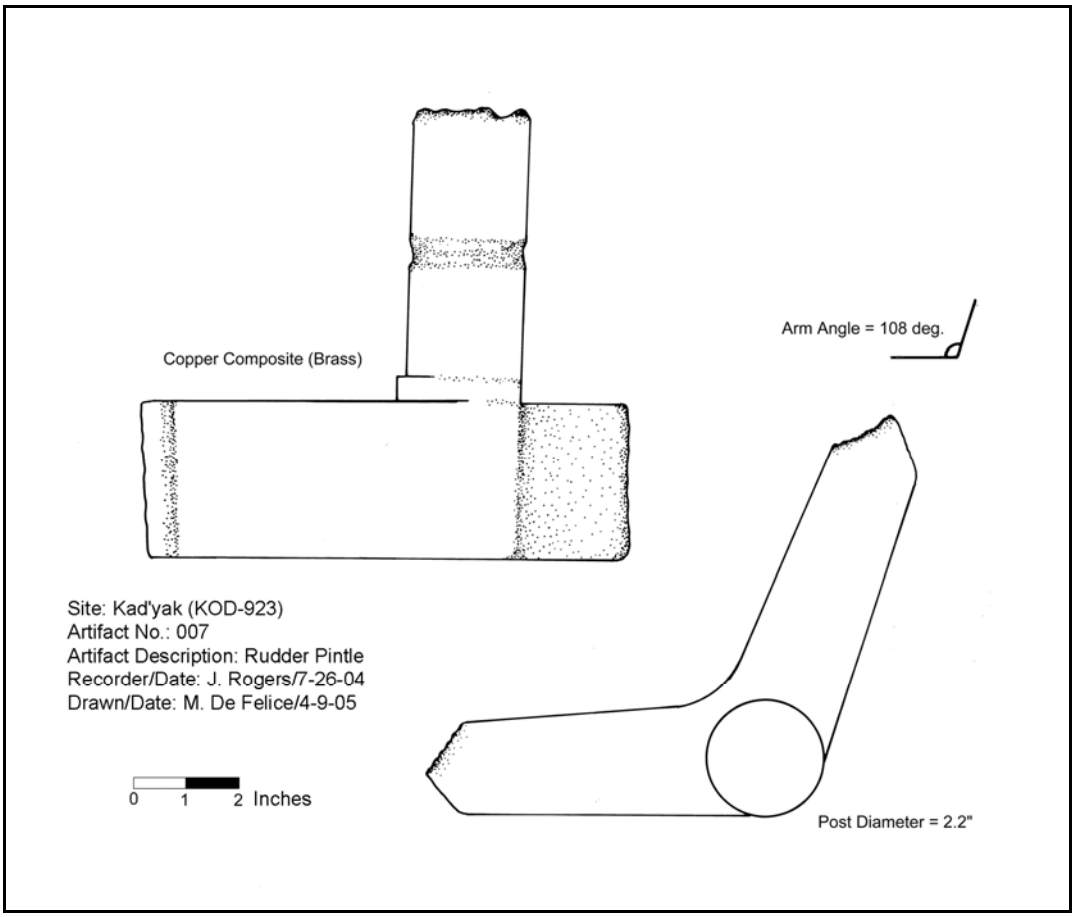


Figure40. Rudder pintle (Artifact 007)

Artifact 008 Gudgeon

The gudgeon associated with the pintle is also copper alloy and nearly intact. The head of the gudgeon is 9.3 in. across and 2.9 in. wide, with a 2.5 in. diameter hole for the pintle. One strap is partially broken but the other one is complete. The complete strap is 14.5 in. long, 3 in. wide, and pierced by three 0.9 in. diameter holes spaced on 4 in. centers. The strap is 0.9 in thick near the head and tapers to 0.4 in. at the end. Fragments of a copper alloy fastener remain in the strap holes near the gudgeon's head. The center of the fastener is missing. By extrapolating from the width between the two straps, the aft edge of the stern post had a sided dimension of 7.8 in.

Figure 41. A rudder pintle (Artifact 007) and gudgeon (Artifact 008) were found articulated in this position

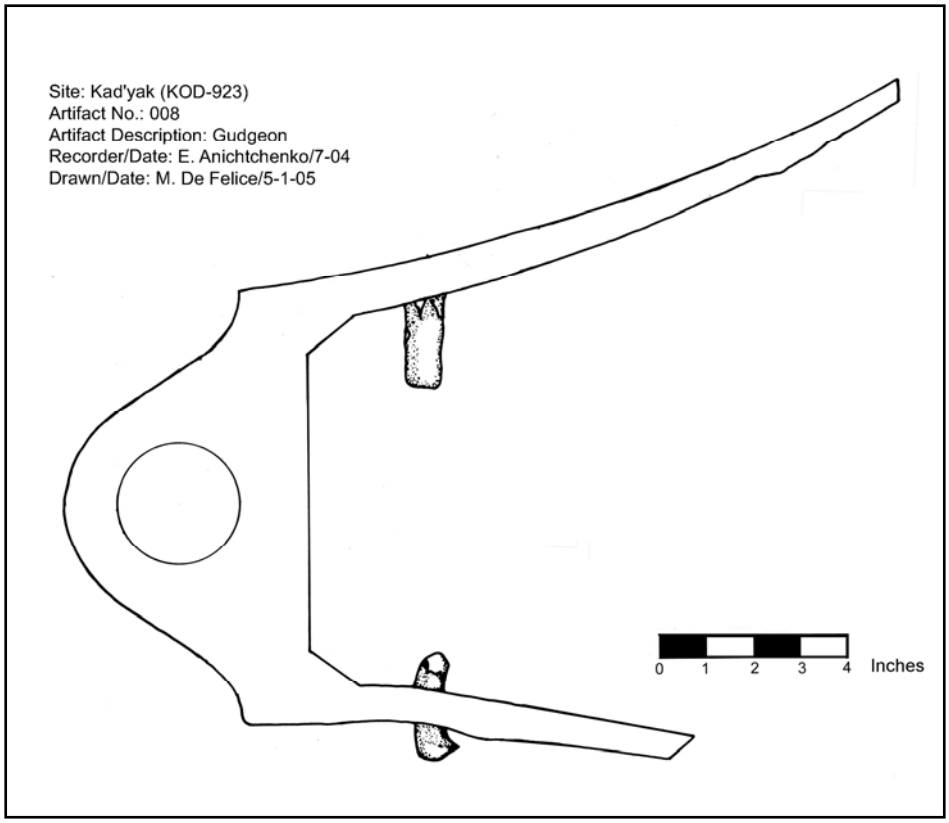


Figure 42. Gudgeon (Artifact 008).

Artifact 009 and 010 Gudgeon

Artifacts 009 and 010 (Figure 42) represent a single gudgeon made of copper alloy with a strap broken off (Artifact 010). The head is 12.8 in. across 3.1 in. wide with a 2.5 in. diameter pintle hole. The strap on artifact 009 is 13 in. long and has two intact fastener holes with 0.9 in. diameters. Artifact 010 is a strap broken at each end that measures 10 in. long, 3 in. wide and 1.0 in. thick. There is a break at a fastener hole on the distal end of the strap leaving one complete fastener hole with a diameter of 0.9 in. Numerous hammer marks surround these holes. The fastener holes on each strap are centered approximately 5.8 in. apart. The width between the straps is 11 in. indicating that the stern post where this gudgeon was mounted was 11 in. wide.

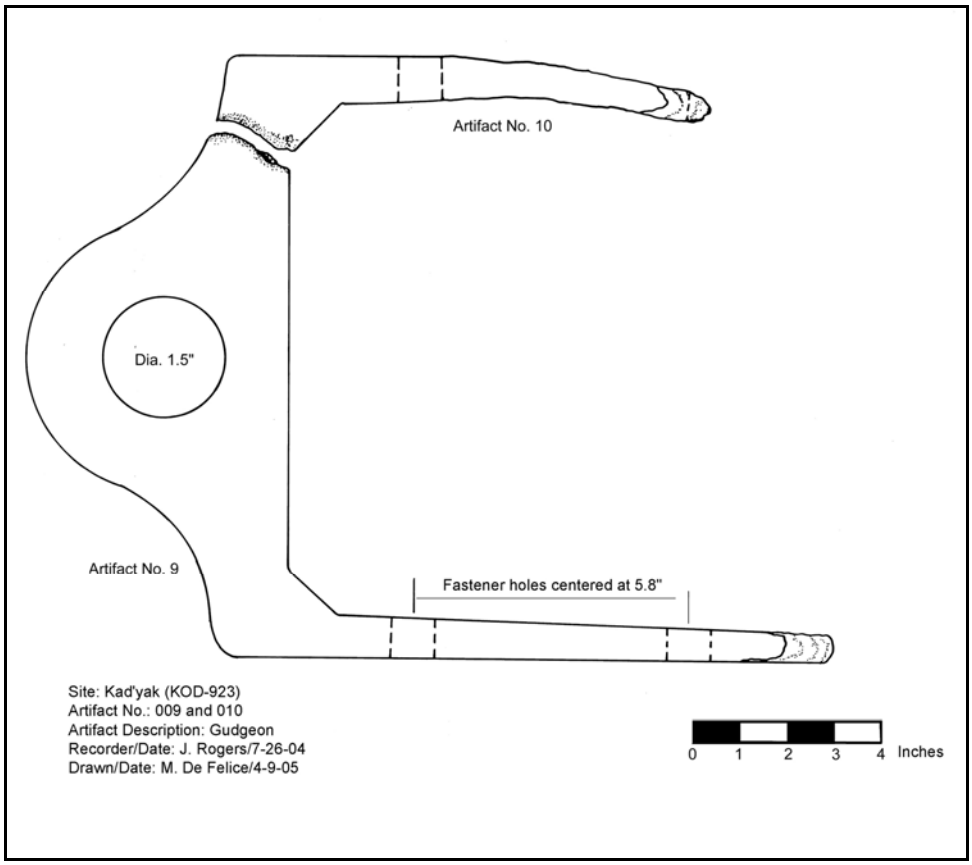


Figure 43. Gudgeon (Artifact 009 and 010)

DISCUSSION

The shipwreck in Icon Bay off Spruce Island has been positively identified as the *Kad'yak* based on an artifact with the vessel's name (Artifact 001). This answers the primary research question as posed in the research design. The shipwreck contains a wealth of material culture related to Russian America, mid-nineteenth century sailing vessels and ship-board life. *Kad'yak* was a working vessel in the north Pacific, a tough environment by any measure. It sailed these waters for eight years traveling to Russian ports in Alaska and trading in California and Hawaii.

An examination of the wreck starts with the historical accounts of the vessel's construction and loss. Built by Hans Jacob Albrecht Meyer at his yard in Lübeck, *Kad'yak* measured 238 ¼ kommerzlast (Archiv der Hansestadt Lübeck:1851-1852, n.p.n.). No dimensions are given. The kommerzlast is a German unit of volume measurement equivalent to tonnage in ships. For the *Kad'yak* the measurement converts to 477 tons. The ship, *Sir Robert Peel* built by Meyer in 1852, whose measurements have been preserved, provides a useful comparison (Kresse 1969: 209). The *Sir Robert Peel* had a similar tonnage at 250 kommerzlast and measured 132.19 ft. in length, 28.8 ft. in beam and 19.2 ft. depth of hold. These measurements can be applied to the *Kad'yak* for the purposes of this study. The *Kad'yak*'s hull was copper sheathed and she carried deck cabins (Archiv der Hansestadt Lübeck 1851). Some of these cabins proved unreliable and cabin space was constructed below deck after the voyage to Alaska in November 1853 (Arndt and Pierce 2003:236, Records of the Russian-American Company 1853: 216-221).

The ship's log books provide details available nowhere else. The bark drew 12 ft. at the stem and 14 ft. aft when loaded. *Kad'yak* was equipped with two chronometers whose serial numbers were recorded in the log book, compasses, and two or three boats. She carried four to six cast-iron guns on the voyage from San Francisco completed on October 13, 1859, just five and a half months before she sank. A bilge pump is also mentioned (Records of the Russian-American Company 1853-1859).

On March 30, 1860, *Kad'yak* struck a submerged rock when leaving the dock at Woody Island with a cargo of ice bound for California. Within twenty minutes she laid

over on her side allowing the crew of twenty-five to get off unharmed in two boats. Pushed by wind and waves for three days, the vessel eventually sank in Icon Bay taking the crew's personal belongings, ship equipment, and cargo to the bottom. No mention is made as to whether *Kad'yak* heeled over to port or starboard (Records of the Russian-American Company 1860: June N 2).

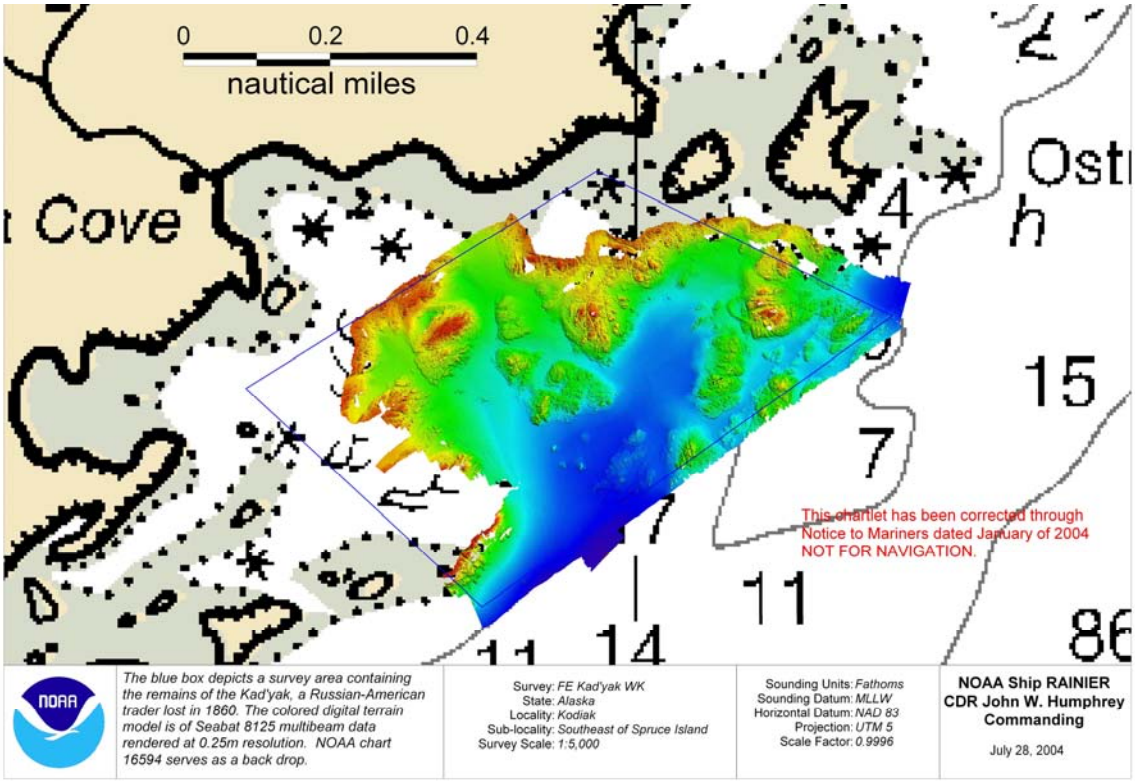


Figure 44. Bathymetric map of Icon Bay completed by the NOAA ship *Rainier* overlaid on NOAA Chart 16584 (Marmot Bay and Kupreanof Strait).

These details give a brief description of the vessel's construction and rig along with events of the ship's loss. This information is critical to interpreting the site formation processes and the distribution of material remains. Combining historical sources with archaeological findings provides a reasonable interpretation of the vessel's sinking. As *Kad'yak* drifted into the bay on her side, spars hanging down in the water column could have snagged any of the shallow rock outcrops. In fact, the vessel ended up fairly deep inside the bay considering the bottom topography. At some point *Kad'yak* came to rest between two outcrops, one to the north and one to the south, and settled to the bottom in about 80 ft. of water. Legend says the hull came to rest upright on the

bottom with the yards and mast forming a cross. The fact that Captain Arkhimandritov took a bearing to the mast confirms that a portion of the vessel rose above the water.

Site formation processes

In themselves, ships are a complex artifact consisting of numerous systems that must be well maintained for efficiency and safety. An innumerable number of items go into a ship's construction and operation. Added to that are cargoes and the personal belongings of the passengers and crew. When a ship is lost the entire vessel and its contents begins to break down and the process of archaeological site formation begins. A number of variables determine what materials remain on the site, what materials deteriorate, and how remaining materials are distributed. The observations and interpretations of this report are dependent on these site formation processes. Generally, the processes operating on the site are extractive and scrambling filters. The archaeologist examines what is left behind as a result. Shipwrecks experience a loss of material from three causes or extractive filters: the wrecking process, salvage operations, and disintegration of perishable materials (Muckelroy 1978: 165). Scrambling devices redistribute the remaining material and include the process of wrecking and seabed movement. The wrecking process, loss of perishable materials, and seabed movement have operated on the *Kad'yak* for 145 years. *Kad'yak* sank nearly intact on a bottom of coarse sand and rock in a small bay. Unfortunately, the relatively shallow water of Icon Bay does not offer very much protection.

Icon Bay opens to the southeast facing the Gulf of Alaska. The north Pacific is a breeding ground for winter storms and many of these are created by the Aleutian low pressure area over the Gulf of Alaska. During the height of the winter storm season three or four storms a week can move out of the gulf and batter the Pacific Northwest region. Winds in excess of 50 mph and high waves characterize these storms (Heirdon 2003). These storms can pound Icon Bay with wind, waves, and high swells. High sand ripples on the site attest to the strength of surge cause by waves and swell. This effect may be amplified as water moves through the narrow gap between the north and south rock outcrops on the eastern end of the site.

As *Kad'yak* heeled over and drifted for three days, loose items, especially those left on deck, certainly fell off. According to historical sources once inside the bay the vessel apparently grounded on a reef at low tide, possibly the north rock outcrop (Records of the Russian-American Company 1860: June N 2). The artifacts on the north outcrop in Area 2 are related to the stern, particularly the rudder, and some of them are

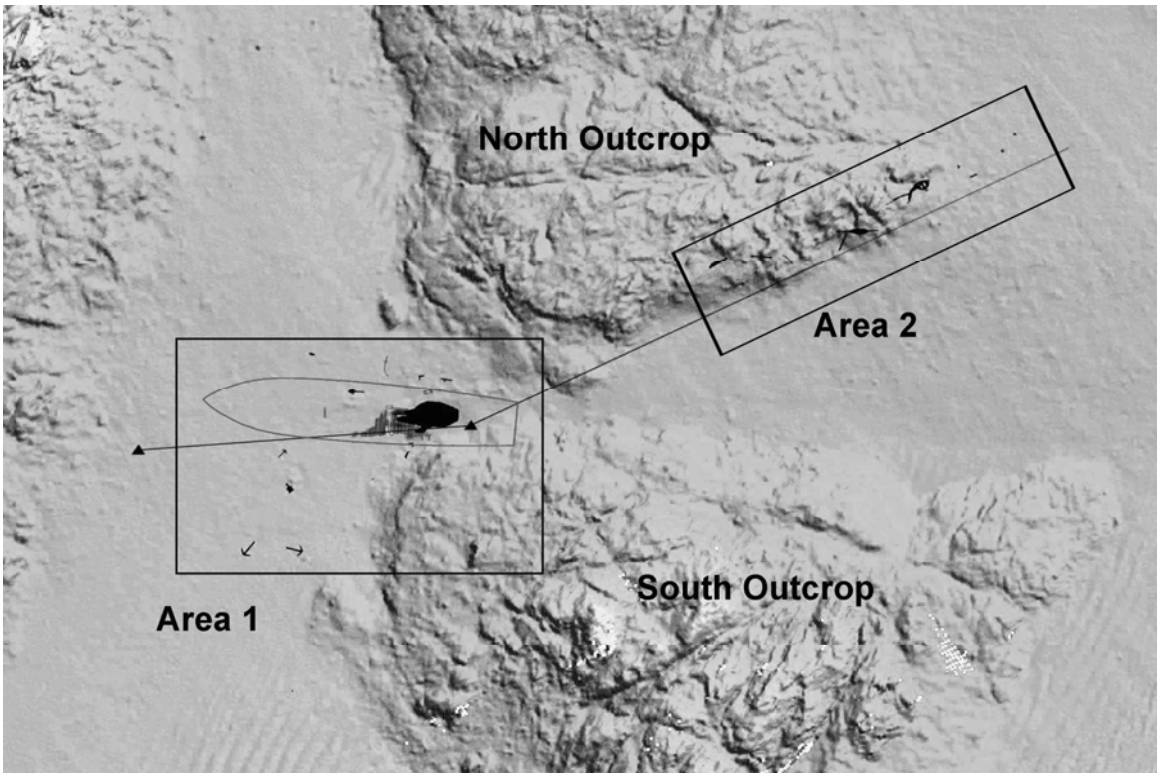


Figure 45. This enlargement of the NOAA bathymetric map (July 2004) shows the north and south rock outcrops, or reefs, adjacent to the site and the location of Areas 1 and 2. An outline of a vessel approximately the size of the *Kad'ya*k is superimposed on Area 1.

located high on the reef. This suggests that *Kad'yak* initially sank or grounded on the reef and was pushed off later by wind or waves and came to rest in the deeper water between the two outcrops. The linear distribution of artifacts indicates the stern broke away as the vessel shifted. Once settled on the bottom in deep water, material remaining on board the submerged hull became water-logged making it less likely that it would float away. This includes the wooden parts of the ship. After the stern broke away the wrecking process was probably slowed down until wooden elements of the vessel began to deteriorate and weaken. The vessel broke apart, assisted by the weight of cannon, anchors and the windlass, under the constant surge caused by seas coming in from the

Gulf of Alaska. As the decks collapsed and the hull came apart the distribution cultural material was created around the periphery of the lower hull in Area 1 as seen in Figure 46. Some parts of the vessel probably drifted away and now lay on the bottom undiscovered.

Perishable materials, including organics and small or fragile artifacts appear to be lost from the *Kad'yak*'s archaeological record. These materials are best preserved in sediments where they can remain undisturbed and protected. The coarse sand and gravel covering much of the site area is relatively shallow and prone to movement by surge. Although some small artifacts are certainly buried, the coarse sediment does not provide the anaerobic conditions needed for good organic preservation. The largest organic component of the vessel is the wooden ship itself and only the lower hull remains partially buried under the sand. The areas examined are heavily damaged by the wood boring mollusk shipworm (*Teredinidae*) and possibly piddocks (*Pholodaceae*) (Florian 1987:15). Other organic material in the form of textiles, leather, paper, and food stuffs have largely disappeared. Given the right conditions leather and some textiles are more durable and fragments may be present in small amounts, concreted among the ballast stone. In fact, a leather strap fragment was found concreted to the ballast pile and was the only organic object seen on the shipwreck other than wood. The *Kad'yak*'s cargo of ice was the ultimate perishable material and may have completely melted before the vessel sank.

Materials remaining on site after the operation of the extractive filters are subject to movement or scrambling. Seabed movement on the site is pronounced as seen during the field investigations and by large sand ripples that appear in the multi-beam bathymetric data in Figure 44. Seabed movement is directly related to water movement over the site primarily caused by large waves and corresponding bottom surge. Small artifacts can be transported along with bottom sediments or moved by the water itself. This seems to be the case with the bilge pump tube (Artifact 003) which has a large surface area compared to its weight. It was found southwest of the main site (Area 1) on a rocky bottom apparently transported by water movement.

Historical documents provide information on how the *Kad'yak* sank and provide clues on how much of the vessel survives. By combining the dimensions of the ship *Sir*

Robert Peel (Kresse 1969: 209) with the location of the bilge pumps on the site, a vessel outline can be superimposed on the site map (Figure 45). This is possible because in nineteenth century shipbuilding practices the pumps were usually placed just aft of the main mast or about two thirds of the distance between the bow and stern (Crothers: 419, MacGregor 1988:119). In fact, bilge pumps were paired to the port and starboard side of the keelson at the same location along the deck. The remains of the port pump are exposed while the starboard pump is buried under the ballast stone. The location of the pump box supports the assumption that the remaining portion of the vessel is the lower amidships hull.

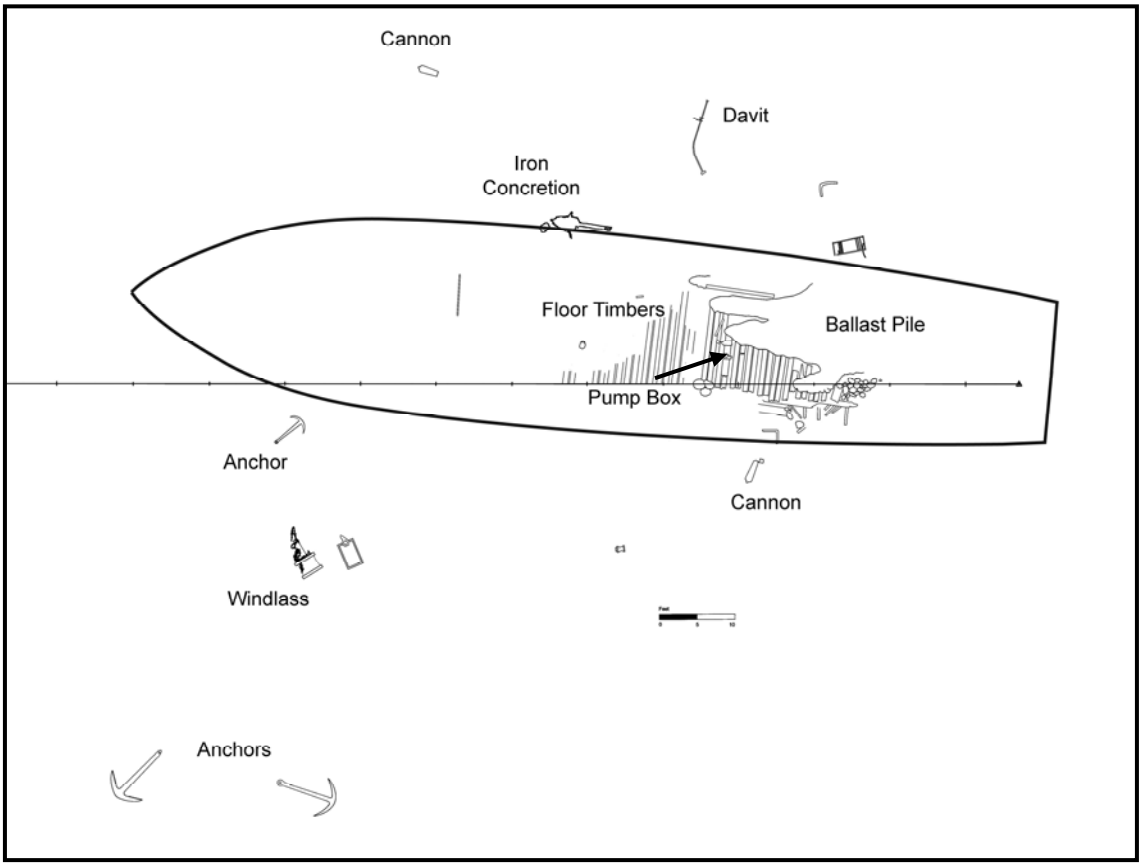


Figure 46. This site map shows the remains of the ship's structure and the distribution of large artifacts. The vessel outline is approximately the same dimensions as the *Kad'yak* and is placed over the site map using the orientation of the remaining frames and the location of the bilge pump box.

The orientation of the ship is indicated by several features. Frames are positioned perpendicular to the longitudinal axis of the hull. The baseline bisects the lower hull section almost perpendicular to the frames and near the line of the keelson. A linear

cavity under the ballast pile is the location of the keelson and formed as the timber deteriorated. The cluster of anchors and the windlass on the west end of the site also suggest the bow faced west as *Kad'yak* sank. One cannon along with the anchors and windlass are on the port side. A second cannon, davit and large iron concretion lay on the starboard side. The forward section is buried under sand and its extent and condition are not known. It is likely that this area contains a rich collection of material culture protected by a deep sand deposit. Ballast is concentrated in the aft one third of the vessel and further east the bottom changes from sand to gravel and rock. Most of the small artifacts observed during the investigation were found among the ballast and rock. Only the last 10 to 20 ft. of the stern falls in this rocky area where none of the ship structure has been preserved.

Area 2 is a debris trail that leads across the north rock outcrop in the direction of Area 1, the main site. Rudder hardware specifically associated with the sternpost and rudder, including the gudgeon and pintles, lie furthest from the main site. Concreted chain and pipe form a linear debris field between the two areas. This distribution indicates the stern post was torn off along with the rudder as the vessel was displaced to the west after it sank on the rock outcrop. The steering chain was probably pulled off the steering drum and tiller as the vessel moved and it now stretches across the reef. At some point the ship's wheel became detached from the rest of the steering mechanism and was deposited off the port side amidships (Artifact 001).

Material culture

The *Kad'yak* site contains an extensive material culture record of the ship, crew, and life aboard the vessel. One artifact, the ship's wheel hub (Artifact 001), positively identified the vessel and answered one of the primary research questions. Many large and small artifacts, like anchors and cannon were recorded on site. Eleven artifacts were recovered because they were either diagnostic, possibly threatened by looters, or for wood identification. Presently, the shipwreck remains in an undisturbed context and represents a unique archaeological record as the only known ship from the Russian-American Company.

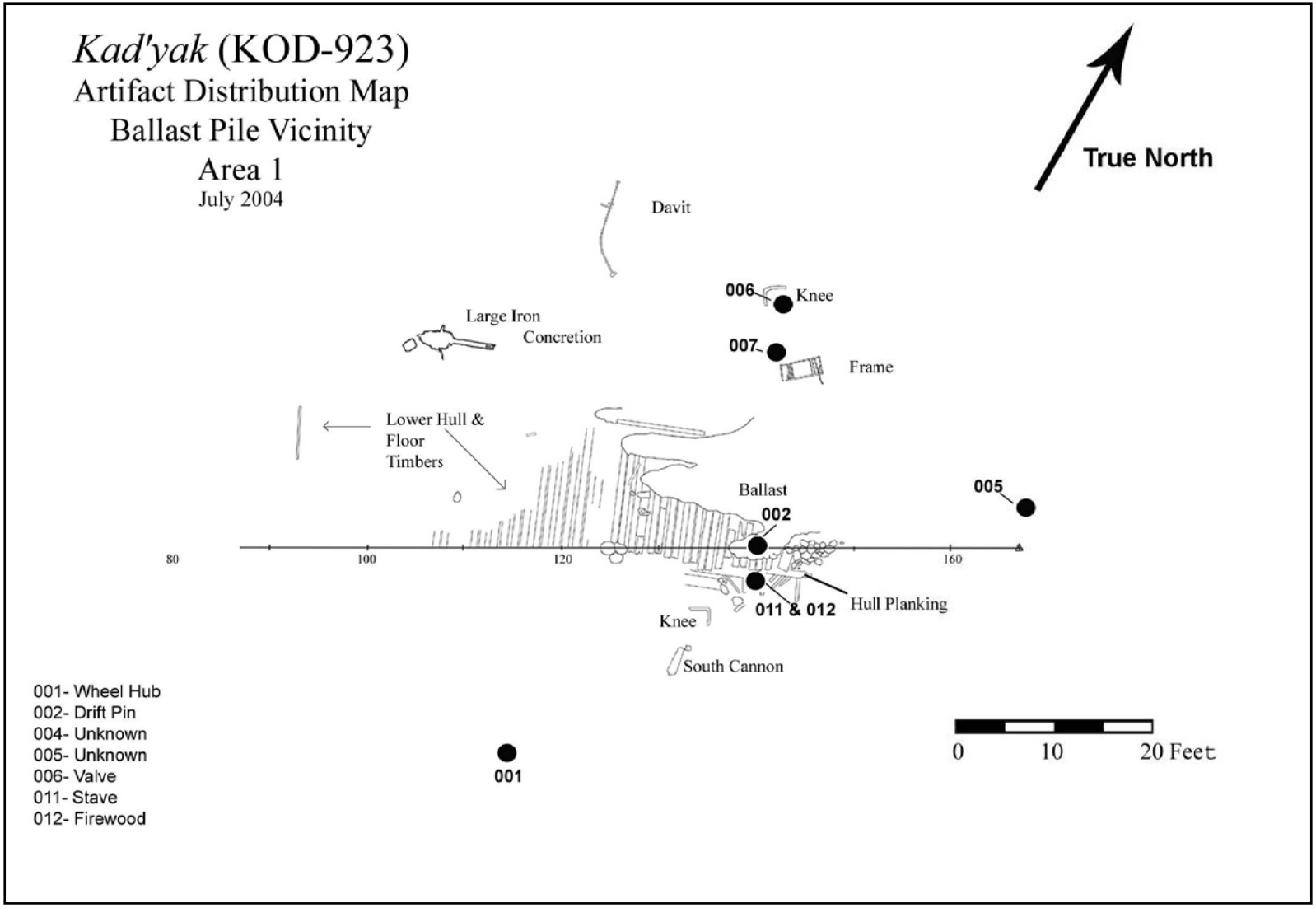


Figure 47. Area 1 artifact distribution map.

Anchors

Three anchors on the site include two bowers and one kedge. Bower anchors, the largest carried onboard, serve as the principal anchors and are carried on the bow. The kedge is a smaller utility anchor used in tight places to work a ship against current or wind. It was carried away from the ship in a small boat and dropped with a long cable attached. The cable led to the ship's capstan which was then used to draw the ship along (Curryer 1999: 51).

The bower anchors are two different styles and represent changes occurring in anchor design in the first half of the nineteenth century when the arms of anchors began to transition from a straight to a curved form. These design changes were made to improve strength and holding power. Traditionally anchors of the late eighteenth century were constructed with a long shank and straight arms. These anchors did not easily penetrate the seafloor and had to actually move horizontally across the bottom to allow the arm to catch and hold the seabed. They were also weak at the crown where the arms and shank join together. When weighing anchor a great deal of leverage is put on this point to break free of the bottom, stressing the weld joining the shank and arms. Failure of the joint was not uncommon (Scientific American Supplement 1902:22240).

In Great Britain, anchor design was refined throughout the nineteenth century with a general trend in developing curved arms. Richard Pering recognized that by using a curved arm the weight of the shank and upper arm would force the lower anchor arm to sink into the ocean bottom without any longitudinal displacement. By welding together flat bars instead of rounded bars into an arrangement that rounded the junction of the arms to the shank, the point of greatest stress would be transferred to the anchor shank making the anchor less likely to fail (Cotsell 1856:12-13, Curryer 1999).

All three of the *Kad'yak*'s anchors have curved crowns but the bowers are distinctly different from one another. Anchor 2 is much rounder than Anchor 1. The variation could be due to differences in manufacturers, styles, or age. *Kad'yak* sailed the north Pacific for eight years and if she lost any of her anchors in that time they were probably replaced by any available. Anchor 1 resembles Pering's design from 1813 and Anchor 2 is similar to the 1840 British Admiralty anchor attributed to Sir William Parker (Cotsell 1856:15, Curryer 1999:76).

The three anchors on the *Kad'yak* site were fitted with wooden stocks that have disintegrated. Wooden stocks were used exclusively prior to the nineteenth century (with the exception of those found on vessels from the first century AD). Beginning about 1800, iron stocks appeared on smaller anchors and subsequently became more prevalent on larger anchors as the century progressed (Curryer 1999:110).

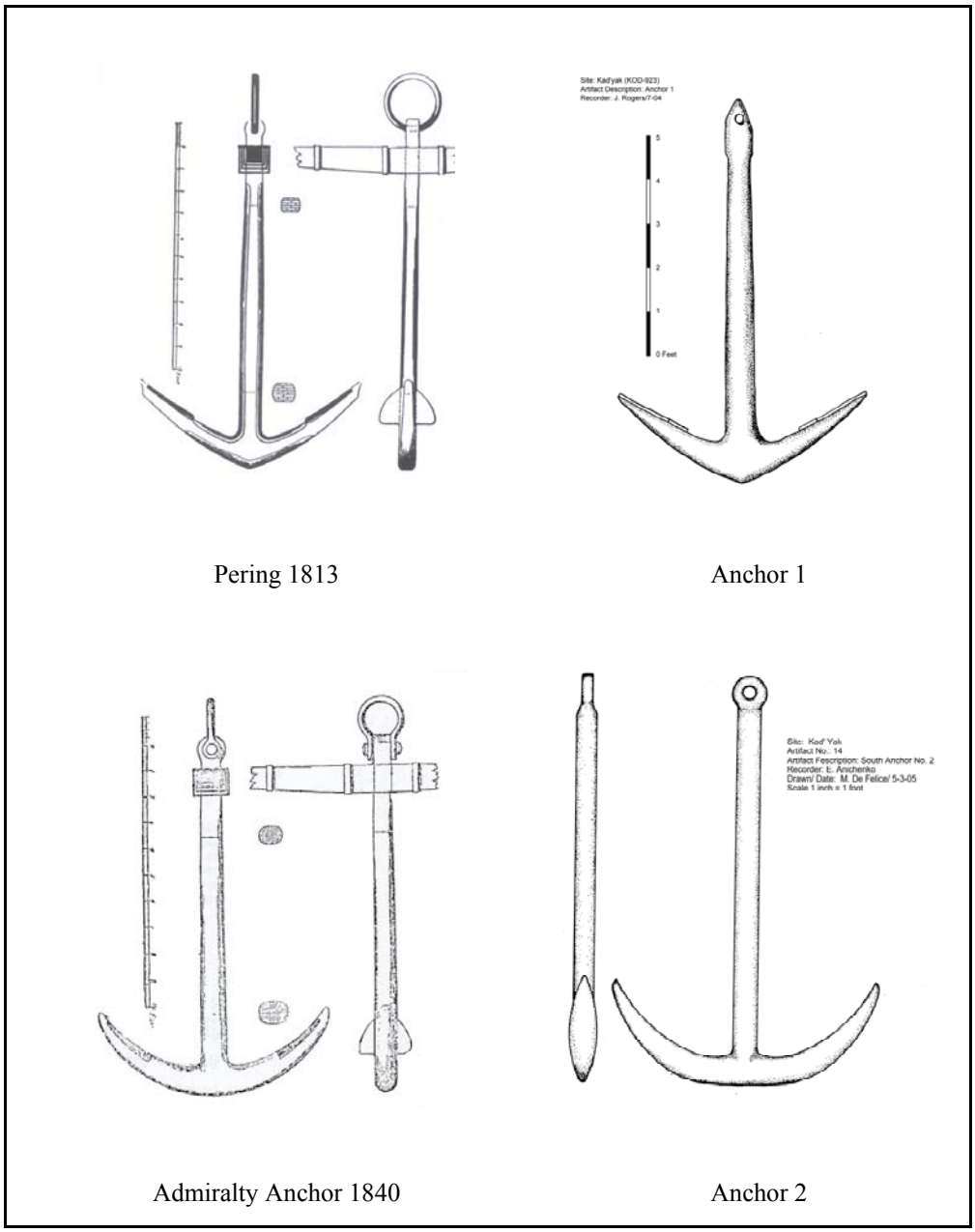


Figure 48. A comparison of Richard Pering's 1813 anchor to Anchor 1 and the Admiralty anchor of 1840 to Anchor 2 (Cotsell 1856: 11, 14).

Given the style of *Kad'yak*'s anchors with rounded crowns and wooden stocks, their manufacture can be placed sometime in the first half of the nineteenth century. The similarity of the bower anchors to Pering's and Parker's designs provides a useful chronology, but these men were British designers and the origin of the anchors is unknown. Trends in anchor design, like many technical innovations, may have spread from Britain as their value became known.

These anchors are presumably northern European, possibly made in Germany, but without recovering them for conservation and close examination it is not possible to determine their origin or if they are the original anchors used to outfit the ship. The Russians in Alaska had a large fleet and traded extensively with the British and Americans. They certainly had the opportunity to remove, replace, or re-equip items such as anchors.

