Underwater Archaeology

LAWRENCE E. BABITS
CATHERINE FACH
RYAN HARRIS, EDITORS

1998

Published by
THE SOCIETY FOR HISTORICAL ARCHAEOLOGY
RONALD L. MICHAEL, Editor
ISSN 1074-3421

Composition by
TransVisions
Uniontown, Pennsylvania

Printed in the United States of America

ISSN 1074-3421

♾ The paper used in this publication meets the minimum requirements of the American National Standard for Information Sciences–Permanence of Paper for Printed Library Materials, ANSI Z39.48-1984.

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THE SOCIETY FOR HISTORICAL ARCHAEOLOGY AND
THE ADVISORY COUNCIL ON UNDERWATER ARCHAEOLOGY
EXTEND THEIR APPRECIATION TO THE FOLLOWING FOR THEIR
FINANCIAL ASSISTANCE IN THE PUBLICATION OF THESE PROCEEDINGS

J. Barto Arnold, III

Bateaux Below, Inc.

East Carolina University, Program in Maritime Studies

Friends of the Corpus Christi Museum of Science and History

R. Christopher Goodwin & Associates, Inc.

Institute of Nautical Archaeology

Martin Klein

L. A. Landry & Associates

National Park Service - Submerged Cultural Resources Unit

Naval Historical Center

North Carolina Maritime History Council

Panamerican Consultants, Inc.

Ships of Exploration and Discovery Research

South Carolina Institute of Archaeology and Anthropology

FOREWORD

LAWRENCE E. BABITS, CATHERINE FACH, AND RYAN HARRIS, EDITORS

The highly successful Atlanta conference proved to be the second largest meeting since the society's inception 31 years ago, attracting in excess of 1,000 participants. Of the 405 scheduled papers, 64 dealt with underwater archaeology and related topics. As in previous years, these contributions were diverse in character, attesting to the expanding scope of underwater research and the continued integration of its adherents into a cohesive international community. A perennial emphasis and the abiding challenge of *Underwater Archaeology* and its predecessor *The Proceedings*, has been to adequately reflect this broad range of research within the limited confines of a short volume. At the same time, from an editorial standpoint, it is also desirable to convey the general disposition of the various symposia and of the conference as a whole. It is hoped that this year's publication manages to effectively address these respective aims.

Notwithstanding the diversity of research presented in Atlanta, two distinct impressions emerge nevertheless. The first pertains to the expanding influence of technology in the conduct of underwater research, the second, to the burgeoning interest in the maritime dimension of the African Diaspora. These seemingly unrelated themes are germane insofar as they both reflect the expanding horizons of archaeological inquiry.

While the frontier of underwater archaeology continues to embrace increasingly remote, far-flung reaches of the maritime geography, so technology continues to sound the depths of the watery world. The session organized by Dr. Anna Marguerite McCann-Taggert, focusing on deep-sea archaeological applications, was particularly well attended. Likewise, the Norwegian University of Science and Technology (NTNU) outlined its innovative ROV-conducted excavation techniques, a likely portent of future developments. The volatility of change and intractability inherent to 'frontiers' of any persuasion, true here of the technological frontier, understandably causes marked apprehension and controversy within the pale. In effect, the limited access to technologies attenuates somewhat the scrutiny of the professional community. The SHA conference provided an important forum for discussing how technological advances can properly and responsibly be incorporated into the discipline, and how these can best serve the ultimate objective of cultural resource management. These developments raised several pertinent issues in regard to applying technological resources, such as who will have access to these resources and how might they be shared? What are the most exigent applications? And what will the role of the archaeologist be in an increasingly technology-oriented profession?

Another highlight of the conference was the session on the *Henrietta Marie* and the archaeology of the Middle Passage. These papers reflect a growing appreciation for black maritime history that is evinced both professionally and publicly, the latter best demonstrated perhaps by the recent success of the film *Amistad*. In this volume, Christopher Amer conveys how public resources and the expertise of archaeologists were enlisted in supplying live oak for a reconstruction of this historic vessel. It is also interesting to note that Florida State University conducted its survey in Kingstown Harbour, St. Vincent and the Grenadines, under the initial premise that a wreck in the harbor potentially represented the British slaver *Africa*. In another submission, Marco Meniketti touches upon the under-appreciated role of "slave mariners" in the sugar industry of Nevis, West Indies. He stresses that black Nevisans have been subject to "heritage deprivation" as they have been largely neglected in the documented maritime history of their island. The importance of incorporating local communities into the historical legacy, particularly in areas where Cultural Resource Management initiatives are absent or inchoate, is essential for establishing responsible stewardship of the maritime heritage worldwide.

Underwater Archaeology, 1998, 1-2.

The obvious dilemma facing archaeologists, in this regard, centers on how to detect slavery-related activities in the archaeological record. This difficulty is demonstrated by Joseph Zarzynski and D. K. Abbass in their continuing investigation of the "reputed slave ship" *Gem*. Similarly, the recent discovery of what may represent the wreck of the *Queen Anne's Revenge*, the erstwhile French slaver *Concorde*, potentially presents an opportunity to examine the remains of a slave ship later operated by the notorious pirate Blackbeard. This ship, in essence, could prove to be an archaeological palimpsest of considerable value. Perhaps the most memorable aspect of the session on the *Henrietta Marie* was the examination of shackles recovered from the wrecksite. These clearly demonstrate the emotive potential of an artifact to evoke the past. Discerning the activities of pirates in the archaeological record is similarly problematic, as both Mark Wilde-Ramsing and L. E. Babits demonstrate. The papers on the Emanuel Point Ship represent another diaspora, this involving the colonization of Florida. The contributors to this symposium outline the manner in which the unique activities of colonizing expeditions are archaeologically manifested.

In the preceding volume of *Underwater Archaeology* (edited by Denise C. Lakey. Corpus Christi, Texas), Mark Staniforth presented a paper entitled "The Archaeology of the Event - The Annales School and Maritime History" (1997:17-21) that seems particularly relevant. Many of the submissions included in the present volume demonstrate a heightened interest in *événements* — the archaeology of individuals at a select moment in time. Moreover, there is a growing desire to investigate "the people without history," be they slaves, pirates, convicts, or colonists, the less-tangible elements of the human past that have hitherto been misinterpreted or relegated to the marginalia of history. Nautical archaeology is particularly well positioned to explore these issues given the opportunity to study unbiased, single-episode archaeological depositions.

While the authors and presenters of the papers contributed most to this publication, this volume is particularly indebted to the patience exhibited by Ronald Michael, the editor of the SHA, and to Denise Lakey, the associate editor for *Underwater Archaeology*. They have prodded us when we needed direction and provided encouragement when the task appeared most daunting. Our thanks also go out to Mike Rodeffer, who provided a great deal of information and assistance with financial considerations.

Pat and Barbara Garrow are noted for their almost single-handed organizing and editing of the final program in Atlanta. The burden of Underwater Chair was greatly lightened by their efforts. Their continued support of our efforts since January is also greatly appreciated. The Program in Maritime Studies, at East Carolina University, and in particular the director, Timothy Runyan, deserve special thanks for granting us the time to complete the editorial challenge involved in preparing this edition of *Underwater Archaeology*.

Final thanks go to the individuals and organizations contributing financial assistance to publish this volume. The generosity of these contributors, who are listed in the preceding acknowledgment section, make the dissemination of the past year's archaeological findings possible, elevating the underwater archaeological community to a more public and accessible venue.

Lawrence E. Babits
Catherine Fach
Ryan Harris
Program in Maritime Studies
East Carolina University
Greenville, North Carolina 27858-4353

IAN RODERICK MATHER
GORDON P. WATTS, JR.

Geographic Information Systems for Submerged Cultural Resource Management and Site Specific Investigation

Introduction

Geographic Information Systems (GIS) are computer based systems that store, display and mathematically analyze spatially related data. GIS software packages link graphic and rational databases together. Graphic images such as maps, site plans, drawings, photographs and even video can be linked to tabular and text data. A GIS is like a "smart map" in which most graphic features have associated data base information. That information is stored in the computer and can be accessed almost instantaneously by users. Because of the speed and efficiency with which data can be recovered, the use of the Geographic Information Systems has grown rapidly during the last decade. It has become a principal tool for planners and managers, who must store, organize and access data necessary to facilitate effective management and decision making. Today, Geographic Information Systems are being developed to assist both submerged cultural resource managers and research archaeologists in effectively storing, organizing and recovering data (Allen et. al. 1990).

GIS data sets are invariably structured in one of two ways. Raster data, like photographs and scanned images, are comprised of pixels arranged in a grid or matrix, while vector data, like CAD drawings, are made up of points, lines and polygons constructed from nodes and vertices. GIS data is stored in "coverages," similar in appearance and principle to "layers" in CAD systems. What sets GIS apart from CAD programs, however, is that each coverage or layer has an associated spatially referenced database. Coverages can be interrelated and new data sets created from information already within the system. It is this capacity to interrelate, analyze, and display multivariate spatial data sets that renders GIS such an important tool for archaeologists.

The potential use of GIS in submerged cultural resource management and underwater archaeological research appears almost limitless. A GIS can provide a highly effective vehicle for geographically identifying known submerged cultural resources, areas of potential resource sensitivity, historic and cartographically identified patterns of human activity, and waterway development and maintenance impact areas. Access to those data can be a critical factor in the effective conduct of the Section 106 review process.

A GIS can also be used to store and access the entire spectrum of data generated by site-specific research. That data might include architectural and construction features, stratigraphic profiles and artifact provenience, photographic documentation, and historical or literary references essential to archaeological interpretation. Once the site-specific GIS becomes a more universal product of research, it can be used to support comparative analysis.

Over the past three years, Tidewater Atlantic Research, Inc. (TAR) and the Institute for International Maritime Research, Inc. (I^2MR), have undertaken development of a number of Geographic Information Systems for both regional and site specific submerged cultural resource management and research. One of the first was constructed for the Charleston Harbor Project; a five year Special Area Management Plan developed to focus management attention on the impact of development on the Charleston Harbor estuary system, Charleston, South Carolina. That system included the harbor, Ashley, Cooper, Wando and Stono rivers, along with their natural resources and adjoining lands. Goals of the project were to enhance the quality of the environment, while maintaining the many uses of the waters and natural resources, and to anticipate and act on potential problems before they harmed the harbor system. In order to formulate a comprehensive plan, the project staff identified a se-

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ries of priorities, which included the development of a submerged cultural resource management plan for the Charleston Harbor Project study area.

Tidewater Atlantic Research worked with the Charleston Harbor Project to develop a GIS based, submerged cultural resource management plan for the study area. That management plan provided a Geographic Information System, an analysis of known submerged cultural resources, as well as the identification of potentially sensitive archaeological areas. The GIS provided resource managers with a quick and efficient means of accessing computerized data regarding submerged cultural resources in the project area. For over 300 hundred years, Charleston has been one of the most important seaports and maritime centers in the south. As a result, Charleston Harbor and the surrounding river systems have become an important repository of submerged cultural resources. Those resources preserve a significant physical record of American and southern maritime history. In order to preserve that record, submerged archaeological resource managers must work within state and Federal legislation and a variety of regulations and orders designed to guide the activities of all Federal agencies and Federally permitted projects.

Sections 106 and 110(f) of the National Historic Preservation Act of 1966 require that agencies assess the effects of Federal, Federally assisted, or Federally licensed projects on properties included in or eligible for inclusion in the National Register of Historic Places. The Section 106 process, therefore, is designed to address historic preservation concerns. Consequently, a GIS facilitates a more effective, project specific Section 106 review and compliance process.

In Virginia, the United States Army Engineer District, Norfolk, has the responsibility for maintaining and developing navigation channels in one of the most historically sensitive waterways in the United States. Since the first permanent English settlement was established at Jamestown in 1607, the James River has been one of the most important river systems in the eastern United States. As a result of continuous development and military activities associated with the American Revolution, the War of 1812 and the Civil War, the James and its tributary systems have become an important repository of submerged cultural resources. Those resources preserve a significant physical record of national, regional and local maritime activity.

Like the submerged cultural resources in Charleston Harbor, those in the James River are protected by a variety of regulations and orders designed to guide the activities of all Federal agencies and Federally permitted projects. To more effectively coordinate their historic preservation responsibilities, the U.S. Army Corps of Engineers (USACE), Wilmington and Norfolk Districts, cooperated in the development of a long-term Historic Properties Treatment Plan for the James River Navigation Project. The project area included the James River from below the fall line at Richmond to the Chesapeake Bay at Hampton Roads.

Objectives of the Historic Properties Treatment Plan for the James River Navigation Project were to provide both an historical and cultural background for the James River, an inventory of known historic and archaeological resources, and the identification of priorities and methodologies for remote sensing survey and archaeological research designed to locate and assess submerged cultural resources that could be impacted by continued maintenance dredging activity. The overall project goal was to identify and develop effective Section 106 procedures for the Norfolk District to assist the agency in the responsible implementation of submerged cultural resource obligations associated with its maintenance dredging program on the James River. The project design identified a series of priorities including the development of a submerged cultural resource management document and a computer based Geographic Information System for the James River.

The remains of the USS *Monitor*, one the first ironclad warships tested in combat, lie off the coast of North Carolina. After successfully en-

gaging the Confederate ironclad CSS *Virginia* at Hampton Roads, Virginia on 9 March 1862, the John Ericsson-designed warship sank in a gale off Cape Hatteras. In 1973, the remains of the *Monitor* were located and identified by a research team operating from the Duke University research vessel *Eastward*. Two years later the *Monitor* was designated as the nation's first Marine Sanctuary and the National Oceanic and Atmospheric Administration assumed management responsibility for the wreck.

Although management of the *Monitor* National Marine Sanctuary involves a single shipwreck, that task requires storing, organizing and accessing volumes of data necessary to facilitate effective management and decision making. Like the submerged cultural resources in Charleston Harbor and those in the James River, the remains of the USS *Monitor* are also protected by a variety of regulations and orders designed to guide the activities of all Federal agencies and Federally permitted projects. Sections 106 and 110(f) of the 1966 National Historic Preservation Act apply to all activities in the sanctuary that impact that historic vessel. I²MR developed a site specific GIS to assist the National Oceanic and Atmospheric Administration in managing the *Monitor* National Marine Sanctuary.

Geographic Information Systems

Software

Archaeologists from TAR and I²MR used several computer software packages to construct the various Geographic Information Systems. AutoCAD 12 (Autodesk, Inc.) and ArcCAD 11.4 (Environmental Systems Research Institute Inc. [ESRI]) acted as the main construction tools, along with image processing software developed by Hitachi. ArcView 3.0 (ESRI) provided the principle means of displaying and analyzing GIS data in a user-friendly environment. With this program, archaeological and historic images and data can be retrieved, displayed, and analyzed almost instantaneously. It is easy to use, relatively inexpensive and can be installed on virtually any modern PC or Apple computer.

Regional Management: James River Historic Properties Treatment Plan GIS

Tidewater Atlantic Research developed the James River Historic Properties Treatment Plan GIS to enable the USACE, Norfolk District, to fulfill their dual, and sometimes conflicting, statutory obligations to identify, protect, and preserve archaeological resources on the James River while at the same time maintaining a navigable waterway between Richmond and Hampton Roads. This ninety-mile stretch of river is archaeologically and historically one of the most important in the United States. Along its banks and within its sediments, the James preserves literally hundreds of discovered, and as yet undiscovered, archaeological and historic sites.

The James River GIS provides resource managers with a quick and efficient means of accessing computerized data associated with the river's submerged cultural resources. Rather than performing manual searches, the GIS allows users to query computerized site information by selecting on-screen symbols displayed against a series of digitized USGS 7.5 minute quadrangle maps. The user may access the GIS for information regarding archaeological sites, historic sites, past and present channel alignments, dredge cuts, known wrecks and obstructions, archaeological surveys, remote sensing targets, and submerged cultural resource sensitivity zones.

Twenty USGS 7.5 minute quad sheets served as the cartographic base maps for the James River GIS. Coverages representing the quad sheets, the river, and all major highways in the region were extracted from these maps and displayed in real world coordinates (Virginia State Plane Coordinates, NAD 83). Researchers developed two data sets associated with channel alignments and dredge cuts. First, Norfolk District's channel alignment data were converted into a

GIS coverage representing the currently maintained James River channel. Second, TAR archaeologists digitized channel cuts from historic charts, topographic maps, navigation charts, and USACE survey charts, to form a coverage representing previously dredged channels.

An intense program of historic, cartographic and archaeological research resulted in the development of three further GIS data sets. The first represented and comprised 264 historic sites. Using the direct historical approach, historic maps and charts were analyzed for areas of cultural activity, particularly in relation to shipbuilding, shipping, and other activities impacting the scope and nature of the submerged archaeological record. Included in those historic areas were plantations, landings, shipyards, ferry crossings, forts, redoubts, derelict vessels, and shipwrecks. Comparing historic maps with present day USGS 7.5 minute topographic maps revealed a striking similarity between physiographic aspects of the project area's rivers and streams. Landmarks such as river bends and tributaries, coupled with written historical records, permitted researchers to employ the computer assisted design program (AutoCAD) to identify historic areas on the digitized current USGS 7.5 topographic maps. These areas of historic activity were developed into a GIS coverage of historic sites. In its final form, the GIS permitted end-users to select a graphically displayed symbol for each historical area and obtain database information such as name, description, and reference data.

The second data set represented and comprised 139 known archaeological sites and regions preserved along the banks or within the sediments of the James River. Site locations - derived from published and unpublished archaeological reports and from the Virginia Department of Historic Resources site files - were entered into CAD drawings and used to create a GIS coverage for known archaeological sites. The resulting database allowed end users to query individual sites for specific information such as location, site name, cultural affiliation, type, and National Register of Historic Places significance (Figure 1).

The third data set represented and comprised 204 charted or documented wrecks and obstructions. For more than 400 years, humans have been mapping America's river systems. As a result, charts of the James River contain the locations for hundreds of wrecks and obstructions. Through detailed cartographic research, TAR archaeologists recorded the location of these documented wrecks from historic maps and overlaid them on modern digitized charts. These data were then used to create a GIS coverage of documented wrecks and obstructions. Researchers also included the location of wrecks and obstructions from modern navigation charts and information derived from the National Oceanic and Atmospheric Administration's (NOAA) Automated Wreck and Obstruction Information System (AWOIS). The database information accessible to the end user varies in accordance with the cartographic source for the wreck or obstruction. Where wreck sites had been derived from historic maps, for example, the end user could access information such as the name, description, location, and cartographic reference. Where the documented wrecks or obstructions had come from the AWOIS database, all information from that source became accessible to the end user.

Archaeologists have conducted a number of submerged cultural resource surveys along the James River. TAR researchers delineated, digitized and developed data from these surveys into a GIS coverage. They also created a second data set containing all potentially significant magnetic and acoustic remote sensing targets identified within those survey areas. End users were then able to access both tabular and textual data associated with survey areas and targets. Access to textual data, itself taken directly from the pertinent archaeological report, was made possible by an ESRI software function known as "hotlinking." By using the "hotlink tool" and selecting an entity, end users were able to view a descriptive passage associated with a survey area or target.

One of the earliest and most controversial uses of GIS in archaeology has been in the field of

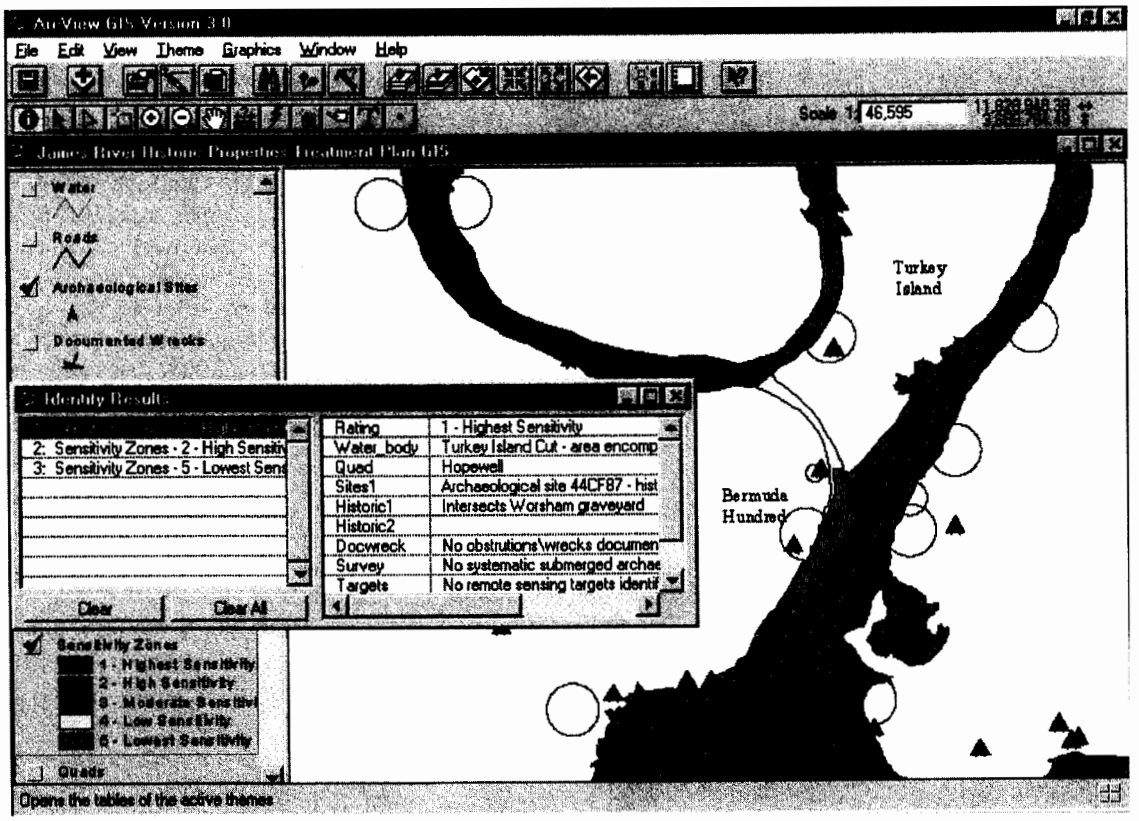

FIGURE 1. James River Historic Properties Treatment Plan GIS.

predictive modeling (Maschner 1996:10-12). Although a predictive model of shipwreck losses in the James would have been extremely useful for Norfolk District, the high degree of mobility associated with ships and the random nature of environmental impacts created a major obstacle to predicting the location of James River shipwrecks. Without a fairly specific documentary record, our ability to develop accurate predictive models for shipwreck locations is extremely limited. Given the historically high usage of the James River, one can not eliminate the possibility of intact shipwrecks in any unsurveyed or undisturbed area.

As an alternative to predictive modeling, TAR researchers divided the river into a series of sensitivity zones. By using GIS map overlay techniques, TAR personnel examined the spatial relationship between the system's data sets. By overlaying the various historic, archaeological, dredging, and remote sensing survey coverages, researchers examined the relationship between areas of historic significance, the level of possible site disturbance, as well as the level of archaeological survey. Researchers then divided the river system into zones and assigned a sensitivity rating to each area. This sensitivity and submerged cultural resource analysis was a rather general analysis. While the random nature of vessel losses associated with storms and other unpredictable catastrophes cannot be fully quantified, an examination of the historical record associated with settlement patterns, regional economics, and the riverine environment provided

insight into areas of potentially high sensitivity for associated submerged cultural resources.

Sensitivity ratings assigned to various parts of the river system included: (1) highest sensitivity (National Register eligible sites), (2) high resource sensitivity (3) moderate resource sensitivity, (4) low resource sensitivity, and (5) lowest resource sensitivity (areas that had been surveyed and reliably demonstrated not to contain potentially significant submerged cultural resources). End users were then able to query the GIS for zone specific information, such as sensitivity rating, USGS quad, body of water, previous survey activity, known archaeological sites, documented wrecks, and historic activity along the waterway.

Regional Management: Charleston Harbor Project GIS

The Charleston Harbor Project GIS was designed and developed by Tidewater Atlantic Research to help preserve and manage submerged cultural resources associated with Charleston's rich maritime heritage. Researchers constructed the system along lines similar to that developed for the James River Historic Properties Treatment Plan GIS. The cartographic foundation of the Charleston GIS was derived by digitizing seven USGS 7.5 minute quadrangle maps and developing the resulting shorelines and riverbanks into a GIS coverage. TAR personnel used historical records of river and harbor improvements, particularly in relation to (USACE) dredging activities, to create GIS data sets which identified previously disturbed bottom lands as well as currently maintained channels.

A vigorous program of historic, archaeological, and cartographic research resulted in the development of GIS coverages for archaeological sites, historic sites and previously documented wrecks and obstructions. The inclusion of GIS data for submerged archaeological sites was an important element of the project, as was the development of GIS coverages for historic sites and areas of historic activity along the waterways. Previous research demonstrated that settlement in the Charleston area developed in close proximity to the waterways, especially along the Cooper, Ashley, Wando, and Stono rivers. The identification of areas of historic activity, such as brickyards, plantations, and landings, aided researchers and resource managers in defining high probability areas for submerged cultural resources. Based on previously documented submerged sites in the Charleston project area, researchers found that submerged archaeological sites may be an extension of, or associated with, terrestrial sites (Errante 1993:58, 62). The historic sites coverage enabled TAR archaeologists to develop a geographic framework for settlement and maritime activities along the project area's waterways. Previously surveyed areas and remote sensing targets were also delineated, digitized and developed into GIS coverages. Those survey areas were then laid over areas of historic and channel maintenance activity to assist with the sensitivity analysis.

As researchers constructed the Charleston Harbor Project GIS, they encountered familiar problems of predictive modeling and sensitivity analysis. Due to a dearth of information regarding historic site predictive modeling, particularly for submerged sites, and the sometimes random nature of vessel losses, researchers determined that a GIS based predictive model for Charleston's submerged archaeological resources would be unreliable and possibly misleading. A sensitivity analysis, however, seemed to offer greater potential for facilitating effective management and decision making. To prepare that sensitivity analysis, TAR personnel examined the spatial relationship between the various system coverages. By overlaying the historic site, dredging, and remote sensing survey coverages, archaeologists were able to examine the relationship between areas of historic significance, the level of possible site disturbance, and the level of archaeological survey. TAR personnel also utilized a methodology previously employed by South and Hartley (1980), Hartley (1984), and Ferguson and Babson (1986) to locate seventeenth, eighteenth, and nineteenth century terrestrial sites within the

Charleston area. By examining historic maps, and hypothesizing that settlers desired "deep water and high ground," South, Hartley and Ferguson successfully located numerous historic terrestrial sites illustrated on historic maps. Using GIS overlays, along with the "deep water and high ground" methodology, TAR researchers divided Charleston Harbor and the river systems into five sensitivity zones corresponding to areas of highest, high, moderate, low, and lowest sensitivity. The result was a system that permitted users to query the GIS for zone specific information, such as sensitivity rating, USGS quad, body of water, previous survey activity, known archaeological sites and historic activity along the waterway (Figure 2).

Site Specific Research: The Monitor National Marine Sanctuary GIS

The *Monitor* National Marine Sanctuary GIS was developed by the I²MR for NOAA, and represents one of the first attempts to realize the potential of GIS technology for site-specific archaeological research. The system was designed to store and display archaeological and historic data associated with the remains of the USS *Monitor* and to assist managers with planning research and the preservation of the vessel.

The *Monitor* National Marine Sanctuary GIS was organized around the geographical location and extent of the sanctuary. Institute researchers used a digital map of North Carolina as the car-

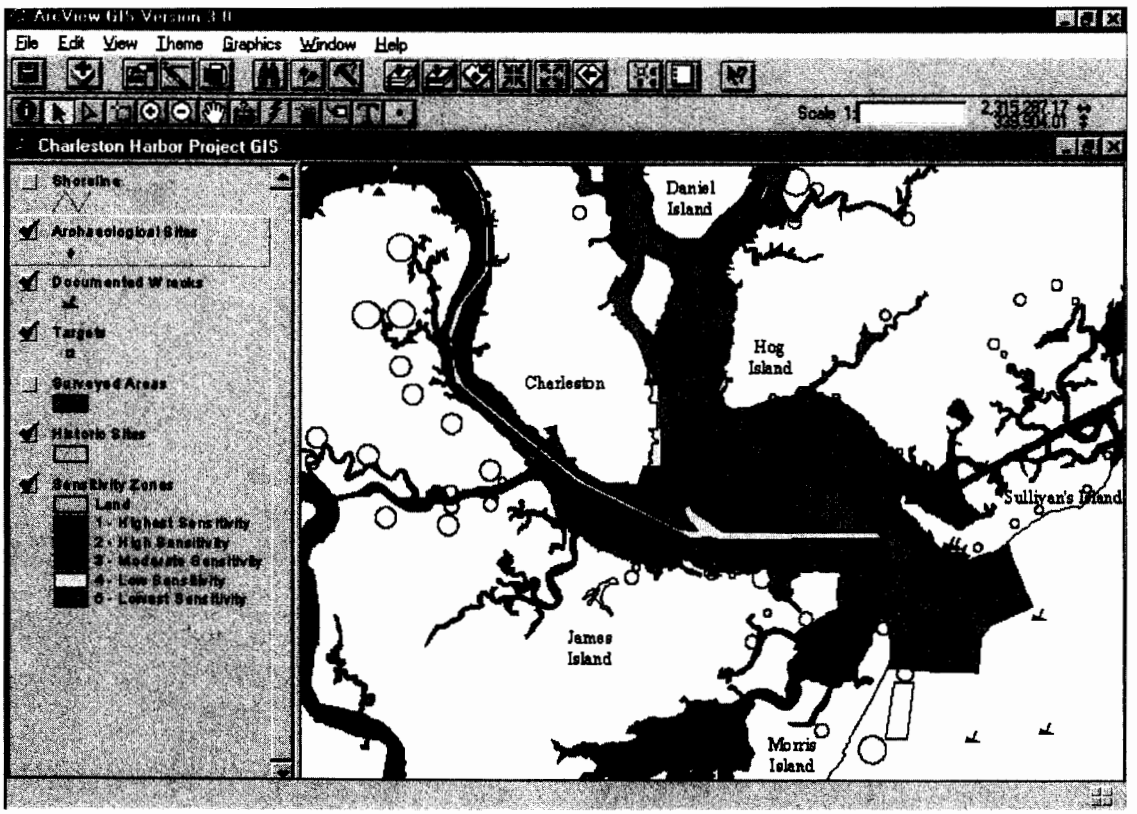

FIGURE 2. Charleston Harbor Project GIS.

tographic foundation for the *Monitor* GIS. This provided the geographic context data against which end-users could access both sanctuary-specific and site-specific information. The GIS included two sanctuary-specific coverages. The first comprised a circle representing the one nautical mile in diameter sanctuary boundary. The center of this circle was located in accordance with the coordinates established by Congress for the sanctuary. The second coverage comprised a sonar mosaic of the sanctuary compiled in 1985.

I²MR developed a total of ten site-specific vector and raster image coverages for the *Monitor* National Marine Sanctuary GIS. The first of these was a high resolution, close up view of the 1985 sonar mosaic. Institute personnel scaled, oriented and aligned the sonar mosaic with the wreck (Figure 3).

In order to generate a GIS coverage and plan view of the *Monitor*, I²MR personnel digitized a photo mosaic of the wreck, which had been constructed in 1974. When scaled and rotated, the resulting CAD drawing was used to develop a GIS coverage of the wreck and its main features. In order to locate the wreck in real world coordinates, the I²MR used locational data supplied by NOAA. In the absence of an overall measurement for the wreck, historic engineering drawings along with the known dimensions of features such as the turret and armor belt were used to scale and manipulate the raster image. The scale, location and orientation of all subsequent GIS

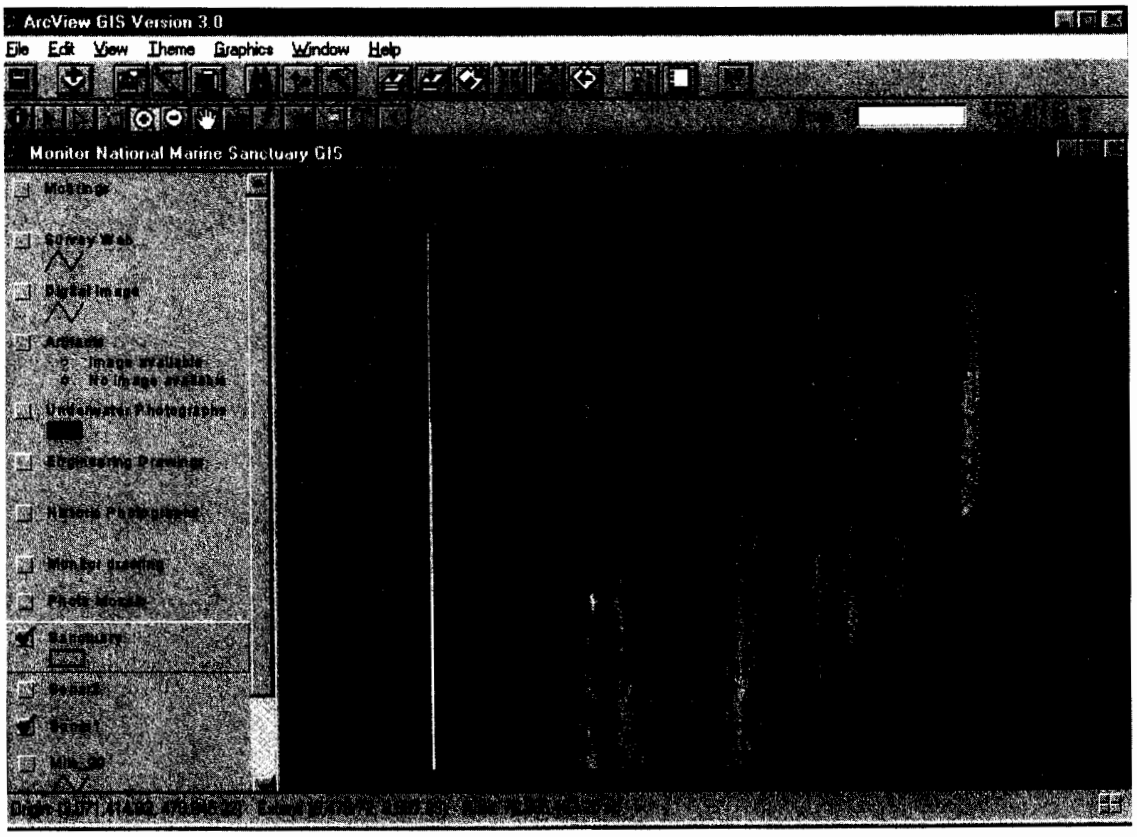

FIGURE 3. *Monitor* National Marine Sanctuary GIS. Close-up view of 1985 sonar mosaic.

FIGURE 4. *Monitor* National Marine Sanctuary GIS. 1974 photo mosaic image.

vector and raster coverages of the *Monitor* were controlled using the same coordinates and assumptions.

NOAA provided I²MR with two digital images of the wreck – the 1974 photo mosaic and an archaeological illustration of the vessel. Institute personnel scaled, rotated, and aligned both images in accordance with the established coordinates and orientation of the wreck. Both digital images were found to contain some distortion, which was corrected using the 24-point rubber sheeting capabilities of the image processing software (Figure 4).

