In: Pollock NW, Godfrey JM, eds. Diving for Science 2007.
Proceedings of the American Academy of Underwater Sciences 26th Symposium.Dauphin Island, AL: AAUS; 2007.

Submerged Cultural Resource Management on the Last Frontier: Reconnaissance, GIS Mapping, and Biotic/Geochemical Characterization of Threatened Shipwreck Sites in Southeast Alaska

J. David McMahan[1], John O. Jensen[2], Stephen Jewett[3], John Kelley[3], Sathy Naidu[3], Hans Van Tilburg[4], and Michael Burwell[5]

[1] Office of History and Archaeology, Alaska Department of Natural Resources, 550 W. 7th Ave., Suite 1310, Anchorage, AK 99501; davemc@dnr.state.ak.us
[2] Sea Education Association / University of Rhode Island / Jensen Research and Heritage Services, 708 South Road, Wakefield, Rhode Island 02879; jensenheritage@cox.net
[3] School of Fisheries and Ocean Sciences, 245 O'Neill Bldg., University of Alaska Fairbanks Fairbanks, Alaska 99775-7220; jewett@ims.uaf.edu / ffjjk@uaf.edu / ffsan@uaf.edu
[4] NOAA/NOS, Pacific Islands Region, National Marine Sanctuary Program, 6600 Kalaniana`ole Highway, suite 302, Honolulu, HI 96825; Hans.VanTilburg@noaa.gov
[5] U.S. Department of the Interior, Minerals Management Service (MMS), Alaska OCS Region, 3801 Centerpoint Drive, Suite 500, Anchorage, AK 99503-5823; michael.burwell@mms.gov

Abstract

In April 2006, Alaska's Office of History and Archaeology collaborated with the University of Alaska Fairbanks, the University of Rhode Island, the U.S. Minerals Management Service, and the National Oceanic and Atmospheric Administration (NOAA) National Marine Sanctuary Program to collect information on five historic shipwrecks in Southeast Alaska. Under a grant from the NOAA Office of Ocean Exploration, the project team documented the shipwrecks through dives, interviews, the use of a DIDSON sonar unit, and recordation of biota. Sediment samples adjacent to wrecks are being analyzed to detect changes in soil chemistry due to wreck degradation. These data sets will allow researchers to track changes to the sites as a result of vandalism and natural decay processes. Public education components of the project included public talks, radio and newspaper interviews, and the development of websites.

Introduction

Recent geographical information system (GIS) data suggests that around 44,000 miles or nearly half the United States coastline falls within the boundaries of Alaska. The U.S. Minerals Management Service (MMS), a federal agency that maintains a database of shipwrecks and other sub-sea obstructions, estimates that Alaskan waters contain more than 3,000 shipwrecks. Even though many of the wrecks hold archaeological or historical significance, their systematic exploration and documentation have been precluded by high costs, vast distances, and seasonally cold violent weather. In recent years, however, new and inexpensive remote sensing and diving technologies have removed many of these barriers, resulting in increased incidents of unauthorized disturbance. Most of the wrecks are on or embedded in state submerged lands and are protected under state law. While diving on the wrecks is allowed, disturbance or collection of historic artifacts requires a permit. The State of Alaska, with no dedicated underwater archaeology staff position and limited expertise has been unable to generate the data needed to manage its underwater heritage sites. As an alternative strategy, the state has built partnerships with experienced federal agencies and academic institutions outside Alaska. States with active submerged cultural resource programs such as Maryland, Michigan, Florida, North Carolina, South Carolina, and Wisconsin have demonstrated the importance

of archaeological surveys, not only as a means for gathering data, but as a mechanism for developing support for preservation within the dive community and the general public.

Another important line of defense in the protection of Alaska's submerged heritage is the development of data which will contribute to a better understanding of decay processes, corrosion, and biotic relationships specific to coldwater heritage resources. This has implications for the development of management and conservation plans. Wooden structures of shipwrecks in tropical waters, along with associated metal artifacts, are typically subjected to intense submarine weathering, corrosion, and biological encrustation, which results eventually in poor preservation. Conversely, it is generally believed that colder waters support relatively less dense benthic biological populations and contribute to better wreck preservation. In another context, the shipwrecks could be local microcosms for focused kelp and benthos colonization. To achieve a better understanding of these processes submerged cultural resource managers need baseline information on sediments, trace metals, organics, and benthic biota. This is best achieved through multidisciplinary collaboration with marine biologists, geologists, chemical oceanographers, and other scientists with appropriate expertise.

In 2005, the State of Alaska and collaborating organizations applied for and were awarded a National Oceanic and Atmospheric Administration (NOAA) Office of Ocean Exploration grant (OE_2005_078) to document several threatened historic shipwreck sites in Southeast Alaska. The field phase of the project was carried out in April 2006. Three submerged wrecks were targeted: the *Princess Sophia*, the *Princess Kathleen*, and the *Clara Nevada* (formerly *Hassler*). These particular wrecks were chosen due to their popularity as recreational dive sites, good accessibility in fair weather, and reports of vandalism. Additionally, two historically important intertidal shipwrecks, the *Islander* and *Griffson*, were targeted. They were fortuitous inclusions in the survey due to their proximity to the route used to access the submerged wrecks. This modest pilot project is considered a first step towards the collection of baseline data that will allow for submerged cultural resource management planning and the initiation of community outreach.

