Along the Shores of Time

Submerged Historic & Indigenous Resources In The Pacific Rim Region

PROCEEDINGS FROM AN INTERNATIONAL AND INTERDISCIPLINARY CONFERENCE

ALONG THE SHORES OF TIME: SUBMERGED HISTORIC AND INDIGENOUS RESOURCES IN THE PACIFIC RIM REGION

Roger E. Kelly
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Editors

PROCEEDINGS FROM AN INTERNATIONAL AND INTERDISCIPLINARY CONFERENCE HELD AT THE UNITED STATES ARMY CORPS OF ENGINEERS SAN FRANCISCO BAY MODEL VISITOR CENTER SAUSALITO, CALIFORNIA

MARCH 31-APRIL 3, 1999

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THE CONFERENCE

Funded by a $13,800 grant from the National Park Service Cultural Resource Training Initiative during Fiscal Year 1999, the conference was designed as an opportunity to assess and address several broad themes of maritime heritage and to bring together an international group of persons engaged in Pacific Rim maritime issues. This volume includes many presentations made by attendees as well as a few papers prepared by individuals who could not attend, but who offered important contributions. Some participants did not wish to submit written materials - their remarks are briefly summarized below.

About 70 persons attended, representing agencies of the following governments:

United States
- Interior Department: National Park Service, Bureau of Reclamation
- Defense Department: US Army Corps of Engineers, US Marine Corps
  Naval Amphibious Base Museum,
- Justice Department: Torts Branch, Civil Division, and West Coast Office
- Commerce Department: National Oceanic and Atmospheric Administration
  (National Marine Sanctuary Program)
- State of California
  - California Lands Commission
  - State Historical Resources Commission
- Territories: American Samoa, Guam

Canada
- Province of British Columbia

Commonwealth of the Northern Marianas Islands
Federated States of Micronesia
Republic of the Marshall Islands
Republic of Palau

Other attendees represented academic institutions, avocational organizations, private firms and researchers and Native American communities as follows:

- Sonoma State University, Department of Anthropology:
  Anthropological Studies Center
- Santa Clara University, Department of Anthropology
- Santa Rosa Junior College, Department of Anthropology and Sociology
- University of California, Berkeley; Department of Anthropology
- Drake Navigators Guild
- Coastal Maritime Archeological Resources
- Nautical Appraisals
- Underwater Archeology Society of British Columbia
- Marin Nova Albion Society
- San Diego Maritime Museum Association
- 'Rosie the Riveter' Memorial Initiative
- Olaf T. Envig
- James Allan
- Aaron Golbus
- Sheldon Breiner
- Nancy Ferrell
- Tim Campbell, Federated Coast Miwok of Graton Rancheria
- Chuna McIntyre, Yu'pik Nation, Alaska

Keynote Address:

Speaking from his perspective as an executive director of a successful West Coast maritime museum, Ray Ashley examined the worldwide importance of maritime historical activities over many centuries and to the American experience particularly. Preservation for historic resources and education of a nation's citizens about their maritime heritage with historic vessels, museum programs, learning activities, and community-wide events can work within a national culture but the 'voyage along the shores of time' will not be an easy trip. Regretfully, we were not able to reproduce all of the illustrations used in Mr. Ashley's excellent presentation.

Session Themes:

The Conference was organized around a sequence of several sections as follows:

Public Issues Regarding Submerged and Indigenous Heritage Resources
- Native peoples' use of coastline and offshore marine environments
- Recreational activities such as diving, boating and avocational historical research
- Artifacts and maritime object collections as commodities
- Abandoned Shipwreck Act as US national legislation

Nexus of Shorelines and Offshore Waters
- Wreck Events and Native Peoples
- Shoreline facilities: Historic Shipyards and Wharves
- Lessons from Indigenous Peoples of Pacific Islands and Alaska
- Impounded waters as impacts upon cultural resources
- Inland maritime landscapes

Maritime Heritage Resource Protection and Legal Issues
- SS BROTHER JONATHAN case
- National and International enactments
- Submerged Resource Inventories
- Detection Methods and Identification
- Regional Maritime Archeology Comparisons

Cost-Effective Partnerships for the 21st Century
- Volunteers and cooperating private organizations
- 'Rosie the Riveter' Memorial Initiative
- Outreach and Tourism

Participants' Remarks

As noted, some participants did not utilize written notes but spoke extemporaneously on their subjects. The list below indicates individuals who played very important roles in sharing their knowledge and experience with the Conference in this way:

Donna Graves presented the initiative to recognize and celebrate the very significant role of women in the non-traditional shipyard workplace during World War II - "Rosie the Riveter"- in the Kaiser shipyards of Richmond California, as a cooperative effort among the Richmond Museum of History and many interested researchers, citizens, and individuals who were there.

Peter Pelkofer, now retired from his position as Senior Counsel for California's Lands Commission spoke on the complex issues of California's legal case before federal courts, including the US Supreme Court (Deep Sea Research, Inc v. The Brother Jonathan; case C 91 3899 LCB) and the relationship of this case to the federal Abandoned Shipwreck Act of 1988.

Edward Ueber presented an illustrated talk about the interagency cooperative project at Drakes Bay, Point Reyes National Seashore in 1998 to conduct electronic and diver search for maritime resources, particularly the lost Spanish Colonial Period galleon SAN AGUSTIN, wrecked during a November storm in 1595. Sharing costs, personnel and equipment, expertise, and capabilities between federal and state agencies produced a successful project although evidence of the galleon remains illusive.

Michele C. Aubry provided information about the published Guidelines regarding how the US Abandoned Shipwreck Act was implemented without the development of legally binding Federal Regulations that were not authorized by Congress for this Act. She also provided a timely discussion of the draft UNESCO Convention regarding submerged heritage and ICOMOS Charter which set forth world-wide perspectives and recommendations about submerged heritage resources.

Chuna McIntyre, a Yu'Pik community member now living in Rohnert Park, California described and demonstrated indigenous technology utilized by Yu'Pik people along southwestern Alaska coasts in adapting to arctic maritime environments. He showed many artifacts and tools made from ocean resources as well as contemporary materials, with associated songs.

Sara Conklin described her work as an appraiser of maritime antiques, objects of art and relics. She spoke about difficulty of comparisons, assessing condition and association, and tax implications of appraising artifacts from shipwreck sites.

Philip Berns, senior admiralty attorney, discussed the Department of Justice's position regarding the BROTHER JONATHAN case and the Supreme Court decision to remand the case back to the 9th District courts in San Francisco where the case was heard again (#91-3899, March 1999).

Sheldon Breiner, pioneer developer of the magnetometer, discussed the various electronic methods of detection for shipwreck or other maritime materials. He compared the methods of side-scan sonar, acoustic penetration of sediments, types of magnetometers, and metal detectors as well as recent developments of these methods.

The delegation from various Pacific Island governments (Richard Williamson, Chris Lindberg, Emensio Eperiam, Richard Davis, Scott Russell, Vicky Kanai, and David Herdrich) spoke individually about applying local preservation regulations to submerged or maritime cultural resources, whether of indigenous or European origin, World War II Era or 'recent past' wrecks as popular diving destinations. Impacts from local fishermen and recreational divers were discussed. Vicky Kanai spoke about her cultural knowledge of Palau utilization of sea resources and the importance of ocean environments to Palau traditions.

Richard Ambro described the on-going excavations at San Francisco's Crissey Field shoreline where the historic Presidio wharf and remains of US Army Quartermaster facilities were revealed.

Goodyear Kurt Walker discussed the importance of a maintained inventory of shipwrecked vessels along California's coasts, based on historical archival information, to use in the permitting process by the State Lands Commission.

We appreciate the excellent services from Robert Hoover, Thomas Mulhern, and Ray Ashley as session leaders. All presenters, whether their contribution appears in this volume or not, and participants who were lively discussants within some sessions deserve our deep appreciation for their shared ideas, concerns, and information.

Exhibited materials brought by members of the Drake Navigators Guild, George Epperson and Chuna McIntyre added significant value to oral presentations. Robert Allen took photographs of speakers, exhibits, and participants enjoying the refreshment table. Some participants also enjoyed a visit to the USS HORNET as a post-conference field trip; we thank David Look for transportation services for this visit.

We have retained individual author's style of persuasion and methods for reference citation and have only edited for clarity and reader's enjoyment.

Lastly, we give appreciation to the welcoming remarks from Amy Belser (Mayor of Sausalito), Nancy Rogers (Director of the Bay Model Facility), Col. Peter Grass (Commanding Officer, US Army Corps of Engineers, San Francisco District), and James Shevock (National Park Service Associate Regional Director, Resources Stewardship and Partnerships).

Roger E. Kelly
Gary Franklin

May 2001

CONFERENCE PARTICIPANTS

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Damon Maydu, Sonoma State University, Rohernt Park, California
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Deborah A. King, NPS USS Arizona Memorial, Honolulu, Hawaii

G.James West,Bureau of Reclamation - Sacramento, California
Kent Lightfoot, Department of Anthropology, UC Berkeley
Mark Norder, Coastal Maritime Archeological.Resources
Carl Harrington, Coastal Maritime Archeological Resources
Cicely Muldoon, NPS Superintendent, San Juan Island National Historical Park

Linn McLaurin, Naval Amphibian Base Museum, San Diego
Raymond Aker, Drake Navigators Guild, Palo Alto, California
Donna Graves, "Rosie the Riveter" Memorial Initiative, Richmond, California
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Ray Ashley, Executive Director, San Diego Maritime Museum Association.
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Cecilia McCartney, Port of Oakland
Jeremy Bates, Santa Clara University, Santa Clara, California

Sara Conklin, Nautical Appraisals
Olaf Engvig, Burbank, California: Maritime Archaeologist and historian, ship restorer
Thomas Mulhern, NPS Collections Manager, San Francisco National Maritime Historical Park
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Scott Russell, Deputy Historic Preservation Officer, Northern Marianas Islands
Carmen Bigler, Historic Preservation Office, Republic of Marshall Islands
Victoria Kanai, Historic Preservation Officer and Chief, Cultural Resources, Republic of Palau

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David W. Look, NPS Cultural Resources Team Leader, San Francisco, California
Sheldon Breiner, Palo Alto, California

Russell Skonenek, Associate Professior of Anthropology, Santa Clara University
Thomas Beasley, British Columbia Underwater Archaeological Society, Victoria
Paula Creech, NPS Cultural Resources Team, San Francisco
Cris Lindberg, Kwajilein Cultural Center, Republic of the Marshall Islands
Richard Williamson, Archeologist; Republic of Marshall Islands

Goodyear K. Walker, California State Lands Commission
Aaron Golbus, Sausalito
Nancy Rogers, Director, San Francisco Bay Model Visitor Center
Richard Stratford, US Army Corps of Engineers Archeologist, San Francisco District
Richard Ambro, Holman and Associates, San Francisco

The Bay Model Association was formed as a 501-C3 nonprofit corporation in 1989 to assist the Bay Model Visitor Center and the U.S. Army Corps of Engineers in developing educational programming and public outreach. An Exemplary Board of Directors who encourage and support the staff Program Coordinators directs the Association. A roster of extraordinary volunteers has assisted the organization in many types of events and projects.

The Bay Model Association will continue to sponsor scientific conferences and workshops, create a variety of public exhibits and educational programs and work closely with hundreds of organizations at the Federal, State, regional and local levels.

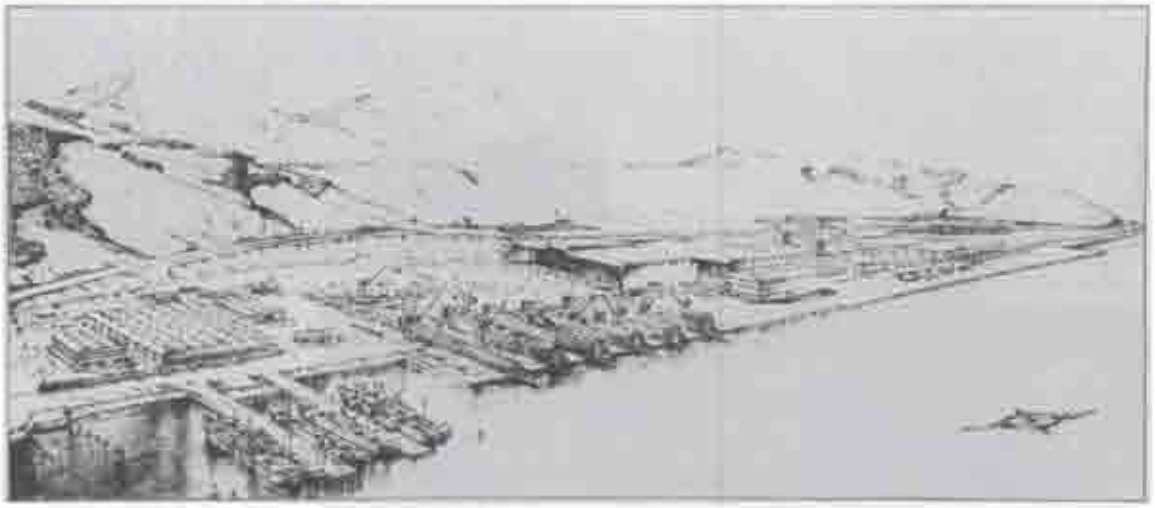
This collaboration between the National Park Service and the Bay Model Association encourages the open exchange of ideas and information that is critical to the increased understanding of and appreciation for submerged cultural resources of the Pacific Rim.

Welcome Remarks:

On behalf of the San Francisco Bay Model Visitor Center I am delighted to welcome the participants of the "Along the Shores of Time" Conference. The combined missions of the US Army Corps of Engineers and the Bay Model Visitor Center blend the responsibilities for maintaining navigation and regulating waterways with the use of it's tidal hydraulic model for studying tidal flows and interpreting San Francisco Bay's historic, natural and cultural resources. The WWII maritime history of the San Francisco Bay is further interpreted via the *Marinship 1942-45* exhibit permanently housed in the Bay Model building. What better place to host this significant event!

The rich and diverse maritime history of the West Coast is equal only to the diversity of studies, issues, projects and historic explorations in which you are all so actively engaged. Hosting this Conference will be one of the year's programming highlights for us as we provide a public venue for the exchange of ideas and collaboration with colleagues.

Nancy Rogers
Director, Bay Model Visitor Center



UNITED STATES
MARITIME COMMISSION

CARGO – VESSEL – SHIPYARD

SAULSALITO, CALIFORNIA

W.A. BECHTEL CO.
MARIN SHIPBUILDING DIVISION

Conference Photographs taken by Robert Allen

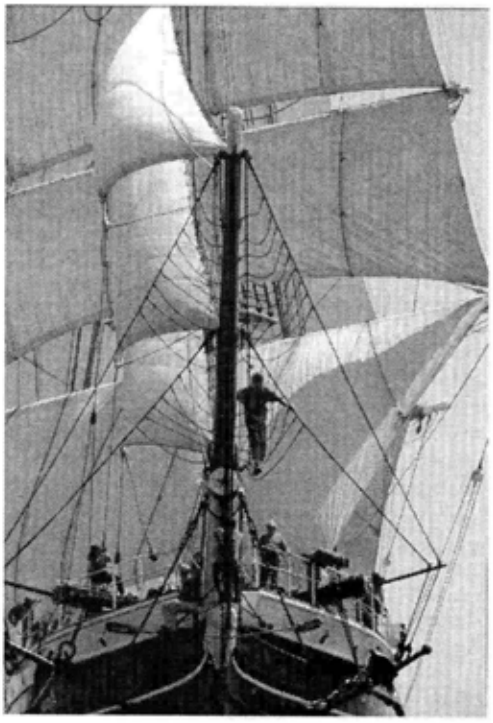
Conference Photographs taken by Robert Allen

SECTION ONE

PUBLIC ISSUES REGARDING SUBMERGED AND INDIGENOUS RESOURCES

How our fellow citizens view their nation's maritime history and the heritage resources of other countries colors a view of their future. In Section One, four viewpoints address public issues of maritime education using real vessels and museums, protective government measures, shipwreck research for mixed motives of profit and patrimony, and the global conservation ethnic for submerged historic resources.

Ray Ashley's illustrated keynote talk sets the stage and introduces the early actors who shaped our interest in maritime history, as told by museum exhibits and from the decks of historic ships, particularly the STAR OF INDIA. Brian Apland and Tom Beasley show us how British Columbia came to recognize the Province's maritime historic resources and established protective policies and regulations. Roger Kelly summarizes the small number of 16th and 17th century ship losses located and investigated in the vast Pacific where European powers played out geopolitical dramas, leaving wrecks as patrimony and profit resources as defined by local governments. Olaf Engvig speaks from his Scandinavian experiences regarding the moral and ethical perspectives needed to properly study, conserve, and make accessible to all citizens the irreplaceable evidence of past maritime activities.



Our Voyage Along The Shores of Time

Raymond Ashley

Along the Shores of Time is such a poetic and evocative title for a conference that it is almost impossible not to begin this series of presentations by trying to extract as much from the metaphor as possible. Therefore, In the next several pages I hope to take us on something of a voyage along those shores, carried by a few of the steadfast ships that have stood us so well through the last several thousand years.

Indeed, it is the vessels themselves that will serve as the focus of this paper. We are accustomed to thinking of ships as conveyances of people, objects, and even ideas as they have provided and continue to provide essential connections between peoples separated by expanses of water. As technological creations dedicated to specific purposes, they provide such service in the narrow context of their working lives. As artifacts, however, they also possess the capacity to act as conveyances through the dimension of time, providing kinds of connections between generations for a transfer of information and ideas never envisioned by their creators. It is the thesis of this paper that we are living in an age when the number and intensity of such voyages along the shores of time has reached an unprecedented level.

I would like to pursue that thesis through a number of threads which, hopefully, will seem to weave together into something like a coherent story. First, I would like to address the idea that, from antiquity, voyaging has served to stimulate curiosity and conjecture about the natural and artificial worlds that existed over the horizon, and spurred efforts to render encounters with these worlds into rational systems of belief. Among the byproducts of such encounters are physical objects, the "curiosities" we now refer to as natural specimens and artifacts and usually see in museums. In a reflexive way, the accumulation of knowledge is revealed not only in the historical collection of such intellectual souvenirs, but also in the ships that made the collection of information possible. Especially in the last century, as the awareness that artifacts inevitably embody aspects of the societies that produce them has intensified, it has taken form in the accelerating proliferation of museums, historical parks and monuments, and historical societies. All such institutions presume that artifacts can function as texts, which allow the storage of information and ideas, and can be "read" as such. Of all artifacts, ships are among the most complicated and therefore among the most signifying of objects produced by any culture that contemplates making extensive use of the sea. Thus, it is entirely understandable that museums which cater to interpreting the maritime experience never before to embark on voyages along the shores of time.

Secondly, I would like to suggest that the collection and preservation of artifacts in museums has intensified with the awareness of sweeping cultural change, especially when that change has come about through the revolutionary application of new technology. The more we perceive our world to be changing, the more we are apt to become alarmed at the prospect of loosing the cultural mementos we hold dear, and even the values embodied within those things. Again, as complex expressions of technology, the preservation and replication of ships has also intensified, despite the universal recognition that almost nothing is as hard to preserve or take care of as a ship in its natural environment.

Third and finally, I would like to suggest that as ships inevitably operate on two levels, spatial and temporal, to achieve success in either they must enjoy complete integration within the societies that produce and care for them. As carriers of things, military power, and ideas across space, they must be capable of operating within rigid economies of efficiency according to their mission. As carriers of information and ideas across time, they must resonate well with the belief system of their caretakers, as fully integrated components of their culture. By way of example, today's voyage will conclude with the story of a particular ship and its community.

To begin the voyage, the first great museum we can identify as such in the western tradition was the museum of the city founded by Alexander the Great in 332 BC at the mouth of the Nile. As Alexandria flourished under the rule of the Ptolemys, one of its most distinguishing features was its intellectual complex or academy, composed of a university, medical school, botanical gardens, research institute, astronomical observatory, the famous library (which at one time contained more than 500,000 volumes), and the museum proper which contained thousands of specimens and artifacts from across the known world. Alexandria was a good site for such an enterprise to flourish because among other things, it was also one of the greatest seaports of antiquity, standing at the confluence of many of the most important trading routes. The great harbor was one of the most spectacular manmade creations of its day, dominated by a seawall that extended more than a mile and terminated with the fabulous 440' tall lighthouse (erected in 280BC and destroyed in the 14th century) that once numbered among the seven wonders of the world. Into this commercial center flowed goods and materials from across Asia, Africa, and Europe. Among the exotica making its way in ships to Alexandria were the accumulation natural and artificial curiosities that represented peoples and places that might have otherwise existed for the citizens of Alexandria only in the stories of sailors or the narratives of travelers. Unlike elements in books or tales, these were things that one could see, touch, analyze and compare.

The ancient world's greatest project of collecting objects and texts did not go on indefinitely or even without interruptions. As we know, Alexandria was partially burned in 47 BC and then more thoroughly in AD 272 (by order of the Roman emperor Lucius Domitius Aurelian), in 391 (under the Roman emperor Theodosius I), and then again in 640 (by Muslims under the caliph Umar I). Under the pressure of such catastrophes, the various components of the academy finally either withered away or transplanted elsewhere, never to be reassembled together in a comprehensive form until they did so in the imagination of the Elizabethan courtier and philosopher Francis Bacon.

Bacon wrote during the early modern age of oceanic exploration, when the popularity of voyage narratives excited widespread public interest in strange lands and exotic cultures. Among intellectuals, the same travel stories also inspired introspective philosophical speculation about contemporary European society. These included utopian visions of alternative worlds such as Sir Thomas More's *Utopia* (1516) and Tommaso Campanella's *City of the Sun* (1623). Bacon's own *New Atlantis* of 1624 might in retrospect be considered an early, if not the first work of science fiction, for in it, Bacon postulated the benefits of a strange and advanced society in which the intellectual and political apparatus of a scientific establishment was commingled inextricably with the state.

In his narrative, Bacon described the tribulations of a band of English mariners who are wandering lost and dying in the empty reaches of the Pacific when they happen upon the uncharted island of Benselam. There they find a wonderfully functional society ruled by "philosopher kings" from an institution called Solomon's House (clearly a reprise of Alexandria's academy). Under the direction of this institution the discretionary resources of society are marshaled for rational investigation of the natural world to advance technology and better the human condition. As in Alexandria, distant lands offered to provide a wealth of information, so that systematic voyages for collection of natural and artificial curiosities was an important part of the research program. The merging of politics and science may not seem far fetched today, living as we are in a period of state sponsored "big science" and continual technological change, but to readers of Bacon's day the capabilities and influence of Solomon's House seemed outlandish. Why? Because at the time there was little convincing evidence that science based upon mathematics, instrumentation, and rational classification represented a body of useful knowledge or indeed, was anything more than a parlor diversion for intellectuals and dilettantes.

There were only two exceptions to contradict such perception, artillery (and other elements of military engineering) and oceanic navigation. Yet these were telling exceptions! The instruments and mathematics necessary to long distance voyaging had allowed Western Europeans to emerge from a backward and discordant assortment of feudal kingdoms clinging tenaciously to the geographical remnants of once great empires. Once Europeans had married the three masted, square-rigged ship to heavy artillery and navigational astronomy, everywhere they sailed they found themselves able to conduct trade on their own terms, by force when necessary. The oceanic ship became the primary technical agent of mercantile empires, facilitating a concentration of wealth and power into the hands of European states on an unprecedented scale. Seaborne networks of trade and power spread from an Atlantic core across the earth, gradually generating a maritime technology based Atlantic world economy. It was artillery and navigation that made mathematics based science respectable by proving its usefulness in sustaining the Atlantic world, at least in those two applications, though in Bacon's day a wider usefulness was by no means obvious.

It is thus with some irony that a century and a half after Bacon's death, an English ship did enter the Pacific on a voyage inspired by the vision of New Atlantis. The voyage was a state funded mission to investigate the natural world, sailing under naval command and discipline, embarking a scientific contingent, and sponsored by a state sanctioned scientific society based on

Bacon's concepts. The ship deployed an unprecedented arsenal of mathematical technique and instrumentation in an effort to unravel geographic, geological, and astronomical mysteries. Unlike Bacon's hapless English voyagers, her crew was able to determine their longitude through astronomy and hold scurvy at bay through dietary regimen. Moreover, it was also her mission to engage in cultural exchange with peoples of newly discovered lands and from this experience to collect botanical and ethnographic data. Much of this data would be contained within the massive collection of natural and artificial specimens she was to gather (in the end she collected more than 30,000). Her name was *Endeavour* and we think of her today as the ship, which made Captain James Cook famous.

Why the irony? Because by 1766, Bacon's vision of a rational, science based state devoted to an economy of technological efficiency no longer seemed that far fetched. Indeed, in the midst of the industrial revolution, much of Bacon's vision had arguably already been achieved. But the vision was no longer so "utopian" to those who had to live in it. War seemed endemic. It was noted with alarm that differences in circumstance between rich and poor were becoming ever more extreme. Mechanization, concentration of labor, urbanization, and land enclosure were changing ancient patterns of labor and production. Cities were deadly places that, for many years to come, would kill more people than they could replace through natural increase. Black clouds of air pollution hovered constantly over London and other large European cities. The world was demonstrably becoming a different place within the space of single lifetimes, not in all ways a better place, and technological change could be seen to be a part of it.

By contrast, when the enlightenment voyagers encountered the cultures of newly discovered Pacific islands, those attractive peoples seemed to possess the innocence of an imagined European past presumed long vanished and now increasingly mourned. The Tongans, Marquesans, Samoans, but most of all the Tahitians seemed to live in a world of green valleys and blue lagoons, where war was an occasional amusement, adequate sustenance was obtained without effort and available to all, hoarding of material possessions served no end, and sexual mores were a simple matter of gratification and consent. Of course, the Europeans were more than inclined to project their own fantasies upon their Pacific islander hosts and see what they wanted to see, resurrecting an old notion of "noble savages" in the recently updated philosophy of Rousseau. None the less, it was a compelling image, reinforced by the romantic painters that accompanied the voyages, so that ever after it has been the Tahiti of Cook's day, the land without writing or formal mathematics, instruments, or machines that has fulfilled European imaginings of paradise. Not New Atlantis!

If the human condition could be so susceptible to material circumstance, especially when that circumstance was so heavily influenced by technology, then the relationship between society and its objects was clearly important to understanding historical forces that promoted change. An intellectual awareness of modernism and an Enlightenment imperative to classify, quantify, and analyze resonated in the writings of social philosophers such as Malthus and Adam Smith. It also took form in the creation of great Museums, including the British Museum, founded in 1753.

As maritime technology facilitated discovery and travel, it also facilitated the accumulating of signifying objects that seemed to embody characteristics of distant and exotic

societies. Joseph Banks, the naturalist who accompanied Cook on his first voyage and later served as President of the Royal Society, was one such collecting traveler, seen here with a few of the souvenirs that made him for a while London's most popular dinner guest. The collecting ethos personified in such influential individuals as Banks came to be embraced by a European elite that considered travel a component of worldly sophistication, and awareness of distant places the next best thing for those who didn't travel themselves but aspired to elite sensibilities. A well-stocked collection of curiosities thus provided an indication of status, so that well to do enlightenment intellectuals often dedicated significant space in their homes to "curiosity cabinets" for such purposes. Today, for instance, visitors to Thomas Jefferson's restored Monticello can look at his curiosity cabinet, stocked among other things, with objects gathered in the expedition of Lewis and Clark across the American continent.

It also seemed reasonable that individual collections could be combined into community or national repositories. Not only did such collections constitute potentially useful databases of the natural and artificial world, they conferred status upon communities that possessed impressive collections. As with elite individuals, community collections signified worldliness, sophistication, power, and wealth. It is thus no accident that the oldest Museum now operating in the United States is the Peabody-Essex, founded in 1799 by the Salem East India Marine Society to house the collections of great trading and whaling voyages to distant and exotic lands. Not only did its collections of natural and artificial curiosities appeal to a sense of intellectual enterprise, it symbolized the pride of a small maritime community that dared to extend its mercantile reach across every ocean to the far corners of the world. Needless to say, the means also became part of the message, so that today many people consider the Peabody Essex first and foremost a maritime museum.

Our great national museum, the Smithsonian, was established in 1846 in consequence of the first large philanthropical bequest in this country. Originally envisioned as a scientific research institute, the Smithsonian very quickly became instead a collecting institution with the realization that its first secretary, Joseph Henry, happened to be one of only a few practicing scientists in this country capable of conducting basic scientific research. Thus, instead of immediately embarking upon a basic research agenda, Henry and his colleagues dedicated themselves to fabricating a scientific establishment according to the pattern of earlier British experience, embarking upon the "taking inventory" science of collection and classification popularized by Joseph Banks in the previous century. As had been the case earlier, museum collections continued as the byproduct of a social/intellectual process of status accumulation, now turned to the political objective of creating science based agencies that would control the intellectual destiny of the American

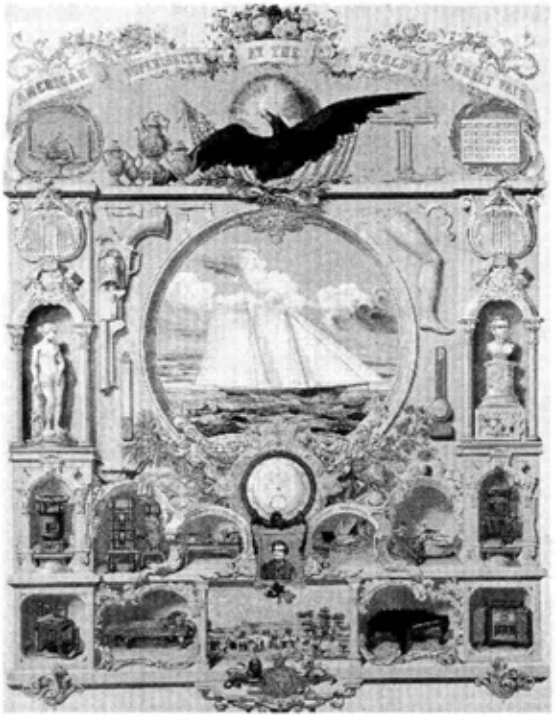
republic. Eventually, the vision of Henry and his colleagues would permeate the universities, the military, and government, inextricably binding them as completely as Bacon had ever envisioned, into an American Atlantis.

As industry and trade stimulated the rise of great cities in America, the status-gathering potential of collection exhibitions continued to gain cachet. America achieved notice on the world stage as an industrial power in the Crystal Palace World Exposition of 1851. As America's technological products first came under the world's systematic scrutiny, the "American system" of manufacture (mass production) achieved tangible recognition through exhibition and demonstration of such objects as Colt's revolver, McCormick's reaper, and Isaac Singer's sewing machine. Also worthy of note in connection with the Crystal Palace exposition was the appearance of a rakish black schooner named *America,* a vessel that proved invincible in racing against an impressive English squadron of racing yachts. Just as America's emerging industrial prowess could be demonstrated in the remarkable array of products on exhibit, so it also seemed aptly symbolized in *America's* mastery over the sea and her adversaries. As has been the case in every America's cup match since, an object seemed to embody the essence of an entire society.

In years following the Civil War, New York, Boston, Chicago, Cincinnati, and Pittsburgh saw the establishment of at least one major museum, often beginning as the byproduct of a major exposition. Increasingly as the 19th century progressed, large-scale expositions came to be seen as defining moments for major cities, inspiring entire movements within architecture, urban planning, and the arts. The Worlds Colombian Exposition in Chicago in 1893 was established ostensibly to commemorate the four hundred-year anniversary of the European discovery of Americas and also to celebrate the rebirth of Chicago after the great fire. Again, the byproduct of this exposition was the establishment of a number of permanent museums devoted to the exhibition of collections. The Chicago exposition particularly entrenched the museum as an essential ingredient of the "City Beautiful" movement it helped to inspire. Just as exhibitions produced defining moments for communities, museums promised to celebrate civic cultural attainment in perpetuity. The Hudson-Fulton exhibition of 1909, again in celebration of historic voyages (the Henry Hudson voyage to the Americas of 1609 and Fulton's steamboat voyage of 1809), sparked a fascination with the decorative arts and the "period room" as a style in museum exibitry.

By the turn of the 20th century, the museum phenomena had reached sufficient momentum in America to rationalize a professional corps dedicated to caring for and interpreting community repositories. In 1906, the American Association of Museums was founded to establish standards of training and mission for museums. The first university level museum studies course "Museum Work and Museum Problems" was held at Harvard in 1921, emphasizing a theoretical orientation. This was followed by a course taught by one of the museum movement's founding leaders, John Cotton Dana, at the Newark Museum in 1925, which dealt with more pragmatic issues of cultural resource management. In the same year, the AAM issued its first *Code of Ethics for Museum Workers*. Emphasis on interpretation of collections and education emerged at a very early stage. In 1915 Benjamin Gillman (secretary of the Museum of Fine Arts, Boston), added the word "docent" to the museum lexicon in an address to the AAM annual meeting to introduce the

teaching role of the museum. By 1930, data collated by the AAM indicated that 30 million people were visiting museums yearly, a phenomenal quantity no doubt influenced by the advent of the automobile. To update us to the present, more people in the United States now visit museums than all public scheduled events combined – sporting events, theatrical performances, etc. This mass popularity is also reflected in the proliferation of museums across the American landscape. As listed by the American Association for State and Local History, by 1988 there were 9375 historical association and museums (a tenfold increase since 1944), appearing at the rate of two per day. By 1990, the AAM registered more than 6,700 museums, far more than half of them history museums.



This has taken us a bit off course in regards to the maritime connection, but it does serve to indicate that, with increasing intensity, people are seeking to invest the historical identity of their communities in collections of artifacts. Likewise, there is an audience for these repositories as visitors increasingly seek encounters with objects that signify larger meaning. Though such objects were initially presented as curiosities of exotic and distant lands, the collection and interpretation of them in museums has proliferated even as the technology of transportation and communication has facilitated rapid, in some ways almost instantaneous, contact with regions and cultures once exceedingly remote. As technology has annihilated distance, it has also rendered the geographically exotic commonplace, causing history museums everywhere to redefine their product.

As we make voyages to the past, we see that to facilitate this kind of contact the ship has re-emerged as the most effective means of transportation available. In the long tradition of voyage literature, almost every commentator has dwelled to some extent on the nature of the ship as a closed, self-contained society – a replica in microcosm of the larger society from which the voyage derived. It is just the kind of dense, rich, and self-contained environment inherent to all ships that museum planners and exhibit designers now aspire to when they strive to create total emersion experiences for their visitors. It should thus be no surprise that as our perceptions of cascading technological revolution became the norm, when we felt we could afford it, we should choose to memorialize the achievements and great moments of our maritime past in three dimensions by the preservation of these large, complicated, and expensive artifacts. Britain, the greatest seapower of the 19th century, provides perhaps the best example of the historic ship phenomenon in such monumental projects as Nelson's *Victory* (arguably holiest of artifacts within our universal maritime reliquary) and H.M.S. *Warrior* of 1859 (said to be the first modern

battleship) at Portsmouth, and Brunel's *Great Britain* of 1842 (arguably the first modern steamship) in her original construction dry-dock at Bristol. These vessels function as monuments always have, as embodiments of national identity and pride, but their preservation and interpretation has also followed the course of historiographical emphasis from the doings of great men, to heroic waypoints in the development of technology, to objects that signify the lives and accomplishments of ordinary people acting collectively. In their function as the distillation of human experience from vanished worlds, they have once again become conveyances of ideas, taking us places we could not get to otherwise.

The preservation of maritime mementos is not unprecedented. The Greeks and Romans are said to have preserved the rams of defeated warships as trophies and the Elizabethans made a vain attempt to keep Drake's *Golden Hind* as a souvenir of the first English circumnavigation (and, no doubt, also to irritate the Spanish), a preservation effort that lasted about sixty years. However, preserving historic ships on the scale we do now of maintaining them in perpetuity, is unprecedented. To give only one indication, the third largest fleet of warships on earth is now the assortment of obsolete warships registered as ship museums by the Historic Naval Ships Association. Furthermore, members of HINSA are beginning to note with some alarm that as warship museums proliferate, they will soon collectively possess more warships than any single nation, along with the formidable responsibility of caring for them.

Nor does the phenomenon end with the preservation of historic vessels. As we know, ships in their natural environment are among the most perishable of commodities, and the ones which survive to such an advanced age that they are recognized as "historical" usually do so by odd happenstance. If we are indeed lucky in the ones we have been able to save, we certainly did not get all of the ones we may have wished for.

Except that we do, in a way, through the production of replica ships. All ships are said destined to become either wrecks or replicas anyway, and it is often the kind of choice between presenting a few bits of rotten wood that Admiral Nelson may have cast eyes on but which have now become unrecognizable, or preserving the familiar form in some verisimilitude but composed of completely new material. Disturbing as this choice may be when contemplating the gradual metamorphosis from sacred relic to replica, it is perhaps worth remembering that we ourselves manage to replace almost all of the cells of our bodies several times during the course of our lives without a loss of identity. The "idea' of the person transcends such gradual replacement, just as the "idea" of the *Victory* or the *Constitution* seems to survive countless rebuilding. To carry the biological metaphor further and into Michael Creighton's territory, if one had enough information it should presumably be possible to "clone" a ship from a vanished world, with all of its capabilities intact.

At least this seems to be the idea behind the truly unprecedented phenomena of the present worldwide ship replica movement. In the second century AD the Romans are said to have

built replicas of what they imagined were Greek Triremes for amusement, as reputedly, did Louis XVIII. However, nothing on the scale of what is now taking place has ever been contemplated before. Even as this is being written, around the world, in dozens of locations, naval architects, artisans, and craftsmen are frantically producing operational ships fully capable of performing missions that have vanished utterly, sometimes centuries or millennia ago. The project of recovering extinct ships for active duty in the present is sweeping in scope, as the following few pages will briefly illustrate.

In 1967 divers discovered a fourth-century Greek shipwreck off the island of Cyprus at a site now known as Kyrenia. Over the next several years underwater archeologists led by Michael Katsev and a team from the University of Pennsylvania excavated the vessel, whereupon it was meticulously reconstructed under the direction of Richard Steffy. Even before the reconstruction was complete, however, plans went forward to build a replica of the ship. Subsequently, the *Kyrenia II* has conducted voyages throughout the Mediterranean, and at one point was even transported to New York to take part in a tall ships event.

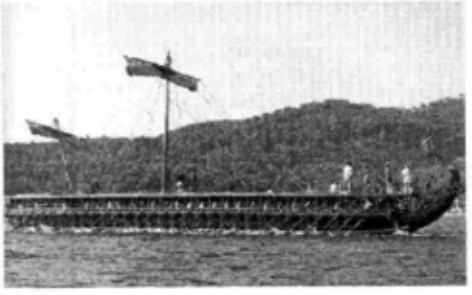
A far more complex project involved the replication of an operational Greek trireme from the age of Perecles. Bringing such a ship to life required considerable historical detective work, reverse engineering, and informed conjecture. Despite the fame of this ship type derived from the pages of Herodotus and Thucydides, there was little technical material available to draw upon to hypothesize the construction and performance characteristics for this dreadnought of the ancient world. Scholars had a few images from contemporary pottery, a few relief sculptures, the dimensions of the boat sheds of Piraeus and contemporary naval dockyard inventories which specified the lengths of oars. Unlike the sailing merchantmen of antiquity such as the Kyrenia ship, no examples of oared warships have been located in underwater sites, probably because the unballasted vessels did not sink, even when holed and flooded. The paucity of evidence stimulated endless debate among classic historians concerning what these ships were really like, especially pertaining to the arrangement of the tiers of oars. A little more clarity ensued in 1980, when the bronze ram from an oared warship of the first half of the 2nd century BC was found in an underwater site off Israel, with some of the ship's timbers yet attached. Extrapolating from such evidence, conjecture, and experiment with scale mockups allowed a complete Athenian trireme to be constructed in 1987. Following her construction, *Olympius* was immediately put into service to test operational characteristics, a process that some refer to as experimental archeology. Thus it is that we have an object that can provide physical insight to the events of the Persian and Peloponnesian Wars, a three-dimensional text to serve as a complement to the words of Herodotus and Thucydides.

In like fashion to the Kyrenia ship, when a complete Viking ship from about 850 was discovered in a burial mound located at Gokstad farm, Norway, in 1880, it was quickly excavated, conserved, reconstructed, and for several generations has resided at the Viking Museum in Oslo. Within a few years of the excavation, a replica was proposed to sail across the Atlantic for the 1892 Columbian exposition in Chicago, mentioned earlier. The voyage would presumably test the operational characteristics and seaworthiness of the original ship, commemorate the Nordic traditions of Viking voyages to America, and serve as a good natured

counterpoint to the three Columbus replica ships also expected also to make a transatlantic voyage to the exposition. Such a ship was constructed, sailed to America, and still exists. It was only the first such project, and today there are perhaps more than a dozen Viking ship replicas (most based upon the ships recovered from the Skudelev site beginning in 1962), some of them private yachts, plying their ancient routes, attending wooden boat festivals, and in general seeming to inspire a warmer welcome than might have been the case a thousand years ago.

The most important ship type of the late Middle Ages and the quintessential cargo carrier of the Hanseatic League is known to us as the cog. As with the trireme, until recently little technical information existed to suggest what cogs were actually like. A few paintings, relief carvings on church doors, and images from coins and seals suggested the general shape of such ships and hints of construction, but little of real detail. Then, in 1962, dredging operations in the harbor of Bremen on the river Wesser uncovered an intact cog from about 1380. More than six hundred years ago it seems, the ship was under construction and nearing completion when it was snatched away by a flood and buried in river mud. In the years following the excavation, the ship was carefully dismantled, reconstructed, and immersed in a bath of PEG (from which it emerged fairly recently). Before this entire process was completed, however, sufficient information had been gathered to generate two replica ships, which today sail the North Sea.