Anchor chain is present in the area around the *Kad'yak*'s windlass, but there is no chain attached to any of the anchors. In fact, all of the anchors are missing the ring where the chain is normally attached. The largest portion of the windlass present is the chain lift, a type of windlass wildcat formed to engage chain links for lifting the anchor. Prior to the nineteenth century nearly all anchor cable was made from hemp or other plant fibers. There are few historical references to chain cable before 1800. Technology developed during the industrial revolution led to processes for manufacturing chain from iron and then steel, making it widely available by the mid-nineteenth century. Between 1800 and 1850 there were many improvements in manufacturing and proofing chain for strength. One early innovation, in 1812, was the addition of a stud across the link to stiffen and strengthen the chain. Stud-link chain became recognized for its strength and is still used as anchor chain today. By 1853, the British underwriter Lloyds issued strict rules requiring the use of chain cable on merchant vessels for insurance purposes (Scientific American Supplement 1902:22240). *Kad'yak* was not insured by Lloyds, but an anchor with a chain cable is listed as cargo in the logbook on a voyage from New Archangel (Sitka) to Kodiak in 1859 (Russian American Company). The intended use of this anchor is not known but its mention demonstrates the utilization of chain cable by the Russians and is not unexpected given the date of the *Kad'yak*'s construction and the need for strong ground tackle in the north Pacific.

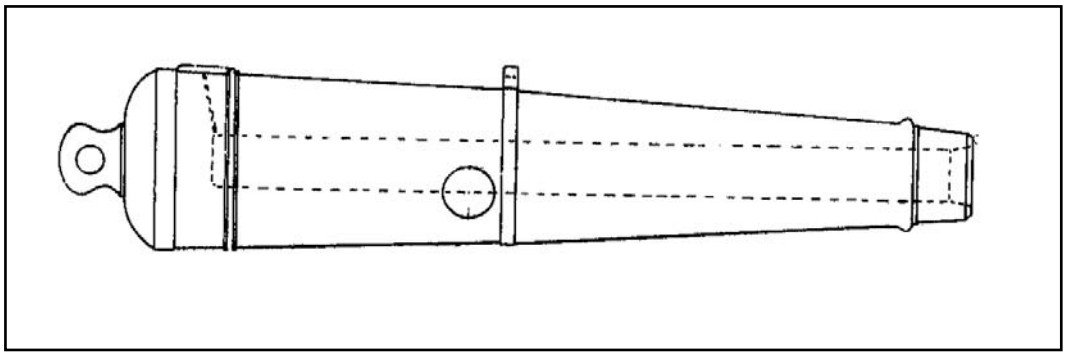


Figure 49. A 24-pounder Congreve gun (Tucker 1989: 138)

Figure 50 The muzzle of *Kad'yak*'s north cannon is very similar in form to the Congreve muzzle**.**

Cannon

Russian-American Company vessels were outfitted with cannon for self defense (Golovin 1979: 146-149). Historical documents say that at various times *Kad'yak* carried from four to six cast iron guns. Only two have been found on the site, which leads to speculation as to why two to four additional guns are missing. There may have only been two onboard when the vessel was lost or some of the guns may have fallen overboard when the *Kad'yak* rolled on her side. Or they may still be on the site and undiscovered. Sometimes guns were stowed below deck on the ballast or even used as part of the ballast. The two guns found on the site are located away from the ballast pile indicating that they were probably not stowed but kept available for use. *Kad'yak* carried a hold full

of ice, so storing the guns below deck would make them inaccessible during the voyage. No remains of the gun carriages have been found.

Kad'yak's cannon are small and are two different lengths. Muzzle loading cannon of this period are designated by the weight of the ball they fire. Balls of each weight require a specific size bore so the bore diameter can be used to determine the size of the canon. Both cannon are heavily corroded and the inside of each barrel is thick with concretion making any diameter measurement suspect. However, a rough bore diameter measurement was possible on the north cannon. The length of this gun is 3 ft. with a bore of 3.6 in. This diameter conforms to a 6-pounder (Hogg 1970: 274). The south cannon is larger at 4 ft. long, but the muzzle is broken off. The muzzle and the broken end of the bore are heavily concreted. The measurement of 2.4 in. is considered too small to be accurate for a gun this size.

Neither cannon has a noticeable muzzle swell. The north cannon has the smooth tapering muzzle lines of a carronade. The carronade was a development of the late eighteenth century. The first prototype was produced by the Carron Company of Scotland in 1776. It was shorter and lighter than the long gun and could be served by fewer men. The carronade became popular on smaller vessels replacing the 4 to 12 pound guns but had a shorter effective range. The carronade was not mounted on trunnions, but instead was secured to the carriage by a bolt that passed through a loop cast on the underside of the barrel. The bore at the muzzle was enlarged to accommodate loading (Tucker: 120-121).

Sir William Congreve, an innovative British artillery designer at the turn of the nineteenth century, modified the carronade design producing a gun with a longer barrel and traditional trunnions while retaining the distinctive features of the carronade muzzle (Kiley 2004: 68, Tucker 1989: 138). The Congreve gun first appeared in 1814 and came in one size; a 24-pounder, 7 ft. 6 in. long. The muzzle style came to be known as the Congreve muzzle or straight muzzle (Tucker 1989: 137). A similar gun called the gunade was a modification of the carronade which retained the gun length and carronade form (Tucker 1989: 129).

The muzzle on the *Kad'yak*'s north cannon is similar to the Congreve muzzle, but far too small to be a Congreve gun. A photograph (Figure 48) of Russian cannon in

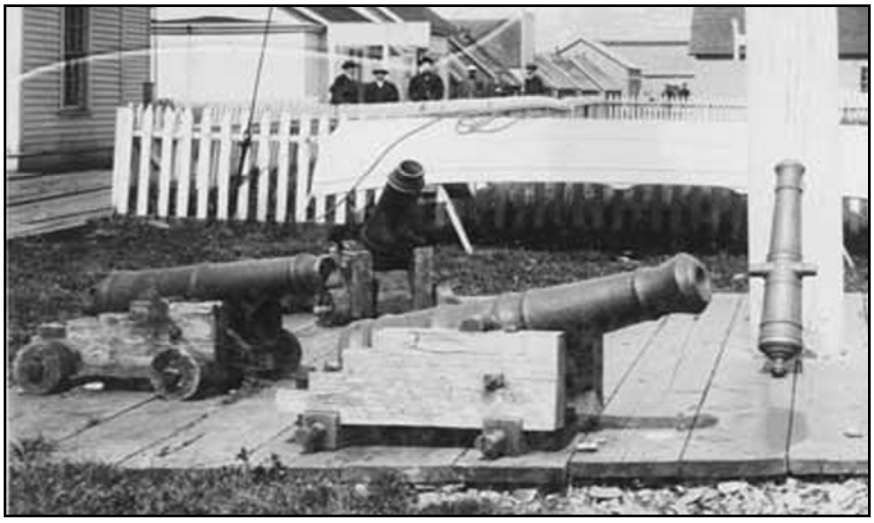


Figure 51. These cannon on the island of Unalaska at the turn of the twentieth century are attributed to the Russians. The two guns on the left have the straight Congreve style muzzle. Alaska State Library, Skinner Foundation Collection, Frank H. Nowell, 1896 to 1913, ASL-PCA-44

Unalaska near the turn of the twentieth century shows two guns with straight muzzles similar in size and form to the north cannon. Golovin's report of 1862 lists the armament of all the Russian-American Company vessels as of July 1, 1860 (three months after the *Kad'yak*'s loss). Of thirteen vessels listed nine carried armament ranging from two to eight cannon. Sizes of cannon are not given on all vessels but include 9 and 12-pounders. One vessel carried four carronades of unspecified size. Also listed are powder, cannon balls, canister shot and gun tools. The arms carried by Russian vessels are well documented in Golovin's report and photographic evidence demonstrates that the Russians used more than one style of gun. Each of *Kad'yak*'s guns is different, but fall within the range used by the company in the 1860s.

Wood samples

Wood identification can provide a geographical origin for wood used to make an object like a ship timber or artifact. This is obviously useful when trying to determine the origin of a vessel or object but there are limitations. Identification is done by examining the characteristics of wood cell anatomy under a microscope. It is generally accurate to the genus or sometimes to the sub-genus level (ex. white oak group). Rarely can an exact species be determined. A genus or sub-genus, such as white oak, may grow in several

parts of the world. For example, wood analysis can identify a sample from the white oak group but cannot delineate between species found in North America or Europe (Wiedenhoeft: 2005).

Five wood samples were collected at the site for identification by the Smithsonian Center for Materials Research and Education. Three of the samples were taken from the vessel and two were taken from artifacts. Table 1 presents the sample analysis and a discussion of the analysis can be found in Appendix I. The samples show two of the wood types used in *Kad'yak*'s construction. Samples 1 (floor timber) and 5 (rudder) are from the white oak group and sample 2 is beech (sample 2 is a very small wood fragment found attached to Artifact 007, a rudder pintle). Species of both the beech and white

Sample No.	Description	Provenience	Identification
1	Floor timber	Baseline 131 ft., 4.5 ft. north	**White Oak Group** (*Leucobalanus*)
2	Outer hull plank	Baseline 139 ft., 3.2 ft. south	**Beech** (*Fagus* spp./fagaceae)
3	Stave (Artifact 011)	Baseline 140 ft., 3 ft. south	**White Oak Group** (*Leucobalanus*)
4	Firewood (Artifact 012)	Baseline 140 ft., 3 ft. south	**Western Hemlock** (Tsuga spp.)
5	Rudder (Artifact 007)	Area 2, Baseline 268.75 ft., 12.25 ft. north	**White Oak Group** (*Leucobalanus*)

Table 1. Wood identification

oak group grow in North America and Europe but it is impossible to distinguish between species within each group. Beech also grows in Asia (Alden: 1995, Appendix I). Use of white oak for shipbuilding follows traditional practices in North America and Europe and its use on the *Kad'yak* is not unexpected. It probably represents original construction and not repair. Beech is used in ship construction and considered a good wood for frames. It is not a very durable wood in wet/dry areas where it is prone to warping (Mitchell 1994: 66, 75, 83). Use of a beech plank on the bottom of the *Kad'yak*'s hull was probably not the best choice but in this location it would stay submerged minimizing the problem of warping and resulting leaks.

A layer of sticks and miscellaneous wood fragments was noted in the space below the hull plank where sample 2 was taken. This space lies outside the vessel's hull so the material must have lodged there during the wrecking process or been transported by seabed movement. Pine branches were used as dunnage to pack and insulate ice on ships loaded at Woody Island (Stevens 1878: 336). There would have been an ample supply of dunnage on board *Kad'yak* similar to the materials found under the hull plank. Artifacts 011 and 012, from which samples 3 and 4 were taken, were found among the dunnage. Artifact 011 is a stave from a bucket or other type of open staved container and made from white oak. Artifact 012 is tree branch with cut marks from an axe or hatchet. It is Western Hemlock which grows from California to Southern Alaska, but its range stops on the Kenai Peninsula and does not extend to Afognak or Kodiak Islands (Viereck and Little 1975). Between 1853 and 1859 firewood is listed among the supplies carried on the *Kad'yak* (Records of the Russian-American Company 1853-1859). It is possible that Artifact 012 is a piece of firewood loaded in Sitka before *Kad'yak* departed on its last voyage to Kodiak.

Metallurgical analysis

Several copper alloy artifacts were recovered when the *Kad'yak* was discovered in 2003. None of these artifacts had good provenience so a decision was made to take a sample of metal from two artifacts for testing to determine their composition. Analysis was done at the University of Alberta with a scanning electron microscope (SEM) using energy dispersive analysis (EDA) (Kory Cooper 2005, elec. comm., Appendix II). Bronze and brass are alloys of copper that are found on shipwrecks. They may contain both tin and zinc in the alloy. Bronze, often used in casting, contains a higher percentage of tin while brass, often used to make wrought objects, has higher zinc content (North and Macleod 1987:86).

A fragment of hull sheathing contains 62% copper and 38% zinc with no other trace elements. This proportion of copper to zinc is nearly identical to Muntz metal, which is 60% copper and 40% zinc. Muntz metal came into widespread use as hull sheathing in the late 1840s and 1850s (Staniforth 1985:27). The use of Muntz metal on the *Kad'yak* is expected given her construction in 1851. The second sample came from a

strap similar to those on the gudgeons found in 2004 (Artifacts 008, 009, 010), although, there is no evidence to indicate that the strap is actually from a gudgeon. The strap contains 66% copper, 31% zinc, 1% tin, and 1% lead. The proportions of copper and zinc are indicative of brass (North and Macleod 1987:86). The tin and lead may be impurities.

Kad'yak and the ice trade

Not surprisingly, there is no trace of the ice cargo *Kad'yak* carried on her last voyage. Ice is highly perishable and great pains were taken to minimize melting on voyages to distant markets. While the ice is gone, ice handling tools, packing materials, and modifications to the vessel made to carry this special cargo may remain on the site. During the investigation, however, no ice handling tools were found and no obvious modifications to the vessel structure were noted. These modifications may not be present in the lower hull section and artifacts may be buried under sand.

Ice production on Woody Island started when the population of California increased dramatically after the discovery of gold in 1848. This influx of people created a ready market. Alaska was reasonably close and the Russian-American Company recognized the potential business opportunity. The first shipment, made in February 1852, was consigned to the Union Ice Company of San Francisco at $75 per ton. Early shipments of ice came from Sitka but the weather there was often too warm to produce a good product. Ice production quickly shifted to Woody Island where the climate was colder and ice production more consistent. The island contained two interconnected lakes where the ice was harvested. To improve production the upper lake was dammed to raise the water level and increase the surface area. The company stored the ice in two ice houses before shipment, each with a capacity of 3,000 tons (Stevens 1990: 193-197).

The operation of shipping ice from Kodiak is described in some detail by Stevens (1878:336): "At Kodiach…ice is taken out of an artificial lake less than a quarter mile from the place of loading – a small pier, where the ship is moored. Large blocks are drawn along by iron hooks over planks fitted with iron rails running to the ship's hatchways, down which the blocks are lowered on an inclined plank, into the hold. Dunnage consists of the cuttings from the dwarf pine tree, which grows freely on the

island. Considerable quantities of branches, thickly covered with their cool foliage, are placed between the blocks on each layer as the stowage proceeds; a profuse supply is laid over all." Dunnage found on the site is consistent with cuttings from indigenous pine trees, but analysis has not been completed to determine if the material is from the local area.

Ice was an unusual cargo and ships were often modified to carry this perishable commodity to minimize melting. A contemporary account illustrates how this was done.

> The first thing is to make an even floor in the hold of the ship, by filling up the furrows, so to speak, each side of the keel, with what sailors term "dunnage," consisting of fragments of lumber or ballast of some kind. This gives a tolerably wide floor for the lower tier of ice, which (the floor, not the ice) is covered with a layer of straw or hay, and this again with a coarse layer of saw dust or wood turnings. This allows the water from the melting ice to trickle down, and to be removed by the pumps. But as the space in the bow and stern of the ship is necessarily narrow, and would admit of the packing of but one cake of ice in the extreme parts of it, which would be attended with great loss and waste without any compensating advantages, it has been found necessary to erect partitions, or bulkheads, across such parts of the vessel as its particular model shall render advisable, so that from half to two-thirds of all the available space in the ship shall be occupied by the cargo, equidistant between the bow and stern. This done, the ship is prepared to receive her cargo (Scientific American 1868: 338-339).

No historic sources mention if Russian-American Company ships were modified, but this passage provides information on two features that may appear in the archaeological record. Ballast stone was used as dunnage to create a flat surface in the bottom of the ship covering the keelson and ceiling planks. On *Kad'yak* the ballast stone only covers part of the lower hull but it is higher than the keelson affording a flat surface to stack ice. Most of the ballast is located in the aft third of the vessel and very little stone was observed on forward areas of the hull. The reason for the disparity is not known and it is impossible to tell if this was how the ballast was arranged when the ice cargo was loaded or if the wrecking process displaced stone further aft. The historical account describes structural modifications made to the cargo space of contemporary vessels to contain the ice in a bulk load with minimal contact with warm surfaces. Bulkheads were built to keep the ice out of narrow areas like the bow. Traces of bulkheads may be present in the remaining hull section if wood degradation has not destroyed the evidence. In the area of

hull examined during the investigation the ceiling planking had completely decayed and several inches of the frames were also missing eliminating any sign of bulkheads. Therefore any modifications would have to be found in areas not examined where the wood is better preserved. The sand deposits covering the lower hull in the western end of the site may contain this evidence. Another consideration on *Kad'yak* is the passenger and crew cabins built below deck. Utilizing this internal space for cabins limits the amount and location of space available for cargo. Contemporary ship plans of a similar vessel with deck cabins show cargo hatches amidships (MacGregor 1988:119). Presumably *Kad'yak*'s main hold was amidships and that is where the ice was loaded.

Conclusion

Alaska's maritime orientation is apparent throughout its history and prehistory. It is a remote place where many communities rely on air and water transportation rather than an intrastate road system. Alaska also has the largest commercial fishery in the United States. Between the nineteenth and twenty-first centuries the orientation of maritime trade has changed somewhat, from ice and furs to fishing, but the method of transporting cargo and earning a living from the sea today would certainly be recognized by the Russians living in Alaska in the 1850s.

The *Kad'yak* exists within this maritime context as a unique archaeological resource. It is the only known example of a Russian-American Company shipwreck in U.S. waters and is currently the oldest shipwreck in Alaska. The site has not been disturbed by looters or souvenir hunters so the archaeological context is virtually intact. The material culture represents the ship, its outfit, passengers and crew, and cargo. Few shipwreck sites in coastal waters contain the integrity of the *Kad'yak*. This is due in part because of the remote Alaska coast where recreational diving is limited and the *Kad'yak* lay undiscovered. Fortunately, the *Kad'yak* was not destroyed by the devastating earthquake and subsequent tsunamis that nearly destroyed Kodiak in 1964.

The 2004 pre-disturbance survey positively identified the shipwreck and completed site documentation showing the distribution of artifacts and remaining ship structure. The work also discovered a new section of the vessel that is accounted for in the historic record describing the events leading to the sinking. A review of the site's

condition shows that it is a very sensitive resource. The actions of marine organisms have left the wooden hull in a degraded condition prone to damage if mishandled. This is exacerbated by periodic exposure to scouring and water movement which causes continued erosion. A large number of artifacts remain on the site. Some of these are lying exposed on the bottom but there is likely a large collection of material culture buried in the sand. In general organic material is not well preserved and iron artifacts are heavily concreted and have undergone extensive corrosion. Copper alloy artifacts exhibit very good preservation.

Future site investigation should include two objectives. First, Area 2 should be visually surveyed to identify the extent and type of artifacts present. The majority of artifacts were observed on the reef, but cultural material is also present on the sand at the base of the reef and some of it may be buried. Identifying the materials in this area can help determine how the *Kad'yak* settled on the seabed.

The next phase of investigation in Area 1 should be a test excavation to address specific research questions. Possible strategies include defining the extent of hull remains by excavating a trench along the vessel's longitudinal axis from the ballast pile forward. This will reveal the condition and depth of the buried hull and the concentration of artifact material. Transverse trenches extending past the hull should identify the location of upper hull structure that collapsed during site formation. The artifact distribution suggests that wooden portions of the ship may lie buried beyond the main hull section.

Any further site work involving excavation will have to include the cost of conservation to treat the artifacts recovered. A wide variety of material can be expected on the site including ceramics, glass, iron, lead, pewter, copper and cuperous alloys, wood, leather, and probably several unexpected materials types. Funding for future research should include the means to conserve artifacts. A temporary or permanent facility will be needed along with skilled personnel. One possibility is to use the State Archaeology Laboratory in Anchorage. Another is to create a lab in Kodiak. Allowance should be made to contract for the conservation of certain sensitive materials at specialized laboratories.

Site management will remain an issue regardless of whether research continues on the vessel. The K*ad'yak* is an icon in the local culture of the Kodiak area where the stories of Saint Herman are well known and Russian heritage is strong. There is great interest in the site and it is expected that there will be pressure to allow divers to visit the shipwreck. As with many shipwrecks, cultural resource managers in Alaska will have to find a way to work with divers to minimize impact on the site and prevent the loss of cultural material. The *Kad'yak* is a very sensitive resource and would be prone to accelerated degradation if diver impact is high. The *Kad'yak* is a unique site, and the loss of archaeological integrity would be irreplaceable.

The *Kad'yak* is representative of Alaska's maritime and Russian heritage. It is the oldest shipwreck in Alaska and is the only Russian-American Company ship discovered. Because of its significance, it received an immediate listing on the U. S. Department of Interior's National Register of Historic Places. The initial survey completed in 2004 illustrates the great potential of the site as a resource to investigate this unique period in Alaska's history.

PUBLIC OUTREACH AND EDUCATION

This project included a component unrelated to the direct collection of archaeological data from the *Kad'yak* shipwreck. If the popularity of television programs and magazine articles are any indication, public interest in archaeology, especially underwater archaeology, is tremendous. Addressing this popular audience serves many purposes with tangible and intangible benefits. Increasing awareness of the public to the sensitive nature of archaeology helps preserve the resources. Targeting school children engenders this awareness at an early age and creates an appreciation of science and history that can last a lifetime.

Several avenues of public outreach were used to convey the excitement of discovery and the story behind the shipwreck. This included newspapers, on-line articles and web sites, public talks, radio interviews, presentations and papers at professional conferences, and development of curriculum materials for school children. The project also provided a practical experience in nautical archaeology for students in the Maritime Studies Program at ECU.

Public outreach

Alaska is a sparsely populated state and includes a large Native American population. Awareness of history and cultural identity is strong among these people. The story of the *Kad'yak* is woven into the history of the Alutiiq living in the Kodiak area. The association of the vessel with St. Herman and its location in Icon Bay, or Monk's Lagoon, almost within sight of St. Herman's chapel, make this a strong icon in local culture. There is a strong sense of ownership among the communities that generates both interest and suspicion toward anyone disturbing the archaeological remains. This project offered a unique opportunity to communicate with people about the role and significance of the *Kad'yak* to the local communities. This dialogue raised questions on history, archaeology, ownership, and preservation of cultural materials. Meetings held in Ouzinkie Village on Spruce Island and at Kodiak College allowed archaeologists and local people to interact. Goals of the projects were discussed along with the results of the field survey. Individuals expressed concerns over artifact ownership and the ultimate

disposition of the material. Some thought that the project might involve the recovery of all the artifacts on the site and that they would be taken away and never returned. The state's views on ownership were expressed by Alaska State Archaeologist Dave McMahan who pointed out that the state will retain ownership of the material but will support the display of artifacts at a museum facility in Kodiak that can provide security and environmentally controlled conditions. The meeting held in Ouzinkie Village elicited several stories about the shipwreck and artifacts found from the Russian period that have been discovered on the island. These meeting generally reassured the communities that the project had legitimate goals and a desire to involve local people.

Outreach beyond the local communities included coverage by the Kodiak Daily Mirror that was posted on the Associated Press wire service and picked up nationally by newspapers. The New York Times ran a feature on the project in the July 27, 2004 issue of the Science section. As a sponsor, NOAA provided coverage of the project on its web site. **http://www.noaanews.noaa.gov/stories2004/s2270.htm** and the NOAA Maritime Heritage Program also has a web site on the project **http://sanctuaries.noaa.gov/maritime/expeditions/kadyak.html** . Archaeology Magazine Online carries an article describing the field expedition at **http://www.archaeology.org/online/features/kadyak/**. The State of Alaska Office of History and Archaeology has created a web site for the project providing details of the *Kad'yak's* history (**http://www.dnr.state.ak.us/parks/oha/kadyak/kadyakindex.htm**).

Public radio stations in Kodiak and Anchorage interviewed project personnel and the project's PIs participated in a radio call-in show taking questions from listeners. Radio provided an avenue to reach a much broader audience in Alaska. The daily radio feature program, Our Ocean World, broadcast two segments on the *Kad'yak* project. These can be heard at **http://www.ouroceanworld.com/**. Our Ocean World is produced in cooperation with the National Oceanic and Atmospheric Administration and sponsored by NOAA Ocean Explorer.

Numerous presentation were made addressing the history and archaeology of the *Kad'yak*. These include invited presentations to the Society for Historical Archaeology annual conference held in York, UK in January 2005, the Alaska Anthropological Association annual conference, the Alaska Historical Society/Museums Alaska annual

conference, and the NOAA Maritime Heritage Education Conference held in Norfolk, Virginia. These presentations disseminate information to professional audiences.

The project enlisted the help of eight volunteer divers. Although limited in number, volunteers provided the manpower necessary to complete the field investigation and their involvement was planned from the beginning. Logistically, the *Kad'yak* is a difficult site to investigate because of its remote location. With the help of Bradley Stevens, a Kodiak resident, local arrangements were made to secure air fills, equipment and the help of volunteer divers. Volunteers were screened for their diving ability and skills. Most of these divers work in fisheries research and historic preservation. Their involvement in one of Alaska's first professionally conducted underwater archaeology projects created a pool of skilled volunteers aware of preservation issues and the techniques used in this field.

Education

The cornerstone of the project's public outreach was the collaboration with two Kodiak Public School Teachers, Balika Haakanson and John Adams, to develop lesson plans for grades 3 and 4 (see Appendix IV). They are aimed at the Kodiak Island Borough School District using the *Kad'yak* to address history, science and civics. Copies of these lesson plans were provided to the Kodiak Public School system at no cost in printed and digital form. The curriculum material is intended for school children in the Kodiak area, but it also has broader applications. Many of the topics are pertinent to Alaska in general and the lesson plans on science are universal. The goal of introducing these materials in the Kodiak school system is to continue to give children a means to learn subjects of local importance that have international significance.

BIBLIOGRAPHY

Alden, Harry A.
1995 Hardwoods of North America. General technical Report FPL-GTR-83. Forest Products Laboratory, Forest Service, U.S. Department of Agriculture. Madison, WI.

Andrews, C. L.
1934 Russian Shipbuilding in the American Colonies. *The Washington Historical Quarterly* 25:3-10**.**

Anonymous
1980 Preparations to dive on Russian wreck. *Alaska Fisherman's Journal* 4:63.

Archiv der Hansestadt Lübeck,
n.d. *Lübeck Genealogisches Register*, Band 10 (M), AHL HS 864, Lübeck, Germany.

Archiv der Hansestadt Lübeck.
1851 Altes Senatsarchiv Iterna Lastadie, MS. 4/13, N 16. Lübeck, Germany.

Archiv der Hansestadt Lübeck
1851-1852 *Kanzlei 8, folder for years 1851-1852*, Lübeck, Germany

Arkhimandritov, Illarion.
1860 *Journals of Explorations of Captain Arkhimandritov. Records of Russian-American Company. 1860.* Microfilm M11. vol. 49, roll 77, United States National Archives, Washington DC.

1869 *Letter from Illarion Arkhimandritov regarding the donation of an icon of St. Nicholas to a chapel on Spruce Island.* Alaskan Russian Church Archives: records, 1733-1938 , Library of Congress, Washington DC, Container D262, Microfilm Reel 181.

Arndt, Katherine and Richard Pierce
2003 *A Construction History of Sitka, Alaska as Documented in the Records of the Russian-American Company*. Sitka National Historic Park, Sitka, Alaska.

Barratt, Glynn
1977 *Russia in Pacific Waters, 1715-1825*. University of British Columbia Press, Vancouver.

Black, Lydia
2004 *Russians in Alaska, 1732-1867*. University of Alaska Fairbanks. Fairbanks, AK.

Capps, Stephen R.
1937 *Kodiak and Adjacent Islands*. United States Department of the Interior Geological Survey Bulletin 880-C. United States Government Printing Office, Washington.

Cotsell, George
1856 *A Treatise on Ship's Anchors*. John Weale, London.

Crothers, William L.
1997 *The American-Built Clipper Ship*. International Marine, Camden, ME.

Curryer, Betty Nelson
1999 *Anchors: An Illustrated History*. Naval Institute Press, Annapolis, MD.

Davidson, George
1867 *Papers on Alaska*. n.pub., Washington, D.C.

Davydov, Gavriil I.
1977 *Two Voyages to Russian America, 1802-1807*. Colin Bearne, translator. Limestone Press, Kingston, Ontario.

Florian, M-L. E.
1987 The Underwater Environment. In *Conservation of Marine Archaeological Objects*, edited by Colin Pearson, pp 1-20. Buttersworth, London.

Furuhjelm Johan Hampus
1852 *Report of the Chief Manager of the Russian-American Company, Johan Hampus Furuhelm, to the St. Petersburg office, May 12.* Records of Russian-American Company, Correspondence of Governors General, Communications Sent, January 1- December 31, 1852, Volume 33, Microfilm Roll 58, National Archives.

Gibbs, Jim.
1997 A*laskan Maritime*. Schiffer Publishing, Atglen, PA.

Gibson, James
1976 *Imperial Russia in Frontier America: The Changing Geography of Supply of Russian America, 1784-1867*. Oxford University Press, Oxford, England.

Golder, F. A.
2004 *Father Herman: Alaska's Saint*. St. Herman of Alaska Brotherhood, Platina, CA.

Golovin, Pavel N.
1979 *The End of Russian America: Captain Golovin's Last Report, 1862*. Basil Dmytryshyn and E.A.P. Crownhart-Vaughan, translators. Oregon Historical Society, Portland, OR.
1983 *Civil and Savage Encounters: the Worldly Travel Letters of an Imperial Russian Navy Officer 1860-1861*. Basil Dmytryshyn and E.A.P. Crownhart-Vaughan, translators. Oregon Historical Society, Portland, OR.

Greenhill, Basil
1988 *The Merchant Schooners*. Conway Maritime Press, London.

Heidorn, Keith C.
2003 Gulf of Alaska Storms. http://www.suite101.com/article.cfm/13646/103530. October 1, 2003.

Hieke, Ernst
1968 *Rob. M. Sloman Jr., Errichtet 1793*. Verlag Hanseatischer Merkur, Hamburg.

Hogg, Oliver F. G.
1970 *Artillery: Its Origin, Heyday and Decline*. Archon Books, Hamden, CT.

Keithahn, Edward
1945 Alaska Ice, Inc. *Pacific Northwest Quarterly*, 36(2).

Kiley, Kevin F.
2004 *Artillery of the Napoleonic Wars 1792-1815*. Greenhill Books, London.

Kostromitinov, Petr
1851 *Letter from Russian-American Colonies to China.* Alaska State Library PCA 20- 221.

Kresse, Walter
1969 *Seeschiffs-Verzeichnis der Hamburger Reedereien, 1824-1888*. Museum für Hamburgische Geschichte. Hamburg, Germany.

Kruzenshtern, Ivan F.
1809 *Puteshestvie vokrug sveta v 1803, 1804, 1805, 1806 godakh na korabliakh* Nadezhda *i* Neva [Voyages around the World in the Years 1803, 1804, 1805, 1806] Morskaia Tipografiia, St. Petersburg.

Lübeckische Anzeiegen
1851 *No title*, 167, 18 Juli, n.p.

MacGregor, David R.
1988 *Merchant Sailing Ships 1850-1875*. Naval Institute Press, Annapolis, MD.

Meyer, Jürgen
1971 *Hamburgs Segelschiffe 1795-1945*. Heinemann, Norderstadt.

McCarthy, Mike
1996 Ship's fastenings: A preliminary study revisited. *International Journal of Nautical Archaeology*, 25.3: 177-206.

Mitchell, Amy
1994 A Comparison of Wood Use in Eighteenth Century Vessels. Master's Thesis, Department of History, Maritime Studies Program, East Carolina University, Greenville, NC.

Morskoi Sbornik
1869 The dispatch from Novo-Arkhangelsk from December 22, 1860, Morskoi Sbornik [Maritime Digest] LII, St. Petersburg, Russia

Muckelroy, Keith
1978 *Maritime Archaeology*. Cambridge University Press, London.

National Oceanic and Atmospheric Administration Office of Coast Survey
2005 *United States Coast Pilot, Volume 9: Cape Spencer, AK to Beaufort Sea, AK*. (23rd Edition) NOAA National Ocean Service, Washington, DC.

North, N. A. and Ian. D. Macleod
1987 Corrosion of Metals. In *Conservation of Marine Archaeological Objects*, edited by Colin Pearson, pp 68-98. Buttersworth, London.

Pierce, Richard A.
1972 Alaska's Russian Governors, *The Alaska Journal: History and Arts of the North-Quarterly*, 2(4), Autumn, 21.
1983 Record of Maritime Disasters in Russian America, Part Two:1800-1867. In *Proceedings of the Alaskan Marine Archeology Workshop, May 7-19, 1983, Sitka*, J. Langdon, editor, pp 59-72. Alaska Sea Grant College, Fairbanks.
1990 *Russian America: A Biographical Dictionary*. Limestone Press, Kingston, Ontario.

Pietsch, Ulrich

1982 *Die Lübecker Seeschiffahrt vom Mittelalter bis zur Neuzeit (Lübeck Seafaring from the Middle Ages to the Present)*. Museum für Kunst und Kulturgeschichte der Hansestadt Lübeck, Lübeck, Germany.

Plafker, George and Reuben Kachadoorian.

1969 *Geologic Effects of the March 1964 Earthquake and Associated Seismic Sea Waves on Kodiak and Nearby Islands, Alaska*. Geological Survey Professional Paper 543-D. United States Government Printing Office, Washington.

Records of Russian-American Company

1852 Cor*respondence of Governors General, Communications Sent, January 1-December 31, 1852*, Volume 33, Microfilm M11, Roll 58, United States National Archives, Washington, DC

1853 Cor*respondence of Governors General, Communications Sent, January 2, 1853- April 21, 1854*, Volume 34, Microfilm M11, Roll 59, United States National Archives, Washington, DC

1853-1859 *Logs of the bark Kodiak*, Microfilm M11, Roll 75, United States National Archives, Washington, DC

1858 *Correspondence of Governors General, Communications Sent,* Volume 40, Roll 62 Microfilm M11, Roll 62, United States National Archives, Washington, DC

1860 *Correspondence of Governors General, Communications Sent*, January 16-December 30, 1860, Microfilm M11, Volume 41, Roll 63, United States National Archives, Washington, DC

Russian-American Company

1852 *Otchet Rossisko-Amerikanskoi kompanii, Glavnago Pravleniia za 1851 god(Annual Report of the Russian-American Company, Head Office, for the year 1851)*. St. Petersburg.

1853 *Otchet Rossiisko-Amerikanskoi kompanii, Glavnago Pravleniia za 1852 god(Annual Report of the Russian-American Company, Head Office, for the year 1852)*. St. Petersburg.

1854 *Otchet Rossiisko-Amerikanskoi kompanii, Glavnago Pravleniia za 1853 god (Annual Report of the Russian-American Company, Head Office, for the year 1853)*. St. Petersburg.

1856 *Otchet Rossiisk-Amerkanskoi kompanii, Glavnago Pravleniia za 1855 god (Annual Report of the Russian-American Company, Head Office, for the year 1855)*. St. Petersburg.

1858 *Otchet Rossiisk-Amerkanskoi kompanii, Glavnago Pravleniia za 1857 god(Annual Report of the Russian-American Company, Head Office, for the year 1857)*. St. Petersburg.

1859 *Otchet Rossiisk-Amerkanskoi kompanii, Glavnago Pravleniia za 1858 god (Annual Report of the Russian-American Company, Head Office, for the year 1858)*. St. Petersburg

1860 *Otchet Rossiisk-Amerkanskoi kompanii, Glavnago Pravleniia za 1859 god (Annual Report of the Russian-American Company, Head Office, for the year 1859)*. St. Petersburg.

Scientific American

1868 Ice–Its Collection, Storage, and Distribution. *Scientific American*. 18(22): 338-339

Scientific American Supplement

1902 The History of the Anchor. *Scientific American Supplement*. 54(1388): 22240.

Sharma, Ghanshayam D.

1979 *The Alaska Shelf: Hydrographic, Sedimentary and Geochemical Environment*. Springer-Verlag, New York.

Staniforth, Mark

1985 The Introduction and use of Copper Sheathing–A History. *The Bulletin of the Australian Institute of Maritime Archaeology* 9(1-2): 21-48.

Stevens, Gary

1990 The Woody Island Ice Company. *Russia in North America: Proceedings of the 2nd International Conference in Russian America 1987*: 192-212. Richard A. Pierce editor. Sitka, Alaska. Limestone Press, Kingston, Ontario.

Stevens, Robert Whiten Company

1878 *On the Stowage of Ships and Their Cargos*. Longmans, Green, Reader, and Dyer, London, England.

Teben'kov, Mikhail D.

1852 Atlas Severo-zapadnykh beregov Ameriki, ostrovov Aleutskikh i nekotorykh drugikh mest severnogo Tikhogo Okeana (Atlas of the Northwest Coasts of America, Aleutian Islands, and some other sites in the North Pacific Ocean). St. Petersburg, Russia.

Tikhmenev, Piotr

1978 *A History of the Russian-American Company, Volume 1*. Richard Pierce and Alton Donnelly, translators. University of Washington Press, Seattle, WA.

1979 *A History of the Russian-American Company, Volume 2*. Richard Pierce and Alton Donnelly, translators. Limestone Press, Kingston, Ontario.

Tucker, Spencer
1989 *Arming the Fleet: U.S. Navy Ordnance in the Muzzle Loading Era*. Naval Institute Press, Annapolis, MD,

Viereck, Leslie A. and Elbert L. Little
1975 *Atlas of United States Trees, Volume 2, Alaska Trees and Common Shrubs*. U.S. Department of Agriculture, Forest Service, Miscellaneous Publications 1293.

Whymper, Frederick
1868 *Travel and adventure in the territory of Alaska, formerly Russian America-- now ceded to the United States-- and in various other parts of the north Pacific*, J. Murray, London, England.

Wiedenhoeft, Alex.
2005 Wood Identification Procedures. Technology Transfer Fact Sheet. U.S. Department of Agriculture, Forest Service, Forest Products Laboratory, Center for Wood Anatomy Research. http://www2.fpl.fs.fed.us/WoodID/idfact.html

Yarborough, Michael
1983 *Search for the Russian-American Company Bark Kodiak*. Unpublished research proposal. n.p.

APPENDIX I

WOOD ANALYSIS

Smithsonian Center
for Materials Research and Education

Wood Analysis Report

DATE: **6/6/05**
SCMRE#: **5938**
OBJECT: **shipwreck (Kad'yak -Russian American Co.)**
ACCESSION #:
RESPONSIBLE PERSON, DIV , DEPT: Dr. Frank Cantelas, East Carolina Univ., Program in Maritime Studies Admiral Ernest M. Eller House, Greenville, NC, 27858-4353
SUSPECTED PROVENANCE:
OWNER: East Carolina Univ., Program in Maritime Studies
EXAMINED BY: **Harry A. Alden**

ANAL YSIS:

Sample # 1	White Oak Group	Floor Timber
Sample #2	Beech	Hull Plank
Sample #3	White Oak Group	Artifact 011, Stave
Sample #4	Western Hemlock	Artifact 012, Firewood
Sample #5	White Oak Group	Rudder, from Artifact 007

Quercus spp.
Fagaceae
White Oak Group

Worldwide, the oaks (*Quercus* spp.) consist of 275 to 500 species that can be separated into three groups based on their microanatomy: the live or evergreen oak group, the red oak group (*Erythrobalanus*), and the white oak group (*Leucobalanus*). Species within each group look alike microscopically. The word *quercus* is the classical Latin name of oaks, said to be derived from Celtic fine and tree.