Methods

Prior to the field-phase of the project, team members (Burwell, Jensen) conducted archival research on the wrecks, relying heavily on published materials. In Juneau and Haines, this information was supplemented by interviews with local historians, museum staff, and divers. During the field phase, a six-person team (including four divers) operated off the U.S. Fish and Wildlife Service (FWS) vessel *Curlew,* chartered through an agreement between FWS and the State (Figure 1). The field phase included two days for local interviews and dive preparation, six days at sea (dive days), and two days for post field phase archival research in Juneau. The *Curlew*, with its field team, staged its operations from the NOAA docks at Auke Bay Laboratory outside Juneau in order to test equipment with the Dive Safety Officer (Jewett) prior to going to sea. Once at sea, dive logistics were planned around slack tides to minimize depths and currents whenever overall scheduling allowed. Wrecks were located using existing, albeit not always accurate, coordinates coupled with verbal or published descriptions, and depth finder observations. Once a suspected wreck site was located, a skiff with an operator and divers was deployed. The skiff team further defined the wreck location via transects with a depth finder, then dropped a weighted descent line with a buoy. An initial pair of divers would descend the line and conduct a general site reconnaissance, then surface and report their observations. Armed with information from the reconnaissance, a second team continued the effort. The divers characterized and recorded the condition of the wrecks by use of digital still photos and video clips with the intent that these 'snapshots in time' could be compared against future data to document change at the sites. Photographic images were supplemented by a rough inventory and description of the salient structural elements, features, and associated materials at each site. The team also attempted

to ascertain if damage had occurred to the wrecks as a result of anchors from recreational dive boats. An important project component was the addition of a high frequency DIDSON sonar unit (Kelley), loaned by the Alaska Department of Fish and Game. This new technology holds promise for future shipwreck work, especially in poor dive conditions. The DIDSON, designed for port security, is relatively compact. It can produce good images even in 0 visibility conditions and can be used either stationary or moving at slow speeds (via attachment of a mounting arm to a rail).

In addition to basic archaeological recordation (Jensen, Van Tilburg, McMahan), a marine biologist (Jewett) inventoried biota in the vicinity of the wrecks and collected sediment samples for trace element analysis (Naidu). The latter included a control sample from Berger Bay, away from any shipwreck sites. These data will potentially contribute to a better understanding of decay processes, corrosion, and biotic relationships specific to coldwater heritage resources. This has implications for the development of management and conservation plans.

To ensure that visitors to the sites are aware of their protected status, engraved brass survey caps were placed at the visited wreck sites, along with engraved plastic tags, identifying the wrecks as heritage sites protected under state law (Alaska Statute 41.35) (Figure 2). Finally, the team collected GPS data for each wreck site, deploying pelican buoys from key features when possible. The data were used to update the Alaska Heritage Resources Survey (AHRS) database, the official inventory of Alaska's archaeological and historical sites. AHRS data are available to land and resource managers, as well as to authorized researchers, but are restricted from public access due to potential for site vandalism. The coordinates will also be used to update the MMS shipwreck database and incorporated into their GIS product. Like the AHRS, the MMS database withholds specific coordinates from public access to help protect the resource. Data is also being provided to NOAA, who plans to conduct a hydrographic survey at the *Clara Nevada / Hassler* site in support of archaeological recordation efforts.

Figure 1. The project's field team (L to R): Dave McMahan, John Kelley, John Jensen, Hans Van Tilburg, Stephen Jewett, and Mike Burwell. Not shown: Ed Grossman.

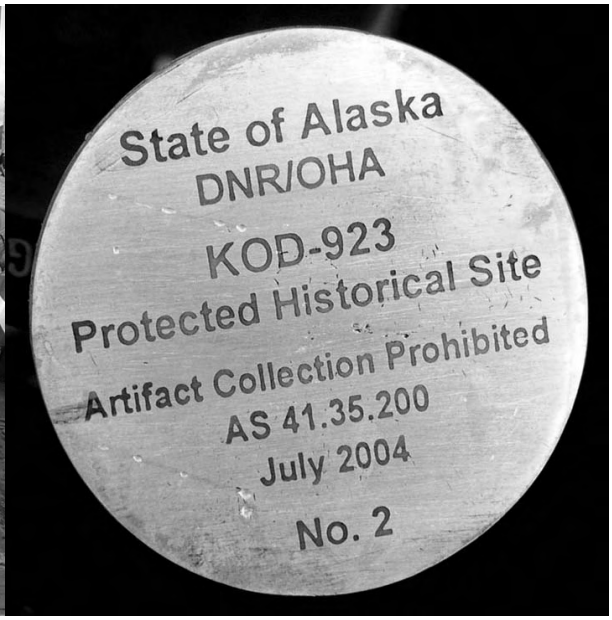

Figure 2. Example of one of the brass survey cap placed on the wreck sites, inscribed with the AHRS site number and proclamation of the site's protected status under State law.