Finally, least we imagine that this phenomena exists simply to commemorate and glorify the seagoing accomplishments of western civilization, the case of the *Hokule'a* should be instructive. *Hokele'a* is a Hawaiian voyaging canoe built in 1975, originally intended to serve as a platform to test non-instrumental navigation techniques that may have been used Polynesian voyagers more than a thousand years ago. At the time of her construction, there was no definite plan of what to do with the vessel after her test voyage to Tahiti. Since that initial voyage, however, *Hokule'a* has sailed more than 100,000 miles to every corner of Polynesia, always using traditional navigation techniques. Most recently (1999) she sailed from Hawaii to Rapa Nui (Easter Island). Mover, the vessel has far expanded upon the role initially envisioned for her, serving as an ongoing educational platform for navigation and seamanship training, and perhaps more importantly, as an engine for cultural revival. She has also inspired additional voyaging canoe replicas, so that today there are no fewer than six voyaging canoes from four different Polynesian island groups making extended oceanic passages and serving as repositories of community identity.



Thus, in some cases we have ships that are recovered from the past having never quite passed out of material existence, and in others ships that are reconstructed only from the scraps of information that have survived. The point to emphasize is that never before have such an eclectic and anachronistic assortment of ships been brought together at a common point in time, as though they've been captured in a vast cultural eddy that has swirled across two and a half thousand years to deposit them in the present.

In the way of all voyages this one must now close in on its destination, proceeding from the general to the specific and to our case study, the ship project with which I am most familiar. The San Diego Maritime Museum is one of the several floating museums that utilize their principal artifacts to house everything else. Our major vessels include the steam ferry *Berkeley* (1898), the steam Yacht *Medea* (1904), our most recent acquisition the harbor pilot boat *Pilot* (1914) and our flagship, the iron bark *Star of India* (formerly *Euterpe* - 1863). The three largest ships share only one significant historical attribute: none of the came anywhere near San Diego during their working life. So, entirely in keeping with the notion of a great cultural eddy that draws together ships from all places and ages my institution is faced with the challenge of providing context. How to integrate such an eclectic and unrelated assortment of vessels into something that makes sense?

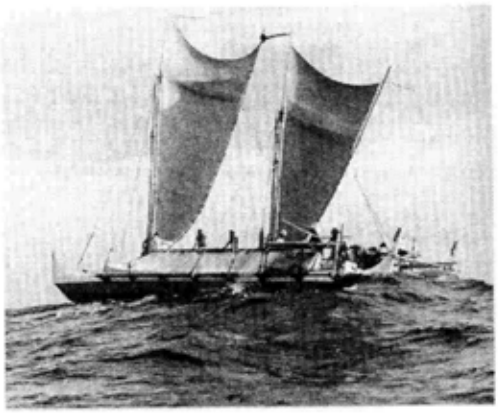
Here we see *Star of India* (then *Euterpe*) on her launching day in 1863 just a few days after Abraham Lincoln delivered his Gettysburg address. I've been told by people with better eyes than mine that it is just possible to make out an American flag waving atop her stump launching mast. (Her builders, so it seems, followed American politics and were Union sympathizers). *Euterpe* was one of four ships built to her general design, and were the very biggest ships that could be launched in the little Manx yard at Ramsey, and floated in the narrow river adjacent. At the time there were only about 100 metal hulled ships in existence, so iron shipbuilding was a rather new, if not cutting edge, process and she represented a significant investment in new technology on the part of her builders, and significant risk.

According to the insurance actuarial tables of the day, she would not have been expected to last more than about a dozen years in service, and indeed, all of her sisters lived fairly normal lifespans of about this length. Such a short lifespan was expected not because the ship would wear out, but because there was always enough chance of a catastrophe of some kind that a dozen years would more than even out the odds against her. It was a dangerous world for a sailing ship: fire, collision, stranding, navigational error, de-masting, capsizing, entrapment in ice and ice bergs themselves. Something would get her, it was almost certain, and as it actually turned out, *Euterpe* experienced each of these calamities during her lifetime, but none ever quite finished her off. Because the odds against longevity were so long, however, it wouldn't have made sense to build her so durably. And indeed, her builders certainly could never have intended or even guessed that she should still be sailing 137 years later because of a technological quirk.

Euterpe was fortunate in arriving on the seen in the dawn of iron shipbuilding, but before the advent of steel construction. This was a narrow window of only about twenty-five years and it gave her that rarest of benefits for a ship, an actual advantage to age. For, because steel is immensely strong compared to iron, the ship's structure requires much less material to achieve

the requisite strength and steel is more apt to rust and corrode in salt water than is iron. Unlike a steel ship, if she could somehow avoid coming to a violent end, or an end through neglect, *Euterpe* might last almost forever.

As a new ship *Euterpe* was a stunning triumph of technology. She could haul more than 1000 tons of cargo better than 100 miles per day, day after day, to the ends of the earth through the efforts of about two dozen men. To quantify this capacity in terms of economic throughput, *Euterpe* was capable of 110,000 tons per mile per day, roughly the same economic throughput as 15,000 horse drawn wagons. In cost efficiency, no steamship could touch her. In fact, at the time of her launch, no steamship but one could transport anything between Europe and Australia without needing to stop multiple times for fuel. The typical P&O steamer of the day, for instance, required 27 coaling stops between England and Australia. Coal was expensive, and no systemic networks had yet developed to provide it on a practical worldwide scale.

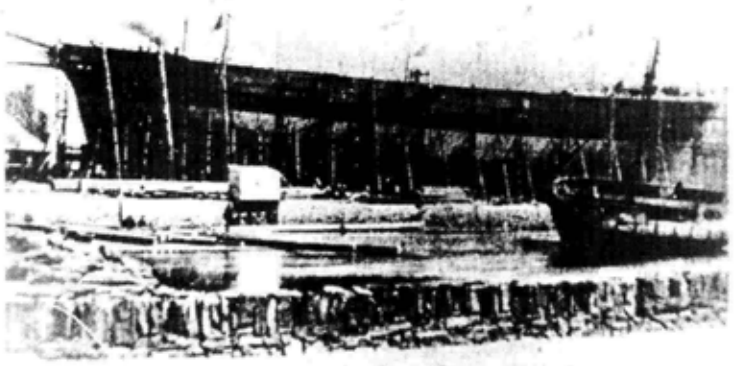


That one exception to the range limitation was Isembard Kingdom Brunel's masterpiece, *Great Eastern* of 1858. There has never been anything quite like *Great Eastern*, and she owes her freakish size and appearance to the quirky state technology sometimes assumes when, in retrospect, it seems to be reaching beyond itself. Engines of the day were so inefficient that fuel economy could only be achieved through building ships to great size. Where the typical steamer of the day was 2000 tons and the real giants were 3500, *Great Eastern* was 18,000 tons — by far the largest moving object ever to have been built, and she would remain so throughout her odd life. She was not only huge but technologically baroque, she had paddle wheels AND a propeller, and, as if that were not enough, seven masts to drive her along under a press of canvas. She certainly seemed to need the help for, of the 18,000 tons capacity, fully 12,000 tons of that was devoted to coal. *Great Eastern,* in other words, was a veritable floating coalmine. But she was not an effective ship for all her strange magnificence, and as it turned out the only occupation she pursued successfully was to lay the transatlantic cable.

By contrast, *Euterpe* benefited from 5000 years of cumulative development in the perfection of the oceanic sailing ship. In many ways, in fact, she can be seen as the quintessential sailing ship for, though they grew much larger as the 19th century progressed, and a little more sophisticated, sailing oceanic cargo carriers did not change their essential form thereafter. As mature forms, such ships were perfectly integrated within the economy and the culture that produced them, though the ancient equilibrium was about to be disturbed.

Originally *Euterpe* was intended for the carrying trade between Europe and India. But she was soon put out of that business by the Suez canal (the Suez route between Europe and India was impractical for sailing ships) and entered the immigrant trade, which took her on a succession of voyages around the world. The change of careers forced upon the ship was the first episode of a phenomenon that would rule *Euterpe's* life and in the end, come to define it more than the

storms, or the ice, or the war with Cape Horn. The phenomenon I speak of is the technological cycle of integration and displacement. *Euterpe* was a manifestation of the world's first large-scale technological system, as historians are want to define technical archetypes that sustain themselves through complex networks that achieve hegemony across geographical and cultural boundaries. We have accumulated much experience with large-scale technological systems in the last century: the railroad, the automobile, electrification, radio, television, air travel, the computer, and so on, but the oceanic sailing ship was the first such comprehensive system and it provided the facilitating technology that made the Atlantic world possible. Reflexively, the Atlantic World economy was regulated by the comings and goings of sailing ships dependent upon their peculiar source of energy - wind. As a source of power, wind is greatly variable in its distribution, availability, and intensity and this variability imposed essential criteria governing human activity: the calculated expenditure of time and resources for work, play, politics and art. In the Atlantic World, all of these were inextricably intertwined with the development of the sailing ship through the pervasive nature of wind power, the last great technological system to employ hunting and gathering as its primary means of acquiring energy. The economy of the Atlantic world was thus, by our standards, highly organic in nature, and also highly inefficient because the delivery of goods and information could never be planned for precisely. However, so long as the sailing ship was mated to other organic systems such as horse drawn transport, or human, animal, wind, and water powered machinery, it was perfectly suitable.



But like the Atlantis of fable, it was also perfectly doomed. A quarter of a century before *Star of India* was launched, the marriage of railroads and telegraph first linked London to Dover and Paris to Calais. Neither enterprise was financially successful so long as sailing ships maintained the cross channel connection between the two links. Their replacement by steam ferries, which could run to schedule, made the difference financially. On a larger scale, commercial steamship routes linking California to Panama and New Orleans to Panama were established by 1847. Again, neither route was profitable until 1855 when a railroad connected them across the Isthmus. In the first case a steamship route linked two railroads, in the latter a railroad linked two steamship routes; neither mechanized system could function efficiently with organic components.

Though we often like to portray the twilight years of the great sailing ships as a heroic but doomed challenge to a less human and less ennobling technology (Joseph Conrad, for instance, spoke of "leaving the sea to go into steam"), it is the way of myth to mute a larger complexity. Two different worlds existed for a long time in uneasy equilibrium, one organic (the

old Atlantic world) and one mechanized. For decades the two worlds ran in parallel, so that commercial sail and steam were as much complements as competitors. But each new stitch in a growing mechanized world gradually unraveled the weave of the older Atlantic world, substituting for wind a large scale technological system that could arrange the acquisition, transportation, and storage of fossil fuel for consistent and predictable expenditure by ever more integrated machines running ever more precisely to schedule. In the end, the fatal limitation in the persistence of commercial sail was not the speed or the size of sailing ships, or even of efficiency in cost per ton delivered, but effective integration with other technological components such as the railroad, the telegraph, or the weapons systems of mechanized navies. The sailing ship became incompatible with its technological context and as it did so, it became increasingly marginalized. To use a modern analogy, the sailing ship became the Beta Max carrier in a VHS world. In the life of the *Euterpe*, this unraveling was experienced as a successive retreat into ever more marginal occupations, from general carrier on prime routes, to emigrant ship, to Pacific lumber carrier, to fisheries support vessel. Above we see the *Euterpe* in San Francisco about 1901 as a participant, and not a very successful one, in the Pacific lumber trade.

At the end of her working life she belonged to a fishing consortium known as the Alaska Packers, an enterprise that specialized in squeezing a few more years of profitable life out of aged square riggers. Now known as the *Star of India,* every year between 1902 and 1923 she made a yearly migration between San Francisco Bay and the salmon fishery in the Gulf of Alaska. Each summer, *Star of India* sailed north (usually to Nushagak) with the fishing boats, cannery workers, cannery supplies and raw materials necessary to keep the enterprise going, and returned in fall before the icepack froze her in, bearing canned salmon for distribution to the American market. By the end of the First World War, the ship had survived far beyond her expected service life and was looking very tired indeed. By this time, it was fairly apparent that the days of the oceanic sailing ship and the culture that it embodied were numbered. In 1923 the Star of India was laid up out of service in Alameda estuary and awaiting her final trip to the breakers yard, the typical end for ships that had somehow survived beyond their practical service life.

But the very displacement, which rendered Star of India irrelevant to her economic context now, enfolded her from another direction. In 1926 a number of civic leaders in San Diego, notably some on the board of the San Diego Zoological Society, came to the conclusion that the fading sunset of the great sailing ships had acquired a sufficient afterglow of romance to illuminate a blighted section of the city's waterfront. Today, we might be tempted to credit them with the vision to realize that some of the meaning of a vanishing subculture could be embodied in its artifacts. However that might be, they wanted a big square rigger to symbolize San Diego's historic maritime enterprise and were not especially concerned to pick a ship that had some connection to that history. They wanted a piece of ship sculpture to ornament the waterfront and any decent looking square-rigger would do.

With only $9,000 dollars to spend, Star of India was all they could afford. Even then she was one of the oldest working watercraft in existence. Had there been more money, they might have gone for a bigger and newer ship, such as the Star of France, for they intended a multifunction installation where the ship was also to serve as an aquarium building and more room would be useful. In retrospect, it was a stroke of fortune that their resources were limited, for had they picked another ship, it would have undoubtedly been a steel ship and there might have been nothing left by now.

But as we know, they picked Star of India. Their plan was to entomb the ship behind an enclosed breakwater that would also contain an assortment of marine life. The ship herself would house a number of curiosities and aquaria attesting to the primal relationship between man and the sea. In some ways it was a typical city beautiful project of that day and fairly common even now: part monument and part attraction. It is also worth noting that this was one of the first large-scale historic preservation projects devoted to glorifying a working class object. In the days before social history, quantitative history, labor history, women's history, etc., most people regarded history simply as the recorded doings of great Caucasian men. When it came to historic preservation projects in America, we generally preserved presidents' homes, historic battlefields, and places George Washington spent the night. Contemporary big preservation projects included the reconstruction of Colonial Williamsburg, and the "pennies from schoolchildren" restoration of the USS Constitution, both beginning in 1927, the year Star of India arrived in San Diego.

Obviously, once imprisoned within her breakwater, there would be no opportunity for the Star of India to sail again. At first there was some reaction against this concept. In discussions about ways to raise money, it was suggested that the ship might be rented out to Hollywood filmmakers, who had discovered an enthusiastic audience for maritime epics. Other old square riggers were finding profitable use as movie props, but before the idea could really take hold, a local cement contractor offered what seemed like a good price for her suit of sails. Since the towing bill from San Francisco was due and no movie contracts were in the works, the sails were hoisted out of storage in the hold and Star of India assumed the role of static waterfront ornament. It was another quirky element to this story that the entire operation of removing the sails took place under the mournful

gaze a Viking ship replica built for the San Francisco Panama-Pacific exposition of 1915 and thrown in with Star of India as part of the sale.

The aquarium scheme fell to the wayside with the onset of the depression, which may have been a blessing for the Star of India, for she escaped entrapment behind the breakwater. If there was no money for such civic improvements, however, there was also no money to take care of aging and expensive ships. Star of India was particularly vulnerable because she had no real connection to the history of San Diego, she was not a famous ship or one associated with famous people, and unlike the USS Constitution, was not the victor of stirring duels with enemy frigates or the embodiment of the US Navy (the ships are seen here together in 1933, during USS Constitution's national cruise). Rather, she was a tired castaway from the lives of ordinary people, and the sad reminder of a public project gone badly. She continued to get by, somehow, in portraying herself as a curiosity.

As might have been predicted, the ship gradually sank into decrepitude. During World War II her masts were cut down because they were deemed hazardous to seaplanes. For a while, it was proposed to load her with ammunition, tow her to New Caledonia as a barge, and run her up on a beach. This plan was cancelled when she was reported to be too unseaworthy for such a voyage, a fabrication it is said, on the part of a high ranking naval officer who couldn't bear to see her end her life that way. She then became eligible as scrap for war material until a local surveyor testified that there wasn't sufficient good metal in her hull to make the exercise worth the effort, yet another benevolent and life-extending lie.

These actions bought time, while the ship continued her sad decline into an object of pity, now completely displaced from both the vanished world she was built to serve and the present one which seemed not to know what to do with its accidental legacy. By the late 1950's, the condition of the ship had reached such a state that it was clear something would have to be done, either to restore the ship or remove the embarrassment she had become from public view.

In 1957 Alan Villiers, the renowned seaman, maritime historian, and popularizer of great voyages came to San Diego on a lecture tour to promote his books. As with most public speakers, it was his custom to begin his talks with a few flattering words of gratitude for local hospitality, but when confronted with a large audience of San Diegans, including several prominent civic leaders, he took another tack. Instead of praising San Diego, he took his audience to task for letting a beautiful old ship decay to ruin on the waterfront. She was a unique and historic vessel, he argued, and if San Diego didn't know what to do with such a treasure, he was sure he could find someplace that did. Of course, Villiers was an early and enthusiastic supporter of the historic ship movement,

and had conspired beforehand with supporters of the Star of India to humiliate the city into the desired response. His remarks were duly reported in the local newspapers, amplified for effect by editorial and popular commentary. In consequence of a well-orchestrated effort to raise public awareness, the Star of India became the city's first large historic preservation project.

After a survey determined that the hull of the ship was sound, a serious and comprehensive restoration effort began under the direction of Captain Ken Renyard and rigger Jack Dickerhoff. About 10 years earlier the Maritime Museum Association of San Diego had established itself as a separate entity from the San Diego Zoological Society, and it was now the board's intention to restore the ship to a credible and authentic appearance, but not to go to the extraordinary expense and effort to put her in condition to go to sea again, for that was an objective with no foreseeable purpose. It is clear, however, in retrospect that Captain Reynard intended to make her seaworthy from the first, though he probably concealed these intentions for some time. The task of restoring the ship was indeed monumental, and Reynard's objective was at first probably easy to conceal. Even when Reynard himself began to sew the first of her suit of new sails, the stated purpose was buried within the larger question of helping the ship pay her own way. After all, more people seemed to notice the ship and come on board when sails were set.

Thus it was that as the nation looked towards the celebration of its bicentennial in 1976, San Diego found that it possessed its own fully functional square-rigger to augment the climactic tall ship celebrations. When the tall ships of the many seafaring nations gathered in New York for Fourth of July 1976, the overwhelming public response formed the largest mass celebration thus far in American history. While millions watched enthralled as the stately ships glided past the Statue of Liberty, on the other side of the continent the oldest square rigger of all prepared to go to sea for the first time in more than half a century. When the Star of India cast off her docklines on that day, vehicular traffic blocked up on every approach to the harbor and a vast armada of small craft set out to accompany her. Estimates for the crowd of spectators turning out in person to watch the ship sail ran as high as 300,000. At the end of the day, when Star of India sailed back into the harbor unassisted, rounded up to the dying afternoon breeze, and dropped her anchor off the Embarcadero, the roar from the crowd standing shoulder to shoulder was deafening. Thus it appeared that, after having been a general oceanic carrier, emigrant ship, lumber ship, fishery support vessel, and waterfront sculpture/waterfront derelict, Star of India once more had managed to circumvent the cycle of technological integration and displacement. She had obviously become a symbol of something, of what was as yet unclear, but she caused undeniably powerful feelings to

resonate in the emotions of all those who watched her complete the first of her modern voyages.

Even before the docklines were ashore, the question on everyone's mind was when (and if) would she sail again. Curiously, at that time there were no concrete plans for subsequent sailings, probably because the initial undertaking had been so all-consuming that little serious energy or thought could be spared for what was to come after. In the end, Star of India did sail again: in 1984, 1987, 1992 (twice) and in 1996 (three times). Each time the crowds turned out, each time there was a fleet of spectator craft constantly surrounding the ship. But there were also trends to this popular response that were disturbing: the mobs of spectators and escort vessels got smaller each time the ship sailed. Truly frightening, this tendency was reflected in normal gate attendance at the museum.

It was important for the Museum to know why. After all, like many similar institutions the San Diego Maritime Museum and the Star of India floated on a sea of good will and public interest. If the ship were growing less interesting, despite the spectacular and public performances she put on, the implications for the future of the Museum were not pleasant to contemplate.

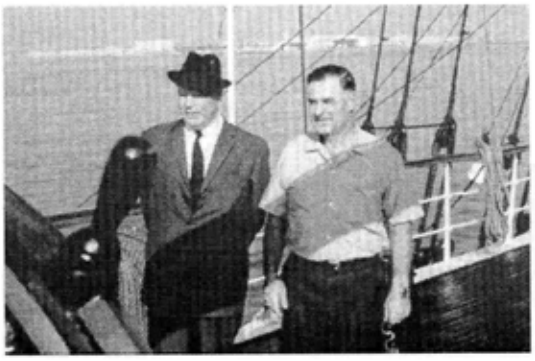
Then it occurred to us, as we examined the hundreds of photographs accumulated in the course of various sailings, that almost none of the images contained any background that distinguished the location as San Diego. The images of the Star of India under sail were hauntingly beautiful, but they might have been taken anywhere. On a philosophical scale, our manner of doing things seemed to install the Star of India as an object within a giant old-style curiosity cabinet, interesting to look at, but not particularly relevant to anything. Like so many model ships, in those photographs she seemed to be floating within a monstrous glass case, devoid of context. If indeed she meant anything, especially to the community upon whom she depended for survival, we were certainly not making clear what it was. For one thing, due to operational considerations, almost the entire public performance of sailing the ship was conducted at sea, well beyond the gaze of any really large audience. Subliminally perhaps we were sending an unintentional message that Star of India was really an experience for and about mariners only, especially those who were fortunate enough to be able to get out on a boat to watch the spectacle. Perhaps the ship and the museum were not so well integrated within the fabric of the community as we liked to assume.

The history of the ship provided ample clues to the problem. All through her life, she had flourished when most thoroughly integrated within the economy and culture of her sustaining society, surviving the long retreat to the margins of a disintegrating Atlantic world only because she found niches to integrate herself into. Testing this thesis, we began efforts to reintegrate the ship within the community by addressing an area of perceived community need that all museums are well placed to serve education. The initial phase of our educational strategy involved the

creation of a living history program we developed in partnership with Orange County Marine Institute.

Within such programs, ships provide total environments, situating the child with the frame of reference of a reconstructed past. Whereas the traditional classroom is based upon the presentation of information as abstraction, history museums provide encounters with real artifacts in real time, albeit the time of worlds long vanished. All of us experience culture shock to some extent when we step off a plane into a new country or city, and, as our minds and senses become more receptive to new sensations and ideas. In a living history scenario, however, it is a past world and a very strange world that the child encounters, where the assumptions and attitudes that govern their everyday lives are no longer relevant. The child becomes a player in an ongoing story unfolding more than a century before their own present, and as with any story, suspension of disbelief is crucial to loosing one's self in the living narrative. The ship enfolds the child with its undeniable authenticity, and the child is swept away irresistibly. What happens next is a voyage.

It is a clearly a kind of voyage that is also capable of sweeping adults away too. We had always noticed that a crowd gathered when our sailing crew trained on site, practicing sail setting evolutions and maneuvers. More people seemed to be visiting the ships on these training days, as well as during those special events, such as the Star of India's birthday, when we set sail at the dock. However, the actual impact on visitation of setting sails had never been quantified. When the History Channel asked us to set all the sail we could at the dock for a whole week in order to film one of their Great Ships episodes, we took care to measure the effect on the Museum gate.



The results were truly astounding. We found that on days when we were able to set everything to the royals (the topmost square sails) our gate numbers were about 50% higher than expected. If the wind was too strong to carry anything above the upper topsails (and it doesn't take much), the gate effect turned out to be about 25%. Thus it seemed that a mathematical relationship linked the number of visitors that came on board to the amount of sail we set. Should we ever have too many visitors, some joked, we'll simply solve the problem by reducing sail!

Setting all the sails thereafter became a public performance that drew considerable attention. People saw the ship from jetliners landing at nearby Lindberg field, from the freeway, and from other places around the horizon, sometimes from miles away. To such spectators, the activity signaled life and they came, like moths to a flame, just to be near her and get a chance to

see what must have been a rare sight even in the nineteenth century, a 1200 ton square rigger under a press of 18,000 square feet of sail only feet away (in a historical setting such a ship would have been well at sea before she had so much sail set and then it would have been dangerous to approach one so closely). We began to employ a phrase from the movie Field of Dreams: "if you set it they will come."

The physical context for the museum changed, creating a number of astonishing, even shocking, views of the ship situated within her immediate surroundings in ways that cause one to look twice, perhaps to wonder in disbelief. Headed south along Harbor Drive, for instance, it sometimes appears that Star of India is slowing vehicular traffic in the far right lane. Or, coming from the opposite direction, it often looks like she is sailing through the trees. Perhaps the view that is most striking is the approach to the bay down Ash street. As one gets nearer to the water, the bowsprit begins to protrude into the frame until finally, one is confronted with an image that seems impossible to accept, as though one were looking through a tunnel leading into the nineteenth century.

Of course there are problems to expect when you try to set 18,000 square feet of sail, even in San Diego where the wind is usually light. Among other things, Star of India is a home for many of the Museum's exhibits and has other attributes of a museum building that become problematic when she begins to heel excessively (at more than 4o of heel, the toilets don't flush). Another problem is manpower, since even with the increased attendance, it is difficult to envision that we could afford to keep a full crew employed day after day in setting and taking in sail.

Taking a page from Tom Sawyer, we resorted using our visitors to do most of the work in setting sail and taking it in. We were seeking ways to intensify the museum experience for visitors and make it more interactive anyway, and Star of India offered to provide the latest word in interactivity. There are a few caveats. We don't send visitors aloft. Sail setting exercises are conducted according to schedule, on the hour, and trained members of the professional sailing crew supervise every action. We always watch the wind. Every area of the rig to be used is regularly inspected (one by-product is enhanced readiness to sail the ship).

In consequence, people who are drawn to the ship because they saw the sails unexpectedly find themselves with a line in their hands and about to sheet a topsail home or raise a yard weighing two tons. Some of them have never been on a ship before and find themselves setting the sails on the oldest active sailing ship in the world. On days when we employ sail setting, we find that the average length of a museum visit has gone up, and return attendance has increased, as has membership.

Of course, it still remains the case that the most dramatic thing we can do with the ship is to sail her, and we have come to believe that doing so regularly is essential to her continued well being. Sailing the ship provides incentive for volunteering, stimulates membership and donor support, ensures that the ship is inspected regularly and maintained to operational standards, and keeps the ship within the eye and the consciousness of the community through news coverage and promotion of sailings. Of late, sailing the Star of India has become a regular feature of the US Navy's Fleet Week celebrations.

Yet we still faced the question of how to operate the ship in such in a way that endears her to the community. An opportunity to change the script came in 1998 when the san Diego Maritime Museum was honored with the Maritime Preservation Award by the World Ship Trust. It was an honor of sufficient stature to require something special in way of a formal presentation. It seemed fitting that we should deviate from our standard sailing regimen and sail the ship far down the narrow channel of San Diego Bay to moor at the US Naval Station for the ceremony. This was not only much further into the Bay than the Star had sailed, but more importantly, it provided a number of superb vantage points on land to view the ship at close range while under way. The occasion would provide an opportunity for the people of San Diego to see their ship, which they had lovingly restored, stand gracefully down the channel to be recognized by international authority as one of the great treasures of humanity. The shoreline of the surrounding city would provide context for the spectacle, and ample symbolism for integrating the identity of the ship with that of the city. Needless to say the wind had to be right, for there would be no room to maneuver the ship once committed to a course of action (we did have tugs standing by), and the crew trained to take in all sail in within six minutes in the unlikely event of a squall (which did occur). Our objective, was that image of the ship, which would ever after link her indelibly to the city.

There remains one more waypoint to this voyage along the shores of time. When Star of India sailed down the bay to receive the World Ship Trust award, she all but completed a transformation from everyday object to physical counterpart of myth. Through suspension of disbelief, she placed the vast crowd of spectators, once again numbering more than 300,000, within the context of her own narrative, composing a collective memory and gateway to vanished worlds. Conspicuously, she had engaged in single combat against time and dissolution, as we all must do, and prevailed. But it was a solo performance. It remained to be seen how her story would resonate with the larger worldwide context of ships preserved and ships replicated across the shores of time.

Even at that moment when Star of India passed under the Coronado Bridge, a branch of the vast eddy was swirling. By August of 1998, big plans to celebrate the sesquicentennial of California statehood in the following year were well advanced. As with the American bicentennial, a series of tall ship events to be held in California ports was planned to commemorate the anniversary and underscore California's maritime heritage. This would be the first large tall ship event to be held in the Pacific and would also serve to signify the threshold of a pacific millennium. Tall ships from all the Pacific seafaring nations were invited. Many accepted, departing from home on revised itineraries weeks before their planned arrival in California.

But by then things were starting to go wrong. The entire organizational structure of the event collapsed at the state level less than eight weeks before the scheduled arrival of the

international fleet in San Francisco. The reasons for the collapse don't matter much, suffice to say that the turn of events placed enormous pressure on the individual port cities to welcome the tall ships in a fitting manner with only a few weeks in which to compress a year's worth of planning. In each port city, some maritime related non-profit entity accepted the challenge of organizing and hosting the arrival of the tall ships. In San Diego, the only possible non-profit entity capable of taking on the task was the Maritime Museum.

For a variety of reasons that can be well imagined, the responsibility for organizing such an event, with little time and no sources of funding readily available, was frightening. However, as an organization, we attributed the rejuvenation of the institution to recognition that there was something about these ships that seemed to resonate with the human spirit. On a practical level, we believed that Star of India proved such sentiments were compelling and widely held, and that if some sort of modest admission structure could be arranged, the revenues derived would offset expenses sufficiently to stave off financial ruin. Everything hinged on a public that would respond joyously and massively if Star of India stood out to sea, met a fleet of fourteen tall ships from around the Pacific, and then sailed with them into the bay. Right to moment of their arrival, civil authorities estimated crowds at the Embarcadero would number in the range of 5,000-20,000 per day over the five days the ships would be on exhibition. We knew we would need more to make our financial commitment recoverable and hoped we were right. In the end, more than 500,000 people attended Festival of Sail, the largest public outdoor event in the history of the city. More than 40,000 came on board the ships, the maximum amount that could be accommodated.

What are we to conclude from this voyage along the shores of time? We are experiencing, I would argue, a truly astonishing phenomenon. The communication and transportation technologies of our New Atlantis have, in many ways, completed the annihilation of space and time begun five centuries ago with the invention of the oceanic sailing ship. As we come to this realization, we seem also to sense, with growing discomfort, that it was really the voyage all along which mattered and not the destination, the connecting rather than the connection. If indeed it was the voyage, which defined us, then how, is it, in a world so instantaneously effortlessly connected that we are to know who and what we are?

Such questions, of course, don't have answers. The only purpose they really serve is a review of old assumptions. I used to believe that historic preservation was essentially a grand rescue operation mounted against the wreckage of history. Once I assumed we were saving ships. I was wrong. They are saving us.

SUBMERGED HERITAGE RESOURCES STEWARDSHIP IN BRITISH COLUMBIA, CANADA

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On October 19, 1987 the government of British Columbia released a report of a Ministerial Task Force on Heritage Conservation. That report, titled "Stewardship and Opportunity" (Project Pride, 1987), summarized the results of a major review of heritage conservation policies, programs and legislation in the province resulting from public hearings in 12 communities as well as 2,900 written submissions from individuals and heritage organizations. In the report, maritime heritage was identified as a significant but an under-appreciated component of provincial heritage. It was noted that in Canada, these resources often fall under the jurisdictions of both Federal and Provincial governments. To address this situation, the province was urged to work with its Federal counterparts, to develop effective legal protection for submerged heritage resources.

During the review it was specifically noted that marine heritage resources have not received level of attention attributed to their dry land counterparts. This is primarily because of the access limitations imposed by the submerged environment. However, that situation has been changing in the latter half of the 20th Century as a result of the rapid advances in underwater technology and affordability of that technology to greater numbers of people. That relatively rapid increase in accessibility has had a significant down side, as it was noted that that in virtually every case where a wreck has been discovered along the BC coast, material has been removed limiting the future value of the site not only for archaeological study, but also for the recreational diving experience of future generations.

The understanding that submerged heritage resources have interests for multiple user-groups brought about a further recommendation that resource management must involve a variety groups both avocational and commercial as well as in both the public and private sector. These interest groups Include archaeologists, historians, recreational divers, marine biologists, collectors, salvers, charter boat operators etc.

The history of regulatory management of submerged heritage resources unfortunately, has been rooted in outdated mid-nineteenth century maritime law that was designed more for the protection of vessels and their cargo that were "in peril", than the management of submerged maritime resources. The gradual extension of maritime salvage law to cover long submerged shipwrecks has created a miasma that makes development of enlightened public policy in the area of submerged heritage resource management very frustrating.

In spite of this, the province of British Columbia took the position that submerged heritage resources were an integral part of the sea floor and therefore were on Provincial Crown lands. Unless a wreck posed a hazard to navigation, or was located within Federal Crown lands; it fell entirely within the regulatory jurisdiction of the Province. This view has been subsequently supported in R v. *Mar-Dive Corporation et al and all those persons alleging an interest in the vessel "Atlantic"*, Ontario S.C., unreported December 20, 1996 decision.

In 1994, the province of British Columbia passed a number of major amendments to its *Heritage Conservation Act.* One of those amendments was to include a "heritage wreck' to the list of

heritage resources automatically protected under the legislation. Heritage Wreck was defined to mean the remains of a wrecked vessel or aircraft where (a) 2 or more years have passed from the date that the vessel or aircraft sank, was washed ashore or crashed, or (b) the vessel or aircraft has been abandoned by its owner and the government has agreed to accept the abandonment for the purposes of the Act. Heritage objects including heritage wreck can not be damaged, desecrated, altered or removed without a provincial permit. This heritage protection is arguably the most extensive and strongest wreck protection in the world.

The British Columbia *Heritage Conservation Act* however is designed only to be a tool to help facilitate and encourage the protection and conservation of the province heritage resources. Legislation in and of itself cannot provide absolute protection or conservation of all such resources; those objectives require the support and assistance of the larger community. In fact, the 1994 legislative amendments would not have been possible without the strong grassroots support of the diving community and the avocational underwater archaeologists who want to preserve wrecks for recreational, and scientific opportunities. In British Columbia, that support exists because of the public organizations such as the Underwater Archaeological Society of British Columbia (UASBC) which has maintained a primary focus on education and inventory of the province's submerged heritage.

While legislation provides a backdrop for the protection and conservation of resources, it must be accompanied by coordinated resource management process to be effective. One of the first steps in any resource management program is to begin to inventory the resource base. In this regard, the provincial Archaeology Branch as the agency responsible for administration of the provincial heritage law, relied upon a longstanding relationship developed between the Archaeology Branch and the UASBC, the province's largest avocational diving organization.

As a means of providing interesting and informative diving experiences to its members, the UASBC initiated a series of systematic wreck site inventories on a regional basis. Much of this work has been funded by the BC Heritage Trust, a provincial heritage grant-funding agency.

As the number of wreck sites being recorded began to increase through those surveys, the need to standardize recording practices and formats became apparent. This gave rise to an initiative in late 1990 between the Archaeology Branch and the UASBC to develop a comprehensive shipwreck recording form and guide resulting in the publication of the *British Columbia Documenting Shipwrecks / Shipwrecks Recording Guide* (Archaeology Branch, 1991).

One important consideration in developing a cohesive recording system, to be used by both professional and avocational diving groups, was the recognition that each group would have different interest levels with respect to technical documentation. If an integrated system was to be developed it should accommodate both frames of reference. Academic researchers normally require considerable recording documentation, while recreational enthusiasts, often the first to find submerged heritage resources, may not be inclined to spend a lot of time to perform detailed recording. To address this point, the new recording process embodies two recording levels, a Basic format for avocational divers, and a Detailed Format for professional researchers.

Over the years, the UASBC membership has promoted the need for public regulatory programs to facilitate the conservation and protection of resources. At the same time, the Archaeology Branch has acknowledged that avocational groups can, and are, willing to provide dedicated, high quality program assistance.
By working co-operatively with the Archaeology Branch and other stakeholders interested in maritime heritage resources, the UASBC has attracted the interest of diving enthusiasts, not only

in marine waters, but also the province's inland waters. This expanded community, industry and government base, has resulted in a number of regional shipwreck inventories and exploration reports (Marc, 1989, 1990, 1997,1999; Stone, 1993,1994; Delgado, 1997), and has lead to the involvement of professional archaeologists. It has also resulted as well in the recognition and recording of numerous submerged heritage resources beyond shipwrecks, such as submerged ancient shorelines with associated archaeological occupation sites, submerged train wrecks, plane wrecks, ancient canoes etc.

This marriage of professional resource management and research with avocational interests has worked very successfully with the best interests of the resources being the common goal. We have found that working with non-profit avocational organizations such as the UASBC also open up partnership opportunities with private sector corporate businesses not fully available to government regulatory agencies. This approach has resulted in initiatives between the UASBC and many stakeholders, including universities, subsea technology firms, the recreational diving industry (stores, charters, certification agencies), and museums. Those joint projects have included numerous high-tech searches, conferences, educational seminars, and films. The UASBC and Simon Fraser University cosponsored the Society for Historical Archaeology's Annual Conference in 1994 in Vancouver. In 1992, the UASBC did a 5 day high-tech survey of the Vancouver Harbor with about 6 corporations, and government agencies providing all of services for free.

We feel that there are a number of exciting opportunities potentially available as we enter the next millennium. By expanding the collaborative multi-interest group approach to submerged heritage resource stewardship, underwater archaeology in particular can focus on broader multi-disciplinary studies such as the geomorphology of submerged shorelines and biological colonization regimes. By working together and with an educational format at the community level, our knowledge of submerged cultural resources has significantly increased and the resource has greater protection.

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Author's note: Further information available from Archaeology Branch web site: www.archaeology.gov.bc.ca

ARCHAEOLOGY OF PACIFIC RIM GEOPOLITICS THROUGH SHIPWRECK STUDIES

Roger E. Kelly, National Park Service

INTRODUCTION

Archeological techniques have been applied to maritime history for several decades. To locate, identify, and study the tangible evidence of sailing vessel losses, disasters, and human misfortunes is one application of "Underwater Archeology" which has broad public interest (see Green 1990, Gould 1983). In recent years, attention has been paid to 'treasure ships', to retelling the drama of the TITANIC loss, or to re-examine a world-shaping naval event such as sinking of the MAINE a century ago.

But westward from our Pacific coasts, the study of early geopolitics between European nations from maritime archeological evidence is a different challenge. In the Pacific Rim region, archeological discoveries not documented well, wrecks investigated are widely scattered in the region, and information is difficult to compare to the Caribbean, Atlantic or Mediterranean areas. Tracing early European presence is an important theme to five National Park Service units in coastal California, including Point Reyes National Seashore. There, an interagency team, has been searching for the 1595 Spanish galleon SAN AGUSTIN for several years (see Aker 1965, Murphy and others 1984). Her loss and her Captain - Sebastian Rodriguez Cermeno - bring 16th Century Pacific Rim maritime geopolitics to our doorstep as do Drake, Cabrillo, and others.

Since the early 1980s, continuing field projects at Point Reyes have utilized state-of-art electronic methods to discover the SAN AGUSTIN and other shipwrecks. New technology allows for better communication between divers and non-divers as inspections of the submerged lands are made and to generate computer maps of suspicious magnetic anomalies for verification work. From archeological work underwater and on land at Point Reyes, we believe we can significantly add to the historic story of exploration and cultural interaction between natives and visitors to our shores during the late 1500s.

MARITIME TRADE NETWORKS AND VESSEL LOSSES

Ships are like needles, weaving threads of commerce and culture between nations. The maritime thread connecting Mexico to Manila via Alta California was of course the galleon trade, lasting more two centuries over several thousand miles of ocean (Schurz 1939).

The SAN AGUSTIN was part of this early linkage between Pacific Rim nations, which we can study from several disciplines - naval architecture, economics, art history, maritime archival research and archeology (see Keith 1988). Of the hundreds of Dutch, Portuguese, Spanish, English, Chinese, and other ships sailing in the Pacific Rim during the 16th and 17th Centuries, a large number were lost to due to a variety of causes. A recent atlas of shipwrecks indicates that a minimum number of 130 vessels were documented losses during this two hundred year period (Pickford, 1994).

We can estimate the minimum rate of vessel loss for each national power sailing in the region. For example, during this two century period, at least 32 Portuguese ships were lost, 39 Spanish ships were lost, 39 Dutch vessels lost, 8 English and 5 Chinese vessels lost (see Pickford 1994).

Many of Spanish and Portuguese wrecked vessels (97) carried major cargo of specie or silver coinage bound for Asian silk exchange (see Flynn and Giraldez 1996). Thirty-two lost vessels carried cargo of Chinese porcelain and/or gold objects bound for Mexico and Europe. At least 12 lost vessels carried 'treasure', that is, looted cargo or prizes taken from land sources. Finally, only 2 lost ships carried the well-known "pieces of eight" as basic cargo. Of course, maritime technology, ships' armament, personal possessions of officers and passengers, subsistence supplies and ship's stores make each lost vessel a time capsule for its period and nationality, if found intact. Since cargo and ship's equipment were very valuable, salvage at the time of loss occurred at 22 wreck locations, by crews of each nation and in also modern times by salvage firms as economic investments.

From this minimum number of vessels lost during these two centuries, one might suspect that a great deal of research has been completed. But only a few shipwrecks for this period in the region have been researched using archeological or other systematic methods! This is a much smaller number of investigated shipwrecks than those known for the Caribbean, North Atlantic, or Mediterranean regions.

SHIPWRECKS INVESTIGATED

Although only a minimal number of wrecks have been studied, the examples noted below are suitable comparisons to the search for the SAN AGUSTIN. These excavated 16th and 17th century wrecks give real examples of what to expect hundreds of years after the loss, in different coastal environments and from different wreck events. The best known wrecks are these:

NUESTRA SENORA DEL PILAR DE SARAGOSA Y SANTIAGO 1690

Known -as the "Pilar Wreck" of Cocos Island, Guam, cannon, specie, anchors and 5000 pesos were salvaged from the vessel shortly after the loss. But underwater archeology in 300 years later produced iron rods, spikes, 47 ballast stones, musket balls, and coins spread over a long area of Guam coastline. No vessel architecture was preserved and only a few types of artifacts were recovered (Mathewson 1992).