The commercial North American species are as follows:

White Oak Group (*Leucobalanus*)

Quercus alba American white oak, Arizona oak, Arizona white oak, forked-leaf white oak, Louisiana white oak, mantua oak, ridge white oak, stave oak, true 'white oak, West Virginia soft white oak, **white oak**

Quercus bicolor blue oak, cherry oak, curly swamp oak, swamp oak, **swamp white oak**, white oak

Quercus garryana Brewer oak, Garry oak, Oregon oak, **Oregon white oak**, Pacific post oak, Pacific white oak, post oak, prairie oak, shin oak, western oak, western white oak, white oak

Quercus lyrata American white oak, **overcup oak**, swamp post oak, swamp white oak, water white oak

Quercus macrocarpa blue oak, **bur oak**, burr oak, mossycup oak, mossy-overcup oak, overcup oak, scrub oak, white oak, white mossycup oak, white overcup oak

Quercus michauxii American white oak, basket oak, cow oak, swamp oak, swamp **chestnut oak**

Quercus muehlenbergii chestnut oak, **chinkapin oak**, chinquapin oak, dwarf chestnut oak, dwarf chinkapin, pin oak, rock oak, rock chestnut oak, running white oak, scrub oak, shrub oak, white oak, yellow oak, yellow chestnut oak

Quercus prinus American white oak, basket oak, **chestnut oak**, chestnut rock oak, chestnut swamp oak, cow oak, mountain oak, rock oak, rock chestnut, rock chestnut oak, swamp oak, tanbark oak, white oak, white chestnut oak

Quercus stellata American post oak, barren white oak, bastard oak, bastard white oak, box oak, box white oak, brash oak, Delta post oak, Durand oak, iron oak, pin oak **post oak**, ridge oak, rough oak, rough white oak, southern oak, turkey oak, white box oak, white oak

Live Oak Group

Quercus virginiana dwarf live oak, encino, **live oak**, rolfs oak, scrub live oak, Virginia live oak, Virginia oak

Distribution: Widely distributed throughout the United States.

The Tree: Oaks can reach a height of 125 ft (38 m), with large diameters.

General Wood Characteristics: The sapwood of oak is white to very light brown, while the heartwood is light to dark brown in the white oak group and reddish brown in the red oak group. Oak wood has a course texture; it is heavy, straight-grained, hard, tough, very stiff, and strong. Fast-grown oak, with wide rings, is stronger and heavier than slow-grown oak.

Working Properties: Oak wood has good working properties. It machines and glues well and holds fasteners extremely well. It tends to split when nailed, unless predrilled. Oak finishes well, but shrinks considerably.

Durability: The oaks are rated with respect to resistance to heartwood decay as follows (98):

Very resistant	bur oak, chestnut oak, Gambel oak, Oregon oak, post oak and white oak
Moderately resistant	swamp chestnut oak
Slightly to nonresistant	black oak and red oak

Preservation: The heartwood of the white oak group is resistant to impregnation with preservatives, whereas that of the red oak group is more easily penetrated.

Uses: Ships, railroad crossties, timber bridges, tannin dyes, fuel wood, hardwood dimensions and flooring, furniture, veneer, plywood, barrels, kegs and casks (white oak group), truck and trailer beds, mining timbers, containers, pallets, caskets, boxes, paneling.

Toxicity: May cause allergic bronchial asthma, rhinitis, and dermatitis (40, 64, 105).

Additional Reading: 29, 55, 68, 74, 78.

6. Boone, R.S.; Kozlik, C.J.; Bois, P.J.; Wengert, E.M. 1988. Dry kiln schedules for commercial woods-temperate and tropical. Gen. Tech. Rep. FPL-GTR-57. Madison, WI: U.S. Department of Agriculture, Forest Service, Forest Products Laboratory .
29. Elias, T.S. 1980. The complete trees of North America, field guide and natural history New York: van Nostrand Reinhold Company.
40. Hausen, B.M. 1981. Woods injurious to human health. A manual. New York: Walter de Gruyter .
55. Little, Jr., E.L. 1979. Checklist of United States trees (native and naturalized). Agric. Handb. 541. Washington, DC: U.S. Department of Agriculture, Forest Service. U.S. Government Printing Office.
59. Markwardt, L.J.; Wilson, T.R.C. 1935. Strength and related properties of woods grown in the United States. Tech. Bull. 479. Washington, DC: U.S. Department of Agriculture, Forest Service. U.S. Government Printing Office.
64. Mitchell, J.; Rook, A. 1979. Botanical dermatology: plants and plant products injurious to the skin. Vancouver, BC: Greeng1ass Ltd.
68. Panshin, A.J.; de Zeeuw, C. 1980. Textbook of wood technology, 4th ed. New York: McGraw-Hil1 Book Co..
74. Record, S.J.; Hess R. W. 1943. Timbers of the new world. New Haven, CT: Yale University Press.
78. Sander, I.L.; Rosen, H.N. 1985. Oak, an American wood. FS-247. Washington, DC: U.S. Department of Agriculture, Forest Service.
86. Simpson, W.T. 1991. Dry kiln operator's manual. Ag. Handb. 188. Madison, WI: U.S. Department of Agriculture, Forest Service, Forest Products Laboratory.
90. Summitt, R.; Sliker, A. 1980. CRC handbook of materials science. Boca Raton, FL: CRC Press, Inc. Vol. 4.

98. U.S. Department of Agriculture. 1987. Wood handbook: wood as an engineering material. Agric. Handb. 72. (Rev.) Washington, DC: U.S. Department of Agriculture. 466p.
105. Woods, B.; Calnan, C.D. 1976. Toxic woods. British Journal of Dermatology. 95(13): 1-97.

From: Alden, Harry A. 1995. Hardwoods of North America. Gen. Tech. Rep. FPL-GTR 83. Madison, WI: US. Department of Agriculture, Forest Service, Forest Products Laboratory. 136 p.

Fagus grandifolia
Fagaceae
American Beech

Beech (*Fagus* spp.) contains eight species which grow in Asia [4], Europe (F. sylvatica), and North America (F. grandifolia). The word fagus is the classical Latin name, from the Greek word meaning to eat, in reference to the edible beechnuts. All species look alike microscopically.

Other Common Names: beech, Carolina beech, gray beech, red beech, ridge beech, stone beech, white beech, winter beech.

Distribution: American beech grows in southeast Canada and in the eastern half of the United States, from Maine to northern Florida, and west from the Atlantic Coast to Wisconsin, Missouri and Texas.

The Tree: The American beech tree grows in large pure stands and intermixed with sugar maple, yellow birch, American basswood, black cherry , eastern hemlock, eastern white pine, red spruce, sweetgum, Southern magnolia, ashes, hickories and oaks. It grows best in deep, rich, moist, well-drained soils. American beech trees reach heights of 120 ft (37 m), with a diameter of almost 4 ft (1.2 m). The bark is thin, smooth, and gray to blue gray.

General Wood Characteristics: The sapwood of American beech is white with a red tinge, while the heartwood is light to dark reddish brown.

Weight[a]

		Weight	
Moisture content	Specific gravity	Ib/ft^3	kg/m^3
Green	0.56	54	865
12%	0.64	45	721
Ovendry	0.67	NA	NA

[a]References: specific gravity , green and 12%, (98); specific gravity, ovendry, (59); weight, (59).

Working Properties: American beech ranks high in holding nails, but it should be pre-bored. The wood wears well and holds a polish, and it bends readily when steamed. Care is needed in gluing, but the wood finishes well with paint or transparent finishes.

Durability: Rated as slightly or nonresistant to heartwood decay.

Preservation: Sapwood and heartwood are permeable when pressure-treated with a compound like creosote. The red heartwood is extremely resistant to penetration.

Uses: Lumber, veneer, charcoal, railroad ties, pulpwood, cooperage, boxes, crates, baskets, pallets, furniture, flooring, sash, doors, trim, paneling, general millwork, woodenware, novelties, handles, brooms and brushes, food containers, turnery , and chemical extracts such as methanol, acetate and wood tar (creosote).

Toxicity: No information available at this time.

Additional Reading: 12,29, 55,68, 74.

6. Boone, R.S.; Kozlik, C.J.; Bois, P.J.; Wengert, E.M. 1988. Dry kiln schedules for commercial woods-temperate and tropical. Gen. Tech. Rep. FPL-GTR-57. Madison, WI: U.S. Department of Agriculture, Forest Service, Forest Products Laboratory .
12. Carpenter, R.D. 1974. American beech. FS-220. Washington, DC: U.S. Department of Agriculture, Forest Service.
29. Elias, T.S. 1980. The complete trees of North America, field guide and natural history .New York: van Nostrand Reinhold Company.
55. Little, Jr., E.L. 1979. Checklist of United States trees (native and naturalized). Agric. Handb. 541. Washington, DC: U.S. Department of Agriculture, Forest Service. U.S. Government Printing Office.
59. Markwardt, L.J.; Wilson, T.R.C. 1935. Strength and related properties of woods grown in the United States. Tech. Bull. 479. Washington, DC: U.S. Department of Agriculture, Forest Service. U.S. Government Printing Office.
68. Panshin, A.J.; de Zeeuw, C. 1980. Textbook of wood technology, 4th ed. New York: McGraw-Hill Book Co..
74. Record, S.J.; Hess R.W. 1943. Timbers of the new world. New Haven, CT: Yale University Press.
86. Simpson, W.T. 1991. Dry kiln operator's manual. Ag. Handb. 188. Madison, WI: U.S. Department of Agriculture, Forest Service, Forest Products Laboratory.
90. Summitt, R.; Sliker, A. 1980. CRC handbook of materials science. Boca Raton, FL: CRC Press, Inc. Vol. 4.
98. U.S. Department of Agriculture. 1987. Wood handbook: wood as an engineering material. Agric. Handb. 72. (Rev.) Washington, DC: U.S. Department of Agriculture. 466p.

From: Alden, Harry A. 1995. Hardwoods of North America. Gen. Tech. Rep. FP L-GTR-83. Madison, WI: US. Department of Agriculture, Forest Service, Forest Products Laboratory. 136 p.

ADDENDUM

Beech *(Fagus* spp./Fagaceae) contains 8 species that grow in Asia (4), Europe *(F. sylvatica)* and North America *(F. grandifalia)*. All species look alike microscopically.

Eastern North America		**Europe**	
Common Name	**Scientific Name**	**Common Name**	**Scientific Name**
American Beech	*F. grandifolia*	Beech	*F. sylvatica*

Oak *(Quercus* spp./Fagaceae) contains 275 to 500 species and can be separated into three groups based on their microanatomy; the Live or Evergreen Oak Group, the Red Oak Group and the White Oak Group. Species within each group look alike microscopically. For each group there are species on both sides of the Atlantic.

White Oak Group *Leucobalanus*

Eastern North America		Europe	
Common Name	Scientific Name	Common Name	Scientific Name
Chestnut Oak	*Q. prinus*	Algerian Oak	*Q. canariensis*
Chinkapin Oak	*Q. muehlenbergii*	Cork Oak	*Q. suber*
Overcup Oak	*Q. lyrata*	Downy Oak	*Q. pubescent*
Post Oak	*Q. stellata*	Durmast Oak	*Q. petrel*
Swamp Chestnut Oak	*Q. michauxii*	Holm Oak	*Q. ilex*
Swamp White Oak	*Q. bicolor*	Hungarian Oak	*Q. frailest*
White Oak	*Q. alba*	Pedunculate Oak	*Q. rabur*
		Portuguese Oak	*Q. faginea*
		Pyrenean Oak	*Q. pyrenaica*
		Round-Leaved Oak	*Q. ratundifalia*
		White Oak	*Q. alba*

Hemlock *(Tsuga* spp.). The genus *Tsuga* contains about 14 species native to North America [4] and southern and eastern Asia [10]. The wood of all species in this genus looks alike microscopically. The word *tsuga* is the Japanese name for the native hemlocks of Japan. The species native to North America are listed below.

Scientific Name	Trade Name
Tsuga Canadensis	Eastern Hemlock
Tsuga caroliniana	Carolina Hemlock
Tsuga heterophylla	Western Hemlock
Tsuga mertensiana	Mountain Hemlock

APPENDIX II

METALLUGICAL ANALYSIS

From: Kory Cooper [mailto:korycooper@gmail.com]
Sent: Monday, November 14, 2005 5:36 PM
To: Cantelas, Frank
Subject: more results

Frank,

The presentation at Chacmool came off without a hitch. No one had any comments about the results but it wasn't really a shipwreck or metals crowd. Anyway, I will get with Wayman later this week concerning preparation of a quick report on your two specimens, we will send you some photos and maybe some comments regarding the materials used but I thought I would go ahead and send you the results of both the SEM and NAA for you to look over. The quantitative SEM data was obtained using energy dispersive analysis (EDA). Wayman was going to give some more thought to the alloy used for the gudgeon. The sheathing material is quite likely just that. Muntz metal (60% Cu and 40% Zn) was patented in 1832 and was used to replace pure copper for sheathing ship hulls. The discrepancy between the SEM and NAA results regarding zinc are due to some de-zincification which is difficult to quantify but we will comment on more in the report. There is no data on copper or lead with NAA because lead doesn't activate well and since there is so much copper the signal is too strong to accurately quantify, NAA is too sensitive which is why it is good for trace amounts. I don't know what you had in mind other than including the results in your NOAA report and but I would like to see this written up and published as a report somewhere, perhaps in Historical Metallurgy or something more specific to underwater archaeology. Let me know what you think and no worries either way. Also, no rush, I am neck deep into my thesis right now and will be for a few months.

SEM	Cu	Zn	Sn	Pb
Gudgeon	66	31	1	1
Sheathing	62	38		

NAA			
Gudgeon		27.9	nd
Sheathing		32.4	nd

Thanks,

--
H. Kory Cooper, MA
Department of Anthropology
University of Alberta

APPENDIX III

ARTIFACT CONSERVATION

Artifact Conservation Treatment Table

Artifact Number	Date Collected	Collector	Item Name	Item Material	Treatment & Notes
001	7/22-23/2003		Drift pin	Copper alloy	Size: 14.3 x 4.4cm
002	7/22-23/2003		Drift pin	Copper alloy	Size: 29.9 x 1.6cm
003	7/22-23/2003		Drift pin	Copper alloy	Size: 48.2 x 1.6cm
004	7/22-23/2003		Drift pin	Copper alloy	38.4 x 1.7cm
005	7/22-23/2003		Strap fragment	Copper alloy	
006	7/22-23/2003		Hull sheathing	Copper alloy	5 x 3cm
007	7/22-23/2003		Hull sheathing	Copper alloy	8 x 5.5cm
008	7/22-23/2003		Hull sheathing	Copper alloy	4.5 x 3cm
009	7/22-23/2003		Hull sheathing	Possible iron	11 x 6.5cm
001	7/15/2004	Frank Cantelas, Steve Sellers	Ship's wheel hub	Copper alloy, wood	In tapwater with periodic changes 7/04 - 11/02/04; 5% sodium sesquicarbonate 5 wks with 1 change; tapwater with periodic changes until chlorides <10ppm; mailed in wet packing to Texas A&M for 18 mo. polymer passivation treatment 3/2/05
002	7/18/2004	Jason Rogers	Drift pin	Copper alloy	Returned to site after documentation
003	7/18/2004	Steve Sellers, Tane Casserley	Bilge pump tube	Copper alloy, lead, wood insert	In tapwater with periodic changes 7/04 - 11/02/04; 5% sodium sesquicarbonate 5 wks with 1 change; tapwater with periodic changes until chlorides <10ppm; 9/05: acetone soak 24 hrs, 3% BTA / ethanol brushed, air dried 24 hrs, Krylon clear acrylic in/outside

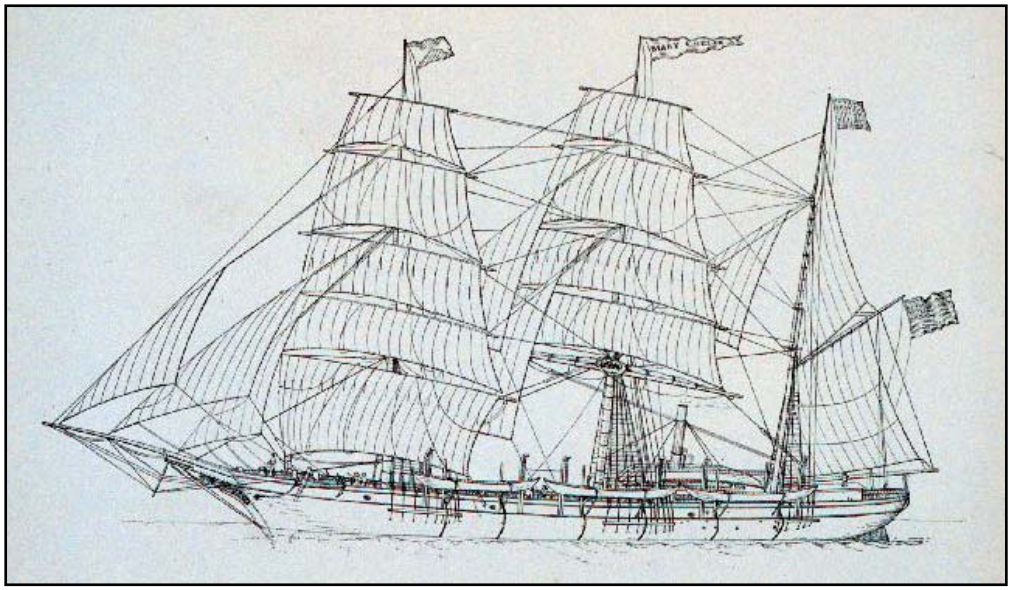
Artifact Number	Date Collected	Collector	Item Name	Item Material	Treatment & Notes
004	7/19/2004	Jason Rogers	Unidentified	Copper alloy	In tapwater with periodic changes 7/04 - 11/02/04; 5% sodium sesquicarbonate 5 wks with 1 change; tapwater with periodic changes until chlorides <10ppm; 9/05: acetone soak 24 hrs, 3% BTA / ethanol soak 24hrs, air dried, Krylon clear acrylic.
005	7/21/2004	Evguenia Anichtchenko	Unidentified	Copper alloy	In tapwater with periodic changes 7/04 - 11/02/04; Electrolytic reduction with monitoring to remove encrustation; brushed; distilled water soak until chlorides <10ppm; 1/05: acetone soak 48 hrs, 3% BTA / water soak 24 hrs, air dried, Krylon clear acrylic.
006	7/21/2004	Bradley Stevens, Evguenia Anichtchenko	Valve	Copper alloy / lead	In tapwater with periodic changes 7/04 - 11/02/04; 5% sodium sesquicarbonate 5 wks with 1 change; tapwater with periodic changes until chlorides <10ppm; 9/05: acetone soak 24 hrs, 3% BTA / ethanol brushed on, air dried, Krylon clear acrylic.
007	7/23/2004	Tane Casserley, Frank Cantelas	Rudder pintle	Copper alloy	In tapwater with periodic changes 7/04 - 11/02/04; 5% sodium sesquicarbonate 5 wks with 1 change; tapwater with periodic changes until chlorides <10ppm; 9/05: acetone soak 24 hrs, 3% BTA / ethanol brushed, air dried 24 hrs, Krylon clear acrylic.
008	7/23/2004	Tane Casserley, Frank Cantelas	Gudgeon with detached pin	Copper alloy	In tapwater with periodic changes 7/04 - 11/02/04; 5% sodium sesquicarbonate 5 wks with 1 change; tapwater with periodic changes until chlorides <10ppm; 9/05: acetone soak 24 hrs, 3% BTA / ethanol brushed, air dried 24 hrs, Krylon clear acrylic.

Artifact Number	Date Collected	Collector	Item Name	Item Material	Treatment & Notes
009	7/23/2004	Tane Casserley, Frank Cantelas	Gudgeon	Copper alloy	In tapwater with periodic changes 7/04 - 11/02/04; 5% sodium sesquicarbonate 5 wks with 1 change; tapwater with periodic changes until chlorides <10ppm; 9/05: acetone soak 24 hrs, 3% BTA / ethanol brushed, air dried 24 hrs, Krylon clear acrylic.
010	7/23/2004	Tane Casserley, Frank Cantelas	Gudgeon strap fragment	Copper alloy	In tapwater with periodic changes 7/04 - 11/02/04; 5% sodium sesquicarbonate 5 wks with 1 change; tapwater with periodic changes until chlorides <10ppm; 9/05: acetone soak 24 hrs, 3% BTA / ethanol brushed, air dried 24 hrs, Krylon clear acrylic.
011	7/21/2004	Bradley Stevens	Stave	Wood, White Oak group	Polymer Passivation: In tapwater with periodic changes 7/04 - 11/02/04; acetone soak with periodic changes for 6 wks; in polymer PR10/12 + 5% CR20 8 wks; CR20 brushed; fumed with catalyst CT32 and air dried.
012	7/21/2004	Bradley Stevens	Cut/split wood (Firewood)	Wood, Hemlock	In tapwater with periodic changes 7/04 - 11/02/04; in distilled water several weeks; air dried with no further treatment.

APPENDIX IV

LESSON PLANS: A Chilling History and Science of Ice Transportation Seen through the Wreck of the *Kad'yak* in 1860.

A Chilling History and Science of Ice Transportation Seen Through the Wreck of the Kad'yak in 1860



Funding provided by the National Oceanic and Atmospheric Administration's Office of Ocean Exploration.

Photo by Bradley Stevens

Curriculum written by Balika Haakanson with assistance from the Maritime Studies Program of East Carolina University.

Introduction to the Story of the *Kad'yak*

The US Coast Guard vessel Eagle is a barque rigged sailing vessel

For decades, people have been wondering, and sometimes searching, for the *Kad'yak* (Kad'yak, short a), which sank over 100 years ago off of Kodiak's Spruce Island. In 2003 it was located, and in 2004 it was explored further. The discovery is a significant archaeological find, as the *Kad'yak* is the only shipwreck associated with the Russian period of Alaska history, 1741-1867, discovered to date.

The Russian-American Company purchased the German-built barque *Kad'yak* (Barque- A sailing ship with three to five masts, all of them square-rigged except the after mast, which is fore-and-aft rigged) in 1851 to sail between Alaska settlements, and in 1857 it began hauling ice from Woody Island to San Francisco where the Gold Rush had hit in 1848 (causing a huge population explosion). In 1860, company records note loading the *Kad'yak* with 356 tons of ice at Woody Island. After putting to sea on March 30, the vessel hit an uncharted rock close to shore and immediately filled with water. Captain Illarion Arkhimandritov, officers and crew abandoned the ship and safely reached shore. The ship's log indicated the *Kad'yak* typically had three or four officers, fourteen seamen, and ten deck hands. Of note, the deck hands were described as young Alaska Natives. After striking the rock, the *Kad'yak* remained afloat for three days, probably because of its cargo of ice.

The history of Kodiak is tightly woven to the Orthodox church in which Father (later Saint) Herman played a major role, and there is a popular story revolving around the mysticism of the *Kad'yak* wreck that has been passed down through oral history and has been written about as well:

The wife of the Governor (Voevodskii) had asked Arkhimandritov to hold a Te Deum service in Father Herman's Spruce Island Chapel (near the place where St. Herman was buried) before he sailed the Kad'yak for the first time, and he had not done so. After the vessel wrecked, it drifted to Spruce Island and sank directly in front of the chapel with just one mast

above water forming the shape of a cross. Some said that supernatural forces may have been involved, and many include this in the long list of mystical and religious occurrences that led to Father Herman being canonized as the only Orthodox saint from America.

With the help of archival research by Anchorage archaeologist Michael Yarborough along with Russian scholars Dr. Kathy Arndt and Dr. Lydia Black, researchers were able to narrow down the possibilities of locations for this shipwreck. The *Kad'yak* has since been determined eligible for the National Register of Historic Places, which has enabled the state to retain ownership of this historic ship. In July of 2003, a small team of divers discovered the remains of the *Kad'yak*, and in 2004 they explored it further.

The original crew who discovered the wreck plotted a search grid based upon sightings taken soon after the accident by Captain Arkhimandritov himself. The group searched the sea bed with a proton magnetometer, a device that senses the presence of ferrous metals such as iron that can signal the presence of underwater wreckage. Conditions during the search were less than ideal, but they detected some possible magnetometer hits within the first several hours.

Several teams of divers entered the water to conduct an underwater search, but the strong surge and limited visibility made it difficult to locate any signs of the badly deteriorated *Kad'yak*.

When the grant-funded East Carolina University (ECU) dive team returned in 2004 they had much better luck (and equipment and training) and they were able to identify anchors, canons, wooden timbers, and the holy grail of that summer- a piece of brass (most likely from the cap of a winch) that had *Kad'yak* written on it (in Cyrillic). The remains were remarkably well preserved by Kodiak's cold water. Nobody knows what the future holds for the *Kad'yak*, but there is hope that future funding can be secured to carry out further surveys and exploration, and eventually, archiving.

The *Kad'yak* and How Ice Changed the World

This resource is meant to address Kodiak Island Borough School District's 3rd and 4th grade Science and Social Studies curricula and is aligned to Alaska and National Standards. Many lessons can be easily modified to suit middle school or high school classes, and extensions are noted in the lessons.

As a stand-alone curriculum, this guide could take 3-4 weeks to complete, but lessons may be taught singly as well. Please see the lesson overview to see what concepts are addressed in each lesson.

This curriculum addresses early Russian exploration, the civics of three different governance systems, the science of heat transfer, importance of the ice trade, phases of matter, and buoyancy, the Alaska transfer, and most importantly, the role of Kodiak and the Kad'yak *in all of those concepts and ideas. This curriculum would be enhanced if students are encouraged to keep a portfolio of activities and worksheets focused around Russian America, so that as new material is learned, students can look back over past material.*

Teben'kov chart of Kodiak area, and Spruce Island, where the *Kad'yak* sank.

Lesson Overview and Index

Russian Period

1. **The Wreck of the *Kad'yak*- discovery and investigation. P. 7**
   **1a-Introduction to the Kad'yak shipwreck. 1b-Careers in underwater archaeology, history and science.*
2. **The Ethics and Law of Maritime Discovery p. 12**
   **Critical thinking lesson regarding maritime law and ethics.*
3. **How Ice Changed the World- Introduction. P. 16**
   **History of the ice trade and importance of refrigeration.*
4. **Make an Ice boat- p. 20**
   **4a- boat building activity to reinforce principle of insulation. 4b- reflection on the ice boat activity 4c- history of Kodiak's ice trade.*
5. **Make Ice Cream. P. 26**
   **heat transfer science experiment.*
6. **Buoyancy p. 29**
   **science lesson on Archimedes' principle. Why do things float?*
7. **The Boat Float Experiment p. 33**
   **Science experiment to extend on Archimedes' principle and theories of displacement.*
8. **Who was Arkhimandritov? P. 37**
   **8a- Art activity designed to test student preconceptions about Natives in Alaska. 8b- Background on the Kad'yak captain.*
9. **Why-and how- did Russians come to Alaska? P. 42**
   **History of Russian Exploration and mapping activity.*
10. **The Russian period- what was life like? P. 49**
    **history of Russian America- life in early Kodiak.*
11. **The Whaling period p. 54**
    *****History of whaling on Kodiak.*

The American Period

12. **Should America buy Alaska? P. 59**
    **Alaska history critical thinking group activity.*
13. **Governance Lesson- P. 65**
    **Civics lesson focusing on the comparison of life in 3 times: Pre-contact, Russian period, and American period.*
14. **Kodiak Historical Landmark Project P. 74**
    **Students explore local history*

15. **Timeline comparison Activity P. 76**

**Researching skills, World History and linking activity.*

16. Culminating Activity. P. 78

**Can choose between historical, science or reading activity to assess knowledge and history of Alaska or local history.*

17. Test and Answer Key P. 79

Appendix

-Timeline of Alaskan Events

-Awa'uq: Discovery and Excavation of an 18th Century Alutiiq Refuge Rock in the Kodiak Archipelago

Knecht, Rick, Sven Haakanson, and Shawn Dickson
2002 Awa'uq: Discovery and Excavation of an 18th Century Alutiiq Refuge Rock in the Kodiak Archipelago. In *To the Aleutians and Beyond: the Anthropology of William S. Laughlin*, edited by Bruno Frohlich, Albert B. Harper, and Rolf Gilberg. Ethnographical Series 20. Department of Ethnography, The National Museum of Denmark, Copenhagen.

-MAHSNews Volume 11, No. 3

Howe, David P.
2000 Maritime Law and Historic Preservation-A Brief Review. *MAHS News,* Maritime Archaeological and Historical Society, 11(3).

1: The Wreck of the *Kad'yak*: Discovery and Investigation
Teacher's Guide

Goals and Objectives: In this lesson, students will learn about the discovery of the *Kad'yak*, some of the scientific instruments used and procedures followed to determine the location of the shipwreck. In addition, students can have the option to explore different careers in the science and historical fields.

Time: 1-2 45 Min Class periods.

Alaska Core Content Standards: Science A-15, C. History A1-2, 4-5, 8; D-4, 6. Employability B.

Materials/ Resources:

Student readings: *The Wreck of the Kad'yak: Discovery and Investigation*, and: *Careers Related to Underwater Archaeology* for extension

Procedure: Hand out the student reading, *The Wreck of the Kad'yak: Discovery and Investigation*, for students to read (or to be read out loud). Let students know that this reading will start an exploration of the role of the *Kad'yak* in Kodiak, Alaska and the world's history that will amaze them.

Extension: When done, you may choose to have students learn about the different careers a little more, if desired (*Careers Related to Underwater Archaeology*). Students can use the AKCIS site (or another college search site) to learn how much training must go into each field and how many jobs exist in each area. If you choose to do the extension, make sure to go over terms such as Bachelors, Masters and PhD first so students know what they mean.

1a: *The Wreck of the Kad'yak: Discovery and Investigation*

The discovery of the wrecked 132 foot *Kad'yak* in 2003 was a group effort that took many years of research. What prompted the research were the many stories of the wrecked ship that had been passed down through generations. The Russian Orthodox people told stories of a sea captain, Arkhimandritov, who ignored a request to pay homage to local Saint Herman in Monk's Lagoon before he left on his first trip board the *Kad'yak*. Later, when the boat hit a rock off of Monk's Lagoon, it drifted a full six miles until it sank in front of Saint Herman's chapel. People's stories were confirmed even more when they said that the mast of the ship formed a perfect Russian Orthodox Cross in the water- and that was all that remained of the ship for much time.

It was the year 1860 and the *Kad'yak* was taking a load of ice from Woody Island to San Francisco when it hit a rock; the journey would have taken them two to three months. The crew all got off safely, but because of the load of ice aboard, the boat stayed afloat for another 3 days before it finally sank.

Whether or not people believe the mystical stories behind the sinking of the *Kad'yak*, what remains is true: 1) The *Kad'yak* is the only surviving Russian-era ship known in existence. 2) It was indeed found nearby Saint Herman's chapel in Monk's Lagoon.

This is the story of the journey to find the *Kad'yak*:

- In the late 1970's Archaeologist Mike Yarborough read about the shipwreck in books and began a file on the subject.

- Various crews attempt to find the wreck with little luck.
- Russian historian Dr. Katherine Arndt translates documents from Russian into English which gives more information to the team. Historian Dr. Lydia Black also helps solve the mystery of where the *Kad'yak* might be located.
- Yarborough's wife meets Marine Biologist Brad Stevens who puts together a volunteer team of divers who discover what they assume to be the *Kad'yak* in July of 2003.
- The team writes a grant to fund the travel and work of a team of underwater archaeologists from East Carolina University. In the summer of 2004 the team finds a brass object with *Kad'yak* written on it, confirming their find.

So what now? Well, excavating parts of the *Kad'yak* would be very expensive, because the minute that artifacts are brought out of the water and are exposed to oxygen, they start to react and decompose even more. Scientists were very surprised to find such a well-preserved wreck 80 feet underwater after more than 140 years, and it seems that the cold water and the lack of oxygen helped to keep the ship from deteriorating. Scientists were able to remove a few brass items, which are easier to conserve than iron objects. They found three anchors, a ballast pile, deck braces, two cannons, and copper sheathing that once covered the ship's wood.

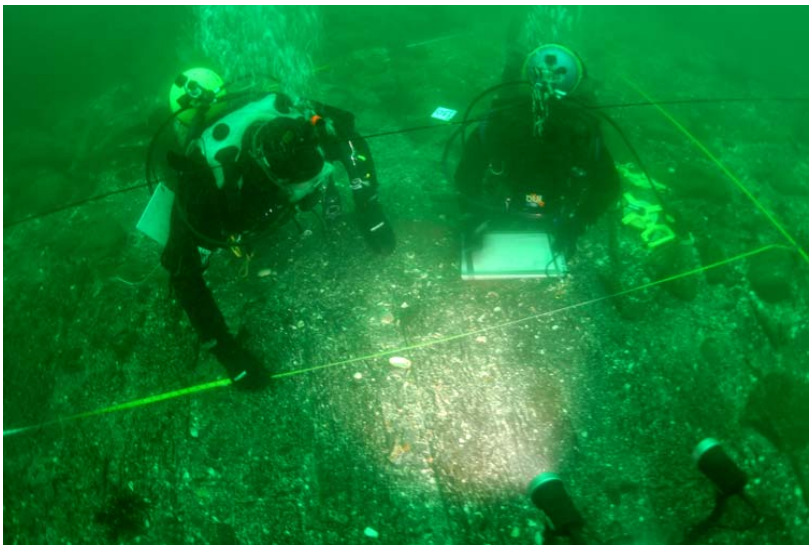
What the future holds for the *Kad'yak* is up to the people of Alaska involved in historical and scientific work. Through writing grants, funding can be achieved to explore this shipwreck further.

1b: Careers Related to Underwater Archaeology

Are you interested in being involved in finding shipwrecks someday? If so, you can choose to study many different things, because all shipwreck teams need different specialists. Here are a few examples:

Historian/ linguist- If you learn another language fluently you can help teams translate original documents and ship logs to solve mysteries about where ships may have gone down. Also, if you become an expert in the history of a certain country, you may be called on to help analyze documents and find important books. You will most likely need a PhD in history to do this well.

Marine Biologist- Most underwater archaeology teams use a marine biologist as a part of their team as well, because that person can help solve mysteries about what has happened to the ocean floor, what has grown over the wreck of the ship, etc. You will need a PhD or a Master's degree in Marine Biology for this.



Underwater Archaeologist- An underwater archaeologist works on preserving artifacts and diving on them, as well as reconstructing and mapping archaeological sites. They need to be skilled with computers and mechanical devices, as well as physically fit for diving on wrecks in many different temperatures of water. There are a few programs in this field. You will need a Master's or a PhD in this area.

Conservator- Are you interested in the objects that are brought up from the ocean bed? If you are a conservator, you spend your time

preserving them and storing them where they will not be damaged by the air. You will need to be good at science (chemistry) and patient, because it is a lot of cleaning. There are Master's programs in conservation through many universities.

Boat Captain- Someone needs to run the boat, and dive teams often search in the local community to find a good boat (with a good captain) to rent. If you already have a boat, you may not need more than years of experience and patience (because looking for a shipwreck is often boring, although finding it is fun!). However, if you want to be a captain of a scientific vessel, you can join the Navy to get (free) experience, or you can enter a school for Mariners.

Grant Writer- Many times other members of the team do this, but sometimes they hire a professional. If you enjoy writing, you would enjoy being a grant writer, because their job is to write proposals to large foundations where they make their project look exciting and worthwhile. They often receive payment by earning a fee if the grant is funded. You will most likely need training as a grant writer, which is available through many universities and other programs. Other members of the team often get paid through grant funds as well.

2: The Ethics and Law of Maritime Discovery
Teacher's Guide

Goals and Objectives: In this lesson, students will get a chance to explore the ethics of 'salvaging' shipwrecks. This lesson is optional, as it doesn't pertain to history so much as ethics and law, but it does show students how 'looters' can steal the chance of historians to piece together history. This lesson gives kids a good chance to explore the complexity of history, and to discuss the importance of historic finds to the flow and changeability of history.

Time: 1 45-60 minute period

Alaska Core Content Standards: Government and Citizenship B3-5. E, G. History A.

Materials/ Resources:

Student Worksheets, *Ethics and Law of Maritime Discovery, Case of the Otter and Otter Follow-up*

Overhead or Chalkboard

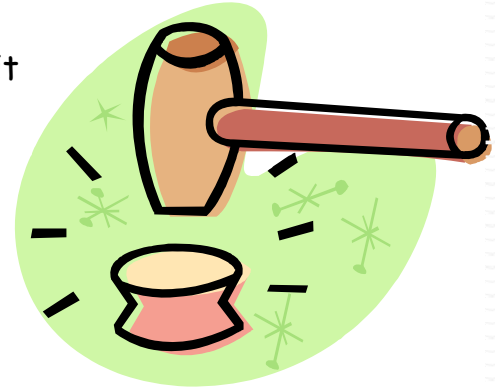
Procedure: Hand out Worksheet, *Case of the Otter*. Have students read the case (or read out loud), discuss and try to come to a conclusion about the case. After students make their judgments at the bottom of the worksheet, hand out *Otter follow – up* worksheet and discuss maritime law with students. For more information on this subject, see MAHS News in the Appendix.

Extension: For an advanced or older group of students you can hand out MAHS News and ask the following questions: 1) How have ideas about ships in 'peril' changed over the years? 2) What is the law of 'salvage'? 3) How does the federal government determine what is 'historic' (requires a bit of research, but the answer is that it is relative); 4) How did the Abandoned Shipwreck Act of 1987 change shipwreck ownership?

Name _____

2a: The Ethics and Law of Maritime Discovery

The Case of the Otter



How do we decide who a shipwreck belongs to? Is it just 'finder's keeper's or are there other issues to consider? In this fictional court case, you will be looking at both sides of an argument for ownership of a shipwreck, deciding who we think should own the wreck, and then looking at the actual laws to see if it agrees with your opinion.

Facts: The *Otter* was a vessel that sank on the east side of Kodiak Island in 1920 as it was carrying a load of salted and canned fish to San Francisco. It was owned by a private investor who later gave up ownership when it was determined that the boat was lost. No lives were lost in the wreck.

<u>The Plaintiffs- Joe Smith and John Blye</u>: We are suing for rights of ownership to the merchant vessel *Otter*, because of many reasons:

1. We spent $25,000 of our own money and years researching the location of the wreck- the state didn't have any interest in the boat until we found it.
2. The state does not have the money or plans to restore anything on the ship, so the shipwreck will end up being looted and eventually rotting away, all history lost.
3. This is NOT a historic wreck- just a merchant vessel hauling supplies from Kodiak to California.

<u>The Defendant- State of Alaska</u>: We are attempting to maintain ownership of the historic vessel *Otter* for many reasons:

1. The vessel was found in state waters.
2. The vessel is of historic value and because of that, the state needs first right to the control its artifacts. We need to ensure that everyone who dives on the wreck is

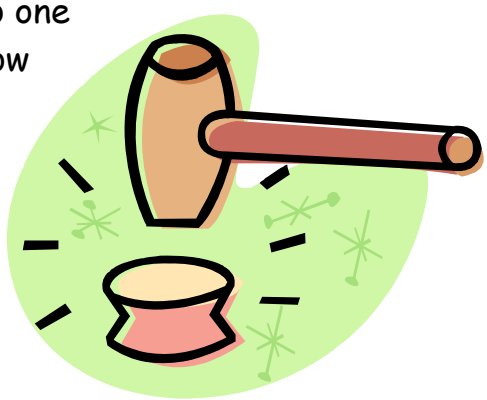
cleared and will not remove items from the wreck to sell or for their personal collections.

3. If the plaintiffs earn the rights to the Otter, what will stop other treasure hunters from raking the state's ocean bottom and claiming whatever ship they come across? These ships belong to the state if they are found in state waters. The plaintiffs should have to apply for permits through the state, but all things taken off the boat should be owned by the State of Alaska.

Who do you think should win this court case?

What other information do you think would help you make a decision?

2b: The Ethics and Law of Maritime Discovery
Otter Follow Up



So, who won? This was a fictional case so no one did, but here is the law: First, did you notice how the state referred to the vessel as 'historic' while the plaintiffs did not? This is important.

The main issues in maritime law are who owns the land and how historic the wreck is. In this case it would have helped us to learn just how historic the Otter was.

If the Otter was very important to Alaska's history, they probably would have won. However, if the Otter was just a vessel used to ship goods back and forth and its history very documented, then the state could not argue that it needs to have control over the information and the Plaintiffs would have probably won.

<u>The Law of Finds</u>- This law says that if the original ship's owner abandons the property at sea, the law of finds is true- finders keepers. However, recently a law was passed that changed things slightly, so historic vessels would not be totally looted. *The Abandoned Shipwreck Act of 1987* says that the federal government would be owners of any shipwreck found 1) within 3 miles of their shore, and 2) abandoned, and 3) embedded or stuck in a seabed or coral (could not be moved without harming the ocean floor, or 4) 'historic', that is eligible for inclusion in the National Register of Historic Places.