The locations of the NOAA and navy moorings in the vicinity of the *Monitor* were grouped together so as to create their own GIS coverage. By accessing the moorings database, the end user was able to identify each mooring and its associated GPS coordinates. In addition, control points for future recording and data recovery were identified in a web that provided datum stations within the surviving vessel remains. Once replicated in both a GIS coverage and on the site itself, these reference stations can provide spatial control for future research activities at the site.

One of the key elements in the *Monitor* National Marine Sanctuary GIS was the development of a spatially-related artifact inventory. This coverage identified the location of all artifacts recovered from the wreck since on-site investigation began in 1973. The location of each recovered artifact was entered into the GIS and repre-

sented by a symbol. By selecting the symbol, the end user was able to access data base information including provenience, condition, date recovered, associations, as well as drawings and photographic images pertinent to the artifact.

In order to demonstrate the further potential of GIS for managing site specific data within the *Monitor* National Marine Sanctuary, I²MR personnel developed coverages which linked engineering drawings, historic photographs and underwater photographs to appropriate areas of the wreck. As the *Monitor* GIS is developed, the entire spectrum of data associated with the vessel's historic career, archaeological investigation, and engineering efforts to recover material from the wreck, or perhaps the wreck itself, can be stored within the framework that has been established.

Conclusions

The Geographic Information Systems developed by Tidewater Atlantic Research and the Institute for International Maritime Research are already proving to be valuable management tools for both cultural resource managers and site specific investigations. The systems are being used to preserve, store, display, and analyze multivariate spatial data sets, and to access instantaneously information which was hitherto often difficult or cumbersome to acquire.

The potential uses for GIS in archaeology far exceed any goals thus far realized. As with any technological advancement, user adaptation has been slow, but through continued development and research, GIS implementation will prove to be extremely beneficial. One of the most important aspects of GIS use is that design, implementation, and maintenance become part of an ongoing process that constantly expands and updates the system. Once the geographical foundation has been developed, the amount of data that can be associated with specific features is limited only by ever expanding computer capacity. GIS will no doubt be adopted as the primary reference for Section 106 decision making.

While GIS will probably never entirely replace hard copy site documentation, the continued development and use of this technology in site-specific research appears inevitable. Excavation and documentation records lend themselves to coverages that can be sufficiently complex to build an electronic image or reconstruction of the entire site. Specific diagnostic features can be linked to detailed drawings, photographs, historical records, literature references and data from comparative sites. Artifacts, samples and other material associated with on-site features can be cataloged in association with those features. Artifact photographs, drawings, and historical and comparative analytical data can be tied to specific symbols associated with layers of the master site plan. As more archaeological sites are preserved in GIS format, and an increasing number of cultural resource managers turn to spatial databases as a way to enhance their effectiveness, so the opportunities for inter-site and intra-site comparative analysis and wide spread dissemination will grow.

ACKNOWLEDGMENTS

The authors would like to express their appreciation to the staff of the Charleston Harbor Project, the United States Army Engineer District Wilmington, the United States Army Engineer District Norfolk, and the *Monitor* National Marine Sanctuary for the opportunity to develop the geographic information systems that made this article possible.

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IAN RODERICK MATHER
DEPARTMENT OF HISTORY
UNIVERSITY OF RHODE ISLAND
KINGSTON, RHODE ISLAND 02881

GORDON P. WATTS, JR.
PROGRAM IN MARITIME STUDIES
EAST CAROLINA UNIVERSITY
GREENVILLE, NORTH CAROLINA 27834

ROBERT S. NEYLAND

The Archaeology of Navies: Establishing a Theoretical Approach and Setting of Goals

Introduction

This paper has a two-fold purpose: one is to promote the study of naval archaeological sites as the remains associated with the specialized missions of navies — a specialization that requires development of its own research objectives and methodology. The second purpose is to consider the current status of archaeological research conducted on naval sites, particularly those of the U.S. Navy, and to establish future priorities and goals.

Orser and Fagan (1995) in their text *Historical Archaeology*, point out types of sites that are studied by function, of which a prominent example is military sites. Terrestrial archaeologists have focused on military sites, forts and battlefields for some time as deserving special consideration. Battlefields have been restudied with archaeological methods, as with studies of the battle of the Little Bighorn (Fox 1993; Scott et al. 1989), such that this analysis changed interpretations of historic events.

Studying Naval Shipwrecks

Is the archaeological record of naval shipwrecks amenable to study as a specialized military site type? Warships, smaller combat craft, military transports, auxiliary craft, privateers, and naval aircraft are our primary naval sites. Naval shipyards, smaller structures such as caissons or floating gun emplacements, and the sites of naval battles should not be excluded from study. We should keep in mind that while armies put their resources into forts and camps, navies put theirs into ships.

Warships and the other smaller naval craft are highly specialized structures, designed to convey men and supplies, and to conduct missions of war, exploration, or diplomacy, and to provide a home at sea. They contain communities, made up of individuals with dissimilar backgrounds, frequently multi-ethnic, which are organized in a hierarchy to function as a unit. Warships are monumental structures and can represent the product of the best construction techniques, skills, and materials of their time. Warships can also be the opposite of deliberate and expensive constructions. An arms race occurs in times of conflict, resulting in hurried and expedient constructions. Naval shipwrecks thus offer an obvious wealth of technical and architectural information.

The cognitive decisions of individuals are evident in the archeological remains of navies. Unlike archaeological sites from prehistory or the wrecks of unknown merchantmen, the impact of individual decisions in producing the archaeological record, and the course of history, can be considered with the remains of naval vessels that reflect naval and military strategy of their time. Naval victories and defeats have been pivotal to the fate of nations. A long history of naval engagements supports this statement — Ramses II defeat of the Sea People, the Battle of Lepanto, destruction of the Spanish Armada, the Battle of Midway, among others — all of which are turning points in history.

The methodology of research on navy shipwrecks may not differ dramatically from other archaeological research. It should be kept in mind, however, that with naval and other state-owned vessels there is often more documentation than exists on merchant ships. This in itself calls for a thorough use of documents as well as archaeological materials. Another consideration is that warships, as well as protecting a nation's interests at sea, were built as a national symbol, to make a political statement, and perhaps even express the nation's world view. As Dr. Kevin Crisman, an underwater archeologist who studied the naval vessels of Lake Champlain, expressed in a personal communication, "A warship is not just a ship, but a statement." How these vessels reflect the military strategy or national view of

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their time is a relevant issue for research and interpretation.

Archaeological Potential of Naval Vessels

The archaeological remains of navies might have great potential, but how is this potential realized? A survey of articles in the *International Journal of Nautical Archeology* (IJNA) and *Underwater Archaeology Proceedings from the Society for Historical Archaeology Conference*, now *Underwater Archaeology* (UA) reveals that most articles on naval shipwrecks consist of preliminary reports on surveys and excavations.

The percentage of naval sites discussed in IJNA and UA differs. In UA, from 1987 to 1997, articles on naval sites range from 16 to 35% of each years' contribution, averaging 22%. For IJNA, the proportion is significantly lower with only 10% of the articles considering military ships, including ancient warships and artillery. The reason why UA has a greater percentage of articles on military shipwrecks versus IJNA is unclear, but the higher proportion may represent the strong archaeological record in the United States of naval sites and the interest in the historic period in which the nation's navies became well established

Recent conferences have resulted in monographs, such as *The Archaeology of Ships of War* (Bound 1995) and *Artefacts from Wrecks* (Redknap 1997) that have many thoughtful and analytical papers dealing with naval sites or materials from such sites. There are also some well-done, scholarly books that provide meaningful analysis of naval shipwrecks and combine these with the existing historical records. Kevin Crisman (1983; 1987) has done outstanding work on the Lake Champlain vessels USS *Ticonderoga* and USS *Eagle*. The National Park Service-Submerged Cultural Resources Unit has done by far the best work on World War II shipwrecks at Pearl Harbor, Bikini, and in Micronesia (Carrell 1991; Lenihan 1989; Delgado, Lenihan and Murphy 1991). It should be obvious that the potential is being tapped but that it is underutilized.

The most immediate and significant contributions have been to our understanding of the history of ship construction, studies that essentially fill in gaps in our technical knowledge. The most obvious benefits are in the excavations of ancient and medieval warships. Evidence of ancient warships, such as the *Athlit Ram* found off Israel (Casson and Steffy 1991), the remains of two warships found off the coast of Sicily (Freschi 1995; Riccardi 1995), and the late Roman River warships of Mainz, Germany (Höckmann 1985), have increased our understanding of the construction of ancient oared warships, rams, and early naval strategies. Investigations of the 15th-century Henry V's *Grace Dieu* (Hutchinson 1995:22-25) and the 16th-century Tudor warship *Mary Rose* (Rule and Dobbs 1995:26-29) have taught us a vast amount about late medieval warship construction and provided insights into the transition from clinker to carvel construction. Contributions to the history of ordnance parallel those to the history of ship construction. Likewise the knowledge of small arms and their use aboard ship has grown accordingly and made possible improved typologies.

An important use of naval shipwrecks is that their artifact assemblages provide more accurate dating and complete typologies. Shipwrecks represent sites with known dates and thus their ceramic assemblages are used to improve ceramic typologies used for dating less well-documented sites. Typologies for other artifact classes can be improved by using artifact collections from naval shipwrecks which are accurately dated. This is particularly true for those artifacts that rarely survive on terrestrial sites due to their fragility or, in the case of metal artifacts, recycling.

Naval shipwrecks can be studied as social sites — how their assemblages reveal life on board, communities of differing classes, organization of shipboard space, nutrition and hygiene. Artifacts from the Swedish warship *Kronan,* the English *Mary Rose,* and the British army transport *Betsy* have been used to infer class distinctions on board ships (Einarsson 1997:209-18; Hildred 1997:51-72; Broadwater 1995:58-63). In a Dutch

shipwreck, Vlierman (1997) contrasts a merchantman outfitted for war with assemblages found on commercial counterparts to illustrate the increase in manning of the former.

Some researchers have shown how our knowledge of a specific battle or military strategy can be increased through analysis of archaeological finds. The provenance of weapons found on board *Mary Rose* has been used to interpret spatial organization of small weapons, and may reveal shipboard strategies and battle readiness (Hildred 1997). Colin Martin's research shows that a confusing multiplicity of gun sizes, ammunition and gunners' rules hindered gunnery performance of the Spanish Armada (Martin 1997). The recovery and study of the Blakely cannon from the CSS *Alabama* reveals that the gun was underweight and thus substantiates Captain Semmes complaints of the Blakely's poor performance (Guérout 1995). The role of auxiliary vessels can be interpreted as Broadwater's (1995) study of the British transport *Betsy* demonstrates the selection and conversion of a merchant vessel for military transport.

No one has reinterpreted a naval battle by the location of spent munitions, as was done by Richard Fox and Douglas Scott at the battle site on the Little Bighorn (Scott et al. 1989). Don Shomette (1995), however, did hypothesize that the Chesapeake Flotilla's naval engagements in the War of 1812 might be interpreted using such an analysis.

Archaeology is used to both support and contradict the documentary record. A number of studies compared and contrasted a ship's manifest with the artifact assemblages from wrecks. Gawronski (1997) favorably compares artifacts from Dutch shipwrecks with the extensive Dutch East Indies Company records. Faunal remains of sheep bones recovered from the Spanish wreck *Trinidad Valencia,* however, contradicted the documentary record for the meats used to provision the ship (Martin 1997:1-14). Likewise, faunal remains from *Betsy* indicate supplementing of ship's stores with fresh provisions (Broadwater 1995:58-63).

Nevertheless, except for a few well-done works, we have not accomplished a great deal more than produce site reports. Comprehensive analytical reports and articles are lacking. This is especially true where Civil War naval wrecks are concerned, since this seems to be a period from which there has been extensive archaeological survey and recovery of large inventories of artifacts. Collections of Civil War naval artifacts include approximately 16,000 from CSS *Neuse*, 534 from USS *Florida* and *Cumberland*, 220 from CSS *Alabama*, and over 1,000 from USS *Tulip*. Other significant collections include those from the CSS *Chatahoochee*, CSS *Jackson*, and USS *Monitor*. These collections offer opportunities for comparison and analytical studies of Civil War cultural material.

Obstacles to Finished Research

There are, of course, many different reasons why this research never reaches final analysis and publication: (1) The lack of funding for completing research is always a problem. (2) Few ever get around to preparing the final publication because of the time involved–a season of excavation can produce several years' work on artifacts and documentation for analysis. (3) It is possible that cultural resource management strategies, which maximize cost-effective surveys and emphasize management in place with minimal disturbance, have produced a significant number of survey reports but not the type of thoughtful and thorough analysis that comes from more extensive archaeological investigations. This is perpetuated by policy among federal agencies towards basic compliance with the National Historic Preservation Act (NHPA), which results in completing as little work as possible for the lowest bid. (4) Another factor is that many of the more extensive recoveries of artifacts have, at least in their beginnings, been salvage attempts rather than planned archaeological investigations. (5) As a final factor, we have not established acceptable formats and time-tables for producing final products and their publication.

Potential Solutions

More detailed reporting and a professional dissemination of the results should be required when considering potential archaeological investigations. Thorough and professional archaeological documentation is the key to producing an archaeological record of which future analytical questions can be asked. There is a need to be cautious in issuing authorization to excavate navy shipwrecks if there are not adequate resources to insure quality reporting or if the individuals involved have a poor track record in finishing their reports. There is also the possibility of holding periodic conferences dedicated to research on naval shipwrecks. Then there is the issue of finding funds or other resources to assist with publications. Federal agencies, focused on only minimal compliance with NHPA, may be unwilling to use public money for this purpose unless there is a change in either the legislation or emphasis in cultural resources strategies.

Future Areas for Research on Naval Wrecks

There is a vacuum of careful and detailed archaeological research into navy shipwrecks. Foremost among the areas for future research are the naval shipwrecks from the American Revolution and War of 1812, especially the sea-going capital ships, since as yet none have been studied by archaeologists. The smaller combatants, the sloops and schooners, are important to look at as there is little information on these. Privateers, although not U.S. Navy-owned, played a dominant role in American naval strategy both in the American Revolution and the War of 1812. Very little has been done on the French and Spanish naval efforts supporting the American Revolution.

Vessels built between the War of 1812 and the Civil War are of interest. The small swift schooners built for suppressing the slave trade and piracy, which are a significant step above the Jeffersonian gunboats, have a great deal to reveal about developing American ship construction, both from a naval aspect and for understanding development of the clipper ship. Certainly more can also be done with Civil War wrecks, but first some meaningful analysis should be accomplished with extant artifact collections and field investigations of Civil War shipwrecks.

Spanish-American War or World War I shipwrecks have not been studied. Although these and the World War II wrecks are from our most recent past, there is always something new that can be added. The wrecks off the landing beaches of Normandy, for example, could be interpreted as the site of a battlefield. Very few naval aircraft have been archaeologically investigated; certainly much awaits us in this area, particularly in the study of wartime construction, modification, and interpreting battle damage.

Other periods of interest are those of technological change, transition from one class of ship or mode of propulsion to another. The transition from sail to steam and the last of the wooden hulled navy should be considered. As James Delgado, former Maritime Historian for the National Park Service who researched many naval shipwrecks, pointed out, those times are also periods of social change and transition. Social change is one area historians have found rewarding in recent years. It may be that interpretation of artifact assemblages can shed light on class distinctions within the U.S. Navy and identify the presence of different ethnic groups on board.

I originally thought that I would research what meaningful questions are being addressed with naval shipwrecks. Now I see that, for U.S. Navy shipwrecks, not much can be accomplished in the way of comparing ships or assemblages without more published reports and intensive archaeological research.

The Naval Historical Center's immediate focus, for now, is to finish our naval shipwreck inventory and to establish partnerships with the states for assessment and management before initiating extensive research. Inventory, assessment, and management are the foundation for making informed decisions for selecting the research priori-

ties on navy shipwrecks. Once this is accomplished, there will be great potential for more profound investigations into the archaeological record of the navy. A list of potential research questions should be extensive, perhaps virtually endless.

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ROBERT S. NEYLAND
1228 S. 24TH STREET
ARLINGTON, VIRGINIA 22202

CHRISTOPHER F. AMER

The South Carolina Historic Ships Supply Program

Introduction

In 1993, during scheduled restoration of the USS *Constitution* 'Old Ironsides,' project staff contacted the South Carolina Department of Transportation (SCDOT) and the South Carolina Institute of Archaeology and Anthropology (SCIAA) regarding the supply of live oak timbers for the effort. This request became a catalyst for the two state agencies to form a partnership to save live oak trees slated for unavoidable destruction as a result of bridge and road construction, and provide the valuable and scarce timber to an historic ship restoration project. This effort began the South Carolina Historic Ships Supply Program (SCHSSP).

Background History

This was not the first time South Carolina, or the South for that matter, provided live oak timber to frame up navy ships. It had been long recognized that the timber from live oak trees had great potential for a variety of purposes, including shipbuilding. Live oak (*Quercus virginiana*) is not a true oak, but a semi-evergreen and a member of the beech family. It is found along the coastal reaches of the continental southeastern United States from southeast Virginia to Texas, and is abundant on the west coast of Cuba. The trees grow as high as 70 ft. with crowns surpassing 150 ft. in diameter. Visually the live oaks are noted for large, horizontal limbs growing out from the trunks about five to 18 ft. above the ground, and the gnarled nature of the branches. The trees are very resistant to salt spray, and flourish in coastal regions. The wood is very dense, weighing 75 lb./ft.^{3}. Dry, it has a specific gravity of 0.8 and is very resistant to rot (Wood 1981:3-6).

While the technical details of live oak were not known in the 16th century, its potential was recognized when Pedro Menendez de Aviles, founder of St. Augustine, wrote to King Philip II of Spain in 1565 including "green" or "live" oak in his list of the new country's wealth. When live oak was first used in shipbuilding is not known. However, live oak's suitability for shipbuilding purposes was noted by Thomas Ash in 1682 when he wrote that the "Toughness, and the Goodness of its Grain is much esteemed." Twenty-seven years later, in 1709, John Lawson, Surveyor General of North Carolina extolled the virtues of live oak for ships' frames and knees, and noted that the wood frightened sawyers due to its hardness (Wood 1981:8-11).

By the 1740s, ships in the Southeast were being advertised with an emphasis on the live oak frames used in their construction, and advertisements for transportation of southern live oak timber to northern shipbuilding ports began to occur. In South Carolina alone, between 1740 and 1760, one ship and two schooners were launched with the name, *Live Oak*, as well as the 180-ton ship, *Heart of Oak*, launched from a Charleston shipyard in 1763 (Coker 1987:52, 63).

The earliest extant evidence of live oak being used in watercraft construction in North America comes from the Brown's Ferry Vessel discovered in the Black River, South Carolina, in 1976 (Albright and Steffy 1979; Nylund 1989). The vessel, built during the 1740s, had frames, posts, and knees fashioned from live oak (Steffy 1978). In fact, the majority of 18th- and early 19th-century sailing vessel remains found in the coastal regions of South Carolina are framed with live oak, and archival shipbuilding records clearly indicate the propensity of South Carolina shipwrights to use live oak (Amer and Hocker 1995).

During the latter half of the 18th century, European nations began to show an interest in live oak. A testimonial by British shipwright Roger Fisher, sent to the British Admiralty in 1770, described the lengthening of a South Carolina-built ship, *Fair American* (Coker 1987:50). The shipwrights complained that the ten-year-old live

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oak frames were as hard as iron and virtually impossible to cut, while numerous, similarly aged white oak timbers were rotten. With British timberlands largely deforested, and over 60 acres of trees needed for a 74-gun ship, the Admiralty took notice. However, before they could act, their efforts were thwarted by the Revolutionary War.

Soon after the war, the need for live oak and ships for a new American navy became acute. The war had depleted American warships, and merchant shipping, no longer under British protection, was preyed on by corsairs from West Africa. In 1794, by an act of Congress, George Washington formed a navy under the War Department with plans to build six frigates. Realizing that the average life span of a warship was 10 years, assuming it wasn't blown out of the water before the elapsed time, designers recommended live oak over the traditional white oak for framing pieces and compass timbers. A contingent of shipwrights armed with axes, cross-cut saws, ship molds, and oxen was sent south to secure suitable timber, starting on the islands of St. Simons and Hawkins in Georgia. Joshua Humphrey, the chief constructor, estimated that 55 men, working 24 hours per day for two months could cut enough timber for a frigate. These estimates proved unrealistic as rains set in and the wet, swampy terrain became increasingly difficult to negotiate (Wood 1981:23-28). Three years after passage of the Navy Act, the frigates *Constitution*, *Constellation*, and *United States* slid down the ways. Naval shipwrights resumed work on the remaining three frigates, and by April 1800, the *Congress*, *Chesapeake*, and the *President* were launched (Wood 1981:32, 162).

In 1799, during an undeclared war with France, Congress passed acts to consolidate national defense including providing funds for additional warships. The hunt for live oak freshened. Even at this early date, readily available live oak supplies were difficult to secure. Cotton planters were clearing forests to plant 'the seed,' and accessibility was still a problem, not to mention the extremely labor intensive process of reducing the cut timber to usable balks. This process came abruptly to an end with a change of administration. The Quasi-War with France ended, and by 1801 construction of large warships was supplanted by fabrication of much smaller gunboats under Thomas Jefferson (Bass 1988:170).

The War of 1812 saw a renewed interest in large warships with the *Constitution*, *President* and *United States* winning several engagements. Congress, once again, authorized construction of large warships. Surveyors, once again, roamed the South looking for, and inventorying, suitable live oak timber. The frigates and 74-gun ships authorized by Congress required the largest quantity of live oak ever used in this country (Wood 1981:39-40).

By 1868 the public resources of live oak totaled 268,000 acres in Louisiana, Florida, Alabama and Mississippi alone. As the timber reserves increased, the main problem turned from accessibility to trespass and poaching of the naval timber. By 1826, illegal cutting had taken nearly one-half of the Florida reserves. Even with the passage of the Timber Trespass Act in 1827, the navy often ended up paying for its own trees when they were illegally cut and sold to navy yards up north (Wood 1981:48-60).

After 1840, steam-powered vessels began replacing sailing ships. This, along with the change to iron hulls that occurred during and after the Civil War, helped to hasten the demise of live oaking for the navy (Laing 1971:219; Wood 1981:63; Still 1985). However, even though live oak stocks were greatly depleted by the war effort, this timber continued to be used in merchant shipping and brought up to four times the price of white oak on the New York market.

Ship Construction

The use of Southern live oak in shipbuilding can be traced back at least 250 years. Because of the shape and nature of the trees, utilization of live oak generally was restricted to structures that required great strength and curved shapes, or 'compass timbers.' These included floor timbers

and futtocks, as well as knees, railings, and belaying structures like sheet bitts.

In selecting and fashioning timbers for a ship, consideration had to be given both to the ability to work the wood and to the survivability of the timber. With live oak, this balance was especially acute. Green or unseasoned live oak is relatively soft and easy to work but will quickly rot in the damp bowels of a ship. Once dry, it literally becomes as hard as iron (hence, 'Old Ironsides').

Working live oak in the 18th and 19th centuries involved predominantly hand hewing with axes, adzes, saws, and a variety of bladed tools. After felling the trees, shipwrights inspected them for rot and fashioned them to their approximate finished shapes following ships' molds, which they brought to the site. Green live oak is heavier than water and could not be floated down rivers in rafts like many other tree types. Consequently, live oak was hauled to landings slung beneath 'big wheels,' using oxen, before being inspected again, recorded, and loaded onto waiting schooners to be shipped north (Figures pp. 113-116; Wood 1981). At the shipyard, the timbers would be seasoned by slow air drying then fashioned to their final dimensions.

While this same process is followed today, the methods are a bit different. In earlier days the blacksmith was the most important person on the crew, as he kept the tools in shape. Today it is the mechanic.

South Carolina Historic Ships Supply Program (SCHSSP)

The 1992-95 restoration of USS *Constitution* provided the impetus for the SCHSSP. Completed in 1796, 'Old Ironsides' has been on active duty ever since. During restoration of the *Constitution* between 1928-1931, the navy used hundreds of tons of live oak that had been stored underwater at Pensacola Naval Air Station since before the Civil War (Wood 1981:65-68). Since that time, the navy periodically tested the remaining live oak at Pensacola with limited success. When the most recent restoration plans were drawn up, the navy had to search out new sources of the valuable timber.

The navy looked to the same states that had supplied live oak before, including Texas, Georgia and South Carolina, from which they previously received live oak after Hurricane Hugo. In early 1993, Robert McFee, Project Coordinator for Bridge Construction at the SCDOT, began looking for a way to save, or at least utilize, live oak trees destined to be destroyed during the construction of an expressway near Charleston, South Carolina. McFee contacted SCIAA, and with guidance from the *Constitution* shipwrights, trees of appropriate shapes and sizes for the project were selected. Two local contracting firms cut the trees to the necessary dimensions and transported the timber to Patriot's Point, in Charleston, for storage. With the assistance of the United States Marine Corps, nine tons of South Carolina live oak made its way to Massachusetts and into the fabric of the historic ship. Once at the Charlestown Navy Yard, the timbers were seasoned and finished to size before replacing old and rotted timbers in the vessel's upper works and below decks. These included fife and pin rails, hatch coamings, sheet bitts and futtocks.

News of the restoration project quickly spread, and soon private citizens and companies wanted to donate trees. In response to this obvious need for South Carolina live oak, the two state agencies signed a memorandum of understanding formalizing the goals of the program and outlining the respective roles of each agency. While the majority of live oak trees used to date have come from public projects, private donations, both from residential and commercial properties, constitute a significant proportion of donated timber. In these cases, the individual on whose property the tree is located often bears the cost of cutting and transporting the timber to our storage locations.

The latest, and by far the most ambitious project utilizing live oak during modern times began three year ago at Mystic Seaport Maritime

Museum in Connecticut. SCIAA was approached by Quentin Snediker, Project Coordinator for the *Amistad* Project; he wanted to secure live oak to build a full-size working replica of the schooner *Amistad*. The dramatic *Amistad* story began in 1839 when 53 Africans — 49 men, three girls and one boy — were kidnapped from their homes in Western Africa and smuggled into Cuba where they were sold as slaves. Forced aboard the cargo ship *Amistad*, the Africans were bound for a plantation in eastern Cuba when they revolted and attempted to sail for their homeland (Mystic Seaport Museum, Inc. 1997).

After drifting in the Atlantic Ocean for two months, the ship was discovered by the U.S. Navy off Montauk Point, NY, and towed to New London, Connecticut. A federal trial followed, drawing international attention to the slaves' plight. Federal District Judge Andrew T. Judson freed the Africans, but President Martin Van Buren quickly ordered an appeal of the decision. Former U.S. President John Quincy Adams, elderly and nearly blind, successfully argued the Africans' case before the U.S. Supreme Court. The lower court decision was upheld, and the Africans were returned to their homeland near modern-day Sierra Leone (Mystic Seaport 1997).

The reproduction *Amistad* will be built and administered by Amistad America Inc., a consortium of groups including Mystic Seaport and the Connecticut Afro-American Historical Society. The mission of the project is to teach lessons of history, cooperation, and leadership illustrated by the *Amistad* incident and its legacy. Major funding for the project is being provided by a $2.8 million bond and private donations. More than 100 tons of live oak are needed to construct the 77-ft. hand-hewn schooner (Mystic Seaport 1997).

In 1997, during clearing for a connector highway on Hilton Head, South Carolina, some 30 live oak trees were identified for removal along the right-of-way. With guidance from Quentin Snediker, SCIAA's Underwater Archaeology Division staff identified usable sections of the trees and a project sawyer cut the oaks to those specifications. In July, Snediker arrived to select suitable timber. With the assistance of the project contractors, he left after two days with 12 live oak trees loaded in three, 40-ft. gondola trucks, which represented approximately 15% of the total live oak needed to complete the replica. Once at the Henry R. Point Preservation Shipyard at Mystic Seaport, the timbers were quickly fashioned to their final dimensions and then set out to season. Construction of the *Amistad* began in March 1998.

Future Considerations

The South Carolina Historic Ships Supply Program continues to identify, and stockpile, suitable live oak timber for this project, and for the next restoration of the USS *Constitution* in 2015 that will require some 500 trees to complete. The program is instrumental in helping to preserve one historic ship and in building another. Roads and highways continue to be built and land developed, processes that often sentence stately live oak trees to removal and possible destruction. Providing scarce live oak timber to projects such as *Amistad* and USS *Constitution* is a service that few would criticize. However, to be more effective, the program needs to address several concerns. These include:

(1) Storage locations for harvested trees are open to the elements. If timbers are not transported to destination shipyards expeditiously, they become prone to infestation and rot in the humid southern climate.

(2) More advanced coordination with all parties involved needs to be addressed. Most contractors work on the 'time is money' creed, and delays are seldom viewed with sympathy for either the timber or the ship reconstruction projects. For example, less than one-quarter of the suitable live oak identified for the *Amistad* project made it from Hilton Head to Mystic Seaport. This was due largely to the sheer volume of trees available at one time and to the logistics of handling the extremely heavy and often cumbersome timber.

Some of the larger and more suitable trees were located in swampy areas where trucks and loaders were unable to venture.

(3) Finally, funding is an ever-present problem. This program began as a cooperation between two agencies. Neither agency has a budget specifically earmarked for such a large enterprise, nor does either agency possess all the necessary specialized equipment, nor staff assigned solely to this program.

Notwithstanding, through the goodwill and dedication of the agencies involved and increased public and private support, icons of the United States like 'Old Ironsides' will survive for future generations to appreciate, and projects like the *Amistad* will provide cooperation and leadership for America's youth.

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CHRISTOPHER F. AMER
SOUTH CAROLINA INSTITUTE OF ARCHAEOLOGY AND ANTHROPOLOGY
1321 PENDLETON STREET
COLUMBIA, SOUTH CAROLINA 29208

DELLA A. SCOTT-IRETON

An Examination of the Luna Colonization Fleet

Introduction

Much has been researched and written about the *Carrera de Indias*, the round-trip voyage from Spain to the Caribbean basin that delivered goods and, more importantly to the Spanish Crown, returned with treasure (Haring 1964; Peterson 1975; Andrews 1978; Phillips 1986; Smith 1988). The records of the *Casa de Contratación*, or House of Trade, established in Seville in 1503 to regulate Indies commerce, provide vast amounts of information pertaining to merchant shipping from the 16th century to the 1790 closing of the *Casa*. However, this information pertains only to merchant shipping; little information exists regarding Spanish fleets sent to settle and secure new colonies, such as the Tristán de Luna expedition of 1559 to 1561.

This paper examines the Luna expedition and, in particular, the Emanuel Point Ship, to illustrate how Spanish colonization fleets were formed. To date, the Emanuel Point Ship is the only known shipwreck of the early Spanish colonial period involved in colonization efforts (Smith et al. 1995). Information related to the fleet's background history, provisioning, armament, and personnel also is included, as is procurement of colonists and materials needed for the settlement. This information is crucial to understanding how the ships were utilized, what each ship carried, how it was loaded, and what may be found in the archaeological record.

The Luna Expedition

The first attempt to settle what would become Florida was the 1559 expedition of Don Tristán de Luna y Arellano (Priestley 1936; Milanich and Milbrath 1989:119-134). The Viceroy of New Spain, Luis de Velasco, selected Luna, an experienced conquistador, nobleman, and personal friend, as *adelantado* of *La Florida* and charged him with founding the newest overseas Spanish colonies. The effort was intended to stake a Spanish claim to the northern frontier of New Spain and keep other European powers, such as the English and, especially, the French, out of this fringe area of the empire. It would also protect the route of treasure fleets as they returned to Spain and provide relief to shipwrecked Spaniards (Means 1965). Settlements were to be planted at Ochuse (Pensacola, Florida), the inland province of Coosa (northern Alabama/Georgia), and on the Atlantic coast at Santa Elena (Parris Island, South Carolina) (Milanich and Milbrath 1989:124).

Luna's colonists set out from the New Spain port of Vera Cruz on 11 June 1559. The fleet consisted of 11 ships, loaded with 1,500 people, including entire families of settlers, slaves, soldiers, priests, artisans, craftsmen, and Aztecs (Luna to King Filipe, Priestley 1928, 1:7; Smith et al. 1995:4). Sufficient materials and supplies were carried to build an entire Spanish town at Pensacola including a governor's mansion, storehouses, jail, and residences for the colonists (Priestley 1928, 1:18-33). Livestock — cattle and 240 horses — were carried as well. The fleet entered Pensacola Bay on 15 August 1559. Luna ordered the town built on a level, high point of land with room for house lots for the 80 to 100 settlers staying in Pensacola; the rest of the party was to continue inland and settle at Coosa and Santa Elena (Smith et al. 1995:6).

On 19 September, the colonists were struck by a hurricane. Having been in Pensacola such a short time, not all the materials and supplies were unloaded and so were lost when most of the fleet was sunk. Only three of the smallest ships, one caravel and two barks, rode out the storm anchored in the harbor. Larger ships, such as galleons, on which the supplies for the colony were stored, were destroyed. Once these ships with their all-important cargos were sunk, so too were the chances for the success of the colony. Survivors wandered in the interior looking for

Underwater Archaeology, 1998, 25-30.

food and suffered extreme hardships. The expedition to Pensacola is a tale of starvation, betrayal, mutiny, illness, insanity, and finally abandonment. The remaining colonists returned to New Spain and Cuba; Luna was ordered to Spain to explain his failure to the King.

Although the Luna settlement attempt ultimately was a failure, it was, in a sense, a relief to the Spanish Crown since it proved the difficulties inherent in establishing a presence on the northern Gulf Coast (Andrews 1978:86). The Spanish did not return to Pensacola until 1698, over 100 years after Luna's expedition. A second Spanish colony, the presidio of San Carlos de Austria and its adjacent town, Santa María de Galve, currently under investigation by University of West Florida archaeologists, marked the beginning of permanent settlement at Pensacola.

The "Typical" Colonization Fleet

Was there such an entity as the "typical" fleet of colonization? Probably not, as each fleet utilized such ships and boats as were necessary for the size, location, and purpose of the colony. Regulations enacted by the Crown to standardize the size of ships in the Indies trade, though not intended to regulate ships in colonization fleets, nevertheless affected colonizing efforts in terms of the availability of ships. Ships often were in short supply in Spain as well as in the New World. Some were lost to wreck or piracy; those in seaworthy condition were retained for service in the Indies where they quickly succumbed to *teredo* worms and other tropical hazards. Many were broken up upon arrival in the Indies and their timbers and fittings sold for construction (Andrews 1978:57). In order to relieve the shipping shortage, the Spanish Crown often hired vessels to serve its purposes.

As a result of these conditions, the "typical" colonization fleet probably contained a variety of vessels, depending upon what was available at the time of loading. Most were large ships of 100 *toneladas* or more, galleons and *naos* which arrived in the New World as members of the *Carrera de Indias* and avoided the shipbreakers, or perhaps had been built in the Indies and served for several years in the Caribbean basin. A few smaller vessels such as *pataches* were included to serve as messengers, as well as to explore newly discovered inlets and bays. Armed galleons were included to protect settlers and their interests in the new land, as well as to transport goods and livestock. Round-bodied *urcas*, or storeships, were used to haul much of the materials and supplies necessary to build the colony, as well as to carry provisions for the colonists and the vast amount of fodder required for livestock.