NUESTRA SENORA DE LA CONCEPCION 1638

The CONCEPCION was a 2000-ton vessel, probably 140 to 160 feet long with a draft of 18 to 22 feet and was lost along Agingan Beach on the south coast of Saipan. In 1684, 35 or 36 cannon and 7 of 8 anchors were salvaged. The vessel carried silks, porcelain, ivory and jewelry; 1300 pieces of gold jewelry were found in 1988, as were Asian stoneware storage jars, cannon balls, porcelain, and other artifacts. Very little naval architecture was preserved (Mathers, Parker and Copus 1990; Mathers, Shaw and Wygant 1993). A large collection of artifacts has recently been purchased by the Government of Commonwealth of the Northern Mariana Islands for public display in the Commonwealth Museum of History and Culture. Remaining artifact collections are in private ownership, according to salvage agreements.

SAN DIEGO 1600

The SAN DIEGO lost a naval battle with a Dutch East Indian Merchantman and was a 700 to 800 ton vessel, 35 to 40 meters long, and 11 to 12 meters in beam. She was an older merchantman or 'nao', converted into a ViceAdmiral's war ship. In 1992-93, hull timbers and ballast resting on coral sands in about 50 meters of water were found and over 5,000 artifacts were recovered (see Desroches, Casal and Goddio 1996). Analysis of the surviving ship's architecture is very

important to Pacific Rim shipwreck projects since the vessel was probably built on Cebu Island, from 6 species of woods still found in the Philippines. The SAN DIEGO is probably the closest 'sister ship' to the SAN AGUSTIN, although much larger, and was refitted with additional gun ports and cabins which made the vessel overloaded and out of balance for proper buoyancy.

Because there are no drawings or plans extant for the SAN DIEGO, computer modeling was used with 16th century Spanish shipbuilding formulas to reconstruct her lines from detailed measurements of the surviving ship's architecture. The large artifact collection included Ming porcelain cargo, armament and weapons, coins, jewelry and personal ornamentation; devotional objects, and navigational items. Even skeletal remains of the lost crew were available for assessment and sufficient archival information allowed reconstruction of the naval battle and daily life aboard

BATAVIA 1629

This Dutch East Indian Merchantman was lost offshore of Western Australia and was thoroughly researched in 1972-1974. She contained many porcelain pieces, lead seals for silk shipments, armaments and ships equipment, and many personal items of her officers and crew (Green 1975, 1989). Although partially salvaged soon after the wreck, the artifacts and ship's architecture as documented are very useful comparisons (Baker and Green 1976). Murder, mayhem, mutiny, and fate of castaways make this wreck a classic 17th century tale of human drama (Pickford 1994). Several other vessels have been investigated but with less detailed reports (see Pickford 1994):

SANTA MARGARITA 1601

This vessel was lost on a reef of Rota Island in the Marianas and was partially investigated in 1996. Copper ingots, porcelain, stoneware fragments and a few items of jewelry have been recovered, but the ship was salvaged at time of loss also. In 1998, the Northern Marianas Commonwealth government approved a contract for continued fieldwork by professional archeological staff. The contract includes a 25:75 percent distribution of collected artifacts between the Commonwealth and IOTA Partners, a salvage firm.

VERGUILDE DRAECK 1656

A Dutch East Indian Merchantman, this vessel was investigated by salvers in 1963 who recovered lead, ivory, and ten thousand silver coins. Some of these artifacts are on display at the Freemantle Museum (Australia) but others were sold at Christie's auction house in London. No documentation of ship remains was made (Pickford 1994).

HATCHER WRECK Ca 1643 - 1646

Somewhere in the South China Sea, about 1980, Captain Michael Hatcher conducted commercial salvage operations on a shipwreck believed to be of Chinese origin. He was able to recover 25,000 pieces of unbroken Chinese porcelain in many styles and forms, which were later sold by Christie's in Amsterdam in four sales events during 1984. While a technical description of the porcelain cargo has been published, no further information is extant regarding the vessel or other artifacts observed (see Sheaf and Kilburn 1988).

VUNG TAU WRECK Ca 1690

This Chinese wreck is known by a Vietnam name due to its location, 100 nautical miles from the modern city of Vung Tau. Ships architecture remaining showed a vessel 110 feet long and 33 feet in beam whose hull, keel and sternpost illustrated Western influence. The vessel also has evidence of Chinese shipbuilding methods in terms of bulkheads, stepping of the masts, and use of caulking materials. But the amazing cargo recovered by a Swedish salver in 1990 included over 1000 multiple lots of 'blanc-de-chine' porcelain, later sold at Christies in London for $7 million dollars! This wreck also contained a smaller number of utilitarian artifacts (see Pickford 1994).

FLOR DE MAR 1511

This Portuguese 'caraval' loaded with treasure from the port city of Melaka on Malaysia was returning to Goa, India, but ran aground on a reef along eastern Sumatra. Currently, an Indonesian salvage company has found only tin coins and a few other objects and the wreck is disputed between the governments of Indonesia and Malaya (Pickford 1994).

SUMMARY

From these examples, complexities of studying Pacific Rim geopolitics during the 16th and 17th Century from shipwreck evidence are apparent. Even with known numbers of lost vessels from five nations, the vastness of the region, its weather and landform patterns, and competing interests of economic salvage with historical research are basic factors. Since our interest is in one lost vessel, the SAN AGUSTIN, four wrecked vessels do provide useful comparisons. From the studies of the SAN DIEGO, PILAR, BATAVIA, and CONCEPCION, sufficient data exists to address six basic themes:

> a) Naval Architecture as practiced in the Pacific Rim during the 16th-17th centuries in Spanish shipyards, using local woods and labor, guided by skilled Spanish shipbuilders; b) Degree of preservation - of lack of it - at a wreck site over 300 to 400 years and what may be anticipated in terms of a ship's key elements of rudder, hull and keel construction, ballast, armaments, cargo, and personal equipment; c) Events leading to vessel loss, from weather, warfare, lack of nautical knowledge or experience, or overloading; d) Post-wreck salvage and survivors' experiences on land with or without interaction from native peoples; e) International significance of ships' remains to modern nations in whose waters these ships sailed centuries ago; f) To construct models for public display, based on expert naval architecture and archeological discoveries (see Steffy 1994).

The SAN AGUSTIN may or may not be found but the saga of early European and various Asian nations' interactions in the Pacific Rim is the larger story of beginnings of the modern Era, told through shipwreck studies.

Clearly, shipwreck salvage in vessels similar to these is driven by modern market interest in antique Chinese porcelain as ceramic art with the added aura of shipwreck associations. And jewels, gold, silver, and other intrinsically valuable artifacts aboard some wrecks add considerable interest to the commercial salver. Larger historic objects such as bronze or iron cannon, cannonballs and ship's fittings also command prices as relic artifacts. Certain laws of some Pacific Rim nations provide for a distribution of artifacts recovered from wrecks among governments, private investors, and maritime salvage firms, thus separating recovered materials into disparate collections (see Kelly 1987, 1988).

As a balance to economic interests are the historical, archeological, and national heritage interests of Pacific Rim region early shipwrecks. Detailed publications containing as much information about the vessels, recovery methods, and collected artifacts and items of technology should be conditions of government permits. Portions of shipwreck artifact collections should be on public display and curated with necessary conservation methods. Funds for such reports and displays need to be identified in the permit process as well, with additional partnerships for preservation.

On a global scale, the ICOMOS draft "Charter on the Protection and Management of Underwater Cultural Heritage", released for consideration in 1996 at the 11th ICOMOS meeting in Sofia, Bulgaria, has been expanded into 24 Articles. During late June of 1998, a Paris meeting of governmental experts on submerged historic heritage was to complete a final draft for broad adoption by UN member nations. This expanded Charter, if implemented by Pacific Rim nations consistently in the future, will enhance discovery, identification, study and recovery of wrecked vessels representing the global importance of early geopolitics among nations in Asia, which continues to the present era.

Agency name is provided for identification purposes only: the author has expressed his professional opinions only, not policy or position of the National Park Service.

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PROTECTION OF UNDERWATER HERITAGE

By Olaf Engvig, Burbank, California

A ship at sea is a self-sustaining social system. It reflects the time and area where it belongs. It also often contains cargo of some sort. When a ship is lost it becomes a time capsule with artifacts. If we allow it to be left alone, only the elements of nature will have an impact. In a high-energy area close to the shore, a ship may be broken up and its contents scattered in a matter of days. Over time artifacts may disintegrate but some will survive. On the other hand, a ship may settle on the bottom and be protected by the environment in such a way that it is complete and nearly seaworthy centuries later if leaks or other causes of sinking are repaired.

An actual site of a shipwreck will usually fall somewhere between those two possible scenarios. Marine archaeology has shown that surprisingly many artifacts and pieces from a wreck are found even in an area where one would expect little to remain centuries later. Any site contains information for the experienced scholar. Such an area would provide knowledge about the past for generations to come. Like a crime scene, it produces specific data that could support or correct old written sources or yield more precise information than previously known. For example, the pig bones of the frigate LOSSEN excavation told us that the best meat on the pigs were cut away before it became ship's provision. Officers of the Royal Danish-Norwegian Navy had no cutlets for Christmas 1717!

Furthermore, many ships go down with the loss of human lives. Remains of crew and passengers may still be on the site. Sometimes, as in great known disasters, the site will be declared a maritime grave, warning people not to disturb. But in most cases this ethical problem is bypassed by pretending that as long as it is underwater, grave robbing is legal. Hundreds of steerage passengers were trapped inside the TITANIC when she sank. Their remains are still there. Pieces and artifacts from the ship are picked up or broken off and salvaged. It could best be compared to picking valuables and souvenirs from a cemetery at night.

This has created a dilemma for people trying to learn from the past when an old wreck site or a submerged piece of land is accessed. The invention of SCUBA-diving equipment has opened up a new entrance to history along with the possibility to do great damage by the first ones to get there. It is tempting to try to find and keep items as souvenirs or to get compensation. The finders-keepers rule is often claimed even if there are clearly many differences in finding lost valuables on land compared to discovering a wreck site at sea. A time capsule with items untouched for centuries belongs to everyone, not just the person who discovers it. It often has great interpretive value. To interrupt is an environmental crime. If this could be paralleled on land it would be the treasure digging and grave robbing of archaeological sites from Egypt to China, Viking graves or Indian sites. We regret today that they have been disturbed.

Educational institutions from kindergarten to Ph.D. programs, museums and collections, as well as public entities have an obligation to inform citizens about this so our own and future generations "get it right". There are many sport divers and professional wreck hunters trying to discover a treasure ship from the past. Very few will make a sensational find such as the three sport divers off Rundo in Norway in 1972. By chance, and in a highly exposed area, they found 56,433 gold and silver coins from a ship that sank in 1725, valued at millions of dollars. Such a find is extremely rare. Excavation showed that the area contained many other remains from the ship including the 40 guns she carried.

Education of divers is important. It is imperative that they are informed about the diving environment they are visiting and that they respect shipwreck sites. If they find a new site, divers should be recognized with appreciation and perhaps receive a proper compensation if they leave everything in situ. They have discovered a part of our common past, for scholars to investigate and for our children to visit in the future if protected and kept undamaged.

Some nations have come a long way in trying to save their common past by laws, enforcing them by catching poachers, confiscating finds and equipment, prosecuting, fining and expelling those divers that violate the law. International bodies are now working to find a common approach to the protection of sites even in international waters. Costly expeditions have proven that it is possible to recover "Stalin's Gold" from deep inside a World War II warship on the floor of the Barents Sea or reach to the depth of the TITANIC. Not addressed on a large public scale are the ethical questions related to disturbing a graveyard underwater.

Finds at sea open up many new possibilities for information, education and public outreach. But it is up to us to set the rules so that old sites underwater are protected to benefit generations to come.

SECTION TWO

NEXUS OF SHORELINE AND OFFSHORE WATERS

"Shipwrecks as resources for local populations" is Kent Lightfoot's theme, using several known examples from California's coastal zones. Over long periods of time, Kent argues that native people and newcomers alike took advantage of shoreline wrecks to gather useful materials, and therefore changed their lives from these accidental finds.
David Chappell weaves many similar stories of non-native castaways or deserters who became living connections between distant cultures in the far Pacific, and who were self-defined cross-cultural innovators. These stories have been the stuff of Hollywood films as well. Kim Esser takes us to a fresh water maritime landscape in the Sacramento River delta where historic farming and ranching are linked to waterway transportation and transformation of marshlands. Adapted to the rugged West Coast shoreline, historical development of the lumber schooner is provided by Aaron Golbus who notes how these special vessels were built in coastal shipyards and became the only connections between isolated coastal communities and sawmills for many decades.

SHIPWRECKS AS COASTAL RESOURCES: NATIVE SALVAGING PRACTICES ON THE CALIFORNIA COAST

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INTRODUCTION

The Pacific Ocean has provided sustenance to many generations of coastal native peoples in California. Over thousands of years, native hunter-gatherer-fisher peoples have learned to be very opportunistic in harvesting a diverse range of resources from the sea. Recent archaeological investigations document human use and occupation of the Channel Islands and southern mainland extending back at least 9,000 to 11,000 years. In the greater San Francisco Bay, impressive shell mounds extending hundreds of feet in length and rising 20 to 30 feet above the bay shore were first constructed by coastal peoples 4000 to 5000 years ago. Along the north coast, where archaeological evidence for coastal occupation is somewhat later than the south, the earliest known shell midden dates back about 8000 years at the Duncans Point Cave on the Sonoma coast. By the time the first European voyagers ventured into California waters (between 1542 and 1603), much of the coastline was dotted with the villages and seasonal camps of sophisticated maritime peoples who were very adept at exploiting a plethora of sea mammals, fish, shellfish, and marine plants for food, medicines, tools, raw materials, and ceremonial objects.

Yet California maritime peoples did not limit their harvesting to only the natural bounties of the sea. The purpose of this paper is to make the case that disabled vessels and shipwrecks should be viewed as yet another kind of coastal resource that was exploited by native peoples for many hundreds of years (see also White Wolf James 1994:24-26). Shipwrecks not unlike the occasional whale that washed upon shore, afforded substantial windfalls to local native peoples who salvaged the contents of the vessels, as well as the timbers and hardware of the ships themselves. I begin by suggesting that native salvaging of stranded vessels in California was probably not limited to European and American ships in the historic period, but may have been a common practice going back into deep prehistory with native ocean-going canoes and even Asian fishing boats. I then consider the earliest European ships that plied California waters in the mid-to-late 1500's and how these exploration vessels and Manila galleons occasionally became grounded on rocks and reefs or blown to shore during storms. I also outline several documented cases of native salvaging of shipwrecks that date from 1595 to 1850. I conclude by emphasizing the diversity of artifacts exploited from stranded vessels and the long duration in which this practice has taken place along the shores of California.

EARLY VESSELS ALONG THE CALIFORNIA COAST

There is probably an extensive time depth to native salvaging of useable materials from disabled vessels in California. While the first recorded shipwrecks for California date to the late 16th century, it must be emphasized that native societies inhabiting the coastal zone constructed and used ocean-going watercrafts for many thousands of years, and inevitably some of these vessels were stranded on distant shores in turbulent weather. Ocean-going boats may date back to the initial peopling of the Americas, as there is growing consensus that this migration involved multiple waves of peoples from diverse homelands, some of whom probably used watercrafts to cross north Pacific waters (or even north Atlantic waters) during the last ice age (see Erlandson 1994:267-269; Wilford 1999). The initial settlement of the Channel Islands between 9,000 to 11,000 years ago probably required an ocean trip of at least a few miles to the northern islands,

and a 50 mile voyage in open seas to the southern island of San Clemente (see Jones 1991:425, map of southern California shorelines at 10,000 B.C. and 15,000 B.C.). The large plank canoes (*tomol*) used by southern California peoples to ferry people and goods between the mainland and the Channel Islands were reportedly in use by about the sixth or seventh century A.D. Canoe remains from mortuary contexts, as well as canoe-making localities consisting of macrodrills, redwood, asphaltum cakes and plugs, and tarring pebbles, have been unearthed in several prehistoric sites (Arnold 1992:71-74; Hudson et al. 1978; Olson 1930:18). The large ocean-going canoes built and used by the northwest coast peoples of California to visit offshore rock and island rookeries date back to prehistoric times as well (Fredrickson 1984:483-484).

Sudden squalls, rough waters, and contrary winds must have marooned some native vessels in unknown or hostile peoples' territories. One can imagine that crews paddling plank canoes to and from the Channel Islands were periodically blown off course or capsized by unpredictable Pacific gales. The people, who crewed the large dugout canoes of the northwest coast, while they tended to stay close to the coastline, probably shared a similar fate in stormy weather. There is also the possibility that Chinese and Japanese fishing vessels were occasionally transported by major tempests to the coast of California at an early date. There are several recorded examples of major storms driving Asian fishing ships to the California coast in the 1800's (e.g., Heizer 1941:323). While such wreck events remain undocumented for prehistoric California, it seems likely that native peoples would have periodically discovered stranded vessels on their beaches, as well as strange crews from distant homelands who survived the unexpected landings. Even more common would have been the finding of buoyant objects from the cargo of capsized canoes or even fishing gear from Asian vessels that washed up on beaches.

EUROPEAN SHIPS IN CALIFORNIA WATERS

The first documented shipwrecks on the California coast in 1595 was a consequence of Spanish exploration and the Manila galleon trade. With the opening of the Philippines to Spanish commerce in the mid-1560's, there began a concerted effort to find a safe route across the Pacific for merchant ships laden with Asian goods. In 1584, Francisco de Gali discovered a northern course across the Pacific that followed the favorable warm waters of the Japan Current that would transport Manila galleons to the northern coast of Alta California, often within sight of Cape Mendocino (Richman 1911:14-16). Once in California waters, the galleons would set a southern course to Acapulco, today's Mexican port that flourished earlier during the Manila trade. The captains of the merchant galleons tended to steer a wide berth along the California coastline given the many islands and shoals, dense fog, and unpredictable squalls (Schurz 1917:107-108). However, after the devastating voyages of Francis Drake (1578-79) and Thomas Cavendish (1587) who plundered Spanish shipping in the Pacific, it was recognized that a port in Alta California was needed to provide protection for the Manila galleons, as well as a place where ships could be repaired and sailors could find some relief from scurvy (Bolton 1916:43-44). Subsequent explorations of the Alta California coast by Sebastian Rodríquez Cermeno (1595) and Sebastian Vizcaíno (1602-1603) and their crews were initiated primarily to produce better charts of the northern California coastline and to locate potential ports for settlement. Although the ports of Monterey and San Francisco were not settled until 1770 and 1776, respectively, the King of Spain did decree on May 16, 1776 that Manila galleons should make use of these harbors en route to Mexico (Richman 1911:186-187).

While most Manila galleons supposedly kept their distance from the California coastline, the long and arduous voyage across the Pacific forced some ships to make landfalls for repairs and to take on drinking water. Before the shoreline was accurately mapped, the risk of running aground on treacherous rocks and sandbars was great. While the loss of their merchant ships was not widely

disclosed by the Spanish Crown, there are several reported shipwrecks of Manila galleons along the Alta and Baja California coastlines (see Johnson 1982:20, 30-32; Walker and Hudson 1993:20-21). Explorations of California waters were also dangerous, as Sebastian Rodríquez Cermeno learned when his ship, the *San Agustín*, was broken up during a sudden storm while anchored in Drake's Bay in 1595. In addition, vessels from other European nations were also exploring the Pacific coastline, in direct contradiction to Spain's territorial claims, and the subsequent shipwrecks that took place tend not to be very well documented for geopolitical reasons. For example, Erlandson and Bartoy (1996:305) report that a Portuguese ship was stranded on the Oregon coast in the 1630's.

NATIVE SALVAGING OF EUROPEAN AND AMERICAN SHIPWRECKS

When the first Manila galleons became disabled along the California coast in the late 1500's and 1600's, they would have presented a substantial bonanza of goods and raw materials to native peoples. Wreck events could have dispersed goods along nearby beaches and offered the possibility of salvaging cargo, as well as the wood and hardware from the vessels themselves. Interestingly, as the following three examples indicate, native salvaging of wrecks continued over a period of more than three centuries in California.

1) *San Agustín* (1595). Native salvaging of the wreck of the *San Agustín* in Drake's Bay is well documented by eyewitness accounts and archaeological investigations of native villages in the nearby area. When the ship was lost in Drake's Bay in November 1595, Sebastian Rodríquez Cermeño was able to take his stranded crew to Mexico in a small launch (Aker 1965). Before they embarked to Mexico, the Spanish sailors attempted to stop more than 20 local natives from salvaging wood from the wreck. A fight erupted and at least one Spaniard was wounded (Wagner 1924:23). Once Cermeño and his crew departed Drake's Bay, it is clear that the local Coast Miwoks scavenged the wreck and combed the nearby beaches to recover pieces of the cargo that originated from Manila, as well as wood and iron implements from the vessel itself. Archaeological field work in the greater Drake's Bay region, in what is now the Point Reyes National Seashore, has unearthed more than 800 European/Asian objects that were collected by native peoples and transported to 17 nearby villages and camp sites (Meighan 1981:55; Shangraw and Von der Porten 1981,1997). The materials recovered from these archaeological contexts include decorated Chinese porcelain sherds, fragments of Indo-Chinese stone wares, pieces of Spanish colonial terra-cotta wares, bitumen, square-shanked and hand-forged iron spikes, and small metal objects that may possibly be a crude compass needle and square-headed nails (see Von der Porten 1963; 1970; Shangraw and Von der Porten 1981). Shangraw and Von der Porten's (1981:13, 1997) detailed analysis of the ceramics indicate that many of the porcelain sherds came from various sized bowls, plates and vases that were manufactured during the Ming Dynasty's Wan-li era (1573 to 1619). While some of these artifacts may have originated from the voyage of Francis Drake in 1579, it appears the majority of the European/Asian materials recovered from nearby native sites were salvaged from the timbers and cargo of the *San Agustín* (see Lightfoot and Simmons 1998:156).

2) Santa Catalina Island (1602). As part of their exploration and mapping of the Alta California coastline in 1602-1603, Sebastian Vizcaíno and his men visited Santa Catalina Island off the coast of southern California. As recorded in the official diary of the expedition, on November 30, 1602 they met a native women who showed them two pieces of figured China silk that were in fragments (see Bolton 1916:85). She told them that the silk had been obtained from people just like the Spanish voyagers who were accompanied by one or more black persons. They had come on a ship "which was driven by a strong wind to the coast and wrecked, and that it was farther on" (Bolton 1916:85-86). Evidently, the Santa Catalina people knew where the vessel was

located, as Vizcaíno asked two or three Indians to go with him to show him the wreck. The native guides, who were to be paid in clothes, refused to go on the Captain's ship and left in a separate canoe. Unfortunately, immediately upon leaving port a strong head wind struck Vizcaíno's ships and they were unable to go in the direction indicated by the native guides, who subsequently returned home to Santa Catalina Island. It is not clear whether the shipwreck in question was the *San Agustín*, or another Manila galleon that had been lost closer to Santa Catalina Island. While Cermeño and his crew made landfalls on some of the Channel Islands (e.g., Santa Rosa and Santa Cruz Islands) following the wreck of the *San Agustín* when they sailed their launch to Mexico, there is some debate among historians whether they ever visited the people on Santa Catalina Island (see Wagner 1924:6). Given that the native guides of Santa Catalina were willing to take a small canoe to the wreck site, I tend to think that this vessel was situated closer to the island than Drake's Bay and was not the *San Agustín*. It is interesting that during Vizcaíno's visit to Santa Catalina Island in 1602, Father Ascención (a priest who accompanied the voyage) noted that some of the children of the island were white and blond, indicating a possible connection with shipwrecked sailors or previous European explorers (Wagner 1929:237).

3) *Frolic* (1850). Thomas Layton's (1990, 1997) exhaustive research on the shipwreck of the *Frolic* is the best-documented example of native salvaging on the California coast. The *Frolic*, a Baltimore clipper that was built in 1844 especially for the opium trade, was carrying a "veritable emporium" of mid-1800's Chinese export goods to the California gold mines when she ran aground at Point Cabrillo on the Mendocino County coast on July 25, 1850. Her 135-ton cargo included assorted Chinawares, jewelry, furniture, paintings, silks, camphor-wood trunks, silverware, 6108 long-necked green bottles of Edinburgh ale, and even a prefabricated house (Layton 1997:134-136). When the Frolic sank about 75 feet from shore, she was initially salvaged by the local Mitom Pomo who combed the nearby beaches for materials that were washed ashore and who swam out to the wreck to recover objects. However, word quickly spread about the sinking of the ship from the crew who survived, and local Euro-American ranchers began to plunder the remains of the wreck. By the spring of 1851, only a few months after the wreck, eyewitness accounts indicate that little of value remained at the wreck site (Layton 1997:144-145).

The Mitom Pomo recovered a variety of goods from the *Frolic*. One visitor to the area observed Indian women wearing silk shawls from the wreck, and a white woman from Ukiah obtained three bolts of silk from natives who had taken them from the *Frolic* (Layton 1997:13- 14). Layton's (1990) excavations of Three Chop Village, a native settlement located about 12 to 13 miles (as the crow flies) in the interior from the *Frolic* wreck site, revealed evidence of porcelain and glass from the vessel's cargo. Fifty pieces of Chinese porcelaneous stoneware were recovered in or around house depressions.The ceramic assemblage included 45 detritus fragments from the production of disk beads, while five ceramic sherds represented different stages in ceramic disk bead manufacture or tools that exhibited rounding on one corner (Layton 1990:183). A total of 148 green glass pieces from the longneck beer bottles carried by the *Frolic* were found at Three Chop Village. Of these glass fragments, 138 appeared to be detritus from glass flaking, while the other 10 pieces were intentionally flaked artifacts. These latter tools included three possible projectile point preform fragments, two utilized flakes, and five modified flakes (Layton 1990:184). In addition, a brass sheet fragment and brass tack were recovered from Three Chop Village that may have been decorative embellishments on furniture salvaged from the *Frolic* (Layton 1990:184).

CONCLUSION

The primary purpose of this paper is to make the point that shipwrecks and stranded vessels should be viewed as an important kind of coastal resource that was exploited opportunistically by native peoples. Wreck events presented significant windfalls to coastal peoples. Not only could the cargos be salvaged and the materials recycled into a native context, but also the timbers and hardware of the vessels themselves could be used as raw materials for making houses and tools. I argue that maritime peoples of California have a long legacy of salvaging disabled vessels, probably dating back to prehistoric times when native ocean-going watercraft and even Asian fishing vessels were blown off course. The remains of the vessels, the cargoes, and even the crewmembers that survived, were probably incorporated into local native groups.

The advent of European exploration of the California coast and the Manila galleon trade in the mid-to-late 1500's ushered in a new period of native salvaging. These vessels and their cargoes offered a wide assortment of artifacts and raw materials that were previously unknown to Native Californians. The first contact that many coastal peoples probably had with the full richness of European and Asian material culture was not from encounters with early explorers, as they tended to trade primarily food and clothes to Native Californians, and to a lesser extent small manufactured goods such as glass beads, mirrors, or bells (Lightfoot and Simmons 1998:153-155). But rather the first contact that most maritime peoples had in sampling the diverse array of European and Asian materials was in salvaging wrecks. When merchant ships went down along the coast, a vast "emporium" of goods from Asia and Europe was available for exploitation.

Artifacts recovered from archaeological contexts probably represent only a small fraction of what was actually salvaged from wrecks and used by native peoples. Many of the goods carried by Manila galleons would not have survived for any length of time in most coastal archaeological contexts. For example, the ceramic and iron artifacts from the *San Agustín* that were recovered during archaeological investigations of Coast Miwok villages and camp sites should not be viewed as a representative sample of what was taken from the wreck. Cargoes from Manila, such as that carried by the *San Agustín*, should also have included silks, various kinds of textiles, clothing, wood furniture, cushions, carpets, leather trunks, baskets, foods and spices, wax, and jewelry. Many of these goods had no cultural references in local native societies, and archaeological evidence suggests that they tended to be used as or transformed into native objects. Some of these materials were probably traded to inland tribes. Other materials may have taken on religious or ceremonial functions in coastal native societies, serving as symbolic referents of distant places and unknown worlds (see Lightfoot and Simmons 1998:158- 161, for a more detailed discussion).

The Frolic wreck exemplifies the extensive legacy of native salvaging practices in California waters. As Keith White Wolf James (1994:25), a Native Californian from nearby Ukiah, succinctly articulates: "The story shows how the native people utilized the wreck as a resource, taking things and adapting them to fit their environment. The wreck was not an isolated incident. Shipwrecks had happened before. The people knew what to do, how to take advantage of the opportunity."

It appears that the local Mitom Pomo knew about the wreck almost as it went down, and began their salvaging operation shortly thereafter. It is important to emphasize that much of the cargo had been salvaged within a relatively short time after the *Frolic* sank. While other non-Indian ranchers shared in scavenging the wreck, it appears the Mitom Pomo were very effective in dismantling the cargo and combing the beaches for materials that washed to shore. Viewed from this perspective, the Mitom Pomo's salvaging of the *Frolic* exemplifies a significant kind of

practice that had been going on for many hundreds of years by Native Californians -- the opportunistic exploitation of shipwrecks as yet another important kind of coastal resource.

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BEACHCOMBERS IN OCEANIA: MEDIATORS BETWEEN SHIP AND SHORE

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"What really differentiated the beachcombers from other immigrants was the fact that they were essentially integrated into and dependent for their livelihood on, the indigenous communities" (1).

A "beachcomber" can be defined in two ways, either as a long wave rolling in from the sea, or as a "loafer" who makes a poor living on the waterfront (2). The popular image of a beachcomber is a free spirit who leads a simple life without responsibilities or luxuries, improvises a hand-to mouth living, and inhabits a no man's land between the sea and the land without making a firm commitment to either, i.e., to a career. One can find them even now, but the real heyday of the beachcombers in the Pacific region was from about 1780 to 1840, when a commercial boom in the China trade, whaling, and sealing increased the numbers of strangers who arrived on beaches in Oceania either by choice, through desertion from a disagreeable ship or escape from the convict colony in Australia, or as a shipwrecked castaway. What they all had in common was that they crossed the cultural beach *alone,* without the support of a ship's guns, so their survival depended, as historian Harry Maude said in the opening quotation, on their ability to adapt to their hosts' environment and to contribute in some way to the community. Greg Dening has said, "Crossing the [cultural] beach...did violence to a man in all his parts." (3) Unlike Robinson Crusoe (based on Alexander Selkirk), most beachcombers landed on inhabited islands(4).

Beachcombing belongs to that historical literature on "transfrontiersmen" or "transculturites" (5) which addresses the recurring theme of non-indigenous actors who cross cultural borderlands and "go native" in various ways, such as North American fur trappers or captives of Indian raids. (6) Such individuals were "cultural brokers" between two societies, mediating communication and acculturation during the early stages of contact. (7) In fact, the knowledge that beachcombers had of foreign languages and ways was often their currency to earn their keep as advisors to Oceanian chiefs. They did not have the power *to force* changes on their hosts, but their contributions to Islander nautical and military technology, and even to liquor distilling and syncretic versions of Christianity, could earn them high-born wives, lands and other emblems of status usually at the price of getting tattooed and learning the local language and customs. (8) The latter "backsliding" earned beachcombers unsavory reputations among "proper" Euroamerican residents in the islands, such as missionaries, merchants, planters or consuls. As one ship captain complained, "To carry them to any island would have been to convey a plague to the unfortunate inhabitants". (9)

Ian Campbell studied the Pacific beachcombers in his dissertation, recently published as a book, and warns against romanticizing about their precarious lives: "For most of them, island residence intended to be a temporary sojourn -- undertaken for reasons of survival or out of desperation to escape a situation that, if not life-threatening, was at least intolerable." (10) The first European beachcomber in the Pacific was Gonzalo de Vigo, who in 1522 deserted from one of Magellan's vessels in the Marianas. Four years later he rejoined a leaky Spanish ship and helped it to kidnap eleven native Chamorros to man the pumps. The captives made it to Mindanao in the Philippines and perhaps to the Moluccas, where Spain and Portugal were fighting over the Spice Islands. That episode reveals another side of beachcombing in Oceania: over-lap between the arrival of foreign beachcombers, and the "blackbirding" (kidnapping) of indigenous seamen to replace lost crewmembers, thereby turning them into beachcombers on strange islands. (11) Indeed, Maude suggested that even larger numbers of *kanakas* (Oceanian seamen working on foreign ships, not

inter-island canoes) wound up on others' beaches than their better-documented Euroamerican counterparts. (12) During the peak of the American whaling era in the mid-nineteenth century, more than six hundred vessels plied seasonal circuits around the Pacific, and as many as a fifth of their crews deserted, while another third were discharged before the end of the voyage. (13) What began as a trickle became more of a steady stream as transregional shipping boomed.

The Hawaiian islands lay on the sailing route from Northwest America to Canton, China, and they were thus well-situated to receive ship visits, first from British and American fur traders and sealers, then from sandalwood traders, and finally from whalers. As early as the 1780s and 1790s "cultural brokers" made their appearance in local ports of call, and King Kamehameha I ordered young Hawaiians to work on foreign vessels in order to train crews for his new fleet of Western style schooners. In 1788, he welcomed into his entourage Chief Ka'iana of Kaua'i, who had traveled from his home island to China and the Northwest coast. During a war, Ka iana came ashore from a British fur trading ship with four swivel cannons, six muskets, three barrels of gunpowder, and five double canoes loaded with metal tools and iron bars. (14) Two years later, Kamehameha acquired more foreign *mana* (power) by absorbing into his forces John Young and Isaac Davis, who had been kidnapped from two American fur trading vessels. Both men rose in rank because of their experience with muskets in battle, until they became governors of islands under Kamehameha's monarchy. By 1793, they told British explorer George Vancouver that they no longer wanted to leave. Davis was murdered in 1810, but Young lived until 1835, when he was buried like a high chieftain.

The voluntarism of beachcombers varied depending on when and where they disembarked. Some European explorers kidnapped Oceanians as laborers, guides, interpreters or specimens of "noble savagery" for scientists and socialites in Paris or London to examine, thus making their "beachcombing" a reverse form of globe-spanning counter-intelligence, if they survived. Many Oceanians died if taken from their region, because they were as vulnerable epidemiologically as Native Americans were. (15) In 1606, the third of three futile Spanish expeditions from Peru to Malanesia to find King Solomon's ancient gold mines, led by Pedro de Quiros, brought two young captives to Acapulco, but after converting to Catholicism, they soon died of fevers. Nor did Tahitians brought to Peru in the 1770s or western Oceanians taken to Manila live very long; the French took two Oceanians to Paris, but both died prematurely. English explorer James Cook took several Society Islanders away with him in the 1770s: most got off at nearby islands, but one traveled around the South Pacific, another as far as Java (where he and his Tahitian servant died), and a third, "Omai," made it to London (where he was vaccinated against smallpox) and back. Cook set up "Omai" with an English-style arsenal, house, garden and livestock, almost like an unintentional parody of Robinson Crusoe, but because the young man had low traditional rank his celebrity lasted until his exotic possessions were absorbed into the local exchange system. (16) Nevertheless, Pacific Island chiefs often sought beachcombers with foreign skills. In 1783, a British East India Company vessel wrecked in Palau on the way to China. After serving a local chief in wars, most of the crew left on another ship they built, except for Mad Blanchard: the beachcomber of the commercial era. While a relative of the chief went with the English captain to London (and died of smallpox), Blanchard lived for six years in Palau as a war leader. He acquired two wives, a chiefly title, tattoos, and a plantation, but he was finally killed, like many such "brokers," in battle. (17) *Bounty* mutineers played the role of military beachcombers in Tahiti until HMS *Pandora* came to arrest them (18) and shipwrecked opportunists like ironically named Charlie Savage played significant roles in Fijian and Tongan wars in the early 1800s. (19) In 1806, a Tongan chief lured half the crew of the English whaler *Port au Prince* ashore and ambushed them, with help from some Hawaiian deserters from other ships in his entourage. William Mariner survived the massacre, because he said "aloha" to one of the Hawaiians during the fight. For the next four years, he and other castaways served their chief

by manning muskets and cannons in local wars. The Tongans also grilled Mariner for information about European ways, from writing and money to Western astronomy and government, and rewarded him with his own "vassals." He finally returned to England to become a stockbroker, and drowned in a London canal at age 53. (20)

In 1836, another Tongan chief lured a New Zealand Maori to desert from an English whaler, then accepted a reward from the captain for returning him: axes, knives, fishhooks and cloth. This was a clear measure of how much beachcombers were worth to ambitious rulers. (21) James O'Connell was shipwrecked on Pohnpei (Ponape) in Micronesia in 1830 and, according to his own published account, he had to do an Irish jig on the beach to amuse the Pohnpeians and stay alive. O'Connell became a chief, took a wife, and underwent both tattooing and having one testicle ritually crushed. He played a role in trade with foreign ships and finally left on one in 1833, later to do his famous jig in carnivals in England, much as the French ex-beachcomber Jean Cabri traveled Europe as a tattooed curiosity. (22) Because Pohnpei was on the whaling circuit between hunting the Line (equator) in winter and the Japan grounds in summer, they numbered over one hundred by the mid-1800s and wielded power collectively as middlemen in the ship-to-shore trade. In 1843, five Maori beachcombers on Pohnpei fought over local women with their European counterparts; two men died on each side until the surviving Maoris escaped to an islet with the women. (23) The British convict colony in New South Wales became a base for trade and whaling in the South Pacific, and a maritime circuit soon shuttled Maoris to Sydney and escaped convicts and other deserters to Bay of Islands. In New Zealand, the latter became known as *pakeha* (white) or 18 Maoris, because they got tattooed, married local women and helped to mediate between the two cultures. Maori chief Te Pahi visited Sydney himself and brought home a beachcomber named Bruce to command his army, marrying the man to his favorite daughter. Three years later, Bruce left with his wife for Calcutta, though after many adventures he died in Sydney. (24)

A Tahitian called Jem also arrived in New Zealand, after visiting Sydney in a pork-trading vessel. He had tired of working as a house servant in Australia, though he learned to read, and shipped out for Bay of Islands, where his knowledge of firearms and foreign ways earned him a position as war leader and ship trade mediator. In 1814, Jem was dressed like a Maori warrior and translated for English ships buying provisions, a position he retained for at least another thirteen years. (25) Foreign beachcombers sometimes clashed with missionaries in representing the outside world (and Christianity) to indigenous societies. In 1797 the London Missionary Society (LMS) vessel *Duff* arrived in Tahiti equipped with a vocabulary obtained from a repatriated *Bounty* mutineer. In Tonga, George Vason disembarked and established a mission, but he soon "backslid" into local ways, getting tattooed, marrying a chief's daughter and becoming a war leader. He finally fled for his life back to England. He remarried and became Governor of the Nottingham Town Gaol. (26)

Two LMS preachers left on Tahuata in the Marquesas tried to stick to their mission but fared little better. John Harris fled after a chief's wife resented his refusal of her favors and inspected him one night to see if he had genitals. William Crook expected help from Tama, a Hawaiian who got off a Boston fur trading ship with "a suit of regimentals, a chest of cloth, a musket and some ammunition." But Tama used his foreign knowledge and spear-throwing skills to become a war leader and told his hosts that he had been to the white man's country and seen with his own eyes that they had no gods. (27) In 1798 Edward Robert's deserted from an English whaleship at Tahuata, where he too served as a war leader and trade negotiator and married a chief's daughter. He left after seven years, taking his wife and children to India. (28)

As early as 1668, when Spain was establishing the first European colony in Oceania, on Guam, a shipwrecked Chinese beachcomber named Choco stirred up opposition to the missionary work of Jesuit Diego Luis de Sanvitores. Choco told the Chamorros that baptism was poisoning people (who were in fact dying of introduced epidemics), and a consequent generation of warfare against Spain drastically reduced the indigenous population. (29) In Samoa, European beachcombers went farther and introduced what missionaries derisively called "sailor cults" among the indigenous people. As escaped convicts began arriving from Sydney, "Tom the Devil" murdered most of his compatriots and became advisor to a Samoan chief. He was such a hardened criminal, however, that they assassinated him. Yet another English beachcomber, Big-Legged Jimmy, organized a church with help from fellow ex-convicts. They made themselves God's sacrosanct agents on earth, taking multiple wives and using sea chanteys as hymns. Even a Samoan ex-sailor called Siovili, or Joe Gimlet, came home to tell his people that the Tahitians had converted to Christianity and started his own version of the church. He claimed direct divine revelations and healing powers and said that his followers should stop working and have endless feasts while waiting for Jesus to come ashore on a giant wave to reward the faithful with paradise on earth. (30)

The Choco episode on Guam shows that more research could bring to light the impact of beachcombers from Asia, including Japanese castaways from fishing boats. (31) Maude estimates that the vast majority of non-Oceanian Pacific beachcombers were Anglo-American, and that about one fifth were escaped convicts from Australia. But he also acknowledges that numbers of Bengali "Manila-men" (such as those who manned Ahab's whaleboat *in Moby Dick),* and other ethnic groups also contributed to the beachcomber phenomenon in the Pacific. (32) This process began with the annual Trans-Pacific Spanish galleon routes between Manila and Acapulco from 1565 to the 1780s and continued through the Anglo-American China trade into plantation labor recruiting in the late nineteenth century, when whole populations of Indians, Japanese and other Asians established themselves in places like Fiji and Hawai'i. (33)

What generally brought the Communities, whose inhabitants had better outside connections, via trading firms and missionary churches that looked down upon beachcombers as less than ideal representatives of the West. In addition, as time passed the beachcombers lost their monopoly on cross-cultural understanding to indigenous travelers, converts and intermediaries. (34) Campbell suggests that the keys to beachcomber longevity were respect for chiefs, cooperative conformity with host ways, generosity in traditional exchange systems, and being entertaining or useful. When one recalls that Euroamerican seamen were often conscripted, and that unscrupulous captains might strand sailors to avoid paying them, "The difference between discharged seamen and deserters was rather arbitrary..." (35) Campbell regards them as "like the flotsam and jetsam of the great ocean that they crossed. On their coming to ground on isle shores, they were picked up to be used, discarded, destroyed or returned to the ocean as the island inhabitants chose." (36)

By the 1840s, about 2000 European beachcombers resided in Oceania, with many more *kanakas* and more than a few Asians sharing the cultural no man's land with them. Most stayed only for short periods in the islands, if they survived to leave. Some Europeans who returned home were disappointed at their loss of status as their exotic allure all too-rapidly dissipated, leaving them jobs as doormen or perhaps returning them to seafaring. (37)

Historically, the beachcombers contributed in various ways to the early phase of contact between Oceanian societies and outsiders, and the memoirs and grammars left behind by a dozen individuals have proven helpful to researchers who want to avoid the biases of passing explorers or evangelical missionaries. Herman Melville parlayed his brief stay on Nuku Hiva into a literary career -- and was remembered as Merivi among the indigenous Marquesans. He was given a wife

and carried about on a litter in honor of his foreign *mana.* When he escaped in a visiting ship's longboat, his hosts were furious at losing their pet white man. (38) Even his rescue, by his own account, was due to help from "tabooed kanakas," i.e., Oceanian beachcombers. (39) Such men represented an era before Euroamericans colonized the region, and the maritime frontier was more fluid and multi-faceted. Isolated deserters and castaways had to adapt to indigenous customs to survive, helping local leaders to acquire foreign military and nautical technology, linguistic and commercial insights, and other invaluable knowledge about the outside world economy that was gradually encroaching on previously self-sufficient island archipelagoes.