In this case the plaintiffs probably would have won, because the wreck would not be considered 'historic'.

Kad'yak

The *Kad'yak*, however, WAS considered historic, so one of the first things state historians did after the discovery was to place the wreck on the National Register of Historic Places so no one else could claim ownership.

3: How Ice Changed the World
Teacher's Guide

Goals and Objectives: In this lesson, students will be learning about the importance of Kodiak's ice trade before even Alaska was a state! Students will learn about the importance of refrigeration to food safety and shipping.

Time: 1 45-60 minute period

Alaska Core Content Standards: Science D; E 1-4. English B; History a 4,7; B 2-5.

Materials/ Resources:

Student Worksheets, *How Ice Changed the World* and *Story of How Ice Changed the World*

Overhead or Chalkboard

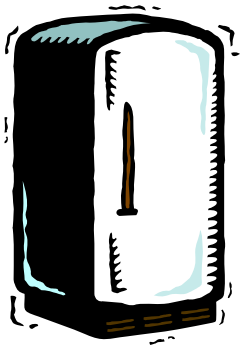
Procedure: Students should brainstorm on their own for at least 5 minutes on the ways the world would be different if there was no way to refrigerate anything, using *How Ice Changed the World* worksheet. Then, if desired, allow students to work with a partner for another couple of minutes to think of even more ideas. When done, put ideas on an overhead or on the board in order to impress on the students the importance of refrigeration. As a class, discuss how things in the world would have been before there was refrigeration. When done, either hand out or read out loud the *Story of How Ice Changed the World*.

When finished, say that students will be learning about Kodiak's role in the ice trade, and in particular about the *Kad'yak*. Impress on students how important this period is to Kodiak's history. Students will be surprised to hear about just how important Kodiak's ice was to the purchase of Alaska.

Name_____

3a: How Ice Changed the World

1. What are some ways that our world would be different now if we didn't have refrigeration? List as many reasons as you can think of.



3b: The Story of How Ice Changed the World

Before it occurred to people that they could use ice to cool food, life was very different in our world. Early people spent most of their waking hours hunting and foraging for food and had very little time for anything else (relaxation, art, even staying in one place, because they had to follow their food sources). They had little choice since bacteria and molds would rapidly spoil the food, once obtained, especially in warmer climates.

With time, they learned how to prolong their food supply by drying, smoking, boiling, pickling or salting it. However, these techniques often caused changes in taste and texture, and probably reduced the food's nutritional value.

Those members of that ancient society living in the more temperate climates probably noticed that food did not spoil so quickly during cold weather, and that frozen food remained edible for quite a long time. Food storage in caves and cold cellars could be used effectively as the temperature warmed.

In later years, people dug cellars underneath their houses to keep food cool, or left food in their cupboards or closets. Still, things like meat, milk and butter would not stay safe and fresh for longer than a day or so in the heat of the summer, so people had to shop daily for food for their families.

Then, a smart and daring young man named Frederick Tudor had an idea that would change the world- he could sell ice! People thought he was crazy, and indeed it took him at least ten years to convince people that he was not- and in those ten years he was imprisoned several times for debt. One of the main problems Tudor had once he delivered a load of ice to India or the West Indies, was convincing people what to do with it- they carried the ice home and it melted. Once Tudor came up with the idea to build ice storage houses at the docks in these places, people could get ice delivered daily and the ice trade started to flourish. It was when the Ice Box (future refrigerator) was developed that the ice trade really started to do

well, because people could store their blocks of ice in a specially designed box where their food was also stored.

Then life really changed as ice became commonly used. People made ice cream, meat was able to be shipped to other communities, produce such as apples and vegetables could be shipped across the country with ice to keep them cold, ice was able to be shipped daily to hospitals so it could be used in treatments (and it was hung from the ceilings during heat spells with a fan directed at it to create a cold current of air or air conditioning).

As the gold rush in San Francisco occurred and people flocked to California, food could be shipped in cold from far-away places. With ice people could cool their warm drinks and preserve their food rather than spend their time worrying about how to get safe food during the heat of summer. Suddenly, fish could be shipped without salting and fruit could be shipped without rotting. In 1852, ice was shipped to San Francisco for $75/ ton!

People became so concerned about having a steady supply of ice that in warm years (when the northern states had warm winters) people positively panicked about an ice shortage.

For over 100 years and up to 200 years in many places people relied on daily deliveries of ice for their homes. It was only when refrigerators were created (and widely used- in the early 1900's) that the ice trade stopped.

Comprehension Questions:

1. Who was the man who came up with the idea of selling ice?

   _____

2. What were two of his problems in making a strong ice trade?

3. In the early days of the ice trade, what were the most important changes?

4: Ice Boat Activity
Teacher's Guide

Goals and Objectives: Students will learn about the scientific principles of heat transfer and insulation, and by extension about phases of matter, through construction of an 'ice boat'. After the boats are built, students will learn about Kodiak's ice trade, including how and when ice was cut and shipped in Kodiak. If you would like to skip the science activity, at least make sure to have students read *Kodiak's Ice*, because it gives the historical background to Kodiak's role in the ice trade.

Time: 2-4 45 minute periods.

Alaska Core Content Standards: History A 1, 4-9; B2. English A1,4. Math B2-4, 6-7. D. Science A1-2, 15. B, D1, E 1-4.

Materials/ Resources:

As many milk cartons as you have students.
Insulation materials
Ice, 3 pieces of equal size per student
Ice Boat Activity
Ice Boat Reflection
Kodiak's Ice

Procedure: As an introduction, ask children, "Why do people use refrigerators in Alaska if it is already cold?" (answer: to slow heat transfer, and in Alaska, so food doesn't freeze! Discuss insulation as being things that slow down the transfer of heat- ie. they keep warm things warm and keep cold things cold. Talk about ways we insulate ourselves against the cold weather and poor examples of insulation.)

Hand out milk cartons and *Ice Boat Activity Worksheet* the day before the contest takes place. Have students brainstorm different ways to insulate their 'cargo' (ice) and assign as homework that they bring their insulating material to class with them for the contest. Remind students that the only thing they can do to their 'ship' is to insulate it on the inside, not the outside. Discuss the fact that the heat in this contest is coming from outside the milk carton, so the ice will want to be protected from this heat loss.

You may choose to get more in depth with this lesson if desired, and you may have students take temperature readings of the air and their ice. Otherwise, you can choose to use the amount of ice left in the boat as a visual indicator of how well insulated the kids' boat were. Also, depending on the age of your students, you may decide to give them a 1/2 or 1 hour time limit.

Science Background for the Teacher- Why does ice melt? It is all about heat transfer. When ice melts, it absorbs heat radiation from the warm room, causing it to melt. Warm air can flow around the ice as the cooled air falls to the ground so it creates a mini-current around the ice cube, keeping it constantly melting. To cut down on the rate of melting, you need to insulate the ice against the current of warm air. Warm hands can melt ice as well, which is why students should handle it as little as they can.

If you would like your students to really buy into this idea of milk cartons as boats you may allow students to decorate and name their milk cartons, but if students want to use paper on the outside of their cartons for decoration, you'll need to give this option to all students, as this is another form of insulation. Make sure to keep extra paper, sawdust, rocks, etc on hand for students who forget their insulators.

Contest Day: Students should all have their insulation and their boat ready. Students should all receive their ice at about the same time, and as soon as you decide that the 'time' has started, have students put their boats in a spot where there wont be large fluctuations in temperature, and wait for the desired amount of time.

After the 1/2 to 1 hour has passed, have all students unwrap their ice from their 'boat' and either weigh the amount of ice they have left over, or the teacher can visually declare a 'winner'.

After a winner or winners have been determined, students should be given the *Reflection on the Ice Boat Activity*. On the board, make a list of the types of materials that students used and how effective they were. Then, go through and discuss with students which ones would have been available to merchants 150 years ago. Students should be encouraged to make hypotheses regarding why certain insulators worked so well.

Introduce the Kodiak Ice Trade: Hand out or read the story, *Kodiak's Ice* about how Kodiak's ice was shipped all the way to San Francisco to impress on them how big of an undertaking the ice trade was (the journey would have taken them 2-3 months).

Extension: For a really wonderful description of Wood or Woody Island, you can read Chapter 9 of Hannah Breece's book A Schoolteacher in Old Alaska, which describes what the ice trade was like and what life was like on and around Woody Island *after* the ice trade ended in Kodiak. Please note to students that this book is written from the standpoint of a teacher new to Alaska, so her view can not always be considered 'unbiased.' Regardless, it's a good book that lets students visualize what life was like during the early American period. Note: she also writes about life on Spruce Island.

Name _____

4a: Ice Boat Activity

You are an ice merchant responsible for sending a cargo of ice from Kodiak to San Francisco. What is the best way to get your ice there? You may use a milk container from the lunch room, ice provided by your teacher, and whatever packing material you choose to use. Whoever's ice boat still carries the largest amount of ice after time is up wins. Your ice and all insulation must be held *inside* your milk carton, and no material can be placed outside the milk carton. You can change the shape of your milk carton if you choose.

Brainstorm:

How will you change your milk carton?

What are some ideas of things that you could use for packing around the ice?

Where is the best spot in the boat to put your ice?

Name_____

4b: Reflection on the Ice Boat Activity

1. What is insulation used for?

2. What were some of the best insulators that students used?

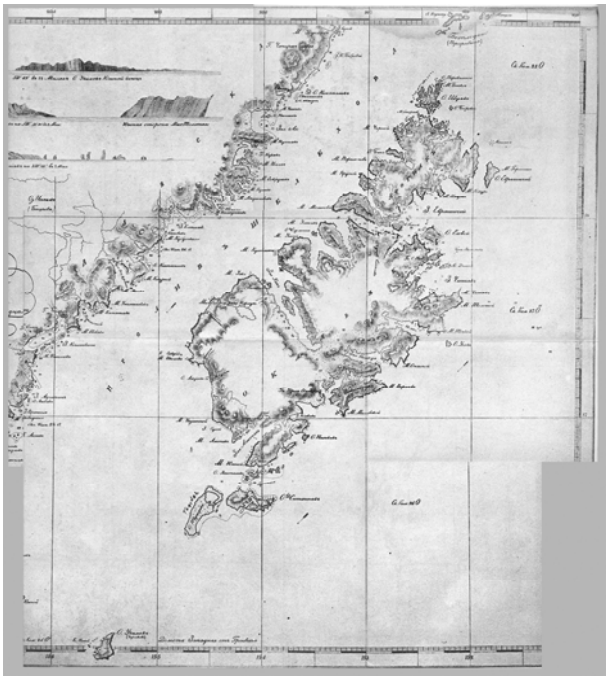
3. What was the best part of your boat design?

4. What would you do differently next time if you had this project to do over again?

5. Considering some ice would melt on the trip from Kodiak to San Francisco, how do you predict how much ice would survive the trip?

4c: Kodiak's Ice

One hundred and forty years after the sinking of the *Kad'yak*, and long after the ice trade stopped, the wrecked barque *Kad'yak* began to be explored off of Spruce Island's Monk's Lagoon. This started all over again the tales of the wondrous ice trade that once kept so many of Kodiak's workers busy during the winter. In fact, Kodiak's ice trade was so important and so profitable that it was reportedly responsible for 3% of the total amount paid to Russia for Alaska by America.



On Woody Island, just off of Kodiak Island, there was a thriving ice trade that operated fir 28 years from 1853 to 1879. Most of Kodiak's ice was shipped to San Francisco where is was sold for a handsome profit

Many people lived in San Francisco following the Gold Rush of 1849, and there was great demand for the cooling properties of ice. They could either ship that ice from Boston around the tip of South America, or inland from the Sierra Nevada Mountains. San Francisco business people realized that Alaska ice would be easier to get so they worked to form an ice company in Sitka. However, Sitka did not have a consistent supply of ice, so they moved the operation permanently to Kodiak.

Woody Island became a thriving community when the ice trade came to the island. Between 150- 200 people were involved in harvesting this ice, and they were able to stay busy in the summertime hunting. The very first road constructed in Alaska was the thirteen mile road around Woody Island. They also built a water-powered sawmill to cut planks for the dock and to supply sawdust in which to pack the ice. The people of Woody Island grew 12 acres of oats to feed their horses, which was important because it was the horses who pulled the giant saws over the lake which cut the ice into blocks, then hauled them to the storage shed. The manner in which ice was 'made' was very creative as well. The company dammed 2 lakes, and would flood the lower lake whenever they wanted to rapidly freeze a new batch of ice. The ice houses built on Woody Island could store between 5-6,000 tons of ice per year!

In the year 1860 the *Kad'yak*, with 356 tons of ice onboard, left Woody Island on March 30th, hit an uncharted rock close to shore and immediately filled with water. Captain Illarion Arkhimandritov, officers and crew abandoned the ship and safely reached shore. After striking the rock, the *Kad'yak* remained afloat for three days because of its cargo of ice.

By 1879, artificial ice was available to people in San Francisco at such a low price that Kodiak's ice could no longer compete and the business was abandoned. However, the ice trade left wonderful memories for those who made Woody Island their home for many years. Even now we visit Woody Island for camping trips, although rarely do we think of the time when horses roamed the island, barabaras and houses lined the roads, when winter was the busiest time of year, when barques like the *Kad'yak* would visit its docks to load their valuable harvest, and hundreds of people worked together to harvest Kodiak's wonderful natural product- ice.

5: Ice Cream Activity
Teacher's Guide

Goals and Objectives: Students will learn about the properties and phases of water while learning how to make ice cream.

Time: 1 45- 60 minute period.

Alaska Core Content Standards: English D1 a-d. Science A1-2, 8. B1-3.

Materials/ Resources:

Making Ice Cream Worksheet
Rock salt
Crushed ice
Spoons
Snap lock bags (medium and largest sizes)
Measuring cups and spoons
Small cups
Sugar
Milk (any kind)
Vanilla Extract
Towels
Toppings, if desired.

Background: Rock salt mixes with ice and melts it. Rather than just melting the ice, it is actually a chemical reaction that takes place to LOWER THE FREEZING AND MELTING POINT OF THE LIQUID LEFT BEHIND. As you know, all chemical reactions require energy, and in this case the reaction sucks heat out of the ice cream to fuel the reaction, rapidly cooling the cream. The "brine" or liquid that forms ABSORBS heat from the ice cream mix and gradually lowers the temperature until the ice cream begins to freeze.

Making Connections: As students complete this activity be sure to draw connections between making ice cream (where you want to 'suck the heat out' of the cream mixture to cool it rapidly) and its opposite, insulating a load of lake ice as it makes its journey from Alaska to San Francisco, where you want as little heat transfer as possible.

Procedure: Work in groups of 2-3. Measure 1 cup of milk, 2 T of sugar and 1 t of vanilla into the medium bag. Squeeze out AS MUCH air as you can and seal- tightly.

Place the medium snap lock bag in side the large snap lock back. Add 4 cups of crushed ice and 6 T of rock salt to the large bag. Squeeze all the air out and seal the bag.

Shake the bag vigorously for several minutes (between 5-10), wrapping a towel or sweatshirt around the bag so hands do not get too cold.

When the ice cream is the appropriate consistency (thick and creamy) take the medium bag out of the large bag and rinse off the salt.

Squeeze your homemade ice cream into the small cups and enjoy!

Student Connections/ Extensions:

Students can make this into a science project/ experiment by altering the recipe, so that some students use splenda instead of sugar, some students use cream while others use low fat milk. If this is done, make sure that students change only ONE variable of the original recipe so as to be a scientific experiment.

Investigate why and how rock salt can lower the freezing/ melting point of ice.

Discuss the importance of cooling and refrigeration of food processing. List some common foods we eat today which could not have been used, or would have only been made occasionally, before refrigeration was developed.

Discuss the three states in which water can exist on earth?

Most materials are denser (heavier) in their solid form. Explain how the solid form of water (ice) can float on the liquid form (water). Alternately, why does water swell when it freezes instead of shrinking as you would suspect (answer: When water freezes, ice molecules form large, oddly shaped crystals which push other water molecules aside, creating air pockets in the ice).

The water we drink today could have been Shakespeare's bath water or Napoleon's drinking water! Explain how water can be recycled for millions of years.

Name _____

5: Making Ice Cream

Recipe:

1 Cup Milk
2 Tablespoons sugar
1 teaspoon vanilla
4 Cups crushed ice
6 Tablespoons rock salt

- What did you notice about your cream mixture after you added the salt to the ice?

- If you wanted to conduct a scientific experiment to test the affect of the type of milk on your ice cream, what could you do?

- After listening to your teacher's explanation of why salt makes your ice cream freeze, explain in your own words why you need salt to make ice cream.

- Mindteaser Problem: Why do you think that water swells when it freezes, even though most things shrink when cooled?

6: Buoyancy
Teacher's Guide

Goals and Objectives: This is a lesson that can be taught if you'd like to focus on Archimedes' Principle, density, and why the *Kad'yak* took so long to sink. In this lesson, students will learn about density and buoyancy. In the Boat Float lesson, students will test a new boat design and set load limits under different weather conditions.

Time: 1-2 45- 60 minute periods

Alaska Core Content Standards: Science A5, B, C, D.

Materials/ Resources:

Student Worksheet, *Buoyancy*
Various materials to demonstrate buoyancy
Plastic see-through tub filled with water

Teacher background- Why do things float or sink? It all has to do with Archimedes' Principle, which says that the weight of an object is reduced by the amount of water that it displaces. So, if an object is dense yet small (paperclip) it doesn't displace enough water to reduce its weight by the amount it needs to float. If an object is large (apple) it displaces a large amount of water (the size of the apple). If you were to weigh the water that is pushed aside by the apple (the part that was submerged anyway), it would be the same as the weight of the apple, so the weight of the apple is REDUCED by that amount, and thus weighs nothing, and floats, in the water.

Another example: When you place a block of wood in a pail of water, the block displaces some of the water, and the water level goes up. If you could weigh the water that the wood displaces, you would find that its weight equals the weight of the wood. This does not mean that if you had a few blocks of wood that were exactly the same size and shape, they would each displace the same amount of water. A block of wood made of oak, for example, sits deeper in the water (and therefore displaces more of the water) than does a block of pine. The reason is that it is heavier for its size, or denser -- in this case, the molecules that make it up are more closely packed together than the molecules that make up the pine.

If you could somehow keep increasing the density of the block, it would sink lower and lower into the water. When its density increased enough to displace an amount of water whose weight was equal to the weight of the block, it would, in a sense, become weightless in the water. Making the block just slightly denser would cause it to sink to the bottom.

Procedure:

1. First students must understand what density is, so a class discussion on this topic is the first order of business. Show students different materials that will either float or sink and ask what it is that makes an object float, versus what makes it sink. Students may say that objects that are "heavy" will sink while those that are "light" will float. A pan balance can be used to compare, for example, a paper clip and an apple. Students may predict that, because the apple is heavier, it should sink. Demonstrate that the apple

floats and the paperclip sinks. You can show several discrepant events of this type to both generate student interest and point out that there is something more to floating and sinking than just weight. Tell students that you will be exploring this idea further in this activity.

2. Lead the discussion into drawing conclusions about how we describe objects that float or sink.

3. This is an appropriate time to introduce vocabulary. Students have a concept in mind - objects that float - that can be described by a new word, "buoyant." The concept of density can also be introduced at this time; a good visual demonstration is the buoyancy of a golf ball and a ping-pong ball. They have similar volumes but one is much heavier, therefore, more dense. The concept of density can be further explored, as described in the Extensions below.

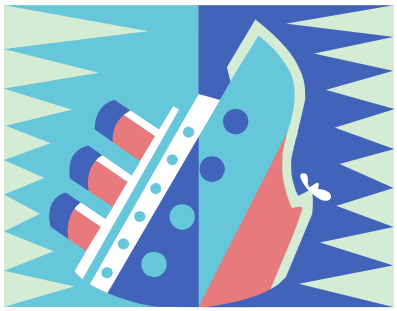
4. Have students complete the *buoyancy worksheet* to assess their understanding of the concepts.

Extension: These experiments can serve as a precursor to further exploration of density of solids and liquids. Who was Archimedes and how did he ‘discover’ how things float?

Name_____

6: Buoyancy Worksheet

Archimedes' Principle states that the weight of an object is reduced by the weight of the water that it pushes aside.



- You have a 20 pound piece of clay that you need to have float in the water, but as a ball it doesn't push aside enough water to make it float. What do you do to the clay?

- Why does an apple float while a paperclip does not?

- Why would a very wide (not very dense) 100 pound log float better than a very narrow, very small (dense) 100 pound log?

- Why do you think that the *Kad'yak* stayed afloat for three days after hitting a rock, while the Titanic sank so quickly?

Name_____

6: Buoyancy Worksheet Answer Key

Archimedes' principle states that the weight of an object is reduced by the weight of the water that it pushes aside.

- You have a 20 pound piece of clay that you need to have float in the water, but as a ball it doesn't push aside enough water to make it float. What do you do to the clay?

Make it into a shape that will displace a large enough amount of water (boat shape, for example) to decrease its weight by 20 pounds. You would need to figure out how to displace 20 pounds of water.

- Why does an apple float while a paperclip does not?

An apple displaces a great amount of water, so its weight is reduced by enough to enable it to float. A paperclip does not displace enough water to counteract its very dense weight.

- Why would a very wide (not very dense) 100 pound log float better than a very narrow, very small (dense) 100 pound log?

It would displace a greater amount (and thus weight) of water, which would reduce its weight by more.

- Why do you think that the *Kad'yak* stayed afloat for three days after hitting a rock, while the Titanic sank so quickly?

The *Kad'yak* was kept afloat by all the ice in its hold (because ice contains air bubbles it will float) and the Titanic's holds burst, filling with heavy water. Soon the Titanic weighed too much and could not possibly displace enough water to reduce its own weight by enough to float.

7: The Boat Float Experiment
Teacher's Guide

Goal/ Objective: In this lesson students will design, build, and test the specifications (water displacement and load line) for a model boat. The lesson focuses especially on integrating design principles with inquiry-based experimental skills.

Time: 2-3 45-60 minute Periods.

Alaska Core Content Standards: Science A5, B, C, D.

Materials/ Resources:

Boat Float Worksheet Follow up

Milk carton boats from Ice Boat activity (and a few extra) or plain milk cartons from lunch room.

A bucket, pan, or tub of water. This container should be at least twice as deep and twice as long as the maximum size of the boat. If preferred, you can use one larger, common pool or tub for testing. You will need at least one set of a smaller container (e.g., plastic shoebox) within a larger one (plastic dishpan or 13 x 9 pan) to allow students to check the water displacement of their boats.

2-4 cup liquid measure with milliliter markings.

1 roll of tape per group.

Extra supplies that you may choose to give students to use: tin foil, wax paper, etc.

Waterproof markers or wax pencils for marking load lines and writing name of boat.

Cardboard shoeboxes for mounting and displaying ships

Weights (such as nuts, bolts, or coins) for setting load limits.

Background: Overloading of ships has, historically, been a dangerous practice. Students often have the misconception that ships first fill with water and this causes them to sink as opposed to the reality that ships sink when they weigh more than the water they displace, whether that weight comes from water flowing into the ship or too much cargo loaded on the ship. This misconception is further challenged in the hands-on activity included in the lesson.

Students will develop a procedure to determine the load line for their boat while it is in "calm" waters. Finally, they test their boat in "rough" waters to determine whether the load line is a practical one. Through these activities, students should learn that every design involves trade-offs and decisions. They may find that their initial design fails and they need to revise and rebuild. These hands-on activities not only allow students to explore the uses of technology and engineering, but they also hone experimental design skills and data collection and analysis skills.

Students can apply what they have learned to develop an explanation of how and why two real-life ships sank (the *Titanic* and the *Kad'yak*). This application of knowledge to real-life situations demonstrates to students that even good designs can fail (the *Titanic*) and how after putting a hole in the hull (the *Kad'yak*) that a boat could possibly

float for so long!

Procedure-Assign students to teams of 3-4 (or whatever works for your particular class size). Tell students that each team will be in charge of designing, building, and testing a boat using their milk carton boats and other limited supplies (3 to 4 milk cartons per group, which they can cut apart and design a new boat).

Each boat should:
be capable of carrying a load at least as heavy as the boat itself;
be “seaworthy” in both calm and rough waters; and
be constructed from the materials provided.

Determining the load line: After the boats are built, challenge students to develop a procedure for determining the boats' load lines in fresh and salt water. In general, each group should float its boat in a tub or container of calm, room temperature, fresh water and add weight to the boat until it sinks; this weight represents an “overload” for the group's boat. Then students should repeat the procedure, adding weight only until they feel the boat has reached a safe load. Using a permanent marker, they should mark the fresh water load line. Then they can repeat the procedure using salt water (see below) or you can demonstrate with one boat.

Optional Extension: After you have approved the procedure, students can determine the load line for their boats in both fresh water and in a tub of salt water (3.5% salt, that is, 3.5 grams of salt per 100 ml of water). Students should find that the boats can carry additional weight in salt water without sinking due to the greater density of salt water and, therefore, the greater weight displacement of the boats in salt water. It is important to allow teams enough time so that, if their initial designs are not successful in floating and carrying a load, they have time to adjust their design and repair their boats.

Next, students can determine their boats' water displacement by using the same procedure as Archimedes. To do this, set a dishpan on a flat surface and set a plastic shoebox in the middle of the dishpan. Completely fill the shoebox to the very rim with fresh water, making sure not to spill water over into the dishpan. Students should then float their unloaded boat on the water in the shoebox and begin loading it carefully and evenly with weights (nuts, bolts, etc.) until they reach the load line. Water will spill over the side into the dishpan. When their load line is reached, they should carefully lift out the boat, then the shoebox. Pour the water in the dishpan into the liquid measuring cup. This is the amount of water the boat displaces when fully loaded (that is, at the load line).

Remember that water displacement is measured in the weight of water displaced rather than the volume of water displaced. In this case, 1 milliliter of fresh water = 1 gram of water

Therefore, you can measure your water displacement in grams. If students are curious about how the water displacement of their boats compares to the ships they researched, use the following approximate conversions:

Unit	Grams
U.S. Ton (2000 pounds)	1,100,000
Metric Ton	1,000,000

For example, if a ship displaces 7,000 tons of water, this is equivalent to 7,000 U.S. tons x 1,100,000 grams/ton = 7,700,000,000 grams!

Finally, each team can test its boat in “rough” water. Teams should load their boats with a full cargo (at the load line) and test them in a tank where another team is creating waves with plastic lids or plates. The water should be rough enough to create a turbulent “ocean” but not so rough as to destroy the boats. Ask students what modifications they could make to their boats to make them more “seaworthy” in rough weather.

When done, using an upside down shoebox, teams should mount their boat on top, and glue or tape the boat's specifications on the side. If you prefer, students can be encouraged to decorate the mounting box for their boat. Each team should describe to the class how they built their boat, how they determined its load line, what load it will carry in fresh and salt water, and what the water displacement is.

***Kad’yak* Connection:**

The *Kad’yak* hit a rock and yet floated for three days, presumably because of the buoyancy of the ice on board. How could you test this example using your milk carton boats?

Assessment

-To complete the lesson, ask each group to write a song about their ship. This can be in a contemporary format or can follow the format of more traditional seafaring songs such as "The Edmund Fitzgerald."

-Assess student understanding with a class discussion, using the following questions as guidelines. If preferred, you can assign these questions to each group to answer in writing:

-Which boats seemed to hold the most cargo? Were they the biggest boats? -Were they shaped differently than the other boats?

-When you added weight (cargo) to your boats, did you put it in one end or along the whole length of the boat? Why?

-What did you find about loading your boat to travel in salt water versus fresh water? Why do you think that’s true?

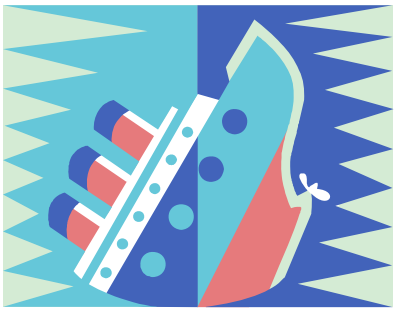
-How did your boat fare on rough seas?

-How would you improve your boat design if you were planning to build another one?

Name_____

7: Boat Float Worksheet Follow-up

Now that you know why things float, you will be designing a boat to carry the maximum amount of weight (you are trying to push aside a great deal of water before your boat sinks). You will only have a set number of milk cartons to do this, and a roll of tape, so be creative!



Each boat should:

Be seaworthy

Be built of only the agreed-upon materials.

Procedure:

- Complete your load (how much weight your boat will hold) test, following the teacher's directions. What is the maximum load that your boat will hold before it sinks?

  _____

- Complete the water displacement test, following teacher's instructions. How much water does your boat displace?

  _____(milliliters- grams)

- What worked well about your boat design?

- What could have been improved?

- Why did certain boat designs work better than others?

8: Who was Arkhimandritov?
Teacher's Guide

Goals and Objectives: This is a lesson plan designed to let students challenge their preconceptions of Alaska Natives as simply 'fur hunters' or 'noble natives' in the 1800s.

Time: 2-3 periods

Alaska Core Content Standards: Arts A 3,4. Geography D. History A, B.

Materials/ Resources:

Student Worksheets, *Who was Arkhimandritov? and Who was Arkhimandritov Really?*

Colored Pencils or other medium

Procedure: Tell students that they will be doing an art project where they will represent Arkhimandritov as they 'see him' in their imagination. It's important that you don't let on to students that he was native before students complete their art assignment. You can be as creative or simple with the art project as you want or are able to.

After students have completed their pieces, either display them or prop them up on the board in front of the students. Ask what the common themes or characteristics are that students primarily used. Then, ask students to close their eyes and picture a doctor, then a President, etc. When done, ask students to raise their hands if they pictured anyone 'of color', or any women. Then reveal the fact that Arkhimandritov was an Alaska Native. Did anyone portray him as anything but white? Have a discussion with students about what this teaches them about themselves and their expectations of people.

Hand out, or read out loud, the reading about Arkhimandritov's life.

Extensions: You can follow this lesson up with a couple of options, if time allows:

1) have students write a poem about their preconceptions of people, or about Arkhimandritov in particular
2) Have students alter their portraits to show Arkhimandritov as Alaska Native, or by adding Unangan imagery around the portrait.

Name_____

8a: Who was Arkhimandritov?

The captain of the *Kad'yak* was named Arkhimandritov. He had an interesting career as a navigator, a boat captain, and he spent many years charting the coast of Alaska, etc. Your job for this assignment is to create a portrait of this man. We do not have any photos or paintings of him to show students, so your job is to draw a portrait of him as you imagine him, as you imagine a boat captain in the 1800s to look. Be creative!

Name _____

8b: Who was Arkhimandritov really?

You would not think that the captain of a shipwrecked vessel would be a good person to study- but you have to first understand the time period in which he was working. Captain Arkhimandritov was working in a time when many of the rocks and reefs were uncharted, so captains never knew when they would come across a submerged rock. It was actually very common to lose boats to rocks and reefs in Alaska, but it was the rest of Arkhimandritov's career that made his life so fascinating and important to Alaska's history.

Illarion Arkhimandritov was born of a Aleut mother and a Russian father in the Pribilof Islands (St. George Island) in 1820, went to boarding school in Unalaska where he was taught by a wonderful Russian teacher who would go on to become St. Innocent (Bishop of Alaska). At the age of eleven he first served in the crew of a Russian American Company (RAC) ship and sailed to California. The following year he went to the School of Merchant Seafaring in St. Petersburg, Russia, where he graduated in 1836 after three years. Two years after completing school in Russia Arkhimandritov, then a navigator, bravely faced a storm that killed his Captain and First Mate, assumed command of the ship, and thus saved it. He earned a gold medal for this feat, and went on to have a grand career.

He went on to chart Alaskan waters (Cook Inlet, Kodiak and Prince William Sound), commanded Russian American Company sailing ships and steam ships (from the Aleutians through Southeast Alaska), and submitted his charts to Atlases to help other mariners. His career survived the sinking of the *Kad'yak*, and after this he went on to chart more waters around Kodiak to ensure this did not happen to other mariners. He was also a devoted Russian Orthodox church

member, and brought his American bride back to Sitka in 1863 to have their marriage blessed in the Orthodox Church.

Even though the *Kad'yak* sank seven years before the Alaska Purchase, Arkhimandritov continued to work through the purchase, until he made his last voyage in 1872. Hutchinson & Kohl (soon to be the AC company) hired him because of his Alaskan knowledge. After living in San Francisco for several years, his fellow Unanguns or Pribilof Islanders, asked him to help them in protecting their marine mammal herds after the Alaska sale left their lands open to foreign competition in the fur trade. Because of Arkhimandritov's influence, the Revenue Cutter Service was sent to Alaska to defend marine mammals. Arkhimandritov was very important to his people as well as Alaska's maritime history. His life is especially interesting because he worked through the 'Russian Period' as a Native Captain on Russian vessels as an employee of the Russian American Company, then worked through the American purchase of Alaska in 1867 to work for American companies. In a time when many natives were working in their own small communities, Arkhimandritov was traveling the world and making a name for his people as brave and honorable- not just 'noble, uneducated natives', which is what many Americans assumed Alaskan natives to be.

Name _____

8c: Who was Arkhimandritov Really?

1. How was Arkhimandritov's career important to Alaska natives?

2. Were you surprised to find out that Arkhimandritov was Alaska Native?

3. What did you learn about yourself and how you look at the world?

4. Make a timeline of Arkhimandritov's life below, being sure to label (with dates) the following events: Arkhimandritov's birth, first crewed a boat, graduated from Merchant School, loss of the Kad'yak, married, Purchase of Alaska, last voyage.

_____

9: Why- and how- did the Russians come to Alaska?

Teacher's Guide

Goals and Objectives: This lesson gives students a brief overview of early Russian exploration of Alaska and provides them the opportunity to chart the early journeys to Alaska, label important islands and rivers as well as track the early explorer's journeys.

Time: 1-2 60 minute periods

Alaska Core Content Standards: Geography A, B, D, E.

Materials/ Resources:

Student reading guide and map
Overhead of map
Colored pencils or markers

Procedure: Hand out the *Why- and how- did Russians come to Alaska reading guide* and have students complete the two pre-assessment questions.

Show an overhead of the same map that students received and have students label the following landmark on their maps: Kayak Island (near Mt. St. Elias). Be sure to also point out important landmarks such as the Bering Strait, the Bering Sea, Kodiak, and the Aleutians. You may want to show a larger map of the world to show the size of Russia, which will impress on students the amazing feat of getting supplies from the cities on the west coast of Russia to the port of Okhotsk.

Then, as a group or independently, depending on the level of your students read through each section of the reading guide, and when they finish each section students should follow the directions for labeling the different important journeys of early Russian exploration. Remind students that they must use different colors for each journey and label each journey.

When done, put up the overhead of the teacher's guide to show students the actual Bering journeys. Use this as an opportunity to discuss why Bering did not always choose the shortest, straightest routes to his targets, asking students what could have been happening during the times that the ships seemed to flounder in the ocean or weave unpredictably. Do not make the students correct their maps to the same accuracy as the teacher's guide- having a rough idea of the routes that Bering took is good enough.

Also, when done discussing Bering's journeys and using a large world map, discuss and show the route that the *Neva* would have had to take to arrive in Alaska from Russia going by sea only.

Extension: For more in-depth lessons on the early expeditions, life on the Russian ships, or on the early explorers, please see the Science Under Sail curriculum guide, available through the Anchorage Museum of History and Art. Also, for a good discussion topic students can debate/discuss the idea of 'discovery' (of Alaska vs America) and if they have the background, they could compare the 'discovery' of Alaska to the 'discovery' of America.

Name_____

9: Why- and how- did the Russians come to Alaska?

What do you already know about why the Russians came to Alaska?

What do you think life was like in Alaska before the Russians came?

Early Russian Ships

At first, Russian ships were made to be light, so that they could be sailed down rivers, taken apart to be carried across ice or land, then quite easily be put back together again. These ships were not designed to go on long ocean expeditions. These early ships, called Shitik (from the Russian verb to sew), were made from a single dugout tree trunk, then boards were tied or sewn to the sides with willow branches or whalebone. Moss would be stuck in the cracks of the wood for caulking (so they would not leak). The boats would be moved by oars or sails, and sails would often be made of reindeer skins, and anchors would be wood, and rocks would be tied on for weight. Amazingly, no iron fasteners or nails were used to build Shitik ships.

Later ships would be built much bigger and deeper for ocean travel. Iron, canvas and ropes would be used as well. These ships were very expensive, but were much safer for ocean travel.

***What wasn't used in early Shitik ships that was used in later ships? _____**

The Story of why Russians wanted to come to Alaska

The Russians were interested in gaining land in the 'New World' in the 1700s because other great countries such as Great Britain and France were doing the same thing and it was making them rich. So what did Russia see in Alaska that could make them great? Well, when Russian explorers journeyed to Alaska in 1741, they saw sea otters everywhere, and knew that their thick furs would make them rich. But

the Russians explorers and traders did not come straight to Alaska; first they spread eastward into Siberia, and then crossed the ocean. They knew that gaining new lands in Alaska would make their country great and would honor their king, or tsar.

It all began in 1639, when a group of 33 Russians formed a settlement near the coast of the Sea of Okhotsk, took hostages from the tribes there, and began to send furs to the tsar to impress him. Russians began to discover silver, copper and iron in these Eastern regions of Siberia. And then they heard the sound of the waves and became even more curious.

Slowly, over the course of almost 100 years, Tsar Peter I began to think that there may be a future in the east, so he started sponsoring expeditions. In 1724, the Emperor, Peter the Great, directed Bering to sail to the northern land that "appears to be part of America." After leaving from Okhotsk and sighting St. Lawrence Island, his ship the *St. Gabriel*, sailed through the strait that now is called Bering Strait and turned back when it began to seem unsafe (67, 18' N).

Directions:

1. On your map, use a colored pencil or a marker to track the journey of the St. Gabriel, labeling this journey "St. Gabriel 1728". The journey went from Okhotsk, around the southern coast of Kamchatka, and up to just south of Cape Hope, all the time keeping close to the Russian coast.

The Amazing Story of Bering's 'Discovery' of Alaska

Vitus Bering had quite a trip to Alaska in the year 1741! Can you imagine getting into a ship, and sailing to where no one you know had ever been before? You would not know where rocks were- you would not even know if there was anything out there- it might take years to cross the Ocean. Regardless, Bering decided to take two ships- the *St. Peter* and the *St. Paul*- towards this 'large country'. Near the beginning of the voyage, however, the boats became separated and because they had no way to communicate with each other, the *St. Peter*, under the command of Vitus Bering, sailed onward on its own.

The *St. Peter* reached the Alaska mainland and claimed American land for Russia on Kayak Island, but on the return voyage wrecked on Copper or Bering Island and the crew had to spend the winter. Only a few crewmembers survived the difficult winter, and the next summer it was only those who returned to Russia in a small boat that they had built out of the pieces of the *St. Peter*. Bering did not make it through the winter. A man named George Steller survived, however. Steller was a naturalist who studied and drew much of the new and exciting wildlife that existed in Alaska. The Steller's jay and the Steller's sea lion are named after him. It was his drawings and reports that made the Russians hungry for more exploration in this new land.

The *St. Paul* sailed on but had a difficult journey and lost almost 1/3 of its crew. Together, though, the ships made a great discovery for Russia- Alaska had sea otters on the Aleutian chain! A sea otter pelt could be sold for a huge sum, because of its incredibly soft fur, so this discovery justified more expeditions to Alaska.

Directions:

1. Now, using a different color marker, show the route of the *St. Peter* as it traveled from the mouth of the Okhotsk River, to Petropavlovsk, where they had to spend the winter, then quite far out to sea on to Alaska's Kayak Island, back towards Kodiak Island, then along the Aleutian chain back towards Russia. They shipwrecked on Bering Island, then (some of them) made it back to Kamchatka. Label journey, "Bering's *St. Peter* journey, 1741".