Results

Princess Kathleen

Most of the historical background for the *Princess Kathleen* is derived from an earlier inventory (City and Borough of Juneau 1992) and from information contained in the MMS and AHRS databases. The *Princess Kathleen* was built for the Canadian Pacific railway by John Brown and Company Ltd., at Clydebank, Scotland in 1925. It was 352 ft long, with a beam of 60 ft and a depth of 26 ft (Figure 3). Modern in design with three distinctive stacks, its twin screws were powered by four oil-fired steam turbines. It was licensed to carry 1,500 passengers and had a gross tonnage rating of 6,000 tons. The *Princess Kathleen* served in the Vancouver-Victoria-Seattle coastal service until taken over during the war in 1939 for troop transport. In 1947, it resumed service on her old route, and two years later was transferred to the Canadian Pacific's Vancouver-Alaska cruise service. The *Princess Kathleen* sank after running aground bow-first on Lena Point, 17 miles north of Juneau, on September 7, 1952, with no loss of life.

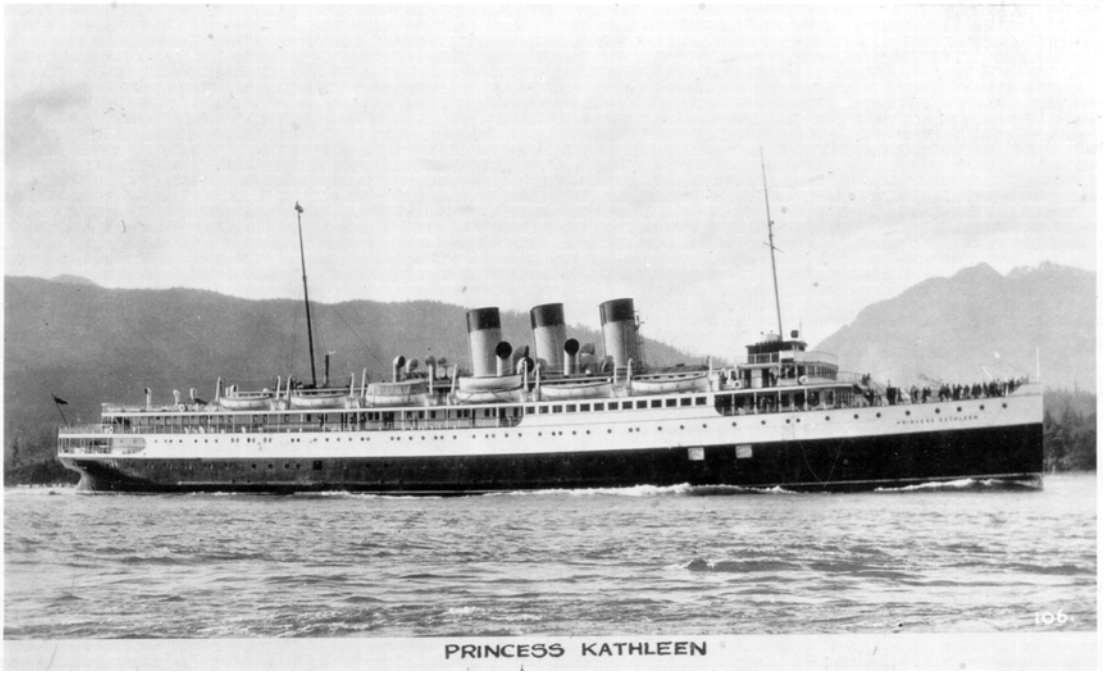

Figure 3. Starboard view of the *Princess Kathleen*, from a photo postcard in the private collection of Dave McMahan.

Even with better navigational aids than in earlier times, the wreck of the *Princess Kathleen* re-emphasized the dangers of the waters of Southeast Alaska. Even though no lives were lost with the wreck of the *Princess Kathleen*, the incident struck a responsive chord with residents of the community, who were relieved that this incident had not ended in tragedy like so many before. The wreck, which is relatively intact, reflects the history of the ship and events surrounding its sinking. Because of the intact nature of the wreck, there is a possibility that more information could be extracted from the site in the future.

The *Princess Kathleen* lies with its bow in about 50 ft of water near Lena Point and the stern away from shore in 120 ft of water. Its hull lists to port approximately 80 degrees and its bow is pointed generally in a northerly direction. The ship's three stacks are still in place although the wooden decks are badly rotted and collapsed. Much of the steel superstructure is twisted and fallen. The starboard

cargo bay door is wide open, as well as some of the passenger stateroom doors. Much of the wooden structure within the staterooms has rotted and collapsed. Some of the ship's larger windows are still intact.

The 2006 project team dove only once on the *Princess Kathleen*, descending to the vessel's bow via a buoy line, then explored along the deck to about amidships before backtracking. The dive was plagued by poor visibility (±10 ft) and moderately strong currents. While visibility precluded usable photographs, divers were able to inventory the biota (Table 1), collect a sediment sample, and place both a brass monument and plastic tag at the wreck site. On the return trip to Auke Bay, the team attempted a second dive on the *Princess Kathleen*, but failed to locate the wreck due to faulty depth finder readings caused by a loose transducer. Scheduling constraints did not allow for a second dive. Instead, the team made several passes over the wreck site with the DIDSON sonar (Figure 4). This ultimately provided better data on the overall condition and position of the wreck than could have been obtained via low visibility dives.