Maude idealizes beachcombers as "essentially human and tolerant, and wishing to change no One". (40) Perhaps, in that sense, their latest incarnation is Eco-Tourism?

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A CONTINUUM OF MARITIME USE IN THE CALIFORNIA DELTA

By Kimberly Esser, Minneapolis, Minnesota

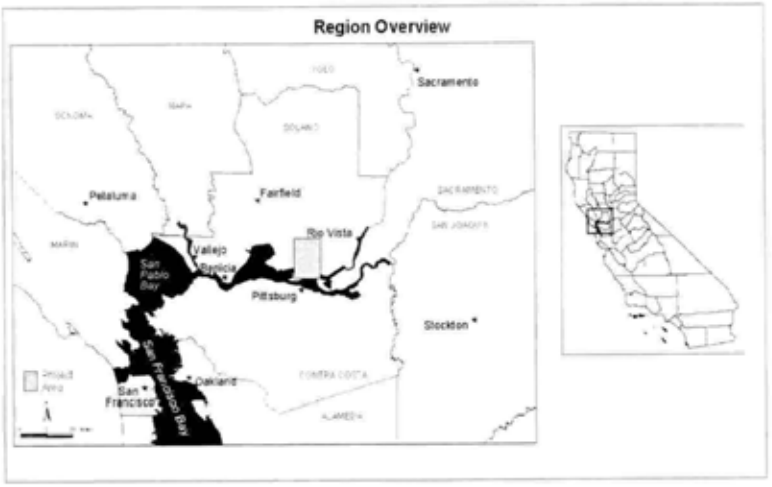
Introduction

Historically, surveyors used the phrase "notoriously swampy and overflowed," to describe the wet marshlands of California that were inaccessible to mapping crews. Their language alone, as viewed on maps, implies a cultural value about such lands. Not only were the swampy and overflowed lands inaccessible to surveyors, but they were also considered inaccessible to farmers, land developers and land owners. Notoriously swampy and overflowed meant a wet and boggy, reed covered land, infested with mosquitoes in the summer, flooded and water covered in the winter. In other words, a place no one in their right mind would want to settle. Yet, the Montezuma Slough region, along the western edge of the California Delta, is just such a swampy and overflowed region and it has a long and varied cultural history. The rivers, sloughs and marshes of this region have been important, not only for the modern economic development of California, but also for prehistoric and protohistoric communities. This seemingly "no-man's land" actually has a long continuum of use, one that has been predominately centered along the local waterways.

Cultural landscape studies seek to understand the human processes (both modern and historic) that have changed and altered a particular environment. The study or 'reading' of those processes, in conjunction with historical research, can indicate the cultural and social values of the groups that created the existing landscape (Groth and Bressi, ed. 1997; Meinig 1979). Typically, the focus is on land and the ways in which it has been modified and controlled. In many regions throughout the U.S., however, groups also modify and control local waterways. The study of these modifications and processes are equally as important and should not be ignored. I have taken to calling this slightly different focus, *maritime landscapes*. Both land and water activities are dependant on each other and a combined approach, that studies both is necessary when studying and evaluating the landscapes of the California Delta.

Geographical and Visual Description

Montezuma Slough lies near the confluence of the Sacramento and San Joaquin rivers, on the north edge of Suisun Bay, approximately halfway between San Francisco and Sacramento (Figure 1). The slough itself actually has two outlets into Suisun Bay, one to the east, near the confluence of the two rivers, and one to the west and farther north along the bay. The direction of flow for Montezuma Slough is influenced by coastal tides and currents, and varies from east to west or west to east. The area of significance discussed here is quite linear and encompasses the eastern portion of the slough and the lands along its edge, from the city of Collinsville to the historic site of Mein's Landing. The Montezuma Hills lie to the east and Grizzly Island lies to the west. Several historic landing sites lay along Montezuma Slough, including Dutton's Landing, Bird's Landing and Mein's Landing (Figure 2).



A valid visual description of the Montezuma Slough area could be as simple as flat and wet. The casual observer might look no further. Yet, there is much more detail if one only takes the time to look a little deeper. True, the land here is flat and there does seems to be water everywhere, but look carefully and certain important landmarks stand out. Mt. Diablo is an ever-looming presence to the south, constantly helping to orient oneself when wandering the marshes (Figure 3). The Montezuma Hills provide a backdrop for the eastern boundary of the slough and provide some variety from the consistently flat land that surround it. Grizzly Island is surprisingly colorful with a wide variety of plants and animals, although photographs don't begin to do it justice. Throughout the region, large, exotic, eucalyptus trees are clear indications of human use and modification. Long lines of trees line drainage ditches, provide wind breaks for modern and historic ranches and often mark historic landing locations.

Levees wind and twist their way alongside the slough and are less noticeable from the land as they are from the water. Many roads here lie atop the levees, providing dry transportation, most of the time. From these higher points one can see across the slough to other ranches or into the marsh. The world looks very different, however, from a boat. The dirt and vegetation that make up

the levees create a border between water and land, almost tunnel like. One can see ahead and behind, but views to the left and right are blocked. This does not mean there is nothing to see from the water. If a careful observer looks towards either shore, he or she will notice wood pilings at frequently spaced intervals. Some of these are old, rotting pilings with reeds growing on top; others are newer pilings that support agricultural pump stations (Figure 4). Near historical landing sites, the density of pilings increases, both old and new. Most of these features are difficult to see at high tide and are barely visible from land. A view from the levee offers a broad overview of the region and its patterns, but a view from the water offers more subtle detail.

Of course, the season and local weather patterns can significantly alter the look of the land. During the dry summer months, the marshes may be green and colorful, but the surrounding hills and grazing lands are a scorched and dry brown. The fall and winter rains bring bursts of vivid greens, creating a lush, almost tropical look. During the winter, dry, solid lands can be quickly transformed into wet and boggy marshes, either by the pooling of water behind levees, or by the actual breaking of a levee wall. The cloudy, rainy skies can obliterate familiar landmarks and features. Throughout the year, the low-lying tule fog can reduce visibility to inches.

Historical Background

As for the local history, it often begins in 1848, at the start of the California Gold Rush. Yet, prior to 1848, the Montezuma Slough area provided important resources and saw moderate use by local Native American tribes. This region was essentially a borderland between the Patwin and Bay Miwok. The Patwin most likely occupied the region closest to Montezuma Slough, while the Bay Miwok were located along the lower Sacramento River itself. Villages were located outside the marshes and along the rivers, but the tule marsh was a place of plentiful food and other resources (Johnson 1978; Kroeber 1925). Wild game was rich and varied, including grizzly bear, tule elk, river otter, beaver and an abundance of waterfowl. The use of controlled burning was a common practice throughout California and most likely one practiced by the Patwin (Lewis 1993). Dry tule grass and the underlying peat soil would have burned easily during the summer months, helping the Patwin to flush out game. According to the State agricultural report of 1872, the ash from these burnings was thought to intermix with tule roots that combined with river sediment and created small levees (Brown 1948). If this were indeed the case, then the inland valley landscape first seen by Spanish explorers would have been a controlled and managed environment. The ideal locations for later, post gold rush settlement, may well have been atop the so-called 'natural' levees created by local Indians.

Other significant maritime activities included, water transportation and salmon fishing. Tule grass was used for building canoes and rafts that allowed the Patwin and Bay Miwok access to California's interior bays, rivers and sloughs. A variety of fishing equipment, including weirs, nets and spears were used to catch sturgeon, salmon and other fish (Johnson 1978; Kroeber 1925, 1932).

The marshes of Montezuma Slough were not exactly ideal for permanent Patwin or Miwok settlements, but the marsh and river resources were extremely valuable. Many of the resources so

readily available to these tribes were again valuable resources to later settlers. Hunting, fishing and boating became important economic ventures after the gold rush and levee building remains a significant economic factor today. The Native Americans continued to use these resources after the arrival of the Spanish, but their communities and lifeways were greatly changed.

Spanish and Mexican settlers showed less interest in this region. Their primary interest was cattle grazing and the marshes were unsuitable for such activities. These groups may have changed the cultural make-up of the region, but did not have a direct impact on the land or water itself.

Although, the Montezuma Slough region was being used and modified in the years up until the gold rush, the scale and intensity of activities increased dramatically after 1848. Maritime traffic on the Sacramento River increased, carrying miners from San Francisco to Sacramento (Holliday 1981; McGowan and Willis 1983; Olmstead 1988). Settlers started farming and ranching the fertile soils adjacent to the rivers and sloughs, often a more reliable and more profitable venture than gold mining (Dillon 1982). Small, shallow draft vessels were best suited to the narrow channels and sloughs of the Sacramento River and these boats made frequent stops at individual farms and small landings. Maritime trade continued after the completion of the transcontinental railroad, often operating in tandem with the rail companies. The real decline in maritime trade began with the introduction of trucks and the building of bridges. Farms and ranches could now be reached by land at cheaper rates, increasing the growth of truck traffic, while decreasing maritime traffic. Although maritime transportation in the Montezuma Slough region has declined as an industry, a certain maritime orientation can still be seen today.

Landscape Typology

A single place, activity or material remnant does not represent a maritime landscape. Historically, maritime activities were diverse and encompassed a variety of spaces. For the Montezuma Slough region, four landscape categories help to classify the development and modification of the maritime cultural landscape. Each category has two components: one, a historic activity, known through primary records, which produced two, the material remains visible today. The four landscape categories include,

1. The waterway
2. Landings
3. Land features and
4. The modification of the waterways

The Waterway

First, the channel itself linked the farms along Montezuma Slough to Sacramento, San Francisco, and points beyond. Roads were few, and without bridges, rarely crossed the marshes or sloughs, and roads often flooded or became muddy and impassable. Even the transcontinental railroad avoided the marshes and passed to the west of Suisun Bay. Navigating the narrow channels, understanding tides and currents of the bays, sloughs and rivers, and knowing the locations and frequencies of landings required a unique knowledge base, probably limited to those working the river. Direct historical reference to such knowledge is rare and few documents discuss the life of boatsmen. Shipwrecks and navigational aids are the few material remnants of waterway activity. Vernacular watercraft, however, were commonly designed and built specifically for this region, so boat design often reflects local variations.

Landings

Landings were the meeting points between the maritime and terrestrial worlds. A variety of boats traveled up and down Montezuma Slough, stopping at local landings, bringing an assortment of

goods to local residents – groceries, textiles, mail, even beer and wine (Dillon 1982; Walters 1983). The same or similar boats transported local products: milk, eggs, cattle and grain to market in Sacramento or San Francisco. Throughout the Delta landings varied between simple brush pilings, where gang planks were used to transfer goods, to more formal wooden structures or piers. In the 10-mile stretch of slough between Collinsville and Mein's Landing, historic maps show 6 landings, 3 of which have historical documentation. The landings at Dutton's, Bird's and Mein's had wooden piers or wharves that lay parallel to the shore, with large warehouses at the water's edge (Dakin 1885). Current material culture remains include the pilings that mark these historic locations and the archaeological remains of the landing sites. As mentioned earlier, eucalyptus trees also can mark such sites.

Each piling that exists on the slough today does not represent a former historic landing site. Often, newer pilings are driven near older, established pilings. This reinforces the concept of a continuum of use. Other pilings may be remnants of intermediary links between land and water, like sounding boards or navigational aids, but these uses require more research.

Land Features

Now we can turn directly to the land. But, even though our feet are now firmly planted on soil, we cannot turn our backs on the water. Boats only traveled up Montezuma Slough because there were goods to be bought and sold. On the other hand, the ranches were only here because their goods could easily be transported to a profitable market. One could not have existed without the other. Many land features reflected the important relationship between land and water. The front doors of houses faced the water, barn doors opened directly onto the water so that grain and livestock could be easily loaded and unloaded (Frost n.d.). Cows were marched on to barges and taken directly to market. The city of Collinsville, an Italian fishing village, was built entirely on stilts, raised above tide waters, with a boardwalk for its main road. According to local accounts, children rowed small boats from their homes to school. Even today, Collinsville has a row of houses directly facing Suisun Bay and the road sign has been moved to the top of the levee, between the houses and the water. Clearly, the communities throughout the Montezuma Slough region relied on the waterways and valued it as an important resource, even if that resource was transportation. Land features like house and barn orientation reflect the value of the river as an important resource.

Modification of Waterways

The fourth and final activity category is the modification and control of waterways. As the value of agricultural lands grew, so did the need to control the slough. A delicate balance was necessary to protect local properties from winter floods, while maintaining the waterway. Although the recurring floods restored the fertile soils, they also destroyed towns and ranches. Local residents felt that their farm lands needed protection from such disasters. Yet, the waterway was still an important transportation network that connected individual ranches to the rest of California. To control the slough, levees were built to protect the land, while dredging helped to maintain the waterways (Kelley 1989).

These four categories represent a portion of the activities that helped to shape the Montezuma Slough landscape. Of course, these are only the historical influences, proto and prehistoric influences also exist, although less visible on the ground today. Hunting and fishing were important Patwin activities that provided a plentitude of resources and the waterway was the most accessible transportation system. Later, in historic times, European settlers used the same resources, if on a larger scale. Hunting clubs were common along Montezuma Slough, salmon fishing and canneries were one of the most prominent landmarks in the Delta. Throughout all times, the waterway has played an essential role, as a resource and as a transportation link.

In conclusion, any historical or archaeological surveys that focus on land features alone will miss many of the intricate workings of an integrated maritime and terrestrial landscape. A narrow, land based study also reflects the values and perceptions of the modern researcher and fails to record the local, historical values. By developing methodologies that examine a complete cultural landscape, archaeologists and historians can better record and analyze local landscapes, both terrestrial and maritime.

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THE EVOLUTION OF THE PACIFIC COAST LUMBER SCHOONER

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Introduction

Most sailing vessels built in the last few thousand years have belonged to some identifiable type. They have been built to follow preconceived ideas for the most successful hull form, rig and size to do their intended work, and therefore, often share many similarities with other vessels in their trade. The principal influences on the development of merchant type vessels are: 1) proposed cargo which dictates the most advantageous hull shape and size; 2) proposed trade routes which will determine the vessel's rig and 3) the available building materials which will influence the size of the ships, their strength, and the quality of their construction and fittings. Specialized ships frequently dominated the trades for which they were built, exerting a strong influence on a region's economic history. They accelerated the technological development of their places of origin, and formed the base of those countries' mercantile sea power (Myers, M, 1967).

Sailing ships built on the West Coast of the United States provide a good example of maritime trade's effect on the area's economic history and technological development. A major part of the West Coast's economy, the shipping of lumber to Central and Southern California and other ports of the Pacific, was nearly exclusively dominated by locally built ships for at least three decades. Technological innovations such as the development of a hull that could stow 130% of its registered tonnage in cargo and yet sail well with little or no ballast when lightly loaded were products of West Coasters' evolution. The commercial sea power, which developed, and secured the Hawaiian Islands for the United States, was but another aspect of the growth of Pacific Coast built ships (Myers, M, 1967).

A SHIP TO FIT THE PACIFIC COAST

The story of the West Coast lumber schooner helps to illustrate the story of all ships. During the last half of the 19th Century, the Pacific West Coast of North America developed its own tradition of maritime endeavors. The settlement and development of the Pacific West Coast was largely an outcome of the growth of American sea commerce. Coastal conditions for approximately two thousand miles of the Pacific West Coast, from San Francisco to Alaska, are very similar, with prevailing winds blowing out of the northwest, down the coast for most of the year, and from the southwest and southeast up the coast in winter. Designed for the coast's environmental conditions and the needs of the coastal shipping industry, the West Coast ships evolved into something never before seen. The schooner developed from small, practical, simple vessels built for a specific need into a massive, standardized, highly specialized ship, which dominated its trade until the end of the era of sail. Locally built sailing ships tied the coast together (Myers, M, 1967).

Much of the technological innovation and economic influence that was both the cause and effect of the Pacific Coast Lumber Schooners was centered on the San Francisco Bay. In 1776, the Spanish established their most northerly outpost in North America with a presidio and mission at the future site of San Francisco. Soon after, Spanish supply ships were sailing from Mexico to the Golden Gate (Delgado and Haller, 1989). The booming fur trade and whaling brought an increased number of American vessels to the Pacific Coast between 1769 and 1846. This increased traffic gave rise to the new settlement and port of Yerba Buena, established in 1835 by a former British mariner, William A. Richardson. Richardson's port was just east of the Spanish presidio. From his port Richardson shipped hides, tallow and lumber, which he had purchased,

from the whipsawyers of the forests surrounding the San Francisco peninsula (Cox, 1974; Delgado and Haller, 1989). Establishments like Richardson's represent the first retail lumber industries. Eastern ships bringing cargo and passengers would make the return trip around the Horn with cargoes of lumber. Richardson's small port on the San Francisco peninsula grew to a village of 400 by 1846, the year the Mexican War began. The village of Yerba Buena was an early prize for the Americans and was renamed San Francisco by the military appointed Alcalde in 1847. With the war came a decline in maritime trade in the region (Delgado and Haller, 1989).

The societal and industrial changes that had begun when the United States extended its influence to California and into Oregon country in 1846 were revived by the discovery of gold at Sutter's Mill, California in 1848. San Francisco grew in population as the bay swarmed with ships. Thousands of vessels arrived in San Francisco, as it provided an anchorage and a way station for goods and passengers bound for the gold fields, thus helping to establish its position as the principal port of the West Coast, and launching it towards becoming a major metropolis (Delgado and Haller, 1989). Many of the people who migrated to the West Coast to find gold discovered that it was more lucrative to establish businesses to cater to (or exploit) the needs of the gold miners. The growth of commerce helped stimulate the timber industry needed to build the physical establishments of new businesses and tied the West Coast's lumber industry firmly to the scattered markets of the Pacific Basin (Cox, 1974). If the growth of San Francisco were to continue, food and lumber for housing would be needed. Expanded transportation was vital if San Francisco was going to meet these demands.

On the rugged West Coast, transportation meant, nearly exclusively, shipping (Myers, M, 1967). Although there was a great demand for ships, Yerba Buena Cove (the heart of the old San Francisco waterfront) was choked with unsuitable ships. These ships remained unused because they were the wrong types for the demands of the Pacific Coast. Many deep-water merchant vessels that could have found lucrative business transporting cargo around the Horn and to points farther west, were abandoned as their crews jumped ship to search for their fortunes in the gold fields. Even with the increased demand on shipping, the jungle of masts and spars of deserted ships floating on the bay continued to grow.

Until the completion of the transcontinental railroad in 1869, the Pacific Coast was dependent on ships for contact and trade with the rest of the world (Delgado and Haller, 1989). The natural features of the rugged West Coast, meant transportation was nearly exclusively by shipping, placing further dependence on San Francisco's maritime commerce. Wagon roads were few and far between, and the railroad did not begin to penetrate the Coastal Mountain Range until well after the productive and industrial potential of the Pacific Coast had been realized, therefore the sailing vessel was the most efficient (and in many cases the only) form of transportation between communities separated from each other by mountains and rivers (Delgado and Haller, 1989). The expedience of this efficient system probably further delayed the development of high cost roads and railroads through the mountains. Prior to 1875 the very existence of the majority of the coastal towns depended entirely upon sail and a few steam passenger ships. Schooners brought passengers and freight, and they departed with lumber, other wood products (firewood, railroad ties, shingling), farm produce, fish, game, and the perennial passenger (Jackson, 1969).

Ships for use along the Pacific Coast needed to be small enough to sail into river deltas and enter ports with a shallow sandbar across the entrance. The fore and aft sails on all masts of the schooner rig was the preferred rig for the coastal lumber trade and for most sailing related endeavors requiring travel up and down the Pacific coast. The schooner rig had the ability to be sailed closer to the wind than a square-rigger, thus allowing it to beat upwind along the coast with a smaller crew.

THE LUMBER INDUSTRY

With only the product of the whipsawyers, scattered mostly in the Santa Cruz Mountains, the potential of the lumber industry had not yet been realized by 1840. In that year, lumber for construction of the growing west coast communities was still being shipped in from the Hawaiian Islands to San Diego and San Francisco (MacMullen, 1969). The scattered small lumber enterprises that appeared around 1840 combined with the established lumber enterprises of Thomas O. Larkin who had purchased the cut of the whipsawyers in Monterey and the Santa Cruz Mountains since 1833, and the Hudson's Bay Co., in Oregon, served to make the production of lumber a familiar, if not yet a prevalent, sight in the forests of the far west. Although these operations helped pave the way, it would be claiming too much to say that they laid the foundations of a Pacific coast lumber industry (Cox, 1974). Both Larkin and the Hudson's Bay Co. were non-specialized merchant-capitalists involved in too many projects to be considered purely lumber companies. None of the important lumber firms on the Pacific Coast were to spring from such origins. The greatest contribution of these enterprises lay in demonstrating that logging could be carried out successfully at locations other than those immediately tributary to Fort Vancouver in the north and Monterey and Santa Cruz in the south. They also demonstrated that, although the market for lumber was limited in northern California and almost nonexistent in the Pacific northwest, it was possible to sell significant quantities in southern California, Hawaii, and beyond (Cox, 1974). The true lumber barons of the Pacific Coast would not only fell and mill their own timber but would eventually acquire and own the ships to get their lumber to prospective buyers and retailers.

Most of the early mills were on the few large bays, which provided protection for the loading ships and were within easy reach of the timber supply. Because most of the coastal trade sailed well off shore to avoid the many reefs and shoals, the rich timber regions of Humboldt and Mendocino Counties were not discovered until the 1850's, well after the great demand for lumber had been stimulated by the establishment of San Francisco retail lumber dealers.

The Bolinas Lagoon, 12 miles north of the entrance to San Francisco Bay, is the first protected inlet north of the Golden Gate. The effects of the burgeoning lumber industry stimulated by the gold rush, on the township of Bolinas and nearby Dogtown are representative of the massive growth (and eventual decline) that would occur along the coast. In the case of Bolinas, the area went from a rural, semi-isolated tiny community in 1848, to a town of more than 200 people practically overnight, representing more than 63% of the population of Marin County (just north of San Francisco) in 1850 (Phelan, 1990). Lumber mills were built at Dogtown under contract with a San Francisco company to harvest nearby timber. In the 1850's as many as seven sawmills operated in Dogtown, each cutting up to 20,000 board feet of lumber a day. The cut was hauled two miles to the head of the lagoon where it was loaded onto schooners bound for San Francisco. A wharf was established in Bolinas for the increased schooner traffic, and a local shipbuilding family, the Johnson Brothers, began building schooners at McKennon's Landing on the lagoon (Phelan, 1990).

The area around Bolinas Lagoon was heavily lumbered in addition to being used for agriculture and livestock. This caused erosion and the accumulation of sediments and silt in the lagoon and resulted in a decreased water depth. By 1852, the lagoon was so silted that the lumber had to be floated on flat-bottom barges to loading docks at the wharf. Although the Johnson's moved their yard several times in search of deeper water within the lagoon, by 1874 the channel into the lagoon had become so shallow that schooners could only pass through during the high tide. That year was the last that schooners were built at Bolinas (Phelan, 1990). It is ironic that the

harvesting of timber which allowed for the establishment of a shipyard on the Bolinas Lagoon would eventually also be responsible for the decline of the enterprise at that location.

The rich groves of redwood and Douglas fir along the coast increased an already busy lumber trade, supplying San Francisco and other growing urban areas on the West Coast. In 1848 a single tree of redwood or Douglas fir could produce twice as much lumber as a vessel of that era could carry (Newell and Williamson, 1960). By 1852, Harry Meiggs of San Francisco had a steam sawmill in Mendocino City and one under construction in Crescent City. The trade eventually expanded to meet the lumber needs of the world. As early as the 1860's more than 300 mills operated in the redwood forests of northern California. By the mid 1880's there were more than 400 mills in the Humboldt region alone (Newell and Williamson, 1960; Delgado and Haller, 1989).

The Pacific Northwest offered even more opportunities for logging and shipbuilding than did Mendocino and Humboldt counties. Firms in San Francisco owned the first mills of the northwest. They were built to accommodate complete families of mechanics and sawyers, recruited and supplied from The City. The schooners leaving the mills of the Pacific Northwest would travel heavily laden down the coast to The City and return to the north with much lighter cargoes of supplies for the lumber mill towns.

PORTS

Lumber was hauled from unsheltered outside ports and the few naturally protected harbors from as far north as Puget Sound to San Francisco, San Pedro, and San Diego. There were several methods for loading lumber employed by the different types of sites on the West Coast. These methods included tying up at a mill-site, lighters, chutes, and wharves. Seventy-six outside ports, known as "dogholes", have been identified along the coast of Mendocino between Bodega Bay and Humboldt Bay (Martin, 1983). In addition to San Francisco Bay, of the over 100 shipping points along the "Redwood Coast", only four could handle the largest of ships: Mendocino, Noyo, Humboldt, and Crescent City (all of which had hazardous sandbars). Perhaps an additional 20 with deep river mouths could handle medium size ships, while the remainder could only be reached by small schooners (Jackson, 1969).

Fortunately for shipmasters elsewhere, the manner in which "doghole" schooners would load lumber at these outside ports was peculiar to the Mendocino coast. The establishment of an outside port or "doghole" was possible where ever there was sufficient depth of water next to a slight indentation in the coastline cutting into high or shelving forest land. Most of these indentations lacked any sort of landing which would not be lashed by surf in heavy weather, but were able to baffle the prevailing northwesterly winds and provided a minimal amount of protection for a small ship. Two-masted schooners were the main users of dogholes well into the 1880's. Wharves at a doghole were usually not possible, and a unique loading device came into use (Myers, M, 1967).

Most dogholes consisted of mooring buoys and a slide chute or wire chute for the loading of lumber and, occasionally, the loading and unloading of passengers and produce (Martin, 1983). Prior to 1900 the chute methods were the most commonly used means of loading lumber (Jackson, 1969). Sawmill sites were commonly chosen so as to be near both a loading place for ships (often on high ground over looking a cove) and a large stand of timber (Myers, M, 1967). Doghole ports were sometimes transient, not lasting more than one season due to the violent and rough winter storms. By 1884, at least 300 outside ports had been built on the coast (Martin, 1983).

To load the piles of lumber which were stacked on the cliff tops, the Captain sailed straight toward the cliff, and then, less than 100 yards from the rocks, the ship would come about, pivoting on its center. With the ship parallel to the cliff, before and beside the breakers, four moorings would be attached to buoys and to iron rings set in the cliff rocks. A schooner crew always had to be ready to cut or drop the moorings in case the seas suddenly became rougher (Myers, M, 1967).

In the "under the boom" or slide chute method there was a trough or slide chute running down from the cliff top to a tall "A"-frame structure located at the water's edge or on an outlying rock. This contraption supported a long boom fashioned of spars lashed together pointing diagonally upwards. From the boom a hinged continuation of the chute was suspended far out over the water. This part of the chute was raised and lowered from the fixed boom using a block and tackle arrangement. Some chutes extended well over 200 feet from the cliff in order to clear, rocks, reefs, shallow water, and kelp beds (Jackson, 1969).

Even the major bays and harbors posed threats that required knowledge of local conditions and supported the use of local vessels. Most of the bays had sandbars that went through seasonal variations, creating hazards for deep draft vessels or the unknowing ship's master. The development of lumber schooners, doghole ports, harbors, piers, and lumber handling equipment proceeded along parallel lines, and kept a fairly even pace with the demands of the lumber industry (Myers, R, 1927).

SHIPBUILDING

The shipbuilding industry of the Pacific Coast was a natural result of the growing Pacific Northwest lumber industry. Many shipyards sprang up to meet the industry's demand for the large number of small ships required to haul huge cargoes of lumber (Newell and Williamson, 1960). Fortunately, the tide of immigration produced by the gold rush provided experienced Easterners and European shipwrights and ship's carpenters. Most had tried gold panning before settling down to their serious trade, which for many was a far more lucrative venture. Most of the West Coast shipbuilders learned their trade abroad, but all used very similar designs to meet the needs of the local conditions (Myers, M, 1967). The shipbuilders quickly learned that it was extremely profitable to set up shipyards in the midst of the lumber country. Except for boom times there were only two large shipbuilding firms in San Francisco, the Dickie Brothers' and Matthew Turner's. Between 1850 and 1905 the shipyards of the Pacific coast produced 182 two-masted schooners, 112 three-masted schooners, and 130 four-masted schooners (Hitchman, 1990).

Matthew Turner, one of the few American born shipbuilders, was responsible for producing more ships than anyone else in North America. Born in Geneva, Ohio near Lake Erie in June 1825, he learned the shipbuilding trade on the Great Lakes. After almost 15 years of successfully owning and operating ships in the Pacific, he built a shipyard in San Francisco in 1875, where he built 56 vessels totaling 5,515 tons by the end of 1882. He moved to Benicia in 1883 where he produced additional 145 ships. By the end of his career in 1907 he had completed 220 vessels (Myers, M., 1967; Gibbs, 1968; Jackson, 1969).

Turner introduced a unique hull which combined a very long and sharp bow with a "full run" (the run is the shape of the after part of the underbody of a ship which relates to the resistance she engenders as she goes through the water) (Kemp, 1976) and little or moderate deadrise (the angle of the rise of a ship's bilge from the horizontal). The longer bow bit into the sea, preventing the ship's head from falling off from the wind when beating to windward and creating the much envied weatherliness (ability to work close to windward) thus creating increased maneuverability.

His design improved both the speed and stiffness (the disinclination to roll heavily) of the ship (Myers, M, 1967). Above the waterline, Turner's lumber ships had a characteristic sharp forward raking stem with little sheer. He placed the heavy windlass machinery and the catheads (from which the anchors were suspended), both of which are usually found in the bow, farther aft than was common, which took weight off the long, narrow bow and distributed that weight to where the hull was fuller (Myers, M, 1967).

Turner pioneered the use of one piece masts (Myers, M, 1967) which the large trees of the Pacific coast made possible, and which were soon sought after by shipbuilders around the world. He also introduced the triangular "leg o' mutton" spanker sail as the after-most fore and aft sails on Pacific ships. Previously the quadrilateral gaff-headed spanker sail was used on ships carrying fore and aft rigs, such as brigantines and barkentines in addition to schooners. The gaff-headed sail required a heavy spanker gaff, which could move about from side to side when the ship rolled in "light airs" or could snap violently to the opposite side when wearing ship (changing tack - or the side presented to the wind, by turning the stern towards the wind). The triangular "leg o' mutton" sail allowed Turner to remove the long gaff which reduced damage and strain on the ship, and increased the sail area by setting a long triangular topsail between the topmast and the end of the spanker booms (Myers, M, 1967).

Hans Bendixsen established a shipbuilding yard at Fairhaven on Humboldt Bay in 1865. Having been born in Denmark in 1842, he apprenticed in the shipyards of Aalborg and Copenhagen. When he arrived in San Francisco in 1862 he worked for several yards around the bay (including at Matthew Turner's enterprise) before making his way to Eureka. Bendixsen's shipyard is a prime example of a shipbuilder taking the necessary labor and tools to the heart of the timber country where building materials were most readily available. The yard at Fairhaven launched over 100 oceangoing and coastal vessels (Hitchman, 1990). That area of Eureka in Humboldt County was the most active ship building site on the Pacific Coast prior to 1900.

Many of the sailing vessels built on Humboldt Bay were intended for use there and were not true doghole schooners because of their large size. Real doghole schooners were less than 200 tons; anything larger than that would not be able to enter the doghole ports. Like most shipyards on the Pacific coast,, Bendixsen did not draw or keep vessel plans. Ship building techniques were kept in the minds and, occasionally, in personal notebooks of builders and their shipwrights (Jackson, 1969; Kiser, 1984).

Thomas H. Peterson was a Schleswig-Holstein Dane born in 1836. When he arrived in San Francisco at the age of 21 he already had completed his apprenticeship in shipbuilding. Peterson's shipbuilding career is another example of the variety of lucrative strategies employed on the West Coast. He established transient shipyards. Instead of remaining at the center of capital, labor and merchandise to build more ships out of timber shipped down by the retail lumber merchants, Peterson settled on the Mendocino coast with some hand tools and a few men. In 1866, he found a small cove near a good stand of large fir trees and built a small ways and a 148-ton three-masted schooner (McNairn and MacMullen, 1945; Myers, M, 1967). After that he continued to build from one to ten schooners in different locations along the California, Oregon, and Washington beaches. Peterson built some 35 ships, from a 19 ton scow schooner built at San Francisco to a 547 ton four-masted schooner built at Ballard, Washington, in 1891. Twenty ships of this master builder were schooners built along a 20-mile run of the Mendocino shoreline between 1867 and 1885 (Myers, M, 1967). Most of his ships were like the *Electra*, constructed at Little River. She measured 89' in length, 28' in beam and only, 6'6' in depth of hold with little room for accommodations, being 88 tons net and 92.6 tons gross (Myers, M, 1967).

Unlike the majority of shipbuilders on the West Coast, Peterson did not retain a small investment in the fortunes of the vessels he constructed.

The Dickie Brothers were from Tayport, Scotland and had one of the major shipyards on the San Francisco Bay. While building wooden ships, James Dickie devised many variations in the methods of framing and fastening to make use of the softwoods of the west coast for shipbuilding (Dickie, 1945). Most of the Pacific Coast's shipbuilders and carpenters were familiar with the oak and pitch pine of the east and required training to understand Douglas fir (Dickie, 1945). By 1860 Douglas fir was found to be an excellent replacement for Eastern hardwoods which had to be transported around Cape Horn, and therefore became the principal ship building material on the Pacific Coast (Kiser, 1984). A government test of strength and durability was conducted at the Mare Island Navy Yard, in San Francisco, which put an end to any reservations that Douglas fir, softwood, was too weak and soft for shipbuilding. The test found that Douglas fir was a much better building material then any of the other well known woods because it was available in long lengths. The great length of the timbers allowed for less scarph joining. It was the strongest resinous wood that had ever been tested. The extra strength may have been due in part to the spiral reinforcements found in the cells. Experience had also proven that a basalm within the fir clenches to, and prevents corroding of imbedded ironwork (Dickie, 1945; Myers, M, 1967; Hall, 1882; Kiser, 1984). There was no record of any complaint about the woods durability by the shipmasters and builders who had been working with Douglas fir for 15 years before the test.

Planks of Douglas fir had to be fastened by passing bolts through them with clinch rings on each end, rather than depending on surface friction to hold the driven bolt. According to James Dickie (Dickie, 1945), "when the vessel hogged or sagged, the fore and aft timbers slipped or sheared upon one another if there were insufficient fastenings or if the fastenings were not arranged so that a particular bolt was in positive or negative shear simultaneously on both edges of the timber it was driven through." The fastenings had to be larger in diameter for oak..."so that the sides of the hole would not be crushed when the timbers were strained to the point where they would slide upon one another." The long fir timbers without butt or scarph joints concentrated the shearing forces at the fastenings. Cutting the timber oversize and seasoning improved the finished ship but entailed considerable waste to get rid of the surface checking (Dickie, 1945).

Several different schooner types adapted to the pressures and opportunities of the Pacific Coast. Schooners evolved certain characteristics for the many industries of the Pacific west coast; including the South Sea Island trading schooner, the halibut schooner, the oyster man's schooner, the pilot schooner, the flat-bottoms scow schooner, (Myers, R, 1927; Jackson, 1969) and the doghole lumber schooner.

The small doghole schooner was one of the first exclusively West Coast types to appear on the Pacific. However, vessels of this type did not appear overnight. Rather, they were developed when different builders of different backgrounds sought a successful solution to the carrying of lumber cargoes and freely adopted each other's good ideas. It was a frequent habit in West Coast shipbuilding that the most successful hulls or rigs would eventually see wide imitation. By the 1870's West Coast shipyards had settled on the general characteristics needed for the specialized conditions of the coastal lumber trade (Myers, M, 1967; Delgado and Haller, 1989).

The doghole schooners, which worked in very tight spaces, shared in common certain trademarks. For example, the spiked bowsprit became common on the Pacific. The average schooner was no more than 150' long, but usually smaller (70' to 100' in length) with a 30' beam, and less than 150 tons. The doghole schooners' shallow draft and sturdy build drew little water in order to accommodate inshore work (often lying at anchor in the surf zone) at the dogholes and enabled

them to negotiate the dangerous sand bars which protected the entrance to most of the west coast harbors and bays (Delgado and Haller, 1989). The overall hull form was somewhat broad beamed and shallow with a slight deadrise and fairly fine, moderately sharp ends which gave the schooners a shallow draft, strong decks, weatherliness and moderate speed (Myers, M, 1967). Full bodied but finely lined below the waterline, the schooner had enough submerged surface area to allow it to stand up and sail without ballast or a deep draft for stability (Myers, M, 1967). Its design gave the ship strength to carry heavy loads above deck and great carrying capacity in the hold below deck. The almost straight sheer enabled the schooner to load great numbers of long straight timbers. The wide beam and strong, relatively unobstructed decks were needed to carry the great deck loads of lumber which were piled up and secured after the hold was completely filled (Myers, M, 1967). The main hatch was quite large to facilitate the loading of the long planks of lumber, and the cabin was placed aft, under the poop deck or projecting through it. The hold was large and undivided except by the mast steps. (Myers, M, 1967) Rectangular portholes were cut into the stem and stern of many schooners to allow for the loading of long straight timbers in sites that could shelter a wharf. The odd shaped portholes would be re-cocked and fastened with threaded bolts before every voyage.

It was a West Coast characteristic that all masts were equal in height from the waterline (Myers, M, 1967). In most cases, the two- and three-masted schooners were built and rigged "baldheaded" (without topsail) for ease of handling and in order to beat north against prevailing winds. The simple rig of these schooners and their deep waist not only allowed for large deckloads of lumber but also for ease of loading and unloading (Delgado and Haller, 1989).

The accommodations for officers and crew were crude. In some schooners, the crew was berthed forward under the forecastle head. The Captain generally had a room to himself, but in many of the old schooners the two mates occupied a room over the boilers on the main deck and the fireman had the other side. In early steam schooners the two engineers had a small room, sometimes aft, and occasionally on the upper deck. (Myers, R, 1927).

In 1982 the National Park Service Historian James Delgado, of the Golden Gate National Recreation Area, and a consulting naval architect, Raymond Aker, determined that the remains of a shipwreck recently exposed by seasonal beach erosion at Fort Funston's Ocean Beach was the two masted schooner *Neptune* (Delgado, 1983). Built at Bendixsen's Fairhaven Yard in 1882, the *Neptune* was 106' 5" long with a 30' beam and 8' 7" depth of hold, 184 gross tons, and 175 net tons. She had a single deck, billethead, and elliptic stern and was heavily built similar to the *CA Thayer*. The CA Thayer, which is still afloat, was built by Hans Bendixsen in 1895. She is 156' in length, 36' in beam, and 11'8" in depth, weighing 453 tons gross and 390 tons net. She could stow 575,000 running feet of lumber (130% of her registered capacity), with most of the timber carried on deck (Myers, M., 1967; Birkholz, 1991). The CA Thayer had a moderately raked stem, a pole mast over 100' tall and a bowsprit 58' long. She was rigged with three headsails, three lower sails, and occasionally used a gaff topsail, or fisherman's sail.

Although these two ships are of different size, many aspects of the fastening techniques are identical, including; plank and futtock connections, treenails 1.5" in diameter (used to hold the planks of the vessel together), clench bolts 1" in diameter, clench rings 1.5", and chainplates 3.5" wide (Delgado, 1983; Kiser, 1984). The techniques used for fastenings were standard for shipbuilding; the holes through the plank were bored slightly smaller than the diameter of the treenails, the treenails were either hand or machine-driven, and were lopped off at either end flush with the planks. A hardwood wedge was then driven in at either end across the diameter of the treenail to expand the ends for a tight fit. The *CA Thayer* treenail fastenings appear to have been turned on a lathe and to be perfectly round as opposed to being eight-sided (Kiser, 1984).

Clinch bolts (usually steel or iron) were used to supplement treenails. Clinch bolts of the standard type and fastening technique were present in both vessels. They were sent entirely through the planks and had their ends hammered over, with a clinch ring placed at each end. The ends of the bolts were upset with a round-faced top maul (hammer), forcing their necks to swell over the clinch ring. The swelled ends were then riveted over into a rounded head using a flat-faced top maul. It was important not to split the ends of the bolts because that would cause weakness (Davis, 1918; Kiser, 1984). The Hyde Street Pier, an annex to the National Maritime Museum of San Francisco, has an interactive display where visitors can practice this fastening technique.