The following details the kinds of materials and supplies Viceroy Velasco and *adelantado* Luna thought necessary for the voyage to Pensacola, as well as information on settlers and livestock. The first ships carried items that were absolutely essential for the immediate survival of the colony, such as tools for building shelter, planting crops, preparing food, and providing protection. Once the colony was established, then the goods needed by settlers to maintain a Spanish lifestyle on the fringes of the empire would be imported (Parry 1963:177). Due to natural and human misfortunes, however, Luna's settlers never got the opportunity to transplant their Spanish culture to the wilds of Ochuse.

Provisioning the Fleet

Ships, whether hauling bulk freight or human cargo, carried foodstuffs to sustain people throughout a voyage. In the case of colonization ships, provisions for use during the initial establishment of the new settlement were carried as well. Historical documents reveal that Luna's vessels loaded supplies for the Pensacola expedition at Vera Cruz. Much of the provisions originated in the surrounding countryside and other areas of New Spain, although some foodstuffs, as well as material goods and supplies, were transshipped from Spain, where they may have been imported from elsewhere in Europe.

In addition to items commonly carried for shipboard consumption in the 16th century, such as hardtack, dried and salted meat and fish, cheese, beans, olives and olive oil, vinegar, wine, and water, evidence from the Emanuel Point Ship indicates that sailors supplemented their diet with native fruits and vegetables as they voyaged around the Caribbean and Gulf of Mexico. Persimmon (*Diospyros virginiana*) seeds, fragments of papaya (*Carica papaya*) stem, and a seed pod from a sapote (*Pouteria* sp.) plant recovered from the ship's bilge point toward consumption of these plants (Smith et al. 1995:91-92). European fruits such as plum (*Prunus domestica*) and cherry (*Prunus cerasus*) are also evident in remains recovered from the Emanuel Point shipwreck (Smith et al. 1995:92). The remains of fruits indigenous to Europe may indicate that preserved fruits were shipped from Spain to be consumed in the New World, as were other foodstuffs.

Spain was a principle source for some victuals considered by Iberians to be indispensable, such as olive oil and wine, especially in the first half of the 16th century before olive trees and grape vines were commercially established in the New World. Olive pits recovered from the Emanuel Point Ship are of two varieties known to be grown in Spain. Wine for colonial consumption was loaded at Cádiz and shipped in ceramic jars sometimes sealed with resin (Parry 1966:126). Much of the required provisions, however, were produced locally in Mexico. For example, the area around Mexico City also produced a wide variety of goods for export such as mules, sugar, preserved fruit, and European-type wares (Parry 1966:131). Beef was easily procured as cattle bred astoundingly well throughout the Indies (Parry 1966:104-105).

Supplies carried by the Luna fleet were meant to last only seven to eight months, just enough to provision the colonists until they could plant crops and adapt to living off the land (Hoffman 1990:156). The hurricane, however, destroyed the supplies still on the ships as well as ruining those which had been carried ashore. Items carried to Pensacola on supply missions after the hurricane reflect the privation of the colonists by listing basic necessities as the most commonly carried goods.

Arming the Fleet

All ships in the 16th century carried some form of self-defense for protection from pirates, hostile natives, and the forces of enemy nations. Although Luna's ships carried defensive weapons, in case of trouble with the local native population, the loading of supplies for initial sustenance and subsequent farming was undoubtedly more important. Various types of shot from the Emanuel Point Ship reveal that Luna's fleet was armed with large artillery such as *bombardetas* and stone-throwing *pedreros*, as well as smaller rail-mounted *versos* (Smith et al. 1995:107-111).

Small arms were as important to the success of the colony as were the large shipboard weapons. Luna's instructions included plans to send parties of men into the interior to scout for suitable locations for the additional colonies; these men needed hand-held weapons and armor for protection from, and to impose their will on, hostile and uncooperative natives. Reports from the 1550s indicate that many soldiers carried pikes but lacked the armor and shields necessary for pikemen, although one breastplate has been recovered from the Emanuel Point Ship. Fewer soldiers had matchlocks or, even more rarely, crossbows, although three crossbow bolt points have been recovered from the Emanuel Point shipwreck, as have two sizes of lead shot for shoulder weapons.

Manning the Fleet

In order to establish a colony, settlers were recruited from among the populace. Under orders from the King, Viceroy Velasco was to enlist enough colonists for towns at Pensacola, Coosa, and Santa Elena. Additionally, enough soldiers to provide protection for the new towns had to be found as well, not to mention sailors to man the

ships. As may be imagined, not every citizen of New Spain was eager to uproot his family and make a new start in an unsettled and undeveloped land. In 1558, when preparation for the venture began, not 40 years had passed since the conquest of Mexico. Many residents of New Spain had migrated from Spain and established themselves as productive members of the society and did not relish the idea of starting over again.

Viceroy Velasco had to find men who were willing to stay in *La Florida* and be content as farmers and tradesmen. As expected, not all the potential colonists were the cream of New Spanish society. For example, two soldiers who accompanied Luna to Pensacola were wanted for murder in Mexico; Velasco decided to leave them with Luna instead of having them extradited as they were serving him well (Velasco to Luna, 25 October 1559 in Priestley 1928, 1:73). Velasco's agents had to search the Mexican countryside to procure the 500 soldiers for the expedition, half of them cavalry and half foot soldiers including arquebus men, shield bearers, and crossbowmen (Priestley 1928, 1:28). The quality of these men, particularly the infantry, is suspect. Some may have been homeless as the precedent had been set for their hiring; 110 transients were employed for three months by the Crown to man the garrison at Santo Domingo in 1553 (Hoffman 1980:101).

Those soldiers also skilled in a craft or trade were most valuable to the effort. At least 100 of these prime settlers were included in the rolls of Luna's militia (Hoffman 1990:155). Some of the sailors were trained in other trades as well. Velasco wrote to Luna after the hurricane disaster instructing him to keep some surviving mariners because they were "artisans," rather than send them back to New Spain (Velasco to Luna, 25 October 1559 in Priestley 1928, 1:71).

The approximately 1,000 non-military settlers seem an aggregate of whoever was available and willing to undertake the journey. Families of some soldiers were included, but so were common camp followers and many personal servants. So many people of limited value signed on to go to *La Florida* that Velasco wrote to Luna scolding him for taking "half-breeds, mulattos, and Indians" who would not be of assistance in colonizing the wilderness but would instead "eat up all the supplies" and cause problems (Priestley 1928, 1:55). Of course, all soldiers and settlers brought their personal items to the new colony. From clothing and toiletries to special possessions, furniture, cooking utensils, toys for the children, and all the other little items that one could not live without; the smallest nooks and crannies of the ships must have been packed to capacity.

As with any Spanish undertaking, the maintenance of the colonists' souls, as well as converting native souls, was of primary importance. Six Dominican friars were chosen on the basis of piety, knowledge, and skill in learning languages (Hoffman 1990:153-154). The royal treasury was to incur the costs of supplying their material needs and they were provided with "ornaments, crosses, chalices, bells, and other things necessary for the service of the divine cult, with clothing and shoes" (Velasco to King Filipe, 30 September 1558 in Priestley 1928, 2:259). Once in Pensacola the friars received supplies of biscuit, flour, salt, and wine from among the provisions sent to Luna.

Materials for Settlement

In addition to the enormous quantities of provisions and supplies necessary for the successful voyage to Pensacola, the fleet also carried food and materials to support the 1,500 members once the landfall was reached and while the town was built and crops planted. Viceroy Velasco was responsible for acquiring these vast amounts of foodstuffs and items. The testimony of one soldier states that the ships of the first voyage carried corn, biscuit, bacon, dried beef, cheese, oil, vinegar, wine, live cattle, tools for building and digging, axes, and mattocks (Priestley 1928, 2:285).

Materials and arms were bought or made for the first ships of the expedition to carry, but

Velasco never intended for everything to be carried at one time. Regular shipping routes were to be set up to continually supply the colony with necessities. Initially, Velasco recommended that Luna leave clothing behind and take as many supplies, arms, and, especially, soldiers as possible without overloading the ships; clothing could go to Pensacola on the "second voyage" (Velasco to Luna, 12 May 1559 in Priestley 1928, 1:57). After the hurricane destroyed most of the supplies, Velasco was under extreme pressure to find even more food and materials for Luna and his starving settlers and then had to contend with the limited availability of ships in which to send the goods. Also, the provisioning of the annual treasure fleets took priority over sending materials to Pensacola (Priestley 1928, 1:99, 107, 129-131).

Livestock was very important to the settlers of *La Florida*. Live animals were needed to provide a "living grocery" in an age before refrigeration or any form of food preservation except salting or smoking. Foundation stock, to ensure successful breeding of future generations of animals, was essential to the survival of any colony, and some areas relied on the export of animals and hides for economic well-being. Horses, in particular, were vital to the conquest of any region of the New World. The sight of a man mounted on a large unfamiliar beast not only caused Native Americans much consternation, but the height and maneuverability of cavalry could be used to full advantage. Ocean voyages, however, presented serious difficulties in livestock transportation and provisioning.

Although the amount of fodder and water loaded on Luna's ships for the livestock was not recorded, ships carrying horses, cows, and sheep to the West Indies from the Chesapeake/New England area in the 1700s had to take 200 to 500 pounds of hay per animal and an additional 10 to 15 bushels of oats per horse. A ship loading 50 horses might need 10 to 12 tons of pressed hay and 500 bushels of oats, in addition to provisions for the crew (Hawke 1989:154). Additionally, water was of major concern when transporting livestock, particularly horses which require an average of eight to 15 gallons of water per day. If the water is foul, horses may develop gastro-intestinal difficulties which can result in death (Belschner 1969:237). Indeed, nearly half of Luna's horses perished before the 1559 voyage to Pensacola had been completed.

While conquistadors learned much about transporting horses at sea during the Crusades (Parry 1966:96), conveyance methods for horses were not particularly effective. A system of slings under the horse's body, together with hobbles on front and hind legs kept the animal's feet off the deck and so prevented injury (Milanich and Milbrath 1989:125). While suspended in this manner, the animal could not support its own weight and the resulting pressure on the abdominal area often led to internal problems. Cattle were probably carried in a similar manner although some may have been housed in pens on deck. They did not have the relatively delicate constitution of the horse but nevertheless required large amounts of fodder and water. Other forms of livestock, such as pigs, sheep, and goats, were taken to Pensacola, but cattle and, especially, horses were deemed the most important. In May of 1560, Velasco wrote to Luna that he wanted to introduce 200 more horses and more cattle because, he writes, "they are the two most essential things of which at present you and your army have most need" (Priestley 1928, 1:101).

Conclusion

Although little information exists on colonization fleets in the Age of Discovery and Exploration, the Luna expedition benefitted from limited study including the gathering and translation of much correspondence between Luna at Pensacola and Velasco in Mexico, as well as depositions from the resulting lawsuits (Priestley 1928). As one of the first and best planned, funded, organized, and supplied of Spain's colonization efforts, the Luna fleet is of prime importance in understanding what materials and goods were included in transplanting a colony. Each ship

carried elements of Spanish culture that, combined, would form a complete community on the edge of the empire. If the hurricane had not struck, the Luna colony had a better chance than most efforts to succeed in establishing a new city for the glory of Spain. Excavation of the Emanuel Point Ship revealed information not previously known about these ships of colonization. Additional archival research in Spain discovered documents relating to the Luna fleet that, when translated, will add to our understanding of Spanish colonization practices.

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DELLA A. SCOTT-IRETON
HISTORIC PENSACOLA PRESERVATION BOARD
120 CHURCH STREET
PENSACOLA, FLORIDA 32501

J. COZZI

Hull Remains of the Emanuel Point Ship

Introduction

In 1997 the University of West Florida (UWF), together with the Florida Division of Historical Resources (DHR), began a second campaign investigating a sixteenth-century Spanish galleon located off Emanuel Point in Pensacola Bay, Florida. Earlier investigations between 1993 and 1995 excavated in the middle of a large ballast mound and in the ship's stern. The earlier work uncovered a mast step comparable to those documented on other sixteenth-century sites, along with framing and planking of the lower stern from the sternpost to the end of the keelson at the edge of the ballast pile (Smith et al. 1995; Spirek 1995). The goal for the 1997 season was to expose as much of the bow as existed forward of the ballast pile, and to locate the forward end of the keel. This would permit accurate estimation of keel length, and thereby the length and size of the vessel. Analysis of material recovered during the first field season suggested that this vessel was one of a fleet brought to Pensacola by Tristán de Luna in 1559. A more precise estimate of overall size, together with archival research, may help identify this ship by name.

Research Strategy

The project's staff consisted of a project director, excavation director, conservator, equipment and logistics manager/diving safety officer, and field technician. The project hosted six graduate interns, each working on the project for a 12-week stint. UWF also ran a six-week field school with five undergraduate and graduate archaeology students. This crew was supplemented with many community volunteers. Equipment and logistical support, including the conservation lab, were provided by DHR.

The project commenced by outfitting a field headquarters in a downtown Pensacola building maintained by the Historic Pensacola Preservation Board. Next, the crew, together with a local metal fabricator, designed and constructed a 36-x-16-x-3-ft. steel work platform. The platform, named *Nautilus*, was moored on site in early June, and excavation proceeded. The site datums from the first campaign were relocated and mapped. The crew installed a grid made of graduated PVC piping. Sediments were excavated by means of water-induction dredges from 1-m^2 units in 10-cm levels. As hull timbers and artifacts emerged, they were mapped in reference to the grid and photographically documented. As entire timber features were exposed they were mapped in reference to one another. The project opened up 16 2-m^2 units in the bow, with four along the centerline of the hull, four more to the port side, and eight on the starboard side. Fifty cubic meters of material were removed to uncover the hull remains.

Hull Structure

Excavation revealed the ship's lower bow and a large portion of the upper starboard bow (Figure 1) that had broken off at the sixth starboard strake and collapsed to the bay floor where it was preserved beneath a compact layer of sand and shell. The timber scatter uncovered around the bow spread over an area 10.25 m long and 6 m wide; hull remains were encountered as shallow as 15 cm beneath the bay floor and up to a depth of 1.70 m. The centerline timbers of the bow list 5° to port. Extant hull remains cover an area 32 m in length with an estimated preserved hull length of 25-26 m. Elements of the ship's rigging encountered include rope, ranging from small line to anchor hawser, and an eye hook. The vessel's 3.3 m-long anchor (Bratten, this volume), which alerted the DHR survey team to the site in 1992, was excavated and recovered.

Underwater Archaeology, 1998, 31-37.

Exterior Centerline Timbers

Excavation beneath a large copper cooking cauldron revealed the forward end of a timber that appears to be the keel. The top of this centerline structural member was 1 m beneath the bay floor. The timber was exposed for a distance of 2.75 m, and along this distance it is angled up 10° toward the bow. This could be a consequence of the bow resting higher on the sand bar than the stern. The depth of water at the bow is 3.3 m, whereas the stern lies in 4 m. This could, alternatively, indicate an incline in the forward section of the timber. The keel of *San Juan* is inclined at its forward end by approximately half this amount (Figure 5-16; Steffy 1994: 140). A combination of these two reasons may also explain this feature. Finally, it could be that this timber is the lowest member comprising the stem. If this is the forward end of the keel, then it places the length of this timber at an estimated 22.6-23.4 m.

The keel is joined by a vertical scarf to a stem timber. This scarf is 48 cm long and fastened with six iron spikes each 10-12 mm in section. At the forward end, the keel is sided and molded 29 cm. Seventy-five cm aft of the scarf, the sided dimension increases to 31 cm and maintains this dimension for at least another 1.60 m to the limit of the excavation. The keel's bottom edges are rounded. The forward end has a rabbet of 4 cm with a 14-cm back rabbet. The margin line is at the inboard edge of the timber.

Two timbers comprising part of the stem were found during excavation. The first timber is scarfed to the keel and extends 2.07 m from the

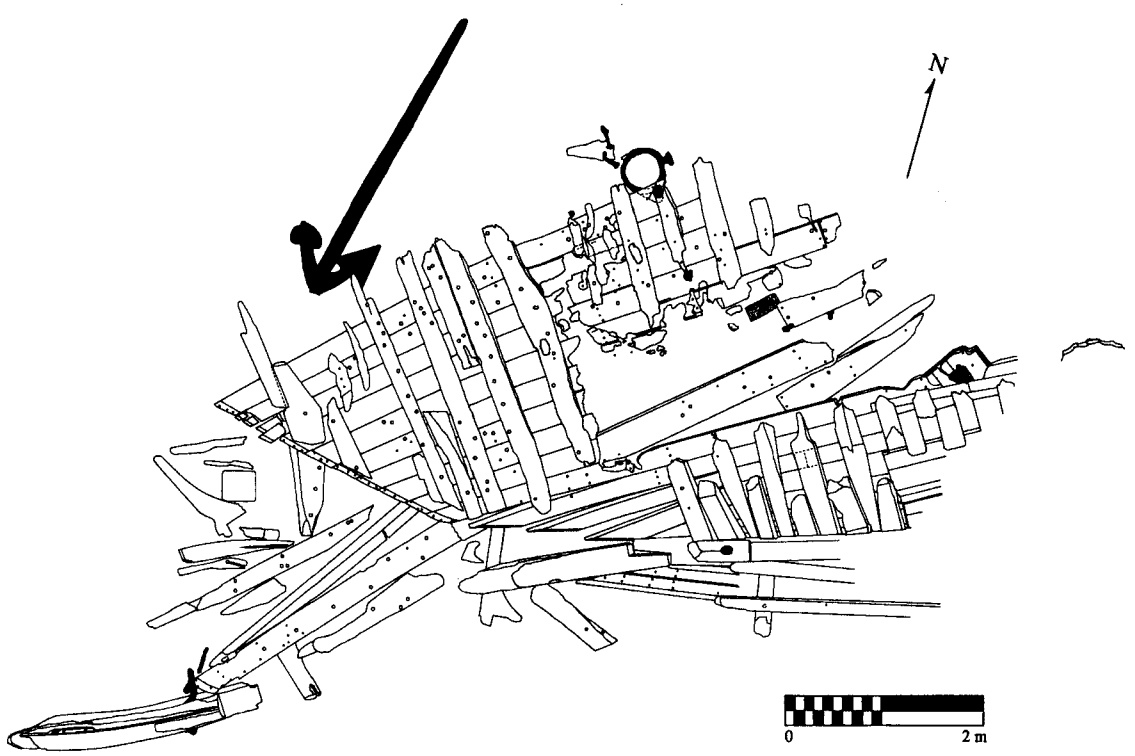

FIGURE 1. Emanuel Point Ship Excavation Preliminary Bow Site Plan.

scarf to its other end, which is worm-eaten and eroded. This timber is sided and molded 28 cm. Its rabbet matches that on the keel, while its back rabbet averages 13 cm over the length of the timber. This timber was raised for detailed recording. While on the surface, tool marks were noted in the scarf. The grain at this location indicates that the timber was fabricated from the heartwood of a tree.

The second stem timber is preserved for a length of 2.56 m. It is sided 30 cm and molded 31 cm. This piece of the stem originated farther up in the ship's structure. The timber has a 41-cm-long vertical scarf in one end, and is worm-eaten and eroded at the other. It was recorded under water as it lay, port side up, due to its fragile condition. Plans to record the starboard side failed as the timber proved too fragile. A repair observed along the port rabbet consists of a 50-cm-long, 4-cm-thick, and 6-cm-wide filler between the rabbet and what would have been the hooding ends of two or three planks. The filler was fastened by two iron nails 11 mm in section. This repair may be evidence of planking deterioration around the ship's waterline.

Evidence of efforts to prevent water from penetrating the seam between the stem and the hooding ends was present on both stem timbers. Rope fibers collected from the starboard rabbet of the lower stem timber most likely represent seam caulking. Similar fibers were noted on the port rabbet of the second stem timber. Staining from lead corrosion product and small closely-spaced tack holes along the rabbet indicate lead sheeting covered this seam on the lower stem timber. Three small fragments of lead and similar staining found on the second stem timber demonstrate extensive use of lead sheeting. Two lead sheeting fragments recovered just beneath the rabbet at the eroded end of the lower stem timber, and two more lead sheets with tack holes found in close proximity to the second timber, all indicate concerns regarding leaks.

Framing

Athwartship frames that were uncovered consist of seven floors, 11 first futtocks, and one second futtock. Fastener evidence in the planking indicates the location of four additional second futtocks. No evidence of transverse fasteners or dovetail joinery was observed, but the excavation did not reach that area of the hull where true square frames would begin. All frames in the bow cant slightly forward.

The first floors in the bow begin at the keel/stem scarf, with the first two floors sitting directly over the scarf. The third through seventh floors sit on the keel proper. The floor bases are perpendicular to the centerline timbers and lean forward, while their arms cant forward. At the keel, the floors range in sided dimension 18-28 cm (avg. 24 cm) and range in molded dimension 21-37 cm (avg. 30 cm). At the rungheads, sided dimension range 11-25 cm (avg. 18 cm), while molded dimension varies 12-17 cm (avg. 15 cm). The floors' spacing is 40 cm on center. Each floor has a square limber hole running through the sided thickness of the timber at the center of its base. The second floor from the bow was temporarily brought to the surface for detailed recording. It has a 34-mm hole piercing the molded height of the timber at the base, presumably for a bolt that would have run through the stemson and the stem/keel scarf. The bolt hole passed through the limber hole and would have hindered water flow to the pumps.

The floors are well preserved on the starboard side with five complete to the runghead. On the port side, only the fourth floor from the bow is preserved to its head, which makes it the only complete floor uncovered in the bow. Its port arm was broken free at the base by some violent action in the deformation process. Only a treenail attaching it to the footwale prevented it from floating away. The port arms of the first through third floors from the bow also broke off in a

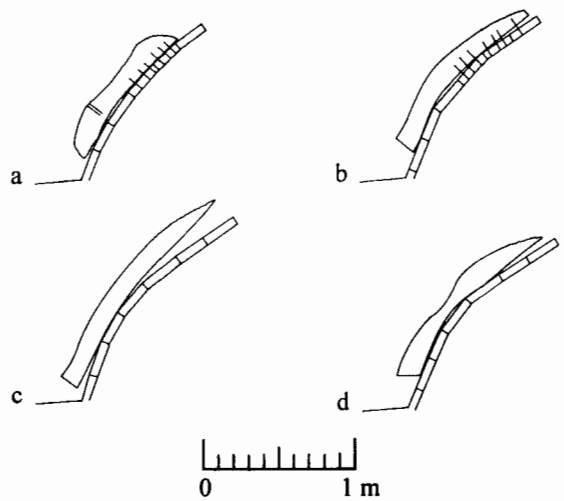

FIGURE 2. Hull sections from the starboard bow of the Emanuel Point Ship: *a*, futtock 4; *b*, futtock 5; *c*, futtock 6; *d*, futtock 7.

violent manner and were not preserved. Excavation did not proceed any further aft than these four floors on the port side. This evidence, together with prior findings, suggest that the port side broke away in the hurricane that sank the ship, or in a subsequent storm.

The first futtocks alternate with the floors and rise from the vessel's centerline canting forward. They are sided 17-21 cm (avg. 19 cm) and molded 14-21 cm (avg. 17 cm). They are spaced 41 cm on center. Only one second futtock was preserved to the extent that dimensions could be taken. It is sided 20 cm and molded 17 cm. It was placed tight against the forward face of the futtock aft of it, so that there is a gap of 5-9 cm to the next first futtock forward. Fastener holes for four more second futtocks also indicate that they were placed against the forward face of the next first futtock to the stern. The second futtocks overlap the first 1.2-1.5 cm, and begin 1.8-2.0 m above the floor heads. Gaps in the framing mean that they were only held together by fastenings to the planking and probably to wales and clamps that do not survive. The futtocks, therefore, must have been inserted into the hull following installation of some planking.

Remains of the lower ends of four first futtocks were raised to the surface for detailed recording and to facilitate taking the lines in the bow with the aid of a digital carpenter's level (goniometer). These measurements revealed that the vessel had an extremely fine entry (Figure 2). The hollow in the bow begins at the keel scarf and proceeds aft along the third strake to the limit of excavation, so the full extent of this hollow could not be determined.

Interior Centerline Timbers

The keelson sits atop the floor timbers beginning with the third futtock from the bow and is estimated to be 18-19 m in total length. It is sided 22 cm and molded 34 cm. The forward end of the keelson was joined to a stemson by a horizontal scarf 60 cm in length. The back end of the scarf has a 3-cm butt. Concreted remains of a broken bolt were noted in the middle of the scarf. The remaining portion of the bolt runs down through the third floor into the keel. The keelson's lower face is notched to fit over the floors (Figure 3). The top edges are slightly rounded and the bottom edges are beveled.

A 98-cm length of the stemson was found just above the stem/keel scarf. It had been unseated from the keelson and moved slightly forward and to port. The stemson is sided 24 cm and molded 21 cm. One end is worm-eaten and eroded while the other is shaped for the scarf to the keelson. The stemson's scarf, however, is only 28 cm in length, while that on the keelson is much longer. In addition, the leading edges of each scarf taper to a point, as on a diagonal scarf, while the back end has a butt, as on a flat scarf. The manner in which these timbers were joined together is not presently understood, although their proximity and alignment suggests that they did. The stemson has a notch on its bottom surface where it would sit on a floor, in the same manner as the keelson. The timber's bottom edges are bev-

eled. Tool marks were noted on all beveled surfaces including the scarf and the 8-cm high butt.

Ceiling

Four starboard ceiling planks and a footwale are preserved. The ceiling planks are 6 cm thick by 19 cm wide on average. The footwale is sided 12 cm and molded 13 cm, and beveled on both inboard edges. At the after end of bow excavation, two ceiling planks rise up from the keelson, followed by a footwale, then two more ceiling planks. The uppermost ceiling plank is notched to receive filling pieces. The forward ends of the ceiling taper in width toward the bow as they approach the interior centerline timbers. On the port side, ceiling survives up to and including part of the footwale.

Filling pieces were encountered in situ at three locations along the starboard side; two others were slightly dislodged and partially eroded but still located between the frames where they originally served a purpose. Filling pieces prevent material from falling between frames and down into the bilge where small objects could clog limber holes and interfere with the operation of the bilge pumps. The remains of two more were completely displaced and moved a considerable distance. One filling piece was recovered for conservation and eventual display. Filling pieces are 5 cm thick, about 40 cm long, with widths ranging from 20-27 cm (avg. 21 cm). The filling pieces are beveled on both ends to fit against the hull and follow the contour of the inboard surface of the ceiling. They are usually held in place by a single iron nail 1 cm in section. Filling pieces were toe-nailed either into an adjoining frame or the hull.

Planking

Hull planking remains begin at the keel with what is believed to be the garboard, although this plank was only examined on its interior surface. Planking continues outboard on the starboard side for the first through sixteenth strakes with at

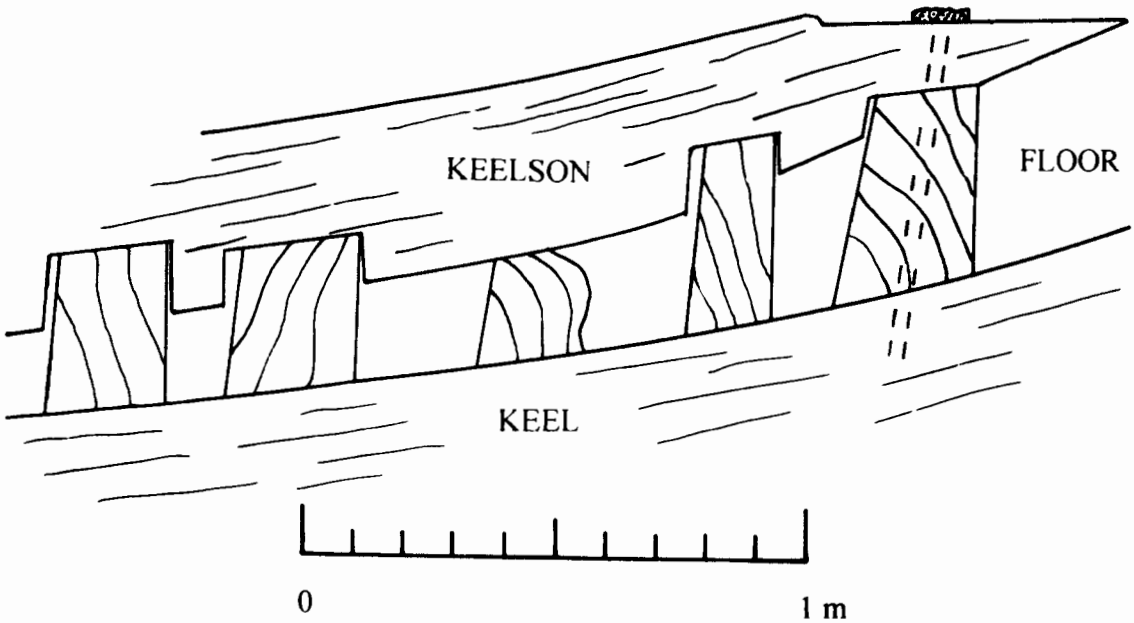

FIGURE 3. Longitudinal profile from the Emanuel Point Ship's centerline bow remains.

least one more strake on site. All but two planks are intact at their hooding ends. On the two that are not intact, hooding ends have broken off but are present in fragmentary condition. On the port side five strakes survive. Planking is 55-60 mm in thickness, and ranges in width 22-31 cm (avg. 25 cm).

A combination of iron and wooden fasteners attach planking to frames. Each frame/plank intersection on the collapsed starboard bow is fastened by at least one iron and one wooden fastener. The most common pattern is a treenail through the plank center with iron nails just in from the edge. In several instances two, and in one case three, treenails occur at a frame/plank intersection. This may reflect misplacement of the first fastener or a concern for sturdiness in the bow. It may, alternatively, indicate repairs. Iron nails are 10-12 mm in section. Treenails, or their holes, have diameters between 26 and 31 mm. Three treenails are locked in place with wooden wedges. The pattern of fastening with treenails changes at the sixth strake; from there to the keel few wooden fasteners were noted.

At six framing stations in the bow along the sixth strake, 15-mm diameter holes were noted in planking. None contained fasteners, although all had concreted iron corrosion product around the holes. While this might simply reflect concretion from nearby square-sectioned iron fasteners, it seems to indicate the use of round iron fasteners at these locations. Two holes with this smaller diameter were also noted on a plank associated with the second stem timber which would place it quite high on the starboard side. On this plank, fasteners are located at the second and third framing timbers aft of the hooding end. Two more small round fastener holes were noted in the middle of hooding ends on planks of the collapsed starboard side. Interpretation at this time suggests that these are bolt holes.

Hooding ends are beveled to facilitate joinery to the keel and stem. The inner surface of the forward edge of the plank reduces its thickness by 1 cm over a distance of 5 cm. Most hooding ends are fastened with three iron nails, excepting the two planks mentioned above, which were fastened with an iron nail near each seam and a 15-mm diameter iron fastener in between. Three hooding ends were removed from the port side to facilitate examination of the keel. These were raised to the surface for detailed recording. After cleaning, it was observed that the nail heads were countersunk and sealed with a resinous substance, most likely pitch. Most countersinks were chiseled four-sided shapes, although two were six-sided. On two occasions, countersinks were round and may have been made by augers of 35- and 22-cm diameter.

Miscellaneous

The upper arms of two hanging knees were found in the bow. One is 1.09 m long, and the other is 99 cm long; both are sided and molded 14 cm. On each timber the space that once fit over a clamp is partially preserved. The angle of surfaces that sat against each clamp indicate that the knees came from opposite sides of the vessel. These partially preserved spaces suggest that the port clamp was sided 16 cm and molded at least 12 cm, and the starboard clamp was sided 16 cm and molded 14 cm. The knees broke at a bolt hole just below the clamp. Only one fastener hole was noted on the top surface of the one knee, and none in the other.

The remnants of two port covers found beneath the lower part of the starboard bow were raised and recorded. The larger measured 56 x 78 cm, and was returned to the site following disassembly and recording. The smaller (40 x 48 cm) was selected for conservation and eventual display. Each was constructed from two sets of planking fastened with 12-mm^2 iron nails. Individual planks are 6 cm thick and range in width between 13 and 31 cm. One set of planks sits perpendicular atop the other set. The smaller port cover is made from four planks, while the large is constructed from five. Each port cover was attached to the hull by a set of iron-strap hinges which survive as a concretion on the larger example and as an imprint on the planks of the

smaller cover. The hinge straps are ca. 40 cm long, 7 cm wide, and of undetermined thickness. The hinges on the smaller cover were attached with 8-mm^2 iron nails, while the larger cover's hinge nails were 12-14 mm in section.

Conclusions

The Emanuel Point Ship appears to be a large vessel compared to other sixteenth-century Iberian shipwrecks. This is reflected by work done in the first campaign (Spirek 1995:47) as well as the findings presented here. The extensive hull remains compare most favorably with those of the *San Juan*. Both galleons are preserved to a much greater extent than finds in open-ocean waters such as Molasses Reef and Highborn Cay (Oertling 1989a; 1989b). Their mast steps are similar except for an additional bilge pump for the larger vessel. The Emanuel Point Ship has a 22.6-23.4-m-long keel compared to 14.75 m for the *San Juan*.

The analysis completed to date points out many parallels between the Emanuel Point Ship and other contemporary archaeological examples, especially the Red Bay whaler. Both vessels have extremely fine entries. Despite its large size, the Emanuel Point vessel did not have a globular bow as iconographic examples suggest. The bow framing with timbers canted slightly forward and large gaps between framing members also mirrors the *San Juan* (Grenier 1988:75). This pattern is in contrast to the true square framing found amidships which indicates a manner of construction that was becoming more modern and efficient.

ACKNOWLEDGMENTS

Thanks to Dr. Judy Bense, UWF Archaeology Institute, and Dr. Roger C. Smith, Florida State Underwater Archaeologist, for their roles in selecting me to direct the excavation. A special thanks to the Emanuel Point Ship Excavation staff: Dr. John R. Bratten, conservator; Capt. Keith Plaskett, equipment, logistics, and diving safety officer; and David Pugh, field technician, for dedication beyond the scope of work. Graduate interns Juliet Tatum, Solomon Wahrhaftig, Philip Mitchell, Jenna Watts, Ty Seale, and Brad Himour deserve recognition for their efforts. Six UWF students warrant mention for participation in field school and/or directed studies: Jason Burns, Andrea Fossum-Schultz, James Hunter, Brenda Rhodes, Lucas Spalding, and Sean Williams. Thanks to the staffs of the UWF Archaeology Institute, the Florida Division of Historical Resources, and the Historic Pensacola Preservation Board for their continuing support of the Emanuel Point Ship project. Thank you to more community volunteers and sponsors than could be mentioned here.

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J. COZZI
ARCHAEOLOGY INSTITUTE
11000 UNIVERSITY PARKWAY
PENSACOLA, FLORIDA 32514

JOHN R. BRATTEN

Recent Artifact Finds from the Emanuel Point Ship

Introduction

Since the conclusion of the 1995 field season at the Emanuel Point Shipwreck, more than 3,500 artifacts comprising seven categories and 47 subcategories have been catalogued and accessioned into state collections. Most have been analyzed and given conservation treatment for their continued preservation and display. The following is an interim report of the 1,500 to 2,000 additional artifacts recovered in 1997. Many are thought to have been associated with the vessel's galley. Others represent items from the hull, stored food remains, munitions, personal possessions, tools, and a variety of other objects transported from Mexico aboard the 16th-century colonization vessel into Pensacola Bay, Florida in 1559.