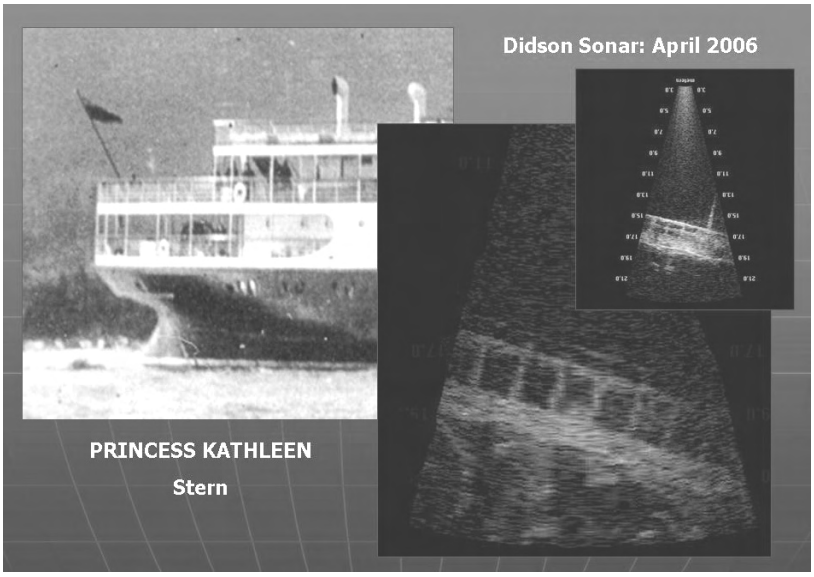

Figure 4. Comparison of a 2006 DIDSON sonar image with a historic photo of the *Princess Kathleen's* stern.

Princess Sophia

Most of the historical background for the *Princess Sophia* derives from an earlier inventory (City and Borough of Juneau 1992) and from information contained in the MMS and AHRS databases. The *Princess Sophia* was built by Bow, McLachlane & Co., Ltd. at Paisley, Scotland in 1911. She was constructed for the Canadian Pacific railway Company at a cost of around $250,000. The vessel was 245 ft long with a beam of 44 ft and a depth of 24 ft (Figure 5). It featured a wooden deck with a single stack and bow mast. The *Princess Sophia* arrived in Vancouver under the command of Captain Lindgren in February of 1912. Soon after its arrival, it was converted from coal burning to oil. The oil fired tripled-expansion steam engine powered a single screw. It was licensed to carry 250 passengers, and if necessary, could carry up to 500 with special permission and with additional floatation devices. It displaced 2,320 gross tons and was run by a crew of 61. Its first run into Southeast Alaska and Juneau was in June of 1912. The *Princess Sophia* was lost with all on board on October 23, 1918, when it grounded on Vanderbilt Reef in a storm, then slid off before passengers could be rescued. With the deaths of around 350 people, the incident may be the most tragic in terms of loss of life of any shipwreck on the North American West Coast. Ironically, the tragedy received little attention from the press, whose attention was focused on the end of World War I.

Table 1. Benthic reconnaissance dive survey of algae, epifaunal invertebrates and fish from the shipwreck *Princess Kathleen*, off Lena Point, Auke Bay, Alaska.

OVERVIEW: Divers descended down line to the top of the wreck at 45 ft. Vessel lay on its port side with the bow orientated N-NW. After noting moderate cover of flora and fauna on starboard side, we descended perpendicular to the keel to the substrate at 73 ft. The covering of flora and fauna was less on the port side of the hull than on its starboard side. Sediment sample #1 was collected within 6 ft of the vessel.

TAXON	COMMON NAME
ALGAE - Rhodophyta	Red algae
Coralline	Encrusting coralline algae
ALGAE - Phaeophyta	Brown algae
Laminaria sp. (juv.)	Kelp
Agarum clathratum	Seive kelp
CNIDARIA – Hydrozoa	
Sertulariidae	Hydroid
ANNELIDA – Polychaeta	
Crucigera sp.	Polychaete
Serpula sp.	Polychaete
MOLLUSCA – Gastropoda	
Fusitriton oregonensis	Oregon triton
Neptunea lyrata	Snail
Unidentified nudibranch	Nudibranch
MOLLUSCA – Polyplacophora	
Cryptochiton stelleri	Gumboot chiton
MOLLUSCA – Bivalvia	
Chlamys sp.	Bay scallop
Pododesmus macroschisma	Rock jingle
ARTHROPODA – Crustacea	
Hyas lyratus	Lyre crab
Oregonia gracilis	Decorator crab
Elassochirus tenuimanus	Hermit crab
E. gilli	Hermit crab
Unidentified shrimp	Shrimp
ECTOPROCTA	
Microporina borealis	Bryozoan
Dendrobeania murrayana	Bryozoan
Microporina borealis	Bryozoan
Dendrobeania murrayana	Bryozoan
BRACHIOPODA	
Terebratalia transversa	Lamp shell
Terebratulina unguicula	Lamp shell
ECHINODERMATA – Asteroidea	
Evasterias troschelii	Sea star
Pycnopodia helianthodes	Sunflower sea star
ECHINODERMATA – Ophiuroidea	Brittle star
ECHINODERMATA – Echinoidea	
Strongylocentrotus droebachiensis	Green sea urchin
ECHINODERMATA – Holothuroidea	
Parastichopus californicus	Sea cucumber
CHORDATA – Urochordata	
Halocynthia aurantium	Sea peach
CHORDATA – Pisces	
Myoxocephalus polyacanthocephalu	