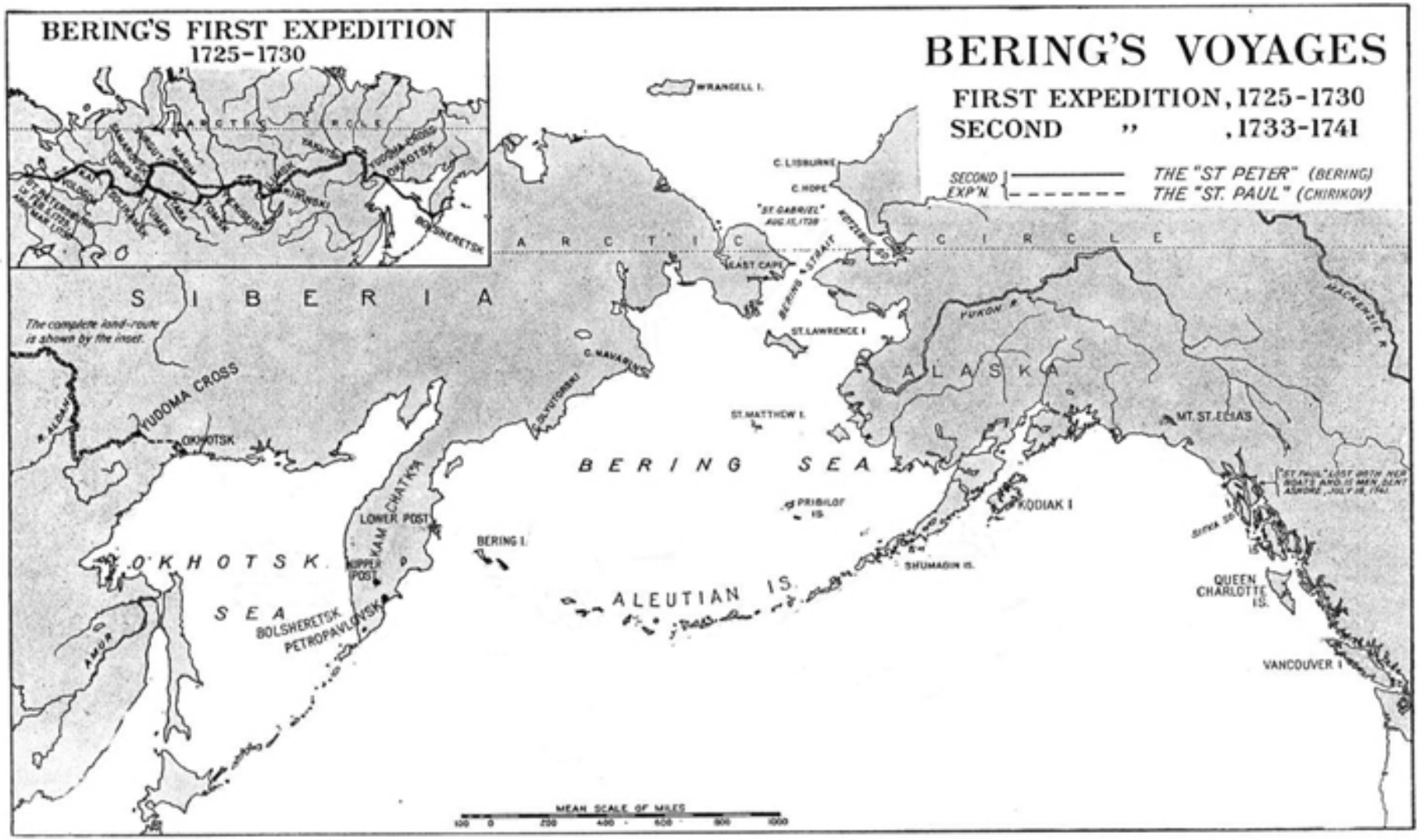
2.Where did Vitus Bering die? _____

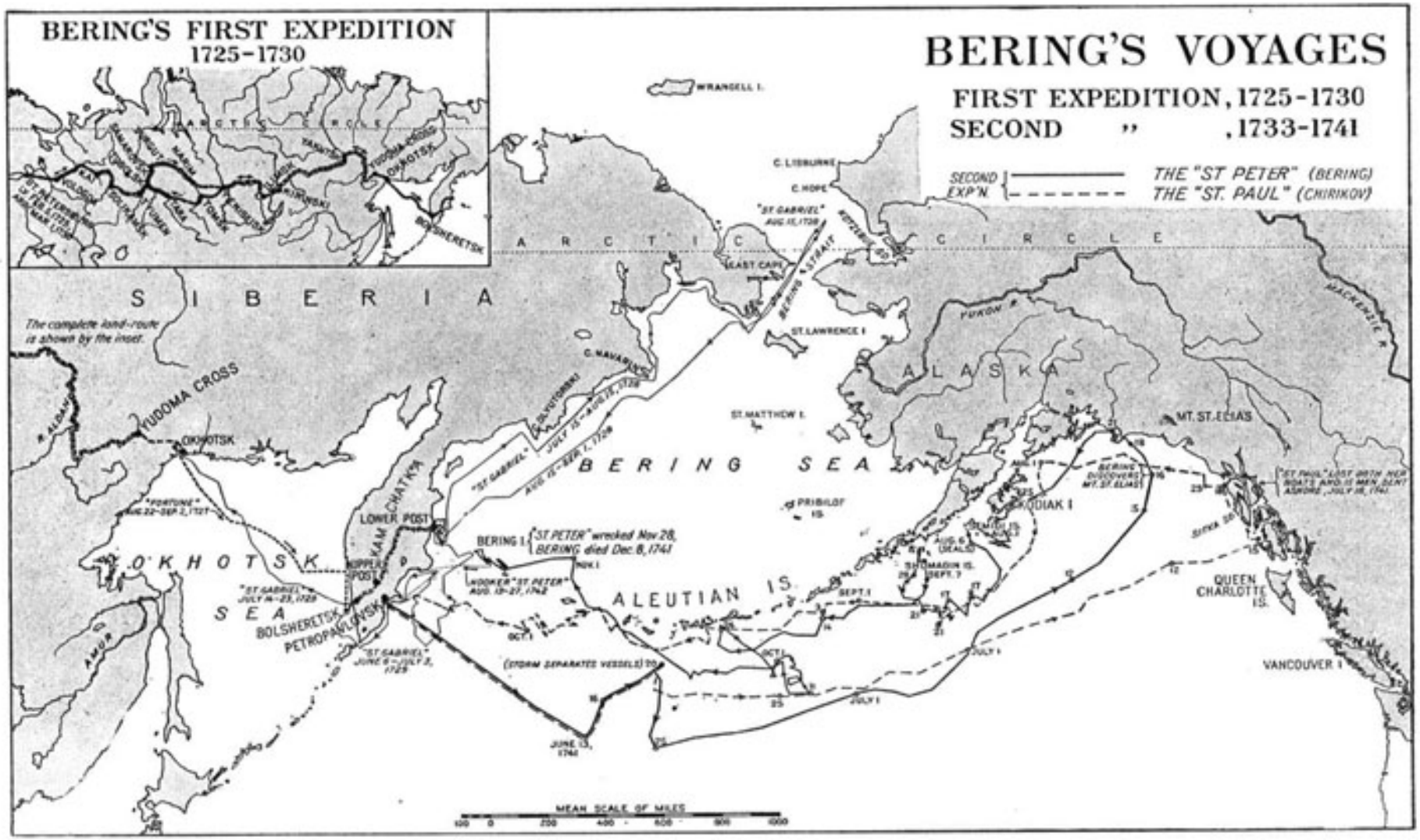
3. Now, using a different color marker and using a dashed line, track the journey of the *St. Paul* from Okhotsk, to Petropavlovsk, then on to the island group just north of the Queen Charlotte Islands, up along the coast, right by Kodiak Island, then back along the Aleutians to Petropavlovsk. Label this journey, "St. Paul, 1741"

Why did the Russians have to travel all the way across Siberia when they wanted to take a ship to America? Let's find out!

The Cost of Travel

Amazingly, when Russians wanted to travel to Alaska from St. Petersburg, they would have to undertake a journey of at least five months over land to get to Okhotsk, and from there take a ship to Alaska. And that was without luggage! When people wanted to take cannons and anchors and other freight to Alaska from Russia, they would have to load up sledges with their cargo, and have horses begin a journey at least ONE YEAR long just to get to the sea. This was because they did not have ships good enough in the 1700s to make the long journey by ocean. Things began to change when, in 1804, the ship *Neva* arrived in Kodiak from St. Petersburg after it traveled the whole way by sea- down around Africa, up off of the coast of China, and then on to Alaska. It took them 400 days, and began a new era of around-the- world travel.


BERING'S FIRST EXPEDITION
1725-1730
BERING'S VOYAGES
FIRST EXPEDITION, 1725-1730
SECOND " ,1733-1741
SECOND EXP'N.
THE "ST PETER" (BERING)
THE "ST. PAUL" (CHIRIKOV)
The complete land-route is shown by the inset.
SIBERIA
ARCTIC CIRCLE
ALASKA
BERING SEA
OKHOTSK SEA
ALEUTIAN IS.
YUDOMA CROSS
OKHOTSK
KAMCHATKA
LOWER POST
UPPER POST
BOLSHERETSK
PETROPAVLOVSK
BERING I.
PRIBILOF IS.
ST. MATTHEW I.
ST. LAWRENCE I.
C. NAVARIN
C. LISBURNE
C. HOPE
EAST CAPE
BERING STRAIT
WRANGELL I.
KODIAK I
SHUMAGIN IS.
MT. ST. ELIAS
QUEEN CHARLOTTE IS.
VANCOUVER I.
YUKON R.
MACKENZIE R.
AMUR R.
MEAN SCALE OF MILES


BERING'S FIRST EXPEDITION
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SIBERIA
The complete land-route is shown by the inset.
YUDOMA CROSS
OKHOTSK
OKHOTSK SEA
BOLSHERETSK
PETROPAVLOVSK
LOWER POST
UPPER POST
KAMCHATKA
BERING SEA
BERING I.
"ST PETER" wrecked Nov. 28, BERING died Dec. 8, 1741
ALEUTIAN IS.
PRIBILOF IS.
ST. MATTHEW I.
ST. LAWRENCE I.
C. NAVARIN
EAST CAPE
C. LISBURNE
C. HOPE
WRANGELL I.
ALASKA
KODIAK I.
MT. ST. ELIAS
QUEEN CHARLOTTE IS.
VANCOUVER I.
YUKON R.
MACKENZIE R.
MEAN SCALE OF MILES

10: The Russian Presence in Kodiak
Teacher's Guide

Goals and Objectives: To learn about life in Kodiak during the time of Russian occupation. This lesson is best aligned with a trip to the Baranov museum, or with a visit from someone with a Samovar tea set to hold a traditional Russian tea party.

Time: 1 45-60 minute class period, unless extension is done.

Alaska Core Content Standards: History A, B, C, D

Materials/ Resources:

Russian Times Reading
Russian Times Worksheet

Procedure:

Ask some opening pre-assessment questions of students, like, "Who knows what life was like for people in Kodiak during the times that Russians controlled and lived in Alaska?" "How big was Kodiak, and who lived here?" "What did people do for jobs then?" "What happened with Kodiak's natives during the Russian period?"

After you get the interest level up a bit in your classroom, have students read the *Russian Times*. When done, have students complete the *Russian Times Worksheet* to assess learning. After students have answered questions in the format you have chosen for them (1-2 paragraphs, poster, whatever you choose), then students should have a discussion about Kodiak's past, and how they feel about the Russian period. So often, students only learn about the Russian Explorers and early leaders as wonderful, brave explorers, and they are not exposed to the reality of slavery and death of the Alutiiq people during this time, so it is important to have this conversation with students.

It is also important to put this period in context with the rest of the world's history and to show that this was happening everywhere, and it is a product of people viewing Native Americans not as human beings (which is the same attitude that led to the Holocaust). This is an important discussion to have with students, especially if students are able to identify how this happens today and whether they feel this way about people from different parts of the world whom they are not familiar with (the Chinese, New Yorkers, Germans, whomever). The main point here is that it is ignorance that leads to people not viewing others as whole human beings.

Modifications: For lower level readers or writers, you can read the worksheet out loud to the class, and assign groups or individuals to answer certain questions, then jigsaw results. Or you can assign one or two questions to each student, and have them demonstrate what they learned on a poster, for example.

Extension: Students can pick an area of interest to explore further at a local museum or they can write a poem or story to honor the forgotten, displaced, or dishonored Alutiiq people from the Russian times. For older students, the reading on Awa'uq in the Extension would be appropriate to discuss the actual Russian takeover of Kodiak Island.

10a: Russian Times Reading

Russian Period in Alaska (1763 to 1867)

By the late 1700s, Russian fur traders had worked their way into the central Gulf of Alaska and colonized the Alutiiq Nation. It was in 1784 that the Russians under Shelikhov's command first took over Kodiak at Refuge Rock in Three Saints Bay (outside of Old Harbor). It is a sad story of an end to an independent people. The Alutiiq were forced to adopt a new economy and social and religious practices and were forced to hunt sea otter for the Russians. Many people died from enslavement and infectious disease. Historians estimate that the Native population plummeted from about 15,000 people at contact to just 3,000 by the middle of the 19th century. During the Russian period, the Alutiiq were made to work in *artels* - camps dedicated to sea otter hunting, salmon fishing, and whaling- by force. In 1794 the Russian Orthodox faith came to Kodiak, which changed the way the Alutiiq were treated and remains a strong force in many Native communities. Sadly, during this time the 60 Alutiiq villages on Kodiak were forcibly moved into bigger, more central (and easier to manage) communities around Kodiak.

By 1786 Shelikhov was the leading fur merchant in the Aleutians but needed someone to manage his business. He found Aleksandr Baranov to do this, who arrived on Kodiak in 1791. He soon moved the settlement from Three Saints Bay to Pavlovsk (now Kodiak city), on the northern side of the island, which had a better harbor and forests to provide wood for construction. It is important to remember that at this point Kodiak was THE capitol of Russian-America!

Baranov faced many problems. Much of the food and almost all finished goods had to be imported, and Russian supply ships were few. Labor was a key problem throughout the Russian period. There were never enough workers for defense, shipbuilding, or the day-to-day

tasks of the colony. Therefore, Natives made up much of the workforce and did most of the fur hunting, while the Russian colonists trapped, cured skins, and stood guard duty.

Shelikhov died in 1795. His son-in-law and successor, Nikolay Rezanov, obtained in 1799 a charter from the Russian ruler, Czar Paul I, that granted his company, the Russian-American Company, a monopoly of the American fur trade.

The Russian-American Company, from 1800-1850's, attempted to diversify the economy by mining coal, catching whales, and exporting ice to San Francisco, but these ventures amounted to little. By the late 1850s, after Russia lost the Crimean War against the British and French, the government became convinced that it could ill afford the luxury of an American colony.

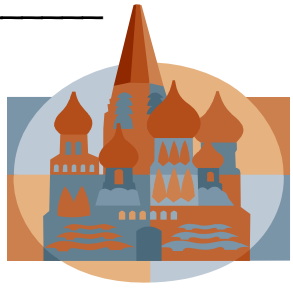
The Russian phase of Alaskan history lasted 126 years. Russian activities had been mainly limited to the coastal regions of Alaska (Aleutians, Kodiak, Southeast Alaska, and the Alexander Archipelago). At its peak the Russian population numbered no more than 700. The greatest impact of this period was the influence of the Russian Orthodox Church and its priests among the Natives of Alaska, which continues today. The church started schools and helped the Russians accept the Native people as human beings.

However, conditions improved later in the Russian period after Russian traders had lived among the Natives. This was the point where people like Arkhimandritov were sent, with a Russian Orthodox teacher's urging, to school in Russia to study shipbuilding, navigation, the church, and much more. It took many years for the Russians to begin treating the Native people as human beings and it is important not to forget that.

The Russians adapted the Alutiiq people to their culture which made the transition to American rule easier for the Natives of Alaska. The Russians allowed the native people to speak their own language, whereas the Americans did not. The Russian Orthodox Church conducted their service partly in Alutiiq. In many ways life was easier for the Alutiiq under Russian rule.

Name _____

10b: Russian Times Worksheet



- What was life like for people in Kodiak during the times that Russians owned and lived in Alaska?

- What did people do for jobs during the Russian period?

- Who was Shelikhov and how was he important in Russian period on Kodiak?

- Who was Baranov and how was he important in the Russian period on Kodiak?

- Who was Rezanof and how was he important in the Russian period on Kodiak?

- How was the Russian Orthodox church important in the Russian period on Kodiak?

10b: Russian Times Worksheet Answer Key

- What was life was like for people in Kodiak during the times that Russians owned and lived in Alaska?

Often difficult- they were forced to hunt and their villages were moved.

- What did people do for jobs during the Russian period?

They were enslaved and made to hunt sea otters, build ships and work in the colony.

- Who was Shelikhov and how was he important in the Russian period on Kodiak?

Shelikhov was the first Russian to take over Kodiak- at Refuge rock. He started the fur trade on Kodiak.

- Who was Baranov and how was he important in the Russian period on Kodiak?

Baranov led Kodiak's colony and moved the capitol of Alaska from Three Saints Bay to Kodiak.

- Who was Rezanof and how was he important in the Russian period on Kodiak?

Rezanof received a monopoly over the American fur trade from the Russian ruler.

- How was the Russian Orthodox church important in the Russian period on Kodiak?

They encouraged the Russians to be kind to the natives, and they started schools.

11: Whaling begins in the Gulf of Alaska and Bering Sea
Teacher's Guide

Goals and Objectives: Students will learn about the history of whaling in Alaska, how it changed through the years and how it changed the face of Kodiak and Alaska.

Time: 1 45-60 minute period

Alaska Core Content Standards: History A, B, C.

Materials/ Resources:

Whaling Reading
Whaling Worksheet

Procedure:

Students should read *Whaling* and when done answer questions, or assigned questions as you choose.

Extension:

This lesson could be combined with a biology/ classification/ anatomy lesson on whales of Alaska, if desired.

The Alutiiq Museum may be able to provide a demonstration of a whale dart game for students, which was a game that people played to increase their arm strength and throwing ability in advance of whale hunting season.

11a: Whaling

For most of the 1800's, American ships were sent to Alaska to hunt whales. It was such a good business, that in 1852, more than 200 whaling ships hunted bowhead whales in arctic seas. The catch that year was valued at a record $14 million.

Why Whales were desired- Of the 77 varieties of whales in the world, the most important have generally been the 11 types of baleen whales (the bowhead and the beluga, for example). Baleen whales are generally larger and slower than toothed whales, making them easier prey for traditional hunters, while the increasingly-complex demands of 18th and 19th century European and American society placed a high value on both the oil and baleen obtained from the whales. One large right whale can provide 25 tons of oil. Although the oil was the reason for hunting them, every other bit of the whale - from flesh to bone - found a use. Sperm whale oil was used for lamp oil, candles, soaps, cosmetics and perfumes, while baleen whale oil was used for margarine and cooking oil. Whalebone was used to make corsets and umbrellas, tendons used to make tennis racquets, and other parts of whale were used to make animal feed and fertilizer.

Whaling in Kodiak- The Alutiiq of Kodiak are known to have hunted whales for thousands of years before the arrival of the Russians. Individual whale hunters went to sea in single seal skin kayaks with only poisonous darts and atlatls or throwing boards. Once a whale was struck the whale hunter went back to shore to wait for it to drift to shore. The poison was powerful enough to paralyze a whale so it would turn over and drown. If the hunt was successful, these brave men achieved enormous stature in their communities. The Port Hobron Whaling Station operated during the 1920s and '30s on Kodiak Island,

(off of Old Harbor) and was the last commercial whaling station operating in Alaska.

How they Traveled- Early European and American whaling voyages usually lasted at least two years. Ships set out from Atlantic Ocean ports in the fall, rounded the tip of South America, and hunted whales in the southern Pacific Ocean until early spring. The ships unloaded the winter's oil and baleen catch in the Hawaiian Islands and took on provisions there for the summer season, which they would spend in Alaskan waters. They hunted whales in the Bering Sea and the Arctic Ocean until fall storms and ice forced them south.

How Whaling Ships Changed Native Life- Most whaling crews traded with Eskimos. They exchanged tobacco, liquor, and other items for ivory and furs. This disrupted the traditional trade network between Siberian and Alaskan Eskimos. Because coastal Eskimos could trade with whalers for more valued items, they traded less with other Native groups. As a result, inland Eskimos were often unable to acquire trade goods they depended upon. Some moved to coastal villages.

Whalers changed the Eskimos' traditional life in another way by hiring them to work aboard ship. Men worked as deckhands and hunters, and women made clothing. This employment altered the Eskimos' annual hunting cycle. The Eskimos hunted less for themselves while they worked for the whalers. Instead of trading one kind of good for another, they now exchanged their labor for goods.

End of Whaling- Soon after the turn of the 20th century, it became clear that the boom years of whaling were gone forever. By 1907, the price of baleen had dropped from a high of $7 per pound, to 50 cents; two years later, the market virtually disappeared as spring steel and other metals replaced baleen. At the same time, improved petroleum distillation techniques were rapidly lowering demand for whale oil. Some recovery in the market for whale products was regained by using various parts of the whale for dog food, and grinding up the rest for fertilizer.

Name_____

11b: Whaling Worksheet

1. What were whale products used for?

2. What type of whales were hunted?

3. How did Kodiak play a role in the history of whaling?

4. Why did the whaling industry end?

5. What was whaling like in Kodiak before Russians came with their larger ships?

Name_____

11b: Whaling Worksheet Answer Key

What were whale products used for?
Oil, baleen for corsets and umbrellas, soaps, candles, perfumes. Tendons for tennis racquets, and for animal feed and fertilizer.

What type of whales were hunted?
Eleven types of Baleen whales were used, as well as other types less often. Right whales and sperm whales were two common types of whales that were hunted.

How did Kodiak play a role in the history of whaling?
Kodiak had Port Hobron Whaling Station, where people made a living off of commercially hunting Alaska's whales for many years

Why did the whaling industry end?
The discovery and use of oil made the more expensive practice of hunting whales obsolete.

What was whaling like in Kodiak before Russians came with their larger ships?
Solitary- hunters would hunt by themselves with poisonous darts then wait for the whales to wash ashore.

12: Should America buy Alaska?
Teacher's Guide

Goals and Objectives: Students will use this lesson as a chance to debate what was going on in the world during the time of America's purchase of Alaska and to decide as a group whether they think that it is a smart idea to purchase Alaska. Students put themselves in the role of legislators during the time of the Alaska purchase.

Time: 1 60 minute class period (2 if extension is done)

Alaska Core Content Standards: History A, B, C, D.

Materials/ Resources:

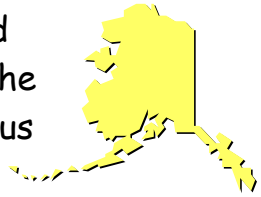
Student briefing sheets, 1 of each per group.
The Story of the Alaska Purchase

Procedure: Introduction: Students should be told that they are pretending to be legislators in the 1800s, so there are certain facts that are still unknown to them about Alaska (namely, oil). Discuss what other things would not yet be known and some of the fears that people may have had about purchasing the state of Alaska. Students should be split into groups of 3 and each student should choose an area to explore within their group (choose one of the worksheets). Students should read their briefing sheets and make a decision about how they will 'lobby' their group to recommend (or not) the purchase of Alaska to congress. The group should try to come to a consensus, if possible. At this point you can have a whole-class discussion about the arguments for and against the purchase of Alaska and hold a class vote. When done with this activity, read or circulate *the Story of the Alaska Purchase* to discover what really happened.

Extension: Groups may choose to make a poster/ advertisement to try to convince the American public that buying Alaska is a good (or bad) idea or they may choose to write a speech to this same end. Also, students may be interested in the Alaska Native Claims Settlement Act and how this act gave land rights to the Natives of Alaska.

Name_____

12a: Natural Resources Briefing Sheet



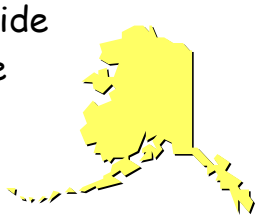
You are a member of the American Congress in 1867 and have been asked to prepare a report on Alaska to help the group decide whether to buy Alaska or not. You will focus on one of the following areas: Natural resources, People of Alaska, Drawbacks to the purchase- and will make your own decision about whether you'd recommend that America buy Alaska from Russia. After you choose an area to research, you will read the informational sheet on the area of your choice, prepare a recommendation to your group about whether to buy Alaska or not, and then try to come to a group consensus about whether to recommend the purchase of Alaska to the government as a whole.

Natural Resources in 1867

- Alaska is near Japan, the Philippines and Russia and may be a good area to trade from.
- The ice trade brings in a large amount of money per year
- The salmon fishery seems promising
- The sea otter is almost gone!
- The trading bans that Russia had set up against America would be eliminated, especially the ones that prohibited Americans from selling firearms and alcohol.
- 1852 was such a successful whaling season that more than 200 whaling ships hunted bowhead whales in arctic seas. The catch that year was valued at a record $14 million.
- Alaska is extremely cold and it is difficult to live there. The climate is dangerous, and it is also difficult to ship food to those living in Alaska.
- Alaska is so distant that Americans living there would be cut off from the rest of the United States and it would not be easy to communicate with them.

Name_____

12a: Pro-Alaska Purchase Briefing Sheet



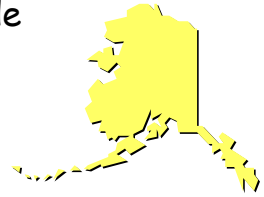
You are a member of the American Congress in 1867 and have been asked to prepare a report on Alaska to help the group decide whether to buy Alaska or not. You will focus on one of the following areas: Natural resources, People of Alaska, Drawbacks to the purchase- and will make your own decision about whether you'd recommend that America buy Alaska from Russia. After you choose an area to research, you will read the informational sheet on the area of your choice, prepare a recommendation to your group about whether to buy Alaska or not, and then try to come to a group consensus about whether to recommend the purchase of Alaska to the government as a whole.

Arguments for Purchase

- America would now own most of North America and would be more protected from invaders and enemies.
- As early as September of 1860, William Henry Seward, who served President Abraham Lincoln as United States Secretary of State during the Civil War, said in a speech at St. Paul, Minnesota:
- Standing here, and looking far off into the North-west, I see the Russian, as he busily occupies himself establishing seaports, and towns, and fortifications, on the verge of this continent, as the outposts of St. Petersburg; and I can say: 'go on, and build up your outposts all along the coast, up even to the Arctic Ocean; they will yet become the outposts of my own country-monuments of the civilization of the United States in the Northwest.'
- Lincoln himself is said to have believed that the United States suffered from a lack of naval outposts in the North Pacific.
- There are plants and animals that we have not discovered living in Alaska! Some may even be helpful in medicine or science.
- The California Fur company wants to take over all of the fur trade, and wants America to buy Alaska to push Russia out.

Name_____

12a: Anti-Alaska Purchase Briefing Sheet



You are a member of the American Congress in 1867 and have been asked to prepare a report on Alaska to help the group decide whether to buy Alaska or not. You will focus on one of the following areas: Natural resources, People of Alaska, Drawbacks to the purchase- and will make your own decision about whether you'd recommend that America buy Alaska from Russia. After you choose an area to research, you will read the informational sheet on the area of your choice, prepare a recommendation to your group about whether to buy Alaska or not, and then try to come to a group consensus about whether to recommend the purchase of Alaska to the government as a whole.

Drawbacks

- The Sitka colony almost completely starved a couple of times.
- Food is very short in the winter
- Natives have gunpowder and may resist new ownership.
- How many of the Russians would actually stay?
- The people of Sitka have been very rebellious towards the Russians.
- We just got over a civil war! Why would we want to buy Alaska at this time when we are recovering from a hard financial time??
- The Russian-American Company is almost bankrupt- it is expensive to run businesses in Alaska. How would we do better?
- Will the natives listen to new 'rulers'?
- What about the Russian church?
- Many natives speak only Russian and their native tongue and it will be hard to trade with them.
- America will be responsible for running schools now, which in such a large land would be very difficult.

12b: The Story of the Alaska Purchase

In 1864, Russia gave in and sold Alaska to America. By that time, the war that Russia was fighting in the Crimea had made the country poor, and unable to support their Alaskan colony. Otters were more difficult to hunt, because so many of them had been killed by this time.

America was attracted by the position of Alaska in the North Pacific and thought that it would be good for trade with the eastern countries and to protect America's borders. They also were attracted by the rich wealth of natural resources in Alaska: fish, ice, furs, etc. Many people in America were against the purchase of Alaska, laughing at the "wasteland" of snow that they were buying, saying that Russia was only selling Alaska now that they had hunted all the otters and had given up on governing the people of Alaska.

The "Treaty Concerning the Cession of the Russian Possession in North America by His Majesty the Emperor of All the Russians to the United States of America" provided for a purchase price of $7,200,000 in gold. All private property was to be kept by its owners, with the Russian Orthodox Church owning church land. People choosing to remain in Alaska would now be called Americans, while those in "uncivilized tribes" (Alaska Natives) would not be called Americans yet and would be "subject to such laws that the United States might adopt about them." Alaska natives would not actually be called Americans until 1924. It is interesting to note how Alaska changed under American ownership. In 1880 there were just under 33,000 natives in Alaska, and only 430 white people, but by 1900 there were under 30,000 natives and 34,000 white people. Americans flooded to Alaska during those years to set up mining claims and to make a fortune in fishing.

At first America's Navy ruled Alaska, and replacement of Russian colonial administrators by Americans meant little to most Eskimos, Indians, and Aleuts of the former Russian-America, now called Alaska. About 20,000 of the state's natives lived far away from where the Russians had traveled (along interior rivers), so had not

even known that the Russians ever claimed to 'own' Alaska. For a number of years they were unaware that Russia had 'sold' the land.

Many of the remaining 10,000 Eskimos, Indians, and Aleuts were largely unaffected by the change. They lived in the southern coastal regions where their contacts with Russians went back 50 years or more. During the early years under the American flag, however, most of them would not even see any representatives of the United States.

Many tribes were upset upon hearing about the sale of Alaska. They argued that it was unfair to sell their land without their consent, and that the Russians were just allowed to live and trade in Alaska under treaties. They argued that Russia should not have been able to sell Alaska because they never owned the state.

Americans were largely absent from Alaska until the early 1900s when gold was discovered. In 1959 Alaska was made a state, and slowly Alaska natives started to win back the right to their own land.

13: Governance in Three Times
Teacher's Guide

Goals and Objectives: Students will compare a child's life in three different time periods- Pre-contact, Russian period, and the American period, to reflect on different styles of governance, different uses of resources, and different concepts of schooling.

Time: 1-2 periods

Alaska Core Content Standards: History A, B, C. Government A, C.

Materials/ Resources:

Comparison Chart
Stories

Procedures: Pre-Teach civics terms by showing grid assignment on an overhead. Use overhead to explain the terms on the grid (such as economy/ social structure). Teachers may want to demonstrate how the grid would be filled in for our current society before students attempt it. Either have students read stories to themselves, to each other, or read them out loud to the class (or a combination). The class could be split up into reading levels for this activity as well. When students are finished reading each story they should fill in their grid with the information that they learned. It may be a good idea to have students underline words that they do not know from the story for a later class discussion. When done, the grid can be graded as a class or passed in to be assessed.

Modifications: Stories may be read aloud for lower-level readers.

Extensions: Students can write their own stories from either their own time or one of their choosing to put themselves in the position of a child from one of these periods.

Assessments: The grid should be completed to show comprehension of the material read.

13a: Traditional- pre 1784

"Cama'i" my uncle said as he walked in the door of the barabara, stooping to make the low entrance. He was dressed in warm furs and walked barefoot on the cold ground, as did I. I said "Cama'i" is back and my uncle sat down to continue his lesson on making spear points out of slate. I loved 'school', because it meant that my uncle would take me trapping, teach me how to throw spears and cut up seal for my family. It was traditional for the uncles to teach their nephews. It made it easier for everyone not to have to learn everything from their parents. Plus, I loved and respected my uncle and he could tell me things that my own parents could not. It made me feel good that I, at the age of 11, could begin to feed my family. While my uncle taught me how to grind the sides of the slate tips he told me stories about the village of Akhiok and what my ancestors had learned from thousand of years of living off the land. I was so excited by the stories, though, that I had a hard time listening and found myself always interrupting to ask questions. Because of this, my uncle gave me the name "Yur" (pronounced Yukh) which means, "Talk too much" (yurpigartut). I was ashamed of my name and tried to keep quiet when elders spoke but it was so hard!

After my lesson it was time to get in our kayaks to paddle to a neighboring village. It was there that we would trade our beautiful locally-made spruce root baskets and hats for furs. It was rare when we had to do this. Usually we could survive on all local materials, but we had had a bad winter for trapping and needed a few more furs to make clothes out of. All of our belongings and all of our food are either made by someone in our community, or traded for.

After a 2 hour paddle with my uncle and two other men, we arrived at the neighboring village. We had our choice of 52 villages to trade with, but this one was the closest. As we paddled to the shore, many children and adults came to greet us. This was exciting because I usually played only with kids from my own village. It was strange to think that someday I would probably marry one of these girls and

bring her to my own village. But this was far off- for now I could play, like a kid.

My uncle walked off to do the trading, while the women busily prepared food for their friends. As usual, the women did the cooking and the gathering of food, while the husbands hunted and worked on the houses. My mother, like the women in this village, was always busy- even when she was sitting around the fire she was sewing or scraping skins. There was much for women to do, since everything we had came from the materials we gathered. Men would bring home a seal, and women would butcher it and share the meat with everyone in the community. The women would take the skin, scrape it, and tan it for use later in clothing or kayak skin covering. For thread, they used sinew from all the animals the men caught.

I raced around the sod houses with the other kids, screaming and laughing. After a bit, the women called us in for dried fish which we dipped in seal oil. The men had finished their trades, and now were laughing and telling stories. The chief had come in to share his recent story of a raid on a neighboring village to get slaves. He had brought home 6 slaves! This made him very powerful and rich to have so many slaves in his village and I could tell my uncle was impressed. In my own village, our chief only had 3 slaves. I could tell my uncle was already making plans about how to put together a raiding party to get more to make our chief look good. My uncle was just a commoner, but he was a respected one, and always worked hard for his village.

Reluctantly, we finished eating and began to get ready to head home. I did not feel like going back out to sea, but once I jumped into the kayak I changed my mind. It felt so good to be paddling behind my uncle in our double kayak. With each stroke of my paddle I would hear a lovely low swish, which was timed with my uncle's paddle on the opposite side. We paddled right through a huge group of puffins- hundreds of them- and they looked at us worriedly, paddled their little legs as fast as they could, and finally dove to get away from us. As we paddled home, I felt happy, my belly full and my arms feeling strong. I looked forward to climbing into my warm furs that night in my family's barabara.

13b: Russian Period- Lena Ivanovna- 1784-1867

I stick another piece of wood in the fireplace and check to see whether the water is boiling yet so I can make tea for my mother. I get soot on my dress and rub it away quickly, not wanting my mother to get mad. Mother is sad lately because dad has been out to sea for more than 3 months, and the village is beginning to think that the boat may have been lost. My dad, Ivan, has lived in Kodiak his whole life. His mother was a native from the village of Afognak (which is where my mother is from too), and his father, my grandfather, was a Russian fur trader. Now, however, Ivan is called a Creole (part Russian- part Native) and is able to get better jobs than a regular Native would be able to. Right now he is first mate on one of the Russian ships! Everyone else on the boat is native- except for the captain- and they are expected to hunt as many sea otter as possible for the Russian fur trade, and for the Tsar. It's getting harder and harder to find sea otter, though, so the boat stays out longer and goes further away each time.

We have just celebrated New Year's and it is now the year 1835! I wonder what will happen in the next 100 years- the last 100 has been both sad and exciting. The Russians came 51 years ago in 1784 and started to make the natives hunt sea otter furs for them. Many members of my mother's family died of starvation and disease after the Russians came, and soon many villages were so small that the Russians moved people around. Now there are only 15 villages on the island and there used to be 53! The Russians at first were very cruel and made the natives work very, very hard. Many died hunting or died trying to stand up for their people. Finally, though, Russian Orthodox priests came from Russia and saw what was going on and stopped it. Now there are schools that we go to. At my school I learn both Russian and Alutiiq, which makes me happy because I can talk to many members of my family. I'm also learning to write in both languages and I can read the bibles at church in both languages!

The tea water is finally ready, so I prepare the tea leaves in our little copper samovar, pour the water in and pour two cups of tea- one for my mother and one for me. We sit at the window of our little wooden house and stare out at the water, waiting to see some sign of father's boat. My mother is quiet, but soon begins to talk about what we need to do for the rest of the day. She opens up her purse and gets out some rubles (Russian money). She asks me to run over to the Russian Store and pay the storekeeper 5 rubles on her store debt. Then I am supposed to go to the Russian American Company and pick up my father's paycheck. My mother threatens to go see the governor to ask what is taking so long, but knows that is not a good thing for a native to do. Maybe she will visit one of her Creole friends to see if they will ask for her. In Kodiak, the governor (who is sent by the Russian Tsar or king) is the leader. Under him, are all the Russians, then the Creoles, and lastly are the full natives. When my father is home we always feel more important. The Governor does what the Tsar wants him to do, and often we are surprised by the rules. But he is a good Governor really, so we try to be polite and nice around him.

I finish my tea and run out the door to do my errands. I go to the store, give the Russian storekeeper the 5 rubles, looking hungrily at all the honey sweets and even the canned beets, but know that I can not buy anything, so I leave quickly. I then go to the Russian American Company to pick up my father's money. The office is loud with happy women, and I soon discover that my father's boat is almost home- someone has seen it pass Chiniak rocks, probably on the way back with a big load of sea otter furs. Everyone in town knows that this is the whole reason the governor is here in Alaska, so we are happy that he will be happy. I secretly do not care. I am just happy my father will be home. I forget my errand, run home to get my mother, and we get dressed up in our nice white Russian dresses and head down to meet the boat.

13c: American period- Zhenya Ivanovna 1867- now

I sit up straight in my desk at the little Woody Island Mission schoolhouse. I do what the teacher instructs and write my name and date on my paper- Zhenya Ivanovna. 10 December, 1870. I wait for further instructions as I think back on the past few years. Alaska had been 'sold' to America 3 years ago and so many things have changed! I still have a hard time understanding how Alaska could just be sold to another country, since it is WE who live here, but I suppose at least the new owners are trying to help out. The thing I find hard is not being allowed to speak Alutiiq at school, which is what I spoke at home to my mother Lena before they took me away to live in the mission. Now they hit me or make me wash my mouth out with soap if I say anything in Alutiiq. I have to say everything in English. Luckily I am learning it quick, but other kids are having a more difficult time.

My teacher asks all 6 of us in the schoolhouse to write a paragraph about the wreck of the *Kad'yak* ten years ago, so I begin writing. I wrote what I had learned about the sinking of the ship, and how it had been taking a load of ice to California at the time. I wrote about how the boat was going south to earn the new American dollar, instead of what I was used to- the Russian Ruble. I wrote about how the ice had been cut up from our lake, and packed onto the ship for shipment south. I wrote that horses would have helped to haul the ice to the boat. I wrote how proud I was that the captain of the ship was part Native, like me. My teacher had just finished explaining to us that the ice trade from Woody Island was one of the main reasons that America had bought Alaska- they make a lot of money shipping our ice to California! Well, that and fish, anyway. I know a lot about fishing because my father fished for cod in the winter and was able to sell it for a pretty good price most of the time.

I look around the school house at all the kids. Three others are Creole like me, and we sit in the front of the classroom. We often make mistakes and call ourselves Russian. Two are native kids and sit in the back. They need a lot of help learning English, but are a lot of fun to play with on the playground because they know a lot of good

games. One, Teacon, is my best friend and we play almost every night at the orphanage.

The other day as we were building a snowman Teacon said something about how our king would be so impressed with all the snow in Kodiak this year and I had to correct him. We now have a president, not a king. We do not vote for our president, because Alaska is not a state, but at least the president sends us a governor so we can make laws. Anyway, we finished the snowman and Teacon said that the president would love the snowman….