Ferrous Artifacts

Ferrous artifacts encountered on the site include spike and bolt concretions, and a few concretions containing nails and tacks (Pugh 1998). These and other concretions await radiography and conservation for further identification. The largest single artifact recovered from the Emanuel Point Ship is a wrought-iron anchor (Figure 1). Buried fluke-down at the shoreward edge of the ballast mound, the anchor was detected by a magnetometer and led to the discovery of the ship in 1992. Preserved length is 3.15 m from the tip of the crown to the end of its broken shank. Similar to anchors from the Padre Island wrecks, the angle from fluke to crown to shank is approximately 65°. The anchor is not perfectly symmetrical, since the two flukes vary in length. The wooden stock is missing, but the anchor's ring (approximately 41 cm interior diameter) was found nearby. Mechanical cleaning and electrolysis are necessary to determine exact dimensions and the presence of any diagnostic markings.

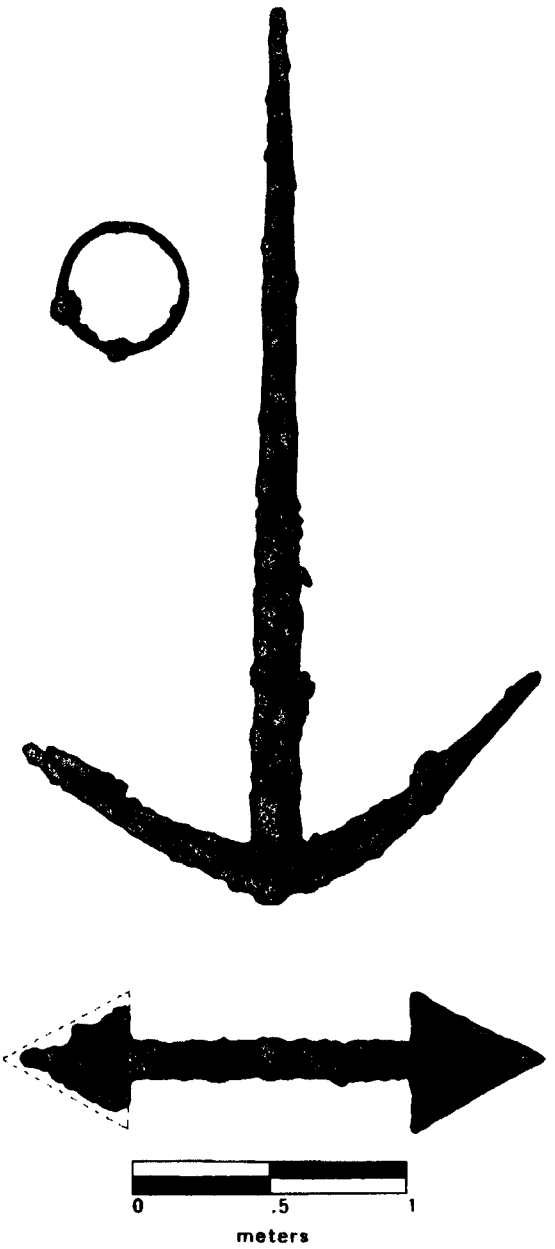

FIGURE 1. Wrought-iron anchor and ring recovered from the Emanuel Point Ship.

Underwater Archaeology, 1998, 38-44.

Cuprous Ware

Equally interesting is the large number of cuprous objects scattered throughout the bow. Two copper cooking cauldrons were recovered. The first was resting in an upright position just above the forward end of the keelson. Parent metal survives in the rim and bail, but the body has been entirely converted into brittle copper sulfide. The cauldron's height is approximately 51 cm and its diameter at the widest part of the body is 61 cm. A very heavy copper bail is attached to the body by two lugs riveted to opposite sides of the cauldron's rim. The cauldron was thoroughly wrapped in elastic bandages and carefully lifted to the surface in a separate container so that its contents could be examined for cultural remains.

The remnants of a second smaller copper cauldron were located a few meters away. This vessel was found resting upside down, and only the rim and bail survive. One lug is still attached to the rim with two copper rivets. Two other rivets on the opposite side indicate that a similar lug had been attached in that position. The surviving rim diameter is approximately 28 cm. If the vessel was similar in proportion to the other cauldron, it would have had a maximum diameter of approximately 45 cm.

In the same area, but at a much deeper level, a third cooking container was discovered. Because the object was much more deeply buried, it was found in an extremely deteriorated and fragmented condition. Unlike other containers, the vessel was oval in shape. The bail is rectangular in cross-section and exceptionally heavy, suggesting that the original vessel was even deeper than its preserved height of 15 cm, or that it was designed to hold a considerable weight. In a preliminary reconstruction, the vessel is 65 cm in length and 48 cm wide. To prevent the thin copper fabric from tearing, a thick reinforcing strap made of two pieces was fastened completely around the body at the rim.

A fourth copper utensil very similar in shape to a skillet was located in the same general area. The upper edges of the vessel are eroded, but taper down to a circular flat bottom 28 cm in diameter. One remaining copper rivet in the side suggests that the cooking vessel was probably very shallow and had at least one handle. A Y-shaped handle found on the other side of the ship's centerline may have been associated with this, or another object. Ingeniously fashioned from one piece of flat copper, the handle was designed for riveting to the body in at least two positions on either arm. The handle thickens considerably at the junction of its two arms and terminates in a socket to accept a wooden extension.

In close proximity to the first cauldron was a large cup, presumably made of copper. This vessel was found resting between the keelson and several ballast stones. One side of the cup was bent inward when shifting ballast smashed it into the side of the keelson. A small handle is attached near the rim with two rivets. The cup is very thick-walled and approximately 14 cm in diameter and 9 cm high.

A large copper funnel with a long spout was also buried deeply among the galley wares. The opening at the top of the cone is 31 cm, nearly the same as its overall height of 35 cm. Added strength was imparted to the body by rolling the upper edges of the cone inward.

Equally useful aboard ship, a bronze pestle was found in excellent condition, although slightly bent. Numerous wear marks on its surface suggest lengthy use. Like many contemporary examples, the pestle is of baluster form with applied mid-rib so that it could be rolled in the corresponding lip or rim of a mortar. Overall length is 21 cm and diameter at the grinding end is 3.4 cm.

An unusually shaped bronze object, similar in appearance to a mortar, was recovered beneath the larger copper cauldron. The small cuplike container is very heavy with an octagonal shaped flat bottom and a rounded top. Four projecting handles, each with a hole, are evenly spaced around the sides. Between each handle is a pair of reinforcing ridges. The interior of the cup has

a rounded bottom and shows very few wear marks other than two small indentations on opposite sides. Stress cracks on the outside of the cup at the same positions suggest that heavy pressure had been applied to the interior. The top has a flared lip similar to that seen in mortars. Mortars recovered from other shipwrecks, and those seen in contemporary paintings, do occasionally have side appendages, reinforcing the notion that this object is a mortar. However, at only 8 cm in height, it would be too small to be a perfect mate for the recovered pestle.

Another large copper container is probably unassociated with the galley. Originally composed of three side panels riveted together with vertical seams, the container was found broken apart and scattered over the site, perhaps by a modern shrimper's net chain. The panels had been inserted into and riveted to a connecting or filler strap, which in turn was riveted into a round bottom (Figure 2). Two horseshoe-shaped handles originally were located at the top. Additional strength was added to the rim and handles by another riveted band of copper. Reassembled, the object is 55 cm in height and approximately 40 cm in width. The addition of the filler piece is curious because it adds very little to the vessel's overall height. Even more curious is the residue present within the bottom of the cauldron. The substance is not a corrosion product and is extremely heavy, suggesting a high metallic content such as lead or mercury. Metallurgical analysis will be conducted in the near future.

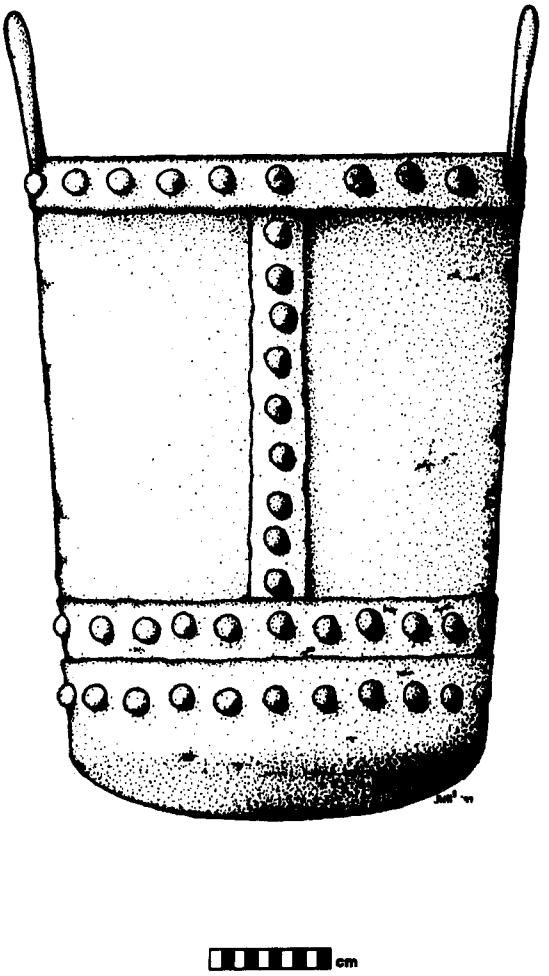

FIGURE 2. Reconstruction of riveted copper cauldron.

Ceramics

More than 800 ceramic sherds were recovered in 1997, bringing the total ceramic collection to nearly 1,600 individual sherds. Not surprisingly, the most common ceramic is the Spanish olive jar. Several hundred sherds were recovered and it will be possible to reassemble at least one jar. Many retain a pale-green interior lead glaze. One sherd has an engraved marking similar to an "8" on its exterior. According to a recent study by Avery (1997:89), Spanish olive jars were used to transport wine, olives, olive oil, vinegar, water, honey, beans, chickpeas, capers, almonds, dates, pitch, and gunpowder. Of these products, olive pits, almond shells, and pitch have all been discovered either in conjunction with, or adjacent to, olive jar sherds recovered from the Emanuel Point Ship.

Second in frequency are several varieties of majolica, nearly all of which are heavily stained dark gray or black in color. This discoloration

results from a chemical infusion of sulfur and iron compounds in the reduced oxygen atmosphere found on the site. The natural colors are easily restored by a short immersion in 3% hydrogen peroxide. Several examples of Columbia Plain *platos* were recovered. Although slightly different in size (17.8 - 20.6 cm diameter) and shape, each saucerlike plate has a raised dimple in the center and a raised ring circling the interior surface roughly mid-way between the center and rim. Yayal Blue on White majolica is present in both the *plato* form and in one *escudilla*. Each vessel features the characteristic cobalt-blue banding and stylized "alfafia" design. Other *escudillas* are present in the Columbia Plain variety and all examples have foot rings.

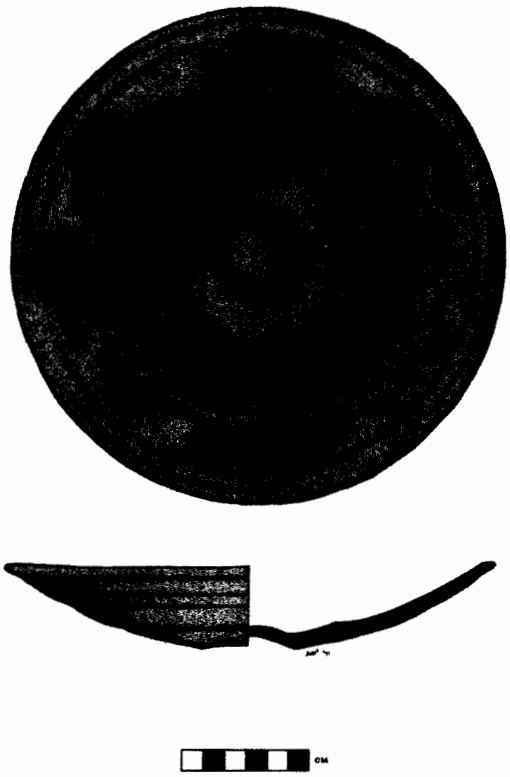

FIGURE 3. Isabela Polychrome *plato*.

Quite surprisingly, the only whole, intact ceramic vessel recovered from the site was discovered under the crown of the ship's anchor. The pattern of the design and its blue and manganese colors are characteristic of Isabela Polychrome (Figure 3).

A number of coarse earthenware fragments with red-lead glaze and gritty inclusions are characteristic of El Morro ware. Obvious forms include *platos* and *lebrillos*. At least two vessels had handles. A single sherd of Brown Cologne Stoneware was present on the Emanuel Point Ship. This fragment comes from a Bellarmine jug and exhibits a floral pattern between two raised bands and part of a medallion with the profile of a helmeted soldier. Similar examples of these non-Spanish, salt-glazed sherds were recovered from the Padre Island wrecks (Arnold and Weddle 1978:259), the Western Ledge Reef Wreck (Franklin 1993:10), and in a 16th-century context at St. Augustine (Deagan 1987:103).

Munitions

Earlier excavation in the stern of the Emanuel Point vessel produced several examples of large stone shot, iron shot, and composite lead/iron shot (*bodoques*). Excavation in the bow produced only small munitions. Three small lead shot (11 -14 mm diameter) were found scattered in the bow. One retains sprue and mold markings indicating it was made in a two-piece mold. Similarly sized lead shot (average diameter 13.8 mm) were recovered from the Molasses Reef Wreck and the Padre Island wrecks (average diameter 13 mm) (Keith 1987:212). This ammunition would have been suitable for use with an arquebus or *caliver* (Steen 1988:81).

Other small arm finds include three copper crossbow boltheads ferruled to accept a shaft end roughly 1 cm in diameter (Figure 4). Two examples are similar in shape, but significantly larger than those found at several sites in North America, notably places thought to have been visited by the Coronado expedition. Presumably these crossbow points were fabricated in Mexico

since European boltheads were most commonly made of iron.

Other artifacts whose origin may be tied to Mexico include two obsidian blades. One specimen was fashioned from a gray core and is approximately 4 cm in length. The second example is much darker and not nearly as complete. Blades like these formed the edges of Aztec swords (*macanas*) or were used singly as razors (*navajas*) (Flint 1997:62-65). Hopefully, the mineralogical signatures of these examples can be identified to determine their precise Mexican source.

Personal Possessions

Two small brass objects, as yet unidentified, were found on the periphery of the excavation. One is rectangular with faceted sides and has a marking similar to a fleur-de-lis stamped over a second marking resembling a starburst or dancing figure. The second object is six-sided and incorporates a cross surrounded by a looped circle and a ropelike circle. A small rampant lion is also present in the bottom right quadrant. The bottom left quadrant contains an image yet to be identified. Both objects are flat and unmarked on the reverse side. Suggested uses include small scale weights (1.70 and 2.18 grams respectively), inlays for jewelry, or gaming pieces.

A small brass buckle was located during excavations at the forward end of the keel. The buckle is 3 cm long and has a width of 2.7 cm. It was likely used with a strap or belt from clothing or shoes. The remnants of one shoe were recovered in 1997. These remains consist of a leather sole and small pieces of rand (strips of leather used to attach the uppers to the sole). The shoe exhibits turnwelt construction and appears similar to two other shoe soles recovered in 1993.

Organics

Fibrous remains of a woven textile were found resting on the interior surface of the ship's planking. Due to its fragmented condition, it is difficult to determine if the fabric was used as a matting to cushion and protect cargo or whether it is the remnants of a collapsed basket. Analysis of the weave and fiber content may help determine geographical origin. Several sizes of hemp rope were found throughout the site in various states of preservation. These ranged from small line 2 cm in diameter to anchor hawser 6 cm in diameter.

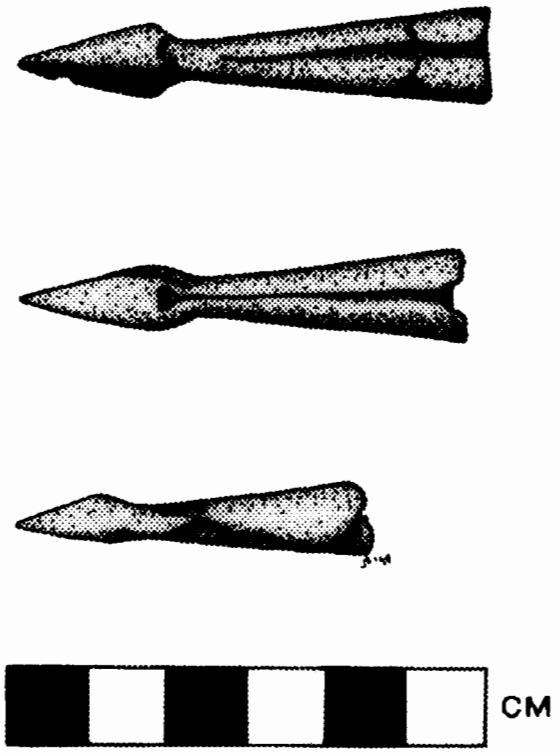

FIGURE 4. Copper crossbow boltheads.

During 1997 only one tool was recovered. Carefully fashioned from hardwood (c.f. ash), the round handle is 21 cm in length and tapers down to a squared end 1.3 cm wide. The end was covered in concretion indicating that an iron implement had been attached. The handle is crudely decorated with three sets of three parallel lines scratched around the circumference of

the handle. Most likely the object was a handle for a chisel or similar tool.

One short piece of barrel stave with a bung hole was recovered underneath the hull. An entire barrel or cask was found next to the stem just forward of the keel-stem scarf. Although the container was partially flattened, its shape was retained by withies. The empty container was surrounded by many large animal bones. Nearly 300 butchered bones were recovered during the 1997 excavation campaign. By far the majority consist of rib bones from a large mammal (c.f. cow or horse). A few smaller examples are in the size range of the order Artiodactyla (pig, deer, sheep, or goat). Several other examples are representative of bird, and may be from domestic chicken, although others appear to come from a smaller sized taxon. Most of the bones were found clustered in two areas at the bow, on the keelson, or at the extreme forward end of the bow.

In addition to olive pits, botanical finds included nutshell fragments, cherry stones, and sapote. Wood samples were collected from all exposed hull timbers. These and the other botanical specimens are undergoing analysis and identification at the Center for Archaeological Investigations at Southern Illinois University at Carbondale.

Conclusion

The artifact assemblage from 1997 Emanuel Point Ship excavations will help to further interpret the vessel and its significance. With the possible exception of the riveted bucket, copper-based objects appear to be associated with food preparation. Since a cookstove was not found in association with the containers, it raises the question of whether the copper wares were intended for use aboard ship or on land. It seems curious that the copper vessels were not salvaged since they were probably the most expensive household items on the vessel. Shifting ballast hid several smaller objects from view, but the cauldrons were found either above or beyond the ballast pile.

A more complete inventory of the types of appliances and supplies carried by Spanish expeditions of the sixteenth century, including equipment for cooking and eating, military hardware, clothing, tools, and food is being revealed as excavation and analysis are completed. Eventually the artifacts recovered in 1997 will be displayed alongside those excavated earlier. At least two more years will be required to finish the analysis and conservation of the remaining artifacts and samples. Although these analyses are often time-consuming and expensive, the information they provide is invaluable for linking the historical and archaeological records of the Emanuel Point Ship.

ACKNOWLEDGMENTS

Special thanks to James W. Hunter III for producing the illustrations used in this report, Edwin "Harv" Dickey, Gigi Naggatz, Marion Bleser, Andrea H. Schultz, and Martha Ridlehoover for their assistance in the laboratory, and Norma Harris, Cathy Parker, Roger C. Smith, J. "Coz" Cozzi, Hera Konstaninou, David Pugh and Corey Malcom for their professional input and assistance.

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JOHN R. BRATTEN
ARCHAEOLOGY INSTITUTE
UNIVERSITY OF WEST FLORIDA
11000 UNIVERSITY PARKWAY
PENSACOLA, FLORIDA 32514

GORDON P. WATTS, JR.
IAN RODERICK MATHER

Underwater Archaeological Investigation of the Remains of the Ironclad CSS *North Carolina*

Introduction

The CSS *North Carolina* was one of two Confederate ironclads built at Wilmington during the American Civil War. After a lackluster, but strategically important career serving essentially as a floating battery, the *teredo*-riddled vessel sank at its mooring off Battery Island in 1864. In 1871, long after salvage efforts removed valuable armor and machinery, the *North Carolina* caught fire and burned to the waterline. Surviving elements of the ironclad remained largely undisturbed until 1995 when vessels engaged in Cape Fear River navigation-channel maintenance work dropped an anchor inside the hull remains. In establishing a storage and staging area for equipment to be used in the dredging operation, a dredge, barge and stocks of dredge pipe were moored in the immediate vicinity of the ironclad. Because of the threat posed by that activity, the staging area was inspected by archaeologists from the North Carolina Underwater Archaeology Unit (UAU) on 3 October 1995. UAU archaeologists discovered that a 15,000-lb. anchor had been dropped into the surviving hull structure. Because of the damage caused by those activities, the U.S. Army Corps of Engineers, Wilmington District, contracted with Tidewater Atlantic Research, Inc. (TAR) of Washington, North Carolina, to identify and assess the extent of the damage and document any subsequent deterioration of the wreck.

TAR's investigation revealed that the CSS *North Carolina* had sustained significant structural damage. In addition, activities associated with the dredging operation continued to destabilize the wreck site environment and contributed to an increased rate of structural deterioration. Because the wreck preserves a significant, although diminished, archaeological record, the U.S. Army Corps of Engineers, Wilmington District, also contracted with TAR to document the surviving hull remains to ensure that the loss of architectural, construction and archaeological data caused by the destabilization of the site was minimized. That research was carried out in June and July 1997 and focused on a detailed recording of the more intact port side of the *North Carolina*. Documentation of the surviving hull structure preserved the architectural and construction record associated with the wreck.

Project Location and Site Description

The CSS *North Carolina* is located in the Cape Fear River in Brunswick County, North Carolina. It lies on the eastern side of the Smith Island Channel near the northern end of Battery Island. The wreck lies on a northeast to southwest axis, with the bow angled down to the southwest. Water depth at the site varies tidally from 12 ft. at low water to 16 ft. at high water. Bottom sediment consists of a layer of gray clay lying beneath 12-18 in. of depositional sand and shell hash. Visibility varies with the tidal cycle and during the project ranged from as little as 6 in. to more than 3 ft. with high intensity lights. Currents also varied with the tidal cycle and ranged between zero during some slack periods to upwards of three knots at maximum ebb.

Description of the Field Research

A preliminary survey of the remains of the CSS *North Carolina* and an assessment of the damage caused by the barge anchor was carried out during the summer of 1996. Exposed hull structure and associated artifacts were mapped using perpendiculars and triangulation, and recorded using three-dimensional mechanical drawings. Data was developed into a plan of the wreck. After recording surface features, archaeologists marked off four areas for test excavation. Those consisted of a 20-ft. section of the bow,

Underwater Archaeology, 1998, 45-53.

two athwartships test trenches, one at 75 ft. along the baseline and another at 115 ft., and a 6-ft.^{2} test pit in the stern that exposed a portion of the rudder. In each area, overburden was removed using light hand-held water induction dredges. A detailed record of hull structure exposed by each excavation was produced and added to the computerized site plan. Artifacts exposed by excavation were mapped in situ prior to recovering them for drawing and conservation.

The following summer, 1997, more comprehensive documentation of surviving wreckage was initiated. After relocating the site, datum points at the bow and on the rudder were relocated. Once the points were identified, a baseline between them was reestablished. Next a hydraulic probe was employed to follow the keelson aft to the sternpost. Immediately aft of the sternpost a third datum station was positioned to serve as the bow/stern baseline, 155 ft. 5 in. in length, for site mapping and documentation.

Once the aft 15 ft. of the hull structure had been exposed, excavation and documentation proceeded simultaneously. As excavation continued forward on the port side of the hull, the plan of exposed frames was extended. For the purpose of recording, the wreck was divided into 10-ft. long sections. Those sections were identified by measurements along the baseline. Again, architectural and construction features and associated artifacts were mapped using perpendiculars and triangulation, and recorded using three-dimensional mechanical drawings. Data collected on the wreck was recorded on mylar sheets, each sheet then being transferred to a computer using AutoCAD.

At the bow both the starboard and port side of the hull were excavated for a distance 15 ft. aft of the stempost. In addition, outside the port side of the hull, excavation was carried to a depth of 4 ft. to facilitate documenting the surviving keel and deadwood.

Once the port side of the CSS *North Carolina* had been documented, the site was backfilled by dredging the spoil piles and pumping the discharge into the wreck. Coordinates for both the bow and the stern were recorded using a differential global positioning system.

Surviving Vessel Structure

The surviving remains of the CSS *North Carolina* consist of the lower hull below the turn of the bilge and a scatter of debris associated with the hull, casemate and armor. Below the turn of the bilge, the lower hull is virtually intact from the stem to the sternpost (Figure 1). Excavation at the bow revealed the stem post, inner stempost, deadwood, keel, keelson, cant frames, half frames and exterior planking (Figure 2). Excavation at the stern exposed the rudder, skeg, sternpost, deadwood, keel, keelson, cant frames, half frames and exterior planking (Figure 3)

The keel was molded 11 in. and sided 12 in. Near the forward end, the keel was rebated 3-1/

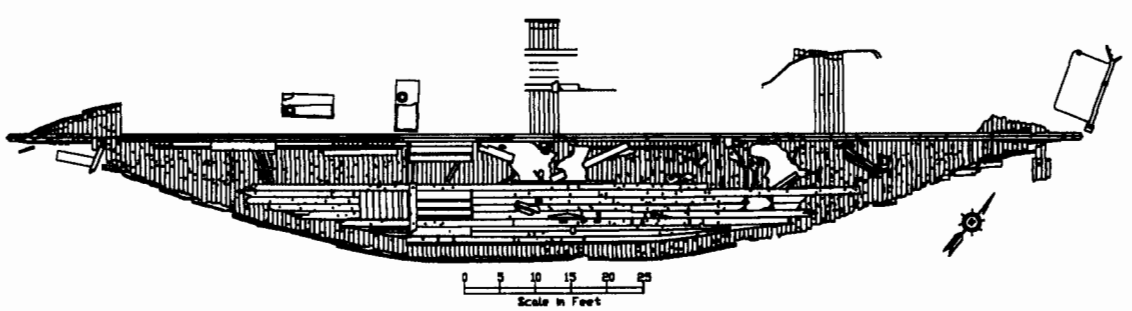

FIGURE 1. CSS *North Carolina* site plan.

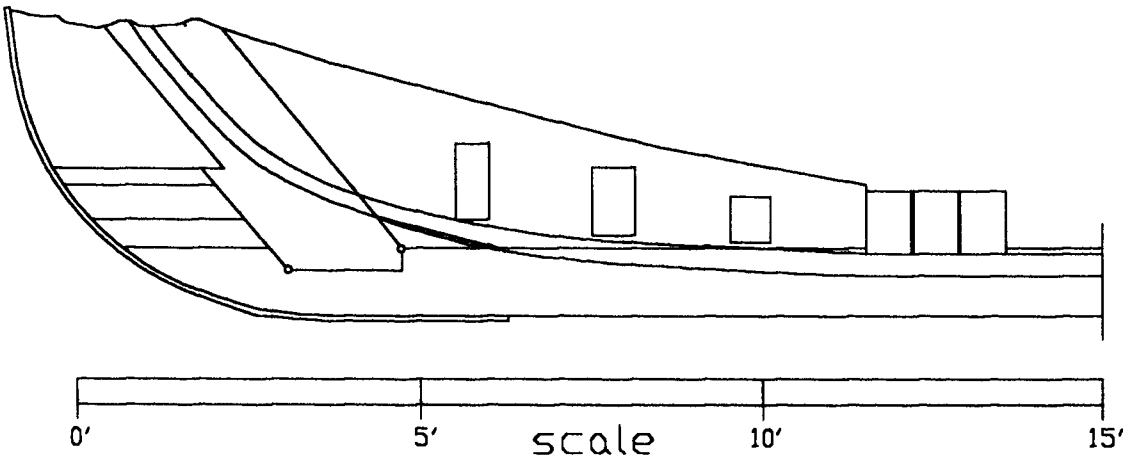

FIGURE 2. CSS *North Carolina* bow profile.

2 in. for the inner stempost and was cut in a gentle sweep that formed the lower forefoot. Three horizontal timbers, molded 5 in., 6 in. and 3 in. respectively, were on top of the forward extremity of the keel to complete the forefoot and provide a base for the stem. The aft end of the forefoot timbers and the forward end of the keel rebate were cut at an angle of 45° to accommodate the inner stempost. The lower remains of the stempost rested on the upper fore-

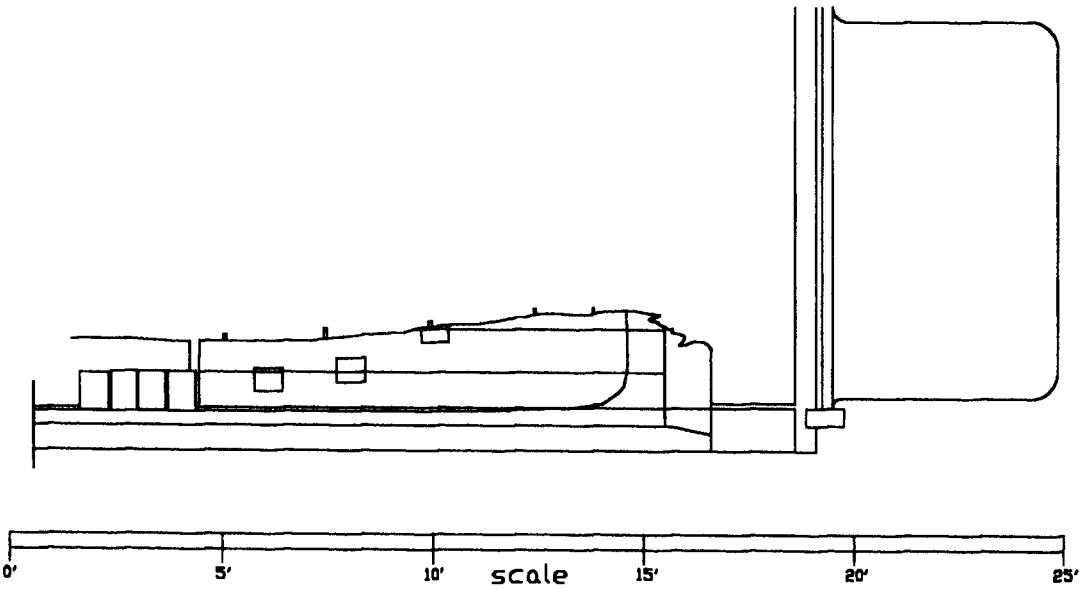

FIGURE 3. CSS *North Carolina* stern profile.

foot timber and lapped 3 in. aft into the inner stempost. An iron strap 9 in. wide and 3/4 in. thick reinforced the forefoot.

The stem was molded 18 in., with the forward surface sided to 9 in. The after, or inner surface, was sided at 12 in., creating a made-rabbet, 3 in. deep along each side of the fayed surface of the stem and inner stempost. The planking hood ends were 3 in. thick, secured in the rabbet with wrought-iron spikes driven into the inner stempost and rising wood present below that timber. Aft of the inner stempost the bow was reinforced by a long horizontal knee. That knee extended from the aft face of the inner stempost 8 ft. to the forward side of the first floor. The knee was fashioned from a single piece of timber. Three rebates on the port side had been cut 1 in. deep into the knee to support cant frames. The cant frames mortised into the knee were located on 24 in. centers. A small triangular chock used to spread the planking occupied a space aft of the base of the inner stempost and below the forward end of the knee.

The framing pattern in the bow consisted of cant frames followed by full and half floors. This pattern survived only on the starboard side of the hull as the port side of the bow structure had been damaged by ground tackle from dredge support vessels once moored in the immediate vicinity of the wreck. The 14 cant frames on the starboard side varied in sided dimensions from 2-1/2 in. to 8-1/2 in. with 1 in. or less space in between each. Although it proved difficult to determine accurately, the starboard cant frames had molded dimensions that ranged from 3 in. forward to 11 in. aft. The inboard ends of three of the cant frames, CF5, CF8 and CF11 were cut to form tenons that fit into mortises in the knee. Each of the cant frames was fastened to the horizontal knee with 1-in.-diameter iron pins.

Excavation at the stern revealed the sternpost, an inner sternpost, deadwood, keel, keelson, cant frames, half frames and exterior planking. At the stern, the keel was molded 11 in. and sided 12 in. The aft end of the keel extended 30 in. beyond the sternpost to function as a skeg that supported the rudder. An iron plate extended from a point 12 in. above the base of the rudder post to cover the top of the extended keel and provide a surface for mounting the base of the rudder post. Below that horizontal plate, the base of the rudder post also contained a vertical plate 11 x 12 in. that covered the aft end of the keel and provided an additional mounting surface.

The sternpost was mounted 30 in. forward of the aft end of the keel. The sternpost measured 12 in. sided and 15 in. molded. The base of the sternpost was mounted flush against the top of the keel, but could have contained a tenon that fit into a mortise in the keel. Immediately forward of the base of the sternpost, the first deadwood timber was attached to the top of the keel and extended 10 ft. forward. That timber was molded 11 in. and sided 12 in. The base of the inner sternpost appears to have been mounted on top of this deadwood timber and, like the sternpost, may have contained a tenon that inserted into a mortise in the deadwood. A second deadwood timber, also measuring 11 in. molded and 12 in. sided was mounted on top of the first and the two were attached to the keel with 1-in.-diameter iron drift bolts driven on centers that measured approximately 30 in.

The framing pattern in the stern consisted of cant frames followed by a pattern of half and full floors. This pattern survived only on the starboard side of the hull as the port side had been damaged during efforts to salvage the ironclad's machinery. The 11 cant frames on the starboard side of the deadwood varied in sided dimensions from 7-8 in. with 1 in. or less space in between each one. Although it proved to be difficult to determine accurately, the starboard cant frames had molded dimensions that ranged from 5 in. aft to 11 in. forward. The inboard ends of three of the cant frames were cut to form tenons that fit into the mortises in the deadwood. The remaining cant frames were cut to fit flush with the deadwood. Each cant frame was fastened to the deadwood with 1-in.-diameter iron pins.

Aft of the bow cants and horizontal knee and forward of the stern cants and deadwood, the

framing pattern of the CSS *North Carolina* shifted to a combination of floors, half-floors and futtocks. Although the pattern was impossible to confirm throughout the length of the hull, it was found to be consistent where damage to the keelson exposed frames on the centerline of the hull. The framing pattern was documented immediately aft of the bow knee, 50 ft. aft of the stem, 100 ft. aft of the stem and immediately forward of the deadwood in the stern.

At all but one location the pattern consisted of a floor followed by two half floors before the pattern repeated itself. The singular observed exception was immediately forward of the deadwood. There, the first 3 frames were half floors. Forward of those half floors the normal framing pattern resumed. First futtocks were butted to the floors. Observable floors ranged from 18 to 22 ft. in length. The length of first futtocks could not be established between 35 ft. aft of the stem and 40 ft. forward of the sternpost because of the surviving bilge ceiling.