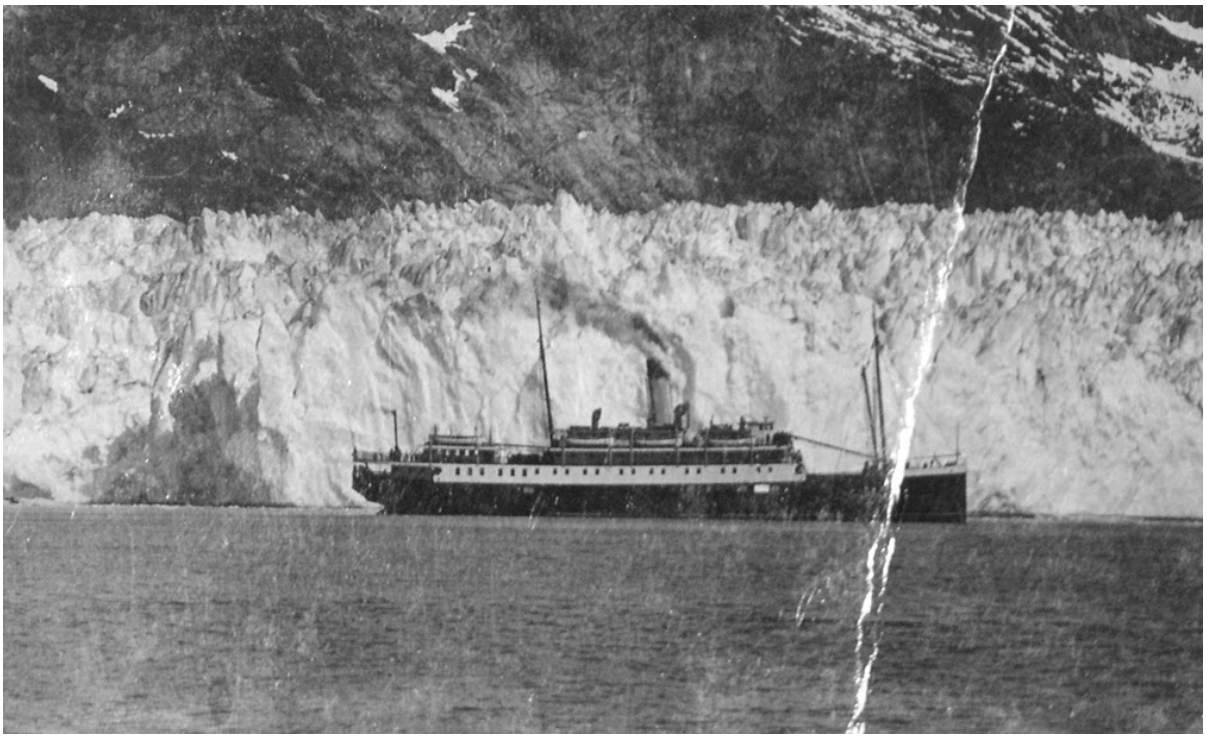

Figure 5. Starboard view of the *Princess Sophia* in front of Taku Glacier, from a photo postcard in the private collection of Candy Waughaman (Fairbanks).

At the time of its demise, the *Princess Sophia* was engaged in the transportation commerce of the last stages of the gold rush. Its wreck re-emphasized the dangers of the waters of Southeast Alaska and the need for better navigational aids.

By all accounts from local divers, the *Princess Sophia* is now hardly recognizable until one gets to within very close proximity to it. The hull is leaning to port about 20 degrees, and about 25% of the bow is broken off and appears storm battered. According to local accounts, it is believed that this happened between 1982 and 1992. The stern is broken up as well, with the boilers and side doors still evident. The wooden decks are badly rotted and are beginning to collapse onto each other. The foremast is lying perpendicular to the ship and the single stack is not visible. In 1992, 60% of the hull was estimated to be intact.

The 2006 team arrived at Vanderbilt Reef at high tide and made several passes over the wreck site with the DIDSON sonar. The DIDSON images, which were acquired at the beginning of our learning curve with the system, lacked clarity. This probably also relates to the depth and scattered condition of the wreck relative to that of the *Princess Kathleen.* Due to the depth of the wreck, the team decided not to attempt no-decompression dives at high tide. This was not a major setback to the project, because the wreck was included in an earlier investigation by a professional marine archaeologist as part of a Canadian documentary. During the summer of 2006, a Juneau diver placed a brass monument on the site at the request of the project team.