For connections between hull planks, the butt joints must be placed on the top of frames so that they are not floating free, but staggered in the planking so that a weakness does not develop from placing them next to each other. A combination of fastenings is usually used at the butt end. (Kiser, 1984). Treenail fastenings resist transverse strains better than metal, but the metal will better resist direct separation strains making a combination of fastenings desirable. The futtocks were also constructed and connected in the standard method: pieces were laid out in the required shape in two layers, one layer overlapping the joints of the other (Desmond, 1919). Chainplates were flat or rounded iron bars bolted to the side of a vessel to support the lower rigging and backstays (mast support leading aft to the deck or another mast).

The flourishing lumber trade in Puget Sound made it practical for the construction of even larger ships on the northwest coast. Larger sawmills could cut bigger trees, rendering longer planks and spars (the longest in the world; for which they became known). Lumber barons of the far North West desired ships that could carry a greater variety of cargoes to and from the large bays of the north such as the deep-water harbors of Puget Sound, but were also able to duck into a "doghole" to load a cargo of lumber. These schooners were more varied in appearance than the vessels built for the Mendocino coast. Three masted schooners became common in the 1870's and 1880's. Averaging 150 feet in length and 300 tons, they had approximately twice the tonnage of a two-masted schooner (Myers, M, 1967).

CONCLUSION

The evolution of Pacific coast lumber schooners was shaped and directed by the socio-economic needs that drove the growth of the lumber industry spawned by the California gold rush. Those needs determined the vessels' intended cargo, the trade routes the vessels would travel, and also provided the building materials for the vessels that would make that same lumber industry possible. Lumber schooners, doghole ports, harbors, and lumber handling equipment developed along parallel lines, and at a fairly even pace with the demands of the industry. Designed for the coast's environmental conditions and the needs of the coastal shipping industry, the ships of the West Coast evolved into something never before seen. Without the lumber industry of the Pacific West Coast the schooner may never have come to dominate shipping in the Pacific. By dominating that trade the lumber schooner was able to exert a strong influence on the economic history of the region. Without the schooner the lumber industry of the Pacific Coast would not have been able to exist and thrive. The settlement and development of the Pacific West Coast was largely an outcome of the growth of the region's shipping industry. The small towns that today dot the Mendocino and Humboldt county coastline catering to tourists and vacationers, exist only because there was once a fleet of doghole schooners to connect them and their only major resource to the rest of the world.

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SECTION THREE

RESOURCE PROTECTION AND LEGAL ISSUES

News media often contain articles about shipwreck discoveries which stress the potential for 'treasure', the antiquity of the wreck or its notoriety in history, or the strongly-held opinions between salvage operators and preservationists. Many nations have laws and regulations addressing maritime prehistoric or historic materials, including ships, artifacts, or indigenous objects and materials. The S. S. BROTHER JONATHAN is a celebrated legal and historic case in California that required about nine years for resolution, following a series of lawsuits. But beyond the gold coins, historic artifacts such as bottles, ceramic items, a padlock, and wooden fragments, the loss of life and impact of the event upon 1865 California life was historically significant. During the Conference, state and federal attorneys who were involved in courtroom action discussed their positions and feelings. Artifacts were on public display in the State Capitol Building from September 1999 to January 2000 and were later curated in the Del Norte County Historical Society Museum.

On a global scale, the ICOMOS program within UNESCO has been developing a worldwide declaration on improvement of management and preservation of submerged cultural heritage resources. The Charter on Protection and Management of Underwater Cultural Heritage was ratified in 1996 and is now under individual review by UN member nations. The Charter contains recommendations for submerged heritage research projects, curatorial management of materials found, qualifications of researchers, and dissemination of project results.

San Francisco Chronicle Fri., May 28, 1999 P.d7

Coins From 1865 Shipwreck To Be Auctioned Tomorrow

Treasure aboard paddle wheeler Brother Jonathan

ASSOCIATED PRESS

Los Angeles- Auctioneers displayed a rare $10 gold coin yesterday that could fetch more than $100,000 at the weekend sale of gold pieces retrieved from the wreckage of the S.S. Brother Jonathan, which was lost in the deadliest shipwreck in California's history.

Experts considered the 1865 coin the prize of the 1,207 gold coins salvaged by a private company from the ill-fated ship, which sank in 1865. Minted in San Francisco, the coin contains a printing blunder and is one of only 36 known to exist. The auction of that coin and about a thousand others tomorrow is expected to draw bidders to Los Angeles from New York as well as countries in Asia and Europe, organizers said.

"The quality of these coins is like they came straight from the mint," said Greg Roberts, a bidder representing the Mandalay Bay Resort and Casino in Las Vegas. "We've never seen anything like this before."

Roberts, who bought an 1804 silver dollar for a record $1.8 million in 1997, said the coins represent California's history and capture the spirit of the Gold Rush era, which began in 1849.

The Brother Jonathan, a wooden-hulled, paddle steamer, sunk about four miles off Crescent City on July 30, 1865. The ship, which carried sailors, miners, politicians and prostitutes, was headed for the Pacific Northwest, but struck a submerged rock. Only 19 of the ship's 250 passengers survived, making it the worst maritime disaster in state history.

The ship's wreckage was undisturbed for more than 120 years until El Cajon-based Deep Sea Research discovered it in the early 1990s. It had searched for the ship for two decades.

Its discovery brought on a protracted dispute over the vessel's treasure. Deep Sea, which spent more than $1 million to recover the ship, had to negotiate with two insurance companies that had paid claims from the wreck. The company eventually gained title to the ship.

But the state's Land Commission then entered the fray, engaging the salvage company in a lengthy legal dispute over ownership of the ship and its contents that made its way to the U.S. Supreme Court. The legal wrangling ended last year with an out-of-court settlement in which the state received 20 percent of the treasure :200 gold coins.

"Our whole purpose in the lawsuit, which took the better part of nine years, was to protect the historical shipwreck," said Peter Pelkofer, senior counsel of the California Lands Commission. "The money the state received is incidental. It's the historic and archaeological value that is of most concern."

The settlement left Deep Sea with the 1,006 coins that will be auctioned tomorrow by the Wolfsboro, N.H., company Bowers and Merena. Another coin, encrusted with coral, was donated to a museum in Crescent City.

Roberts, who will represent Mandalay Bay at the auction, described Deep Sea's attempts to acquire ownership as "a great American story."

He said Mandalay Bay was prepared to spend between $5 million and $10 million at the auction and 'would buy all the coins', if possible, for a museum built at the casino complex.

Donn Pearlman, a spokesman for the auction house, said the $5, $10 and $20 gold pieces held up well despite being submerged for more than 130 years. On some coins, which retain their luster, the figures are so well preserved that curls of hair can easily be made out.

This exhibition and brochure was produced by the California State Lands Commission

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The California Historical Society
Walter Gray, State Archivist, and the staff of the California State Archives

For additional information, please visit the California State Lands Commission website:
http://shipwrecks.slc.ca.gov
and to view the complete *Brother Jonathan* artifact collection, please visit:
The Del Norte County Historical Society Museum located at 6th and H Streets in Crescent City, California.
The museum is open from May to September, 10 A.M. to 4 P.M., Monday through Saturday.

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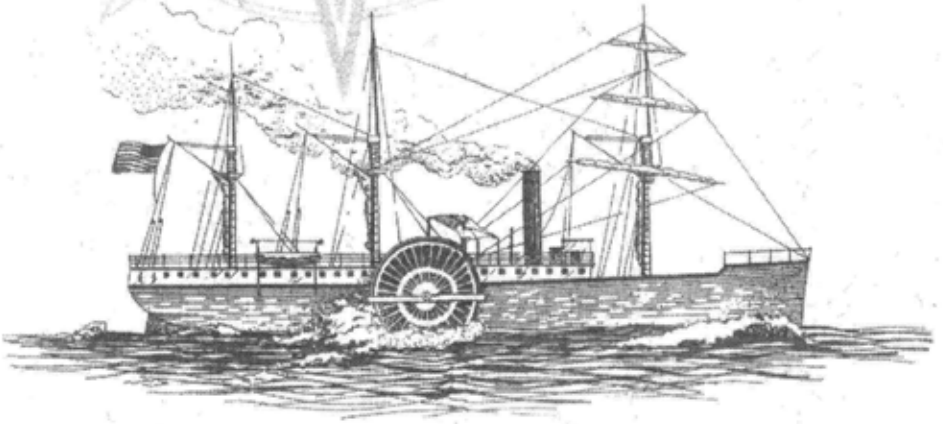
9/1999

The Brother Jonathan

A California Treasure Ship



Supplemental Brochure to the Exhibition
California State Capitol
September 1999 through January 2000

Presented by the California State Lands Commission

The Rush to Gold

Assaying Crucible
c. 1850, glazed crockery.

The news didn't take long to cross the country. Shopkeepers and housekeepers, freed slaves and recent immigrants, dreamers, soldiers, pioneers, fortune hunters, all caught gold fever. 1849 saw the migration of many thousands of gold seekers, later referred to as 49ers, eager to risk their lives in the hope of striking it rich.

But how to get to California? The options for travel were limited, the conveyances primitive, and the trip grueling. Many crossed the North American continent on horseback, by wagon or on foot. Some gold seekers found a less arduous mode of travel, buying passage on a ship bound for California. That trip, a perilous voyage lasting four months or longer, took the individual around Cape Horn at the lower tip of South America and then north to San Francisco. An impatient fortune hunter might also choose to sail to Central America, go ashore at the Isthmus of Panama, ride a mule or walk overland to the Pacific Ocean and there board another ship north.

A SHIP IS BUILT

Eastern ship owners also caught gold rush fever. The 49ers wanted swift and safe passage, and were willing to spend handsomely to reach California as soon as possible. During the height of the gold rush, ship passage for an individual cost from $300 to more than $1,000 ($6,000-20,000 in current dollars). Entrepreneurs outfitted every available ship and then built new vessels for the passage to California.

The double sidewheel steamer, *Brother Jonathan,* was built for New York shipping entrepreneur Edward Mills to take advantage of this golden opportunity.

SPECIFICATIONS: THE *BROTHER JONATHAN*

Built by Perrine, Patterson & Stack Shipyard, Williamsburg, New York
Launched: November 2, 1850

Length:	220 feet, 11 inches
Beam:	36 feet wide
Draft:	13 feet 10 inches
Hold:	21 feet deep
Engine:	Vertical "walking" beam engine, T. F. Secor and Co., originally built for the steamer, *Atlantic*; salvaged and rebuilt for the *Brother Jonathan* by the Morgan Iron Works, New York, New York
Boiler:	Flue type, with coal primary and wood secondary burner
Drive:	Two side-mounted paddle wheels
Masts:	Two
Decks:	Two
Hull:	Wood (live oak, white oak, locust, cedar), secured by diagonal braces of flat iron bar, five feet apart, 4-1/2 inches wide by 3/4, and extending from stem to stern. Copper-plated lower hull, below water line.
Colorway:	Hull was painted black, with a blue wale and buff deckhouses.
Accommodations:	365 berths, some with air-through ventilation.
Cost:	$190,000.00 (1850)

EDWARD MILLS

Edward Mills, a New Yorker who had competed in the Trans-Atlantic shipping trade with limited success, decided to cash in on the hoards of persons wanting passage to the riches of California by building a ship and offering transportation between New York and Panama. Because Mills owned no vessel on the Pacific side, he made an agreement with the Empire City Line to pick up his passengers in Panama and speed them on to San Francisco.

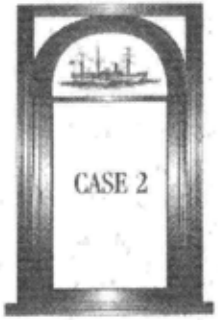
Disaster struck when the Empire City Line's *SS Union* went ashore failing to reach Panama and stranding the *Jonathan's* passengers. With a schedule to meet, the *Brother Jonathan* returned to New York, leaving her passengers to find their way north as best as they could. The Pacific Mail Steamship Company also offered Pacific passage to San Francisco, but refused to honor Mills' lesser-priced tickets, further compounding his problems. Mills' whole operation was plagued by misfortune resulting in declining business and, in March 1852, he was forced to sell the *Brother Jonathan* to Cornelius Vanderbilt.

CORNELIUS VANDERBILT

Cornelius Vanderbilt, c. 1870.

The greatest challenge to the Pacific Mail Company came from Cornelius "Commodore" Vanderbilt. A founding father of Vanderbilt University, Vanderbilt accumulated his fortune in the shipping and railroad industries. Although not a military officer, his skillful domination of the shipping business earned him the nickname "Commodore." At age 13 he was helping his father with shipping cargo in New York Harbor and by 16 he had purchased a small boat to ferry passengers and freight—the beginning of his shipping empire. He bought his first steamship in 1829.

During the Gold Rush, Vanderbilt reduced the travel time to California by establishing a new route through Nicaragua. Although many said the route was not navigable, he personally piloted a small steamboat up the San Juan River to test the route. Vanderbilt's route was 600 miles and 2 days shorter to California than through Panama, and it was cheaper — he immediately slashed the prevailing fare of $600 to $400.



Trade & Commerce

EAST COAST SAILINGS

The *Brother Jonathan* began her career in March of 1851 sailing the Atlantic route to Panama under Captain Charles Stoddard. On her first passage, she made the trip between New York and Panama in 31 days: a new round trip record. During the remainder of that year she made a number of additional trips to Panama and two to Nicaragua. The stranding of passengers in Panama on two occasions when their connecting steamer on the Pacific side failed to arrive, coupled with overcharging and overloading of passengers on a return trip from Nicaragua and the resulting lack of accommodations, led to the decline of Mills' business and the sale of the *Brother Jonathan* to Cornelius Vanderbilt.

The *Brother Jonathan* was completely rebuilt under Vanderbilt's ownership. Her fine clipper bow was cut down to a more practical and seaworthy straight stem, another mast was fitted at the stern, and her accommodations were increased to handle 750 passengers. The rebuilt *Jonathan* left New York for San Francisco in May of 1852. After a rough passage around the Horn, she finally arrived in San Francisco on October 5 to commence her new career as a Pacific Coast steamer.

WEST COAST SAILINGS

The *Brother Jonathan* made regular voyages between San Francisco and San Juan del Sur. In February 1856, the loss of a transit contract ended the San Francisco to Nicaragua passages and the *Brother Jonathan* was sold and renamed the *Commodore*. She then began making voyages from San Francisco to Oregon, Washington, and British Columbia ports.

The *Brother Jonathan* and other early coastal steamships were the commercial arteries of the Pacific coast economy, carrying nearly all consumer goods between California and British Columbia. In fact, the development of San Francisco and other Pacific coast ports was made possible by this regular steamer service.

Brother Jonathan *(top center). San Francisco, 1863.*

Courtesy of the California Historical Society

Pottery.

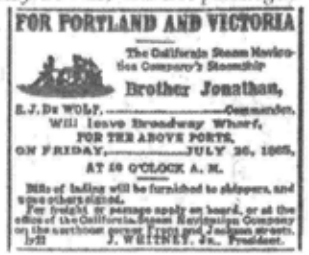
AN ILLUSTRIOUS CAREER

In 1858, gold was discovered on the Fraser River in British Columbia. Although many African Americans had come to California to escape persecution and slavery in the South, as many as 400 of them chose to move to British Columbia in search of gold, cheap land and a better life. The *Brother Jonathan* carried the first group of African Americans who migrated from California to Canada.

Besides holding an extensive history of hauling both gold seekers and commercial cargo, the *Brother Jonathan* also brought the first news to Oregon of that territory's admission to the Union upon her arrival at Portland on March 15, 1859. In addition, she participated in the 1861-1862 rush for gold on Idaho's Salmon River.

The Wreck

The *Brother Jonathan* sailed from San Francisco on July 28, 1865 under the command of Captain Samuel J. DeWolf, with 244 passengers and crew and a large cargo that allegedly overloaded the steamer. On the afternoon of July 30, the *Brother Jonathan* was wrecked in a storm off Crescent City, California. She had struck a submerged pinnacle, now known as "Jonathan Rock," on St. George Reef, also known as the Dragon's Teeth.



FOR PORTLAND AND VICTORIA

The California Steam Navigation Company's Steamship

Brother Jonathan,

S. J. De WOLF, ——————Commander,

Will leave Broadway Wharf,

FOR THE ABOVE PORTS,

ON FRIDAY,——————JULY 28, 1865,

AT 10 O'CLOCK A. M.

Bills of lading will be furnished to shippers, and wine others signed.

For freight or passage apply on board, or at the office of the California Steam Navigation Company on the northeast corner Front and Jackson streets.

J. WHITNEY, Jr., President.

Notice of Sailing, Alta California.

According to the quartermaster, who was one of the few survivors:

"I took the helm at twelve o'clock. A northwest gale was blowing and we were four miles above Point St. George. The sea was running mountains high and the ship was not making headway. The captain thought it best to turn back to Crescent City and wait until the storm had ceased. He ordered the helm hard aport. I obeyed and it steadied her. I kept on due east. This was about 12:45. When we made Seal Rock the captain said southeast by south. It was clear where we were, but foggy and smoky ashore. We ran until 1:50 when she struck with great force, knocking the passengers down and starting the deck planks. The captain stopped and backed her, but could not move the vessel an inch. She rolled about five minutes, then gave a tremendous thump and part of the keel came alongside. By that time the wind and sea had skewed her around until her head came out of the sea and worked off a little. Then the foremast went through the bottom until the yard rested on deck."

Captain DeWolf.

Within 30 to 45 minutes after striking the reef, the *Brother Jonathan* sank. A number of the passengers and crew remained below and went down; others struggled in the water but drowned.

Six lifeboats were launched, but only one made it away from the ship. The other boats were crushed or capsized. The boat that made it away carried nineteen people. Forty-five bodies and loose wreckage drifted ashore after the wreck. The bodies recovered from the sea were buried ashore. In 1950, a special cemetery in Crescent City was dedicated where the bodies had been relocated. The site is now a California Registered Landmark, number 541. In number of lives lost, the wreck of the *Brother Jonathan* is the worst maritime disaster in California history.

Headstone of one of the Jonathan's victims, Polina Rowell, Crescent City.

Previous Searches & Identification


Nail and Wood Fragment, c. 1860, brass and wood

Until located by Deep Sea Research, Inc., the *Brother Jonathan* had remained undisturbed since 1865. The lure of her treasure inspired several unsuccessful attempts at recovery. The first known search occurred in 1877. Other attempts in 1894, 1927 and 1986 were equally unsuccessful. Using side-scan sonar and a small manned submersible, Deep Sea Research located the site and identified the remains of the *Brother Jonathan* in 1993.

WHAT WAS DISCOVERED

Although her remains have slowly disintegrated, the *Brother Jonathan* is the best preserved of any known gold rush-era steamer on the Pacific Coast. She lies 250 feet underwater, southeast of Jonathan Rock.

A significant portion of her hull is still visible, as well as ceiling planking, the ends of floors and frames, and portions of the ship's diagonal iron strapping. Surviving machinery includes the port paddlewheel shaft, the engine machinery, the cylinder, and the boilers.

Artifacts recovered include a dark glass beer bottle, stoneware, an ink stamp, and ceramic pottery. Rows of other plates and bowls are visible, but were not recovered.


Glassware.

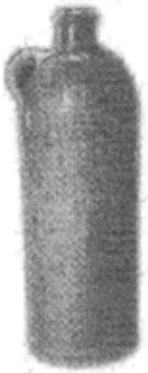
RECOVERY AND CONTROVERSY

Who owns treasure buried in the sea? The answer remains controversial. And so it was with the ownership of the *Brother Jonathan*. After finding the wreck, Deep Sea Research filed suit in federal court claiming ownership and a reward. The State of California, which claims ownership of all historic vessels in California waters, joined the suit. The parties reached a settlement after eight years of litigation.

The settlement grants ownership of the *Brother Jonathan* to the State, with Deep Sea Research receiving a liberal award for its efforts. It also permits the company to continue searching for and retrieving objects. Search and recovery activities are monitored by the State and must be conducted in a manner that respects the historic importance of the ship.

CARGO

Although the original manifest was lost in the 1906 San Francisco fire and earthquake, *The Alta California* reported on August 10, 1865, that "there were about seven hundred tons of merchandise freight, besides the passengers' baggage, all closely under hatch." Aside from the great loss of life, other reports suggest that her cargo may have included:



50 cases of cigars
25 barrels of butter
17 cases of tobacco
Mining machinery, including a quartz (ore) crusher
2 camels (owned by a circus)
Woolen mill machinery
U.S. Army payroll, possibly $200,000 in currency, gold and silver coin
Treaty payment, possibly $100,000 in gold coin
A Wells Fargo bank shipment, possibly $250,000 in gold bullion


L-R. Mineral Water Jug with original wax seal and contents, German, c. 1865, salt glazed crockery, manufactured by "Selters, Herzogthum Nassau." Glass beer bottle, "Collect" Stamp, c. 1860, cast brass and ebony; 1852 Five-dollar gold coin; 1849 Ten-dollar gold coin; & 1865 Twenty-dollar gold coin.

Case 4, continued.

THE CALIFORNIA STATE LANDS COMMISSION

The State Lands Commission is the California agency entrusted with the responsibility for the preservation, protection and management of the State's 3.5 million acres of submerged lands, including the natural and cultural resources found on or in those lands. These lands consist of a strip, from the mean high tide line to three miles offshore, that extends eleven hundred miles along California's coastline and surrounds its offshore islands. They also include the beds of more than thirty navigable rivers and forty navigable lakes.

The California State Lands Commission administers the California Shipwreck and Historic Marine Resources Program that was enacted by the Legislature in 1989. The Commission's Program objectives regarding submerged archaeological sites and historic resources are to:


Padlock.

Identify shipwreck sites or marine areas with archaeological or historical significance.

Provide comprehensive and coordinated conservation and management of such marine sites and area.

Support, promote, and coordinate scientific research on archaeologically or historically significant sites and areas; and

Facilitate to the extent compatible with resource protection, all public and private uses of marine archaeological and historic sites and their resources.

The California State Lands Commission endeavors to protect the historical value and environmental integrity of shipwreck sites, while providing for some recovery by both public and private individuals.

THE ICOMOS INTERNATIONAL CHARTER ON THE PROTECTION AND MANAGEMENT OF UNDERWATER CULTURAL HERITAGE

Ratified by the 11th General Assembly, held in Sofia, Bulgaria, from 5-9 October 1996

INTRODUCTION

This Charter is intended to encourage the protection and management of underwater cultural heritage in inland and inshore waters, in shallow seas and in the deep oceans. It focuses on the specific attributes and circumstances of cultural heritage under water arid should be understood as a supplement to the ICOMOS Charter for the Protection and Management of Archaeological Heritage, 1990. The 1990 Charter defines the "archaeological heritage" as that part of the material heritage in respect of which archaeological methods provide primary information, comprising all vestiges of human existence and consisting of places relating to all manifestations of human activity, abandoned structures, and remains of all kinds, together with all the portable cultural material associated with them. For the purposes of this Charter underwater cultural heritage is understood to mean the archaeological heritage which is in, or has been removed from, an underwater environment. It includes submerged sites and structures, wreck-sites and wreckage and their archaeological and natural context.

By its very character the underwater cultural heritage is an international resource. A large part of the underwater cultural heritage is located in an international setting and derives from international trade and communication in which ships and their contents are lost at a distance from their origin or destination.

Archaeology is concerned with environmental conservation; in the language of resource management, underwater cultural heritage is both finite and non-renewable. If underwater cultural heritage is to contribute to our appreciation of the environment in the future, then we have to take individual and collective responsibility in the present for ensuring its continued survival.

Archaeology is a public activity; everybody is entitled to draw upon the past in informing their own lives, and every effort to curtail knowledge of the past is an infringement of personal autonomy.

Underwater cultural heritage contributes to the formation of identity and can be important to people's sense of community. If managed sensitively, underwater cultural heritage can play a positive role in the promotion of recreation and tourism.

Archaeology is driven by research, it adds to knowledge of the diversity of human culture through the ages and it provides new and challenging ideas about life in the past. Such knowledge and ideas contribute to understanding life today and, thereby, to anticipating future challenges.

Many marine activities, which are themselves beneficial and desirable, can have unfortunate consequences for underwater cultural heritage if their effects are not foreseen.

Underwater cultural heritage may be threatened by construction work that alters the shore and seabed or alters the flow of current, sediment and pollutants. Underwater cultural heritage may also be threatened by insensitive exploitation of living and non-living resources. Furthermore, inappropriate forms of access and the incremental impact of removing "souvenirs" can have a deleterious effect.

Many of these threats can be removed or substantially reduced by early consultation with archaeologists and by implementing mitigatory projects. This Charter is intended to assist in bringing a high standard of archaeological expertise to bear on such threats to underwater cultural heritage in a prompt and efficient manner.

Underwater cultural heritage is also threatened by activities that are wholly undesirable because they are intended to profit few at the expense of many. Commercial exploitation of underwater for cultural heritage trade or speculation is fundamentally incompatible with the protection and management of the heritage

This Charter is intended to ensure that all investigations are explicit in their aims, methodology and anticipated results so that the intention of each project is transparent to all.

THE ICOMOS INTERNATIONAL CHARTER ON THE PROTECTION ANDMANAGEMENT OF UNDERWATER CULTURAL HERITAGE

Article 1
FUNDAMENTAL PRINCIPLES

The preservation of underwater cultural heritage *in situ* should be considered as a first option.

Public access should be encouraged.

Non-destructive techniques, non-intrusive survey and sampling should be encouraged in preference to excavation.

Investigation must not adversely impact the underwater cultural heritage more than is necessary for the mitigatory or research objectives of the project.

Investigation must avoid unnecessary disturbance of human remains or venerated sites.

Investigation must be accompanied by adequate documentation.

Article 2
PROJECT DESIGN

Prior to investigation a project must be prepared, taking into account:
- the mitigatory or research objectives of the project;
- the methodology to be used and the techniques to be employed;
- anticipated funding;
- the time-table for completing the project;
- the composition, qualifications, responsibility and experience of the investigating team;
- material conservation;
- site management and maintenance arrangements for collaboration with museums and other institutions;
- documentation; health and safety; report preparation;
- deposition of archives, including underwater cultural heritage removed during investigation;
- dissemination, including public participation.

The project design should be revised and amended as necessary.

Investigation must be carried out in accordance with the project design. The project design should be made available to the archaeological community.

Article 3
FUNDING

Adequate funds must be assured in advance of investigation to complete all stages of the project design including conservation, report preparation and dissemination. The project design should include contingency plans that will ensure conservation of underwater cultural heritage and supporting documentation in the event of any interruption in anticipated funding.

Project funding must not require the sale of underwater cultural heritage or the use of any strategy that will cause underwater

cultural heritage and supporting documentation to be irretrievably dispersed.

Article 4
TIME-TABLE

Adequate time must be assured in advance of investigation to complete all stages of the project design including conservation, report preparation and dissemination.

The project design should include contingency plans that will ensure conservation of underwater cultural heritage and supporting documentation in the event of any interruption in anticipated timings.

Article 5
RESEARCH OBJECTIVES, METHODOLOGY AND TECHNIQUES

Research objectives and the details of the methodology and techniques to be employed must be set down in the project design. The methodology should accord with the research objectives of the investigation and the techniques employed must be as unintrusive as possible.

Post-fieldwork analysis of artifacts and documentation is integral to all investigation; adequate provision for this analysis must be made in the project design.

Article 6
QUALIFICATIONS, RESPONSIBILITY AND EXPERIENCE

All persons on the investigating team must be suitably qualified and experienced for their project roles. They must be fully briefed and understand the work required.

All intrusive investigations of underwater cultural heritage will only be undertaken under the direction, and control of a named underwater archaeologist with recognized qualifications and experience appropriate to the investigation.

Article 7
PRELIMINARY INVESTIGATION

All intrusive investigations of underwater cultural heritage must be preceded and informed by a site assessment that evaluates the vulnerability, significance and potential of the site.

The site assessment must encompass background studies of available historical and archaeological evidence, the archaeological and environmental characteristics of the site and the consequences of the intrusion for the long-term stability of the area affected by investigations.

Article 8
MATERIAL CONSERVATION

The material conservation program must provide for treatment of archaeological remains during investigation, in transit and in the long term.
Material conservation must be carried out in accordance with current professional standards.

Documentation must provide comprehensive record of the site, which includes the provenance of underwater cultural heritage moved or removed in the course of investigation, field notes, plans and drawings, photographs and records in other media.

Article 10
SITE MANAGEMENT AND MAINTENANCE

A program of site management must be prepared, detailing measures for protecting and managing in situ underwater cultural heritage in the course of an upon termination of fieldwork. The program should include public information, reasonable provision for site stabilization, monitoring and protection against interference. Public access to *in situ* underwater cultural heritage should be promoted, except where access is incompatible with protection and management.

Article 11
HEALTH AND SAFETY

The health and safety of the investigating team and third parties is paramount. All persons on the investigating team must work according to a safety policy that satisfies relevant statutory and professional requirements and is set out in the project design.

Article 12
REPORTING

Interim reports should be made available according to a timetable set out in the project design, and deposited in relevant public records. Reports should include:

- an account of the objectives;
- an account of the methodology and techniques employed;
- an account of the results achieved;
- recommendations concerning future research, site management and curation of underwater cultural heritage removed during the investigation.

Article 13
CURATION

The project archive, which includes underwater cultural heritage removed during investigation and a copy of all supporting documentation, must be deposited in an Institution that can provide for public access and permanent curation of the archive. Arrangements for deposition of the archive should be agreed before investigation commences, and should be set out in the project design. The archive should be prepared in accordance with current professional standards.

The scientific integrity of the project archive must be assured; deposition in a number of institutions must not preclude reassembly to allow further research. Underwater cultural heritage is not to be traded as items of commercial value.

Article 14
DISSEMINATION

Public awareness of the results of investigations and the significance of underwater cultural heritage should be promoted through popular presentation in a range of media. Access to such presentations by a wide audience should not be prejudiced by high charges.

Co-operation with local communities and groups is to be encouraged, as is co-operation with communities and groups that are particularly associated with the underwater cultural heritage concerned. It is desirable that Investigations proceed with the consent and endorsement of such communities and groups.

The investigation team will seek to Involve communities and interest groups in
to the extent that such involvement is compatible with protection and management. Where practical, the investigation team should provide opportunities for the public to develop archaeological skills through training and education.

Collaboration with museums and other institutions is to be encouraged. Provision for visits, research and reports by collaborating institutions should be made In advance of investigation.

A final synthesis of the investigation must be made available as soon as possible, having regard to the complexity of the research, and deposited in relevant public records.

Article 15
INTERNATIONAL CO-OPERATION

International co-operation is essential for protection and management of underwater cultural heritage and should be promoted in the interests of high standards of investigation and research. International co-operation should be encouraged in order to make effective use of archaeologists and other professionals who are specialized in investigations of underwater cultural heritage. Programs for exchange of professionals should be considered as a means of disseminating best practice.

Adopted by ICOMOS in 1996

SECTION FOUR

SUBMERGED RESOURCE INVENTORIES

Since a basic step in maritime heritage studies and management is to conduct an inventory of specific resources located underwater and on shoreline lands, various information gathering methods can be used. In some cases, archival and other historical research yields wreck event narratives, past maritime coastal land uses, and voyage accounts describing native-visitor contacts. Ethnohistory and ethnography combined with terrestrial archeological research can produce identified cultural resource locations. Remote sensing techniques are commonly used to search submerged lands for suspected maritime historical archeological evidence in the form of technology from lost vessels.

The following papers give examples of technological and historical information applied to building inventory data regarding maritime heritage in prehistoric times as well as recent past. Jeremy Bates, Jeff Ota, Aaron Weast, and Russell Skowronek give us an example of 'remote operated vehicle' – ROV – equipped with video and other photographic tools to search Arctic waters for a lost whaling fleet. Jim West, David Hansen, and Pat Welch apply geographic information system (GIS) to plot Native American prehistoric sites located near tidal wetlands margins in a segment of the San Joaquin River Delta. This study has demonstrated the importance of inventorying native habitation sites within a river delta environment, highly altered since 1850.
Michael Burwell and Michel Hope summarize the building of a state-wide shipwreck inventory from historical records, using computer programs to provide an interactive database for public use. The Bates et al paper and Burwell – Hope papers show the linkage possible using a database for project design.

THE 1871 NEW BEDFORD WHALING DISASTER IN ALASKA: A TEST SITE FOR NASA's MARS PATHFINDER TECHNOLOGY

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Introduction

On July fourth of 1997, the Mars Pathfinder lander set down on the surface of the Red Planet, equipped with new space-age technology able to create a three dimensional, virtual reality map of the planet's surface. This same technology, designed for interplanetary exploration, will have a significant impact on research right here on Earth, specifically, in the field of underwater archaeology. Developed by NASA's Intelligent Mechanism's Group (IMG), this technology, when attached to a Remotely Operated Vehicle, or ROV, may provide a more accurate and efficient way for mapping marine sites.

Remotely Operated Vehicles, or ROVs, have been a part of marine research and especially underwater archaeology for decades. ROVs are often preferred over human divers for a number of reasons, including safety and making the most out of limited dive time. However, there is one part of underwater archaeological research that usually been performed, with the exception of sonar soundings, using scuba tanks, tape measures, and a pencil. Mapping marine sites has always represented a major effort, one that requires a lot of time, and one that is difficult to perform with a high degree of accuracy. Recently, the problems associated with the mapping of underwater sites may have been solved by NASA's IMG as part of an archaeology project conducted in the Chukchi Sea off the North Coast of Alaska.

The Technology

NASA's interest in underwater three-dimensional mapping is scientifically driven by the search for life in extreme environments. As part of the agency's new Astrobiology research initiative, one of NASA's primary goals is to identify and study potential Earth analogs of extra-terrestrial conditions that could support life in some form. Hydrothermal vent regions in the Earth's oceans have been identified as top candidates for research since they emit a chemical energy that supports an abundance of non-photosynthetic bacterial life surrounding the vent. With the new data coming from the Galileo spacecraft orbiting Jupiter, there is strong evidence that both Europa and Ganymede have liquid water underneath their icy crusts. Because the magnetic fields of these moons are constantly changing, one of the few possible explanations would be that a shifting conductive material, specifically salt water, must exist beneath the surface. Liquid water requires a heated core, which infers there should be hydrothermal vents somewhere in these extra-terrestrial oceans.

Before exploring the oceans on Jupiter's moons, we need to first understand the hydrothermal vent regions that exist here on Earth. One of the enabling technologies that would aid in this research is the development of an underwater three-dimensional image capturing system that could be viewed within a virtual environment program on a high-powered computer. Fortunately for the Arctic research team, the Intelligent Mechanisms Group at the NASA Ames Research Center in California had already developed a highly successful three dimensional image capture and analysis system for the 1997 Mars Pathfinder mission. This system included two accurately mounted stereo cameras, a synchronized digitizing board, a custom three-dimensional image

processing software named the "stereo pipeline," and a Virtual Reality Modeling Language (VRML) viewer. The challenge for the NASA/Santa Clara University team would be to determine whether this same methodology would work underwater.

In order to prove the system's underwater usefulness, the team established the goal of capturing one image from the stereo cameras and processing them into a three-dimensional mesh. A secondary goal was to generate multiple meshes and then stitch them together to prove the feasibility of three-dimensional mapping. Using a hastily developed mount, two Sony XC-75 black and white cameras, a PC with a digitizing board, a Silicon Graphics O2 machine, and a Macintosh Powerbook G3, the team was able to capture the images, process them on the Macintosh and view them (Figure 1) on the SGI. Both goals were met, and from that experience further development is currently in progress to simplify the system onto one computer and to improve the accuracy of the captured images. Long term goals include automated regional mapping and precision control of a Remotely Operated Vehicle or an Autonomous Underwater Vehicle (AUV) using vision-based cameras. Now the question was whether it would work in the sea. Following a presentation at the Arctic and Antarctic Access Workshop at NASA Ames Research Center, we were approached by the United States Coast Guard and asked to be a part of their Ship of Opportunities program. Dr. Phillip McGillivary, Science Liaison Officer, had reported that a whaling fleet lost in 1871 may be undisturbed and in fairly good condition on the bottom of the ocean near Barrow off the Alaska Coast. It was on this site that a consortium founded by Santa Clara University, NASA, Minerals Management Service, the State of Alaska, the United States Coast Guard, NOAA, and Deep Ocean Engineering, Inc., was to test the technology.

Goals

During our three-week cruise in the Chukchi Sea, we had two primary goals: the first was to test NASA's technology and determine whether or not it would function in a dark, cold ocean environment. This was meant to simulate the environment that a probe carrying the stereo camera system might experience if sent to bodies of water on other planets. The second was to locate an archaeological site that we could use as a mapping test area. The stereo cameras were mounted on an ROV, the Phantom XTL, lent to us by Deep Ocean Engineering in San Leandro, California (Figure 2). Using the ROV as a platform for the cameras, we had the advantage of being able to take photographic images from all angles of a given site. This meant that when the images were converted into a computer-generated three-dimensional model of the site, there were no data gaps, and the entire site could be seen. This was especially important when dealing with structures that may have been standing out from the bottom of the ocean floor.

History of the Site

The site that we chose to search for was that of a well-known whaling disaster that occurred in 1871 between Wainwright Inlet and Icy Cape, Alaska. The following is a brief history of this site, including historical background that serves to put it in perspective.

From the sixteenth century onward, the capture of whales for commercial profit has been an important industry on the eastern seaboard. By the nineteenth century, many cities relied almost entirely on the whaling industry for survival. Whales provided many useful and profitable products: the oil obtained from melting their thick blubber down was used for lighting and heating homes, as well as in the production of varnish, paint, lubricants, soap, and in the process of tanning leather. In Europe, it was even used to make margarine. "Whale bone" taken from baleen whales was an extremely versatile and durable substance, used for making corset stays for women, umbrellas, horsewhips, and a variety of other common items (Davis et al. 1997). Often, the leftover parts of the whales were kept and used as fertilizer or feed for livestock. Whales

were, then, very profitable animals to catch. It should be noted, however, that it was not only the products from the whales themselves that kept the eastern port cities and towns going. It is estimated that for every man that was involved in the actual hunt, six men were able to make a living off the industry on shore (Francis 1990). This is easy to imagine—jobs were created by the needs of the whalers themselves: coopers, sail-makers, carpenters, ship designers and painters, rope-makers, and blacksmiths, as well as those involved in handling, shipping, refining, and selling the products.

By 1823, one city had clearly emerged as the primary hub of the American whaling industry. Through circumstance and adaptability, New Bedford, situated fifty miles south of Boston, controlled an estimated fifty-five to eighty percent of the total United States output of whale products between the 1850s and 1890s (Davis et al. 1997). After 1848, New Bedford whalers began to take advantage of a new whale fishery discovered north of the Bering Strait. The Arctic waters were home to the Bowhead whales, close cousins of the Right whales found in the northern Atlantic. The whales were favorable as targets for many reasons; for one, their easily traceable migration patterns made them relatively easy to locate. Once spotted, they were also fairly easy to catch, being slower swimmers than other species. Their thick blubber, adapted for life in the frigid waters of the northern polar region, yielded up to two hundred and eighty barrels of oil per whale (Davis, et. al. 1997). This combined with the large baleen strands found in the whales' mouths, made the long cruise to the Arctic worthwhile.

This is exactly what one fleet of thirty-nine ships, most of them hailing from New Bedford, did in 1871. The whalemen were sailing barks, a class of wooden ships characterized by slow, squat, yet powerful hulls. The first two of three masts were square rigged, and the mizzen would have been fore-and-aft rigged. To save money, the barks were wind-driven, though the steam engine already existed. The thirty-nine ships sailed from Hawaii, and passed through the Bering Strait between June eighteenth and thirtieth. By the middle of July, they had made it past Icy Cape, Alaska, and were as far north as Wainwright Inlet (Figure 3). During the first week of August, ice floes began to move in, pushed by the strong winds. These floes were blown out to sea again by August twenty-fifth, but moved back towards shore again three days later (Allen 1973). The ships had not left, despite warnings from the Inupiats, and were now trapped between the shore and the ice in an open stretch of water between two hundred yards and one half mile wide (Bockstoce 1986). At depths of fourteen to twenty-four feet, the water was too shallow for the ships to attempt to follow the shore to safety, and the ice closed in (Figure 4). By September eighth, a series of meetings between the ships' captains had begun in an effort to remedy the situation. Scouting parties were sent southward, and returned with a report that seven of the thirty-nine ships had managed to stand off from the ice. It was decided on the twelfth that the ships would be abandoned—a document was drawn up to that effect, and signed by the captains (Allen 1973).

The crews of the doomed ships made ready by fitting the whaleboats with false keels and higher gunwales in order to make them more stable and seaworthy for the journey ahead, as well as sheathing the hulls in copper, to protect them from ice damage. Food, water, and other necessary supplies were loaded up, leaving between one and a half and three million dollars worth of whalebone and oil behind (price not adjusted to current dollar value). This done, twelve hundred crewmembers (including some family members) alternately rowed and sailed the small whaleboats over sixty miles of ocean to the south (Francis 1990). Five days later, they were rescued by the seven free ships, and transported to Hawaii without a single loss of life. The whaling ships that had been abandoned were left anchored between Point Marsh to the south and Point Belcher to the north (see Bockstoce 1986). Some of them were crushed by the ice and sank as they were released later. Others were pulled out to sea by the retreating floes. Many of those

close to shore were stripped of their timber and other supplies by the natives. Often, the ships were eventually washed up on the beach.

Fairly good information exists as to where these ships were last seen before they went down, as is well-documented by John Bockstoce, but little to nothing is known about what happened the ships after they sank. There has been quite a bit of speculation, of course, that the cold Arctic waters would have preserved the hulls virtually intact, and there are stories of people peering down into the water and being able to see the ships with their masts and rigging still intact, sitting peacefully on the bottom. Of course, ice scouring does take place in this area, and therefore it has also been suggested that anything above the sediment on the bottom of the ocean floor would be completely destroyed by this point. So, besides wanting to know exactly where some of these ships might now be, we were also interested in finding out what condition they might be in after being submerged in the Chukchi Sea for over a century.