Fore and aft of the bilge ceiling, narrowing of the hull lines shortened most of the first futtocks, but the longest observable examples were 8-9 ft. in length. With very few exceptions, half floors fore and aft of the ceiling made the turn of the bilge. Where measurements could be taken, the longest half floors proved to be between 9 and 12 ft. in length. Adjacent to the bilge ceiling most half floors butted second and third futtocks just short of the turn of the bilge. Second and third futtocks were butted to the half floors in a pattern staggered from 3 to 14 in.

Sided and molded dimensions of the floors, half floors and futtocks varied. With the exception of a space between the first and second starboard half floors, the framing pattern contained no space. Floors, half floors and futtocks were placed side by side and the only space between them was probably a factor of shrinkage. The molded dimension of the floors and half futtocks varied from 11 in. at the keelson to 8 in. at the turn of the bilge. The bottom of each floor and half floor was cut to extend 1/2 in. over the keel to form a tight flush fit with the garboard strake. The upper molded surface was found to be almost horizontal with the majority of the timber contouring on the bottom to produce approximately 12° deadrise amidships (Figure 4).

Where the framing pattern was exposed, an effort was also made to identify the wood employed. While there were exceptions, the floors were almost entirely of oak and the half floors were of pine. Although some pine was employed at the turn of the bilge, most futtocks there appeared to be fashioned of oak compass timber.

The floors, half floors and futtocks of the CSS *North Carolina* appear to have been horizontally fastened using 1-1/2 in. treenails and 1-in. iron pins. From the first floor forward to the last floor aft, the floors, half floors and futtocks appear to have been systematically attached by iron pins and treenails driven on 3-ft. centers through as

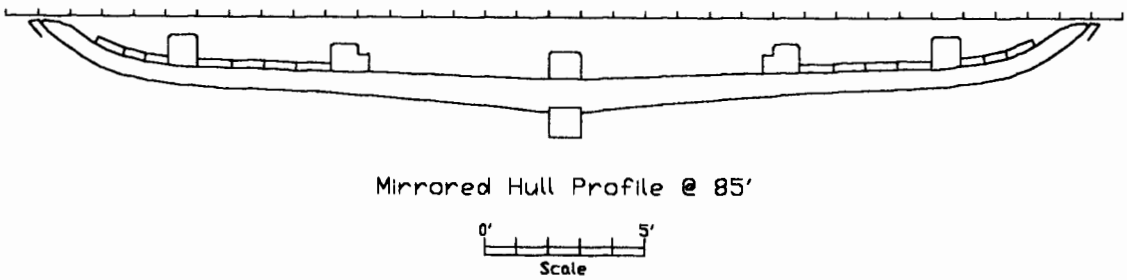

FIGURE 4. CSS *North Carolina* mirrored hull profile at 85ft.

many as four floor, half floor and/or futtock timbers. That pattern is difficult to confirm throughout the hull as the *North Carolina* was built with virtually no space. The one anomaly in the framing pattern appeared 14 ft. 10 in. forward of the stern datum. The aft face of the floor at that location was fastened to the next half floor using iron pins. Although the pattern suggested by the nominal amount of evidence at the *North Carolina* site cannot be confirmed without disassembly of the structure, that pattern was employed in both ironclads CSS *Jackson* and CSS *Neuse*.

The keel of the CSS *North Carolina* extends from the forefoot to the stern where it forms a skeg. It was constructed from 12-x-12 in. pine timbers. At the bow, the keel was cut down horizontally from 12 to 8-1/2 in. for a distance of 22 in. to form a rebate for the inner stempost. Forward of that rebate the keel was trimmed up to form the lower forefoot. The keel also provided a base for several other timbers that comprised the upper forefoot. The rabbet extended down the forward edge of the inner stempost and was cut into the top of the keel 17 in. aft of the innerstem rebate. The top of the rabbet was cut 1/2 in. below the top of the keel, and from top to bottom measured 5-1/2 in. With the garboard strake in place, 6 in. of the keel protruded beneath the hull. At the stern, under the deadwood, the shape of the rabbet changed as the garboard twisted to vertical at the sternpost. Unlike the bow there was no discernible rebate for the sternpost. Aft of the stern post the keel extended 3 ft. providing a skeg that supported an iron rudder post. Although no evidence of scarfs on the keel was visible, the placement of scarfs on the keelson suggests that the keel was composed of at least 3 or 4 separate timbers. If similar to the keelson, those on the keel were butted diagonal scarfs measuring 4 ft. in length with 2-in. deep butts. The bottom edges of the keel were chamfered 2 in.

The keelson extended from the deadwood at the bow to the deadwood at the stern. Timbers forming the keelson measured 12 in. sided and 11 in. molded. The top edges of the keelson were chamfered 2 in. The keelson was broken at the bow but was apparently attached to the top of the aft end of the bow knee. At the stern, the keelson was degraded, but clearly butted the forward end of the second deadwood timber. One clearly defined scarf was found 74 ft. 4 in. forward of the sternpost. That scarf proved to be a diagonal scarf measuring 4 ft. in length with 2-in. deep butts. A second could have been located 50 ft. forward of the stern, but damage made it impossible to confirm.

The pattern of fasteners apparent on the keelson indicated that 1-in. iron drift bolts were employed to secure each of the floors to the keel and keelson. Exceptions to that pattern occurred where either the keel or keelson timbers were scarfed. There, 6 to 8 drift bolts were driven through keelson, floors and half floors, and keel to secure the scarf.

The port side keelson of the CSS *North Carolina* was positioned parallel to and 6 ft. outboard of the keelson. Timbers that made up the port side keelson were sided 10 in. and molded 10-1/2 in. Like the keelson, the top edges of the port side keelson were chamfered 1 in. The forward end of the port side keelson was located 116 ft. 3 in. forward of the stern datum or 34 ft. aft of the cutwater. It extended aft 63 ft. 4 in. to a point 52 ft. 10 in. forward of the stern datum. Like the keelson, the port side keelson was fastened with 1-in. iron drift bolts. The pattern consisted of a bolt through every other frame in a pattern that was staggered from 2-1/2 to 3 in. off the inboard side to 2-1/2 to 3 in. off the outboard side of the timber. The aft end of the port side keelson was broken, suggesting that it originally extended further aft. Although the fastener pattern extending aft suggests that it could have extended as far aft as the ceiling strake that terminates 31 ft. 10 in. forward of the stern datum, excavation of the aft trench on the starboard side revealed no evidence of a starboard side keelson at that location.

The port bilge keelson was positioned parallel to and 10 ft. outboard of the keelson. Timbers that made up the port bilge keelson were sided

10 in. and molded 10-1/2 in. Like the keelson, the top edges of the port bilge keelson were chamfered 1 in. The forward end of the port bilge keelson was located 104 ft. 3-1/2 in. forward of the stern datum or 46 ft. aft of the cutwater. It extended aft 63 ft. 2 in. to a point 41 ft. 10 in. forward of the stern datum. Also like the keelson, the port bilge keelson was fastened with 1-in. iron drift bolts. The pattern consisted of a bolt through every other frame in a pattern that was staggered from 2-1/2 to 3 in. off the inboard side to 2-1/2 to 3 in. off the outboard side of the timber. The forward end of the port bilge keelson was broken suggesting that it originally extended further forward. The fastener pattern extending forward suggests that it could have extended another 4 ft.

On the starboard side of the hull, the test trench excavated 75 ft. forward of the stern revealed both starboard side and bilge keelsons. The starboard side keelson was 5 ft. outboard of the keelson. The bilge keelson was located 4 ft. outboard of the side keelson. Both starboard keelsons were sided 10 in. and molded 10 in. The upper edges of both were chamfered 1 in. The same pattern of 1-in. iron drift bolts driven in a staggered pattern through every other frame that was found on the port side was observed on the starboard keelsons.

Bilge ceiling on the port side of the CSS *North Carolina* covered only a portion of the lower hull. It consisted of several strakes between the side and bilge keelsons and additional strakes outboard of the bilge keelson. Inside both the port side and starboard side keelsons exposed by the test trenches there was no evidence of ceiling. Between the side and bilge keelsons, bilge ceiling consisted of four planks. The combined width of those planks equaled 48 in. Each was approximately 12 in. wide and all were 3 in. thick. A staggered and somewhat random pattern of 1-1/2 in. treenails attached the ceiling to the frames.

Outboard of the port bilge keelson, the aftermost ceiling plank was positioned adjacent to the keelson and extended forward from its aft end 6 ft. 6 in. The width increased from 5 in. at the aft end to 11 in. at the forward end. From the forward end of that first strake three new strakes begin. Each of the planks making up those three strakes began 3-1/2 in. in width. Their width increased to 10 in., 10 in., and 12 in. respectively at a point 75 ft. forward of the stern datum.

The bottom of the floors and half floors of the CSS *North Carolina* were not cut to produce traditional limbers. No doubt that is a consequence of the fact that the framing pattern contained no space between the floors and half floors. Limbers would have been inaccessible for cleaning and pumping. Instead limbers were created by attaching a limber board retainer 7-1/2 in. outboard of the keelson. That retainer was constructed of 3-in. thick plank. The base of the limber board retainer was 3-1/2 in. wide and the top was 2-1/2 in. in width. The outboard side was vertical and the inboard side was beveled. Although portions of the limber board retainer were missing, surviving sections extended from a point 55 ft. forward of the stern datum to a point 130 ft. forward of the stern datum and 25 ft. 5 in. aft of the stem.

Limber boards were found in situ on the port side. Those boards covered the limber channel produced by the limber board retainer from a point 127 ft. 10 in. forward of the stern datum aft to a point 105 ft. 4 in. forward of the stern datum. A second section of limber board protruded 21 in. forward of the bulkhead located at 95 ft. forward of the stern datum. Each of those boards was 2 in. in thickness and was beveled to fit flush against the limber board retainer and flush with the side of the keelson below the chamfer.

Forward of amidships, the CSS *North Carolina* was fitted with a series of non-structural bulkheads that isolated areas within the hull. Remains of the first bulkhead were 85 ft. 6 in. forward of the stern datum. That bulkhead consisted of 2-in. wide planks positioned vertically and extending athwartships. Although all but three of the planks were gone, stains and depressions on the top of

the floors and half floors confirmed that the bulkhead extended from the keelson to the side keelson. The two surviving planks were 8 in. in width.

Between the side keelson and the bilge keelson the bulkhead consisted of four additional 2-in. thick planks. Like those between the keelson and side keelson, these planks were positioned vertically. Stains and depressions outboard of the bilge keelson suggest that the bulkhead extended to the extremity of the hull. Remains of a second bulkhead were found 94 ft. 11 in. forward of the stern datum. That bulkhead was also constructed of 2-in. thick planks positioned vertically and extending athwartships. Although only five of the planks remained in situ, stains and depressions on the top of the floors and half floors and a 3-in. wide, 2-in. thick toe board forward of the bulkhead confirmed that the bulkhead extended from the keelson to the side keelson.

Between the side keelson and the bilge keelson the bulkhead consisted of five additional 2-inch thick planks. Like those between the keelson and side keelson, these planks were positioned vertically. Outboard of the bilge keelson the bulkhead resumed and consisted of two vertical planks and a toe board similar to that between the keelson and side keelson.

Forward of amidships, the CSS *North Carolina* was also fitted with a series of raised floors to isolate material or activities from the bilge. The first section of raised floor was immediately forward of the bulkhead 85 ft. 6 in. forward of the stern datum and butted against the second bulkhead at 94 ft. 11 in. forward of the stern datum. Between the keelson and side keelson the surviving remains consisted of four 2-inch thick planks 9 ft. 6 in. in length. Those planks had been supported by a series of 3-in. thick and 5-in. wide athwartships joists supported by a 3-x-6-in. timber fastened to the inboard side of the side keelson and a 3-x-8-in. timber attached to the port side of the keelson.

At the same point, between the side and bilge keelson a second area of raised floor was found. This section of floor consisted of four 2-inch thick planks 9 ft. 6 in. in length. Battens 1-1/2-in. wide and 3/4 in. thick covered the joints between the planks. Those planks were supported by a series of 3-in. thick and 5-in. wide athwartships joists that were supported on a 2-x-2-in. timber fastened to the inboard side of the bilge keelson and a 2-x-5-in. timber attached to the port side of the side keelson. Outboard of the bilge keelson, a 16-in. wide, 2-in. thick plank extended the raised floor to the turn of the bilge. That section of floor was supported by four 2-1/2-in. wide joists positioned on the bilge ceiling and cut to level the raised floor.

Forward of the bulkhead at 94 ft. 11 in. forward of the stern datum, a third section of raised floor was found between the side keelson and the bilge keelson. That section was composed of seven 2-inch thick planks positioned athwartships. Those planks were supported by and attached to a 2-x-2-in. timber attached to the inboard side of the bilge keelson and a 3-1/2-x-3-in. timber attached to the outboard side of the side keelson. The support timber attached to the inboard side of the bilge keelson extended 26 in. forward of the forward plank suggesting that the raised floor originally extended further forward.

A single in situ plank and several joists located adjacent to the port side of the keelson 115 ft. 2 in. forward of the stern datum suggest that an additional raised floor may have existed between the keelson and side keelson farther forward. That plank measured 15 in. in width, 2-1/2 in. in thickness and 9 ft. in length. Beneath the aft end of the plank, three disarticulated timbers that could have served as joists were partially exposed.

Conclusions

Although the remains of the CSS *North Carolina* consist of the lower hull below the turn of the bilge, the surviving hull structure preserves important information concerning the construction of Confederate ironclads. Data generated by the excavation and documentation of the CSS *North Carolina* provide new insight into the architec-

tural and construction features of those early ironclad warships. In conjunction with data generated by investigation of other Richmond Class vessels, a comprehensive picture of southern ironclads can be developed. While salvage destroyed most of the casemate and a substantial portion of the aft deck of the CSS *Raleigh*, the surviving remains of that vessel preserve considerable insight into the upper hull, foredeck and casemate of Richmond Class vessels. A survey of the remains of the CSS *Fredericksburg*, destroyed at Chaffin Bluff on the James River, confirmed that while virtually all evidence of the hull has been destroyed, most of the casemate of that vessel survives. Investigation and documentation of the remains of the CSS *Raleigh* and the CSS *Fredericksburg*, in conjunction with the work already completed on the remains of the CSS *North Carolina*, can produce sufficient data to permit highly accurate reconstruction of one of the most important classes of Confederate ironclad warships.

ACKNOWLEDGMENTS

The authors would like to express their appreciation to the United States Army Engineer District, Wilmington, North Carolina, for providing the opportunity to conduct research that supported development of this article. We would also like to thank the Underwater Archaeology Unit of the North Carolina Division of Archives and History for their assistance and willingness to share both historical and archaeological records associated with the Cape Fear ironclads. Finally, we would like to acknowledge those who worked on the 1996 and 1997 field projects that generated the data making this article possible.

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GORDON P. WATTS, JR.
PROGRAM IN MARITIME STUDIES
EAST CAROLINA UNIVERSITY
GREENVILLE, NORTH CAROLINA 27834

IAN RODERICK MATHER
DEPARTMENT OF HISTORY
UNIVERSITY OF RHODE ISLAND
KINGSTON, RHODE ISLAND 02881

MARK V. WILDE-RAMSING

A Report on the 1997 Archaeological Investigations at North Carolina Shipwreck Site 0003BUI

Introduction

On 21 November 1996, divers from the private research firm Intersal, Inc., of Boca Raton, Florida, working under North Carolina Underwater Archaeology Unit (UAU) search permit (#96BUI585), reported the discovery of several cannon and a large anchor on a magnetometer target located along Beaufort Inlet's western shoals. Additional dives confirmed numerous cannon, possibly as many as 10 to 15. A sample of artifacts collected at the site included lead sheets (identified as cannon touch-hole aprons), a brass bell (inscribed: IHS MARIA\ANO DE 1709), an English brass blunderbuss barrel, a 21-lb. sounding weight, several curved iron barrel hoops, and two cannon balls (4-pounder and 24-pounder). On the following day, UAU staff archaeologists dove on the shipwreck and observed a large concreted mound with two large anchors, a grappling hook, four identifiable cannons and possibly more within the concretion, and a large number of iron barrel hoops. The primary objective of Intersal's search over the past ten years was the Spanish vessel *El Salvador*, lost in the Cape Lookout area in 1750. However, historical research led them to believe that they might come across one of two vessels lost at Topsail Inlet (now Beaufort Inlet) in June, 1718 by Edward Teach, more commonly known as Blackbeard. Divers from both Intersal and the UAU who observed the newly discovered shipwreck felt that there was a good chance that the vessel was once associated with the notorious pirate.

As managers of the entire population of shipwrecks within North Carolina waters, the staff of the UAU was determined to rise above media and political pressures to determine exactly what the shipwreck represented. The shipwreck appeared to date to the early-18th century, which currently would be the oldest identified shipwreck in the state. The well-preserved materials made it a very important archaeological site with or without Blackbeard's association. As a plan for assessing the site was developed, two brief visits were made to the site.

Site History

On 15 April 1997, members of Intersal and staff members from the UAU and the North Carolina Maritime Museum returned to the shipwreck, #0003BUI, to accomplish several fundamental tasks in preparation for intensive investigations planned over the next several years. The primary tasks were to relocate the site, check GPS readings recorded in the fall, and establish visual ranges from Fort Macon and the North Carolina Maritime Museum building for surveillance purposes. Although visibility was very poor, divers determined that this was the same site investigated in November 1996 and added additional information about the physical remains. It was not possible to photographically record the exposed remains due to the lack of visibility.

On 2 July 1997, a remote sensing survey was conducted using a proton precession magnetometer and DGPS positioning system, over a 750-x-1,350-ft. area around the wreck site. Field analysis indicated that magnetic disturbances were directly related to the mound feature and a smaller feature just north of the mound. Divers conducting a controlled search located a large anchor 52 ft. north of the main mound. This probably corresponds to the smaller magnetic disturbance. A small unidentified metal object was also found 30 ft. from the mound in a northwesterly direction. No other remains were discovered during the controlled bottom search.

Those brief examinations of shipwreck site 0003BUI verified the findings of the fall 1996 investigation. The shipwreck site appeared to

Underwater Archaeology, 1998, 54-60.

contain a wealth of archaeological information, including relatively undisturbed artifactual evidence and portions of intact hull buried beneath the sand. An assessment plan was completed in September 1997 in preparation for a month-long field project carried out during the month of October. This 25-page document identified goals for the project, and outlined the personnel, equipment and methods required to meet primary objectives.

1997 Fieldwork

The proposed 1997 fieldwork was a Phase I investigation, designed to retrieve the maximum amount of information with minimal site disturbance. Non-intrusive archaeological techniques included additional remote sensing surveys using magnetic and acoustic instruments, photography, scale drawings, and artistic perspectives. More direct site examination procedures involved manual probing, limited test excavations using a 3-in. induction dredge and 6-in. airlift, wood and sediment sampling, and recovery of diagnostic archaeological artifacts.

The month of October provided four solid weeks in the field to gather information on the site. In the first week, staff set up operations, installed security systems, established reference stations, and defined the limits of the shipwreck site. In the second week, work entailed the collection of environmental and scientific data, and the mapping and photographing of exposed wreckage. The third week saw the conducting of test excavations, the recovery of small artifacts, the collection of wood and sediment samples, and the mapping of exposed portions of the site. Finally, week four consisted of raising large artifacts, backfilling the excavations, securing the site, and shutting down operations.

Objectives

If this shipwreck really is one of Blackbeard's vessels, it will provide a looking glass into the lives of pirates, 18th-century naval warfare and shipbuilding, and the colonial provisioning and mercantile trade. However, with so little known about shipwreck site 0003BUI, the objectives of the 1997 expedition were basic. The three broad objectives were to provide an opportunity for a wide variety of specialists to inspect the shipwreck, gain insight into the site's layout, make-up and surrounding environmental conditions, and to investigate key elements of the shipwreck to determine the likelihood that this is one of Blackbeard's vessels.

The first objective — a sort of underlying theme of the field project — was to get as many archaeologists, scientists and individuals out to the site as feasible to attain a full range of observations and opinions concerning the shipwreck. Although many hours were spent on all phases of the project, from developing a daily work assignment to cataloguing artifacts, the magnitude of time, energy and variety of participants is best reflected in the dive logs. During 19 field days, 46 individual divers conducted 325 dives for a total of 290 bottom hours. In addition to staff and volunteers from UAU, participants represented Intersal, the North Carolina Maritime Museum, UNC-Wilmington's Center for Marine Science, UNC-Chapel Hill's Institute of Marine Sciences, East Carolina University's Program in Maritime History and Underwater Archaeology, the Institute of International Maritime Research, the North Carolina Office of State Archaeology, the North Carolina Division of Marine Fisheries, and Cape Fear Community College's Marine Technology Program.

A second important objective of the field project was to gain a better understanding of the shipwreck site and its surrounding environment. October was expected to be a good month to work at the site since winds are generally light and from the north. Shackleford Banks offers a measure of protection from northerly breezes, even if they approach gale force. As it turned out, October 1997 was an excellent period of time. Only one day out of twenty planned field days was unworkable.

Shipwreck site 0003BUI (Figure 1) lies approximately 1-1/2 mi. off Fort Macon and approximately 1,500 yd. west of the present Beaufort Inlet shipping channel. The depth of the site ranges from 20 to 25 ft. below sea level. One prime concern during the project was the danger presented by shipping traffic, either commercial or recreational. However, the warning signs deployed around the site were seldom needed as large commercial vessels kept well away. Furthermore, the site seemed to be virtually ignored by commercial shrimpers and recreational fishermen. When investigators examined the wreckage itself they found little evidence of hung nets or lost fishing gear. Fears of boats carrying curiosity seekers and the press were also unfounded.

Observation of the environmental conditions affecting the site during the month found that inlet currents were never strong enough to hamper investigators. Visibility on the bottom was seldom less than 2 ft. and that was only during tidal changes. Clarity was always better at high tide, especially when easterly or southerly winds blew in offshore waters. Those winds increased the sea state due to exposure to the open ocean and could quickly cause wave height and swells to increase, making the site unworkable.

At times the bottom visibility exceeded 20 ft., a rare occurrence on near-shore shipwrecks in North Carolina. This permitted excellent images with both video and still cameras and greatly enhanced the investigators in recording and interpreting the shipwreck. The exposed wreckage, measuring 25 x 15 ft., consisted of 11 cannon tubes, three large anchors (one was 52 ft. from the main mound), a grappling hook, numerous iron cask hoops, several iron strops for deadeye blocks, a cluster of cannon balls, and a large amount of ballast stones and concretions.

A 150-ft. base line was established that extended from 20 ft. beyond the isolated anchor, across the exposed mound, and approximately 50 ft. south. Positioning was based on the north/south orientation of the magnetic signatures and included all exposed remains for mapping. Transect lines placed perpendicular to the base line over the exposed materials enhanced investigators' ability to map, take elevations, and systematically record visible portions with a video camera. Elevations taken from a datum point tied to the site provided a series of profiles of the mound which, despite diver's perception of its looming presence, rose only 2 ft. on average above the surrounding seabed. The highest point

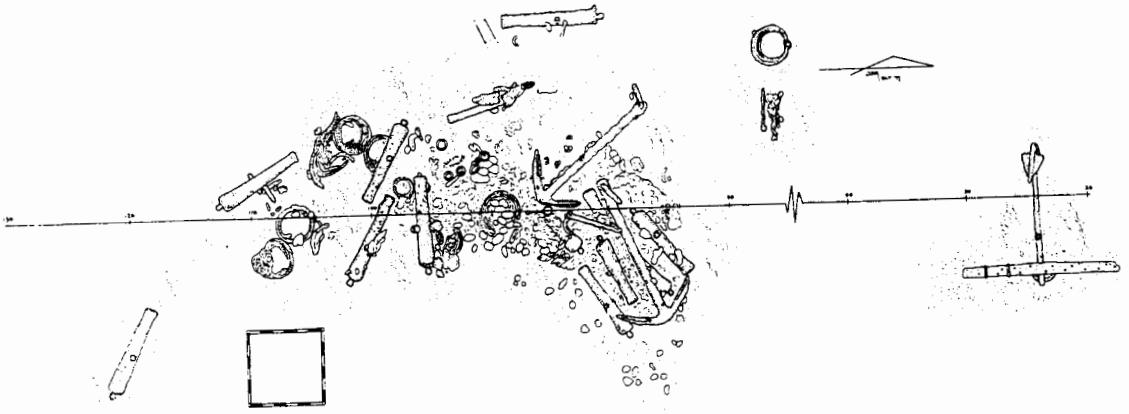

FIGURE 1. Preliminary Site Plan 0003BUI, Beaufort Inlet, North Carolina. (Drawing by David D. Moore, North Carolina Maritime Museum, October 1997.)

was an anchor fluke which protruded 4.6 ft. from the bottom. Part of the deception was due to the scouring effect of the exposed remains. This formed a 3-ft. wide by 1-ft. deep depression around the mound. It is thought that when first discovered in November 1996 the scoured area was 1-2 ft. deeper, perhaps a result of hurricanes Bertha and Fran passing over the site a few months earlier. However, an analysis of coral samples indicated that much of the wreckage seen during the October 1997 investigation had been exposed at least 15 years.

Explorations to determine the sedimentary nature of the sea bottom at the site and the extent of buried remains employed geological coring, probing and test excavations. The controlled excavation of a 6-ft.^{2} test unit prior to the recovery of cannon C-2, revealed three detectable zones. The upper zone, Level I, consisted of 9 to 15 in. of coarse, highly mobile sand. Level II was made up of 12 in. of coarse sand with a large amount of shell inclusions. The vast majority of small artifacts were found within this level, most of which dated to the 18th century but included a few 19th-and 20th-century objects. The bottoms of large artifacts, such as the cannons, lay on top of Level III, a very compact, medium fine sand. Level III contained no cultural materials.

Test Unit I also provided an understanding of the make-up and amount of buried materials surrounding the exposed portions of the site. From this 72-ft.^{3} test unit, 284 objects were recovered, including: small amounts of ceramics, glass, wood and faunal remains; one cannon; two pewter plates; a lead shot; 86 ballast stones; and 76 concretions. The concretions often contained hidden artifacts. Based on these figures, a conservative estimate for artifacts expected at the site is at least 110,000. These artifacts are, for the most part, extremely delicate and will require a lengthy and costly conservation process.

With regard to understanding the extent of the shipwreck site and its surrounding environment, cultural materials appear to be spread over an area 150 x 90 ft. on a northwest/southeast axis based on probing and the site magnetics. The heaviest concentration, perhaps the main ballast pile, extends approximately 25 ft. from the south and east margins of the mound. Limited test excavations identified an additional four cannons buried around the site; more are expected. While investigators failed to locate suspected hull remains, their uncovering of the well-preserved wood stock on the north anchor indicates that organic materials can survive and may be abundant in the lower levels. There is evidence, such as concretions with relatively recent breaks and the existence of plastic materials in the artifact bearing level, that major storm events and perhaps net trawling have disturbed the site since the initial wrecking. The extent of this disturbance is currently unknown.

The third objective of the October assessment and the most pressing historical question remains: "Is this the *Queen Anne's Revenge*?" The research files at the UAU contain over 5,000 historically reported shipwrecks lost in North Carolina waters. Archaeologists can assume that the shipwreck dates to the 18th century based on the artifactual evidence. Specifically, the bronze bell provides a *terminus post quem* of 1709. The lack of carronades, a type of naval cannon predominant by 1812, suggests a date prior to the second quarter of the 19th century. This is also supported by the absence of late-18th-century pottery types, such as creamwares. Assuming shipwreck site 0003BUI dates to the 18th-or early-19th century, the number of possible candidates decreases to 487 shipwrecks or 8 percent of the total population. Taking into account only those ships reported from the general Cape Lookout area, the number further narrows to 14 candidates from the historical record, which is also 8 percent of the shipwrecks known for that locale. These shipwrecks include the 80-ton sloop *Adventure*, which, along with *Queen Anne's Revenge*, was lost in 1718, and the 110-ton Spanish packet *El Salvador* (1750). The majority of other vessels lost during this period, such as the schooner *Susannah* (1753), the sloop *Betsy* (1771), and the sloop *Polly* (1793), were lightly armed coastal

merchantman (Table 1). The *Queen Anne's Revenge,* prior to its capture, was named *Concorde*, a 300-ton vessel of English or French origin, reportedly built for the slave trade and armed with 20 guns. It is reported that Blackbeard may have as much as doubled the vessel's armament when he took command

Preliminary Findings

In order to eliminate candidates and strengthen a case for identifying shipwreck site 0003BUI, archaeologists focused on specific aspects of the site. The following are preliminary findings from the October investigation that are relevant to the ship's identity.

Cannon

The number of cannon exceed the number known to have been carried on any candidate, other than the *Queen Anne's Revenge*, and most appear to be 6-pounders or larger. Six-pounders would have been the maximum size carried on the sloop *Adventure*; the *El Salvador* and other merchant vessels would have been outfitted with smaller guns. In addition, the cannon and recovered cannon balls appear to be of varying sizes, an assemblage that supports a pirate vessel armed with pillaged armament rather than a naval vessel carrying standard-size guns. When cleaning occurs on the recovered cannons, markings likely to be observed will indicate the period and place of manufacture.

Anchors

The three anchors on the site are all rated for a vessel of 250 to 350 tons. These would have been entirely too big for the much smaller sloops. These anchors, especially the one to the north with its preserved wooden stock' are consistent in style with those known to have been in use during the first half of the 18th century.

Ship's Fittings

The size of the deadeyes, calculated from the iron strops found on the site, vary from $8\frac{1}{2}$ to $11\frac{1}{2}$ in. This size matches well with those carried

TABLE 1
EIGHTEENTH-CENTURY SHIPWRECK CANDIDATES
IN THE BEAUFORT INLET AREA

Shipwreck	Type	Date	Lost
Queen Anne's Revenge	ship	06/??/1718	Topsail Inlet
Adventure	sloop	06/??/1718	Topsail Inlet
El Salvador	snow	08/30/1750	Cape Lookout area
Susannah	schooner	04/02/1753	At entrance to Old Topsail Inlet
Freedom	brigantine	11/16/1769	Near Cape Lookout
Unknown	brig	10/19/1769	South of Old Topsail Inlet
Betsy	sloop	01/01/1771	Old Top Inlet
Unknown	brig	05/??/1778	At Old Topsail Inlet
St. J. Planter	unknown	??/??/1791	Near Cape Lookout
Hero	schooner	02/09/1790	Beaufort Bar
Polly	sloop	07/16/1793	Ashore near Beaufort
Unknown	brig	09/17/1814	Beaufort Bar
Antelope	schooner	03/10/1815	Near Beaufort
Eagle	brig	03/10/1815	Near Beaufort
Orleans	brig	03/10/1815	Near Beaufort
Harriot	ship	06/25/1817	Bogue Banks near Beaufort
Santa Maria	ship	03/22/1819	Near Beaufort Bar

on the *Blandford*, a 20-gun, English-built ship of the same period as the *Queen Anne's Revenge.*

Glass Bottles

Several fragments have been identified as case bottles, which were prevalent during the 17th and 18th centuries. Another glass shard from a dark green wine bottle has been dated to the first quarter of the 18th century.

Ceramics

Although sparse in number, pottery sherds were identified from a large lead-glazed storage container(s) and at least three salt-glazed stoneware vessels. One of the latter appears to be part of a Bellarmine jug (1550-1699).

Iron Hoops

The wreck site is littered with large iron hoops of the size used for hogsheads or butts. During the early-18th century, iron hoops were a very expensive and desired commodity since storage of foods and other materials was so dependent on wooden containers. Many of the hoops appear to be stacked inside one another as if stored. Large casks, suggested by the hoops found on the wreck site, often held liquids such as water and perhaps rum.

Bag Shot

A concretion including lead shot of varying sizes surrounded by the imprint of a cloth bag represents an anti-personnel weapon intended to be fired out of a cannon or hurled as a grenade. These were also found in the *Whydah* assemblage. An interesting note is that during Blackbeard's final battle at Ocracoke, "Captain Teach's Men threw in several new fashion'd sort of Grenadoes, viz. Case Bottles fill'd with Powder, and small shot, slugs and pieces of Lead or Iron..." (Johnson 1972:81). Site 0003BUI had lead shot of varying size, some still with casting sprues and the corner of a case bottle attached. Laboratory analysis determined the presence of gunpowder.

Dinnerware

A pewter plate and a platter were recovered during excavation of cannon C-2. Hallmarks on one piece identify its manufacturer as a maker in London, England, where most of the pewter was made during the late-17th and early-18th centuries. Pewter plates were a prevalent part of the ship's items on vessels of the period, such as the *Henrietta Marie* (1700) and the *Whydah* (1717).

Collectively, the artifacts support a wrecking date that coincides with that of the *Queen Anne's Revenge*. In addition, several elements of the assemblage readily compare with materials recovered from the wreck of *Whydah*, a pirate vessel lost off New England in 1717.

Conclusion

The investigation and analysis of North Carolina's shipwreck 0003BUI has just begun. Perhaps in the coming months, as conservators explore the numerous concretions recovered from the site, a definitive clue — "the smoking blunderbuss"— will be uncovered to positively link the ship to Blackbeard. Further proof may come from the examination of structural timbers and the recovery of additional artifacts that might conclusively define the vessel's age, origin, and its use as a pirate ship. Perhaps the strongest piece of evidence would come with finding a second shipwreck dating to the early 18th century in close proximity to 0003BUI. *Adventure*, another vessel in Blackbeard's fleet, was lost within a "gunshot" of the *Queen Anne's Revenge*.

Reported here are the preliminary results of the first study on shipwreck 0003BUI, a submerged site with tremendous potential for archaeological study. While state archaeologists are cautious to

allow room for the possibility that this site represents something other than Blackbeard's *Queen Anne's Revenge*, they are certain that it is extremely significant in terms of its age and preservation. Additional studies to unravel the mystery of this shipwreck will continue to involve the cooperation of various institutions, including scientists from inter-related fields. Site managers will seek to employ the newest and most advanced tools and techniques of study and also use the opportunity to bring underwater archaeology to the public, all the while stressing the discipline's importance to understanding past people and events.

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MARK V. WILDE-RAMSING
UNDERWATER ARCHAEOLOGY UNIT
P.O. BOX 58
KURE BEACH, NORTH CAROLINA 28449

LAWRENCE E. BABITS

I Just Know it's a Pirate: Popular Imagery, Contemporary Details and Actual Fact

Introduction

The wreck site discussed in this symposium was declared to be Blackbeard's *Queen Anne's Revenge* by no less a personage than the Governor of North Carolina. He had obvious reasons for stating this, but he was responding to an older imagery with which we are all familiar.

Most children know what a pirate looks like long before they start learning any pirate's name or the details of piracy. In part, this is attributable to James Barrie and his tale of Peter Pan, featuring Captain Hook (Barrie 1991). As they get older, many children graduate to Robert Louis Stevenson's Treasure Island and Long John Silver (Stevenson 1930). The film "Goonies" is another example with One Eyed Willie sitting at a jewel-laden table on board his vessel. The popular imagery is fairly consistent in showing a pirate leader as a flawed gentleman and his crew as hook-armed, wooden-legged, eye-patch-wearing seadogs. This image was translated to a terrestrial funeral in the recent novel, *Cold Mountain* when a dead preacher whose eye started to open was given two pennies because "to have covered the opening eye would have looked strange and piratical" (Frazier 1997:30).