I finished up my paragraph about Woody Island, handed in my paper and all the kids ran to the mission lunchroom. I was happy to see that the cook had made boiled cod and potatoes, perfect for a cold day. I ate eagerly so I could get back to school.

Name _____	Economy/Resources	Social Structure	School	Government
Traditional Pre 1784				
Russian 1784-1867				
Early American 1867-currently				

	Economy/Resources	Social Structure	School	Government
Traditional Pre 1784	Trade and Subsistence. All local resources used.	The men hunted and the women gathered, took care of children. Chiefs, commoners and slaves were 3 social classes.	No school. Life skills were taught by members of the community.	Chiefdoms.
Russian 1784-1867	Rubles now used for money. Debt exists. Russians used natives to gather furs for trade.	Most important were governors, then Russians, then Creoles, then natives. Natives could move up in rank through hard work.	Russian and Alutiiq taught in school. Schools were led by the church.	Monarchy- the Tsar of Russia ruled over Alaska. Alaska had governors, appointed by Russia.
Early American 1867-currently	American money. Ice trade and Fishing were what first attracted the Americans to Alaska.	Most important were whites, Russians, then natives. Creoles usually called themselves 'Russian'.	English ONLY in the schools. American government runs schools.	Democracy. Before Alaska was a state and it was a territory, the American president would appoint a governor.

14: Kodiak Historical Landmark Project
Lesson Plan

Goals and Objectives: This lesson asks students to look around them and take a fresh look at historically inspired local landmarks.

Time: It would be best if this assignment was given at least a week before it is due to allow kids to visit local museums, research street names and conduct interviews.

Alaska Core Content Standards: History A, B, C, D.

Materials/ Resources:

Student Worksheet

Procedure: Pass out worksheet, making modifications as needed. Students should be given a deadline to choose a topic, and perhaps this assignment could be given in conjunction with a trip to a local museum or with a visit of local elders. You may choose to have students show their knowledge through papers, posters or speeches.

14: Kodiak Historical Landmark Project

Who are the people Kodiak streets are named after? Your job is to pick a person to research and then to present your findings to the class. You may research online, use books, or ask for information at the Baranov Museum. **Here are the options:**

Baranof
Rezanof
Erskine
Shelikhov
Father Herman

More difficult topics: Do you know any members of these families who you could interview about their histories?
Sargent
Metrokin
Antone
Von Scheele
Malutin
Chichenof
Selig
Simeonoff
Ole Johnson

Another Option: Is there someone that you think a street or landmark should be named after? Your job is to research that person (after the person is approved by teacher) and to write a letter to the local government addressing why this person should be honored with a landmark or street named after them.

Other possible topics allowed by teacher:

How I will Show What I Have Learned: _____

15: Timeline Activity
Lesson Plan

Goals and Objectives: Students will research about major historical events to compare what was going on in Alaska with what was going on in the rest of the world.

Time: 2-3 periods

Alaska Core Content Standards: History A, B.

Materials/ Resources:

Internet access
Student Timeline Worksheet
Large paper for Timeline
3 different colors of colored pencil or marker

Procedure: Introduce activity and discuss the types of dates that one would want to list on a timeline. Show a sample timeline on the board.

Name_____

15: Timeline Comparison Activity

You will be creating a timeline to compare what was happening in Alaska to what was happening in America and in Europe. It will be interesting to compare them.

Assignment: Use this paper to take notes until you have enough information to create a timeline on large paper. Your timeline will go from 1750-1900 and should include all major events (at least ten per area, or 30 total). When you make your timeline, use one color for American events, another for Alaskan events, and yet another for European events so it is clear to the viewer. Make sure to include a key.

Notes:

American dates

Alaskan dates

European dates

16: *Kad'yak* Culminating Activity

Now that we have completed an investigation of the Kad'yak and the ice trade, it is time for you to show what you know and to choose an area of interest to investigate further:

Options:

1- Write letters back and forth between a native youth in a boarding school and a Russian youth working on a ship before 1864. There should be at least 6 letters of at least two paragraphs in length and letters should describe feelings, surrounding, happenings, etc.
2- Make a model of Woody Island during the time of the ice trade.
3- Write a story of what Alaska would be like now if it was kept by Russia.
4- Write a book report about an approved book that addresses Kodiak or Alaska history.
5- Create a research project/ science experiment that addresses something to do with phases of matter, heat transfer or buoyancy (topic must be approved by teacher)

Projects will be graded on the following assessment rubric: (100 points possible)

Presentation/Conventions _____ (25)
-Project should be professional-looking, correct, presentable and ready to display in public.
Creativity/ Voice _____ (25)
-Student will be given credit for showing a passion for learning and clear, apparent interest in the chosen topic of study.
Content _____ (25)
-Project should display correct knowledge of factual or scientific events. Project should be researched well!
List of research materials _____ (15)
-Did you keep a list of websites, books and interviews used in your project?
Effective use of class time _____ (10)
Total _____ (100)

Name_____

17: *Kad'yak* Test

1. What was the *Kad'yak* carrying when it sank?

2. Where was it harvested?

3. Where was the *Kad'yak* taking this cargo?

4. What year did the *Kad'yak* sink?

5. Who owns the shipwrecked *Kad'yak* now?

6. Why was the ice trade so important?

7. Who was the man who began to sell ice in the 1800's?

8. What is the purpose of insulation?

9. How was Kodiak's ice cut up?

10. Why do you need salt to make cream freeze for ice cream?

11. What is Archimedes' Principle?

12. If a 150 pound person jumps into a lake and displaces 50 pounds of water, how much do they now weigh? _____ Will they float if they displace 50 pounds of water? _____ Will they float if they displace 150 pounds of water? _____

13. Why did the Russians come to Alaska?

14. How did the Alutiiq people hunt whales before Russians came?

17: *Kad'yak* Test

Answer Key

1. What was the *Kad'yak* carrying when it sank?

Ice

2. Where was it harvested?

Woody Island

3. Where was the *Kad'yak* taking this cargo?

San Francisco

4. What year did the *Kad'yak* sink?

1860

5. Who owns the shipwrecked *Kad'yak* now?

The State of Alaska

6. Why was the ice trade so important?

Food preservation, shipping of goods.

7. Who was the man who began to sell ice in the 1800's?

Fredrick Tudor

8. What is the purpose of insulation?

To slow heat transfer- keep warm things warm and cold things cold

9. How was Kodiak's ice cut up?

Horses pulled great saws over the surface of the lake.

10. Why do you need salt to make cream freeze for ice cream?

It lowers the freezing point of cream. Or it creates a chemical reaction which sucks the heat out of the cream, freezing it.

11. What is Archimedes' Principle?

The weight of an object is reduced by the amount of water it displaces.

12. If a 150 pound person jumps into a lake and displaces 50 pounds of water, how much do they now weigh? **100 pounds**. Will they float if they displace 50 pounds of water? **No**. Will they float if they displace 150 pounds of water? **Yes.**

13. Why did the Russians come to Alaska?

To pursue the sea otter fur trade.

14. How did the Alutiiq people hunt whales before Russians came?

In single kayaks with poisoned spears.

Appendix

Alaska History Timeline

1741 July 15 Aleksei Chirikov with Vitus Bering's Expedition sights land - the Great Land is discovered. Chirikov, in command of the ship the *St. Paul*, sighted what is believed to be Prince of Wales Island of the Alexander Archipelago. Bering's ship, the *St. Peter*, had sailed in a more northerly direction and came upon Kayak Island the next day.
1776 Captain James Cook of England searches for the Northwest Passage. His maps of northern North America prove that America and Asia are separate land masses and remain the standard for over a century.
1784 First permanent Russian settlement is established at Three Saints Bay on Kodiak Island in an attempt to stave off British inroads. Grigory Ivanovich Shelikov brings his wife Natalya to Kodiak: first European woman in Russian America. Shelikov, a Siberian fur merchant, established the first permanent Russian settlement on Kodiak Island as a means of restricting the British fur trade. He wanted to establish a monopoly of the fur trade in Alaska, but the Empress Catherine would not allow it. Shelikov forced the Natives on the island into submission at Refuge Rock.

1791 Baranov arrives on Kodiak
1794 Aleksandr Andreyevich Baranov builds first ocean-going vessel in northwestern America on the Kenai Peninsula at Voskressenski.
1799 First Russian trading charter grants Russian-American Company sole trading rights in America for 20 years. Aleksandr Andreyevich Baranov establishes a Russian post known today as Old Sitka. Violating orders against doing business with foreigners Baranov made friends with James Shields, an English naval officer experienced in ship building. Baranov engaged Shields to construct a vessel. When it was finished the ship was christened the *Phoenix.* It was used in American waters and made two voyages to Siberia. Its chief value was symbolic, a demonstration of what the colony on Kodiak could accomplish.
1802 After the attack on Old Sitka, Baranov was forced to pay 10,000 rubles ransom for surviving settlers.

1804 Baranov returned to Sitka with a large contingent of Russians and Aleuts, and the Russian warship *Neva.* The ship destroyed the Native village and its occupants. Baranov immediately began to build the settlement of New

Archangel, now known as Sitka.
1805 First cargo of Russian furs from Russian America is delivered to Canton, China by Yuri Lisiansky.

1812 Napoleon invades Russia, increasing isolation of Russia from its distant colonies.
1823 December 2 President James Monroe, seeking to exclude European intervention in the New World, issues the Monroe Doctrine.

1850 Russia loses Crimean war.
1853 Oil seeps in Cook Inlet are discovered by employees of Russian-America Company.
1857 Coal mining begins at Coal Harbor on Kenai Peninsula to supply steamers. The Russian-American Company was suffering from financial difficulties and the Tzar wanted to revoke the charter. The company had been beaten by the Hudson's Bay Company in the fur trade. The British company had better and cheaper items to trade with the Natives for furs. The Company tried new business ventures. It opened a coal mine at Port Graham. By 1857 the mine produced enough coal to support the colony. Surplus coal was taken to San Francisco but it was sold at a loss. The company quit the venture. It also failed at whaling because it could not compete with the more efficient Americans. The ice trade prospered, but it was not enough to justify the company's existence. The company's long tenure in the Americas soon came to an end.

1860-*Kad'yak* hits a rock and sinks while taking a load of ice to San Francisco.
1861 Gold is discovered at Telegraph Creek at the Stikine River.

1867 March 30 - Secretary of State William H. Seward negotiates purchase of Russian America: 375 million acres for $7.2 million - less than 2 cents per acre. Many called this "Seward's Folly" because little was known about Alaska, other than its cold climate. Fur seal population, stabilized under Russian rule, declines rapidly. Major General Jefferson C. Davis, U.S. Army, assumes command of the Department of Alaska. A decade of military rule begins.

1879- Woody Island Ice Company closed.
1882 First Alaska salmon canneries are built in central Alaska. First

commercial herring fishing begins at Killisnoo.
1890 Large corporate salmon canneries begin to appear.
1893 Gold is discovered on Birch Creek; Circle City is founded.

1896 Klondike Gold Rush begins.

1898 April 23 - Libby Partners make first major gold strike on Melsing and Ophir Creeks; Nome Gold Rush begins.
1905 First opportunity for Natives to obtain land under restricted title.
1913 First Alaska Territorial Legislature Convenes; first law passed grants women voting rights.

1914 Surveying begins for Alaska Railroad.
1918 Alaska salmon pack exceeds six million cases, valued at over $51 million.

1920 Anchorage city government is organized.
1924 Congress extends citizenship to all American Indians. William L. Paul, a Tlingit, is the first Alaska Native elected to Territorial Legislature.
1926 Alaska Native Townsite Act allows Natives to obtain restricted deeds to village lots. The design for the Alaska flag was selected in a contest for Alaska students in grades 7 through 12. The winning design, submitted by 13-year-old Kodiak native Benny Benson, consisted of eight gold stars on a field of blue, representing the Big Dipper and the North Star.
1927 The Alaska Legislature adopted Benny Benson's design as the official flag for the Territory of Alaska on May 2, 1927. It later became the official flag of the State of Alaska.
1928 Court case resolves the right of Native children to attend public school.
1935 Salmon pack peaks at 8,437,603 cases.
1936 Congress extends the Indian Reorganization Act to Alaska. Nell Scott of Seldovia becomes the first woman elected to the Territorial Legislature.
1942 Japan bombs Dutch Harbor; invades Aleutians. Pioneer Service Road (Alaska-Canada Military Highway) is built between February 14th and September 24th from Dawson Creek, British Columbia to Delta Junction, Alaska.
1943 Kodiak becomes busy military community. American forces retake the Aleutian Islands, Attu and Kiska, from the Japanese.

1947 The Alaska Command is established; first unified command of the US Army, Air Force, and Navy. First Alaska Native land claims suit, filed by Tlingit and Haida people, introduced in US Court of Claims.
1955-1956 Constitutional convention held at the University of Alaska.
1958 Congress passes Alaska Statehood Act conveying ownership of 104 million acres.
1959 Alaska is admitted to the Union as the 49th state, and William A. Egan becomes Alaska's first governor. Sitka pulp mill opens. State revenues: $25.4 million. British Petroleum begins to explore for oil on Alaska's North Slope.

AWA'UQ: DISCOVERY AND EXCAVATION OF AN 18TH CENTURY ALUTIIQ REFUGE ROCK IN THE KODIAK ARCHIPELAGO

Rick Knecht[1], Sven Haakanson[2], and Shawn Dickson[3]

[1]Museum of the Aleutians,
Unalaska, Alaska, USA

[2]Alutiiq Museum and Archaeological Repository
Kodiak, Alaska, USA

[3]The Aleutian/Pribilof Center
Unalaska, Alaska, USA

ABSTRACT

Refuge rocks are fortified settlements built atop steep walled sea stacks, tombolos and islets. They are found throughout the Kodiak Archipelago and the Aleutian Islands, as well as on the Northwest Coast (Moss and Erlandson 1992). Because they are nearly inaccessible, these sites remain poorly known archaeologically. In August 1784, a party of Russian fur hunters, led by Gregori Shelikhov stormed one such refuge rock, upon which a thousand or more Kodiak Island Alutiit had gathered in defense against Russian demands for hostages. The resulting bloodbath broke the back of Alutiiq resistance, and the Russians were able to establish a fur trading post at the nearby settlement of Three Saints Bay. Although this incident is well known historically, the site's location remained unknown until 1990, when it was discovered during an aerial survey. Bill Laughlin was a member of a team that undertook ground reconnaissance confirming its significance. Mapping and excavation at the site followed in 1992.

HISTORICAL BACKGROUND

Russian contact with the heavily populated Kodiak Archipelago had begun in earnest by the 1760s. The Alutiiq proved to be unwilling participants in the fur trade, however, and drove off successive parties of Russian fur hunters that attempted landings in the years between 1763 and 1780 (Black 1992). In 1783, Siberian merchant Grigorii Shelikhov launched an expedition of three galliots, small single-masted ships, laden with a contingent of 192 well-armed men, with the stated intent of establishing a colonial settlement on Kodiak Island (Shelikhov 1981; Crowell 1997). A similar outpost had been already established in Iliuliuk, in the modern town of Unalaska a decade or two earlier. One vessel had become separated from the others shortly after leaving Russia, but the Tri Sviatitelia and the Sv. Simeon sailed on to Unalaska where they took on provisions as well as a dozen Aleut/Unangan men, including two interpreters. One interpreter, Qaspeq, was an Alutiiq who had been taken as a war captive from Kodiak as a child and raised in

servitude in the Aleutians. He spoke Russian, Unangan, and Alutiiq and had worked for Russian skippers as early as 1758 (Black 1992). Qaspeq had previously been involved in a series of violent conflicts between Russian fur hunters and Unangan in 1763-64 and had once betrayed the location of a refuge island just offshore of Unalaska Island. Crowded with Unangan villagers fleeing Russian reprisals, the Ugaalgan site (UNL-143) was the scene of a surprise attack by Russian fur hunters, possibly led by Grigorii Korenev (Veniaminov 1984). The site was located in a subsequent survey by Knecht, Bruno Frohlich, Gary Carver, Larry Merculief, and Melia Knecht (Knecht 2001).

Shelikhov's vessels reached Kodiak on August 3 (August 14 in the modern Gregorian calendar), 1784, and dropped anchor in Three Saints Bay. The Three Saints Bay settlement was the scene of archaeological excavations by Donald Clark in 1962 (Laughlin and Reeder 1966; Clark 1985, 1997). A 1989 site visit by Laughlin, Clark, Knecht and Aron Crowell was preliminary to Crowell's subsequent work there in 1990-91 (Crowell 1995, 1997). The actions of Shelikhov and his crews have been ably recounted by Black (1992) and Crowell (1997), drawing upon Russian archival sources and the oral histories collected among the Alutiiq by Holmberg in the mid-19th century (Holmberg 1985).

Shelikhov began to reconnoiter Alutiiq settlements after landing at Three Saints Bay. Most villagers fled at the sight of the Russians. By August 7, the Russians had discovered that large numbers of Alutiit, probably drawn from a number of villages in the Sitkalidak Island area, had retreated to a refuge at the top of a what was described as a small detached headland roughly 40 km from Three Saints Bay. Shelikhov's own estimates of the numbers gathered there are variously given at 2,000, 3,000 and 4,000 and he described the refuge as …*a single large rock which was inaccessible from the seaward side because of steep cliffs. This rock was estimated by the Russians to be five sazhen (a.10m) high on one side and more than seven on the other* (Shelikhov 1981:38).

Attempts by the Russians to negotiate a surrender failed. *There was a great number of them there, at least 4,000 people, and despite my assurances they began to shoot at us with bows and arrows* (Shelikhov 1981:39). The Russians then established a shore camp and laid siege to the refuge. Historical accounts of the conflict vary between the accounts of three Russian witnesses. Shelikhov's rather self-serving account appeared in his 1791-93 published memoirs (Shelikhov 1981). Miron Britiukov, an assistant surgeon, gave damaging testimony about Shelikhov's behavior to Billings in 1788 (Britiukov 1981). Pilot and company functionary Gerasim Izmailov (Izmailov 1981) cautiously answered questions about Britiukov's accusations in 1790 (Black 1992; Crowell 1997). In addition we have an oral history from Arsenti Aminak, an elder Alutiiq man, recorded 67 years after the event (Holmberg 1985).

On the night of August 12, the Alutiit defenders attempted a foray of some sort, which resulted in what Shelikhov described as a pitched (but curiously casualty free), hour-long battle in which the Russians barely prevailed (Shelikov 1981:39). Britiukov describes this incident differently: …*one night our sentinels noticed the islanders approaching them in the dark; they shot several times but did not kill any of them and, having met no response from the enemy, disregarded this disturbance* (Britiukov 1981).

At this point the Alutiiq born translator Qaspeq, informed Shelikhov …*that for the past few days the savages had been expecting reinforcements from Kiliuda, Ugashin, Ugatak, Chinigak and many other places in great numbers and after joining forces they intended to attack us from all sides*… (Shelikhov 1981:39). Qaspeq indicated that the Alutiit intended to defeat and enslave the Russians, dividing the spoils. Arsenti Aminak recalled that Qaspeq, (transcribed by Holmberg as 'Kashpak'), …*had many relatives among the inhabitants of this settlement; he implored them to willingly accept the demands of the Russians, since otherwise they would have to suffer the consequences.* (Holmberg 1985:59). Qaspeq was fully aware of what those consequences were likely to be, given his involvement in the Russian attack on the Ugaalgan refuge rock at Unalaska. Now at the Awa'uq refuge, he interpreted Russian demands for hostages and as negotiations collapsed, was threatened by the Alutiit on the rock. The infamously traitorous Qaspeq then *betrayed the, until then, unknown portage across the island to the Russians* (Holmberg 1985:59).

The Awa'uq refuge was connected to the landmass of Sitkalidak Island by a rocky spit which was exposed during low tides. Shelikhov ordered an attack at dawn and his force of 71 Russians charged across the spit but soon were driven back by a barrage of arrows. Shelikhov then opened fire with five 2 ½ pound cannon, generating a mass panic among the Alutiit and enabling the Russians to successfully storm the rock (Shelikhov 1981:39).

Five or six Russians were injured in the storming of Awa'uq. Several others were subsequently rewarded for their roles in the attack with money and special notations in the personnel record book (Anonymous 1981:115; Black 1992:172). Alutiit casualties were disproportionately large,

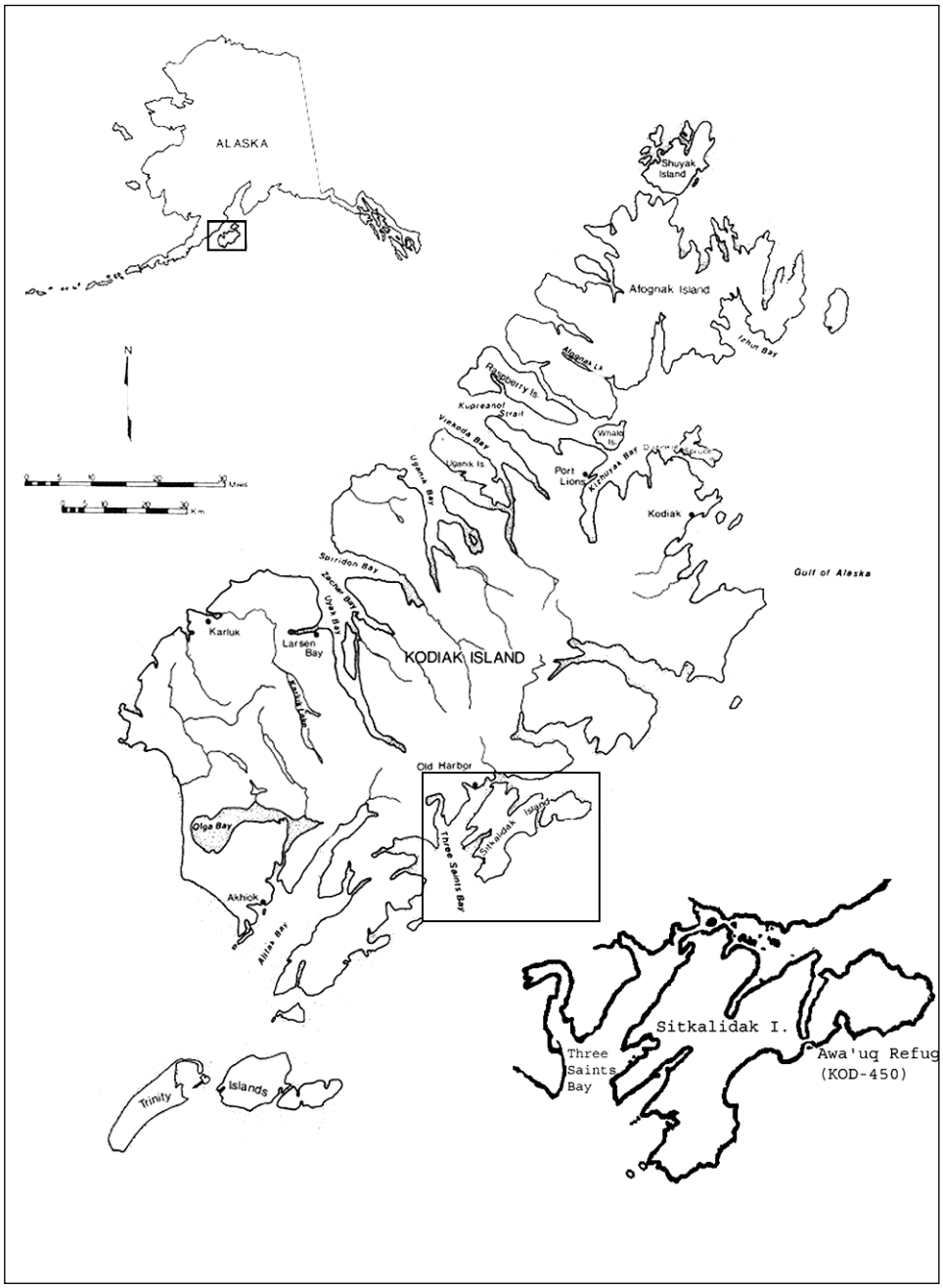


Figure 1. Map of southeast Kodiak Island. Shelikhov's force from Three Saints Bay went around the north side of Sitkalidak and approached the Awa'uq refuge using a hidden pass into Fox Lagoon, revealed to them by a Native informer.

although the historic record again differs on this point. Arsenti Aminak bluntly called it a bloodbath: *Only a few men were able to flee to Aiakhtalik in baidarkas; 300 Koniags were shot by the Russians* (Holmberg 1985:59). Shelikhov evaded the issue of Native deaths, stating that: *Although I had made every effort not to shed blood I cannot believe that we did not kill some of them, I tried to verify this, but in vain, as they carried their dead away with them or threw them into the sea* (Shelikhov 1981:40). Izmailov, when questioned by Sarychev, admitted that: …*about 150 to 200 persons of both sexes were killed by Shelekhov and his Russian laborers but it is believed that many threw themselves from the rock into the water and into baidaras, which we learned about when the sea began to wash the bodies up on shore* (Black 1992:172). Britiukov stated that: *the armed band murdered about 500 of these speechless people; if we count those who ran in fear to their baidarkas and, trying to escape, stampeded and drowned each other, the number will exceed 500* (Britiukov 1981:124).

Afterward the survivors were taken back to Three Saints Bay as hostages, with accounts of their numbers ranging from 1,000 (Shelikhov 1981:40) to 200 (Izmailov 1981), although Black (1992:173) suggests that Izmailov was only referring to adult males. Aminak sums up the aftermath: *When our people revisited the place in the summer the stench of the corpses lying on the shore polluted the air so badly that none could ever stay*

there, and since then the island has remained uninhabited. After this every chief had to surrender his children as hostages; I was saved only by my father's begging and many sea otter pelts (Holmberg 1985:59).

LOCATING THE AWA'UQ SITE

While the events of August 1784 remained a fixture in written and oral histories, the precise location of the Awa'uq refuge site was gradually forgotten. Several refuge islands exist along the coast of Sitkalidak Island, as well as others in the Three Saints Bay area. All of them seemed to be potential candidates. One key descriptor was the enigmatic *secret portage across the island* revealed to the Russians by Qaspeq. Was the *secret portage* a narrow bridge of land? Or did it simply refer to the spit that led to the refuge rock?

In July 1990, geologists Gary Carver, Lou Gilpin, Jim Hinges, along with Knecht, were engaged in a helicopter survey of the east side of Kodiak Island, looking for marine terraces. As the helicopter hovered over Partition Cove, on the south side of Sitkalidak, a refuge island came in view, covered with numerous apparent house pits. At the same time, we had a view of MacDonald's Lagoon, separated from Partition Cove by a narrow spit of land (Figure 1). Two long points obscure the entry of the lagoon from view. Lacking either local knowledge or an aerial view, one would never know that the lagoon could be entered with a boat, or as in Shelikhov's case, with open skin boats loaded with men, arms, and five small cannon. In less time than it takes to tell, the riddle of the secret portage was revealed. We had unwittingly found the likely location of the Awa'uq refuge. Geologists have an endearing willingness to tolerate overexcited archaeologists and were good enough to circle the area so some aerial photographs could be taken.

We now needed to determine the *ground truth* of the site, and see if the depressions we saw on the surface of the islet were in fact genuine house pits. Bill Laughlin was visiting Kodiak and was a long time veteran of fieldwork in the Old Harbor and Sitkalidak Island area (Laughlin and Reeder 1966). In late August 1990, Laughlin and Knecht, along with Kodiak Area Native Association staffers Fred Clark and Joe Kelly, chartered a float plane to Partition Cove, with a pick-up scheduled for later in the day. We arranged to meet Sven Haakanson Jr. at the site, who would arrive by skiff from Old Harbor. As we landed and assembled our gear, we saw that the spit leading to the refuge rock was already covered by the rising tide. The spit was nearly 400 m long, but we found the water still shallow enough to wade to the rock, where we came ashore on a tiny beach in the shadow of a cliff face 9 m high.

We found a coil of old line on the rocks, and Clark volunteered to scale the cliff and lower the rope; so the less nimble among us could climb up. Instinctive mountaineers, we tied the line around Clark's waist so that if he got in trouble during his ascent we could quickly pull him down, dead or alive. Clark nevertheless reached the top without our aid and anchored the line. Bill Laughlin volunteered to go first, and we stood amazed as this 71-year-old image of fitness scrambled up the cliff. He hadn't even bothered to remove the pipe from his mouth. The rest of us eventually followed.

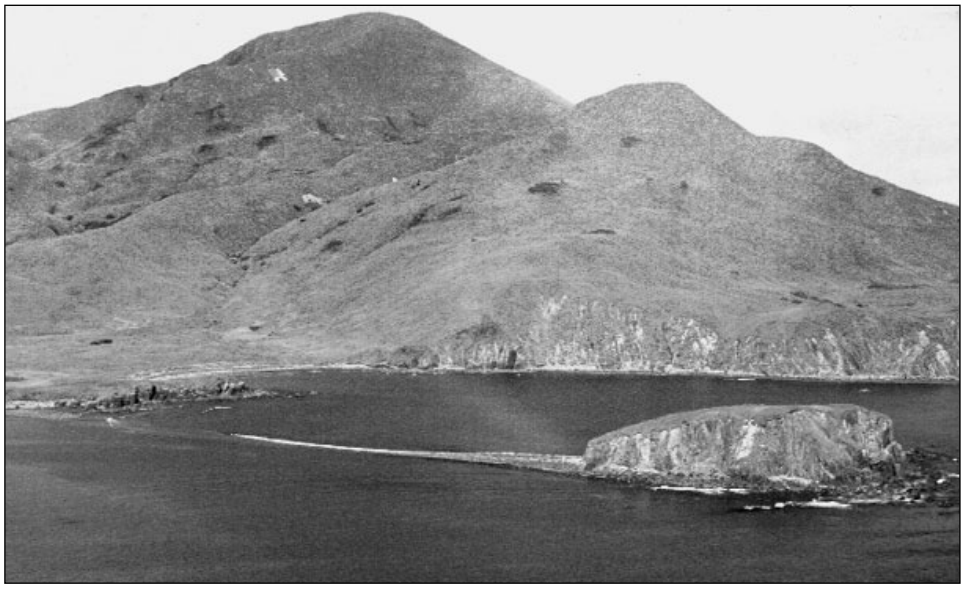


Figure 2. Aerial photo of the Awa'uq refuge. The spit connecting the islet is exposed only at low tide. The Russian position was on the rocky outcrop at the base of the spit.

The top of the rock was covered with knee length grass, tall stalks of wild celery, fireweed and salmonberry. Within a few steps we found a well-defined house pit with the attached side rooms typical of late prehistoric Koniag phase dwellings. Then another, and another, until we had counted 28 house depressions. Patches of exposed midden, hearth rocks, and whalebone supports seemed to be everywhere. Clearly the site had been very densely occupied.

The island refuge was much as the Russians described it. The lowest edge was seven m above the beach, and the highest, southern edge was 26.5 m (Figure 2). The surface of the rock measured about 130 m by 60 m. As we mapped the site and its surroundings we were able to reconstruct the scene of the tragic events of August 1784. The secret portage through MacDonald's lagoon enabled Shelikhov to move large skin boats full of men and arms to within a few hundred meters of where he could block the only land access to the rock (Figure 1). A steep rock outcrop six meters above the beach overlooks the end of the spit, giving the Russians a strategically ideal position from which to maintain a siege.

Although tilted away from the sea and high enough to escape a bombardment by ships, virtually the entire surface of the wedge-shaped rock would be exposed to artillery fire from the Russian position. Small arms fire would only have been effective from about 2/3 of the way down the connecting spit, where only the northern third of the rock surface is exposed to view.

The bulk of the Alutiit by that time, panicked by the cannon fire, probably fled toward the southern half of the island, and were cut off from safe escape. Many may have taken a desperate gamble by trying to climb or jump down the steep 25 m high cliffs and been killed, eventually swept into the sea as both Russian and Alutiiq accounts suggest.

Hoping against all odds to find a Russian cannonball, despite contemporary descriptions of Shelikhov's guns as *stone mortars* (Crowell 1997:56), we ran a metal detector across the site, but quickly gave up after false readings rendered the instrument useless. Surface deposits of fire-cracked rock, evidently rich in iron content, were everywhere. Finally we looked up to find that a thick fog had descended. There would be no plane pick-up today.

Darkness was already falling as we descended the cliff. We stood glumly on our small patch of beach at the foot of the cliff and assessed our situation. It was flood tide, shortly before midnight, and we were marooned without food or alcohol.

We built a small driftwood fire. By some miracle, we found a sealed box of life raft rations among the flotsam on the beach. It contained some white biscuits which we happily cracked our teeth on. We squatted in the firelight against the cliff, looking like an early-man museum diorama. The night wore on and the tide still refused to recede. About 4 a.m. we saw lights on the horizon: fishing boats.

Haakanson realized that he was long overdue at home and that half of the Old Harbor fleet was now looking for him. We reached for our hand held radio and made contact. The F/V Carla Rae C would meet us in MacDonald Lagoon. All we had to do was to get to shore. The spit was now becoming exposed although a hundred meters was still under about two feet of water. Laughlin took his pants off, tied them around his neck, replaced his shoes, and stood in his underwear facing the waves and ready for action.

The large cobbles and boulders of the spit were still wet from the tide and slippery with marine growth. We traveled in a huddle, sharing the beams of the two flashlights we had among us. As we began to wade, a freshening breeze brought waves that splashed us waist high, adding to our misery. We formed a line, gripping each other for mutual support in the surf, and finally made the beach. Then it was a matter of a mile long hike through the darkness and rye grass, following brown bear trails along the shore of MacDonald's Lagoon. Laughlin took a long pull on his pipe. *It's probably best not to frighten the bears,* he said, and put his pants back on. As dawn broke, the F/V Carla Rae C pulled into Old Harbor. We collapsed on our bedrolls in the Old Harbor church house, tired but exultant, for we had found an extraordinary site.

EXCAVATIONS AT THE AWA'UQ REFUGE ROCK

It was 1992 before the authors, along with seven other crew members, were able to undertake test excavations on the site. The logistics of landing and supplying even 10 people for 14 days on the Awa'uq Refuge Rock were daunting despite all of our splendid 20th century equipment and transportation. Our experience with the uneven tidal schedule led us to abandon the idea of a shore based camp. We were landed by the M/V Buccaneer on the rocky shore of the site and managed to haul all 2,600 pounds of supplies and gear up to the top of the island, using the easiest access point which required

a climb of only 5 m using a ladder and natural boulders, then a steep slope that we negotiated with a knotted rope.

Landing our gear and crew on the rock was an exhausting enterprise. We could only begin to fathom what it took to construct the large sod houses, which included lifting driftwood log and whalebone supports. Add to that the hearth stones, banya rock, and rock slabs used in the storage boxes, all of which had to be hoisted somehow to the top of the island. Later we would find that whole whale skulls, mandibles, and other massive bone elements had also been brought in by the builders of this remarkable complex. In a clearing on the highest portion of the island we found a rounded sandstone boulder, nearly a meter in length, lying on the ground surface, which had apparently also been transported here from the surrounding beach.

There was no apparent source of water on the island when we landed, and probably never has been. We found that the nearest source of fresh water was an intermittent stream at the far end of the beach on Partition Cove. The tide exposed the spit for only a few hours each day, and we were forced to carry jerry cans for about one km. Water conservation was a constant concern in our camp. We attempted to collect rainwater from tarps, but found it foul tasting and useful only for washing chores. The Alutiit, at least a thousand strong, had been on the rock for about a week before the Russian attack. It was clear that the shortage of water on the site would have been a major problem, and may in fact have precipitated the midnight foray past the Russian camp with its tragic aftermath. Food and fuel also would have been a major concern for the defenders. It was clear that both were in supply and that the Alutiit had expected to spend some time on the rock. Several patches of weathered and bleached faunal midden were visible on the surface of the site.

A 2 m by 2 m excavation unit revealed very well-preserved faunal midden 10 cm below the ground surface and contained the remains of clam, mussels, sea urchins, chiton, and periwinkle. Most of these littoral resources would have been available at least in limited quantities among the rocks surrounding the island. Seal and porpoise bones were also present, including a complete seal cranium. Curiously absent were bird bones, usually a significant component of Kodiak middens. Large amounts of fire-cracked rock and numbers of ceramic fragments were mixed with the faunal midden.

We mapped 28 individual house depressions, most of which consisted of a square or rectangular central room adjoined by one to five smaller side rooms (Figure 3). They were generally typical Koniag phase houses. However, they seemed to be smaller in overall size by a factor of roughly 1/3. We completed test squares in the main room and side rooms of two houses and excavated one house in its entirety. In the central rooms, we found numerous box-like structures constructed of upright stone slabs, about 30- 40 cm square, and imbedded in the

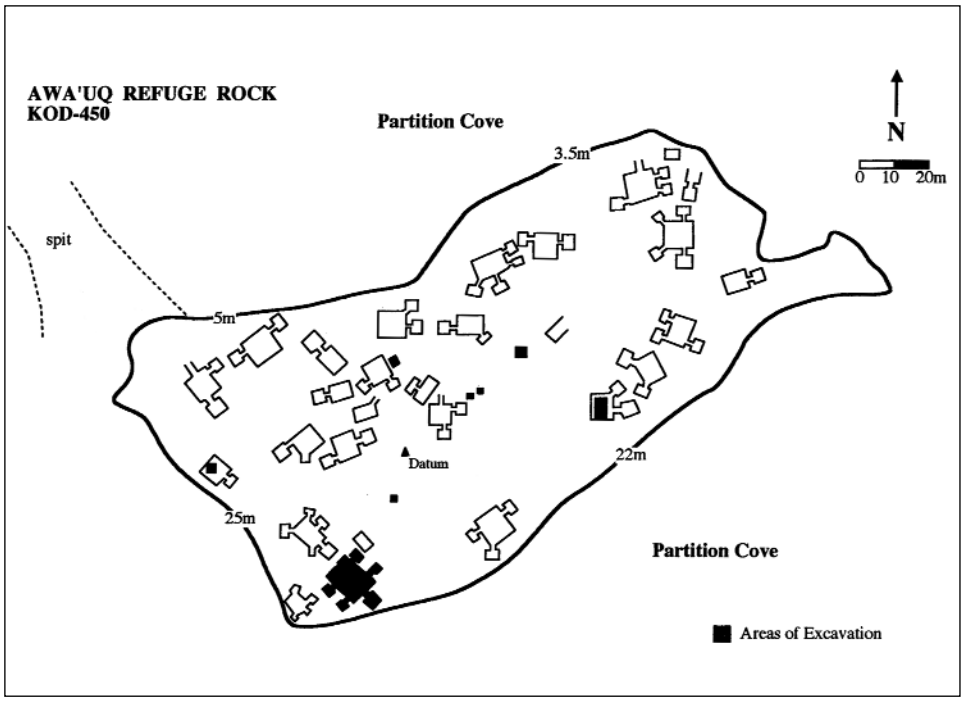
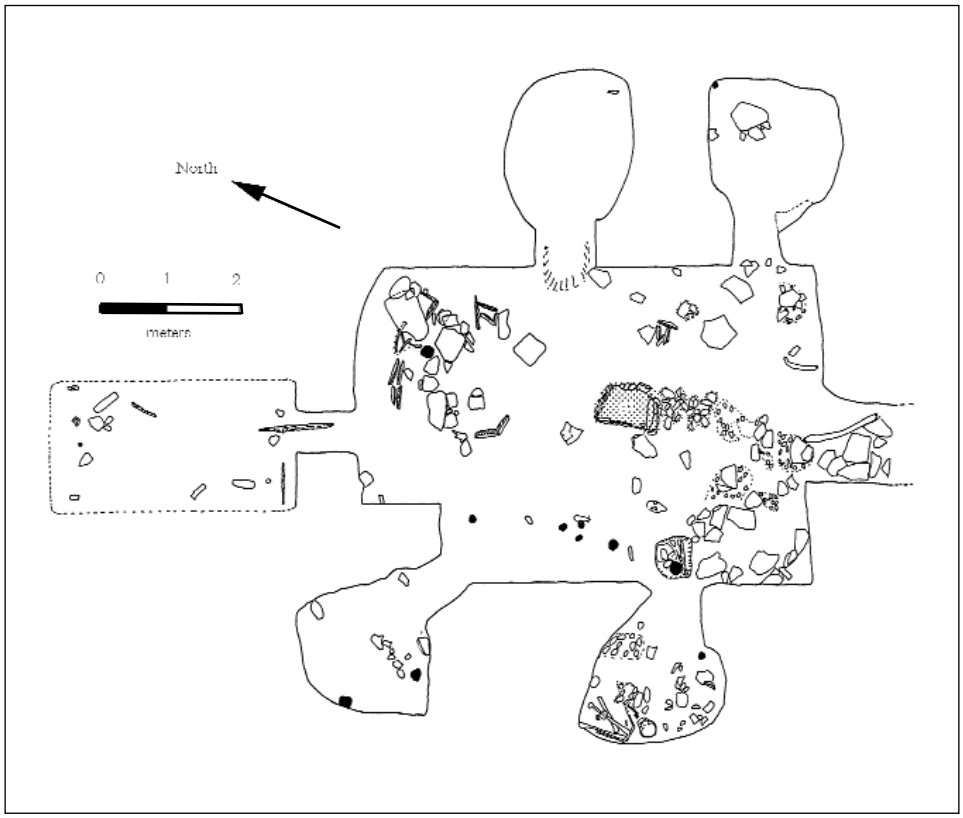


Figure 3. Site map of the Awa'uq Refuge Site (KOD-450). Two house pits were tested and a third house was completely excavated.