Research Design

The search for the 1871 fleet began with project performing extensive literature research on the historical background of the potential site. Interviews were also conducted among inhabitants of Barrow, Alaska, in order to ascertain the degree of knowledge locals have of possible wreck locations. Of particular value in deciding where to begin the search was an Outer Continental survey map provided by the Minerals Management Service through Michelle Hope. This map was compiled using various historical sources, and detailed the areas in which the ships are believed to have been lost. From the areas where the ships were last believed to have been on the surface, we narrowed our search area to a one-mile by two-mile area, taking into account wind and current patterns, as well as submarine terrain and depth. Originally, the first search patterns were to be run through the 1x2 mile grid using side-scan sonar provided by the Navy Arctic Submarine Lab in San Diego, California, and operated by Navy sonar technicians. This plan failed, as the sonar units (two) both malfunctioned. Instead, the ROV itself was deployed off the side of the primary research vessel and run in two forms of search patterns, one linear and one radial. The same search patterns were also used when deploying the ROV off of a "Landing Craft Vehicle Personnel," or LCVP. The latter approach, however, was not as effective as a base of operations as the former. Reasons for this include the difficulty and danger of deploying the ROV, higher risk of damaging the ROV or other equipment due to motion or water damage (when dealing with electronics and computers), personal discomfort due to wave action and temperature, and the greater risk of damage to potential sites due to the more frequent use of boat anchors. When conducting search patterns with the ROV, the search is purely visual. The ROV Pilot and Chief Scientist watch the monitor displaying the ROV's camera images, and visually inspect the ocean floor for signs of any cultural resources.

When a site or potential site was located, the ROV Pilot was conduct a fairly quick "run-by" of the site in order to confirm that the site was worthy of further investigation by divers. This was done in order to make full use of the dive team—dive time was extremely limited due to water temperature and number of personnel, and as such it was our intention to only put divers in the water for the most promising finds. The ROV Pilot was to remain at a hover above the site while waiting for divers to enter the water. During this time, one team member took the responsibility of "capturing images;" that is, switching the ROV's video channel to the black-and-white stereo cameras in order to record images capable of being processed into three-dimensional representations.

Results

As stated above, we had originally planned on searching for remnants of the 1871 fleet using sidescan sonar. Unfortunately, the sonar, upon being plugged in, self-destructed. Fortunately, we had unwittingly moored the ship almost directly over what we believe may be a site. In the course of practicing search patterns and operations with the ROV one evening, we happened to come across a pattern of ridges in formations that did not seem to be natural. We recorded the GPS coordinates, and deployed divers to confirm whether or not the site was in fact a shipwreck. The divers were not able to recover any artifacts, as the site was covered in sediment, which, if disturbed to a high degree, would have made the dive unsafe. The divers did report that the ridges that made up the site were solid and squared off, as timbers would be. They were also arranged in a configuration suggestive of a ship's bow section, including keelson and frames. Extensive video footage was taken using the ROV's cameras. We are not, at this point, able to positively confirm or deny that the site is in fact a wreck. The site was then lost due to an unfortunate series of events related to a second faulty sonar system and never relocated. In the end, we were not able to produce a map of the site, but at least we do know its location as precisely as civilian GPS will let us.

Conclusion

Though we were not able to map the site itself, we took many images of the underside of the Polar Star, as well as the ocean floor. These came out very well, and proved that the technology does indeed work. From a technological standpoint, then, the project turned out to be a success. In the future, we expect that this kind of precise mapping will aid researchers in many different ways—for instance, site access. After a site is mapped, it will not only be available for study for those diving on it, but also to many people on land, who need only a computer to visit the site. Human error will largely be eliminated in the process of mapping, making it a much more efficient and accurate undertaking. Probably the best result, however, is that no longer will divers' safety by compromised. An ROV is able to stay underwater indefinitely, as well, so that dive time can be used in more effective ways.

The project was a mixed success from a strictly archaeological perspective. We do believe that we may have found a man-made structure of sorts, and considering the number of shipwrecks reported off the Alaska coast, it is certainly possible that it is a shipwreck. Whether or not the site has anything to do with the whaling disaster of 1871 remains unknown. However, this project has opened a door to Arctic research, not only archaeological, but to many other disciplines, as well, including marine biology and geology. The use of the ROV and NASA's Pathfinder technology has brought us a wonderful new tool for probing the secrets of the world's oceans.

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A GEOGRAPHIC INFORMATION SYSTEM BASED ANALYSIS OF THE DISTRIBUTION OF PREHISTORIC ARCHAEOLOGICAL SITES IN THE SACREMENTO-SAN JOAQUIN RIVER DELTA, CALIFORNIA: A CALFED PLANNING STUDY

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Introduction

The San Francisco Bay/Sacramento-San Joaquin Delta (Bay-Delta) is the largest estuary on the West Coast of North America (Figure 1). It consists of a maze of tributaries, sloughs, and islands supporting more than 750 plant and animal species. The Bay-Delta is critical to California's economy, supplying drinking water for two-thirds of all Californians and irrigation water for 250 crops and livestock commodities. For decades the Bay-Delta has been the focus of competing economic, ecological, urban and agricultural interests. To address these concerns, state and federal agencies signed an agreement in 1994, which provided for increased coordination and communication for environmental protection and water supply dependability. The agreement laid the foundation for the Bay-Delta Accord and CALFED.

CALFED is a joint Federal-State program to develop a long-term comprehensive plan that will restore ecological health and improve water management for the San Francisco Bay and the Sacramento-San Joaquin Delta system. The primary objectives are to provide good water quality, improve and increase aquatic and terrestrial habitats, improve water supply reliability and reduce the vulnerability of the system to catastrophic breaching of Delta levees. The initial CALFED process is programmatic and, as such, deals only with existing data. Here we present one aspect of the CALFED planning process, an examination of the distribution of known prehistoric archeological sites in the Delta.

Analytical models of archeological site distributions are well suited to applications in project planning such as CALFED. They can be used to identify patterns in spatial relationships between archeological sites and their physical environment and thus indicate potential relationships between the natural or social environment and the locations of past human activities. A causal relationship is posited: environmental factors influence where human activities occur (Kincaid 1988:550). The quantity as well as the quality of analysis necessary to develop such models requires automated spatial analysis of data through the use of a geographic information system (GIS).

Delta Region

The Delta is located at the confluence plain of the Sacramento and San Joaquin Rivers in central California and covers approximately 735,000 acres (297,450 hectares)(Figure 1). While there are several different definitions of the "Sacramento-San Joaquin Delta," for our purposes we will use the area delimited by Atwater's 1982 *Geologic Maps of the Sacramento-San Joaquin Delta* since it encompasses most of the geomorphic units that constrain a distinct prehistoric cultural history, has the highest geologic resolution and conforms, with little exception, to the CALFED study area (Figure 2).

Prior to 1850 the Delta was a vast tule marsh with riparian forests along the natural levees of the major rivers. Fossil evidence indicates that this vegetation was present for at least the last 6000 years (West 1977). While the Sacramento and San Joaquin Rivers are its major tributaries, other streams, particularly the Mokelumne, contribute significantly to its hydrology. Prior to upstream impoundment and diversions the Mediterranean seasonal nature of California's precipitation and the spring snowmelt controlled water flow through the Delta.

The amount of historic modification to lands in the study area cannot be over-emphasized and the modern Delta is a faint reflection of its former self. Artificial levees, highways, bridges, housing developments, marinas, rip-rap, dredging, channel cuts, canals, drainage ditches, pump stations, and cultivated fields characterize the modern Delta. In 1950 Weir observed that "many of the Delta wetlands are now as much as 18 feet below sea-level because of historic land-use practices." Waterways have been shoaled by upstream late 19th century hydraulic gold mines, deepened by dredging of construction material for levees, and interconnected by dredge-cut channels. No stands of unmodified native vegetation remain and many introduced plants are commonly dominant. Thompson (1957) has documented that in the decade from 1860 to 1870 15,000 acres (6070 hectares) had been reclaimed; by 1930 total reclaimed area exceeded 441,000 acres (1 78,470 hectares). Since 1930 most of the remaining 290,000 acres (I 17,360 hectares) has been reclaimed or modified.

Delta Prehistory

The prehistory of the Delta is based on archeological investigations that occurred primarily in the first half of the 20th century. Approximately 80% of the known prehistoric sites were recorded prior to 1960. The Central California Culture Sequence is based on the differences of funeral patterns, artifact types, and induration (Lillard et al. 1939). Three periods, or horizons, are recognized: the Early Period (now dated approximately 2500-500 B.C.), the Middle Period (500 B.C. to A.D. 300), and the Late Period (A.D. 300 to 1840). This archeological construct has evolved into a new classification (Fredrickson 1974) which defines three major patterns: Windmiller, Berkeley, and Augustine. Isolated artifacts thought to be early Holocene to late Pleistocene in age, and thus pre-date the Windmiller Pattern, have been found on the surface at localities on the margin of the study area (Beck 1971; Heizer 1938).

The Windmiller Pattern is known only from the eastern-Delta, middle reaches of the Mokelumne River area, and adjacent areas of the lower valley from the middle Cosumnes River to Stockton. This pattern, equivalent to the Early Period in this area, has distinctive burial patterns, diagnostic shell ornaments and stone tool forms. Considerable debate has focused on the subsistence base of these people (Dorn 1980; Gerow 1974; Heizer 1974; Schulz 1970, 1981).

The Berkeley Pattern is equivalent to the Middle Period in the lower Sacramento Valley, although earlier phases may be coeval with the Early Period in the Bay Area. The Berkeley Pattern is characterized by flexed burial positions, diagnostic ornaments, and, in the valley, by bonefish spears or leister points and stone pestles. The diet emphasized fish and acorns.

The Augustine Pattern corresponds to the Late Period in the lower Sacramento Valley. It is marked by the appearance of small projectile points and changes in funerary patterns and ornament styles. These cultures, in general, appear to be ancestral to the ethnographic groups of the same area (Bennyhoff 1961) and practiced a similar settlement-subsistence pattern.

The Meganos Complex (Fredrickson 1974) deserves mention. This complex, assigned to the Middle and Late Periods, is characterized by extended burials and by distinct cemeteries

disassociated with midden areas. Such cemeteries are known particularly from the sand mounds of the western Delta (Cook and Elsasser 1956). This complex shares the same dietary emphasis of the Berkeley Pattern.

Characteristics of Prehistoric Delta Sites

Prior to leveling for agriculture many of the prehistoric sites in the Delta were low gentle sloping mounds, ranging in height from six inches to over 7 feet above the surrounding land surface (Schenck and Dawson 1929). The mounds are generally assumed to be natural rises that were enlarged by the gradual accumulation of midden, although there is some historical evidence that they may have been intentionally modified by the inhabitants (Belcher 1843:130). Some of the mounds extend below the current ground level and some are buried entirely with no surface evidence (Heizer 1949). The composition of the cultural deposits varies greatly from black loam to yellow silty clay. Intermediate deposits contain varying amounts of fine sand, generally yellow or tan in color, and may be representative of sub-levels of mound deposits. Hardpans are common in sites in the higher elevation depositional units and in some sand mounds, likely the result of long-term weathering.

Native Peoples

The native peoples of the Delta area were divided among five linguistic groups, all belong to the Penutian language stock. The far northeastern part of the Delta region was occupied by the Valley Nisenan, the eastern part and far western part by Plains and Bay Miwok speakers, the southern part by the Northern Valley Yokuts, and the north shore of the Suisun Bay area by the Patwin. Despite sharing the same environment, there were distinct material cultural differences among the five groups (Bennyhoff 1977:47).

The Plains and Bay Miwok are members of the Utian family of the Penutian stock languages (Shipley 1978). The boundaries and divisions of the Miwok are based largely on linguistic evidence (Bennyhoff 1977, Kroeber 1925, Levy 1978, Schenck 1926). The Miwok were intensive collectors; they occupied large, fixed, multilineage villages (tribelets) located on high ground generally adjacent to watercourses. Most villages were occupied permanently except during short periods of harvesting. Camps for fishing and hunting were also part of the settlement system.

The Northern Valley Yokuts were semi-sedentary, with principle settlements on low mounds or levees on or near the banks of major watercourses. Loosely centralized tribes headed by a chief (the position of which was inherited) were tied to one or more principle villages. Secondary settlements consisted of small camps or villages of several households. Next to settlements, there were fishing stations, hunting camps, and lithic-tool-manufacturing sites. The early disruption of Yokut-speaking people resulted in little ethnographic information (Bennyhoff 1977, Schenck 1926, Schulz 1981, Kroeber 1925.)

The term "Patwin" refers to several tribelets of people who occupied the west side of the Sacramento Valley extending from Suisun Bay north to just above the town of Princeton on the Sacramento River (Johnson 1978). Patwin tribelets generally occupied one primary and several satellite villages, some contained as many as 1,000 or more persons (Powers, 1976). Each triblet had a sense of territoriality and autonomy (Johnson 1978). Subsistence, like that of their neighbors, was based on hunting, gathering, and fishing. Details on the lifeway of Patwin are little known because they were among the earliest groups in the region to be affected by missionization and introduced diseases. By 1871-1872, when Stephen Powers surveyed the state

while gathering ethnographic information, the Patwin culture no longer existed.

The destruction of native Delta cultures was the result of several factors. Even before explorers and seftlers made extensive contact, the missions drew Native Americans away from their villages. An 1833 epidemic, possibly malaria, killed thousands and numerous villages were abandoned. The secularization of the missions in 1834 caused Native Americans of various cultural affinities to retreat into areas of previous cultural homogeneity (Wallace 1978). The collapse of the Delta cultures began before the Gold Rush, and ended when later waves of seftlers converted native territory into agriculture fields. Village mounds of the native peoples were abandoned, reoccupied by farmhouses, buried under levees, or leveled for agriculture.

Geomorphic Background

To comprehend the settlement prehistory of the Delta it is necessary to appreciate its geomorphic development. Unlike true deltas, such as the Nile, the geologic Delta is a large tidal wetland and flood plain at the juncture of the Sacramento and San Joaquin Rivers. Drainage from one-third of the State's land area passes through the Delta to San Francisco Bay, finally exiting through the Golden Gate to the Pacific Ocean.

The current Delta is primarily the result of post-Pleistocene sea level rise, aggradation of fine grained sediments, and the bio-accumulation of organics (Atwater 1980, Shlemon and Begg 1975). While there is some evidence for tectonic subsidence, the amount has not been clearly determined for the Holocene but is probably minor. At the end of the Pleistocene, sea level was more than 180 feet (55 meters) lower than today (Atwater, Hedel and Helley 1977) and the shoreline was situated some distance west of San Francisco. As the result of worldwide glacial ice melting sea level rose rapidly until about 8000 years ago and then slowed considerably. By 6000 years ago the current Delta began to form. Consequently, the aggradation of fine-grained sediments and bioaccumulation of organics mostly derived from aquatic-emergent plants, were the primary factors in the evolution of the Delta. With the exception of aeolian sand mounds, most of the Delta deposits at or below sea level are relatively recent (Holocene age) and generally less than 6000 years old.

Prior to 1850, before significant human modification, the Delta consisted of intertidal wetlands laced with about 1 00 square kilometers of subtidal waterways (Atwater and Belknap 1980). Flood plains of tributary rivers, mainly the Sacramento, San Joaquin, and Mokelumne, merged with these tidal environments, producing supertidal levees within the Delta and seasonally converting many tidal wetlands to alluvial flood basins. Additional areas of relatively high ground are the relict aeolian sand mounds scattered throughout the Delta. Cosby's (1941) Piper series soils are representative of some of the aeolian deposits. Many of the sand deposits are strongly indurated, suggesting considerable age, and Atwater (1 982) has dated some of the ancient dunes to between 7000 and 40,000 years ago.

The Mokelumne River is the largest of the San Joaquin River tributaries, contributing about 22 percent of the entire San Joaquin Valley run-off. The result of this large amount of run-off is an alluvial fan that deflects the Sacramento River to the west. The Mokelumne fan offers a coryiparatively old Delta surface, parts of which have remained unchanged for a long period of years under natural conditions. Stone Lake is one of the remnants of a number of small shallow overflow lakes that were present on the Mokelumne fan prior to 1850.

With the geomorphic model of Delta development, in situ prehistoric remains contained within Delta deposits are temporally constrained to the upper two-thirds of the Holocene (6000 years).

Unlike the San Francisco Bay where sites extending 3 feet to 18 feet (0.9 to 5.5 meters) below sea level have been found (Bickel 1978), no prehistoric Delta sites, with the exception of one questionable report (CALTRANS 1989), have been found to extend below contour elevations of -5 feet (-1.5 meters) below mean sea level (based on USGS 7.5'quad. map elevations).

The model does not preclude that earlier sites and sites found in deposits significantly below sea level could be found, but it does indicate the likelihood of finding such sites would be low. Such a finding, however, would be highly significant since it might clarify the role that sea level and subsidence has had in the development of the Delta during the Holocene and reveal an unknown cultural pattern.

It is important to note that isolated artifacts thought to be >6000 years old have been found on higher fan surfaces near the margin of the study area (Beck 1971; Heizer 1938). Since they were surface finds it is unclear whether these artifacts are associated with the surfical deposits or whether later occupants curated them. In places the older fan surfaces and alluvial deposits can be traced beneath the younger Delta deposits (Shelmon 1972).

Methods

To assess cultural resource distribution in the Delta, a multi-level approach was applied. First, site location and attribute data were obtained from the State Office of Historic Preservation and the California Historical Resources Information Centers (information Centers). A delimited file containing the data was clipped to restrict geographic coverage to correspond to the study area. This data was downloaded into Reciamation's GIS with Arc/Info 7.0.3 as the primary software.

Programming was accomplished through ArcMacro Language. Site locations were plotted on U.S.G.S. 7.5-minute quadrangle overlays using Universal Transverse Mercator coordinates and compared to hard copy locations obtained at the Information Centers to check for accuracy. All records where locational errors were discovered were corrected.

The second approach, and a major effort of the study, involved digitizing Atwater's (1 982) map of the Delta's surficial geology and geomorphology and incorporating it into a GIS layer. The site locational information was overlaid on Atwater's map units. Site location was determined for each individual sedimentary/landform unit and distances to watercourses, lakes, and Atwater's 1850 tidal influence margin. Further sorts were based on site attributes. For evaluating the distribution of the spatial relationships of these variables in a statistical framework, Weights of Evidence, an extension to ArcView, was applied to the data (Raines and Mihalasky 1999). Weights of Evidence allowed us to evaluate and interpret the resolution of the various data sets.

Results

A total of 178 prehistoric sites have been recorded for the study area. The State Historic Preservation Office maintains a database of archeological sites using information supplied by individual Information Centers on Encoding Sheets. These sheets include sixteen attributes to describe the variability of California archeology. Sites may be described using one or more attribute and their application is not rigorous or consistent. Encoding level information is used for this study. Existing databases were accessed where available and data collected from individual Information Centers was condensed to be consistent with encoding sheets.

The resolution of Atwater's geologic units and geomorphic features varies and in places errors of greater than 1500 feet (495 meters) are present. While this may seem to be a major problem,

comparison of site record data on location and attributes on soils and geology shows that the overwhelming majority of descriptions are congruent with one another.

Six site categories are used in this study. The categories are: Habitation Debris, Habitation Debris with burials, Burials, Rock shelter, Other and Unknown. More than half (53%) of the sites are reported to contain habitation debris. These sites often contain additional attributes. A fair number of the Unknown and other category sites, as well as some burial sites, may contain habitation debris, but without field checking this can not be determined. Eighty-eight sites (49 percent) are reported to contain burials, but the actual number is probably higher since this figure is undoubtedly biased as to whether or not any subsurface investigation has taken place.

Archeological sites are spread disproportionately across the study area, and three of the nine composite landform groups, which cover 62.6 percent of the Delta, contain 93.8 percent of the sites (Figure 3). Alluvium of super-tidal flood plains represents 33 percent of the total acreage within the Bay-Delta study and yet 54 percent of the prehistoric sites are located within these landforms. Eolian deposits cover just over 3 percent of the Delta landforms yet they contain 16 percent of the sites. Alluvial fans and fan terraces, other than Modesto Formation fans, cover 27 percent of the study area and contain 24 percent of the sites. Modesto Formation fans account for 11 percent of the study area yet contain only 3.4 percent of the sites.

Peat and mud of tidal wetlands cover 23 percent of the study area and contain five sites (2.8 percent of the sites), however, upon closer inspection these five sites are actually contained within eolian sand mounds that were not resolved with the geological mapping. When these five sites are added to the eolian unit (new total = 33) the percent of sites found in eolian deposits reaches almost 19 percent. Thus, the total percentage of sites found within the three-landform groups expands to 96.6 percent.

No sites were found on Hydraulic Dredge Spoils, on the Montezuma Formation, or on bedrock; however, these landforms add up to only 2.5 percent of the study area. Two sites, a rock shelter and a bedrock/milling feature, fall in the mapped area of Qch (Alluvium of creeks from Corral

Hollow drainage to Brushy Creek). This error is due to resolution of the geologic mapping since the rock shelter and bedrock/milling feature occur within small outcrops of bedrock that were not resolved.

To further refine the relationship of sites to the surficial geology, their distribution has been broken down into Atwater's 25 geological units (Table 1). Fourteen of the units contain recorded sites. The other eleven units have no recorded sites present. From this sort it can be observed that 83 percent of the sites are found on 45 percent of the study area. Almost 12 percent of the sites are found on the Riverbank formation, which covers only 7 percent of the study area. The Riverbank formation pre-dates the Modesto Formation and is one of the older alluvial surfaces in the study area that is generally above the Holocene flood plain but still near major drainage. Thus, it is not surprising that a relatively high number of sites are found associated with the Riverbank formation.

Discussion

Inventory in the Delta has been uneven. Relatively little systematic inventory has been accomplished in the face of overwhelming impacts from widespread agricultural development. Recent inventory reports describe systematic methods where only a small percentage of the study area was examined, much of it in peat and mud of tidal wetlands and on made-lands (artificial

levees, spoil areas, etc.). And yet, we believe that the majority of habitation sites present in the Delta have, in fact, been recorded. Prominent prehistoric mounds attracted the interest of early archeologists and many sites were documented. These researchers also recognized the relationship of sites to landforms but never formally quantified their observations. As noted above, approximately 80 percent of known prehistoric sites were recorded prior to 1960, whereas the explicit systematic surveys post-date 1960. The absence of systematic inventories of a large percentage of the study area precludes development of a controlled site density model, although a relative site density model appears to be justifiable.

It is generally believed that organic Delta lands were undesirable for prehistoric occupation (West 1991, 1994). They represent 23 percent of the study area. Ail prehistoric sites recorded for peat and muds of tidal wetlands are, in fact, located upon eolian deposits that were not resolved by the geologic mapping. Pleistocene fossil sand dunes and other sand mounds protrude through the Holocene peat soils and it is these micro-environmental localities that served as the basis for habitation within the tidal wetlands. The resolution of our GIS-geologic layer includes the majority of these sand features. Where the sand mounds have been mapped and the site map layers reconciled through the Weights of Evidence extension for ArcView the correlation with prehistoric sites is unambiguous. Further conformation of this conclusion is provided in the individual site records and survey reports in which no prehistoric cultural deposits, other than isolates, which may have been distributed by plowing and leveling, are reported for peat and mud of tidal wetlands.

Elevation is another variable that enters into site location (Figure 4). In the study area the lowest elevation is 25 feet (7.6 meters) below mean sea level (bmsl) and the highest elevation is 244 feet (74 meters). The higher lands are restricted to alluvium and bedrock in the southwestern part of the study area and the Montezuma formation in the western part that are artifacts of Atwater's decision to include these land forms within his mapping study. Most of the area that we are interested in for CALFED covers some 592,024 acres (239,592 hectares) of the surface that lies below 15 feet (4.5 meters) (81 % of the study area). These include the peat and mud tidal deposits which have a mean elevation of -4.5 feet (-1.4 meters) (median -4 feet (-1.2 meters)). Not surprisingly the majority of prehistoric sites (65 percent) fall between 0-10 feet (0-3 meters) with a mean of 6.6 feet (2 meters) and a median of 5.2 feet (l.6 meters). A Bedrock\Milling feature at 58 feet (1 8 meters) and a rockshelter at 49 feet (I 5 meters) are outside of the CALFED area of interest and were excluded from the calculations for median and mean site elevations.

Of the six sites reported to be below mean sea level, only one (SJo-225) is reported to be greater than 5 feet (l.5 meters) bmsl, with the remaining five between 3-5 feet (O.9-1.5 meters) bmsl. SJo225 was discovered during construction of a drainage ditch. It reportedly contained at least three burials and evidence that suggests habitation debris might be present (CALTRANS 1989). The area of the find was greatly disturbed and only elevations from the ground surface were provided, thus the accuracy of the depth of >5 feet below sea level is questionable.

The current sea level contour is closely related to the location of Atwater's 1850 tidal influence line. In places the resolution of the 1850 tideline may err more than 1000 feet (330 meters)(Atwater 1982). When comparing site locations to the 1850 tideline, 53 percent of the sites fall within 1 000 meters, 66 percent within 1500 meters, and 75 percent within 2000 meters.

Geographic Reconstruction

As noted, the geography of the Sacramento-San Joaquin Delta is far different today than it was prior to 1850, before extensive dredging and building of levees for reclamation of farmland. In

some cases these activities have placed prehistoric archeological sites far out of their proper environmental context. Based on the reconstruction of the lands subject to tidal influence and the surficial geology of Atwater (1982), it is possible to view more clearly prehistoric archeological sites in their original environment (Figures 2 & 4). Sites are found on the margins of watercourses, on sand mounds, and along the edges of lakes, such as Stone Lake; the majority falls within 2000 meters of the 1850 tideline. The data are compatible to those relationships observed in the Cosumnes River area (Pierce 1988).

Previously, reconstructed watercourses, areas presently and formerly subject to tidal influence, and other features of surface geology (Atwater 1982) were used as a basis for generating a non-quantified predictive model of prehistoric settlement patterns in the south Delta region (West 1994). The reconstruction of environmental features in the south Delta suggested a relationship between specific natural features (e.g. streams, major water channels, margins of tidal wetlands), sediment type, and elevation and the presence of archeological sites. Our results are consistent with these earlier findings but expand the interpretation by providing quantitative relationships between the variables.

Future Studies

While the relationship between cultural chronology and site distribution has not been addressed in this initial study, such analysis is warranted in future studies. GIS mapping of subsurface geologic units may help to explain the location of other sites, and can be used to define areas of sensitivity for archeological sites, which may now be buried. Further, a more refined dating of deposits in which sites are found may be useful in constraining their period of occupation and in predicting the location of additional sites.

Conclusions

From this GIS analysis we conclude that there is a quantifiable systematic relationship between the distribution of prehistoric archeological sites and substrate/landforms, watercourses and lakes, the 1850 line of lands subject to tidal influence, and elevation. Since none of these variables are completely independent of one another and their resolution varies, errors do result when comparing data sets (GIS layers). However, the GIS approach allows, in most instances, for errors and data gaps to be readily identified and evaluated. This iterative process and in particular the use of Weights of Evidence allows for continued refinement of systematic analysis of the relationships between the spatial data sets. The value of our initial GIS based regional study of Delta archeological site distribution has the potential to identify research issues and assist in the implementation of survey strategies that will maximize and systematically structure future analysis of prehistoric settlement patterns and other archeological data. Further, the results of such studies can be a powerful tool used to evaluate potential effects to prehistoric resources in the early planning stages of programs such as CALFED.

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Unit	Landform	Acres	% Area	Sites	% Sites
Qb	Alluvium-Flood basin deposits	72598	9.8	19	10.7
Qch	Alluvium of Creeks from Corral Hollow drainage	28371	3.9	5	2.8
Qcr	Alluvium of Calaveras River	38421	5.2	7	3.9
Qds	Hydraulic-Dredge Spoils (post-1900)	5859.1	0.7	0	0
Qe	Eolian deposits, undivived (upper Pleistocene)	22.01	0	0	0
Qfp	Alluvium, Supratidal flood plains, undivided	136203	18.6	44	24.7
Qla	Alluvium, Antioch, intermediate, UP	168.72	0.02	0	0
Ql	Alluvium, Supratidal flood, Natural levees	31809	4.3	33	18.5
Qm	Modesto formation, UP	83185	11.3	6	3.4
Qm2e	Eolian, Upper member of Modesto Fm.	23922	3.3	32	18
Qmz	Montezuma Formation (Pleistocene)	10876	1.5	0	0
Qoa	Alluvium, Antioch, oldest UP	4070.1	0.5	0	0
Qoe	Eolian, older UP	26.52	0	1	0.6
Qom	Alluvium, Montezuma, older, Pleistocene	6881.9	0.94	0	0
Qomc	Alluvium, Marsh Creek, older, Pleistocene	644.44	0.08	2	1.1
Qop	Alluvium, Putah Creek, older, UP	697.12	0.09	0	0
Qpm	Peat and Mud, Tidal Wetlands & Water ways	169014	23	0	0
Qr	Riverbank Formation, undivided, UP	256.37	0.03	2	1.1
Qro	Riverbank Formation, older, UP	50037	6.8	10	5.6
Qry	Riverbank Formation, younger, UP	14419	2	9	5.1
Qya	Alluvium, Antioch, youngest, Holocene	403.68	0.05	0	0
Qym	Alluvium, Montezuma Hills, younger, Holocene	149.16	0.02	0	0
Qymc	Alluvium, Marsh Creek, younger, UP-Holocene	39215	5.3	6	3.3
Qyp	Alluvium, Putah Creek, younger, UP-Holocene	14716	2	0	0
TKb	Bedrock (Tertiary and upper Cretaceous)	2271.3	0.3	2	1.1
Total		734236	99.73	178	

Table: 1 Prehistoric site distribution by Atwater's geological units and area corrected for differences in map resolution.

Figure 1: Map of California's San Francisco Bay/Sacramento-San Joaquin Delta.

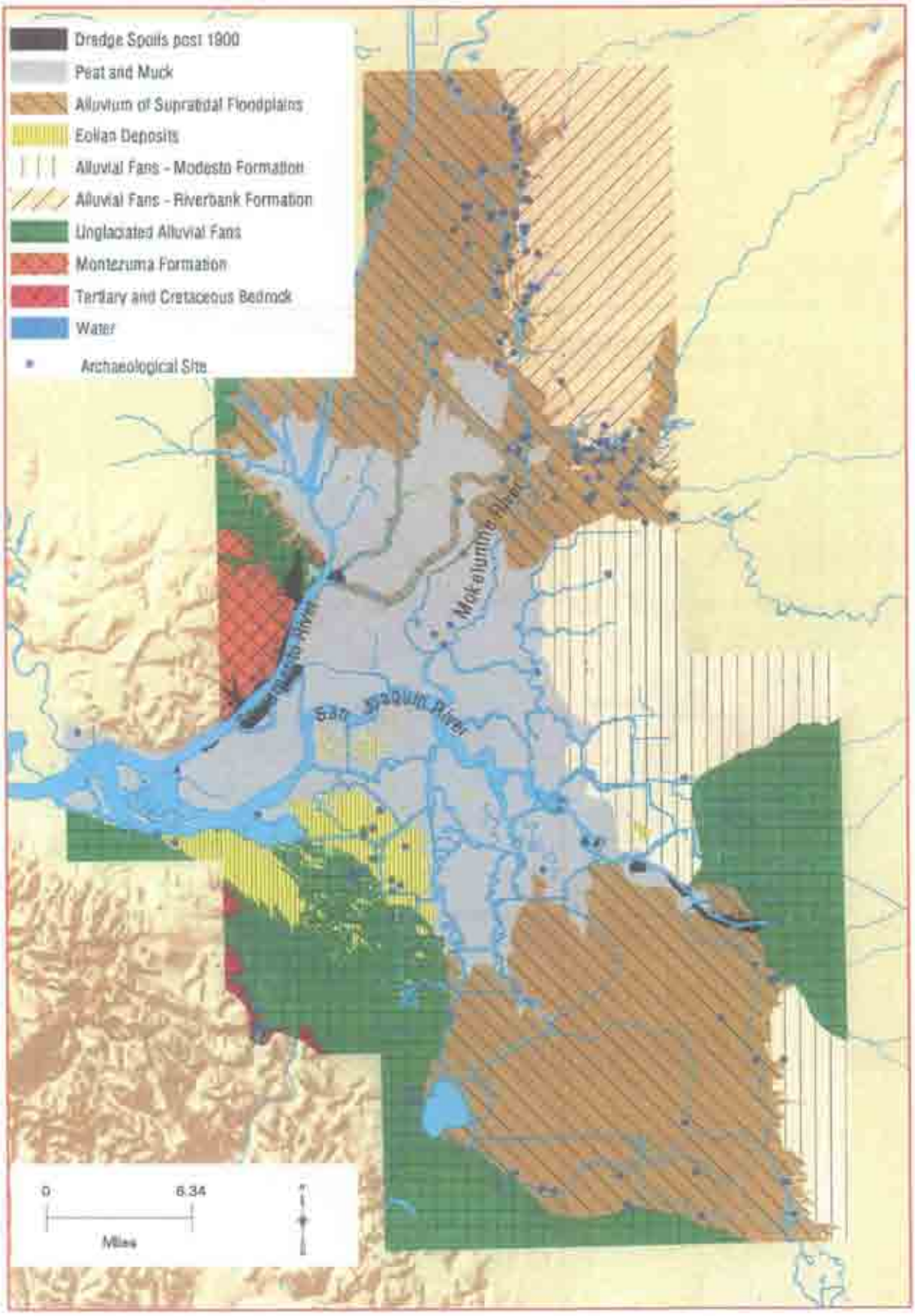


Figure2: Distribution of prehistoric sites and composite geologic units for the study area.(#108)

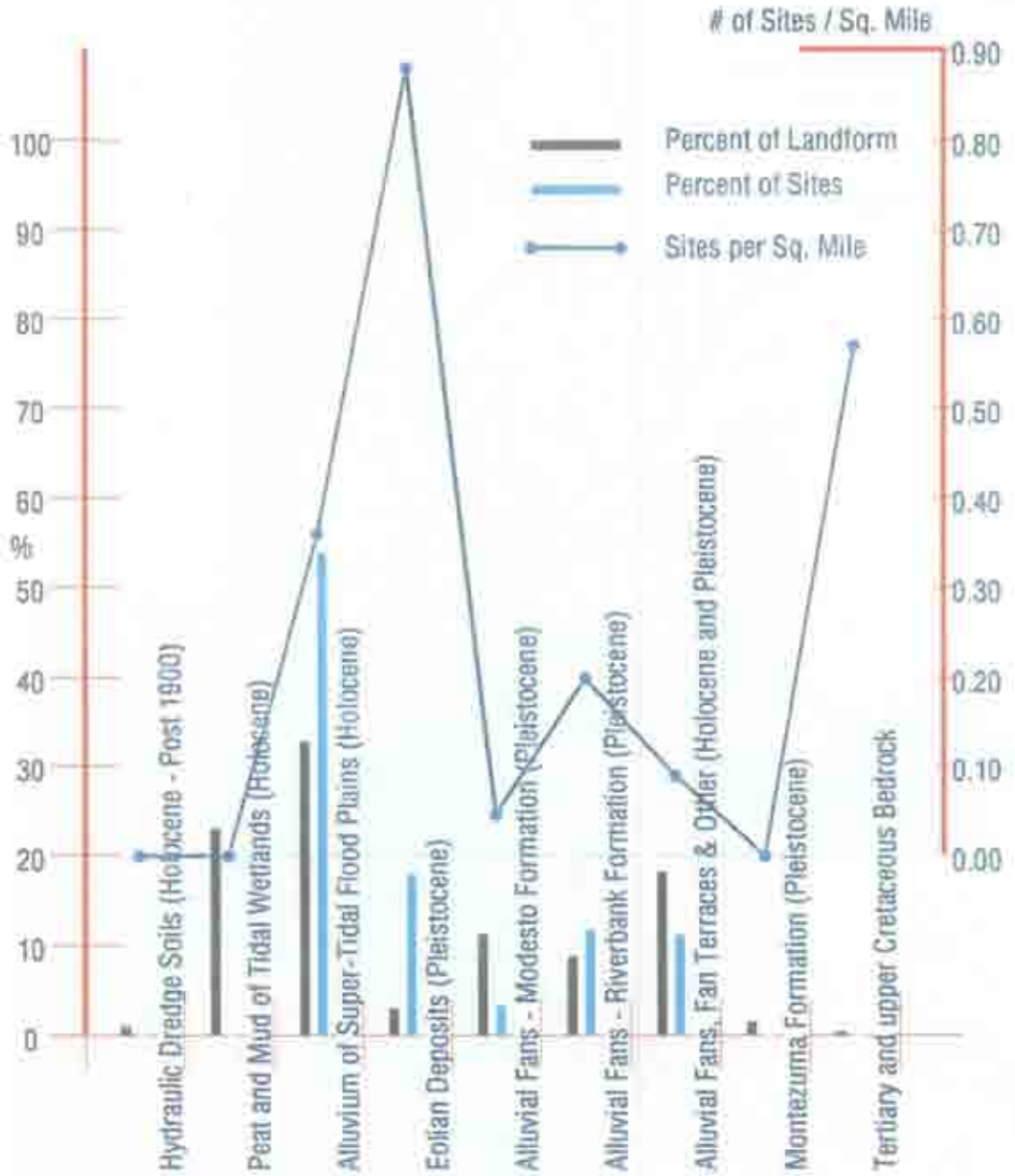


Figure 3: Percentage distribution of prehistoric sites by composite geologic unit (landform) and number of sites per square mile by landform for the study area.

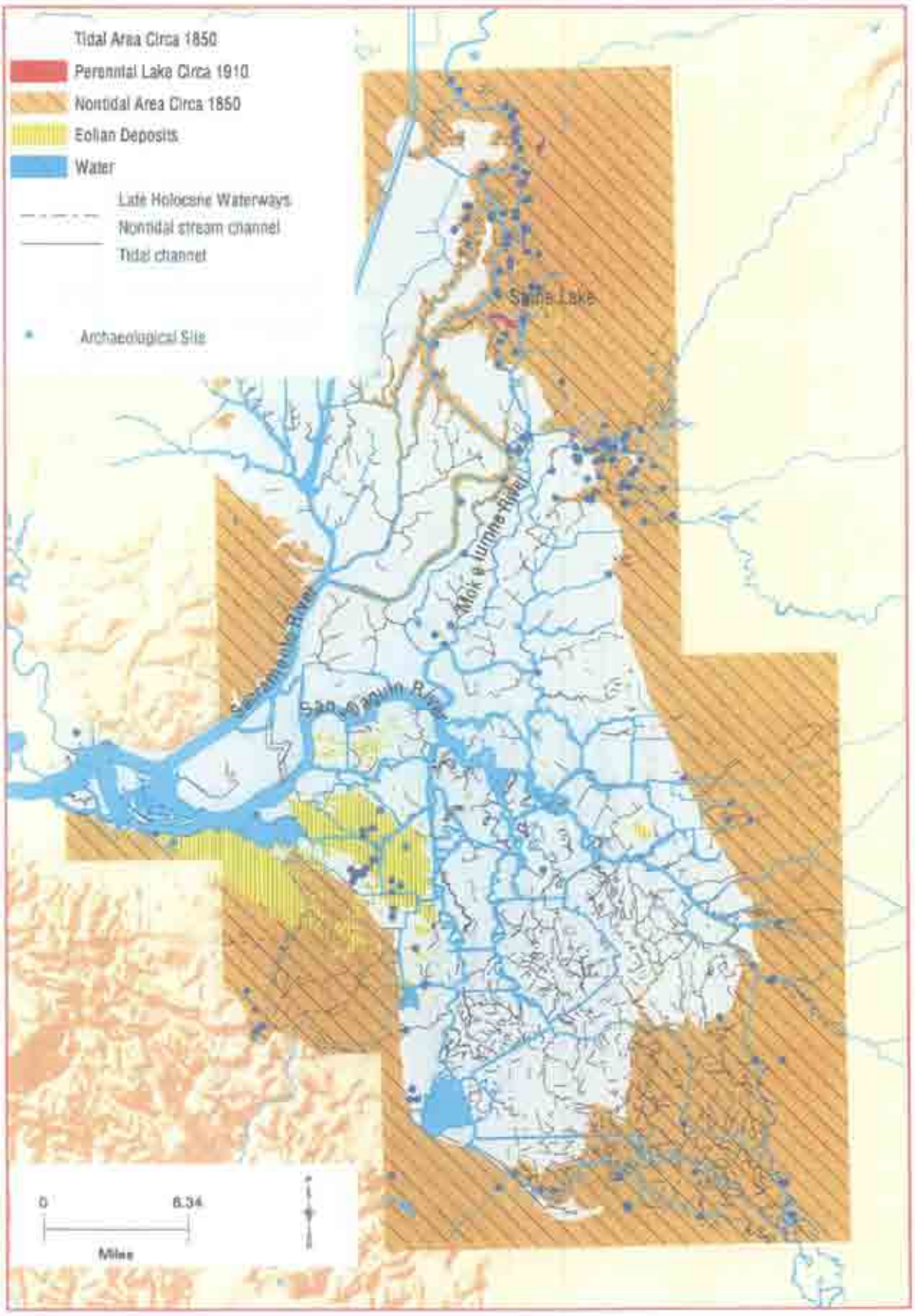


Figure 4: Distribution of prehistoric sites in relation to tidal/non-tidal areas (circa 1850), eolian deposits, waterways, and perennial lakes (circa 1910)(#110).

ALASKA SHIPWRECK SURVEYS AND THE ALASKA SHIPWRECKS DATABASE

Michael Burwell and Michel Hope, U.S. Department of Interior, Minerals Management Service
Alaska OCS Region

The Minerals Management Service (MMS) manages the nation's natural gas, oil, and other mineral resources on the Outer Continental Shelf (OCS). We also collect, account for, and disburse revenues from offshore Federal mineral leases and from onshore mineral leases on Federal and Indian lands. Our environmental responsibilities are to ensure that all activities on the OCS are conducted with appropriate environmental protection and impact mitigation.