The final key to identifying a pirate ship is the flag. The traditional skull and crossbones actually may have been used. Known pirate flags have a range of motifs, many of which include the skull and crossbones (Botting 1978:48-49; Cordingly 1995: 114-118; Lee 1997:232). However, there are many different versions. More common are remarks such as the black flag or red flag (Johnson 1992:72; Cordingly 1995:116-117). In fact, Blackbeard apparently used a black flag in his last fight (Rankin 1965:56; Johnson 1992). Confirmation of both flags actually being used can be seen in the 1718 Pennsylvania pirate ship inventory's reference to "1 black fflagg, 1 Red fflagg" (Pennsylvania 1718) (Table 1).

TABLE 1
PIRATE VESSEL INVENTORY, PENNSYLVANIA

10 Great Guns & Carriages	4 Sponges
2 Swivel Guns	2 Crows
3 Pateraroes	0 Organ Barrels
4 Chambers	7 Cutlasses
30 Musketts	5 Great Gun Cartridge Boxes
5 Blunderbusses	8 Cartridges Boxes
5 Pistols	for small arms
53 hand Granadoes	4 Old Chambers
2 Barrl. Powder	20 Guns Tackles
4 Caggs of Catridge	10 Breechins
2 Powder Horns	2 Guns, Worm & Ladle

ACCT. OF SAILS, RIGGING & STORES, &C

1 Main sail	2 Runners & Tackles
1 ffore sail	a Small Quantity of Tallow
1 Jib	& Tobacco
2 fflying Jibbs	3 Compasses
1 Top Sail	1 Doctors Chest
1 Sprit Sail	1 Black fflagg
1 Square Sail	1 Red fflagg
1 boat Main Sail & ffore Sail	2 Ensignes
22 Spare Blocks	2 Pendants
1 main Sheet	1 Jack
1 Topmast Stay	8 Stoppers
1 ffore halliards	1 fflying Jibb haliards
1 Jib halliards & Down hall	1 Top Sail Halliards
1 Topping Lift	1 main Halliards
2 Grinding Stones	1 main Down Hall
24 Water Casks	1 Jib Sheet, the other for
1 barl. of Tar & a peice (sic)	Bow fast
30 barl. of Powder	1 Flying Tack
7 Dead Eyes	1 Fish Hook & Pendant
1 Kittle	2 Pump Spears
2 iron potts	1 Broad Ax
3 Anchors	1 Wood Ax
1 Cables (sic)	1 hand saw
1 old piece of junk	1 pair of Canhooks
13 planks	1 hammer
2 Top Sail Sheets	1 Auger
1 Boom Tackle	1 plain
13 bbr. of Beef & pork	Some Iron work & Lumber

(Pennsylvania 1718)

Underwater Archaeology, 1998, 61-66.

Archaeological Imagery

The popular image is little different from contemporary sailors on a man-of-war or a merchantman. Even when the typically conservative sailor apparel styles changed, the same styles were used by pirates. In fact, pirates of one time period are often shown dressed in the later clothing typical of a book's publication date, rather than of their own time.

The images of Blackbeard are a case in point. The original Johnson illustration of Blackbeard dates to the period before 1724. In that image, Blackbeard wore what is described as a fur hat but that almost certainly was a thrumm (Johnson 1992:73). When a new edition came out in the 1740s, Blackbeard is wearing a shorter coat and a low, cocked hat (Botting 1978:136). By the 1780s, Blackbeard is wearing a full crown, cocked hat (Cordingly 1995). A recent exhibition on pirates reverted to the 1740s image.

This classic, although irregularly documented, imagery is all well and good for the public but something else occurs with archaeological site reporting away from the media. For an archaeologist, faced with differential preservation, the popular image is little help. Cloth rarely survives in the archaeological record, wood floats away and iron decays. Unless there is a fortuitous occasion such as occurred when the English collier *General Carleton of Whitby* sank in 1785 and a barrel of tar preserved several sets of slops, little identifiable clothing or flags will survive. Clothing clearly defined the sailor with his "short clothes" as opposed to the landsman with his "long clothes" (Rodger 1986:64; Lavery 1989:204).

So how does one tell a pirate from a sailor? How does one tell if a wreck is a former pirate ship? In one case, we deal with the individual sailor's imagery; in the other, we deal with a ship. An examination of what might survive and what has been documented, and what has been found on the site thought to be the *Queen Anne's Revenge* might prove very instructive.

Piracy is robbery at sea without a commission from a sovereign nation. The act of piracy, however, will not survive in the archaeological record. There are three lines of non-documentary evidence: the personnel, the ship itself, and the artifacts. In contemporary illustrations, pirates are impossible to distinguish from common sailors unless the description says they are pirates. In the fight at Ocracoke Inlet, one of Maynard's crew was shot by a fellow Royal Navy sailor, "taking him by mistake for one of the pirates" (Lee 1997:122). Their clothing remnants such as buttons, hooks, eyes, and buckles will also be impossible to link with piracy. Furthermore, their personal weaponry will reflect what was available to any sailor.

The vessel used by pirates may, or may not, have been modified. Modification included cutting down the forecastle, the stern castle, adding gun and sweep ports, and shifting masts (Botting 1978:133; Johnson 1992:64). Maritime archaeologists don't usually admit it, but most underwater archaeology sites have very little to do with the vessel above the turn of the bilge where most human activity was concentrated and distinctive embellishment was placed. This can clearly be seen by reading a typical archaeological report and comparing what was found with Stephen Biesty's cross sections of HMS *Victory* (1993).

Site Artifacts

With the exception of a ship that lay on its side, virtually the only evidence of typical pirate modifications will be mast steps. With mast steps, how does one tell if the step was added, or put out of use, much less if a vessel modification occurred because the ship was converted for piracy? An armed merchantman or a privateer would have many of the same attributes of pirate vessels for exactly the same reasons.

The artifact assemblage may provide some clues. In this case, I am concentrating on weaponry, both the ship's and an individual pirate's weapons. If the history of the wrecked vessel is

known, artifacts from the site should reflect that history. In the case of the *Queen Anne's Revenge*, artifacts should reflect a ship outfitted in France for the slave trade that made at least three voyages to the Caribbean via West Africa, and returned (Mettas 1978:16,37,56; Lee 1997:14). Most basic vessel equipage should be French. Other artifacts should relate to the slave trade and the *Henrietta Marie* serves as a starting point there (Moore 1989). There should be items taken from European and American vessels captured after the slaver was used for piracy. A listing of captured vessels should reflect these origins.

The site thought to be the *Queen Anne's Revenge* has yielded ceramics including salt-glazed stoneware (possibly Rhenish) and redware (possibly Iberian). These are typical ceramics from western Europe for the early-18th century. There were two pewter plates, one of which was marked: "London". There was a Spanish (?) bell, and a sounding weight. The barrel hoops and anchors are not distinctive, at least as far as we have examined them. The actual hoops are gone, now existing as hollow encrustations. Still, this cluster of artifacts represents a generic assemblage at this preliminary stage.

TABLE 2
INVENTORY OF PIRATES PROPERTY, ALABAMA

4 Mosquitto Bar	2 pr Pantaloons
1 Piece Gingaws	2 Vest & one Coat
1 Bed Sack	9 Bags
11 Old guns	10 Pistols
1 Spade and Hatech (sic)	2 Sords (sic)
1 Quadrant	2 Compasses
2 Charts	8 Kegs
1 Sail Bag	1 Boat with 3 sails & 9 oars
2 Hatchets	1 Hammer
1 Hand Lead	1 Small box containing Sundry Articles

(Sands 1818)

Vessel weaponry might provide better clues because it is large, resistant to decay, and diagnostic for time and place. Pirates might be presumed to have a variety of weapons, captured as they upgraded their vessel and personal weapons. A mix of older pieces and up-to-date cannon should be found. In part, this is based on pirate ship inventories from Pennsylvania 1718 (Table 1) and Alabama 1818 (Table 2).

The Pennsylvania inventory (Pennsylvania 1718) shows 10 cannon, two swivels, and nine *patereros*. The *patereros* were generally obsolete by 1718 but they had particular value because they were breech loaders. An old gun, loaded with antipersonnel shot, still would be useful for sweeping decks clear of defenders without requiring the heavy charge for solid shot that might rupture an old barrel. The Pennsylvania inventory shows the pirates planned on fighting on only one side of their sloop because there were only four sponges and five cannon cartridge boxes (or pass boxes). The Pennsylvania inventory also shows 30 muskets, five blunderbusses, five pistols and seven cutlasses, plus 53 hand grenades. A hundred years later, an Alabama pirate vessel had a similar array of weaponry, and their weapons were described as "11 old guns, 10 pistols, 2 Sords [sic]" (Sands 1818). So much for upgrading among Gulf Coast pirates.

The mixed weaponry should reflect several nationalities and sizes as well. In contrast, an armed merchantman, privateer, or man-of-war presumably would have adequate shot for a set of standardized guns on board when leaving port. An upgrading pirate would not.

A number of weapons-related artifacts have been recovered from the *Queen Anne's Revenge* site. These include two cannon, a touch-hole cover, two concreted clusters of smaller shot, and several cannon balls, ranging in size from 2- to 24-pounder. The touch-hole apron is identical to several found on the 1717 *Whydah* (Hamilton 1992:66-71) and the curve is close to fitting the vent field of the recovered cannon.

The two recovered cannon appear to be 6-pounders but only one has been cleaned. Preliminary measurements on all tubes, including the 13 still on site, suggest that there are several lengths, but the bores (determined from trunnion diameter) seem to be all about 4 in. This is consistent for a 6- to 9-pounder cannon. Thus, the range of tube diameters seems fairly uniform and may reflect the original armament of the slaver *Concorde*. The lengths vary from 72 to 105 in., including encrustation in most cases. In length, there seems to be three groups, from 72-76 in. (2 guns), 85-86 in. (2 guns) and 97-99 in. (4 guns). An additional gun was reported as 105 in.; another six were not measured. Lengths are subjective because some were missing cascabels and there was encrustation on the muzzle faces. It may well be that all tubes are virtually the same, as with the trunnion diameters. Upgraded weaponry in this case might be questionable because the *Concorde* may have already been armed when captured and any newer, larger guns may have been saved prior to abandoning the *Queen Anne's Revenge* on its shoal.

Cannon balls certainly reflect the diversity expected aboard a large vessel that upgraded its armament; but this is misleading. The 24-pounder may be intrusive since Fort Macon had 18, 24-pounders and fired them at the Union fleet standing 1.25 mi. offshore during the Civil War. Unless we find a 24-pounder tube on site, it is more likely that this ball is a Confederate projectile fired at the Union fleet in 1862.

The 6-pounder balls match at least one recovered tube. The smaller shot could have been grape shot or meant for lighter swivel guns we have not yet found, but which were common on 18th-century vessels. The two clusters of shot were first described as hand grenades but this is probably an error. Impressions of cloth are clear on both clusters and x-rays show there is a variety of shot present. Pirates would, perhaps, resort to bag shot more than men-of-war because they could make it up without a foundry. If they upgraded their cannon by seizure from victims, the bulky, awkward, heavy shot would be hard to transfer in large quantities. Bag shot could be made up quite easily and used to disable a vessel's rigging and personnel. One newspaper account of the fight at Ocracoke Inlet reported that, "Teach fired some small guns, loaded with Swan shot, spick Nails and pieces of old Iron, in upon Maynard" (Lee 1997:227). It was certainly used on the 1718 *Whydah*, a vessel that has been positively identified as a pirate ship (Clifford 1993). However, bag shot was also used on privateers as late as 1814; "A twenty-four pounder ... was loaded with an immense quantity of grape and buck shot, balls and bullets of every description" (Savannah 1814:3).

Further examination of the lead shot in the concreted clusters shows that there are several size groups including swan shot, buck shot and two larger ball types in the .554 - .576 and the .609 - .688 ranges. The diameters provide clues

TABLE 3
ACCOUNT OF CONTENTS ABOARD A 1779 ARMED MERCHANTMAN

Sundry dry goods	a parcel of nails
several small arms	pistols
blunderbusses	cutlasses
a quantity of powder	a quantity of rum
molasses	canvas
osnabrugs	rigging and sails
ten inch cable	an anchor of 800 wt.
a pair of swivels	

Note. The original quote reads:
"Sundry dry goods, consisting of a variety of articles, a parcel of nails, several small arms, pistols, blunderbusses, cutlasses, and a quantity of powder, and many other articles saved from the brigantine Dispatch, William Sarjeant master, lately chased on shore, and stranded on the coast of North Carolina. And on Thursday the 14th of October, will also be sold at the South Quay, a quantity of rum, molasses, nails, canvas, osnabrugs, etc. also the rigging and sails, part of which are quite new, with a ten inch cable also new, an anchor of 800 wt. and a pair of swivels, also saved from the said brigantine. It is hoped that the skippers on the said vessels will be so obliging as to attend at Petersburg on the above day that some measures may be adopted for adjusting their respective proportions in the value of goods saved."
(*Virginia Gazette*, 2 October 1779).

about other weaponry on board, including the blunderbuss. Gun experts can identify at least three musket sizes and two pistol sizes in these ranges. Far more interesting is that all the shot above a half inch diameter is very poorly cast in the mold, often misshapen, and many still have sprues. I believe these were wasters, but instead of recasting, they were simply bagged for anti-personnel use.

The only personal weapon recovered is a blunderbuss which could take many different sizes of shot, including all those found in the concretions. No other small arms have been identified although some may be found in the encrustations. Pistols and muskets should be found and the bag shot gives some suggestions for bore sizes. Knives and cutlasses should also be found. Suggesting these should be present only on pirate ships is questionable. A 1779 armed merchantman run aground in North Carolina yielded a pair of swivels and several small arms, pistols, blunderbusses, cutlasses, and a quantity of powder (*Virginia Gazette*) (Table 3). This salvaged inventory reads much like a pirate inventory, suggesting the similarity between the two groups of seafarers.

Interpretation

What information we have recovered leaves one short of supporting any firm conclusion about "pirate artifacts." So far we have a mix of artifacts that, except for date, are not diagnostic for Blackbeard. This is not to say they were not used by pirates, but rather, that we have identified little that is specifically diagnostic for pirates.

A suggested model for what should be found to confirm the site as the *Queen Anne's Revenge* exists in the mix of artillery, the range of multi-ethnic artifacts related to the French slave trade, the Caribbean, and the southeastern Atlantic coast. But then, what would make these items different from any other vessel involved in slaving, trading in the Caribbean, and up the southeastern coast?

We recovered few materials and our interpretation of them is subjective. It might be wise to go back to the public imagery and state that what we need to find is subject to differential preservation but that it can happen. We may find a preserved purser's cabin with its prosthetic devices (hooks and wooden legs) and eye patches. If so, we should also expect a skeleton of a wooden legged seafarer draped over the wheel with a parrot skeleton on his shoulder. The key elements are the wooden leg and the eye patch, otherwise we might never know if the vessel were once a pirate ship.

This is not meant to be flippant. Pirates were sailors first and their vessels were in contemporary use. In the case of the putative *Queen Anne's Revenge* site, it is still a very important site because it is the oldest wreck yet found in North Carolina. The pirates are just an added fillip for the public; but until we start asking very specific questions about just what distinguishes a pirate from a sailor, in terms of material culture, including the vessel, we won't know what is diagnostic for this class of vessels, even if we are able to match dates, construction techniques and materials, weaponry and artifacts with the *Concorde/Queen Anne's Revenge* and the Beaufort site.

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LAWRENCE E. BABITS
PROGRAM IN MARITIME STUDIES
EAST CAROLINA UNIVERSITY
GREENVILLE, NORTH CAROLINA 27858-4353

ROBYN P. WOODWARD

USS *Saranac* and USS *Suwanee*: The Forgotten Naval Gunboats Along British Columbia's Inside Passage

It may surprise some to learn that the protected waters of British Columbia's "Inside Passage" are the resting place of two U.S. Navy steamships from the Civil War period. While affording mariners respite from fierce North Pacific storms, this passage also provided sheltered harbors, and during the era of steamships, a plentiful supply of coal at Nanaimo. However, the narrow passages between Vancouver Island and the mainland of British Columbia also have up to 16 knot currents, a tidal variation of 14 ft., and in the late 19th century, an abundance of uncharted rocks. Despite these hazards, which at times proved equally as dangerous as the open ocean, this was, and still is, the favored transit route north to Alaska.

The USS *Suwanee,* a *Mohongo*-class, side-wheeled, naval gunboat hit an uncharted rock in Shadwell Pass in 1868 while enroute to Alaska. The USS *Saranac*, a *Mississippi*-class naval steamship, the older of the two vessels, sank in Seymour Narrows after hitting the infamous Ripple Rock in 1875. Both vessels are within survey boundaries of the Underwater Archaeological Society of British Columbia's (UASBC) current Northeast Vancouver Island Shipwreck Inventory Project. The scope of this project involves documenting 14 shipwreck sites between Campbell River and Cape Scott. The information gathered from this work will form the basis of recommendations to the Archaeology Branch of the Provincial government of British Columbia on how best to manage each site.

The Society received formal permission from the U.S. Navy before including the USS *Saranac* and USS *Suwanee* in the North East Island Survey. Permission to document these sites was granted on the condition that we not remove anything from the vessels and that we send a copy of our survey data to the U.S. Naval Historical Center. All the survey work undertaken by the UASBC is done with the financial support of the British Columbia Heritage Trust.

The first U.S. Navy steam vessel to wreck along the coast of British Columbia was USS *Suwanee,* one of seven *Mohongo*-class double-ended gunboats built near the end of the Civil War (Figure 1). These narrow, shallow-draft vessels were equipped with rudders at each end so they could maneuver forwards or backwards. This design feature was particularly useful when operating in rivers which were too narrow to permit the vessels to turn around. This was the only complete class of unarmored vessels in the U.S. Navy that were built entirely of iron prior to 1870. Their iron hulls necessitated construction in civilian shipyards as the U.S. Navy did not have the capability to build in iron (Canney 1990:118). The *Mohongo*-class riverine patrol ships had an overall length of 255 ft. but were only 35 ft. in beam with a 9.6-ft. draft. They all had double paddle wheels located amidships in armored casemates between the two schooner-rigged masts. These vessels were equipped with a single 850-horsepower, inclined, direct-acting engine designed by Isherwood and two boilers that purportedly gave them a top speed of 15 knots and a cruising speed of 8 knots. The ship displaced 1,370 tons and was equipped with 10 guns (Silverstone 1989:66).

The *Suwanee* was one of two *Mohongo*-class ships built by Reaney, Son and Archbold of Chester, Pennsylvania. Its keel was laid down in 1863, the ship launched on 13 March 1864 and was later delivered to the Philadelphia Navy Yard on 14 December 1865 at a total cost of $171,000 (Silverstone 1989:66).

> The ship's iron construction was based on frames 18 in. apart, measuring 12 in. in depth inside the turn of the bilge, but only 4 in. in depth from the bilge to the rail. Four box keelsons formed the hull's longitudinal strength. ... Plans of the sister ship *Ashuelot* confirmed

Underwater Archaeology, 1998, 67-73.

> that two watertight bulkheads defined the engine spaces and allowed the possibility that two more were installed 15 ft. from each bow. The bulkhead forward of the engine spaces was pierced for a passage through the coal bunker (Canney 1990:118).

On 22 February 1865, *Suwanee* sailed from New York for duty with the Pacific Squadron. Though having hull lines similar to earlier classes of wooden vessels, these iron steamships withstood ocean navigation better and the *Suwanee* received high praise from its commander after riding out a gale "handsomely" en route to Cape Horn (Canney 1990:118). *Suwanee* reported to Acting Rear-Admiral George F. Pearson in Acapulco on 30 July 1865. Under the command of Commander Richard Law, the *Suwanee* continued duty with the Pacific Squadron from 1865 through early 1868 with its principal tasks being to protect the interests of U.S. citizens along the west coast and to explore and survey the north Pacific Ocean and coasts of Alaska. The sidewheeler visited the Royal Navy base at Esquimalt in Victoria harbor on two occasions prior to its last voyage: once in November 1865, after an unsuccessful search for the Confederate raider CSS *Shenandoah*, and again in June 1866.

In 1868 the Government of the United States wanted to establish a naval presence in Alaskan waters and accordingly, the *Suwanee* was dispatched from San Francisco to Sitka. On 1 July 1868 the *Suwanee* anchored in Victoria harbor and was given a seven-gun salute by the USS *Jamestown*, a three-masted sloop already in the harbor. Stores were loaded for three days and on July 4th, the ship held a formal inspection parade and fired a 21-gun salute in honor of Independence Day. After rounding up the last of the truant sailors, the ship left Victoria early on July

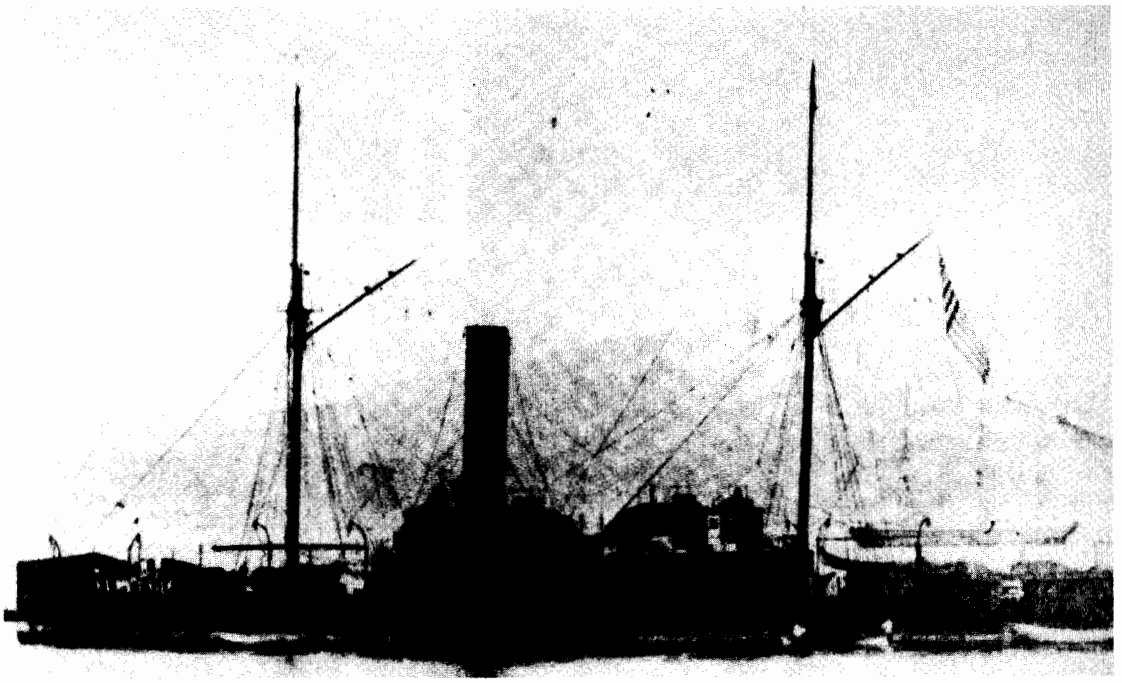

FIGURE 1. A *Mohongo*-class gunboat. (Courtesy of the U.S. Naval Historical Center.)

7th under the charge of a government pilot, Captain James Cooper. Coaling was completed at Nanaimo later that day and by noon on July 8th, the *Suwanee* had traversed the hazardous Seymour Narrows and reported entering the Johnson Straits (United States National Archives [USNA] 1868).

Possibly because of the stormy weather during the night, the pilot opted to stay in the protected waters of the Goletus Channel for as long as possible before entering the open waters of the Queen Charlotte Sound. As the weather cleared in the early morning hours of July 9th, the *Suwanee*, cruising at a speed of 7 knots, entered Shadwell Pass at 5:55 AM between Hope and Vansittart islands instead of the wider Bates Passage. Ten minutes later the ship struck a previously unrecorded rock in mid-channel. The engines were stopped immediately, the pumps were manned and a stern anchor was carried out aft of the ship by a small boat in an effort to reef the ship off the rocks. The ship's log noted that the tide was dropping at an alarming rate, straining the hull. After 30 minutes the stanchions pulled up through the deck, breaking the back of the ship and sending the bow underwater while leaving the stern section hanging above the water on the south side of the rock. The ship's boats were lowered and filled with supplies to be ferried to nearby Hope Island. All crew and provisions were removed from the ship by 1:30 PM and the rising tide soon filled the stranded vessel (USNA 1868). It should be noted that once the tide turns in this area the current runs at about 6 knots.

Some of the crew made shelters and secured the stores; others went in search of water and assistance. A nearby Nahwittii Indian village afforded the stranded Americans considerable assistance, ferrying supplies from the wrecked ship ashore via canoes. One officer and the pilot were sent south in a gig to secure assistance from the Hudson Bay Company's Fort Rupert, which was closer than Victoria.

The next five days were spent salvaging the ship at low tide and ferrying materials to shore. Late on July 13th the HMS *Sparrowhawk* arrived, took on 12 officers and 93 men and the U.S. government's money, and sailed for Victoria the next day. The *Sparrowhawk* reported that the bow of the *Suwanee* was totally underwater but the stern portion was still on the rocks. Further, they left 25 men on Hope Island to guard the salvaged machinery, arms, and stores until they could be removed (*British Colonist* [*BC*], 17 July 1868). The *Suwanee*'s log noted that the crew managed to remove four 24-pounder guns and two howitzers, while six 9-inch guns were still aboard the ship, but had been buoyed.

As the log went with the Commanding officer to Victoria on the HMS *Sparrowhawk*, it was not noted when the final 25 men and equipment were removed, but a smaller vessel, the *New World*, was dispatched on 21 July to salvage equipment and arms (*BC*, 21 July 1868). On 29 July, another ship, the *George S. Wright*, reported that the *New World* and three other schooners were at work on the site and that one of the schooners had sunk while removing the guns (*BC*, 29 July 1868). The August 10th edition of the Victoria *British Colonist* reported that the *New World* had returned to Victoria with $50,000 worth of property from the *Suwanee*, including all 12 guns, shot, shells and a lot of machinery. Salvage efforts continued sporadically for the next few years as documented by numerous notices in the "Shipping Intelligence" section of the *British Colonist* newspaper.

The San Francisco paper of 24 July 1868, described the July 9th disaster and noted that all parties were exonerated from blame in the loss of the vessel as it had hit a previously uncharted rock. They also mentioned that the admiral of the Pacific Squadron was not surprised that the ship broke apart so quickly as it was built hastily during the war and was only lightly plated for river service. Further, the vessel was wholly unsuited for its armament of 12 guns (*San Francisco Daily Alta California*, 24 July 1868). By late 1869 most salvage attempts were stopped and the largely stripped vessel was forgotten until it was rediscovered in 1965 by Fred Rogers, a well-known British Columbia wreck diver.

Rogers recovered a bronze steam safety valve from the site in 1968 which is now in the Vancouver Maritime Museum collection.

The wreck site is relatively easy to find in that it is located adjacent to a large rock known as Suwanee Rock. This rock is covered during the summer months by a mass of bull kelp but is exposed on a 4.2-ft. low tide. To date, the UASBC has made 68 dives to document this remote site. Diving activity is restricted to the 30-40 minutes around slack tide after which a 5-6 knot current creates whirlpools around the rock, making work impossible. Photography is somewhat limited due to sediment churned up by the current.

An historical drawing of the *Suwanee*, from an unknown source, shows that the vessel broke in half forward of the paddle box, just aft of the boilers. On-site findings confirm this scenario. The most prominent feature of the wreck is the large single cylinder of the Isherwood engine that lies in 20 ft. of water south of the rock. Below the cylinder is a 22.9-ft. long piece of the ship's floors and frames. Aft of this is the largest extant piece of the wreck, a 75.4-x-22.9-ft. piece of stern hull structure that has collapsed in on itself exposing the outer hull. Attached to the southernmost end of this stern section is the 6.5-x-4.9-ft. rudder. East of the engine cylinder is a 5.23-x-9.5-ft. iron box, thought to be part of the hotwell and condenser assembly. Finally, west of the engine cylinder are the remains of the forward engine-room bulkhead. This section is pierced with a companionway which, from the original plans, formed the passage to the coal bunkers.

An examination of the hull plates shows them to have been 129 in. long, 27.6 in. wide, and 5/8 in. thick. They are riveted to the frames in a board and batten style. Several other disarticulated pieces of hull lie scattered around the site including a 26.2-ft. section of a keelson that measures 16 in. high and 22 in. wide. The hull pieces deposited on the south side of the rock account for the stern section of the ship. To date, with the exception of a single boiler furnace found 197 ft. northeast of the rock in a shallow gully, the bow section of the *Suwanee* has not been documented. The overall site plan, and detailed feature drawings will not be completed until the 1998 season. It would appear that salvage efforts undertaken immediately after the wrecking of this vessel were both successful and complete.

The 1979 British Columbia *Heritage Conservation Act,* revised by Bill 21 (1994), now includes a heritage wreck provision that protects all wrecks and associated objects sunk or abandoned for more than two years. The local dive charters are respectful and supportive of this new law. This wreck continues to be a popular recreational dive site as it is encrusted with colorful marine algae, anemones and abounds with black rockfish. This site is very remote, however, roughly a day's drive plus a four hour boat trip from either Vancouver or Victoria.

The USS *Saranac,* the older of the two U.S. Navy vessels to be found in British Columbian waters, sank eight years after the *Suwanee* in the summer of 1875. The *Saranac* was a bark-rigged, wooden hulled, side-wheeled frigate designed by Lenthall, Hartt and Humphreys (Figure 2). The U.S. Navy commissioned four *Mississippi*-class warships in 1847. As the first ship of this class, *Saranac*'s keel was laid down in 1847 at the Portsmouth Navy Yard in New Hampshire. The ship was launched on 14 November 1848, but was not commissioned until 12 April 1850 — 18 months later. The ship was 233 ft. overall and 37 ft. 9 in. in beam, exclusive of the paddle boxes. The depth of the hold was 23 ft. and it displaced 2,100 tons.

The vessel was equipped with two inclined, direct-acting, condensing engines designed by Charles W. Copeland and built by the Jabez Coney Iron Works of Boston. The three copper boilers were 27 ft. long and 13 ft. in diameter. The ship could travel at a top speed of 13.5 knots, although a second source says 8.14 knots. The *Saranac*'s paddle boxes were 27 ft. in diameter and it was also equipped with three bark-rigged masts. Details regarding its construction are contained in Charles B. Stuart's *Naval and*

Mail Steamers of the United States (1853), wherein he describes the ship as having...

> ...a composite hull: her oak frames and planks were fastened with bronze bolts below the waterline and iron above. The hull was also braced with diagonal 4 in.-wide iron braces which were placed at a 45 degree angle to the inside frames. Finally there were two water tight bulk-heads dividing the ship into three compartments below the berth deck.

Originally, the *Saranac*'s armament consisted of two 8-inch pivot guns and four 8-inch broadside guns. Over its 25 year career, however, the ship underwent several refits and at the time of its sinking was reported to have had 10 guns. The total cost of the ship, including two minor refits in 1850 and 1852 was $440,148 (Stuart 1853:78). The ship's total complement of officers and crew was 228.

After being commissioned in 1850, the *Saranac* was stationed with the Home Squadron along the eastern seaboard of the United States until 1852 and at some point during this period became the flag ship to Commodore F. A. Parker. After a refit, the ship embarked on 15 September 1852 for Para, Brazil, to return the Brazilian Ambassador, whereupon the ship remained on patrol in the South Atlantic until the following year when it was refitted again. On 5 November 1853 the *Saranac* sailed to the Mediterranean and remained for two years. Refurbished with new boilers, the *Saranac* sailed for duty with the Pacific Squadron on 17 September 1857, where it remained for the rest of its career.

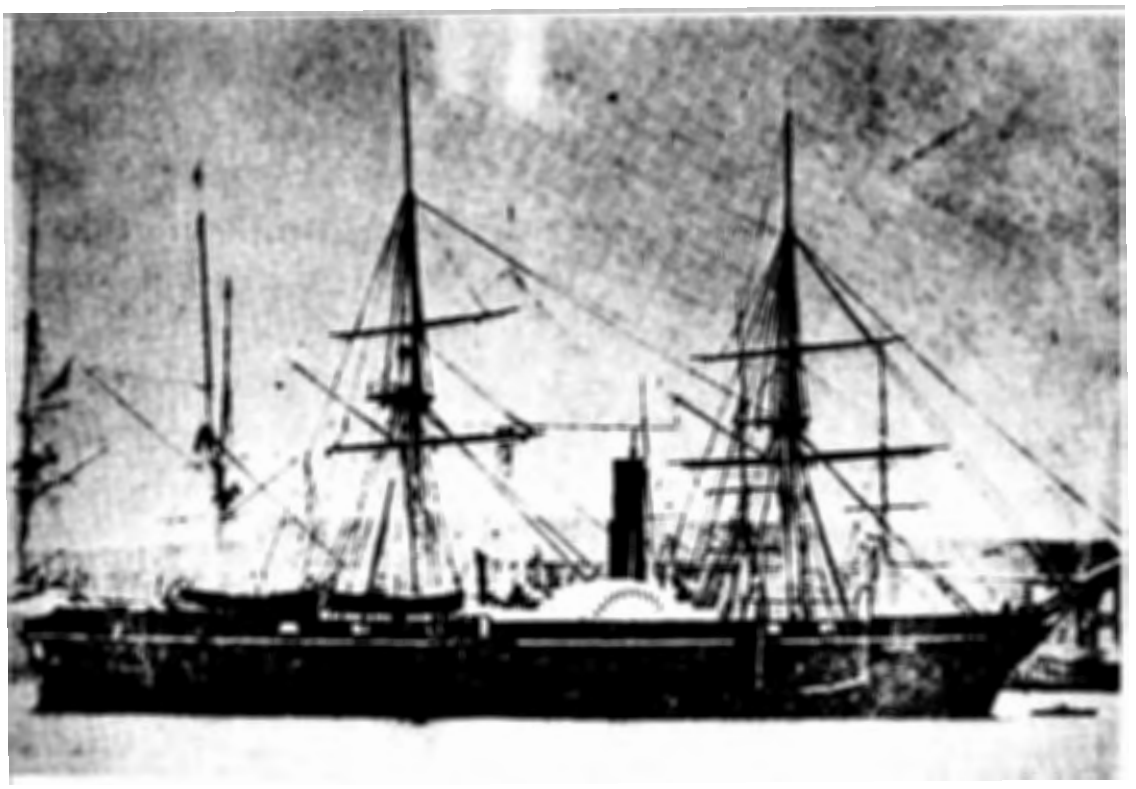

FIGURE 2. USS *Saranac*. (Courtesy of the U.S. Naval Historical Center.)

During the Civil War, the *Saranac* was on patrol off the coast of California to protect U.S. commerce from Confederate raiders. After a refit in 1870, the *Saranac* became the flagship of Rear Admiral John A. Winslow (Department of the Navy 1976:332).