Figure 4. Floor plan of Structure 18.



packed floor soils. These appear to have been used for food storage. Clusters of these slab boxes protruded from the ground surface of central rooms in many of the house depressions.

Hearths were found in the typical square stone configurations of the Koniag phase, however, one or more additional, more casually made hearths were found as well. We found this to be the case in all three houses we tested. It appeared as if the defenders had added new hearths, 'doubling up' in effect, to accommodate more occupants than the dwellings were originally designed to hold. Between houses, we found abundant evidence of other hearths, perhaps reflecting additional temporary camps used during the 1784 siege. Virtually every square meter of the surface of the site appears to have been utilized in some fashion. Random tests on the highest portion of the rock revealed an extensive 1784 sheet midden that averaged about 10 cm in thickness. We also found that the rock had been occupied in early prehistoric times with thin bands of charcoal stained soil occurring some 60 cm below the ground surface and only 20 cm above the till.

Of the artifacts on the house floors, the vast majority were related primarily to the cooking and storage of food and the maintenance of weapons. By far the most abundant artifacts were gravel tempered ceramic fragments, representing vessels with a capacity of between 2 to 4 liters. The clustered distribution of the ceramic fragments suggests that the vessels were broken on the house floors, perhaps as the houses were looted following attack. Several clusters of cooking stones were identified. Hones, slate end blades, debitage were also common. A pair of grooved adze heads may have functioned either as tools or weapons. A nicely carved jet game piece, used in the Alutiiq dice game known in historic times as *stopka* was found in one house, along with a stone ball used in the game *yaamak* (Knecht 1995:577, 598). Several centimeters of charred grass and ash were found on the house floors, indicating that the dwellings had been burned, probably by the Russians in the aftermath of the attack.

One nearly complete whale cranium was found when testing one central room. It had originally rested on the roof. Whale elements, mostly craniums and mandibles, were also seen in association with other house pits. While whalebone is a traditional building material used throughout the north, it appears that the whale skull elements at Awa'uq were used as in ideological contexts. Whale skull elements can be seen on the roofs of Alutiiq barabaras in 19th century photographs. It is also possible that the whalebone was left on the site afterward as a form of memorial by the Alutiiq. At least one upright whale mandible was found on the surface where it had fallen some years ago, leaving a rotted

Figure 5. Stone slab storage boxes in the central room of structure 18, near the preserved wood stump of a house post.

bone stump nearby. One test excavation yielded a small cairn-like feature consisting of small boulders and large whale bones. The same excavation yielded a complete stone oil lamp as well as an oil lamp fragment.

EXCAVATION OF STRUCTURE 18

After testing some of the smaller houses, we selected structure 18, the largest house on the site, for complete excavation (Figure 3). This house had a commanding view of the rest of the rock, had the largest floor area, and the greatest number of attached side rooms. At this time, we had not found any artifacts of non-Native origin that could be diagnosed to contact period and/or post-contact periods. We reasoned that structure 18 may have been occupied by members of the highest status kin group on the site, and therefore would present the most favorable odds of finding evidence of early Russian contact.

Structure 18 consisted of a rectangular central room, measuring approximately 10 m by 7 m (Figure 4), four small side rooms roughly 3 m by 3 m, and a larger side room of approximately 3 m by 5 m. The entrance to the dwelling, like most on the site, pointed downhill in the direction of the spit and the Russian camp on Sitkalidak Island. The comings and goings of the Alutiit on the rock would have been easily observed by the Russians, at least during daylight. A large whale mandible was apparently once propped up near the doorway as a support and had subsequently fallen into the entrance. A flat pavement including hefty stone slabs lined the entryway. This is seen as additional evidence of a significant amount of labor expended on the construction of the site.

Features within the central room of the house were numerous and revealing. The hearth, located in the center of the room, had been used to heat a number of hand-sized cobbles, which had been evenly spread out on the floor toward the doorway (Figure 5). According to elder informants, this was routinely done at night as a means of warming the room. This would be consistent with the timing of the early dawn Russian attack, which apparently took place before the morning fire was built. The entire floor of the central room was covered with burned grass and fine gray ash, evidence that the structure, like others at the site, had been fired. Many of the lithic artifacts found on the floor were likewise charred and exhibited pot-lid fractures incurred from the heat of a fire.

Five slab storage boxes were found largely intact (Figure 4). One was found to contain bird egg shell fragments. Heavy flat stone lids were associated with each storage box and had been shoved or thrown aside in each case. It seems likely that the Russians looted the site for all available stored food, especially in light of the hundreds of hostages they were about to transport to their base at Three Saints Bay. Four of the slab storage boxes and lids were clustered in the southwest corner of the main room. The lid on one storage box was still in place, but had been moved aside to expose about half of the box's interior. A pile of small round stones lay on top of the lid, positioned as if they had been placed in a bag of some kind, which had subsequently decayed.

As we cleared the soil we were chagrined to find an articulated pair of leg bones from a child. The femura and tibia were visible from underneath the lid. The remains were poorly preserved, but were clearly in a flexed position. As we gently lifted the lid aside, we were surprised to see that no other skeletal remains from this individual were present. It was a vivid and sobering reminder that the tragic events on the site had reached into the very room we were now excavating. We explain the presence of an incomplete articulated body as evidence of part of the body being removed at a later time for reburial. Because of the proven articulation, this removal of body parts most likely took place shortly after the tragic event: after the body had decomposed, but before all the ligaments holding the leg bones together had disappeared.

Other central room features included a larger sub-floor pit, also a probable storage feature, which was lined with large cobbles. It measured about 70 cm by 70 cm and about 30 cm deep, and was located near the entrance of the northeast side room (Figure 4). It may have been covered with planks, as it lacked an associated slab lid. This feature may also have been in disuse at the time of the attack, for it seemed to have been filled with loose soils and refuse whereas the other storage units were found to be open. Posts and timber elements were well preserved in the house with the stumps of some support posts still in place (Figure 4). As we removed the floor of the central room it became clear that the refuge had been constructed years before Shelikhov's arrival on Kodiak Island. The floor deposits ranged from 10 cm to 15 cm in thickness and clearly represented at least several re-flooring episodes. Remains of a hearth from an earlier occupation of the house was located east and 10 cm below the 1784 hearth feature.

We found that at least two of the side rooms featured shallow cold-trap entryways. A much smaller pit was found beneath a flat slab against a wall of the south east side room, evidently hidden well enough to prevent detection. The cylindrical hole beneath the slab was unfortunately empty. The northeast side room had probably been used for steam bathing, evidenced by a pile of sweat bath rubble against one wall. More human remains were encountered here. With the permission of the Old Harbor Village authorities, these remains were removed for analysis and reburial.

The remains were poorly preserved but were those of an elder adult woman in a face-down flexed position. The back of the cranium appears to have suffered major trauma. Upper and lower incisors appear to have been lost ante mortem with the tooth sockets well healed. This observation could be interpretated as a deliberate removal of some of the incisors while the person was alive but could also be a result of extremely poor dental health. A circular ivory ornament lay under the cranium and may have originally decorated the individual's hair. Only fragmentary ribs and a single vertebra were in evidence, suggesting that this may have been a secondary burial. Unusual surface patterns may suggest the presence of some pathological anomalies. Complete analysis of the remains are still pending.

Figure 6. Central room floor of Structure 18 after excavation.

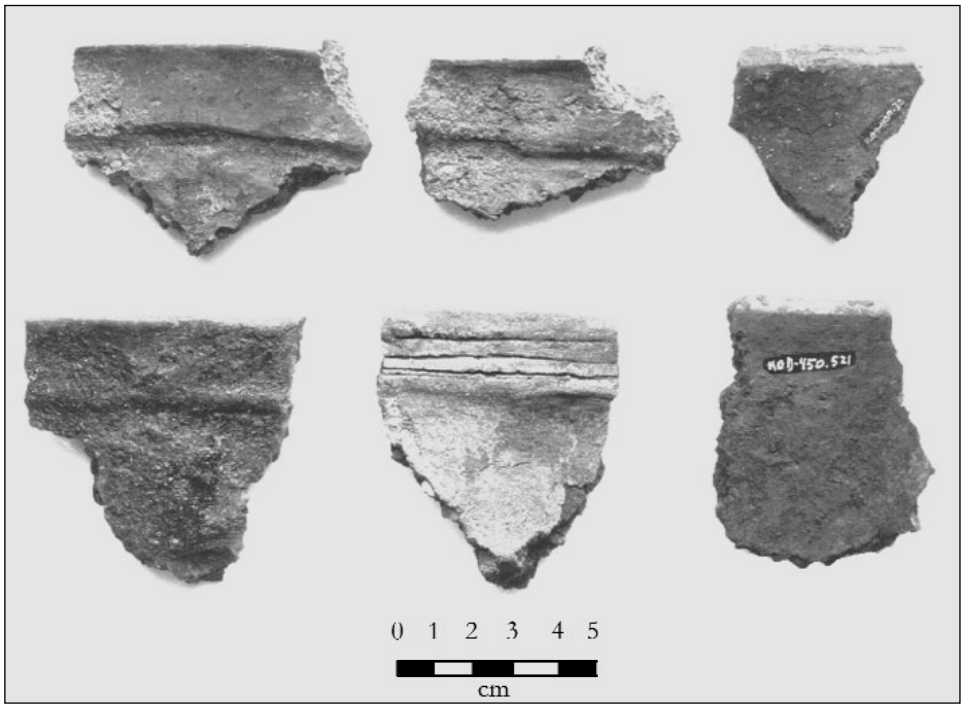


Figure 7. Rim sherds of aboriginal ceramics from Structure 18.

ACTIVITY AREAS IN STRUCTURE 18

Unlike other late Koniag phase houses excavated on Kodiak Island (Knecht and Jordan 1985; Knecht 1995), the distribution of artifacts in structure 18 reflected marked activity areas and possibly even gender divisions. This circumstance may be due to the catastrophic nature of the site's abandonment, which precluded the usual salvage and post-occupational disturbance (Johnson and Wilmerding 2001). It is also possible that new and temporary forms of social organization emerged in response to the crowded siege conditions on the rock. Artifacts usually associated with women's activities, ceramics and ground slate ulu blades, were found to be concentrated on the eastern side of the house. Weaponry, represented by ground slate endblades, on the other hand, were more numerous in the

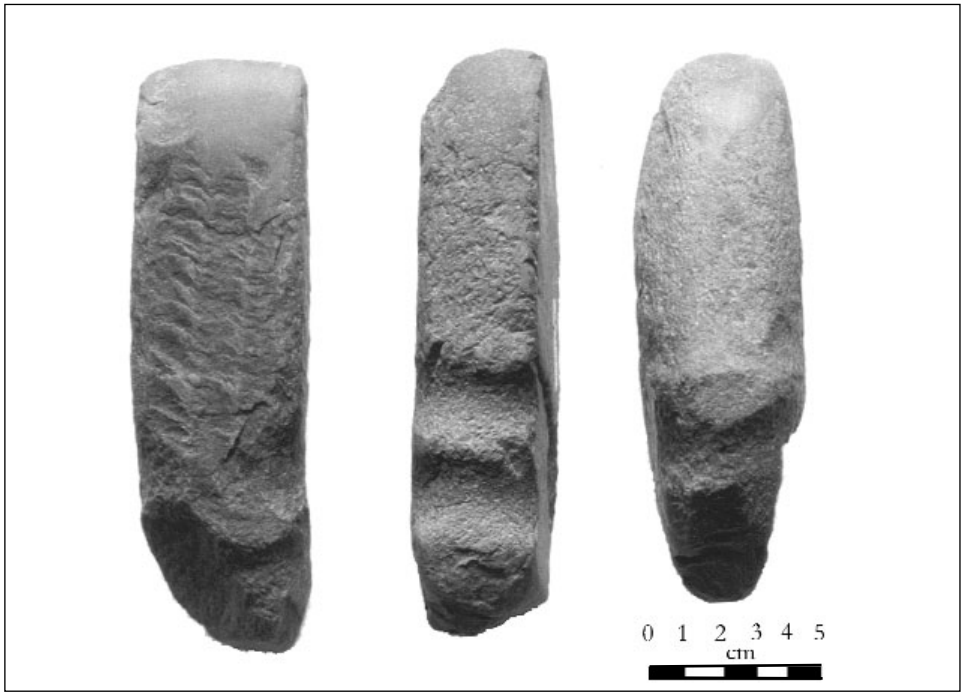


Figure 8. Grooved adze heads from KOD-450.

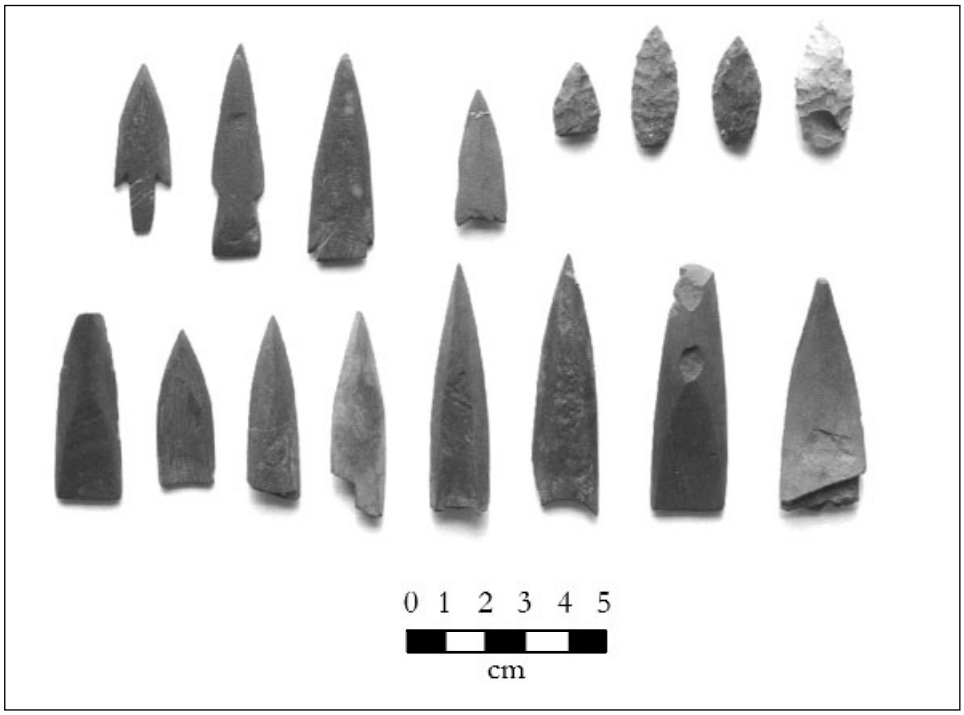


Figure 9. Slate endblades from the south side room of Structure 18.

south side room. Slate points here outnumbered those from the main room and 4 other side rooms by a factor of four. The great majority of samples of ground red ocher and hematite from structure 18 also came from the south side room. By contrast 5 ceramic fragments were found in the south side room as opposed to 341 in the central room. At least some of the clay vessels appear to have been broken where they stood, with the fragments fanned out as if they had been kicked or struck in a violent manner.

ARTIFACTS

A total of 902 artifacts were recovered during the 1992 excavations at the Awa'uq refuge site, 657 of them from structure 18. Biological objects such as bone did not preserve well in the acidic soils. An exception to this was when such objects were found in the faunal middens where sufficient shellfish remains were present to modify the soil chemistry. More than half of the assemblage consisted of ceramic fragments. Gravel tempered pottery is rare or absent in Koniag phase sites on the north and west coast of Kodiak, but relatively common in sites to the south east (Clark 1974). They occur most often in flat bottomed beaker forms, however pointed and knobbed bases are also known. Nearly all ceramics on Kodiak are found encrusted with charred sea mammal fat, suggesting that they were primarily used to reduce fat into oil (Knecht 1995:375). This would be consistent with the distribution of these vessels along coasts where seasonal

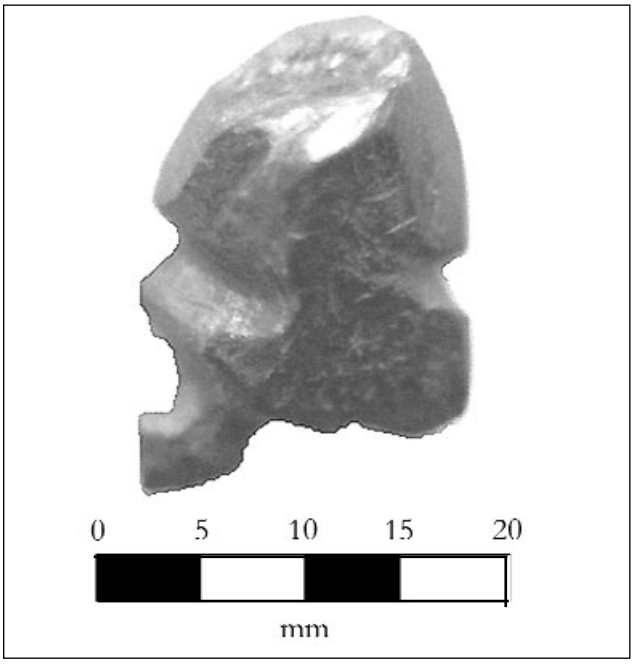


Figure 10. Hematite charm ground into the shape of the Awa'uq Islet.

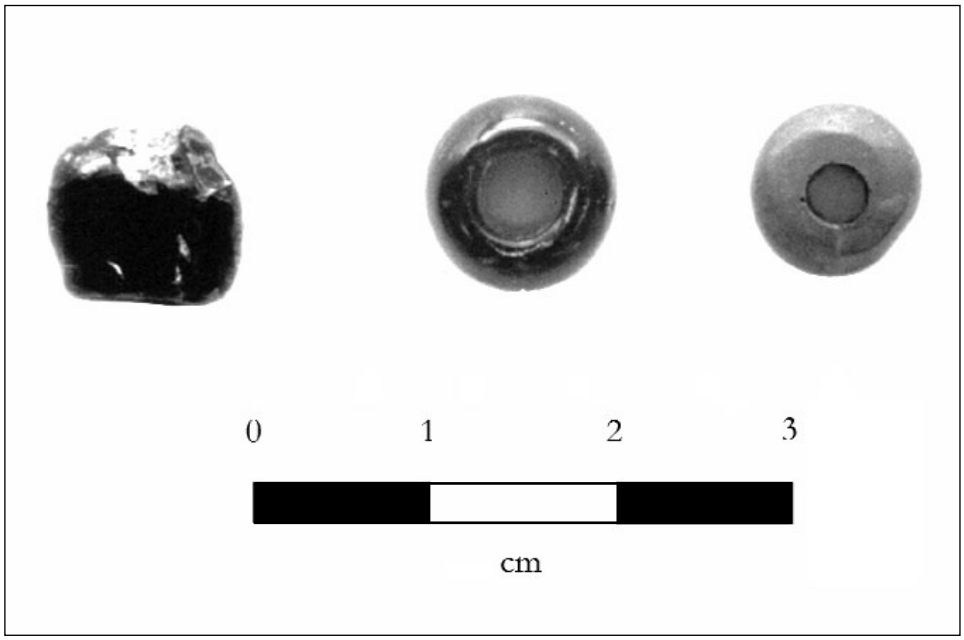


Figure 11. Glass beads found in Structure 18 include three wound beads and a small drawn bead.

sea mammal migrations occur just offshore. The ceramic vessels present on the Awa'uq refuge may have been used to store water. Rims on the vessels from Awa'uq were mostly undecorated, but a few had incised annular rings (Figure 7).

Routine cooking was done by stone boiling in wooden tubs during the Koniag phase (Knecht 1995). Cooking stones, round cobbles smaller than a hens egg, were found in clusters on house floors, in the faunal midden, and in hearth features. They appear to be too small to have functioned effectively as defensive ammunition, unless in a sling at very close range. Ground slate ulu blades were found in plain backed and perforated forms, typical for the Koniag phase. The stone oil lamps were fairly small, with no sign of the typically massive Koniag phase forms, which of course would have been difficult to transport. The only artifacts directly related to routine subsistence were three grooved cobbles, usually employed in offshore fishing, however, when tied on a stout thong, also useable as a club. Three splitting adzes would also have a potential duel purpose (Figure 8). Planing adzes were represented only by fragments, perhaps associated with the original construction of the houses on the site.

It was clear that weapons were being prepared by the Alutiit while they were under siege. Ground slate endblades as well as larger slate lance points were found in various stages of completion, many showing signs of fire damage (Figure 9). Fine grained hones along with pumice abraders were also common. Slate debitage was relatively rare when compared to other occupation sites, suggesting that primary manufacture of slate preforms had been done elsewhere. Burnishing stones were also present in quantity, used in the manufacture and maintenance of yew wood bows (Knecht 1995:).

Artifacts associated with personal adornment included a slate labret, which may be a preform. Crumbs of red ocher and a palm sized grinding pallet were recovered as well as powdered and ground fragments of silvery hematite. One piece of hematite was ground into the shape of the refuge rock itself, with all the various topographical features accurately rendered (Figure 10). It may have functioned as a charm. Similar stone miniatures of geographic features are known from elsewhere in the Eskimo world.

EVIDENCE OF RUSSIAN CONTACT

After the excavation, archival evidence emerged in the form of a 1784 chart by Bocarov and Izmailov, that denotes Partition Cove with the name *Razbitoi Kekur* from the Russian word for large rock, *kekur,* and *razbivat,* defined as *to break, crush, or defeat* (Crowell 1997:46). Four glass beads were found in both side and main rooms of structure 18 (Figures 4 and 11). Three are of the wound variety, roughly the size of a pea. Wound beads predominate only in the earliest historic sites in Alaska, and were manufactured variously in Asia and Russia (Crowell 1997:175-6). A brown and blue wound bead were crudely made, with an additional blue bead exhibiting significant wear facets on one end, indicating that it had been strung and in circulation for some time. This bead may have been obtained either through

earlier Russian visits to the island or regional indigenous trade. A single blue drawn bead is identical to examples recovered at Three Saints Bay, where it was the most abundant single bead type (Crowell 1997:165). It is possible that at least some of these beads represent gifts offered by the Russians during the negotiations preceding the attack. Three irregular lumps of corroded iron were also recovered. Iron obtained from driftwood was also used during pre-contact times on Kodiak but is very rarely found archaeologically. These artifacts are all consistent with the late 18th century context of the site.

EARLIER OCCUPATIONS AT THE SITE

Three chipped stone points are highly unusual in a Koniag phase context (figure 9). We at first attributed these to the possible presence of Unangan/Aleuts that might have participated in the attack along with the Russian contingent. Later, however, we found other atypical artifacts such as red chert debitage and tiny chert endscrapers, most associated with the deep storage pit in the central room of structure 18, which in fact had penetrated well below the Koniag phase floor levels into an earlier component of the site. We had also seen evidence for an early prehistoric component in the form of charcoal stains in the wall of a deep test pit. The chipped stone assemblage is small but distinctive and, we believe, to be associated with an Arctic Small Tool Tradition occupation of the site sometime between 3,000 BP and 4,000 BP.

Unfortunately, C-14 data to support this was not collected. ASTt sites have subsequently been reported from the Cook Inlet area (Workman and Zollars 1996).

CONCLUSIONS

The archaeological record that we were able to sample both supports and supplements the archival evidence and oral history concerning the events of August 1784. First, it seems clear that given the dense occupation of the houses on the rock as well as the spaces in between the structures, that there could easily have been between 1,000 and 2,000 Alutiit on the rock. Shelikhov's figure of 4,000, as Black (1992) has suggested was probably significantly inflated. It is also clear that the Alutiit were far from helpless refugees passively awaiting their fate. They were in fact very well armed at least in terms of indigenous weaponry. They were determined to defend themselves, but the terror induced by cannon fire among a people who very seldom even hear a noise as loud as thunder won the day. Although five guns and a skilled crew can sustain a continuous fire, it was unlikely that very many shots were needed to drive the defenders back from the handful of scaling points on the north edge of the rock.

The human remains found in structure 18 strongly suggest that Shelikhov was lying when he claimed to be uncertain about deaths among Alutiit. Bodies of the dead were probably everywhere following the attack. Again, it may not have taken a concerted attack by the Russians to cause lethal results. It was easy to see how a human stampede away from the Russian attackers toward the high cliffs along the southern edge of the site could have disastrous consequences. Fatalities, many hundreds of them, seem not only likely but may have even been unavoidable once the attack had begun. This does not excuse the actions of Grigorii Shelikhov, which by any standard constituted a needless atrocity. Two hundred years of time and cultural distance did little to erase the sense of grief and outrage we felt at seeing a child's skeleton on a house floor. One cannot make the case that this destruction was not premeditated, for the Russians and their Unangan/Aleut employees were certainly aware of the attack 20 years earlier at the Ugaalgan refuge in Unalaska, in which the interpreter Qaspeq had played a role. Izmailov had formerly been in charge of the Unalaska post, where he met Captain James Cook and his officers when he anchored there in 1778. Izmailov had regaled the English with tales of violent conflicts with Aleuts, showing them scars left by arrow wounds. According to one writer: *The Russians have been obliged to use harsh methods to bring the Natives of Unalaska and the other islands about into subjection…* (Samwell 1967:1149).

Depending on the tidal cycle, the spit connecting the Awa'uq site is exposed at best for only a few hours each day. Securing the rock, rounding up survivors as hostages, gathering up stored food from the houses and then firing them must have consumed a considerable portion of the day. It seems likely that they would have had to await a new low tide in order to return, or perhaps they chose to wade through the icy water. All accounts agree that several hundred survivors were taken to Three Saints Bay and that a number of male prisoners were executed (Black 1992).

It seems certain that the Alutiiq returned to the rock later to bury and memorialize the dead. The forensic evidence suggests that the child's skeleton may have been removed and reburied, with the

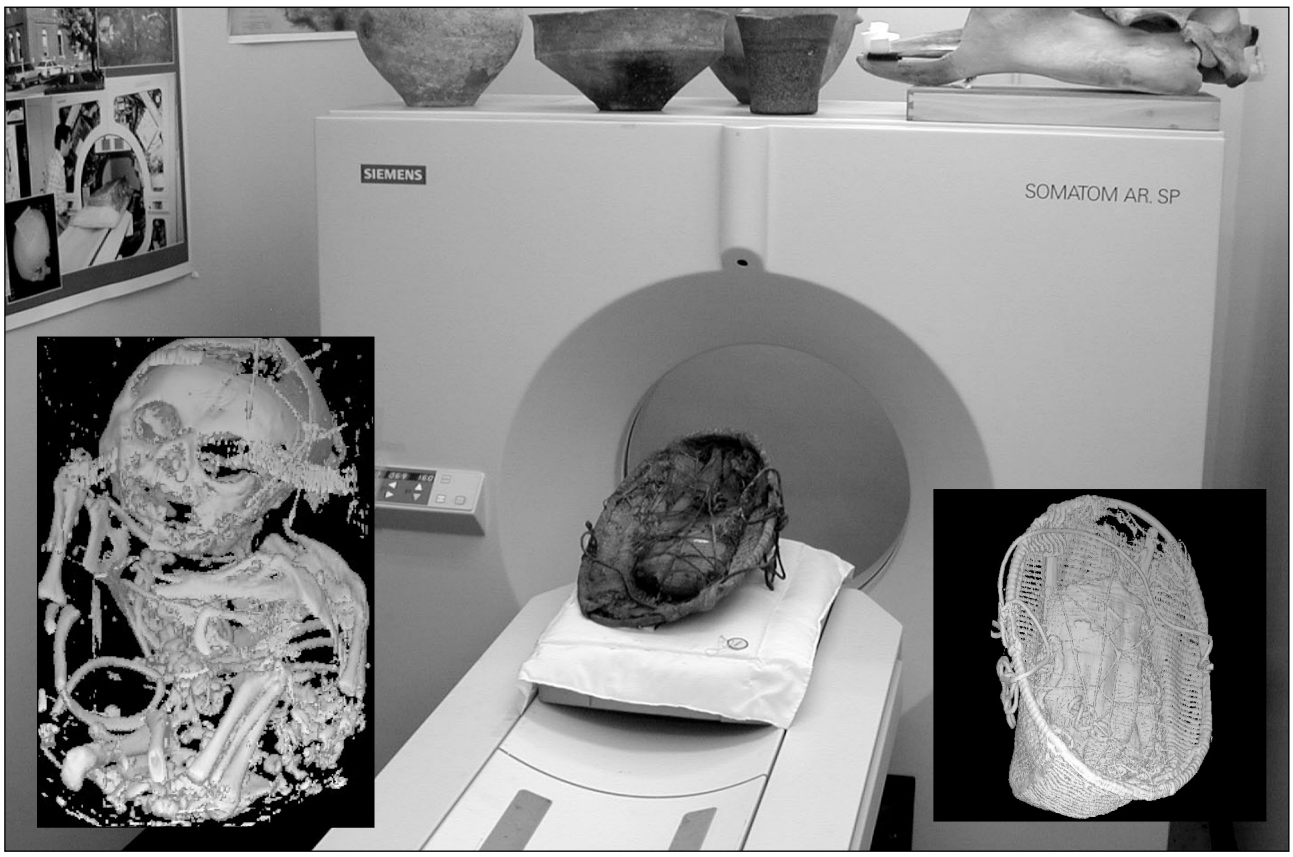
limbs remaining behind, recalling Arsenti Aminak's recollection that the site was revisited during the summer (Holmberg 1985:59). Based on the disarticulated nature of the remains, this likely would have been the summer of 1785. This may also have been the time when the whalebone and boulder cairn feature was constructed, along with other whale mandibles, which may have been left as uprights. The large boulder may also have been a memorial. A test nearby found that at least the top 75 cm of soil near the boulder had been disturbed at some point, suggesting a mass grave, however we chose not to excavate this area any further.

The events at the Awa'uq refuge rock broke the back of Alutiiq resistance and the Russians were able to establish a permanent base on Kodiak Island. It is difficult to imagine what was going through the minds of the Alutiiq hostages as they were taken back to Three Saints Bay. Two weeks before, most of them had probably never seen a European; now they were prisoners in their own land. What they felt at the time is perhaps best summarized by the traditional place name for the spot, Awa'uq, which means *to become numb*. Today the Awa'uq refuge rock site seldom fails to move visitors. It stands as a powerful reminder of the speed of historic change as well as the Alutiiq's enduring will to survive.

ACKNOWLEDGEMENTS

Thanks are due to the people of Old Harbor and the Old Harbor Native Corporation for financial, logistical, and moral support for this project. Support was also provided by the Kodiak Area Native Association. Thanks to Mary Haakanson of Old Harbor for remembering and translating the traditional place name of *Awa'uq*. Our fellow crew members were Daniel 'Putter' Brown, Gary Carver, Lou Gilpin, Roger Gonzales, Louise Jackson, Ellana Tousaignant, and Milo Williams. The authors appreciate the generous editorial support provided by Bruno Frohlich. The authors would also like to thank their lucky stars for the opportunity to work alongside Bill Laughlin on Kodiak Island and the Aleutians. He truly was the last of the rogue gentleman scholars.

Computed Tomography (CT) is used at the Smithsonian Institution to study external and internal surfaces of objetcs. Such studies are nondestructive and noninvasive. Mummy bundle from the Kagamil Warm Cave is being studied (below). Inserts show reconstruction of external surfaces (right) and human remains (left). Photos by Bruno Frohlich.



REFERENCES

Black, Lydia
1992 The Russian Conquest of Kodiak. **Anthropological Papers of the University of Alaska** 24(1-2).

Britiukov, M
1981 [1789] Confidential report of Acting Governor-General of Irkutsk and Kolyvan, Ivan Peel, to the Ruling Senate, #1210. In: **Shelikhov, Voyage to America**; 1783-86, Limestone Press.

Clark, Donald W
1974 Koniag Prehistory. Tubinger Monographien zur Urgeschichte. Kohlhammer, Stuttgart.
1985 Archaeological Test at the Russian Three Saints Bay Colony. **Historical Archaeology** 19(2):114-121.
1997 Research at Three Saints Harbor in 1962. In: Crowell, Archaeology and the Capitalist World System. Plenum Press.

Crowell, Aron L
1995 World System Archaeology at Three Saints Harbor, An Eighteenth Century Russian Fur Trade Site on Kodiak Island, Alaska. Ph.D dissertation, University of California, Berkeley. University Microfilms, Ann Arbor.
1997 Archaeology and the Capitalist World System; A Study from Russian America. Plenum Press.

Holmberg, Heinrich Johan
1985 Holmberg's Ethnographic Sketches. Fritz Jaensch, translator, Marvin Falk, ed. University of Alaska Press. Fairbanks.

Izmailov, GI
1981 [1790] Complaints Made by Natives of the Unalaska District to Government Inspectors in 1789-1790, Report 3. In **Shelikhov, Voyage to America**; 1783-86, Limestone Press.

Johnson LL & Wilmerding EG
2001 Bringing the House Down; Modeling Construction and Deconstruction of Aleut Semi-subterranean Houses. In: **Archaeology in the Aleut Zone of Alaska**. Don Dumond, ed. University of Oregon Anthropological Papers 58. Eugene.

Knecht, RA
2001 Archaeological Surveys of Unalaska Island, 1998-2000. Report on file at **Alaska Office of History and Archaeology**, Anchorage.
1995 The Late Prehistory of the Alutiiq People: Culture Change on the Kodiak Archipelago from 1200-1750 A.D. Ph.D. Dissertation, Bryn Mawr College. University Microfilms, Ann Arbor.

Knecht RA & Jordan RH
1985 Nunakakhnak: An Historic Period Koniag Village in Karluk, Kodiak Island, Alaska. **Arctic Anthropology** 22(2):17-35.

Laughlin WS & Reeder WG (eds)
1966 Studies in Aleutian-Kodiak Prehistory, Ecology, and Anthropology. **Arctic Anthropology** 3(2):1-240.

Moss ML & Erlandson JM
1992 Forts, Refuge Rocks, and Defensive Sites: The Antiquity of Warfare along the North Pacific Coast of America. **Arctic Anthropology** 29(2):73-90.

Samwell, David
1967 Journal. In: **The Journals of Captain James Cook on his Voyages of Discovery**. Edited by J.C. Beaglehole. Cambridge University Press.

Shelikhov, GI
1981 A Voyage to America, 1783-1786 (orig. 1791). Marina Ramsay, translator, Richard Pierce, ed. Limestone Press.

Veniaminov, Ivan
1984 Notes on the Islands of the Unalashka District (orig. 1840). Translated by Lydia Black and R.H. Geoghegan. Edited by Richard Pierce. Limestone Press.

Workman William & Zollars P
1996 The Southward Dispersal of the Arctic Small Tool Tradition: Dates and Data from the Kenai Peninsula, Southcentral Alaska. Paper delivered at the **Alaska Anthropological Association,** Anchorage.

Isa Fjord (bay), Southwest Greenland. Photo by Bruno Frohlich.

MARITIME ARCHAEOLOGICAL AND HISTORICAL SOCIETY

MAHSNEWS

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Maritime Law and Historic Preservation — A Brief Review

By David P. Howe

Several recent court cases have addressed the conflict between the preservation of historic wrecks and the traditional maritime laws of salvage and finds. This article will briefly review the law and discuss those cases.

Salvage

If property is lost or in peril at sea, salvage law generally applies. In a nutshell, "salvage" means that if I save your property from peril at sea and return it to you, you owe me a reward for saving it. For recovery to be salvage, the property must be in peril at sea and the salvor's efforts must be voluntary and must contribute toward saving the property for the owner.

The amount of a salvage reward depends on a number of things. Under ancient Roman law, the reward for recovering sunken property was one-fourth to one-half the property value, depending on the depth where it sank. American courts consider a list of factors announced by the Supreme Court in a case called *The Blackwall*, including the speed, skill, and energy of the salvor, the value of the property the salvor used in the effort, the risks the salvor ran, the value of the salvaged property, the degree of peril to that property, and success. Later cases prioritized those factors. The 1989 London Salvage Convention added pollution prevention to the menu.

Salvage rewards are deliberately liberal to encourage mariners to try to rescue imperiled property (typically a ship or cargo) and return it to its lawful owner or the stream of commerce, thereby avoiding or reducing collateral problems such as the obstruction to navigation and pollution caused by wrecks. These are noble goals,

In a nutshell, "salvage" means that if I save your property from peril at sea and return it to you, you owe me a reward for saving it.... Salvage law promotes the unscientific destruction of historic wrecks and the permanent loss of the archeological evidence they contain by rewarding the economically efficient recovery of commercially valuable objects.

but they have not included the need to protect historic wrecks or to examine such wrecks scientifically. Salvage law promotes the unscientific destruction of historic wrecks and the permanent loss of the archeological evidence they contain by rewarding the economically efficient recovery of commercially valuable objects.

Salvage rewards encourage mariners to try to rescue imperiled property, but if those efforts fail the salvor gets

(Maritime Law, continued on page 3)

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Notes from the Prez—Dave Howe

2000 has been a very productive year for MAHS. We had 66 students (a record number!) in the Basic Course: 30 live and 36 by videotape. Of those who took the course by videotape, 14 did so through the Delaware Maritime Archaeological Society, 10 in Curaçao, and 12 directly from MAHS. In addition, 27 Basic Course graduates took the Field School: 15 at Betterton, Maryland, where they investigated an unidentified wreck in the Sassafras River, one in Florida as part of the Field School video shoot, and 11 in Curaçao.

The Field School Video will soon be finished, rounding out the video series. Underwater footage was shot in Florida, and Steve Anthony and Accent Media are editing the final tape. Congratulations and thanks to Steve for his unremitting efforts to make the video series a reality.

One more Field School may be offered in the fall in connection with a local project. MAHS teams have been to Curaçao twice this year, and another trip is planned for the fall. Jim Smailes will take a team back to Bermuda in September. MAHS members will also help the Maryland Historical Trust in its Head of the Bay Project, investigating seventeenth to nineteenth century sites in the Elk River.

Hot news from the Halls of Justice: the Court of Appeals for the Fourth Circuit ruled that both *Juno* and *La Galga*, the two Spanish Navy frigates off Assateague, are still the property of Spain and are not up for grabs by Virginia or its licensee, Sea Hunt. Kudos to MAHS adviser Jim Goold and his colleagues at Covington & Burling! The decision does not make new law, it but reaffirms and reapplies the principles of prior cases recognizing that sovereign title to a sunken ship does not die merely from the passage of time.