Cultural resource management on the OCS includes protection of submerged prehistoric and historic sites including shipwrecks. In the mid-80's, the Alaska Outer Continental Shelf Region of the Minerals Management Service began in earnest to compile a shipwreck database for Alaskan waters. This information was necessary for historical archaeological resource protection and shipwreck update analysis requirements—an integral part of any Alaska OCS oil lease sale environmental impact statement. By 1992, an extensive 6-year literature search had uncovered over 1,100 wrecks ranging from early Russian occupation (1741) to World War II. This list soon appeared in tabular form in the 1992 MMS Technical Report entitled *Shipwrecks of the Alaskan Shelf and Shore* authored by regional analysts Everett Tornfelt and Michael Burwell.

Being the first comprehensive shipwreck list for Alaska, the report's first thousand copies were soon exhausted, finding their ways into the hands of maritime historians, reference librarians, local, state and federal agencies, commercial fishermen, and sport divers. All 1,100 wrecks were hand plotted on MMS planning area maps and quickly proved useful in the lease-sale planning process. As these maps show archaeological site locations, they are proprietary and only available to other federal and state agencies and to legitimate researchers who are required to sign a confidentiality agreement. By popular demand, MMS reprinted the report and recently posted the wreck list on the Web at http://www.mms.gov/alaska/ref/ships/index.htm. The list is searchable alphabetically by ship name and provides the date, general location (not in latitude/longitude), and a brief narrative of each wreck event.

Ongoing developments include updating the wreck database from World War II to the present day, and, so far, 1,500 new shipwrecks have been identified. Plans are underway to link the database with a more sophisticated search engine available on the Web. Also, coverage of these wreck locations has been developed to make the shipwreck database usable in GIS. Zooming in on any portion of a digitized Alaskan coastline will reveal what wrecks occurred at that location; these locations are then linked to tabular information about each ship. Links to ship and wreck photographs are also envisioned.

Maintaining the database is a constant process of refinement that comes from new data, feedback for those visiting the site, and deeper digging into archival sources—most recently the morgue files of the *Anchorage Daily News* and the *Anchorage Times*. Other ongoing shipwreck research has grown from work on the shipwreck database, and Burwell has given talks, presented

professional papers, and written journal articles on particular wrecks. For information about the Alaska Shipwrecks Database contact Michael Burwell at michael.burwell@mms.gov.

The first scientific survey of shipwrecks offshore Alaska took place from August 22 - September 4, 1998 during the brief open water season in the Chukchi Sea, using the U.S. Coast Guard icebreaker *Polar Star* as the scientific platform. Team members used an underwater telepresence remotely operated vehicle (TROV) developed by NASA's Ames Research Center. The "Jeremy Project" applied this technology which was originally developed for NASA's Mars Pathfinder Project to the field of underwater archaeology to survey for wrecks from the 19th century whaling industry. Michele Hope, Regional Archaeologist for the MMS Alaska Region served as the team archaeologist. Two shipwreck sites were located. These sites were mapped with Global Positioning System and both sites were videotaped with the TROV and by divers. For information about the Jeremy Project contact Michele Hope at michele.hope@mms.gov.

SECTION FIVE

COST EFFECTIVE PARTNERSHIPS

Effective research and preservation of maritime heritage resources is rarely accomplished without partnerships among interested organizations and individuals. Not only can project or activity costs be shared among participants but major initiatives necessitate coordination among people with special abilities, skills, and experiences. Since diving time is limited, several dive teams are often needed to adequately investigate submerged lands and potential locations.

Carl Harrington's article illustrates the high value of help received from avocational or recreation divers who have preservation of discovered maritime resources as a goal. Coastal Maritime Archaeology Resources (CMAR) is one organization volunteering their diving experience and knowledge for the good of a field project such as Carl describes.

Raymond Aker's paper describes the formation and development over many years of an organization focused on specific aspects of maritime history within a discrete geographic area. The Drake Navigator's Guild members have generated their own research projects, funding, and publications regarding 16th century European explorers visiting California as a first encounter of Western Europeans and Native peoples.

UNDERWATER ARCHAEOLOGICAL FIELDWORK IN THE OLYMPIC COAST NATIONAL MARINE SANCTUARY.

Carl C. Harrington III, Coastal Maritime Archaeology Resources

Since before the age of European exploration, the Straight of Juan de Fuca served as a natural route to the interior Northwest. Vessels have traversed these waters in exploration, governmental activity, natural resource exploitation, and commerce. Factors such as complex geography, quickly changing weather, as well as heavy vessel traffic, have lead to hundreds of vessels being lost in these waters. Some were driven ashore in gales, others burned to the waterline. Some sank after collision, and still others were lost without a trace far off shore.

Coastal Maritime Archaeology Resources (CMAR), a group of volunteers with extensive experience working in the Channel Islands National Park has assisted the Olympic Coast National Marine Sanctuary (OCNMS) in fulfilling its mission to inventory, evaluate, and manage the underwater cultural resources within the sanctuary. Guided by NOAA Historian Bruce Terrell, CMAR members have conducted archival research, assisted in a remote sensing program, and have participated in weeklong field reconnaissance surveys in 1996, 1997, and 1998.

The diving programs included checking the 1995 remote sensing survey target, reconnaissance, mapping, and evaluation of the ship GENERAL MEIGS, and exploration and mapping of artifact material reported by local divers. Reports prepared by CMAR assist NOAA in managing the resources and planning future research CMAR has been very successful at locating the remote sensing targets detected in the 1995 survey. Although none of these proved to be historical resources, the dives confirmed the utility of remote sensing and diver reconnaissance. Guided by archival research, further side-scan sonar and maker surveys should provide promising targets for divers to investigate in the future. Already known resources such as the GENERAL MEIGS require continued survey and monitoring. Regular visits provide the opportunity to survey the changing condition of a vessel and to examine any new material revealed by changing ground or water conditions. Recently lost vessels are monitored to assist in understanding artifact deposition processes.

From this established relationship with the OCNMS, CMAR looks forward to cooperating closely with the OCNMS in providing expertise with underwater cultural resources. The data obtained from CMAR's research will contribute to understanding the maritime history of the region. As part of the inventory and data collection aspects, future work in the OCNMS could include an archaeological field school, which CMAR would assist organizing. Additionally, future partnerships with local schools and colleges would increase community participation.

MARITIME RESEARCH ACTIVITIES OF THE DRAKE NAVIGATOR'S GUILD; A BRIEF HISTORY OF A PRIVATE ORGANIZATION

Raymond Aker, Palo Alto, California

The Drake Navigators Guild, established more than 50 years ago, is an example of how a small private organization, organized as a non-profit public benefit corporation could accomplish goals and work with civic organizations and government bodies to share its archaeological and historical findings. Its initial objective was to find Francis Drake's 1579 fortified camp with walls of stone and the careening place of the GOLDEN HIND in Drakes Estero at Drakes Bay, California, where he remained for 36 days. It broadened its mission to explore and disseminate historical facts relative to Drake's voyage around the world, as well as other early navigators to our shores.

The Drake Navigators Guild operates without grants or large donations of outside money. It functions with dues from a small membership and the proceeds from the sale of its publications. Its officers serve in a voluntary capacity without compensation, and all of its work is performed also voluntarily without compensation. Its office is in the home of its executive officer, and membership meetings are usually held at the home of members willing to host a meeting. It was incorporated in 1954, taking a note from the motto on the arms of Sir Francis Drake, *Sie Parvis Magna.*

The Guild started in 1949 with two San Francisco business partners. One of whom, F. Richard Brace, a U.S. Naval Academy Graduate, was drawn to Drakes Bay by the previous discovery of the now known fake of Drake's brass plate claim marker in 1933 and archaeological findings by the University of California in the 1940's, which apparently pertained to Drake. Following a visit to the bay, he told his partner, Matthew P. Dillinger, that they should make a search for Drake's camp and the careening place of the GOLDEN HIND in Drakes Estero because he found that the long accepted location under Point Reyes in Drakes Bay was too exposed and hazardous for careening a ship. The camp with its walls of stone had never been found and should be near the careening place.

The interest and enthusiasm of the two men brought in others of various backgrounds and expertise, including Dr. V. Aubrey Neasham, a National Park Service historian who had performed archaeology at the traditional Drake landing site under Point Reyes the year before. An organization was soon formed as the *Drake Navigators Guild* and was headed by Capt.A. S. Oko, a retired master mariner and resident of Point Reyes. Fleet Admiral, Chester W. Nimitz, USN, who had an active interest in the quest, was brought in early as Honorary Chairman to represent the organization and keep it on a responsible track. Occasionally, meetings were held at his home in Berkeley to keep him informed of the Guild's progress and planned activities, and later at his home on Treasure Island when he moved there to U. S. Navy Quarters One, Yerba Buena Island.

This writer, a master mariner, was brought together with the Guild in 1953 by the Director of the San Francisco Maritime Museum, Karl Kortum, who knew my interest in Drake's voyage around the world and in reconstructing the GOLDEN HIND. In May 1949 I had my first look at Drakes Bay on an early morning watch from the bridge of a cargo liner northbound from San Francisco. As a mariner I was attracted to Drakes Estero as a harbor, much as it might have attracted Drake when he was seeking a harbor. Before then this unspoiled, beautiful and isolated waterway was unknown to me, and I was determined to check it out one day. Little did I know that I was

destined to see a great deal of it researching Sir Francis Drake. It was my last voyage, and I turned back to old maritime historical interests.

In November 1952, Matt Dillingham chanced on the GOLDEN HIND's careening place through photographs that he had taken on a field trip overlooking a cove on the west side of the entrance to Drakes Estero. They bore a resemblance to a cove within a sandspit called *Portus Novae Albino's* shown in an inset on the border of a map of Drake's voyage around the world by Jodocus Hondius, c. 1590. The inset showed his ship at anchor in the cove and his fort on the far shore. A return visit showed that the greater part of the cove not seen in the photos was extensively filled with sand washed in from the sea. Because there was no sign of Drake's fort on the surface, its stone walls were assumed to have been knocked down by the sea and buried under sand fill.

Several years of archaeological search in the filled part of the cove followed without finding the fort, though large stones were found on a buried bank that were suspected of having come from the fort. Although the search for the fort was unsuccessful, a positive result of the work was that it defined the cove as it was in Drake's time and pinned down the place where the GOLDEN HIND was careened. In 1958 it became clear that the fort lay on the beach at the edge of the cove and that its stones had been washed into the cove by winter storms as a plume on the buried bank. The picture was now complete and matched the view of *Portus Novae Albions.* Study and field trips together with archaeological work around the esteros identified all other aspects of Drake's visit and his contact with the native Americans, the Coast Miwok. (Figure 1)

In 1956, Admiral Nimitz announced the discovery of Drake's Cove to the California Historical Society and presented a report of findings. It was uncertain then that further archaeology could find Drake's fort, but otherwise the discovery of Drake's landing place at the cove had become an evident certainty. When the National Park Service acquired the Point Reyes National Seashore in 1962, further archaeological work by the Guild in Drake's Cove was terminated, and no interest was taken in Drake's Cove. It was hoped that professionals would take over to complete the task. Fortunately, enough had been accomplished by 1961 to prove the case for the cove and the location of Drake's fort. No new archaeology was undertaken in the park, but archaeologists affiliated with San Francisco State University completed previous work at Indian sites on Limantour Spit.

While the search was going for Drake's camp, early attention was also given to the Rodriquez Cermeno expedition of 1595 at Drakes Bay, particularly because it was necessary to separate it from Drake's visit. Cermeno's ship, the SAN AGUSTIN was driven ashore in Drakes Bay by a November storm with the consequence of leaving many artifacts from its wreck on the shore and in Indian village sites. The location of Cermeno's camp was tentatively plotted from historical coordinates, his excursions in the esteros and inland was traced, and the approximate location of the wreck was plotted. A reconstruction of the ship was also. The Guild conducted archaeological work on Limantour Spit to find evidence of both the Drake and Cermeno expeditions, most of which were sherds of Chinese porcelain. In 1958 San Francisco State College continued the work.

In 1963 the Guild became concerned that plans for public access and recreation activities in the Point Reyes National Seashore might endanger historic sites. Acting through Admiral Nimitz, meetings were arranged at his home on Treasure Island with the Guild and the Director of the Western Region, National Park Service, and his staff to consider the Drake and Cermeno historic sites. A Study Group of appropriate professionals to review and evaluate the body of evidence for both expeditions. Accordingly, the Guild was asked to prepare detailed reports for both expeditions. Several years were required to produce the reports because we could hardly afford to work on them in their spare time. The Cermeno report came out in 1965 and the Drake report in

1970. In the meantime, Admiral Nimitz died in 1966 and the Regional Director was transferred to Washington, D.C. before the Drake report was completed. A new Western Region Director and staff replaced him

In 1965 the Council of Underwater Archaeology, working with a small National Park Service grant, began a search to find the SAN AGUSTIN wreck using a new magnetometer developed by Varian Associates of Palo Alto and a team of divers. The Guild provided assistance with its findings and its Cermeno report, which had just come out. The project ended with the premature death of the project founder, President of the Council, John Huston of San Francisco.

In 1971 an inadequate three man review committee was put on the Guild's 1970 Drake report, but the Committee could not reach a positive conclusion because of the Drake landing site controversy that was by then raging. Proof for Drakes Bay and Drake's Cove did not seem to the Committee to be conclusive. To make the matter worse, one member was partial toward San Francisco Bay and had been asked by the Guild to not be on the committee. Drake's landing site therefore passed into limbo, clouded by controversy with Drake landing sites starting with San Francisco Bay and ranging up and down the entire West Coast, a modern controversy that started when the fake Drake claim marker was found at Greenbrae near San Francisco Bay in 1936. It was first found at Drakes Bay in 1933 and subsequently discarded by the finder near the Greenbrae find site.

In 1995 and 1996 the Guild was authorized with a National Park Service permit to conduct a search on Limantour Spit for the site of Cermeno's camp and cache of cargo salvaged from the SAN AGUSTIN using high-tech metal detecting and magnetometer equipment. An archaeological team was formed from the Department of Anthropology, Sonoma State University, the Drake Navigators Guild and volunteers under the direction of Guild member Edward P. Von der Porten, who had directed work on Limantour Spit prior to the Park's takeover in 1962. In 1997 and 1998 the work continued with teams from Santa Rosa Junior College and the Guild. Much debris from WW II practice bombing and shelling was found, but nothing of the Cermeno camp or the cache. In 1998 significant pieces from the 1914 wreck of the steam schooner POMO were found under the present day sand dunes near the suspect camp site, which gave evidence of significant sand movement since 1595. The dunes had also been cut back 20 to 30 feet in the previous year's hard winter storms, revealing additional wreckage.

In conclusion, the negative archaeological results and study of the terrain indicated that the Cermeno camp site was probably on the beach at the shore of the bay and at the end of the very old vegetation stabilized eastern part of Limantour Spit where Indian habitation had been found. The boat being assembled for exploration could be easily launched from there into the bay when the surf is low in the month of November. A fortified camp probably surrounded the assembly of the boat, and because its elevation on the beach would have been low, all traces of the camp were undoubtedly washed away when heavy winter storms overtopped the western part of the spit, as they still do.

Our study of the terrain as it exists today, greatly altered by the introduction of dune grass in this century, contrasts with a very finely detailed 1858 map of Limantour Spit made by the U. S. Coast Survey, which allows the camp to be sufficiently located for the National Park Service to identify it for visitors to the park. The location of the SAN AGUSTIN cargo cache remains a mystery and may in fact lie on the west side of Drakes Estero near the wreck, together with burials of those who drowned when the ship was lost.

As a private organization, the Guild formed close links in the early 1950's with The Friends of Plymouth Art Gallery and Buckland Abbey, a private organization dedicated to the preservation of Sir Francis Drake's home, Buckland Abbey, and his history in Plymouth, England. In 1954 the Guild fostered recognition of Drake's achievements with celebrations and museum exhibits in Plymouth and San Francisco for the 375th anniversary of his landing in California. On this occasion, Admiral Nimitz represented the Guild at events in Plymouth and HMS Drake Royal Naval Barracks. The Guild has cooperated with the California Academy of Sciences in San Francisco with exhibits and the Academy's television programs featuring Drake in California. With "Drake in California", it participated in civic events in San Francisco celebrating Britain, these being London Week in 1962 and British Week in 1971.

In 1979, the Guild participated in celebrations of the 400th anniversary of Drake's California landing with an exhibit in Plymouth Art Gallery and with personal representation in Plymouth. In San Francisco, the Guild placed an exhibit at the M.H. de Young Memorial Museum, which contained a large selection of the Drakes Bay porcelains. It also contributed to Drake exhibits in the Oakland and San Diego museums and participated in quadricentennial celebration events in Oregon. The Guild cooperated with the Point Reyes National Seashore to promote the historical link with Drake when the Park was established in 1962 and worked to provide exhibit material in the park's visitors centers. In 1967 it assisted with the *Save our Seashore* campaign to persuade Congress and the Administration to allocate funds to complete the Park.

In 1976, at the request of the Superintendent of Point Reyes National Seashore, the Guild initiated a nomination to have Drake's Cove placed on the Register of National Historic Places. The Regional Nomination Review Board, Western Region, and National Park Service turned this down. The reasons given were that there was no agreement among historians on where Drake landed, there was a lack of primary historical geographic data, such as from Drake's missing log, and there was no conclusive archaeological evidence. Recommendation was therefore made to postpone action until conclusive proof for the location of Drake's landing could be supplied.

Following 1979, archaeological proof was realized when Edward Von der Porten and Clarence Shangraw, Senior Curator and porcelain specialist at the Asian Art Museum of San Francisco analyzed 709 sherds of the Drakes Bay Chinese porcelains. These were found to fall into two categories, one third of them to an early period corresponding to the time of Drake's visit in 1579 and two thirds of them corresponding to the time of Cermeno's visit and the wreck of the SAN AGUSTIN in 1595. The early period porcelain sherds all had clean, bright surfaces and sharp broken edges, whereas the late period sherds had surface and edge abrasion, clearly the result of shipwreck and tumbling in the surf. The early period porcelains had clearly come into the hands of the native Americans intact and had been broken in their villages. Among these sherds, 77 individual plates, bowls, cups and vases could be identified. Drake is known to have had four chests of Chinese porcelains that he had taken from a Spanish ship. The sherds are clearly from those chests. (Figure 2)

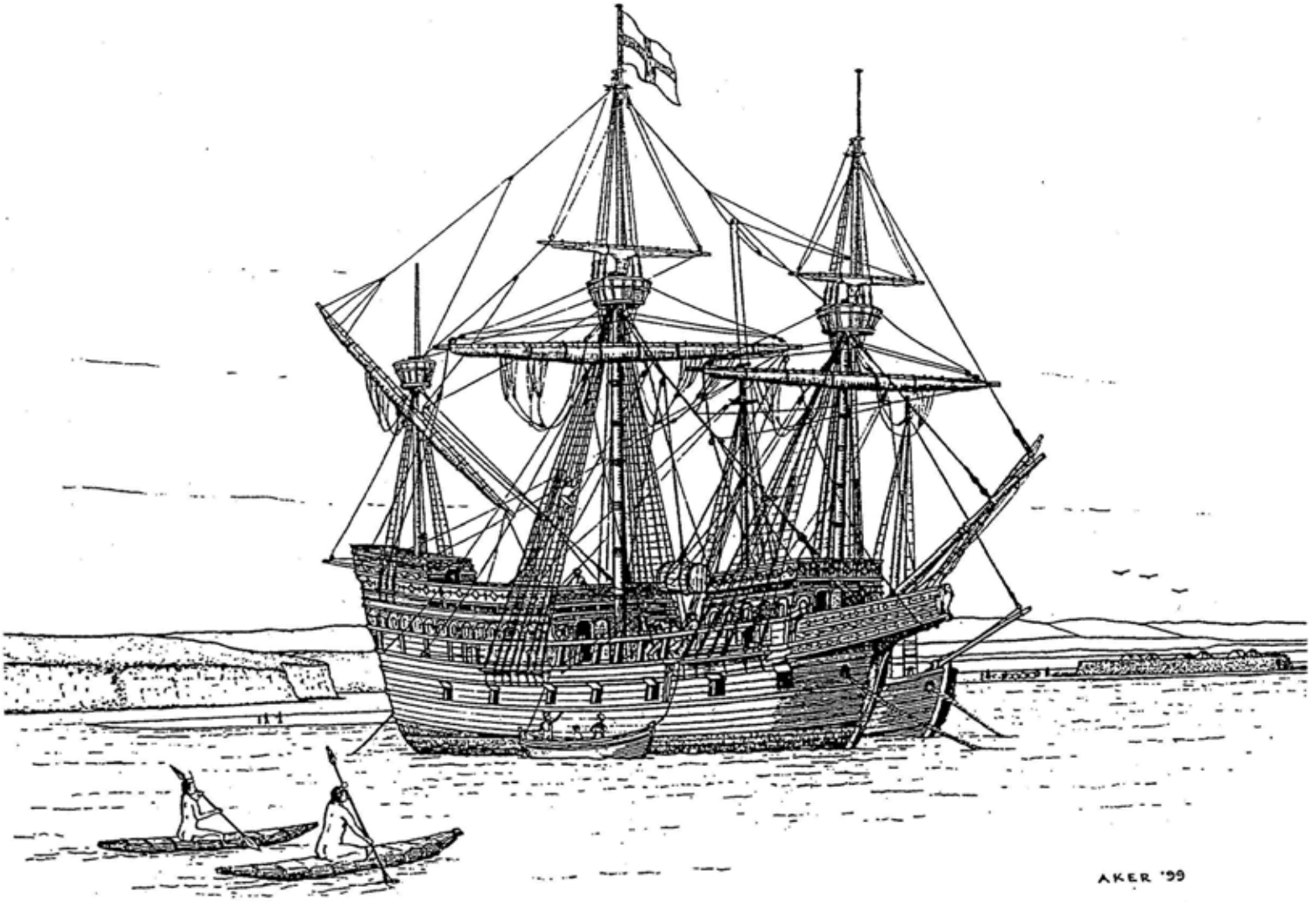
Also after 1997, new evidence for geographical confirmation came from a recently found map of Drake's voyage in the Yale Center for British Art, Paul Mellon Collection. Near 38° North Latitude, the map showed two bays corresponding to Bodega Bay and Drakes Bay with an island southwest of the latter's headland which can only be the Southeast Farallon. The southern bay has a forked inner waterway corresponding to Drakes Estero that is marked at its head with a Cross of St. George flag prominently displayed, a very clear indication that the Estero was Drake's harbor.

Taking an essential step for the National Park Service to get recognition for Drake at Drakes Bay and Drake's Cove, the Guild appealed twice to the California Historical Resources Commission to

get Registration of Drake's Cove as a State Historic Landmark. The first attempt in 1978 was a very expensive three-day hearing with competing testimony about the alternative landing sites in San Francisco Bay and Bolinas Lagoon. Even the U.S. Navy's 18,000-ton attack transport, USS TULARE, was involved, procured by the Guild. Twenty-one scholars wrote or spoke in support of Drake's Cove. No persons spoke for other locations. The second attempt was in 1992 with the archaeological evidence of the porcelains and the new evidence from the Mellon/Drake map. In each case the State Commission chose not to decide. In 1993 the Guild initiated a nomination directly with the National Park Service, Western Region. Required review by members of the Society of American Archaeology has been completed and final action was pending installation of a new National Park Service Advisory Board.

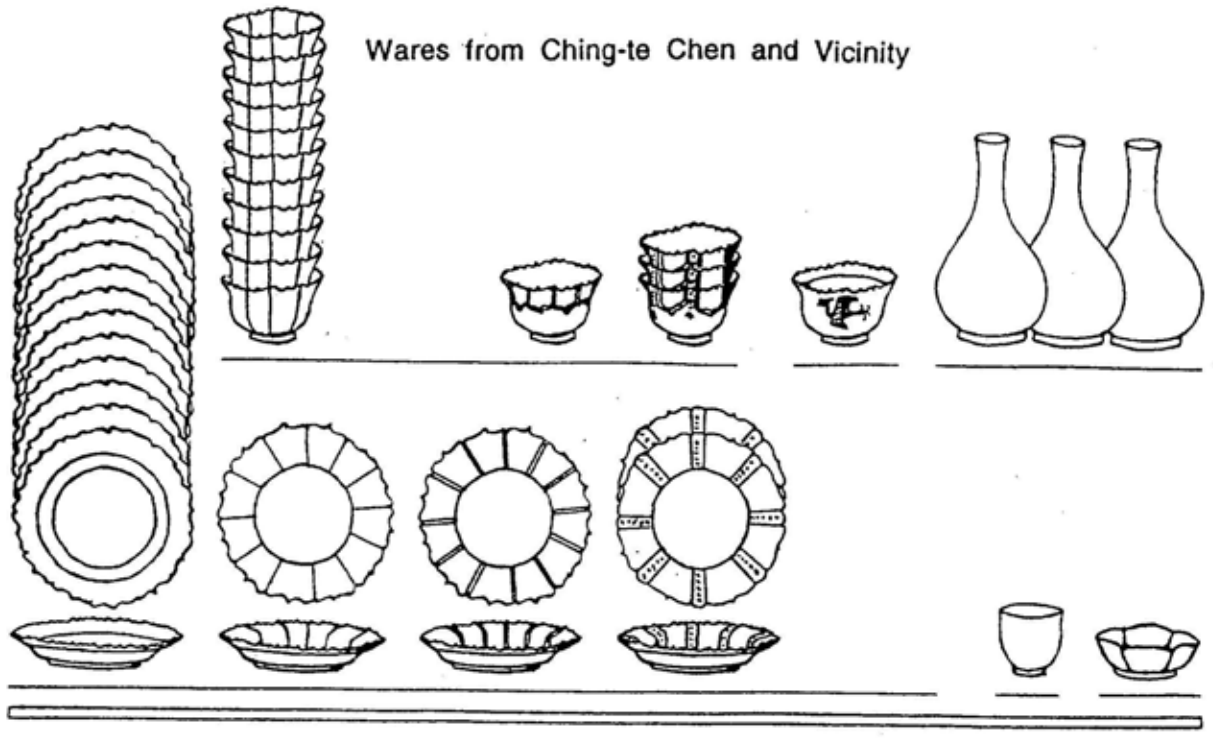
Farther afield, with documentary evidence, field trips on shore, from the air and from the sea, the Guild discovered Drake's northern landfall at the Oregon Dunes and his northern anchorage at South Cove under Cape Arago, Oregon. In cooperation with the Oregon Historical Society and the Oregon State Parks, the Guild participated in the placing of a bronze plaque to mark the anchorage at South Cove and with Oregon's celebration of the 400th anniversary of Drake's presence on the coast of Oregon in June 1579. The highest dune of the Oregon Dunes was named for Drake as also a small headland on Cape Arago, an Oregon State Park. Much farther afield, the Guild in coordination with the National Maritime Historical Society, established proof in recent years that Francis Drake discovered and landed on Cape Horn and that his ship, the GOLDEN HIND was the first to round the Cape. (See *Sea History,* Winter 1996-97, NMHS).

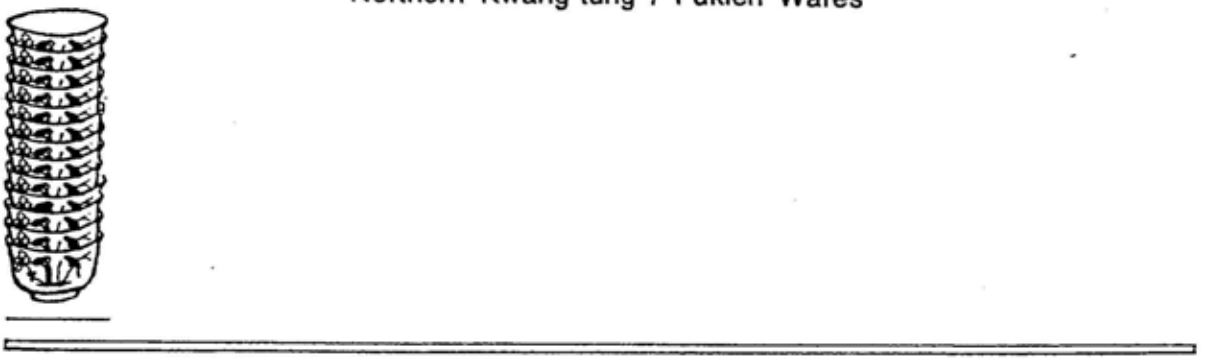
1579. The highest dune of the Oregon Dunes was named for Drake as also a small headland on Cape Arago, an Oregon State Park. Much farther afield, the Guild in coordination with the National Maritime Historical Society, established proof in recent years that Francis Drake discovered and landed on Cape Horn and that his ship, the GOLDEN HIND was the first to round the Cape. (See *Sea History,* Winter 1996-97, NMHS).



Reconstruction of the *Golden Hind* at anchor in Drake's Cove at the mouth of Drakes Estero.

Reconstruction by Raymond Aker





DRAKE PORCELAINS AT DRAKES BAY

Archaeological work in Drakes Bay from 1940 to 1980 recovered approximately seven hundred sherds of sixteenth -century blue on white Chinese porcelain, which represented 235 complete vessels. The sherds were studied for place and time of manufacture using art-historical methods. They were then divided into late period sherds, which were water and sand abraded from the wreck of the *San Agustin,* and earlier period sherds, with fresh surfaces and sharp breaks which can be attributed to four chests of porcelain that Drake had taken from a Spanish ship off Central America in 1579. There is no record that he brought any home to England. Porcelains would have been given to the Native Americans as gifts, taken to their villages, eventually broken, and the pieces left in their middens where they were excavated. Illustrated are 52 vessels reconstructed out of 77 non-waterworn sherd groups representing complete vessels from Drake's chests.

SECTION SIX

21st CENTURY FUTURES FOR SUBMERGED AND INDIGENOUS RESOURCES

Individual research projects of any type – archeological, historical, predictions of a wreck event as testable project questions, or shoreline collections – can combine to build greater understandings of maritime events and interactions of terrestrial and seafaring people in time. Olaf Engvig reconstructs some features of a wooden vessel becoming a wreck and what types of vessel technology a researcher may predict as remaining evidence. Roger Kelly briefly reviews radiocarbon dates and species of trees represented by drifted vessel pieces collected by an interested citizen, George Epperson. Edward von Der Porten reports on the archeological and remote sensing efforts to locate the 1595 shoreline campsite of Cermeno within today's Point Reyes National Seashore. Tom Peterson's paper assesses the possibility of pre-1778 sightings of the Hawaiian Islands by Spanish and English mariners.

POSSIBILITIES OF RECOVERING REMAINS FROM THE SPANISH GALLEON 'SAN AGUSTIN'

By Olaf T. Engvig, Burbank, California

Introduction

This discussion is an assessment of the potential recovery and identification of artifacts and remains of the 16th Century Spanish galleon "SAN AGUSTIN", lost at Drakes Bay in 1595. It is based on the author's personal experience in marine archeology from many years of work as a team member and excavation leader for museums and universities in Scandinavia and Cyprus. This paper considers specifically wreck sites and areas closely comparable to Drakes Bay and which have sustained similar environmental impacts.

A Ship's Contents

A wide range of items would be present at the wreck site of a 16th century Spanish sailing ship such as the 'SAN AGUSTIN', carrying some 80 persons and important cargo across the Pacific Ocean 400 years ago. Such a vessel would be a self-sustaining social unit, taking months to reach its destination. It would carry a variety of artifacts needed for the life of the crew, supplies for upkeep and ship maintenance, for protection of life and cargo against enemy forces, and for accurate navigation for a successful voyage. Private possessions, gifts, clerical and spiritual remedies would also be present on board.

Comparable wrecks from the 16th century have produced many items, from sturdy wood of ships' architecture, iron fasteners, anchors and armaments, and remains of cargo such as ceramics, bricks, or identifying lead seals. In addition, artifacts of iron, copper, bronze or precious metals, wood, leather, horsehair, resin or gum, wax, bone and ivory, glass, porcelain and earthen wares, and gemstones have been preserved in many wreck sites. The elements of the vessel itself, particularly if quickly buried, and personal artifacts of those aboard might represent a wide range of possessions. Well-preserved wreck sites can furnish a wealth of information about daily life aboard a vessel, its economic and social position of passengers, and maritime architecture. Confirmation of the vessel's identity would come from the authenticity of artifact assemblages and of the remains of the ship itself.

Archeological Work at Drakes Bay

Archeological work in former Native American village and camp sites in the Drakes Bay locality has produced Chinese porcelain fragments and wrought-iron ships' spikes with indigenous artifacts and residential midden deposits. But these few Spanish Era artifacts are assumed to have been the only items salvaged by local Coast Miwok people. Certainly, Cermano and his crew would have salvaged necessary items from the beach and wreckage, but it should be remembered that other essential materials were brought to the shore campsite prior to the storm (Aker 1965). To survive the long coastal journey in an open boat would mean that food, water, basic tools and probably some valuable items would be selected from salvaged and at-hand materials. Although a return to the wreck site was made by Vizcaino in 1603 to attempt salvage as was the Spanish policy, no evidence of wreckage were seen during this short revisit.

Wreck Event

It should be kept in mind that as a wooden vessel sinks close to shore if it sustains major damage to the keel and lower hull, the vessel's sides open, letting in quantities of water with force. Cargo, ballast, and heavy objects will spill onto the submerged land although some materials, including buoyant, broken elements of hull, decking, or superstructure float away. The place of sinking for a wooden vessel, depending on many conditions, will contain much information and a variety of associated materials but only a partial inventory.

Artifact categories identifying a wreck site as that of the ill-fated SAN AGUSTIN would include trade goods such as Chinese Ming Dynasty porcelain, baled silk with lead seals, perhaps stoneware jars containing spices, and the ship's armament with her architecture fashioned from Philippine Island woods. Porcelain pieces may have been nested and wrapped in matted straw cylindrical packages for manual loading and storage within the hull. Of course, smaller objects or packages of contraband materials would likely be aboard also as personal possessions. Thus, the cargo would be variable in terms of weight or buoyancy, placement within the hull at time of loading, and container methods used for various types of cargo and ships stores.

During a wreck event, such grounding on a storm-racked beach, what is likely to happen as the wooden vessel breaks apart? Some of the lighter weight cargo stowed in higher positions - for example, cylindrical straw mats containing nested porcelain plates and bowls – would be released from an opening hull and rolled by surf. Bales of silks might rise with the force of seawater to be trapped under decking. Since lower hull and keel portions receive much power from surges of surf, breaking apart of heavy timbers would scatter heavier materials such as ballast, large stoneware jars, cannon or anchors only for shorter distances. After a wreck event, floating or semi-floating but damaged cargo containers, attached planking and timbers, small objects, line and sail pieces, or fittings with their wooden elements would reach beach levels or sometimes carried for distances inland. Other heavier vessel elements would come to rest in an approximate cluster or 'scatter' on the ocean floor and may lie exposed for periods of time. Probably within decades, wooden elements would be damaged by terredo worms and weathering while iron cannon and anchor parts would soon become oxidized by the salt and oxygen – saturated seawater. Bronze, gold, and copper artifacts may not suffer as extensive damage. Thick earthware, cabin window glass, and porcelain would be fragmented but recognizable.

Since Spanish maritime practice was to attempt salvage of wrecked vessels, particularly those of the galleon trade, in 1603 Vizcaino visited the location, guided by Cermeno's pilot. Although this return visit was very brief, no visible wreckage was observed on the sandy beaches of today's Drakes Bay. This may be a significant footnote regarding the length of time – less than ten years – that evidence of a grounded shipwreck becomes buried and unseen in beach sands or submerged lands.

Old World Comparisons

Early 17th Century shipwrecks with documentation about porcelain and lead bail seals have been excavated. For comparisons to the SAN AGUSTIN, several well-studied shipwrecks give instructive examples. In 1629, the Dutch trade vessel BATAVIA went aground on today's western Australian coast. Cargo from an unknown 16th century European trading vessel wrecked near Dimulvik, Norway included bales of textiles identified by lead seals embossed with symbols of manufacturer or city of origin and other information (Engvig 1974, Molaug 1974). Many seals were in excellent condition after more than 350 years in near-shore wreck environments along a high-energy coastline. When the coastline contains many bedrock outcrops or seasonally

exposed rocky tidepools, as does Drakes Bay, historical materials become preserved by lodging between rocks but protected by silted sands. An example of a much more ancient shipwreck yielding well-preserved artifacts from shallow waters is the Cape Kiti, Cyprus wreck which contained a large 2000 year old Roman-style amphora and Palestinian small household amphora which were preserved in sandy fill between coastal rocks (Engvig 1975, Engvig and Astrom 1975, Engvig and Beichmann 1984: figs. 2, 16, S130C).

In many underwater field situations, large or small artifacts are difficult to distinguish from natural rock shapes, even by today's sophisticated recording devices such as video tapes or real time images, still photography, or various remote sensing methods. Of course, exciting pictures of MONITOR, TITANIC or other well-known wreck sites bring visual messages to a worldwide audience. Untrained divers may accidentally find small but very significant items at a wreck scatter. Training sessions using similar items can help project volunteer divers to locate deteriorated, overgrown and partially covered materials, which may be overlooked by magnetometers, metal detectors, or photography.

Summary

Many marine archeological excavation projects have shown that a well equipped ocean-going vessel of any period will leave a considerable number of cultural items with vessel remains at a wreck-site, even on a high-energy coast with passage of centuries. Close study of coastal conditions, comparisons of surviving materials from well-documented wrecks, and systematic use of human observation and electronic images are necessary to dismiss the assumption that all evidence of the wreck event has vanished. The Manila galleon SAN AGUSTIN is the oldest known shipwreck lost on the Pacific Coast of North America. Many artifacts unique to this time and this ship will still be present where the vessel's remains settled. Once items are located and documented, it will not be hard to establish the ship of origin – the galleon – since diagnostic characteristics are significantly different from other vessels lost in Drakes Bay, Point Reyes National Seashore, California.

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RADIOCARBON DATES AND SPECIES DETERMINATIONS FOR DRIFTED WOOD AT AGATE BEACH, MARIN COUNTY, CALIFORNIA

Roger E. Kelly, National Park Service

Introduction

Located along the southwestern shoreline of Marin County, north from the scenic town of Bolinas, Agate Beach is a series of north – south oriented sand and gravel beaches, bordered by bluffs of the Bolinas tableland which juts into the Pacific Ocean as a small coastal peninsular terrace (Fig. 1). For many years, Agate Beach has remained a popular but remote destination for many local residents. A feature linked to the Bolinas peninsula and Agate Beach is Duxbury Reef, a geological formation, visible as horizontal bedding awash in shallow tides. This reef is a also a source for naturally occurring asphaltum which appears as small gobules. Agate Beach itself was a County park until recently when it was added to Point Reyes National Seashore. Duxbury Reef is a State natural resources preserve.

Due to its location along the coastal approach to the San Francisco Bay, Duxbury Reef and Bolinas Point has played an important place in local history of vessel losses (see Table 1).

For many years, George Epperson, a businessman from San Rafael, has pursued his belief that Agate Beach was the 1579 landing and temporary camp of Francis Drake (Epperson 1994). Mr. Epperson has recovered many maritime artifacts such as deadeyes, iron objects, white china fragments, objects of lead, copper, and bronze, and large driftwood pieces from the beach and shoreline. He has exhibited these items and his interpretation of them in many public events and has given many talks on the saga of Drake's visit. In the early 1980s, Mr. Epperson and friends began an annual outing to Agate Beach to re-enact the Drake visit.

Along the materials collected were several large pieces of drifted wood exhibiting alterations such as patterned holes, shaping into planks, or other modifications. Mr. Epperson believed some pieces were from Drake's ship GOLDEN HINDE or a Spanish vessel captured by Drake prior to his North American visit. Mr. Epperson requested assistance from the National Park Service to obtain radiocarbon and wood species identification for six drift pieces. In each case, Mr. Epperson had retrieved pieces from the beach surf zone. After photographing in place, Mr. Epperson stored his collection at his residence for further study.

These six drift pieces are solid but weathered wood, not natural forms of tree limbs or trucks. In some cases, rounded ends and edges indicate considerable drifting and tumbling periods of abrasion. Most pieces are similar to planking – rectangular in cross-section, extended length, flat surfaces, and thickness at least 2 inches. Two specimens showed square or round holes as noted. Many pieces have Toredo worm holes, sometimes containing small pebbles, as noted in Table 2. Mr. Jepperson's nomenclature for these pieces has been retained for consistency with his records and observations.

Radiocarbon Dates from "Chock Beam #1"

Collected in January 1986 from the beach by Mr. Jepperson, this plank-like piece was 4 feet long, 14 - 15 inches wide, and 8 to 9 inches thick with a few toredo worm holes. Mr. Jepperson believed this piece might have been from Drake's smaller ship, the 'Swan'.

Released in March 1990 from the Washington State University laboratory, a sample from this specimen yielded a relative date of 570 +/- 70 years BP (Before Present or 1950), equaling a year date of about 1380AD +/- 70. The specimen was analyzed at Washington State in November of 1989 who reported the result in a letter to Mr. Epperson and the National Park Service dated March 28, 1990 as follows:

> The radiocarbon age of this sample is 540+/- years BP. Using the Arizona Tree ring calibration data of Klein, Lerman, Damon, and Ralph (Radiocarbon 21m 103 (1982) we obtained a tree-ring corrected age of 570=/- 70 years BP. For your information BP in radiocarbon language is 1950. With regard to identification of the wood we are searching for someone on the WSU faculty to tell us what kind of tree produced this wood.
>
> Sincerely,
> John C. Sheppard,
> Professor of Chemical Engineering and Anthropology

In 1999, a sample from specimen " Beam 1500" was submitted to Beta Analytic of Miami, Florida who reported that the measured C14 age and converted C14 age was 270+/- 60 BP or 270 years plus or minus 60 years before 1950AD. Beta Analytic Calibration of radiocarbon Age to Calendar Years table is shown in Figure 3. The intercept of radiocarbon age with calibration curve indicates a calendar date of AD1645. Beta Analytic noted that "...'old wood effect' must be considered, as well as the potential inclusion of younger or older material in the matrix samples." Since it is not known if the Beam 1500 plank was originally living wood from the interior, middle, or outside portions of a tree, the dated sample is not known to have come from younger or older portions of the living tree's growth rings. Beta Analytic staff strongly suggests that this single radiocarbon date be considered only an approximation of true age. Further technical information on this determination is on file at National Park Service cultural resource offices.