The first recorded visit of the *Saranac* to British Columbian waters was in August 1865 while in pursuit of the CSS *Shenandoah*. The ship's presence was recorded twice in 1871 on outbound and inbound voyages to Sitka. On 8 June 1875, under the command of Capt. W. W. Green and Lt. Commander M. W. Saunders, the *Saranac* left San Francisco bound for the Bering Strait, Seal Islands and other parts of the Alaskan coast on a scientific expedition to collect examples of flora and fauna for the Centennial Exhibition planned for 1876. The scientific parts of the mission were under the direction of Lt. Maynard and Dr. Emil Besslla of the Smithsonian Institute.

Six days later, the *Saranac* pulled alongside the coaling dock at Nanaimo, mid-way up the coast of Vancouver Island. On the evening of June 15th, the ship left Nanaimo and sailed north entering Seymour Narrows at the beginning of the ebb tide, shortly after 8:00 AM on the 16th. The log noted that the ship was making 14 knots at the time: 7 knots from its own power plant and another 7 knots by the current (USNA, 1875). At 8:15 the log reported that the ship refused to answer the helm, presumably caught in the massive whirlpools that characterize this stretch of water. The *Saranac* swerved sideways and struck Ripple Rock on the port side of the bow with such force that everyone on deck was thrown off their feet. The current careened the vessel around to port so quickly that it almost turned over, but was then pulled free of the rock. The engineers reported the front hold quickly filling with water. With his ship now in the channel on the west side of Ripple Rock, the Captain ordered full speed as he made for the nearby shore of Vancouver Island where he immediately ran the bow of the vessel up on the rocks.

Soundings taken immediately after grounding were noted in the log — the depth at the paddle boxes was 17 fathoms but it was too deep to measure under the stern. The bow anchors were let go and the crew used a heavy hawser to secure the stricken ship to a tree on the shore. The order was given to abandon ship and take whatever stores and personal belongs could be carried off. At 10:15 AM the bow lines parted and the ship pulled stern first into 63 fathoms (*BC*, 24 June 1875). At the time of sinking the ship was estimated to be less than 100 ft. from shore.

One officer and the pilot set out in a boat for Nanaimo almost immediately after the incident. As no ships were in Nanaimo, they contracted some local Indians to take them by canoe to Victoria. The local British Navy commander organized a rescue party and dispatched the HMS *Myrmidon* and the Hudson Bay Company steamer *Otter* to the wreck site to effect a rescue. When the two vessels arrived on the scene six days later, on 22 June 1875, they found the crew camped beneath shelters made of sails, sheets and hammocks. The rescued crew and ships returned to the Royal Navy's Esquimalt station in Victoria on 23 June (*BC,* 24 June 1875).

Due to the currents and extreme depth of Seymour Narrows, the *Saranac* was declared a total loss. Besides the ship's log, two of the few remaining artifacts from the vessel were a silver covered dish and a fruit bowl from the officer's mess which were traded to the Indians in exchange for venison to feed the shipwrecked crew. The silver was eventually donated to the Vancouver Maritime Museum.

The *Saranac* was the first of 14 large vessels and more than 100 smaller craft to fall victim to Ripple Rock, a twin-pinnacled mountain more than 500 ft. in length and at two points, just 19 ft. below the surface of Seymour Narrows. In 1956, 83 years after the sinking of the *Saranac*, the Canadian Government succeeded in blowing the top 45 ft. off this rock. At the time, this event was the largest, non-nuclear explosion ever created.

Initially, the UASBC planned a side-scan sonar survey of the western channel of Seymour Narrows in search of the *Saranac*. However, given the low probability of success working in the extreme conditions of Seymour Narrows and the cost of the equipment, which would amount to a third of the entire budget granted for the three-year North Island Inventory project, we recommended that the precise location of this site be determined at a later date when additional funds become available.

The final report, with historical data, site drawings, photographs, and recommendations for management of these sites will be submitted to the U.S. Naval Historical Center and the Archaeology Branch of British Columbia late in 1998.

ACKNOWLEDGMENTS

The UASBC would like to thank the Heritage Trust of British Columbia for their generous financial support of this project, as well as the U.S. Naval Historical Center of the Department of the Navy for permission to survey these vessels. The UASBC would also like to acknowledge the ongoing support of the Vancouver Maritime Museum and its Executive Director, James P. Delgado. I would like to thank all the participants of the Northeast Vancouver Island Shipwreck Inventory Project and in particular Jacques Marc, Explorations Director of the UASBC, and David Stone, the Archivist for the UASBC, for their assistance with the research and field work on this project.

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Robyn P. Woodward
Underwater Archaeological Society of British Columbia
1905 Ogden Avenue
Vancouver, British Columbia. V6J 1A3
CANADA

JOSEPH W. ZARZYNSKI
D. K. ABBASS

The Rhode Island Ship *Gem*: Slaver or Propaganda

Introduction

On 3 February 1856, the *Gem*, under command of Captain Townsend, ran hard aground on the west side of Block Island in Rhode Island Sound. "From the West Coast of Africa of and for New York", the cargo was "Palm oil, ivory, ebony, bass-wood, etc." This was salvaged, but by February 23, the vessel was surrounded by ice and operations were suspended. By March 22, the ship had been stripped and was expected to be lost (*Newport Daily News[NDN]*, 6 February 1856, 13 February 1856, 22 March 1856; *Newport Mercury[NM]*, 9 February 1856, 16 February 1856, 23 March 1856).

What happened immediately after that is not yet known, but by 1 November 1856, the *Gem* had made it to Newport, Rhode Island, and was planned to be moved to New Bedford, Massachusetts (*NM*, 1 November 1856). This attempt failed and the vessel stayed in Newport for the next 13 years. During this time the owner refused a government offer to purchase it for use in the Civil War blockade of Charleston, South Carolina (Higginson 1873:47).

The *Gem* As Built

There is a *Gem* listed as a bark of 349 tons built in Baltimore, Maryland, in 1851, and registered at New York the same year on 21 March (Holdcamper 1968:266). The National Archives Project lists it as 349-60/95 tons, length 114 ft. 7 in., beam 27 ft., and draft 12.5 ft. It had one deck, three masts and a billethead. By October 1856, this *Gem* was owned by John D. Northam who surrendered the vessel's enrollment on 23 December 1865 (National Archives Project 1938-1951:236). This is probably the same vessel that the City of Newport spent the next four years trying to remove as an eyesore to the waterfront.

The Hulk *Gem*

On 3 May 1870, the *Gem* was towed to the "flats" of Brenton Cove, Newport, and abandoned (*NDN*, 4 May 1870). In 1873, the Navy Torpedo Station, located on Goat Island in Newport harbor, attempted to patch and refloat the hulk for use in target practice, but they failed and the *Gem* was sold to breakers who were to remove it from the cove (*NDN*, 20 June 1873, 23 June 1873; *NM*, 21 June 1873, 2 August 1873). This effort was not entirely successful and the remains of the *Gem* were reportedly visible above the surface until the hurricane of 1938 (Figure 1) when it disappeared from view (Luther 1970:83).

Jackson Jenks and the *Gem*

The *Gem* was then forgotten by most, but as diving became an increasingly popular sport, the vessel became a favorite snorkel and scuba training ground for artifact hunters. Brad Luther describes how he recovered "worm eaten timbers and bronze drifts" from the *Gem*, to be "machined into unusual items" (Luther 1970:83).

In 1959, Jackson Jenks arrived in Newport, developed an organization dedicated to marine archaeology, and established a museum that many local residents still remember. Jenks used a suction dredge and a crane to remove large pieces of the *Gem* and offered artifacts to be "distributed to any interested groups such as schools, historical agencies and yacht clubs." This is the origin of many of the artifacts attributed to the *Gem* that are now in private hands, including the hawsepipe in the window of the Army/Navy Store on Newport's Thames Street (*NDN*, 20 October 1959, 22 October 1959; *Providence Journal [PJ]*, 22 October 1959, 25 October 1959).

Howard I. Chapelle, at the time Curator in the Division of Transportation at the Smithsonian Institution, was an advisor to Jenks' organization

Underwater Archaeology, 1998, 74-78.

and their correspondence reveals that Jenks was also diving a number of other historic shipwrecks around the country. Jenks operated his Newport museum until after the American Bicentennial (1976), when he sold it with plans to visit every major city in the country, "to call attention to what he feels is a serious threat to underwater archaeological sites" (Steinberg and McGuigan 1976:233). We lose track of him after that.

The "Slave Ship" *Gem*

In recent times, it has generally been known that there is a "slave ship" in Brenton Cove. There is local interest in it, particularly among Newport's African-American community. Despite this local knowledge, film maker Steven Spielberg and the local media paid no attention to the "real" slave ship in Newport's waters as *Amistad* was being filmed in Newport during the winter of 1996-1997 (Abbass 1997).

Given the history of the *Gem* and the local lore surrounding it, two questions become obvious: Was the *Gem* really a slaver? and which vessel in Brenton Cove is actually the *Gem*? Funded by the Rhode Island Sea Grant and the Rhode Island Historical Preservation Commission, and in cooperation with Bateaux Below, Inc., the Rhode Island Marine Archaeology Project (RIMAP) has begun to answer these questions.

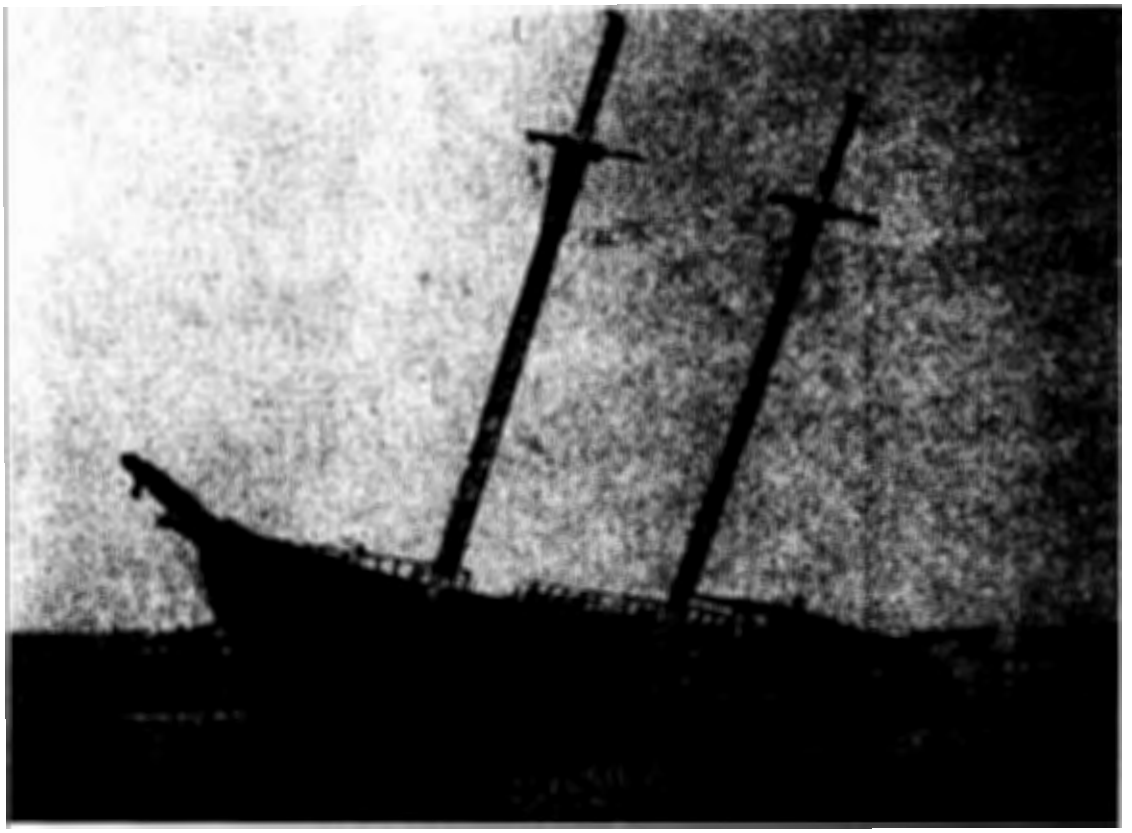

FIGURE 1. The *Gem* (ca. 1870s), shortly after it was abandoned in Brenton Cove, Newport, Rhode Island. (Photo by Thomas Higginson.)

The first question of the *Gem's* role as a slaver is problematic. The early newspaper reports do not identify it as such and do not list slaves in the cargo. The *Gem* was lost after slaving had become illegal, although the clandestine practice continued throughout the period.

The *Gem's* slaving identity comes first from the prominent abolitionist Thomas Higginson who described the ship as it lay at the Newport wharf. We quote him here at length.

> At yonder pier...has lain for thirteen years a decaying bark, *which was suspected of being engaged in the slave-trade*. She was run ashore and abandoned on Block Island in the winter of 1854, and was afterwards brought in here...where the vessel has remained, paying annual wharf dues and charges, till she is worthless...There is no name upon the stern, and it exhibits merely a carved eagle, with the wings clipped and the head knocked off. Only the lower masts remain, which are of a dismal black, as are the tops and mizzen cross-trees. Within the bulwarks, on each side stand rows of black blocks, to which the shrouds were once attached; these blocks are called by sailors "dead eyes" and each stands in weird mockery, with its three ominous holes, like so many human skulls before some palace in Dahomey...the iron belaying pins, a few of which still stand around the mast, are so rusted into the iron fife-rail that even the persevering industry of the children cannot wrench them out [emphasis added] (Higginson 1873:47).

Higginson was a prominent abolitionist who traveled widely and wrote and published anti-slavery tracts (Stevens 1924:1-13). His book, *Oldport Days*, was written as separate essays in the 1860s and then collected into a volume printed a number of times in the 1870s. His is the first indication that the *Gem* was a slaver, although he erred on the year of the *Gem's* loss (1856 not 1854) and he embroiders his identification with incendiary language to promote the political cause of abolition. The early newspaper articles about the *Gem's* loss on Block Island do not mention slaves or slaving, so it is possible that later writers, including the Rhode Island Historical Society, picked up the idea from Higginson (Rhode Island Historical Society 1916:11).

One way to determine the truth of the *Gem's* slaving past is to examine the remains for physical evidence. Unfortunately the local lore is confusing and the documents inadequate to reliably identify the final resting place of the *Gem*. The original 1870 description gives its location only as the "flats" of Brenton Cove, a description that fits much of the south and west shores of the small cove. The 1870s photograph of the vessel appears to show a low cliff behind the vessel, also similar to the present western shore.

Brenton Cove Shipwrecks

Four of the six distinct areas of wreckage now in the cove have variously been identified as the *Gem* by different people who claim to know. Beneath the dock at Brenton Cove's Beacon Rock lies a vessel with readily visible frames throughout its 100-ft. length. This is the *Bessie Rogers*, lost in 1872. In the southwest corner of the cove, now at the foot of a modern boat ramp, 17 frames of the Prohibition-era rum runner *Viola* can be found. In the shallow southeast corner of the cove, at the base of some high cliffs, lies more wreckage that is intermittently exposed. This appears to be one or more vessels deposited in the shallows by storm surges.

To further confuse the issue, there was a derelict vessel along the western shore of the cove, as shown in a block print of 1840 published in 1854 (Mason 1854:21; Highland n.d.). Subsurface probing of this area indicates the potential presence of embedded wooden material here, but it predates the *Gem's* abandonment. Also, a 1959 news article commented that the *Condor*, a clipper ship later used as a coal barge, was sunk north of the *Gem*. No other information has been forthcoming about this vessel and we have found no evidence of it (*NDN*, 28 October 1959).

The most likely location of the *Gem* is indicated by a section of articulated timbers found slightly to the north of the other sites near a sandy, man-made beach. Interviews with a local diver who had worked with Jackson Jenks in 1959, establish that this is the site Jenks called

the *Gem* (Stohlberg 1997, pers. comm.). RIMAP therefore determined that inspection of the remaining structure might reveal some feature to identify its origin and link it with slaving activities.

RIMAP Fieldwork

RIMAP first located this wreckage, lying in less than 10 ft. of water, and sketched its visible structure in the autumn of 1994. In 1995, we spent four days preparing a simple map of the site. Two different attempts to photograph the site failed due to poor visibility, but the third try was moderately successful and we also videotaped the exposed structure.

In 1996, RIMAP teams were busy elsewhere and only monitored the area, but in 1997, we mounted a major effort to document the site. In March of that year members of Bateaux Below, Inc., and RIMAP volunteers conducted a two-day photographic survey of the main section of the site. Led by photographer Bob Benway, a 1.5-x-20-ft. movable frame was employed with an underwater camera system to complete a photomosaic survey of the visible structure. Eighty-six photographs have been assembled to fashion a standard taped-up photomosaic; from this, Bateaux Below's Kendrick McMahan has produced a seamless digitized computer-assembled photomosaic.

In the summer of 1997, the team conducted 10 days of fieldwork to reveal the silt-covered structure. A 12-x-45-ft. grid with 3-x-3-ft. squares was erected over the wooden remains. A plan view of the site was drawn (Figure 2) and videography was shot to document the site visually. The most prominent feature of the site was 19 exposed frames, many with treenails and bronze fasteners. Test trenches were excavated to determine the presence and extent of buried hull structure. Laser imaging binoculars were used to acquire precise distances from shore points to buoys floated directly over the sunken hull structure to fix the wreck's location in the cove.

Several artifacts were recorded and removed for study and conservation. This assemblage consisted of three bronze fasteners, a bronze peg, an iron concretion, a piece of wood, several stones, and a modern-era canvas shoe. The shoe's location, buried under the hull structure, demonstrates that the *Gem* lies in a dynamic environment where the timbers are intermittently disturbed by the scouring and redeposition of sand from the nearby artificial beach; in this process artifacts are easily displaced and introduced into the site.

Conclusion

Through careful documentation of the bronze fastenings, treenails, and massive and closely spaced futtocks, it was determined that this piece

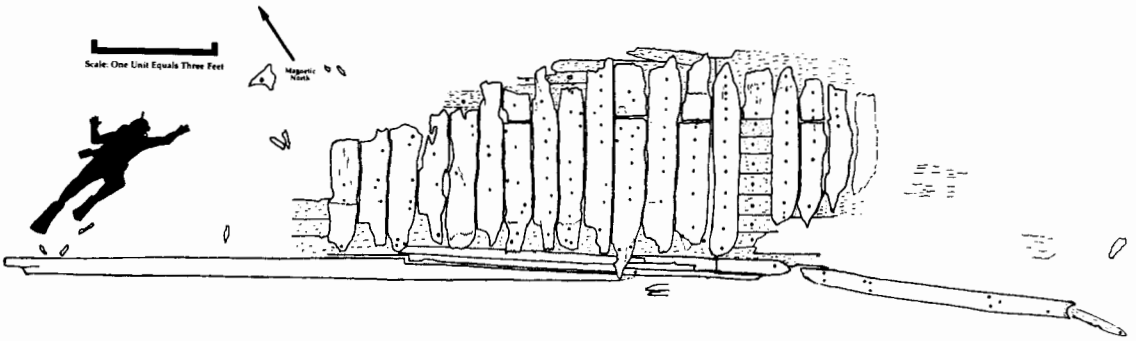

FIGURE 2. The *Gem* Shipwreck Site Plan 1997. (Drawing by Joseph W. Zarzynski, Courtesy of RIMAP.)

of structure could have been built in Baltimore in the 1850s. However, there is nothing on the site that allows us to conclude securely that this is the *Gem*. None of the details described by Higginson or in the National Archives Project are to be found — no eagle, no deadeyes, no belaying pins, no mast, no deck, and no billethead. We rely solely on Jenks' 40-year-old identification, made almost within living memory of the vessel's abandonment.

We also found nothing on the site — no shackles, no trade beads, or other artifacts — to identify it with the slave trade. This is not surprising since the vessel would have been stripped during the 13 years at the wharf in Newport, during the years of abandonment as it lay exposed in the cove, and certainly during the years since SCUBA has generally been available to diving collectors. In the absence of more reliable identification, we shall continue to call the site at the sandy beach in Newport's Brenton Cove the *Gem*, and in the absence of proof of its slaving past, we shall continue to call the *Gem* a "reputed slave ship."

ACKNOWLEDGMENTS

The authors wish to thank the volunteers of Bateaux Below, Inc. and the Rhode Island Marine Archaeology Project for having made this project possible.

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JOSEPH W. ZARZYNSKI
D. K. ABBASS
RHODE ISLAND MARINE ARCHAEOLOGY PROJECT
P.O. BOX 1492
NEWPORT, RHODE ISLAND 02840

DAVID A. JOHNSON
CHUCK MEIDE

In Soufrerie's Shadow: An Introduction to an Historic Shipwreck in Kingstown Harbour, St. Vincent and the Grenadines

Introduction

In December of 1997 and January of 1998, the Institute of Maritime History (IMH) and Florida State University (FSU) conducted a joint field expedition to St. Vincent and the Grenadines (Lesser Antilles) to survey a late-18th-century shipwreck in Kingstown Harbour. During the four-week investigation, the team produced a highly accurate and detailed pre-disturbance assessment through remote sensing, photography, and the mapping of exposed surface features.

An iron cannon was recovered from the site in the belief that it was the most diagnostic of the exposed artifacts. In addition to the underwater investigation, artifacts previously recovered from the site were catalogued, recorded and stabilized. A large portion of this collection was conserved, forming the basis of a display to aid development of cultural heritage awareness and tourism. This project, sponsored by the Heritage Tourism Project of the Organization of American States (OAS) and the Ministry of Education, Culture and Women's Affairs of St. Vincent and the Grenadines, represents the first scientific marine archaeological endeavor in the nation.

Site Description

The historical shipwreck (KH1) lies situated near the southern boundary of the harbor of Kingstown, the capital of St. Vincent and the Grenadines. The shipwreck is in deep water at an apparent natural anchorage overlooked by rocky cliffs. According to local tradition, two modern steel ships, *Nomad* and *Seimstrand*, were at anchor in the same spot in 1986 when a storm caused them to collide and sink. The two massive hulks now lie mere meters from the historic wreckage a narrow miss that now makes a spectacular diving site with vast recreational potential. Side-scan-sonar sweeps conducted near the site produced images of what could be interpreted as the ballast pile of yet another historical wreck (KH2), indicating the possible proliferation of wreck sites within the confines of the harbor.

The historic shipwreck lies on a roughly east-west slope in a sandy matrix between several coral finger reefs. The remains begin at about 65 ft. below the surface and extend to a depth of nearly 110 ft. Visible wreckage is now covered with a living reef, inhabited by a thriving assemblage of marine life. The major site features include three large anchors, at least 10 large cannon, four lead hawsepipes, plentiful copper cookware and both loose and articulated sheets of copper hull sheathing (Figure 1). These surface features suggest the wreck was a large, well-armed ship with either a sizeable crew or a human cargo. The positioning of the anchors and hawsepipes indicates that the bow of the vessel lies upslope. The majority of the remains lie to the south, suggesting that the ship came to rest on its starboard side. A cursory inspection of the in situ and recovered artifacts conducted in October 1996 suggested that the site dated to the late-18th century (Johnson 1996). It was believed that the remains were those of a British warship, privateer, or slaver.

Methodology

The primary goal of the 1997-1998 investigation was to firmly establish the age, cultural affiliation, and function of the vessel, while at the same time documenting the nature, condition, and extent of the wreckage. This was done through remote sensing, extensive mapping of the exposed remains, generation of a photomosaic, and very limited artifact recovery.

An acoustic survey was conducted within the first few days of diving. The system used was

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the Marine Sonic Sea Scan PC 650 MHz side-scan sonar. Numerous high-resolution images were generated of the historic shipwreck as well as the modern wreck *Seimstrand*. The Sea Scan software is a powerful manipulation tool that allows the user to measure height and distance of objects directly from the image.

In order to accurately map the site, a series of primary and secondary datum points were established. The site was delineated by a 52-x-14-m grid, which was further divided into three quadrilateral zones. The corners of each zone were marked by rebar stakes, which served as primary datums. Additional datums were set in the center and to either side of each zone, with a permanent datum being established at the gudgeon of the steel wreck *Seimstrand*. Using this self-referenced system, the survey crew was able to triangulate 75 features with an average residual of under 3 cm per mapping point. In all, over 750 discrete measurements defined the system and the site's features. Detailed, annotated, and measured field sketches were made of each feature.

In addition to scaled drawings, in situ artifacts were all recorded by black and white and color photographs and on underwater video. A photomosaic was generated using a Nikonos V still camera with a 15 mm lens and 400 ASA black and white film. The photomosaic was conducted in four lanes running the length of the wreck, following the contour of the slope. The photographer stayed 20 ft. above the bottom at all times, using floating buoys for vertical control.

Though a Geometrics 866 proton precession magnetometer was available, it was not used to record the magnetic signature of the site as it was believed that the *Seimstrand* would render this data unreliable. A hand-held metal detector was used in a limited survey at the stern to determine the extent of scattered wreckage buried in the sand.

Time-saving digital and data management practices included on-site database development and CAD which laid the groundwork for a multi-relational GIS. Digital photography and videography were extensively utilized in the field.

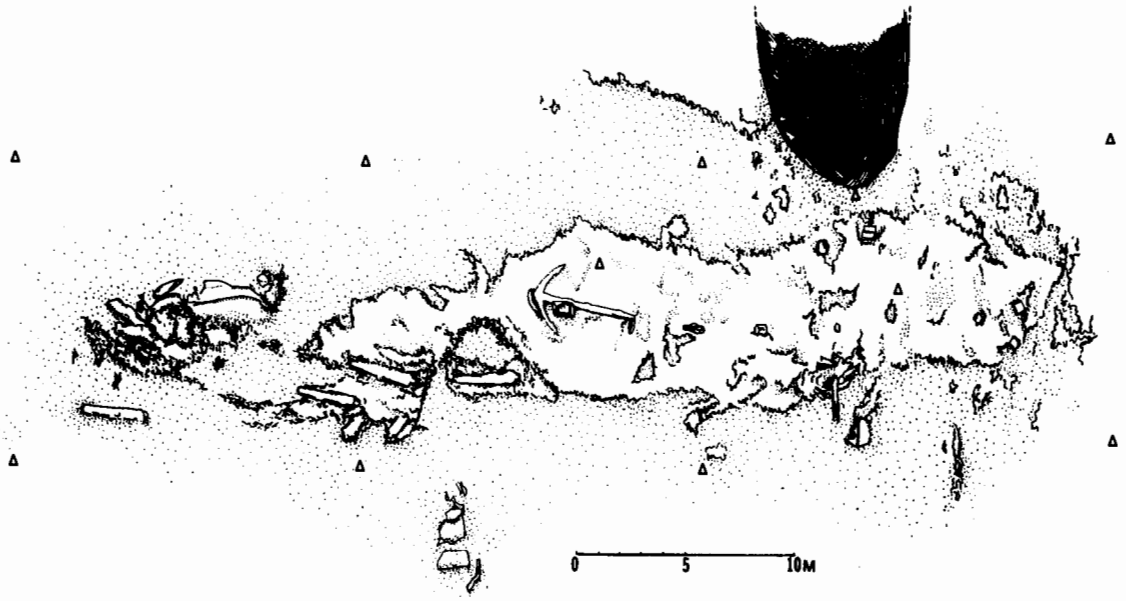

FIGURE 1. Preliminary site plan of the Kingstown Harbour shipwreck (KH1).

These contributed not only to data collection but also made images available, through a remote FTP link to IMH's internet site: http://www.maritimehistory.org, to thousands of browsers on a daily basis.

Diving Supervision and Technology

All diving for the survey was conducted under the auspices of the FSU Academic Diving Program. Over 25 days, 15 staff members logged 267 dives for 119 hours total bottom time without a single safety incident. A primary concern of the diving supervisor, in consideration of the depth of the working dives, was the lack of hyperbaric facilities on the island and the unreliability of emergency evacuation to an off-island facility. The dive plan was amended because of these concerns so that all working dives were planned within the no-decompression limits. To maximize working time at depth, divers breathed hyperoxic air or nitrox. Mixes ranged from 30 to 37%, though the typical blend was 34%. The nitrox was mixed on site directly into the scuba cylinders. The use of enriched-breathing mixes significantly lengthened bottom times, shortened surface intervals, and reduced fatigue associated with working at depth.

In addition to the regular university diving standards, several other methods were utilized to ensure strict diver control. Wireless underwater communication systems were employed that allowed diver-to-diver and diver-to-surface communication. Before each dive, every diver was issued a watch that digitally recorded the depth and time, so that a precise record of the diver's profile could be recorded. After the divers exited the water, their heartbeat and circulatory system were monitored for nitrogen bubbles with a Doppler acoustic system. This allowed customization of dive profiles; for example, one diver who frequently bubbled began to breathe 100% oxygen during his decompression stops.

Because a significant collection of previously recovered artifacts was already in the possession of the archaeologists, surface collection was limited to artifacts that appeared to be highly diagnostic or were considered to be in immediate peril. The research design, however, called for the recovery of one significant artifact, one of the large, encrusted cast-iron cannon. It was hoped that the cannon would have diagnostic markings which would lead to identification through archival research. Due to the time limitations of the survey, a candidate for lifting was chosen within the first few dives on the site.

The selected gun (F35) was located at the stern of the wreck, just off the wreckage in the sand on the starboard side. Unlike the other cannon, this tube was not concreted to the bottom or the surrounding coral reef. The cannon was recorded and documented in situ. Excavation by hand-fanning proceeded around the gun. A number of small artifacts were exposed, chiefly small ballast stones, fastener concretions, and faunal remains (food remains). These artifacts were mapped relative to the cannon itself and recovered prior to extracting the gun. Further excavation around the cannon revealed the remains of hull timbers. The timbers upon which the cannon had come to rest were highly deteriorated, but it was judged that recovery would pose little damage to the wood.

The cannon was lifted from the bottom with a crane. The crane and lifting personnel were provided by the firm of K. A. Kharafi & Son's, who were constructing a nearby cruise-ship dock. The cannon was harnessed in heavy nylon webbing. The lift was performed easily in two stages, and the extraction damaged neither the gun nor its surroundings.

Conservation of Recovered Artifacts

Before the IMH/FSU team arrived for the archaeological survey, a variety of artifacts had already been recovered from the shipwreck. These were objects exposed on the wreck surface that were removed by local divers and a salvage group. Fortunately, most of this collection was

kept intact and in wet storage and the majority were brought to the field laboratory for conservation and cataloguing.

Despite the lack of specific provenance for these artifacts, they provide an extensive representative sample of material culture for comparative analysis and historical interpretation. The extant collection included various specimens of dark-green glass bottles, tin-glazed ceramics, red earthenware vessels, a large brown salt-glazed stoneware jug, earthenware brick tiles, lead shot, a large copper cauldron, a piece of copper sheathing, and numerous concretions. All specimens were recorded in detail and stabilized at a lab facility that was provided by the Department of Fisheries and the OAS.

The other major conservation undertaking was the iron cannon. Before cleaning, the concreted cannon was recorded in detail. Small artifacts concreted to the gun's surface were mapped in plan and profile by offsets and recorded as the encrustation was removed. The cleaned gun was placed in a concrete tank behind the lab, fitted with a steel anode and a regulated power supply for its conservation. Electrolysis in a solution of sodium hydroxide is expected to take a period of 18 to 36 months.

A number of concretions were recovered from the excavation around the cannon. These, along with the concretions recovered before the IMH/FSU survey, were brought to the Kingstown General Hospital to be x-rayed. The resulting x-rays clearly showed the encrusted artifacts and their hollow molds; on one firearm lockplate, the letters SV could be read.

Most of the recovered artifacts were completely conserved and ready for display by the time of the survey's completion. A major directive of the expedition was instruction of local participants in proper maintenance of the collection and also in basic methods of conservation. At the end of the survey, all cultural material was handed over to the Government of St. Vincent.

Preliminary Findings

Approximately 75 artifacts or features were observed and recorded during the four weeks of diving. In addition to isolated finds of ceramic sherds, broken bottle pieces, and unidentified concretions scattered across the site, the major site components generally fell into three broad categories: cannon, kitchenware, and ship's hardware.

Ordnance

Including the recovered gun, at least 10 cannon were identified on and amid the coral encrusted wreckage. Though many of these were partially obscured by the reef (some barely protruded from the coral), they all seemed to be similar in size to the recovered gun, about 2.7 m in length. One of these, however, appeared to be a larger cannon. Judging from concretion, all of the guns were iron. They were all positioned on the starboard side of the wreck, scattered in the midships and stern area.

As expected, the recovered cannon proved to be diagnostic. The overall length of the gun was 2.67 m, the diameter at the breech was 0.48 m and the diameter of the muzzle was .37 m. The concretion was easily removed in less than a day, and the iron was perfectly preserved beneath. A number of markings were observed on the base ring of the gun. The first of these was A 1776, which confirmed the hypothesized age of the wreck (Figure 2). Also on the base ring was the weight of the gun in French pounds, 3236, and the number of the gun, N 31. The trunnions were marked as well; the left had the letters RA while the right had RV. In addition, three fleurs-de-lis were situated beneath the touch-hole, indicating French manufacture.

Upon cleaning the gun, archaeologists contacted the French archival historian John de Bry of the Center for Historical Archaeology. De Bry

immediately confirmed the archaeologists' belief that this was a French 12-pounder, based on the dimensions of the cannon. De Bry reported that the RV was actually RU and that it was the standard mark of the Ruelle foundry, located southeast of Rochefort. The Ruelle foundry was established in 1750 and remained in operation until around 1890. The year this cannon was made, 1776, was the year that Ruelle became property of the crown. Few iron gun foundries at this time were royal property, and the three fleurs-de-lis may emphasize the new status of the foundry (John de Bry 1997, pers. comm.). The marks on this gun are almost identical, except for the different weight and date, to those on a French 32-pounder in the collection of the Royal Armouries housed in the Tower of London (Blackmore 1976:122). The Kingstown Harbour cannon was cast just before the new gun regulations of 1778, and its weight and dimensions match the 1766 French naval regulations (Boudriot 1993:314).