It is often frustrating to clients and attorneys alike that vindicating clear legal rights can be such a difficult, lengthy, and costly process. Sometimes things do come out right in the end, but remember the curse: "May you have a lawsuit where you're right." If you're lucky, with great expense and effort you just might break even and get what you're entitled to. It is particularly puzzling in this case that the federal government was unable to use established legal procedures to assist Spain, which had to retain private counsel to win the case in court. Have we "privatized" foreign relations as well as the protection of historic ships? In any event, Spain's title to both frigates is confirmed, and the legal principles logically extend to hundreds of other sunken ships, aircraft, and cargoes of all

(Prez Notes, continued on page 14)

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(Maritime Law, continued from page 1)

nothing – "no cure, no pay." If the salvaged property has little value the reward might not even cover the salvor's expenses. The salvor's claim for a reward is only against the property *in rem*, that is, against the ship herself, not against her owner *in personam* unless the owner agreed to pay the salvor regardless of success. When a federal court has admiralty jurisdiction *in rem* it can decide the rights of everyone in the world in the ship, even those who do not know the ship is in dispute. Jurisdiction *in rem* requires that the ship be arrested under admiralty process. Mariners have an affirmative moral and legal duty to try to save the lives of those in peril on the sea, so there usually is no financial reward for life salvage.

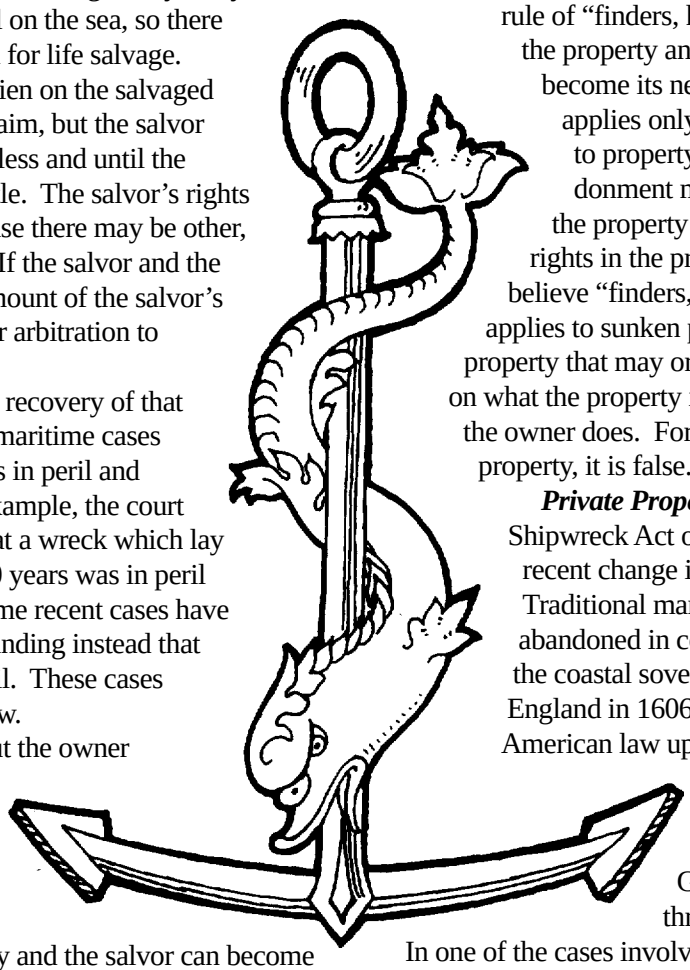
A salvor has a maritime lien on the salvaged property as security for his claim, but the salvor does not own the property unless and until the owner or a court gives him title. The salvor's rights may not be paramount, because there may be other, higher liens on the property. If the salvor and the owner cannot agree on the amount of the salvor's reward they can go to court or arbitration to resolve that dispute.

If property is not in peril, recovery of that property is not salvage. Old maritime cases held that sunken property was in peril and recovery was salvage. For example, the court in *The Espiritu Santu* held that a wreck which lay in the Gulf of Mexico for 400 years was in peril for salvage purposes. But some recent cases have rejected the traditional rule, finding instead that historic wrecks are not in peril. These cases include *Klein*, discussed below.

If property is salvaged but the owner declines the benefits of salvage, in effect telling the salvor that he does not want the property and will not pay for its recovery, the owner thereby abandons the property and the salvor can become the new owner. The owner loses the property but avoids liability for salvage. This does not mean that the salvor automatically has title free and clear – there may be other liens or court costs.

A property owner can control, limit, or even prohibit salvage. This is one way the federal Government can protect its historic wrecks, such as U.S.S. *Monitor*, from unwanted interference under the guise of salvage. The removal of artifacts from a Government wreck can be prosecuted like any other theft of Government property.

Courts have begun to consider the degree of archeological care taken by the salvor as an additional factor in a salvage reward. These cases include *The Andrea Doria*, *MDM Salvage*, and *The Espiritu Santo*. That is good news. The bad news is that courts do not hold salvors to the high scientific standards that good archeology requires. And, strictly speaking, factors for determining a salvage reward do not apply to an abandoned wreck governed by the law of finds. Because salvage and finds are mutually exclusive and a salvor cannot always predict which law the court will apply, lawsuits against sunken wrecks often include both types of claims.



Finds

If the owner abandons property at sea, the law of finds traditionally applies. This is simply the school-yard rule of "finders, keepers" – whoever finds the property and takes control over it can become its new owner. The law of finds applies only to abandoned property, not to property that is still owned. Abandonment means the lawful owner of the property voluntarily gave up all rights in the property. Many divers believe "finders, keepers" automatically applies to sunken property. For private property that may or may not be true, depending on what the property is, where it lies, and what the owner does. For national government property, it is false.

Private Property: The Abandoned Shipwreck Act of 1987 [ASA] is the biggest recent change in this area of the law. Traditional maritime law held that wrecks abandoned in coastal waters belonged to the coastal sovereign. This was the law in England in 1606 and was received into American law upon Independence. The coastal sovereign for these purposes is the state government, not the federal Government, at least within three nautical miles of shore.

In one of the cases involving Mel Fisher and the *Nuestra Senora de Atocha* the court held that the federal Government might have the legal power to claim all submerged wrecks along the coast, but the existing statutes (the Submerged Lands Act, the Outer Continental Shelf Lands Act, and the Antiquities Act of 1906) did not amount to such a claim.

Under ASA the federal Government took title to all wrecks which are abandoned, *and* within three miles of the U.S. coast, *and either* (a) embedded in the sea bed or coral formations or (b) "historic," that is, eligible for inclusion in the National Register of Historic Places under the National Historic Preservation Act of 1966 [NHPA]. The Government then transferred that title to the coastal

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states with guidelines on how to manage the wrecks. ASA also provides that the laws of salvage and finds shall not apply to such wrecks. After ASA was passed, many states developed active programs in underwater archeology for the management of historic wrecks. Unfortunately, a few states have lagged.

ASA only applies to abandoned wrecks, but it does not define abandonment. The traditional test for abandonment is that the owner must have left the property *sine spe recuperandi* (without hope of recovery) and *sin animus revertendi* (without an intention to return to it). Abandonment can be express, where the owner clearly announces an intention to abandon the wreck, or it can be inferred from a number of factors. The passage of time since the ship was lost is one factor, but it is not enough by itself to mean the wreck is abandoned. If the owner could have found and recovered the property but chose not to, a court can infer abandonment. For example, the *Captain Lawrence* sank in 1933 in 60 feet of water near shore in the Great Lakes. The court held that her owners could have salvaged her, and the fact that they never tried indicated that they had abandoned her.

By contrast, the *Central America* sank in 1857 in 8,000 feet of water off the Carolinas, and was found in the 1980s. The District Court held that the owners had abandoned her, and she belonged to the finder. The Court of Appeals reversed, holding that she was not abandoned. The court reasoned that her owners or underwriters (who became her owners when they paid for the loss) could not possibly have found her when she sank, so the fact that they never looked did not imply abandonment. The law of finds therefore did not apply, and the case was remanded to the District Court to decide on an appropriate reward for the salvor. The court gave the salvor 90 percent of the silver, and all the gold.

Under traditional law, lost treasure embedded in land belongs to the landowner, not to the finder. (This rule seems to have arisen in England when landowners wrote the laws.) In one case, Doctor Klein, a sport diver, recovered a sword and other artifacts from an old wreck — probably H.M.S. *Fowey*, built 1744, wrecked 1748 — in Key Biscayne National Park, and sued for title and/or salvage. Florida had ceded the submerged lands to the United States for an underwater park. Regarding title, the court held that the Government owned all wrecks embedded in the submerged lands in the park, and the artifacts were not abandoned and not subject to the law of finds. As to salvage, the court held that the Government could prohibit the recovery of artifacts from those wrecks, and the artifacts were not in peril even though they were submerged. In *The Nashville* the court held that the wreck of a Confederate privateer embedded in a river in Georgia belonged to the state as owner of the riverbed. Divers who found the wreck had no title to the recovered objects.

Government Property: Under federal law, U.S. Government property can be abandoned only by an express act of competent authority complying with federal statutes. This applies to Navy ships and aircraft lost at sea. In *The U.S.S. Hatteras* case a U.S. Navy gunboat was sunk off Galveston in 1863 by C.S.S. *Alabama*. In 1976 a salvage company found the wreck and asked the Navy to allow them to salvage it. The Secretary of the Navy wrote them a letter to say "the Department of the Navy has in fact long since abandoned such vessel." The salvors recovered some artifacts. When the Government demanded them back, the salvors sued for title or a salvage reward. The court held that the Secretary's abandonment was ineffective because it did not comply with the Federal Property and Administrative Services Act of 1949. Therefore the ship and artifacts were Government property. The court also held the salvors were not entitled to a salvage reward because they did not sue for salvage within two years after the artifacts were recovered. For salvage claims, the "statute of limitations" – the time when a lawsuit can be brought – is two years under the Salvage Act of 1910.

> If the owner abandons property at sea, the law of finds traditionally applies. This is simply the schoolyard rule of "finders, keepers".... Many divers believe "finders, keepers" automatically applies to sunken property. For private property that may or may not be true, depending on what the property is, where it lies, and what the owner does. For national government property, it is false.

A year after she sank the *Hatteras*, C.S.S. *Alabama* was sunk by U.S.S. *Kearsarge* off Cherbourg, France. The *Alabama's* bell allegedly was recovered in 1936 by a commercial diver who traded it to a pub on the isle of Guernsey for bragging and drinking rights. The Germans occupied the island in World War II, and the Royal Air Force bombed the pub. The bell was exhumed from the rubble, and in 1979 was sold to an American antique dealer. He offered to sell it to the Naval Academy. They declined. He put it up for auction. The federal Government sued for the bell. The courts held the bell was Confederate government property when the *Alabama* sank, the federal Government had succeeded to title to all Confederate property, the bell had not been abandoned, and the bell therefore was U.S. Government property. As in the *U.S.S. Hatteras* case, the antique dealer was not entitled to a salvage reward because he did not sue within

two years after the bell was recovered (43 years before he bought it). The bell is now in the Navy Museum at the Washington Navy Yard.

In a lawsuit now pending in Florida, treasure hunters located a Navy aircraft off Miami. The aircraft is believed to be a TBD Douglas Devastator that fought in the Battle of the Coral Sea and the Battle of Midway. A private aircraft museum bought the coordinates, recovered a few parts as jurisdictional talismans, and sued the aircraft *in rem* for title or salvage. The federal Government intervened and claimed the aircraft. The District Court went against prior cases, and held that the Government had abandoned the aircraft and the museum was entitled to raise it. The Government has appealed that decision.

In the same way that the federal Government retains title to its sunken ships and aircraft, it recognizes claims of friendly foreign sovereign governments to continued ownership of their ships and aircraft. In 1997 Virginia issued permits to a company called Sea Hunt, Inc., to locate and excavate the wrecks of the Spanish navy frigates *La Galga*, which wrecked on Assateague Island in 1750, and *Juno*, which foundered off the island in 1802. Under the permits Virginia would take its pick (up to 25 percent) of the artifacts that Sea Hunt recovered from the wrecks. MAHS informed the Spanish Embassy about the permits and recommended that Spain assert sovereign title to the ships. The State Department supported the Spanish claim as a matter of foreign relations. Sea Hunt sued the wrecks *in rem* in the U.S. District Court at Norfolk, Virginia. On April 27, 1999, the court ruled that Spain still owned *Juno* and had not abandoned her, but Spain had abandoned *La Galga* by ceding her to Great Britain under the Treaty of 1763 ending the French and Indian War (Seven Years War). In the court's view Virginia had title to *La Galga* and could authorize salvage. Each side appealed, and the Court of Appeals held that Spain still owns both ships.

State Jurisdiction

State claims and state ownership of historic wrecks under ASA raise questions about the powers of federal courts "sitting in admiralty" to decide cases involving wrecks in state waters. Older cases did not question the jurisdiction of federal courts, until it became an issue in one of the *Nuestra Senora de Atocha* cases. The courts in that case held that the Eleventh Amendment to the Constitution barred federal courts from deciding the rights of a state unless the state consented to federal jurisdiction, but the amendment did not bar a federal lawsuit against individual state officials to challenge the constitutionality of their actions.

Most cases after *The Atocha* followed its rule about the Eleventh Amendment. Those cases include *H.M.S. Defiance*, *Jupiter Wreck*, *Marx*, *Riebe*, *Subaqueous*, *The Seabird*, and *The Lady Elgin*. In *The Brother Jonathan* case in 1998 the Supreme Court overruled the reasoning of those cases. In *The Brother Jonathan* the State of California claimed title to a paddlewheel steamer that sank in 1865. The Court held that the state's rights derived from and were limited by the ASA. Although the ship admittedly lay on state submerged lands, the Court held that the state had not proven the ship was both abandoned and embedded — therefore the ASA did not apply. The Court rejected the argument that the Eleventh Amendment prevented the federal court from deciding the state's claim, but held instead that the state must prove in federal court that it owned the ship under the ASA. California and the wreck salvors subsequently reached a settlement to share proceeds from the wreck.

After *The Brother Jonathan* was decided, the state of Rhode Island filed a lawsuit in federal court claiming ownership and exclusive salvage rights to ten British transports that were scuttled in Newport in 1778. This is the first time a state has moved to use maritime law preemptively to protect historic wrecks. A decision in favor of the state should serve to protect the wrecks from commercial excavation or amateur pillage, and should go far to confirm states' rights to manage their historic wrecks.

Even within state waters, federal statutes may protect historic wrecks. For example, Section 106 of the NHPA requires a federal agency to assess the archeological impact of any project that the agency undertakes or permits. Dredging, excavation, construction, and similar work in the navigable waters of the United States requires a permit from the Army Corps of Engineers, under the Rivers and Harbors Appropriations Act of 1899. Consequently, the Corps of Engineers must ensure that the assessment required by Section 106 is performed before issuing a permit. Additionally, the National Marine Sanctuaries Act prohibits the unregulated recovery of wrecks within federal marine sanctuaries such as the Florida Keys and the Channel Islands off California. Other federal statutes, including the Archeological Resources Protection Act of 1979 [ARPA] and the Antiquities Act of 1906, may also apply in some cases.

In some cases, the existing laws work adequately to protect historic wrecks. In others, they do not – because the existing laws are a confused patchwork of redundancies and gaps, and in some cases because they simply are not enforced by executive officials or judges. The fuzzy state of the law is the reason that the ethics statement is so important for MAHS. A comprehensive set of legal standards is needed to establish clear rules for those who dive the wrecks and those officials who manage them.

In the meantime, when you dive on historic wrecks, treat them like fragile, non-renewable, public resources –

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The Manilla Wreck

By Clifford Smith

[The following article first appeared in *MARITimes: The Magazine of the Bermuda Maritime Museum,* and is reprinted with the permission of the Museum. The author, Clifford Smith, is the Museum's Director of Conservation and Underwater Archaeology.]

Heather Weymouth records cannon measurements. (Photo courtesy of the Bermuda Maritime Museum)

The Bermuda Maritime Museum 1998 underwater archaeology field season took place from May to October. A variety of projects were undertaken, including dives on the "Manilla Wreck." Preparation for conducting the underwater survey of this site started in early August with archival research in the Museum library to determine what, if anything, was known about the site.

The "Manilla Wreck" site was discovered by Harry Cox on January 13, 1975, off North East Breakers, at a depth of about 20 feet. An article published by Mendel Peterson in the December 1977 issue of *National Geographic* reports Cox salvaged from the "Manilla Wreck" a number of copper arm bracelets known as "manillas," thousands of glass trade beads, glass bottles, ceramic fragments, and a silver coin from 1690. Additionally, Peterson said there were more than two dozen cannons found at the site. Based on the materials recovered by Cox, he concluded that this site represents the remains of a Dutch slave ship lost during the mid-18th Century and that Cox's finds constituted the largest known collection of slave-trade currency.

Carol Kerr works to establish the baselines. (Photo courtesy of the Bermuda Maritime Museum)

Yet, the most fundamental questions about the "Manilla Wreck" still remained to be answered: what is the extent of the site, are there any remains of the shipwreck, and how many cannons are there on site? Needless to say, our research pointed out only how little was really known about the site. Therefore, three goals were established for this year's "Manilla Wreck" project: developing a map of the "Manilla Wreck," completing a videotape record of the area, and producing a photo mosaic of the site.

The project was undertaken from August 14-28 by Museum staff underwater

archaeologist Clifford Smith, student intern Charlotte Willoughby-Ellis, and 16 volunteer divers from the Maritime Archaeological and Historical Society (MAHS) of Washington, D.C. Work was conducted seven days a week from 8:30 a.m. to 7 p.m., weather permitting. Everyone was happy to put in the time, for all wanted to complete the project before the MAHS group had to leave Bermuda.

As with any site, the first step is to find it. This is not a simple task on an unmarked wreck, for the charted coordinates set the location of the "Manilla Wreck" only within a series of breakers. The question then became: but which breaker? In addition, our research had revealed that the "Manilla Wreck" is the one of four ships reported to be lost on these breakers. Therefore, we had to find the right breaker with the correct wreck site.

To meet this challenge, we divided the area into four north to south sections. A visual search was then completed on each section by a team of four divers. This proved to be a successful method; by the end of the day we had located all of the reported wreck sites in the area including the "Manilla Wreck," which we marked with a float. Naturally, it would have to be the last one found.

Slave trade exhibit at the Bermuda Maritime Museum. (Photo courtesy of the Museum)

Our initial observations of the area found no visible ship timbers on the site. The most prominent feature of the site is a 14-metre double row of cannons running northeast to southwest along the southern of the two rock breakers in the immediate area. The geological features of the area are further defined as extending out to a ridge line that curves around from about 25 metres to the west of these rock breakers. Beyond the ridge line the sea floor drops to more than 30 feet. Within this area the bottom terrain is an uneven mix of coral, rocks, and small patches of sand in the old salvage trenches. The depth of the water over the site ranges from 10 to 20 feet.

The extent of the site itself was identified by conducting a non-destructive visual search of the bottom for artefacts. Divers swam back and forth over the area and all artefacts discovered were marked with red flagging tape. Once these items were flagged, the debris field could clearly be seen extending to the north and south of the cannons and out to about 20 metres west of the rock breakers. No artefacts were found beyond the ridge line or further than five metres north or south of the cannons. Based on this artefact distribution pattern, the main area of the site was established as being 18 metres long by 12 metres wide within the larger 25-metre-square area.

With the size of the site now determined, we began mapping. The first step in this process was to lay out three 18-metre baselines parallel to the cannons. Normally, the hardest part of laying out a baseline is to verify that all of the baselines are extending parallel from the same zero point. To accomplish this, all the divers have to do is set six steel rods into the bottom–and usually this is not a difficult job. Well, it sounds easy on the boat. Two days later, after a few bent rods, a little re-engineering with a hammer, and some loose rocks, we were able to set the last of the rods into the coral and rock bottom.

Baseline one was set one metre to the east of the cannons. The second baseline was eight metres to the west of baseline one. The third baseline was set in four metres to the west of baseline two. Within the three baselines, the depth of the site varied from 10 to 15 feet. Consequently, to minimize any distortion this would cause when triangulating between these baselines, all of the baselines were levelled with the height of the first baseline at the zero end.

With the baselines in place and levelled, the work of mapping the site moved ahead in earnest. The major geological features and the few flagged artefacts found outside the baselines were recorded by triangulating out from the two outer baselines in short order. The three areas within the baselines were then subdivided into 13 four-by-four metre squares and one four-by-two metre half-section. Divers were then grouped into two-person teams and assigned to one of these sections.

Each dive team then triangulated the artefacts, cannons, or important features within their section. To record

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MAHS Continues Work in Curaçao

In June a team of MAHS volunteers travelled to Curaçao to continue work on the *Mediator* wreck site. In addition, they conducted the Basic Underwater Archeology Course using MAHS' videotape instructional series, *Diving Into History*, and followed up with a field school. As the following photo essay attests, it must have been a very busy time for the MAHS team as well as their hosts and student participants from the island. Be sure to check the next edition of *MAHSNews* for a full report on the activities.

Most of the dives were on the Mediator *— this is a shot of the bow.*

Wil Nagelkerken (left), Director of the Institute of Maritime Archaeology of the Netherlands Antilles, and Theo van Giessen (right) of Unique Curaçao, at the bow. Unique Curaçao is a foundation that supports a variety of activities on the island.

Theo looking into the hold of the Mediator

Some days, visibility was better than others. (Bob Spier taking trilateration measurements)

Bill Adams ran the Basic Underwater Archeology Course during the evenings, using the video Diving Into History. *About ten local divers attended the course.*

We then held a field school starting out in the clear water of Caracasbaai, an inlet east of the main harbor at Willemstad.

The field school continued the next day on the Mediator *site in the Willemstad Harbor.*

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MAHS appreciates the support of American Airlines, travel sponsor for the Curaçao Project.

Symptoms and Treatment of Hypothermia for the First Responder

By William Utley

The healthy human body maintains a very delicate temperature balance. Lowering or raising the body's core temperature only a few degrees can cause serious medical complications. Generally, our bodies react to temperature variations automatically and often compensate before we are aware there is a problem. It is only when this thermal regulation is disturbed by outside factors that life-threatening conditions come to the fore.

Our bodies are designed to lose and replace body heat in a never-ending cycle. We generate heat through muscle movement and calorie intake, and if we were not able to shed it we would literally cook ourselves to death. To avoid that somewhat unpleasant experience, the body loses heat in a variety of ways. For divers, the most critical way is through direct heat transfer to water, which conducts heat away from the body *25 times* faster than air at the same temperature.

Because of the high heat conductivity of water, divers must be constantly aware of hypothermia, a condition caused by heat loss from the central body core. Divers should understand the symptoms of hypothermia, take steps to prevent it, and know how to respond if it occurs. This is all the more critical for divers engaged in underwater archeological work. Working underwater, particularly in cold-water, requires great concentration on the task at hand. It can be easy for such divers to be unaware of their condition or to ignore it.

Mild Hypothermia

Any diver, even a warm-water recreational diver, can experience symptoms of mild hypothermia. Mildly hypothermic divers feel cold and may start shivering — shivering is the body's way of using muscle movement to generate heat. Those symptoms put the diver on notice to get out of the water. At this level of heat loss, the diver is active, alert, and generally able to remove his or her own exposure protection suit, dry off, and put on warm clothing. Although the condition should be monitored, simple steps like covering the head and adding heat to the neck, armpits, or groin (places where we lose the most body heat) are generally sufficient for recovery.

Severe Hypothermia – A Physiological Chain Reaction

It is very important for divers to recognize the onset of hypothermia and to take appropriate action, starting with getting out of the water. If ignored or unrecognized, initial symptoms can develop into a very dangerous, potentially deadly condition. Once the body's core temperature begins a downhill slide, its progression gathers speed to the point where the victim is so rapidly overtaken by events that it can be too late for self-help. A relatively simple case of "cold diver" can quickly spiral out of control and become a life-threatening emergency.

- At a body core temperature of about 95°F, uncontrollable shivering starts. The victim is still coherent and able to move about with little or no help, but shivering alone is rarely sufficient to raise the core temperature from this point absent other factors. When the shivering stops before the victim is rewarmed, the real problems begin.

- As the core temperature continues to drop, the body begins to go through many physiological changes, and the condition starts to become life threatening. To sustain life, a body needs to preserve the key elements of the central body core: the heart, brain, and lungs. Our arms and legs, while "nice to have" features of our anatomy, are not necessary to sustain basic life.

- Blood vessels in the limbs constrict to stop the flow of colder blood from the extremities to the body core. The body simply shuts down the blood flow to the

(Hypothermia, continued on page 12)

(Hypothermia, continued from page 11)

limbs. The skin in the extremities also thickens, making it difficult to administer medication via syringe. Medication injected into a seriously hypothermic patient tends to pool in the extremities because of blood vessel constriction.

- About every twenty minutes, the blood vessels in the extremities open up briefly to allow new blood to flow to the limbs. If medication has pooled in the extremities, it can suddenly dump in concentrated form into the body core, potentially causing serious arrhythmia, an irregular heart beat. If the core temperature continues to drop, even this momentary dilation of the blood vessels will cease.

- With a continuing temperature drop, the heart rate will also begin to fall significantly. The victim will appear confused and muscles will stiffen. Speech will be slow and slurred. Pulse, while present will become increasingly harder to detect. Skin will be cold and bluish in color. At this level, victims no longer fend for themselves and will eventually become completely unaware of what is happening to them.

- When the core temperature falls below 92°F, standard thermometers will no longer be able to record the body temperature. Absent First Responder and medical attention, the core temperature drop will now become rapid. Heart rate and respiration will be very slow and shallow. Pulse will become almost undetectable, with rates as low as one or two beats a minute.

- The victim will lapse into unconsciousness and may appear to be dead. As the core temperature nears 86°F., the heartbeat will be irregular. If the temperature drop remains unchecked, the victim will suffer ventricular fibrillation, that is, very rapid twitching of the heart muscle that desynchronizes the heartbeat and the pulse.

- Ultimately, the victim will suffer cardiac arrest. Death will usually occur somewhere between 86° and 69°F core temperature, depending on individual physiology. However, a victim has been revived in a hospital setting with a core temperature of 64.4°F.

First-Aid Guidelines for the First Responder to Severe Hypothermia

- Remove the victim from the cold environment.

This does not simply mean removing the victim from the water and into shelter (room temperature of 65°-72°F). Part of a wet victim's cold environment is the victim's clothes or wet suit and bathing suit. If the diver is physically unable to remove all of his or her wet clothing, then you must assist by doing it for them – modesty has no place in this situation. Cover the victim with dry blankets, dry clothes, or place the victim in a sleeping bag. Take care to minimize victim movement. Don't forget to insulate *under* the victim to avoid heat loss from conduction.

- Ensure ABC*D*'s—Airway, Breathing, Circulation, and "*Degrees*."

If the victim is unresponsive, perform the standard "ABC" first-aid protocol to ensure that the airway is open and to check for signs of life. Any injury that is more immediately life threatening than hypothermia must be treated first. Remember that you will need to make a much longer pulse check on a hypothermic victim, and breathing may be very shallow.

Rescuers should also monitor the victim's body temperature ("degrees"). Normal thermometers will only measure down to 92°F. If you know beforehand that you will be working in a cold environment, you should take along a hypothermia thermometer. Accurate core temperatures cannot be taken by mouth. The preferred method for taking a core temperature is rectally.

While taking a temperature is helpful in assessing the condition, if the victim is showing signs and symptoms of severe hypothermia, such as incoherence, memory loss, lethargy, and an inability to walk – or has lapsed into unconsciousness or has stopped shivering without having warmed up – the emphasis should be on getting the victim to the hospital.

- Prevent further heat loss.

Improper rewarming techniques, along with rough handling, can bring on a condition called "afterdrop," a sudden drop in the body's core temperature. The key is *stabilization* – preventing further heat loss – not rewarming. You can wrap the body core, place the victim in a sleeping bag or thermal recovery capsule, or use skin to skin contact with a rescuer. *Moderate* heat (chemical heat packs, warm water bottles, etc.) *added gradually* can be applied to the head/neck, armpits, and groin. Be sure to insulate the victim from direct contact with the heat source to avoid burning. The addition of heat in this instance is not intended so much to rewarm but to prevent further heat loss. DO NOT induce liquids and DO NOT rub the extremities.

- Avoid rough handling.

Just as with improper rewarming techniques, rough

handling can also cause afterdrop. Victims should always be placed in a supine position. If the victim is coherent and in the shivering stage of hypothermia, the person can walk to a place of shelter. But if the victim is becoming incoherent or confused, the individual *must not* be allowed to walk around. Rough handling causes the blood vessels to dilate, and cold, deoxygenated blood that has pooled in the extremities is suddenly released into the central body core, potentially shocking and stopping the heart. Forcing a victim to walk even a few steps can generate afterdrop. Move the person as gently as the terrain or sea state will permit. If the victim's heart stops, you will have to treat the worst case scenario and administer CPR. CPR is obviously rough handling, but the choice is to have a stable dead person without rough handling or taking a chance that CPR will at least allow the victim a chance of survival when advanced medical care arrives.

■ Transport to the hospital as soon as possible.

Serious hypothermia victims need to be placed in a hospital setting. Even if you think there are no life signs, victims must go to the hospital where they can be rewarmed in a clinical setting and be assessed by a physician. Remember: No hypothermia victim should be considered dead until he or she is *warm and dead!* Again, if you are forced to transport the victim without advanced life support, keep the rough handling and rough ride to a minimum.

■ Never Administer Oxygen

If you recall First Responder protocols for drowning victims, administering 100 percent oxygen is critical to patient survival. However, with hypothermia First Responders should never administer oxygen. It is important to understand that the temperature of the oxygen container is the same temperature as the ambient air. This is generally much colder than the body's core temperature. Introduction of cold oxygen directly into the body core will induce further heat loss rapidly. While there is such a thing as heated oxygen, the temperature of the oxygen must be very precise. Heated oxygen can also shock the heart, and if used, should be administered in an advanced life support ambulance or hospital setting where the patient can be monitored. DO NOT try "home" oxygen warming techniques.

■ Be Aware, Be Prepared

Site managers, crew chiefs, divemasters, and dive partners are the keys to prevention or mitigation of hypothermia. If people are working in the water, be it shoreline survey or diving, then everyone should be wearing appropriate exposure protection and prepared for the worst-case scenario. There must be a plan to deal with hypothermia, and to make sure that everyone on site is familiar with the symptoms and First Responder protocols.

Divers should know that the neck and head are part of the body core, and that 50 percent of their heat loss can occur from those two areas. In addition, buddy teams and dive planners should understand that hypothermia is an insidious condition. It can affect the rescuer as well as the victim. After all, the rescuer is usually exposed to the same conditions that caused the victim's hypothermia. A rescuer has to be self-aware. Moreover, divers must avoid complacency. Hypothermia can even strike in the Florida Keys in summer if divers extend their bottom times beyond the limits of their thermal protection. Even 80˚F water can sap the heat from a body trying to retain a normal temperature. Also, hypothermia can be induced as a result of trauma which can confuse the body's normal regulating system.

Our understanding of the effects and medical protocols for hypothermia is in its infancy. It is only in the past twenty years or so through the pioneering work of individuals such as Dr. Mary Nemiroff of the U.S. Coast Guard that we have begun to comprehend the phenomena. Awareness is the key to prevention and response. ⚓

First Responder Check List for Treating Severe Hypothermia

- ✔ **Remove victim from cold environment**
- ✔ **Ensure ABCD's (airway, breathing, circulation, and degrees)—treat most immediate life threat first**
- ✔ **Prevent further heat loss**
- ✔ **Avoid rough handling**
- ✔ **Transport to hospital**
- ✔ **Never administer oxygen**
- ✔ **Be self-aware**

(Maritime Law, continued from page 5)
because they are. Take only measurements and images, leave only bubbles. The MAHS credo is that sites should be disturbed and artifacts recovered only for scientific purposes, under the supervision of a qualified archeologist. Otherwise, leave the wrecks undisturbed for other divers and future generations to explore and enjoy. Much of the information from a wreck site lies in the relative locations of artifacts, not in the artifacts themselves. That information is forever lost if the wreck is spread over a hundred coffee tables and mantles. If in doubt, call your State Historic Preservation Officer. For U.S. Navy wrecks, call the Underwater Archeology Branch at the Naval Historical Center (202) 433-9784. ⚓

About the author

David P. Howe is the President of MAHS. He has been Program Manager and Legal Adviser at the Underwater Archeology Branch at the Naval Historical Center, Assistant Supervisor of Salvage USN, a Trial Attorney with the U.S. Department of Justice, and in private practice in maritime and international law.

The opinions expressed in this article are the author's and do not necessarily reflect the views of any organization or government agency. Readers interested in legal citations for the cases referenced in this article should contact the author through MAHS at PO Box 44382, L'Enfant Plaza, Washington, D.C., 20026.

(Prez Notes, continued from page 2)
governments. The case should help to protect those sites from disturbance.

At the request of the Old Harford Town Maritime Center (OHTMC), MAHS participated in the annual Summerfest at Denton, Maryland, in August. The OHTMC is a new maritime museum focused on commercial river traffic on the Eastern Shore, and has two skipjacks under restoration. The skipjacks are interesting examples of wooden boat construction. One, a Virginia-built boat named *F. C. Lewis, Jr*., is cross-planked. The other, *Maggie Lee*, built in Maryland in 1903, is one of only two known skipjacks planked fore-and-aft.

Finally, a special tip of the hat goes to Lark Stevens for again hosting the annual summer party. We all had a great time. Thanks for everything, Lark. ⚓

(Manilla Wreck, continued from page 7)
the data, a 1:10 scale grid was superimposed over their dive slate and as each point was measured in, the diver would plot the point on to the dive slate. The information was then transferred by all the dive teams to the master site plan each night and by the beginning of the second week we had all the sections recorded and transferred to the master plan. During this same period the work on the site was videotaped.

With mapping done and the entire area videotaped, we had completed two of the three goals of the project. All that remained to complete the project was the photo mosaic. Unfortunately, hurricane George tracked to the south of Bermuda on its way to North Carolina and we lost four days out of our second week due to storm surge. The photo mosaic would have to be rescheduled. Still, MAHS and the divers from the Museum had completed a substantial amount of research considering the distance to the site from the Museum and the work involved in setting the baselines on site.

East Carolina University graduate student Sarah Milstead shooting images for a photo mosaic of the Manilla Wreck. (Photo courtesy of the Bermuda Maritime Museum)

In September, the last of the project's goals would be completed in two days by students from East Carolina University. Baselines were re-set on the rods that had been put in place by the MAHS group in August. Each one-metre square of the site was defined using yellow nylon lines. A total of 280 photographs were shot to cover the 20-by14 metre area.

The old questions could now be answered: the furthest extent of the site is about 20 by 25 metres, there are no visible remains of any ship timbers, and there are 20 cannon on site. With these old questions answered, new questions can now be asked about the "Manilla Wreck": where is the ballast pile, where are the ship's anchors, and, most important, is this even a wreck site? ⚓

MARITIME ARCHAEOLOGICAL AND HISTORICAL SOCIETY

Statement of Ethics

The Maritime Archaeological and Historical Society is organized for the purpose of enhancing public awareness and appreciation of the significance of submerged cultural resources and the science of maritime archaeology. In pursuit of this mandate, members may come in contact with unique information and cultural material associated with terrestrial and underwater sites containing evidence of the history of humankind. To protect these sites from destruction by commercial salvors and amateur souvenir hunters, the Society seeks to encourage its members to abide by the highest ethical standards. Therefore, as a condition of membership and pursuant to Article 2, Section 1(A) of the bylaws, the undersigned executes this statement of ethics acknowledging adherence to the standards and policies of the Society, and further agrees as follows:

1. To regard all archaeological sites, artifacts and related information as potentially significant cultural resources in accordance with federal, state, and international law and the principles and standards of contemporary archaeological science.
2. To maintain the confidentiality of the location of archaeological sites.
3. To excavate, or otherwise disturb an archaeological site solely for the purpose of scientific research conducted under the supervision of a qualified archaeologist operating in accordance with the rules and regulations of federal, state, or foreign governments. Artifacts shall not be removed until their context and provenience have been recorded, and only when the artifact and related data have been designated for research, public display or otherwise for the common good.
4. To conduct oneself in a manner that protects the ethical integrity of the member, the archaeological site and the Society, and prevent involvement in criminal violations of applicable vandalism statutes.
5. To observe these ethical standards and aid in securing observance of these standards by fellow members and non-members.
6. To recognize that any member who violates the standards and policies of the Society shall be subject to sanctions and possible expulsion in accordance with Article 2, Section 4 of the bylaws.

Signature _____ Date _____

(Revised 1993)

MARITIME ARCHAEOLOGICAL AND HISTORICAL SOCIETY

P O Box 44382—L'Enfant Plaza—Washington, DC 20026

Application for Membership

Membership in the Maritime Archaeological and Historical Society is open to all persons interested in maritime history or archeology whether or not they are divers. Members of MAHS have first preference for enrollment in all courses and other activities and projects of the Society. To join MAHS, please sign the Statement of Ethics and send it to MAHS along with your check and completed application form. Annual membership dues are: $30—Individual or $35—Family

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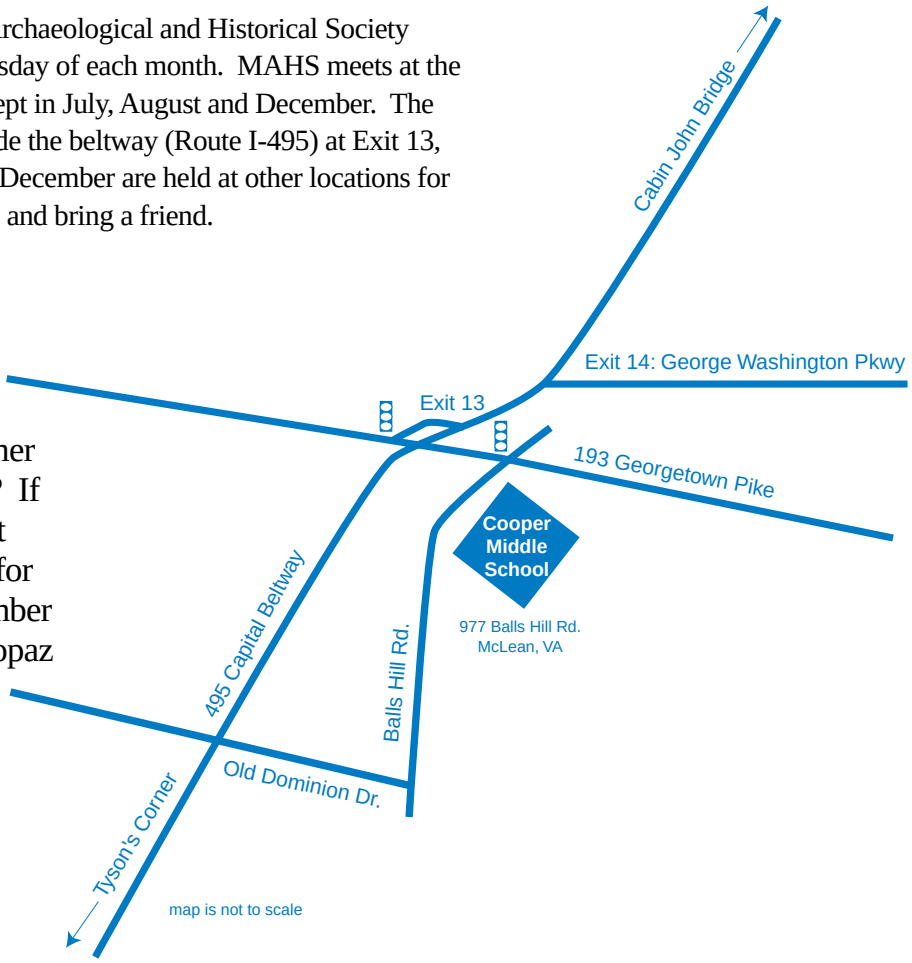
General membership meetings of the Maritime Archaeological and Historical Society (MAHS) are held at 7:30 p.m. on the second Tuesday of each month. MAHS meets at the Cooper Middle School in McLean, Virginia, except in July, August and December. The school is located at 977 Balls Hill Road, just inside the beltway (Route I-495) at Exit 13, Georgetown Pike. Meetings in July, August and December are held at other locations for special events and holiday parties. Please join us and bring a friend.

PLAN AHEAD! Did you miss the summer party at Lark Steven's home on August 8? If so, you missed a good time. Don't let that happen again. Mark your calendars now for the annual MAHS holiday bash on December 12, 2000. The party will be held at the Topaz House in Bethesda, Maryland.