Clara Nevada / Hassler

Historical background for the *Clara Nevada / Hassler* derives from an earlier inventory (City and Borough of Juneau, 1992), using information contained in the MMS and AHRS databases, and a recent manuscript document on the vessel's earlier history (Jensen, 2007). The *Clara Nevada* was

built in Camden, New Jersey in 1872, as a survey vessel for the U.S. Coast and Geodetic Survey (Figure 6). Originally christened the USS *Hassler,* it was involved with deep sea research before spending more than twenty years surveying remote stretches of the Alaska and Northwest Pacific coast. Decommissioned in 1895, it was purchased by the Pacific & Alaska Transportation Company in 1897 and renamed the *Clara Nevada*. While the name selection was supposedly to honor a Hollywood movie star, no actress by that name has been identified. The vessel measured 154 ft in length and had a 24-foot beam. The hull was iron and the deck was constructed of wood. It was originally powered by sail, and the three prominent masts were retained after its conversion to steam power. The converted ship was powered by a steam engine that drove a single screw propeller. The *Clara Nevada* had a capacity for 100 passengers in first class accommodations and 100 passengers in steerage. It had a gross tonnage of 464 tons and could carry 300 tons of freight.

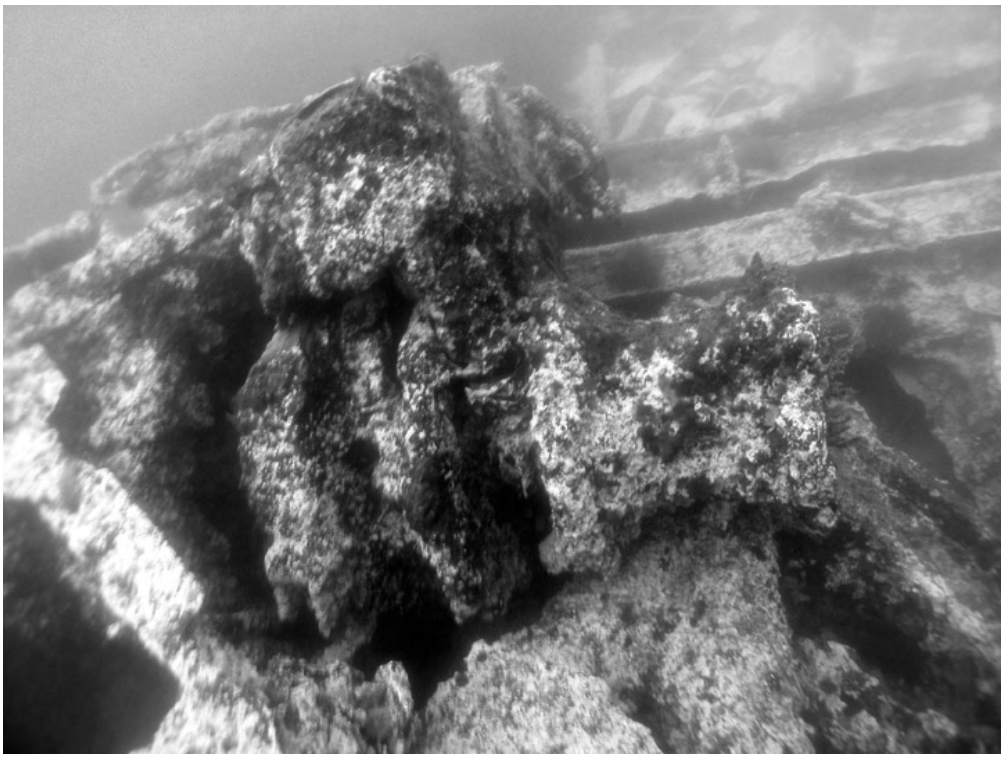

Figure 6. Port view of the *Clara Nevada*. Courtesy of the Alaska State Library, Winter and Pond Collection, No. P87-1594.

The *Clara Nevada* was lost in 1897 when it ran into the reef on the north side of Eldred Rock, around 20 miles south of Haines, and exploded into a fireball seen by witnesses. At the time of its demise, it was carrying passengers on their way to make their fortunes in the gold fields of the Yukon. All on board (around 75 people), were reported to have lost their lives on the ship, but the incident is shrouded in mystery. Some accounts describe sightings of the captain plying his trade at other places after the wreck, prompting speculations of survivors and stolen gold. Like the other wrecks, this incident emphasized the dangers of the waters of Southeast Alaska and reinforced the need for better navigational aids. Largely in response to the tragedy, the U.S. government constructed a lighthouse on Eldred Rock in 1905. The oldest standing lighthouse in Alaska, it is now on the National Register of Historic Places. The wreck site and lighthouse are reminders of the difficulties and dangers of life at sea during this period of Southeast Alaska's history. Although the wreckage is scattered, it bears witness to the important history of the ship and events surrounding the wreck. It is possible that future investigation of the *Clara Nevada*'s *in situ* wreckage may provide further insights into the vessel's history and demise.

The remains of the *Clara Nevada* are in about 30 ft of water at low tide, on the north side of Eldred Rock. The wreckage is broken up over at least a 200 yard area, but many large pieces of the ship's structure remain. Contemporaneous accounts indicate that the six-foot diameter propeller, shaft, and boiler were salvaged a few years after the wreck for their brass content.