Wood Species Identification:

Through the good offices of Alex Wiedenhoeft and Regis Miller, US Forest Service Forest Products Laboratory in Madison, Wisconsin, six samples of wood from six plank specimens collected by Mr. Jepperson were identified as to species (see Table 2). White oak accounted for four specimens with determinations of red oak and eucalyptus for one sample each. No subspecies identification was made. In many shipyards in North America, United Kingdom, and Europe, white oak and other oak subspecies were favorite woods for shipbuilding for throughout centuries.

Available historical details on use of wood species used in shipbuilding is not readily available for most vessels listed in Table 1, but SAMUEL S. LEWIS is known to have been partially constructed with white oak. The Alta California newspaper of April 1853 reported that 'timbers strewn along the beach' after the LEWIS wrecked nearby. WESTERN SHORE, four-masted lumber schooner, was built from Douglas fir and Port Oxford cedar.

Fate of Drake's GOLDEN HINDE

The GOLDEN HINDE returned to London in 1580 and was brought to the Royal Navy Yard at Deptford. On April 4, 1581, Queen Elizabeth knighted Francis Drake aboard the ship. For about 100 years, the ship remained in a specially prepared dock along a local creek. In 1624, a newer

'wharf' was constructed around the vessel's remains. But by 1742, the creek had been filled in for expansion of the Royal Victualling Yard and a cairn of stones was made to mark the resting-place of the historic vessel. In 1977, maritime historian Peter Marsden attempted to relocate the remains but the area is paved over and the cairn has disappeared. There is no available evidence of wood species used in the original construction of the GOLDEN HINDE but her remains may be relocated in the future.

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TABLE 1: WOOD SPECIES IDENTIFICATION

Specimen	Wood Species	Size	Approx. Age
Chock Beam #1	white oak	3 ft long	1380AD
Beam 1500	white oak	4 ft long 2 in. thick, 11 inches wide	1645 AD
Masthole Beam #7	eucalyptus	5 ft long, 2 in. thick	
Agate Beach Beam #5	white oak	2 ft. 9in long, 6-10 in. wide	
Gang Plank #8	white oak	13 ft. long, 14 in wide, (1/2 in. holes on 24 in. center)	
Tellos No. 1 '1530'	red oak	7 ft long,7 in. wide,7in. thick	

Documented Vessel Losses

At the dangerous Duxbury Reef, immediately south of Bolinas, sixteen vessels came to grief: H.C. ALMY, ACALIN, ESPERANZA, CLAUS SPRECKELS, WESTERN SHORE and YFD #20. From Agate Beach northward along the shoreline to Bolinas Point, vessels SAMUEL S. LEWIS, R.D. INMAN, POLARIS, HANALEI and NETTIE LOW were lost. The WILLIAM F. WITZERMAN was lost slightly north of Bolinas Point (see Delgado and Haller l989a: 114).

Wooden vessels which could contribute ships timbers and other shaped vessel architecture pieces are CLAUS SPECKLES, ESPERANZA, HANALEI, H.C. ALMY, POLARIS, R.D. INMAN, SAMUEL S. LEWIS, WESTERN SHORE, WILLIAM F. WITZERMAN and NETTIE LOW. But only SAMUEL S. LEWIS is known to have been built with white oak and WESTERN SHORE was built from Oregon common wood species.

Breakup of these vessels was reported in newspaper accounts and official reports. Both EXPERANZA and HANALEI broke up within sight of Bolinas citizens who assisted in rescues. The H. C. ALMY anchors did not hold and she was forced on shore near Bolinas Lagoon where this small schooner floundered near the location of her original construction. Oddly, both POLARIS and R. D. INMAN, built at the Marshfield, Oregon shipyard of Kruse and Banks only five years apart, wrecked along northern areas of Agate Beach within a short distance of each other (Delgado and Haller l989a: 122-123). Both vessels were partially salvaged of fittings, machinery, sails and lines after each wreck.

Wreckage of SS SAMUEL S. LEWIS was said to have been strewn along the beaches and a floating field of objects, furniture, timbers, and spars was noted in newspaper accounts. The wreck of WESTERN SHORE was salvaged but only for the coal and sails, which were removed by local Italian fishermen (Delgado and Haller l989a: 128). Large pieces of coal were collected from Bolinas Beach as late as l906 (Delgado and Haller 1989b: 117). Photographs of POLARIS, INMAN, LEWIS, HANALEI and ACALIN are published in "Shipwrecks at the Golden Gate" (Delgado and Haller l989b).

Table 2: VESSEL LOSSES; DUXBURY REEF TO BOLINAS (adapted from Delgado and Haller, 1989)

Name	Wreck Date	Vessel Type	Construction and Yard
ACALIN	Aug. 1934	purse-seiner	steel hull (Los Angeles)
CLAUS SPRECKLES	1888	brigantine	wooden (Turner shipyard)
ESPERANZA	1892	schooner	wooden (South Carolina)
HANALEI	1914	steam schooner	wooden (Alameda, CA)
H.C. ALMY	1879	schooner	wooden (Bolinas, CA)
POLARIS	1914	schooner	wooden (Marshfield, OR)
R. D. INMAN	1909	schooner	wooden (Marshalfield, OR)
SAMUEL S. LEWIS	1853	screw steamer	white oak (Philadelphia, PA)
SAN DOMENICO	1935	purse seiner	steel hull (San Francisco)
WESTERN SHORE	1878	full-rigged bark	Douglas fir, Pt. Orford cedar (North Bend, OR)
NETTIE LOW 0	1900	gas schooner	Marin County shipyard
WILLIAM F. WITZERMANN	1907	schooner	Fairhaven, (Bendixsen yard)
YFD #20	1943	floating drydock	steel

ARCHAEOLOGICAL INVESTIGATIONS AT LIMANTOUR SPIT, POINT REYES NATIONAL SEASHORE 1997-1998: A Search for the Campsite, Boatbuilding Site and Cache of the Sebastain Rodriguez Cermeno Expedition of 1595 and the Drake Plate of Brass Post Location Conducted under Federal Antiquities Permit WR-1979-97-CA-3

Edward P. Von der Porten, Drake Navigators Guild

Summary

Archaeological investigations on Limantour Spit and on a bluff overlooking the junction of Drakes and Limantour Esteros, Point Reyes National Seashore, were conducted in 1997 and 1998 by the Drake Navigators Guild and the Field Archaeology Program of Santa Rosa Junior College. The objectives of the searches and excavations were to uncover remains associated with the campsite of the crew of the galleon which was wrecked on a nearby beach in 1595, and with the posting of Francis Drake's claim marker, the Plate of Brass, in 1579.

The bluff was searched with metal detectors, and the spit was searched with metal detectors and a magnetometer. A few artifacts were excavated on the bluff top and numerous artifacts were excavated on Limantour Spit, but all were associated with late-nineteenth-century and twentieth-century activities. The Limantour Spit area was mapped. Much was learned about the suspect areas, but nothing was uncovered that appears to lead toward resolution of the research objectives.

Background

By the late sixteenth century, Spain had established an important trade route between the Philippines and Mexico. Silks, spices, and other luxury goods were shipped east in exchange for silver from the New Spain and Peruvian mines. The eastbound route was in the westerly wind belt and carried the ships to landfalls along the coast of California approximately in the latitude of Cape Mendocino. In order to chart the coast, an expedition was sent from Manila in the small ship *San Agustin* commanded by the Portuguese pilot Sebastian Rodriguez Cermeno, who was permitted to carry trade goods and passengers in order to defray the costs of the voyage. Cermeno sailed from Manilla on 5 July 1595, reached the coast of northern California, and anchored in Drakes Bay on 6 November. Crewmen went on shore to assemble a prefabricated launch, which was to be used for coastal exploration. Later in that month, a storm drove the *San Agustin* ashore, a total loss. The survivors, nearly eighty men, cached salvaged cargo (reportedly consisting of silks, waxes and porcelains) and completed the construction of the launch, named the *San Buenaventura*, in which they sailed on 8 December and which eventually bore them to New Spain's west coast. They had occupied their camp for just over a month. (See Aker 1965 for a thorough analysis of the visit.)

In 1579, Francis Drake anchored two ships in Drakes Estero and camped at Drake's Cove, on the western shore of the Estero entrance, for thirty-six days. Before leaving, he nailed a brass claim marker to a post.

Numerous archaeological surveys and excavations have been carried out on and in the vicinity of, Limantour Spit since 1940, including underwater investigations. (Murphy 1984 and Von der Porten and Peron 1973 are among the most recent reports.) Most of this work has concentrated on

Native-American village sites. Members of the Drake Navigators Guild and porcelain scholars have examined materials from these investigations and have found evidence of the visits of both Francis Drake in 1579 and Cermeno in 1505. The presence of many fragments of sixteenth-century Chinese porcelains attributed to Cermeno in Native-American habitation sites CA-MRN-216, 298E, and 298W on Limantour Spit a few hundred yards east of the primary search area supports the documentary evidence for Cermeno's presence on the spit. (Aker 1965, pp. 30-31, and 1970, and Shangraw and Von der Porten 1981.) In 1995, a search was begun for the remains of Cermeno's campsite. (Praetzellis and Von der Porten 1995.)

Expected Archaeological Remains

Statements made by survivors of the Cermeno expedition suggested that four possible types of archaeological remains might be present in the vicinity of the campsite:

1. The remains of a defensive fortification, consisting of a ditch and bank. Since this earthwork would have been constructed in sand, it is unlikely that any sign of it would have survived.

2. The remains of the boat building site where the crew assembled the vessel to take them to Mexico. This site would have had few permanent features. The only sign of it that may have survived may be a loose cluster of tools, nails, spikes, and other ferrous artifacts that were used in the construction process.

3. The remains of the campsite within the fortification. This probably consisted of a series of simple shelters and cooking fire rings. Archaeological remains might consist of domestic artifacts such as food bone, ceramic sherds, and personal utensils, as well as fire hearths and tent peg lines.

4. The cache of trade goods. Salvaged parts of the *San Agustin's* cargo were said to have been cached, presumably in a bunker in or near the campsite, with the object of retrieving it later. There is no evidence that these materials were ever recovered, and some were of durable materials, Drake's claim marker was mounted on a wood post with iron nails and was accompanied by a silver sixpence, The plate, nails, and the sixpence, and evidence of a posthole, could have survived.

Archaeological Field Work: Surveying, Metal-Detector Scanning, and Magnetometer Scanning

Before excavation began, the authors of the 1995 report closely inspected the portion of Limantour Spit that was believed to be the most likely location for the Cermeno campsite. Since the investigation location was situated in an area of stable sand, which has built up very slowly over the last four centuries, it seemed likely that a layer of sand would cover any materials from the campsite. Consequently, it was believed that the most productive initial method to investigate the area would be to conduct an intensive scan using metal detectors. Each "hit" identified by the metal detectors would then be investigated using standard archaeological technique in the hope that non-metallic remains would accompany the metal artifacts.

An endangered-species survey conducted by Robert Soost in 1995 showed that no endangered plants exist in the proposed work area. *Cordylanthus maritimus palustris,* the only endangered or threatened species in the Limantour Spit area is found only in the zone below the high-tide line, while all work is done above that line.

To facilitate accurate recording, the grid laid out in 1995 by a survey crew under the leadership of Jerry Miller, PLS, of Santa Rosa Junior College, was restaked and extended as necessary, beginning at one-and-a-half-meter-long iron pipes that had been buried at key locations to serve as datum. Wooden laths were driven at fifty-foot intervals and the grid was laid out with string. Two two-hundred-foot centerlines were marked in order to divide the initial survey area into four quadrants. The intersection of these lines was designated 0 North/0 South/0 East/0 West; excavation units were designated accordingly.

A team of metal-detector operators systematically swept the gridded area. The team employed White's Spectrum detectors, which are capable of fine metal-type and depth discrimination to a depth of a foot or more, and a Fisher FX 3 Magnetometer, which has better depth range but detects only ferrous metals. A flag pin temporarily marked each contact made by the metal detectors. The metal detectors worked well in the sand, even in rain.

Archaeological Field Work: Excavation on Limantour Spit

In the prime suspect area, which is north of the road sloping down toward Limantour Estero, and is known to have been stable for centuries because of its scatter of Native-American debris, the sand had been tested in small excavations during the 1995 work. Standard three-by-three-foot excavation units had been established at each metal-detector-contact location, which could be dealt with within the limits which weather, time, and crew size placed on the project. Each unit was given a unique designation according to the grid reference of its northwest corner. Excavation was conducted stratigraphically, that is, according to the layers of sediment encountered. However, where a homogeneous deposit of sand of more than six inches in depth was encountered, arbitrary six-inch levels were employed. Trowels and shovels were used to remove the soil. The sediment was not screened, however, all soil was carefully inspected for cultural remains, which stand out clearly in the sand, and follow-up metal detector sweeps were employed. A standard record form was completed for each layer or level excavated.

Eleven three-by-three-foot units were investigated in 1995, for a total of 151,65 cubic feet. The stratigraphy of all units was identical. The first layer encountered consisted of a dark brown mixture of sand, rotted plant material, and roots this stratum was usually two to four inches in depth. Below this was a four to eight-inch-thick layer of gray sand, often containing native clam- and mussel-shell fragments.

This stratum graded into a light tan sand that was free of both organic remains and organic material. Unit depth varied between six and twenty-four inches. A total of one brass and four ferrous metal fragments were found, all between four and eight inches deep, Other "hits" did not result in artifact recoveries; they may have detected mere traces of disintegrated bits of iron, some of which were noted as soil discoloration.

With this background and aided by the Point Reyes Fire which cleared the ground of the four-foot-high coyote bush, it was decided to change the dig plan for 1997. It was quickly determined that each fifty-foot by fifty-foot square contained not a few but dozens of metal-detector hits. Faced with this problem, and realizing that there was no meaningful stratigraphy in the area, it was decided to search the site of each hit immediately, doing only enough excavation to locate the metal artifact at each site, until an early artifact was found, at which point a regular excavation would be done. It was hoped that discovery of one or more sixteenth-century artifacts would lead toward one or more of the Cermeno sites.

While most artifacts were immediately recognized as recent, it was decided to record and collect them to clear, the ground so they would not interfere with later work, which might find earlier and/or deeper materials. Most artifacts proved to be fragments and shrapnel from 3-inch shells from a World War 11 coast-defense shelling range. The work was stopped temporarily to find out if there was any danger from unexploded ordnance. Fortunately, the U.S. Army Explosive Ordnance Disposal Team determined that the shells posed no danger and the work resumed.

As work progressed, it became obvious that the number of shell fragments was overwhelming. In one test, a fifty by fifty-foot area was cleared, only to produce thirty-five more hits in a resurvey. It was not feasible to clear an area of shallow artifacts well enough to look for deeper ones without interference. No early artifacts were identified.

The work shifted to an area south of the road and west of the most prominent dune. That area proved to be mostly free of shell fragments, but held a scatter of miscellaneous artifacts from the last fifty years, including cans, pop-tops, light bulbs, and a small trash dump from the summer-home period just before the development of the Point Reyes National Seashore. More important, a group of large targets was excavated, which proved to be a section of a ship made of soft wood and tentatively identified as a deck stringer with associated iron and timber from a steam schooner, presumably the *Pomo* wreck of 1913. Clearly, the area west of the large dune was a wash zone a century ago, and could not contain sixteenth-century artifacts.

Sheldon Breiner then surveyed much of the area with a magnetometer. His survey confirmed the conclusions reached by the metal-detector searches and excavations. Most of the high anomaly areas clearly related to a vanished building, the ship wreckage, the artillery range, the garbage dump, and other known phenomena. Excavating the large number of unidentified vague anomalies to see if any of them contained artifacts earlier than the twentieth century was deemed unfeasible in terms of the available manpower and time.

Mapping on Limantour Spit

Parallel with the detector work and the excavations, the area was mapped to attempt to determine the extent of stable sand over time. These maps were compared with an U. S. Coast Survey map of 1859-1860, the only one to show the dunes in detail. It confirmed that the flats to the north of the road were stable at that time, protected by dunes that ran roughly east-west along the line of the present ridge of dunes and the modern road. The highest dune may not have existed at that time. Everything west of the ridge of dunes is clearly unstable and could not contain remnants of Cermeno's encampment. Severe beach erosion in 1997-1998 is reflected in the enclosed topographic map, but summer beach rebuilding apparently prevents such events from destroying the stable areas of the spit. The road building of the pre-National Park era cut into the north side of the highest dune and filled in low areas, particularly west of that dune.

Results and Conclusions: Limantour Spit

The 1997- 1998 investigations provided no evidence of the Cermeno campsite. The metal-detector survey and archaeological work showed that the area contains much metal debris from the ranching-hunting, coastal shipping, World War 11 bombing range, real estate development, and National Park periods. The work showed that no Native-American settlement site exists in the primary search area. Only a light scatter of broken shell and occasional bits of charcoal exists in the sand throughout the area. There is no natural or man-made stratigraphy other than that created by the plant roots and decayed plant materials in the upper layers, and these extend no more than one foot down from the surface.

Evidence for the Cermeno campsite shipbuilding site, and/or cache may still exist in the search area and may not have been detected by the methods used. Alternatively, the sites may have been a short distance west of the now-stable area and were destroyed in the intervening four centuries.

Follow-on Work: Limantour-Spit

No further work relating to the Cermeno campsite is recommended until a new strategy is devised, presumably using methods not available to the investigators at this time.

Possible Drake Claim Marker Site

Francis Drake's chronicler and chaplain, Francis Fletcher, in his account of the California visit, states;

"Before we went from thence, our Generall caused to be set up a monument of our being there, as also of her majesties and successors right and title to that kingdome, namely, a plate of brasse, fast nailed to a great and firme post, whereon is engraven her graces name, and the day and yeare of our arrival. I there, and of the free will, and of the province and kingdome, both by the king and people, into her majesties hands: together with her highnesses picture and armes, in a piece of sixpence currant English monie, showing itselfe by a hole made of purpose through the plate; underneath was likewise engraven the name of our Generall, etc."

The account does not state where the plate of brass was posted. Four places suggest themselves, based on contemporary practice. One is the area of Drake's encampment, on the West Side of Drakes Estero just inside the mouth, the second is the top of the bluff above the encampment, facing the bay. The third is the foot of the bluff which forms the dividing point between Drakes Estero and Limantour Estero, a location which faces the entrance channel from Drakes Bay into the Estero system, as the channel existed in 1579, and the fourth is the top of that bluff, which would be the most prominent landmark to a sailor approaching the entrance channel from the bay. The first and third are low lying and have been washed over by the sea many times in the last four centuries; the second has been subjected to severe edge erosion, possibly between two and four hundred feet, by geologists' estimates; and only the last seemed to survive in approximately its sixteenth-century condition although it too has been subject to edge erosion. The latter site had never been scientifically explored.

That unnamed bluff at the eastern side of the entrance to Drakes Estero has sheer faces approximately I 00 feet high. The top slopes gently upward from the sheer edge, then rises slightly to a small flat area which provides a superb view of the bay, esteros, sand spits, surrounding hills, Point Reyes Head to the southwest, and Inverness Ridge to the east. To the immediate north is a small knoll, and to the north and east the ground slopes upward gradually to a height of over 160 feet. At present, the top of the bluff is grassy, with some brush in spots. No evidence of plowing is visible, although a 1943 aerial photograph shows that the surface had been worked, possibly to clear it of brush. No evidence of Native-American occupation is visible, nor would it be expected as the site is fully exposed to the winds and lacks easy access to the shore and to fresh water.

On 30 April 1997, a party of nine, including three experienced metal-detector operators, went over the surface of the bluff top, as shown on the enclosed map. All the logical places where a post might have been set up -- the edge of the bluff, the flat just above it, the knoll to the north, and the hill to the north and east -- were repeatedly covered with metal detectors. Other than a few traces of barbed wire fences, the only artifacts located were six brass cartridge cases, all

found embedded in the hard earth near the edge of the bluff. All date to this century, and all were within four inches of the surface. As the soil is only one-half to one-and-a-half feet deep, and as the finds include two .22-caliber cartridge cases, the metal-detector sweep can be considered a thorough one, As part of the search, the bluff was studied from the top and, on 3 and 1 0 May, from the shore of Limantour Spit. This visual study showed that the bluff has been subject to more erosion than the other bluffs to the east of Drakes Estero, apparently because the shifting entrance channel is often opposite this bluff, a condition in which the sand spits can not protect the bluff from winter storm waves surging in from the south. The erosion appears similar to that of the bluffs along the shore west of the entrance to Drakes Estero, which have no sand spits in front of them. In contrast, the other bluffs, east of the one in the study, progressively show a more gradual slope and less erosion, a condition created by the protection given them by Limantour Spit. As a result of this study, it is evident that a possible bluff-edge site of the post, like the one on the headland just to the west of the entrance to Drakes Estero, has eroded into the sea over the last four hundred years.

Conclusion: Drake Claim Marker Site

Apparently, the place where Francis Drake posted the first English claim marker to the land that was to become the United States of America no longer exists.

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A CONSIDERATION OF PRE-1778 SPANISH SIGHTINGS OF THE HAWAIIAN ISLANDS

By Thomas K. Peterson, Corvallis, OR ©

Introduction

The route of the Manila Galleons was the longest routinely made business trip in the world at the time, about 12,000 nautical miles. The galleons began their voyages at Manila and sailed to Acapulco, New Spain (Mexico) and then back to Manila. The eastward journey started from Manila during summer when the normal monsoon season began in the Philippines. This is when the needed breezes were most prevalent.

The eastward passage was the longer of the two parts of the voyage. It could last anywhere from four months to almost a year and would take a galleon as far north as Japan before it would head east towards North America. By the time a galleon reached Acapulco, it would be winter in the northern hemisphere hopefully there were no interruptions in the trip. How they could keep going month after month seems almost super human and a miracle must have intervened more than once.

The westward passage from Acapulco to Manila was a "breeze" compared to the eastward passage. This trip usually left in the late winter or early spring, February through May. Once the galleon left Acapulco at 17 degrees north latitude, it dipped to a corridor of between 10 and 14 degrees latitude where it found the winds going west constant and plentiful, all the way to Guam. If these seafarers sailed below 10 degrees there were the doldrums, or no wind situations, the equatorial counter current, could prove disastrous. Since a galleon descended southwest towards the corridor from Acapulco, it would more likely end up north, rather than south of the equator at 15 or 16 degrees north latitude.

This voyage took only two to five months and often stopped in Guam. It seems to me that if the galleons were to discover or sight Hawaii, it would have been during this southern passage near the Big Island at 19 degrees. The crew and passengers had more time to observe cloud formations, fauna in the sea and birds in the air since the voyage was more carefree. These observations could give some clues as to whether there were islands nearby.

Hawaiian Island topography: "Beacon" effect of Mauna Kea and Mauna Loa volcanoes

Eruption Events

It is very possible that when a Manila Galleon was sailing to the south of the Big Island, it might have encountered a volcanic eruption. Both Mauna Kea and Mauna Loa are over 13,000 feet (13,796 and 13,680 feet respectively) making them just one thousand feet less than Mt. Whitney, the tallest mountain in the contiguous United States. My son has figured mathematically that Mauna Loa must be visible up to 100 miles south of the Big Island, assuming that Mauna Loa is forty miles north from the southern tip of the Big Island. When I lived on the southern shore of Molokai, in clear weather, we could see Mauna Loa protruding above the clouds about 140 airline miles away.

There are other eyewitness accounts of sightings from substantial distances at sea. John Guzzwell stated in his, Trekka Round the World that he saw Mauna Kea from 85 miles at sea when he was sailing from Panama to Hawaii. Leonard Wibberley in his book, Toward a Distant Island, saw "two small egg-shaped clouds" above Mauna Kea and Mauna Loa while he was two days at sea.

If these modern mariners could see Mauna Loa and Mauna Kea from far out at sea, there is no reason an off-course galleon crew could not have done the same thing. We have no records of volcanoes on Mauna Loa before 1790 but in their book Volcanic Features of Hawaii, M. H. Carr of the U.S. Geological Survey and R. Greeley of Arizona State University explain that between 1832 and 1950, Mauna Loa averaged an eruption every 3.6 years and was active 6.2 per cent of the time. Carr and Greeley also state that, "activity since 1832 has been almost equally divided between summit and flank eruptions. Eruptions on Mauna Loa usually start at the summit." (p.7). It is reasonable to believe that the eruptions before 1832 occurred at the same rate. Thus, Mauna Loa must have erupted many times during the two hundred years before Captain Cook discovered the Islands in 1778. At least once during that time an off-course galleon crew must have witnessed an eruption atop Mauna Loa.

As a Honolulu resident, I have experienced urban volcanic smoke and ash during eruptions from the Big Island, resulting from a South or Kona wind blowing debris about two hundred miles northwest to Honolulu. Sometimes the plume of volcanic debris and smoke is 1000 miles long. If the northeast tradewinds were blowing normally when an eruption occurred, they would blow volcanic smoke and ash out to sea to the southwest. If a galleon were sailing on its route to Manila it would have intercepted the debris several hundred miles past Hawaii. This would have been entirely possible, and there probably is a record in some pilot's or captain's log somewhere in an archive in Spain or Mexico to attest to this.

Snow capped mountains

Since the westbound galleon left Acapulco in winter it is possible that Mauna Loa could have been shrouded in snow. Practically every winter Mauna Kea and Mauna Loa receive some snow. As a former member of the Hawaii Army National Guard, I participated in maneuvers at Pohakuloa on the saddle between Mauna Kea and Mauna Loa at the seven thousand-foot elevation. One soldier told me he had attended Army maneuvers up there more than once in winter when it snowed. When such conditions occur, Mauna Loa and Mauna Kea would be mantled in white from the summit of over 13000 feet down to 7000 feet, almost half their heights. It must have been an awesome sight. Samuel Clemens, aka 'Mark Twain', saw snow atop Mauna Loa when he approached the Big Island by boat during the winter in the late 1800s. He was touring the Islands as a reporter for the Sacramento Union. A snowcap atop a distant mountain would appear as a gigantic beacon or lighthouse. On a clear winter full-moon night it would have appeared as an eerie omen to a minuscule wayward galleon.

Modern Examples of transport ships and planes off course

With all of the technology that modern science can harness even today it cannot completely eliminate the possibility of being off course or avoiding disaster especially during a storm. In 1983 a Korean Airlines 747 strayed off course into Soviet air space near Sakhalin Island north of Hokkaido, Japan and was shot down; 269 passengers were killed. The Russians thought it was an intruder.

Along the south coast of Oregon, over the years many ships have run aground on the treacherous coastal areas because they were off course. On February 28, 1929 the Sujameco (3542 tons, 324

feet), a steel steamer was on her way from San Francisco to Coos Bay, Oregon when fog set in. The next morning under heavy fog, the captain thought the ship was going into the Bay when she struck a beach eight miles north going full speed.

If a ship goes off course in or near Hawaii it does not have to contend with fog, because at that latitude there is none. Since visibility is much better, all the more reason an off-course galleon could have sighted Hawaii. A Kona or southern storm during the winter could have blown a galleon towards Hawaii from its normal corridor, south of the Big Island. During a Kona storm the visibility is not as bad as during a mainland fog.

If a galleon were off course near Hawaii, it would not necessarily have been a tragedy, anymore than it was for Captain Cook before he decided to land to meet with the Hawaiians. If the Spanish were anywhere within five or ten miles from shore they would have been able to see evidence of inhabitants, perhaps smoke from cooking fires. If the galleons were involved in exploration, they always kept their first priority of business to the fledgling colony in Manila, but certainly some captains must have been curious and maybe some even tempted to go ashore.

Commodore George Anson's Pacific voyage: 1740-1744

During the first part of the 18th century Spain was losing control over her far-flung colonies. Her determined enemies were bound to challenge Spain's supremacy of the Pacific. England found a reason to declare war on Spain in 1739, following the outbreak of the War of "Jenkin's Ear". In January 1740, Commodore George Anson was ordered to harass Spanish shipping in the Pacific and capture a Manila Galleon. The British had not been involved in any military action for some time and it was clear that a triumphant expedition against the Spanish would greatly increase English prestige as a seafaring nation.

George Anson's expedition was ill fated at its inception and he had difficulty crewing his squadron. Many sailors were "pressed" into service and some marines were pensioners from Chelsea Hospital in their 60's and 70's. His men could be called "a motley crew", certainly not in the interest of the overall plan of success! Despite these handicaps, Anson left Portsmouth, England with his squadron of six fighting ships and two 'victuallers' (supply ships) on 18 September 1740 nine months late. He did not reach the vicinity of Cape Horn until March, the wrong time of year to attempt rounding Cape Horn. Two months later, Anson was still trying to get around the Cape. He lost many ships and men doing so and scurvy played its horrible role. However, he was however able to regroup at Juan Fernandez Island off the coast of Chile from June to September 1740. After harassing ships and towns on the west coast of South America, he decided to cross the Pacific and attempt to capture a galleon in the Philippines. By the time he got half way across the Pacific the Centurion was the only ship left!

Commodore Anson's Naval Career

George Anson was born in 1697 in Staffordshire, England and entered the navy in 1712 at the tender age of 14. Not much is known of his early education but he served apprentices on many ships before coming to the Centurion in 1737. In 1731 he commanded the frigate Diamond in the Channel, and in February 1731-32 he was appointed to the Squirrel and was sent to his old station on the coast of Carolina. In December 1737 he was appointed to the Centurion, which had 60 guns and sent to the west coast of Africa to protect English trade. The Centurion was recalled to England in 1739.

The flag ship, Centurion, was the only ship that survived the first year and a half and it alone crossed the Pacific to China in 1742 seeking a Manila Galleon. The Centurion reached Macao in November 1742 where it was completely overhauled and the crew had the opportunity to restore their health because most were suffering from scurvy after being at sea so long.

The Centurion left Macao in April 1743 for Cape Espiritu Santo in the Philippines (San Bernardino Strait - Embocadero), where she lay in wait for a galleon. The crew spent their time in naval maneuvers and target practice during the wait. Then on June 20, 1743 a galleon was noticed beating towards the Centurion in the early morning, as if they thought it was a friendly ship. In a brief skirmish, the Centurion captured the Nuestra Senora de Covadonga and sailed the captured vessel back to Macao, sold it, and took the treasure to England. Commodore George Anson spent the rest of his days in relative luxury.

Journal of Phillip Saumarez

Philip Saumarez was born in 1710 in the Channel Islands on the Island of Guernsey. He practically breathed ocean from the time he was born, as did most of the people born in the Channel Islands. In 1721 Philip was sent to school in Southampton for a couple of years and in 1725 when he was only 15 he entered the navy and sailed on board the Weymouth to the Baltic Sea. In 1734 he was a midshipman or master's mate on board the Falmouth. He was appointed third lieutenant of the Diamond in 1739, Anson's old ship, and left the Diamond before it sailed to be with George Anson on board the Centurion.

Philip remained on board the Centurion during the entire voyage around the world and he kept meticulous notes. His diary, which comprised four volumes, showed up in the attic of a relative during the early part of this century. It remains the best catalog of Anson's circumnavigation of the world from 1740 -1744. Philip also had a younger brother on board the Centurion named Thomas Saumarez. In the absence of George Anson on shore, Philip was in charge of the Centurion and Anson appointed him captain of the Covadonga after her capture.

Philip's career did not last long after the four-year voyage around the world. After recuperating from the grueling voyage, he was appointed to command the Nottingham, which had 60 guns, and he served with distinction in the War with France. He captured the great French warship Mars and had other notable victories. In 1747 he was killed in action against the French at Finisterre. He was only 34 years old.

Capture of Captain de Montero and Nuestra Senora de Covadonga

I have searched many places for information about Geronimo de Montero's life and have found nothing new. We do have several facts about him though. He was Portuguese and how he came to sail for the Spanish in New Spain (Mexico) is apparently unknown. He did, however, sail on six or seven Manila Galleons before he took command of the Nuestra Senora de Covadonga. He was mainly a Pilot (navigator) which was almost as powerful as the captain of the ship. I think the Covadonga was his first command. Nothing is known about him after the Covadonga was captured but that he did survive and was exonerated of all guilt in surrendering the ship to the British, in June 1743.

These three men of the sea all had a great deal of experience in the ways of the ocean. They were all officers who worked their ways up through the ranks but de Montero had by far the most Pacific Ocean experience, as he had made at least four Acapulco to Manila passages.

Conclusion

In 1742 the Centurion sailed near Hawaii, as did all of the galleons. When it was closest to Hawaii on July 1st about 340 nautical miles south-southeast of the Big Island of Hawaii (2800 nautical miles and 2 months from Acapulco), at 12 degrees 15 minutes N. latitude, 153 degrees 31 minutes W. longitude Philip Saumarez made this entry in his log: "This morning we had a great quantity of birds as usual which made us conclude there might be islands near us." Now if Anson and Saumarez could make this conclusion after making one trip in the wake of the Manila Galleons, the Spanish must have been able to ascertain the same conclusion.

Between 1565, when the galleons began, and 1778 when Captain Cook discovered Hawaii the Spanish made at least two hundred successful crossings of the Pacific from Acapulco to Manila. Surely, they must have had the same inklings that Saumarez and Anson had after making only one crossing. After all, the Spanish skippers were much more experienced in the Pacific Ocean than were Anson and Saumarez.

A Critique of Pertinent Literature

Six years ago, when I first began studying the question of whether the Manila Galleons might have sighted or visited the Hawaiian Islands before Captain Cook I was surprised where I might run into leads. Something I copied out of a book five years ago might only now be significant. The research has given me a few ideas about the subject and I don't think that some of the early scholars that pursued this subject, especially John F.B. Stokes and Erik Dahlgren, really proved it was NOT possible for Hawaii to be sighted by Spanish Navigators.

Comments about Erik Dahlgren's book: WERE THE HAWAIIAN ISLANDS VISITED BY THE SPANIARDS BEFORE THEIR DISCOVERY BY CAPTAIN COOK IN 1778?

Dahlgren's book is a better expose of the Manila Galleons themselves than a proof the Spanish could not possibly have seen or visited the Islands. He gives descriptions of the galleons all the way from 1565 to 1743 when Commodore Anson captured Nuestra Senora de Covadonga in the Philippines. Each year he details the name of the galleon, who the captain and the pilot were and he tells of any outstanding event that occurred during the voyage. He spends practically all of the time reporting about the Manila to Acapulco voyage, north of Hawaii, but if the Spanish were going to sight Hawaii, it probably would have been while they were sailing from Acapulco to Manila, south of Hawaii. Therefore, why did he not spend more time describing the southerly route?

Mr. Dahlgren abruptly ends his descriptions of the galleons in 1743. He says: "Concerning the galleon traffic during the thirty-five years that elapsed from the time when Anson performed his exploit till the time when Cook made his famous discovery, I have been able to find only scanty information. This deficiency, however, has practically no bearing on the present subject." In my opinion this is a mistake. Those thirty-five years might have made all of the difference in the world. He should have continued his research all the way to 1778 and not blithely assumed that it doesn't make any difference. If the Spanish discovered Hawaii in 1773, it would have made Cook's discovery null and void. How could Dahlgren be so naive?

Comments about John F.B. Stokes writings for the Hawaiian Historical Society

John F.B. Stokes sidestepped the issue of the "must" theory in his "Hawaii's Discovery by Spaniards, Theories Traced and Refuted." The "must" theory states that in passing the Islands the

Spanish must have seen them at least once. His conclusion was the same as Dahlgren's but in reading it I definitely do not get the impression that Stokes demolishes the theory. He says; "Thus against the 'must' theory, based on fancy, may be placed the records that the tracks of the Spanish vessels led away from and not to the Hawaiian Islands, that Spain eagerly sought islands of such a class for nearly three centuries, and that Spanish officials initiated movements to obtain them when known." How does "the tracks of the Spanish vessels led away from and not to the Hawaiian Islands" constitute a proof of non-sighting? The true movements of the galleons were "past" the Islands. When you are in a ship in the middle of the ocean, passing an island is a perfect time to see it. The problem is, are you close enough to see it's Unfortunately, the Spanish were rarely in the right position to see the Islands.

New Spanish routes across the Pacific

By the time the eighteenth century arrived, the Spaniards were no longer exploring new islands in the Pacific, but they were searching for new ways to make the trip shorter across the Pacific. This predominantly affected the treacherous routes within the Philippines, but they also had designs on other improvements. They knew there was not much they could do to improve the carefree track south of the Big Island of Hawaii, but they did try to shorten the distance from Manila to Acapulco by going south sooner as they approached the California coast. If they veered south too soon in their eagerness to get to Acapulco, it is conceivable they saw Hawaii.

In 1730, the veteran German Manila Galleon pilot, Enrique Herman proposed a new route around the northern tip of Luzon instead of using the traditional route south from Manila to the Embocadero (strait of San Bernardino). Over the years many galleons had been lost skirting the maze of islands through which the route followed to the Embocadero. The Spanish made several exploratory voyages around the northwest coast of Luzon and a couple of galleons even tried it and were successful in shortening the voyage to Acapulco. However, there was still much opposition to this new route and in the 1790s the royal order creating it was cancelled. The first galleon to put into Monterey and try the new route around the northern tip of Luzon (49 years after it was first proposed) was the galleon San Jose in 1779. It is unlikely that the Captain, Don Jose Emparan, knew Hawaii was discovered the year before, and if he had perhaps he would have detoured there since his was an investigative galleon.

A reader might ask, "What are the odds of the Spanish running into the Islands at some point or other?" The answer is it is not possible to calculate the odds, because of the number of variables involved. But it is possible to think about it. If the trips north of the Hawaiian Islands (from Manila to Acapulco) are combined with the voyages south of the Islands (from Acapulco to Manila) that the Spanish made, that makes four hundred voyages in total before 1778 (this is a conservative estimate). How could they not have seen the Islands at least once during those two hundred years? I have spent most of my time dwelling on the Big Island with its volcanoes and high mountains. But mountains on Kauai go up to five thousand feet and can also be seen quite a distance at sea.

In Robert Langdon's book, THE LOST CARAVEL, the Spanish or some other nation such as the English or the Dutch are always discovering or running in to some new atoll or small island. Atolls are rarely more than five feet in elevation. If this is the case, how could any nation have avoided seeing mountains in the middle of the Pacific that are over 13,000 feet if they pass that way regularly?

Conclusions

The technology of sea travel including instrumentation improved immensely in the 1700s. The design of the galleons, their sails and maneuverability progressed to such an extent that navigators could go more places faster. The Castilians had the means to seek out the islands that the Spanish Navigator, Bernardo de la Torre, placed on his charts. Alan S. Lloyd, in his paper titled; "Isles de los Monges, The Sandwich Islands and Charts of the Spanish Navigators" presents evidence that it is no accident that islands lying in the same latitude as Hawaii, but the wrong longitude, appear on many early maps.

Even if the Spanish never saw the Hawaiian Islands they were on the verge of rediscovering the Isles about the time Captain Cook made his famous find because they were back into the same exploratory mode they had been in early in the 1600s. This question of what kinds of intrusions the Spanish made into Hawaiian waters shall never be answered conclusively until more documentation becomes available as historians, translators and scientists sift through evidence whether in the form of marine archaeology or galleon logs. As Herb Kawainui Kane explains, maybe there are still untouched diaries and reports in the Archive of the Indies in Seville, Spain

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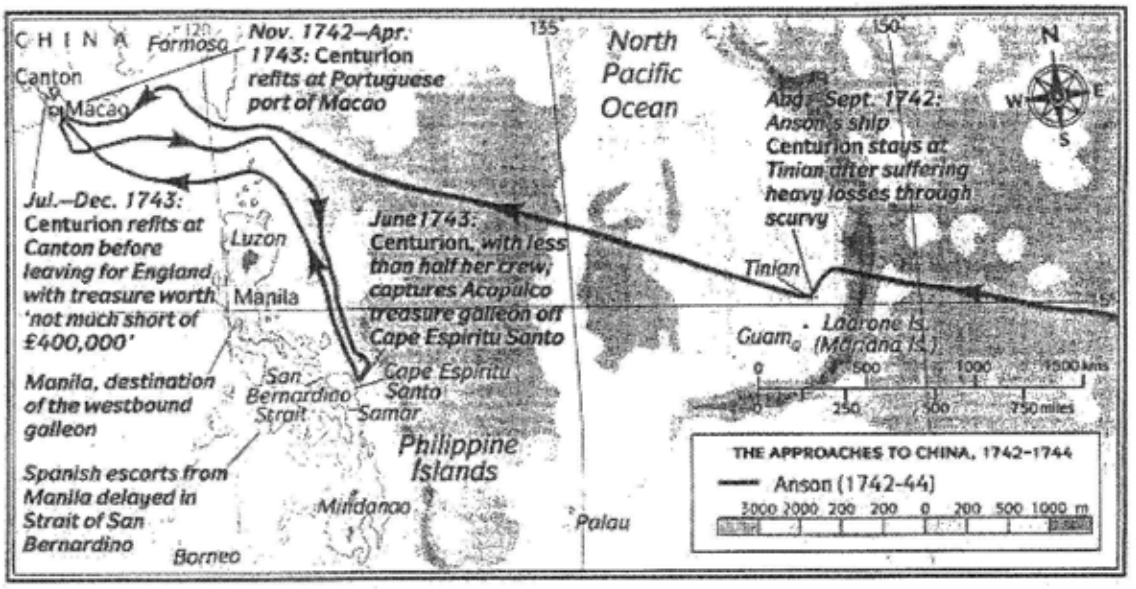
Map of CENTURION'S travels



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