Early in the 2006 project, the team decided to focus efforts on the *Clara Nevada*. This wreck, while more exposed, is relatively shallow and easily accessible in good weather. Because it is further from Juneau, recreational diving activity at the site has not been as intense. Consequently, it was hoped that the wreck would offer more information potential than the better known *Princess Kathleen* and *Princess Sophia* wrecks. The project team made multiple dives at the *Clara Nevada* site while in route to Haines, then again upon the return voyage the following day. Visibility was moderate (±20 ft) initially, but had improved (±50 ft) by the following afternoon. The team conducted extensive photo documentation at the site, inventoried local biota (Table 2), and collected a sediment sample. Remnants of the ship's double hull are present, testimony to ongoing corrosion problems within the cellular iron structure during the life of the vessel. Most of the vessel's propeller shaft is intact, with only its aftermost section missing. Bolts had been removed at the point of attachment with the extant forward sections of the shaft to remove the propeller during salvage. Remnants of the engine, frames, firebox, and stack were noted, along with fragments of ceramic plates and other shipboard artifacts. The windlass was observed in about 50 ft of water, along with segments of anchor chain, which together indicate the position of the bow (Figure 7). Additional investigations by NOAA and State archaeologists were conducted at the *Clara Nevada* site in May 2007, resulting in supplemental mapping and photography. This investigation produced maps and images that are being incorporated into websites under development to commemorate NOAA's 200th anniversary celebration.

Figure 8. Stephen Jewett (L) and Ed Grossman (R) by the steamer *Islander's* sternpost in April 2006.

Table 2. Benthic reconnaissance dive survey of algae, epifaunal invertebrates and fish from the shipwreck *Clara Nevada*, off the north side of Eldred Rock Lighthouse, Lynn Canal, Alaska.

OVERVIEW: Observations of the biota were based mainly on the three dives conducted for this study; two other dives were made by non-project divers to obtain additional photos and videos. The wreckage was scattered between 15 and 50 ft, with the majority at 15 to 30 ft. Sediment samples 2 and 3 were collected at 45 ft within the wreck area.

TAXON	COMMON NAME
ALGAE - Rhodophyta	Red algae
Coralline	Encrusting coralline algae
ALGAE - Phaeophyta	Brown algae
Desmarestia sp.	Acid kelp
Laminaria bongardiana	Split kelp
Agarum clathratum	Seive kelp
Costaria costata	Seersucker
CNIDARIA – Hydrozoa	
Sertulariidae	Hydroid
CNIDARIA – Anthozoa	
Unidentified anemone	Anemone
ANNELIDA – Polychaeta	
Crucigera sp.	Polychaete
Serpula sp.	Polychaete
MOLLUSCA – Gastropoda	
Fusitriton oregonensis	Oregon triton
Dendronotus sp.	Nudibranch
MOLLUSCA – Polyplacophora	
Cryptochiton stelleri	Gumboot chiton
Tonicella _iliate	Lined chiton
Mopalia _iliate	Hairy chiton
ARTHROPODA – Crustacea	
Hyas lyratus	Lyre crab
Oregonia gracilis	Decorator crab
Elassochirus tenuimanus	Hermit crab
BRACHIOPODA	
Terebratalia transversa	Lamp shell
ECHINODERMATA – Asteroidea	
Henricia sp	Blood star
Crossaster papposus	Rose star
Evasterias troschelii	Sea star
Leptasterias hexactis	Sea star
Pycnopodia helianthodes	Sunflower sea star
ECHINODERMATA – Ophiuroidea	Brittle star
ECHINODERMATA – Echinoidea	
Strongylocentrotus droebachiensis	Green sea urchin
CHORDATA – Pisces	
Hexagrammos decagrammus	Kelp greenling

Islander / Griffson

The steamer *Islander* wrecked and sunk in around 250 ft of water on August 15, 1901, while carrying passengers to the Yukon gold fields. The ship is best known for the 1934 monumental salvage effort in which most of the iron-hulled vessel was moved to a beach on Admiralty Island.

The ship's bow broke off during salvage, and has recently received renewed interest as a possible source of lost Klondike gold the vessel was reportedly carrying. The *Islander* was salvaged by extending cables beneath the vessel and securing their ends to salvage vessels floating on either side of the *Islander*'s hull. As each rising tide lifted the vessel, it was moved closer to the beach and the cables tightened. One of the salvage vessels was the wooden schooner barge *Griffson*, abandoned on the beach near the *Islander* in 1934. The intertidal remains of the *Islander* now comprise only the iron hull with missing bow, along with scattered pottery and glass fragments (Figure 8). Some pottery sherds with the *Islander* name have been documented, but are now rare at the site. The 240-foot long ship was built in Scotland in 1888. Its sinking was said to have been the result of an iceberg. A large portion of the *Griffson's* heavily-constructed wooden hull remains on shore, and is accessible at low tide (Figure 9). Less has been written about the *Griffson* than the *Islander*, yet the vessel is deserving of further research to more fully document its history. In 1952, the *Islander* was dismantled and now only portions of its steel frames are still visible on shore.

The 2006 project team took advantage of a low tide to visit the site of these two intertidal wrecks while bringing the *Curlew* from Juneau around Douglas Island to the NOAA Auke Bay dock. The wrecks were found to be as described above. The team conducted extensive photo documentation of the two wrecks, supplemented by basic measurements and observations. No biotic data were recorded, and no sediment samples were collected.

Trace Element Analysis

Results from the analysis of acid-digested solutions of five sediment gross samples (all sandy) are shown in Figure 10. The concentrations of all elements, with the exception of one (lead [Pb] in sample #2) are generally similar or lower than in unpolluted world coastal sediments of comparative granulometry. The concentrations of the individual metals in the 'wreck' samples are also significantly lower than the mean concentrations of the corresponding metals in glaciomarine muds of Valdez, Prince William Sound and Chatham Strait, Alaska (Sharma, 1979; Naidu and Klein, 1988). The relatively lower concentrations of metals in our samples could be due to a combination of factors such as sandy nature of the sampled sediments and lower natural input from the local hinterland, which is in contrast to the muddy composition of the sediments compared and their terrigenous source rich in metal deposits. Contrary to expectation, the ship wrecks have not been a local source of metal contaminants.

Figure 9. Hans Van Tilburg measuring the schooner barge *Griffson* wreckage in April 2006.

Table 3
UAF
SE Alaska NOAA/OE
Reported by Frontier Geosciences, Inc., 414 Pontius Avenue North, Seattle, WA 98109
July 19, 2006

Sample Results (mg/kg DB)

Analyte	SHIPWRECK #1	SHIPWRECK #2	SHIPWRECK #3	SHIPWRECK #4	SHIPWRECK #5
V	64.6	111	124	122	60.3
Cr	33.5	36.9	64.5	32.2	31.9
Mn	386	785	555	430	283
Fe	14100	39600	32500	24000	15600
Ni	4.75	18.4	22.3	8.48	4.15
Cu	9.85	75.9	23.4	13.3	10.3
Zn	30.9	55.3	55.7	36.3	27.0
As	2.65	19.2	7.27	6.40	3.79
Cd	0.161	0.159	0.165	0.276	0.270
Sn[1]	<1.51	<1.44	<1.30	<1.61	<1.70
Pb	3.51	41.6	15.0	3.00	3.13
Total Solids (%)	66.1	69.5	77.2	62.3	58.9

DB = Dry-weight basis
[1] Reporting limit adjusted by total solids result

Conclusions

The shipwrecks documented during this project exemplify the current situation regarding Alaska's historic shipwrecks. Using archival records and reports of obstructions, MMS and the State are developing an excellent, although not yet complete, inventory of vessels lost in Alaskan waters. Locational data for Alaska's shipwrecks, however, is often incomplete and inaccurate. Very few of Alaska's historic shipwrecks have been inspected, much less evaluated archaeologically. Currently, Alaska's wrecks remain the province of, and, in sad cases, the private property of recreational and commercial divers. Despite strong laws, implementation of effective shipwreck management and preservation policy is in its infancy and a strong marine preservation ethic has yet to develop. This project followed in the footsteps of other successful state programs by beginning the process of gathering accurate shipwreck site location data, assessing the condition of important shipwrecks that are immediately threatened or sustain high levels of diver visitation, and developing outreach programs with a strong marine preservation ethic. In conjunction with data collection activities, project participants conducted public outreach in the Juneau and Haines areas through public lectures and interaction with local dive communities. The success of the project was enhanced through coordination with local museums, resource agencies, and the media. The project team hopes that this multidisciplinary pilot project represents the beginning of a strong cooperative relationship between local, state, and federal agencies, and academic institutions to help Alaska manage and preserve its unique and historically significant submerged maritime cultural heritage.

More information is available at from the Alaska Office of History and Archaeology and the NOAA Office of Ocean Exploration:

www.dnr.state.ak.us/parks/oha/index.htm
http://snake.nos.noaa.gov/explorations/06alaska/welcome.html
www.sanctuaries.noaa.gov/maritime/expeditions/hassler/welcome.html

References

City and Borough of Juneau. Inventory and Survey of Historic Shipwreck Sites. City and Borough of Juneau, Community Development Department, document on file at the Office of History and Archaeology, Division of Parks and Outdoor Recreation, Alaska Department of Natural Resources, Anchorage, AK, 1992a.

City and Borough of Juneau. Supplement to the Inventory and Survey of Historic Shipwreck Sites (confidential location data). City and Borough of Juneau, Community Development Department, document on file at the Office of History and Archaeology, Division of Parks and Outdoor Recreation, Alaska Department of Natural Resources, Anchorage, AK, 1992b.

Naidu AS, Klein LH. Sedimentation Processes. In: Shaw DG, Hameedi MJ, eds. Environmental Studies in Port Valdez, Alaska. New York, NY: Springer-Verlag, 1988: 69-91.

Sharma GD. The Alaskan Shelf: Hydrography, Sedimentary, and Geochemical Environment. New York, NY: Springer-Verlag, 1979; 498 pp.