Cookware

In addition to the cauldron previously recovered, an impressive amount of copper cookware was observed on the site. The recovered cauldron was riveted copper, without handle, and quite large, over 50 cm tall. At least three additional

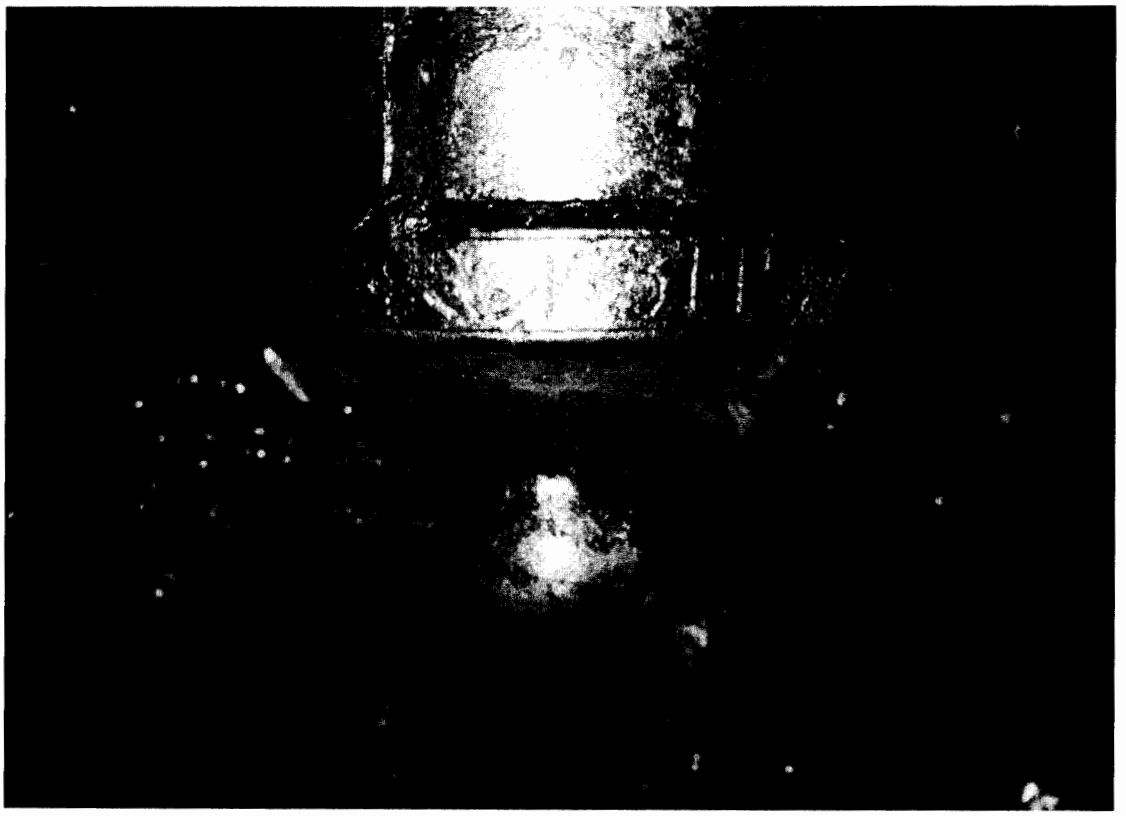

FIGURE 2. The mark *A 1776* denoting the date of casting, on the cannon's base ring early in the cleaning process.

small, round cauldrons were observed in situ on the bottom. There were also two large, rectangular copper cauldrons. One was in very good condition, the other was crushed almost beyond recognition.

In addition to cauldrons, a large three-burner stove was located on its side just forward of the midships area, off the wreckage to the starboard side (Figure 3). It appeared to be made of copper, although it was covered with a thin concretion. A few tile-like bricks (20.2 x 9 x 2.9 cm), which may have been associated with the galley, were observed scattered across the site. All of these artifacts imply a substantial subsistence activity on board this vessel.

Ship's Hardware and Hull Remains

Four large lead hawsepipes were located, in two pairs, in the forward section of the wreckage. These were very large, about twice the size, although otherwise morphologically similar, to those recovered from HMS *Pandora* (Peter Gesner 1997, pers. comm.). They were apparently fastened to the ship's hull with square nails.

Three anchors were present. Two were forward, on the starboard side of the wreckage. One of these was leaning up against a pile of coral and cultural material, its flukes buried in the sand (Figure 4). The second was almost entirely buried, with just its ring and a bit of shank exposed.

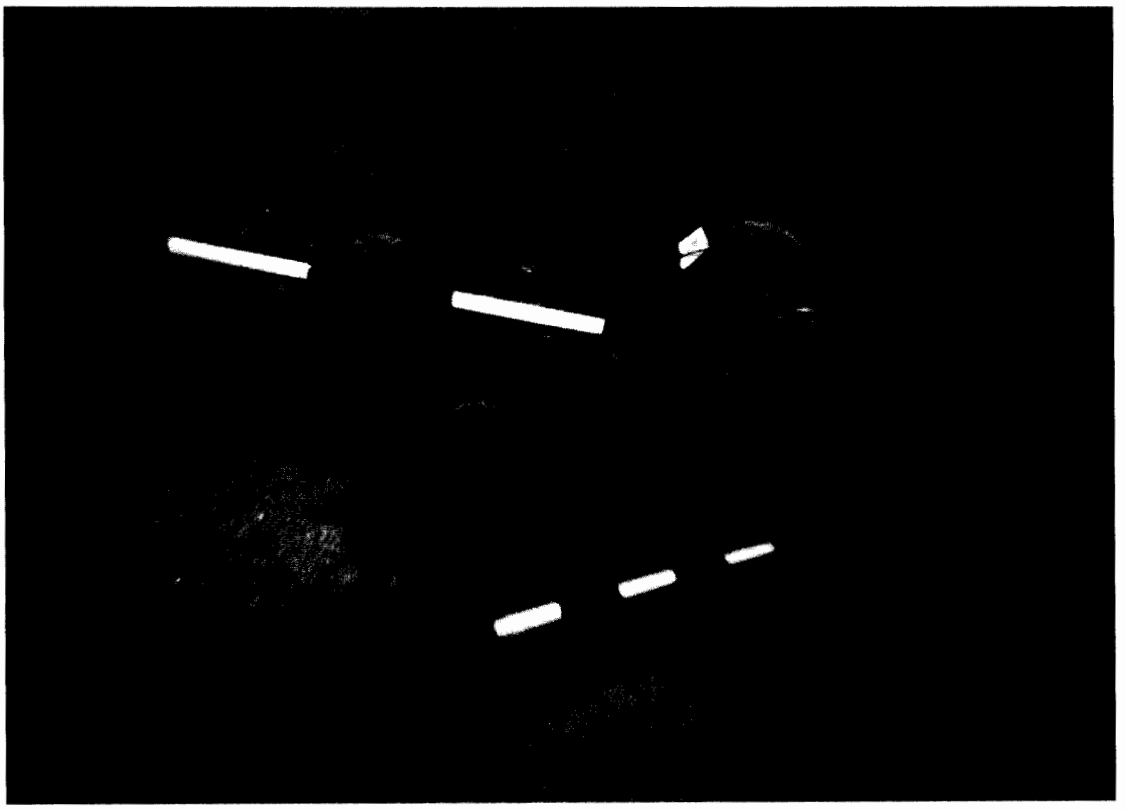

FIGURE 3. Cookware observed on the site included a number of copper cauldrons and this copper, three-burner cookstove.

The third anchor was laying flat amidships, apparently stowed belowdecks when the ship wrecked. This was the largest of the three, measuring 4.91 m from the crown to the end of the shank, and 3.08 m from fluke to fluke. The ring was about 0.75 m in diameter.

An extensive amount of copper hull sheathing was exposed throughout the site. This included many disarticulated sheets concreted into the coral as well as several intact runs of articulated sheathing, with nails still in their holes. Some of the sheets in the stern appeared to have been cut triangularly to accommodate the sharply rising curve of the hull. The British military started using copper sheathing in about 1761, although it did not become commonplace in the Royal Navy until the American Revolutionary War. It took longer for this technology to become accepted by the British merchant marine where sheathing remained rare until the early-19th century. The few copper-clad merchant ships in the last few decades of the 18th century were almost exclusively involved in the East and West Indies trade, usually as slavers. A survey of coppered vessels from Lloyd's Register of 1786 showed that 45.1% were slavers (Rees 1971). The French military first began to use copper sheathing shortly after capturing a British cutter in 1773. After 1785 the French mandated the exclusive use of cuprous fasteners below the waterline (Boudriot 1993:151, 154). The British Navy Board issued a similar order in 1786 (Staniforth 1985:25).

A small section of hull remains was exposed by hand-fanning around the cannon at the stern of the vessel. These were extremely deteriorated, but appeared to be several timbers running athwartships, with upright and transverse iron fasteners. A number of loose, concreted fasteners were also associated with the hull remains. A preliminary interpretation might be that the timbers are frames, but due to the poor preservation and limited area of exposure, this cannot be stated with any certainty. A wood sample was collected, along with ballast and sheathing samples, for analysis and identification.

FIGURE 4. The shank and ring of this anchor (F08) can be clearly seen leaning against the coral-covered wreckage, while the anchor's arms and flukes remain buried. In the background directly behind the anchor is the silhouette of the modern steel wreck *Seimstrand*.

Conclusion

It is apparent that the Kingstown Harbour Shipwreck was a large, copper-clad vessel that sank, possibly while at anchor, in the late-18th century. All of the diagnostic artifacts appear to predate the 19th century, particularly tin-glazed ceramics and dark-green glass wine bottles with v-tooled and string rims. The date range can be

narrowed even further by considering two additional factors: the dated cannon and the presence of both copper hull sheathing and iron fasteners below the waterline. These features suggest a date range from 1776 to 1786.

This site was brought to the attention of IMH initially in the belief that it was the wreck of a British slaver *Africa*, which sank in 1784. Of course, the large copper cookware associated with the wreck could feed a human cargo of hundreds, but it could also feed the hundreds of men needed to crew a privateer or frigate. Documentary evidence shows that not only was the *Africa* sheathed in wood, but it was much too small to be this wreck.

It is more likely that the shipwreck represents the remains of a military ship. The most likely vessel, considering that the cannon was property of the French government, would be that of a French frigate. France and England battled over the possession of this island, and the entire Lesser Antilles, throughout the entire colonial era. Indeed, several naval campaigns took place in the area during the time that this ship wrecked. The French Admiral D'Estang seized St. Vincent and a number of other British islands in the winter of 1778-1779. Before the island returned to British hands in 1783, however, it was ravaged by the devastating hurricane of 10 October 1780. This storm claimed a number of ships throughout the region. On the eastern shore of St. Vincent, it was reported that HMS *Experiment*, 50 guns, and the French ship *Juno*, 40 guns were destroyed with a total loss of life (Marx 1987:286). This shipwreck could represent either of these two ships or another victim of the hurricane. With the present evidence, it cannot be ruled out that this ship was a privateer that, legally or otherwise, came into possession of the royal cannon.

At the completion of this survey, it is clear that the historical wreck in Kingstown Harbour, St. Vincent has much to tell us about the maritime history of the region and the developing global systems of trade, colonialism, and sea power in the late-18th century. With the government's approval, it is hoped that further field research and excavation will be conducted on the site. In the current work, IMH and FSU sought to establish a model in consideration of such sites. While this survey was an ambitious undertaking, a small, close team was able to collect a tremendous amount of information in a month's time. Although this was a more expensive option, the priority of keeping all cultural material in local hands produced immediate and tangible appreciation for the precious nature of artifacts from marine contexts. Displaying this material, in addition to the future detailed analysis and interpretation of the collected data, will provide economic benefits through tourism and enrich the understanding of St. Vincent's largely unexplored maritime heritage.

ACKNOWLEDGMENTS

Special thanks are due to the OAS, especially to Clare Keizer, Dr. George Vincent, and Eustace Gulston. John de Bry of the Center for Historical Archaeology offered tremendous assistance in interpreting the cannon markings. Crucial assistance was lent by Gregg Stanton of the FSU Academic Diving Program and both Jim Jobling and Donny Hamilton of the Nautical Archaeology Program at Texas A&M University. Corporate support was provided by Cagema Agencies, Inc., Marine Sonic, Inc., and American Airlines. Finally, the enthusiasm of the Honorable John Horne, Minister of Education, Culture and Women's Affairs was unfailing and greatly appreciated.

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DAVID A. JOHNSON
INSTITUTE OF MARITIME HISTORY
9801 S. OCEAN DR. 119-1
JENSEN BEACH, FLORIDA 34957

CHUCK MEIDE
FLORIDA STATE UNIVERSITY PROGRAM
IN UNDERWATER ARCHAEOLOGY
TALLAHASSEE, FLORIDA 32306

MARCO MENIKETTI

The Port St. George Project: Reconnaissance and Assessment of a Sugar Plantation/Harbor Site in Nevis, West Indies

Introduction

The vicissitudes of fortune and the tumultuous nature of colonialism are nowhere better expressed than on the Eastern Caribbean island of Nevis. Located at the northern end of the Leeward Island chain, Nevis was well situated to command trade (Figure 1). So prosperous was the colony in the 17th century that it was crowned the "Queen of the Caribbees." However, by the late-18th century, the island was nearly destitute. The industries supporting Nevisan prosperity during this period were the twin pillars of sugar production and the slave trade.

Nevis has begun to enjoy a measure of economic success of late, bolstered by a growing appeal to tourism. Resulting new construction and hotel development threaten to negatively impact historic cultural resources. Airport expansion has already led to the loss of the oldest fortification in the Eastern Caribbean (Slayman 1996:82). Consequently, the Nevis Historical and Conservation Society (NHCS) is making a concentrated effort to identify and document historic sites and monuments. The NHCS was also interested in having assistance in developing a resource management plan.

Nevis is blessed with only three anchorages, none of which are really more than open roadsteads: Newcastle in the north, Charlestown, and Indian Castle Bay in the south. The name Indian Castle apparently was derived from the location having formerly been a Carib Indian compound before, and briefly during, English settlement. Documents in the Nevis Archives hinted that the Indian Castle site might have been the location of an active trans-shipping port for the estates situated on the parched south end of the island in St. George Parish. No survey or archaeological assessment had ever been undertaken in this region.

Historic Background

The first European sighting of Nevis was by Columbus during his second voyage of discovery in 1493. Nevis stirred little interest in the Spanish, thereby sparing the native population from European colonialism for more than a century (Morison 1974:108; Jane 1988:34). In 1623, Thomas Warner, acting with a Royal Patent from King James I, established a colony on neighboring St. Christophers (St. Kitts) intending to produce tobacco, indigo, and ginger. A splinter group from the St. Kitts colony established a settlement on Nevis in 1627 (Hilton 1675:1; Moll 1708:195). Although the Spanish attempted to assert a measure of sovereignty over these islands in 1628, attacking the colonies, burning plantations, and taking hostages, it was for naught. By 1630, the English reestablished themselves and were never again harassed by the Spanish.

The colony on Nevis experimented with sugar production prior to 1640, and finding a ready market in Europe, by 1650 completely abandoned other commodities in favor of sugar (Moll 1708:197). Sugar and slavery are inextricably woven into the fabric of Nevisan history. As the demand for sugar increased, so did the need for labor, and Nevis came to be a center for the slave trade. Plantations were dependent on a large labor force to tend cane, harvest, mill, and process the muscavado sugar for shipment to England. Muscavado is raw sugar, with a slightly brown color due to the retention of a percentage of molasses. It was the principal form of sugar produced by English sugar colonies. Restrictive laws in England forbade complete purification in the islands. Hogsheads of sugar weighing up to 1700 lb. were shipped to England for final refinement (Watts 1929:104). The sugar industrialists were also dependent on shipping for survival.

Underwater Archaeology, 1998, 88-95.

Nevis produced no food of its own nor any manufactured items. Ships arrived in Nevis with every conceivable supply for the colony, ranging from food to nails, timber to breeches, as ship manifests and letters from planters attest (Gay 1929:154-173). This dependency was never more clear to the planters than in times of war when shipping was at risk. The waters surrounding Nevis were the stage upon which the dramas of European power struggles played out. Various authors such as Davis (1962), Pares (1963), Newton (1967), and most recently Hubbard (1993) have examined these conflicts. Nevis was invaded by the French in 1706 and again in 1782. In both instances trade was seriously disrupted.

Other problems during European occupation adversely influenced economic life on Nevis (Iles 1871:8; Pares 1963:240). With the invention of steam-powered engines to run mills in the middle of the eighteenth century, the end of the international slave trade, emancipation in 1832, and a changing global economy, sugar production shifted to competitors elsewhere on the globe. After the 1830s, Nevis suffered a steady economic decline.

While it has been common for scholars to focus attention on famous battles or colorful personalities associated with Nevis, little of the technology of the sugar industry or the day to day maritime activities supporting the colony's life has been investigated. Nevis is known as the birthplace of American statesman Alexander Hamilton and as the place where a young Captain, later Admiral, Horatio Nelson was married.

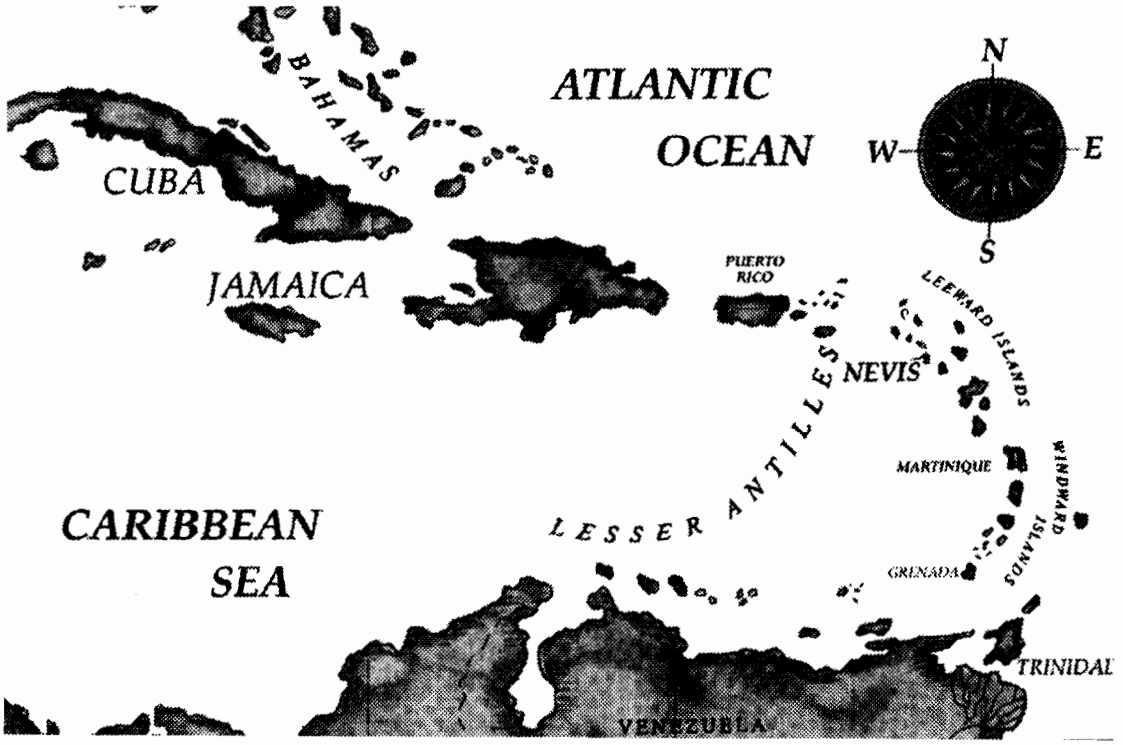

FIGURE 1. Map of Caribbean showing location of Nevis in Leeward Island chain.

Scholars have also scrutinized the history of sugar and slavery in economic terms (Deerr 1949; Dunn 1972; and Mintz 1985). Unrecorded are the lives of plantation workers and local mariners. Additionally, with the exception of Davis' (1962) comprehensive work, analysis of the relationship between sugar plantations and the rise of merchant shipping has been ignored.

In 1997 the NHCS approached the Industrial Archaeology Program at Michigan Technological University to conduct an archaeological assessment of a long-abandoned sugar plantation and harbor site. The site was believed to be the Port of St. George alluded to in historic documents. In particular, the NHCS was interested in identifying the function of a large cliff-side structure at the harbor site which they conjectured was the customs house for the port. The Port St. George Assessment Project was designed as an attempt to gather preliminary information towards a better understanding of these unexplored facets of colonial enterprise.

Research Design

A three-level research plan was developed to coordinate field work on Nevis encompassing both technical as well as preservation issues. The first phase required an extensive survey. The second phase involved limited artifact collection and test excavation. The third phase examined site stability and resource management. Each phase addressed a triad of essential questions focusing on the site's role in shipping, its relationship to the sugar industry, and the site's potential for enhancing knowledge of the island's maritime industrial history. Embedded in this approach is the theoretical premise that settlement patterns are recognizable in the historic landscape. Butzer's (1982) model of "adaptive systems" provided an underlying foundation for analysis. The model examines feedback loops in settlement.

A team was assembled with volunteers from Michigan Tech, Texas A&M, and the University of Vermont. The crew assembled for the project represented both terrestrial and nautical archaeological disciplines. A professional architect rounded out the team. Arriving on the island in July of 1997, the crew prepared to survey the site and initiate the assessment process of the industrial landscape. What was found was a collection of robustly built stone structures that once were part of a thriving sugar plantation. On the highest terrain of the gently sloping expanse around the site were the remains of a stone windmill. The iron mainshaft of the cane mill protruded from beneath tons of wall fall. There are better-preserved examples of mill towers on Nevis, but none with pre-steam-era industrial artifacts in situ such as were found on this site. Close by, overgrown with machineel trees and acacia shrubs, was the sugar works, or boiling house, where cane juice was concentrated and clarified into raw sugar.

Nearly 300 m south, a massive stone structure stood sentinel on the cliff overlooking the sea. The building is significantly imperiled by erosion and stone robbing. Erosion of the seaside cliff has already caused one wall to collapse onto the rocky beach below. Recording this structure became a priority to ensure it was documented before further deterioration. This building was so large, with smaller, subordinate adjacent structures, that it was designated the "main complex." The neutered term "complex" helped act as a shield against assigning a functional name to the structure — one that might become stuck in the literature without sufficient justification. The complex was rectangular and measured 32 m on its north side by 58 m along the east wall. The north wall stands 3 m in height with a finished mortar top. Walls are 1 m thick, including the interior and exterior dressed stone. The complex is divided into two galleries and forms a three-sided enclosure around additional stone structures.

Test units were planned for areas within the complex which would best enable dating and the determining of function. Had this structure served as a customs house or other maritime-related facility, one should expect a recognizable artifact

assemblage in that specific activities theoretically leave identifiable refuse (Nöel Hume 1974:161-193).

Considerable time was spent in the archives, housed in The Alexander Hamilton Museum, in Charlestown. No two of the many existing maps of Nevis are in agreement about the harbor location or name. Indeed, only three documents were found in the archives which even refer to the port by name, and these span 150 years. Documents prior to 1706 do not exist, having been put to the torch by the French (Iles 1871:8). Nevertheless, extant documentation provided three important pieces of information. The first was the Act of the Nevis Council establishing the harbor as an official trans-shipping place in 1704 (Nevis Archives 1735). The second valuable clue was a reference in Government accounting records of payments for repairs to the port, which referred to the "shipping place at Indian Castle" (Nevis Archives 1840). This 1840 reference indicates use as a port to at least that time. The final piece of written evidence was found on a map from 1871 (Iles 1871). Although the map is unreliable in many ways, it did give the proper name of the port and indicates several structures belonging to the plantation adjacent to the port.

But what kind of port was it? No signs of a wharf exist and the site is on a cliff. While one segment of the crew was engaged in recording standing structures associated with pre-steam sugar production, such as the collapsed windmill and boiling house, another was assigned the task of conducting an underwater survey. NAS (Dean 1992) standards were followed during this phase of investigation. Diving operations targeted four goals: (1) to determine if the harbor was suitable for shipping, (2) to appraise the material culture deposits in the harbor in terms of maritime activity, (3) to provide a preliminary bottom profile, and (4) to determine the feasibility of future electronic remote sensing in the area. Underwater surveys were conducted on separate days to the east and west of the site, as well as directly off the cliff from the principal structure.

Preliminary Terrestrial Results

One result of field work was the production of the first comprehensive map of the location. Seven structures associated with 17th- and 18th-century, industrial-scale, sugar production were documented, including the ruins of a windmill tower, boiling house, vaulted-stone cisterns, and subordinate facilities with as yet undetermined functions. Two construction periods are in evidence. Walking surveys located several iron artifacts associated with a three-roller cane mill common to the eighteenth century, and popular even after the introduction of steam power. Surface collected artifacts are being analyzed and conserved at Michigan Tech.

Although analysis is incomplete, initial results point to two periods of activity in the harbor area, one dating to the late-17th century and the other to the mid-18th century. These episodes have been determined by a combination of pipe stem analysis, ceramic distribution, and mean ceramic dating techniques as described by Nöel Hume (1974) and South (1977). The area surrounding the complex displays the classic signs of a deflated site (Schiffer 1987:239, 251). Topsoil erosion has allowed artifacts from different temporal layers to mix. The activity episodes are identifiable in the horizontal stratigraphy of the site. Artifacts from zones nearest the complex included typical 18th-century domestic ceramics such as shell-edged pearlware, creamware, and mocha types. Pipe stems, glass, and wrought-iron nails were also in evidence. Also found were three types of colonoware, including red buff and black. The assemblage from the zone 200 m east of the complex presented a dramatically different picture. Here were shards of onion bottles, blue and gray Rhenish stoneware, Bellermine jar fragments, and gunspalls. Pipe stems and bowls from this area comprised 60 percent of the complete collection and gave a mean date of 1685. The total sample size is rather small, and the mean date may be of questionable statistical validity, but the assemblage from this eastern zone must

be considered as a whole. As South (1977) has stated, "The key to understanding culture process lies in pattern recognition." Evidence suggests an early period of activity east of, and distinct from, the area of the complex itself.

Test units in the "main complex" revealed iron cauldrons set into an undulating mortar and rubble floor. Cauldrons measured more than 2 m in diameter. Troughs built into the floor led directly to the lips of the cauldrons indicating that at least one function of the building was for collecting molasses, suggesting the complex served as a curing house at one stage. While it is possible to speculate that the complex was multipurpose, only one purpose has so far been demonstrated archaeologically.

Preliminary Underwater Survey Results

The most immediate result was learning that the average depth in the harbor would be unsuitable for anything but shallow-draft vessels to enter. British and American hydrological survey maps dating from 1885 and 1923 indicate depths ranging from 2-4 fathoms inside the barrier reef. Our assessment is that this is mostly correct although tending toward the shallower measure. The second finding was that material culture remains littered the bottom, but only in the area immediately below the complex and south of the cliff for a distance of 200 m (Figure 2). Remains include one heavily corroded cannon, one swivel gun, several large L-shaped iron concretions, red clay roofing tiles, bricks, dressed-stone construction material, bottles, and ceramic sherds. The cannon was found only 8 m from the shore and shows signs of recent salvage attempts. A good deal of concretion had been chiseled away exposing raw iron. It measured 2 m in length with a bore diameter of 7 cm. The cascabel and trunnions were broken off. In the surf zone directly beneath the complex was a 1-m diameter iron "wheel." Current analysis is pursuing the hypothesis that the wheel was part of cable-tram system for loading hogsheads to awaiting vessels.

Underwater surveys to the east and west found no traces of material culture but did encounter large rocks and shallower water extending towards a barrier reef 800 m off shore, all of which would have prohibited sailing craft from these zones. These may also prove problematic for planned future magnetometer surveys in the vicinity. Such findings led to questions concerning Nevisan maritime traditions.

Historic Maritime Practices

While it is documented that sugar exports and international imports passed through the port at Charlestown, how sugar and supplies were transported between Port St. George and Charlestown was an unknown. Two lines of evidence, however, reveal that Nevis had a tradition of sailing craft perfectly suited for the shallows of this harbor. The first are Nevisan lighters, shallow-draft vessels used for inter-island commerce and passenger transportation from at least the early-19th century until as recently as 1975 (Pyle 1981:157). Two examples remain — neither seaworthy. One is stranded on the public fishing beach in Charlestown, its mast and spars deteriorating alongside in the sand. The other rests on its keel at the Horatio Nelson Museum. Neither vessel has been fully documented and both offer a unique opportunity for nautical archaeologists and maritime historians to study a traditional island sailing craft. One lighter was sketchily recorded by Pyle in 1978. The lighters are 50 ft in overall length with a 40-ft. keel. Their beam to length ratio is 1:2.5 with a draft of 4 ft. The vessel is undecked, save for a single fixed deck beam crossing the mast, and carries a single mast which can easily be unstepped. The lighters are transom sterned and support a tiller-operated rudder. These swift sailing vessels carry a jib and a "leg of mutton mainsail with a gunter pole connected to the mast" (Pyle 1981:158).

The second source for traditions for shallow draft vessels comes from documents housed in the Bancroft Library at the University of Califor-

nia in Berkeley. Following capitulation to invading French forces, under the command of the Compte De Grasse in 1783, correspondence between the Nevis Council and the Admiral was constant (Watts 1929). Several surviving letters refer to "droghers" being "manned by sailor negroes" [*sic*] to carry sugar and "work the bays." Droghers are flat-bottom single-masted sailing barges of an average length of 60 ft. Like the lighter, they are undecked with an open cargo hold, and are crewed by no more than four sailors. Droghers were common to the sugar industry in Trinidad (Kerchove 1961:245). Were vessels like these operating at Port St. George? The presence of "negroe mariners" [*sic*] is itself intriguing and worthy of future inquiry. Vessels were likely maintained at Charlestown for use throughout the island. More research will be necessary to confirm this hypothesis; however, a direction for further investigation has been established.

Preliminary Assessment

Although it is prudent to proceed with caution after only five weeks in the field, several positive statements can be made about the site under investigation. There is little doubt that the location could have served as a trans-shipment port using shallow-draft vessels of the type traditionally available on Nevis. Documentary evidence supports the use of droghers crewed by mariner slaves.

The main complex can not as yet be identified as a port facility but was associated with sugar curing. Artifacts of industrial sugar production are

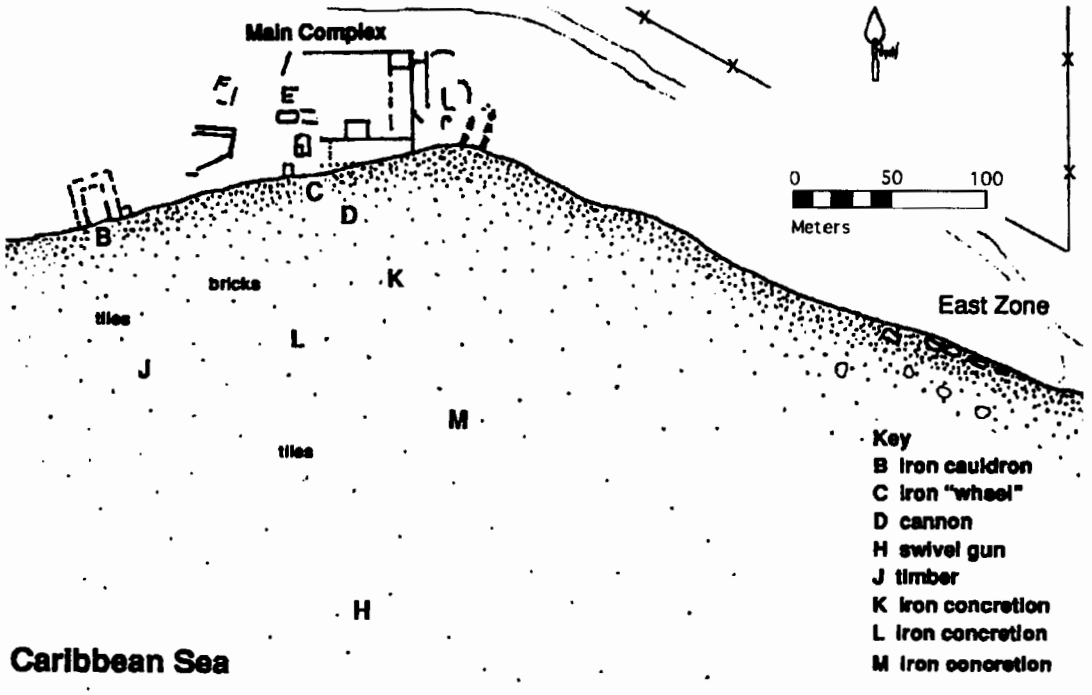

FIGURE 2. General map of waterfront finds at Port St. George site.

in situ within the complex, connecting it with other structures present in the industrial landscape.

Horizontal stratigraphy on the site appears to suggest at least two episodes of activity, one of which predates the official declaration of the site as a port, and the other during the flourishing mid-18th-century sugar trade. Artifactual evidence suggests the area was active in the late-17th century. In all likelihood, the Act of 1704 provided an opportunity for a governmental regulatory presence at an active port. The site offers unique examples for studying what Butzer (1984:284) refers to as "adaptive systems under pressure from exogenic and endogenic forces of change." The relationship can be understood as a form of mutualism. In essence, the Port St. George site might reflect the relationship and feedback systems of the sugar industry and maritime commerce. The growing needs of the sugar industry put pressure on the shipping industry to increase in concert.

Site Management Issues and Future Questions

The Port St. George site is imperiled by erosion from the sea and from stone robbers on land. Despite its remote location, the site cannot escape the adaptive reuse of building materials so common to Nevisans. The main structure was thoroughly recorded, and a series of measured erosion indicators were implanted along the cliff to monitor the rate of site destruction along that front. The site deserves additional attention. Until a site management plan is in place, it is hoped that the NHCS will continue its plan of keeping the location out of the local press. This strategy, for now, protects it from rampant looting through anonymity. However, long range preservation and interpretation are the ultimate goal. In light of this, it is recommended that an education program be initiated alerting Nevisans to the potential wealth of knowledge to be gained from the site, as well as insights to be gained into their own history. Nevisans are interested in history but find most historical accounts of Nevis to be "white history" unconnected to their own reality. Such feelings of disconnection have been called "heritage deprivation" by Lowenthal (1996). Bringing Nevisans closer to their own heritage might help save the site.

Future excursions to Nevis are planned in order to further examine the subsurface stratigraphy and to seek clues relating to its use as a multipurpose facility. Future research will investigate slave mariners and the commerce-based coastal plantations' maritime traditions. In particular, one wonders how the material culture of mariner slaves differs from field slaves and how this appears in the archaeological record.

Conclusion

Nevis is an archaeological oasis. Where other Caribbean islands have become relatively developed and tourist oriented, Nevis remains virtually untouched, either by corrupting tourist influence or by Marshaltown trowel. Plantations and fortifications lie undisturbed save for local stone robbing and grazing goats. More than 200 documented shipwrecks remain unlocated. On the south end of the island, the Port of St. George has begun to give up its secrets. Solid evidence supports the hypothesis that sugar planters in the vicinity used the harbor at Indian Castle Bay for trans-shipping goods. Additional research is necessary, however, to fully understand the mutualistic relationship between the sugar industry and shipping.

ACKNOWLEDGMENTS

The author would like to express the sincerest gratitude to David Rollinson, David Robinson, and the Nevis Historical and Conservation Society (NHCS) for their support during this assessment project. More significantly, warm appreciation must be expressed for The MUKTI Foundation, Vincent Hubbard, and Carey and Linda Ponchione for their contributions, without which this project could not have succeeded. Finally, a special thanks to the faculty of the Michigan Tech Industrial Archaeology Program whose encouragement was of great value.

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MARCO MENIKETTI
MICHIGAN TECHNOLOGICAL UNIVERSITY
SOCIAL SCIENCE DEPARTMENT
1400 TOWNSEND
HOUGHTON, MICHIGAN 49931

PAUL F. JOHNSTON

1997 Excavations of the Royal Hawaiian Yacht *Ha'aheo o Hawaii* in Hanalei Bay, Kauai: Preliminary Report

Introduction

When lost on 5 April 1824 in Hanalei Bay, Kauai, *Ha'aheo o Hawaii* (*Pride of Hawaii*) was the Royal Yacht of Hawaiian King Kamehameha II. Originally known as *Cleopatra's Barge* and built at Salem, Massachusetts in 1816 by shipbuilder Retire Becket for George Crowninshield, Jr., the vessel was subsequently sold to the Hawaiian monarch in late 1820. The famous hermaphrodite brig was the first ocean-going yacht constructed in the United States (Crowninshield 1913; Whitehill 1959; Ferguson 1976). In July 1995, the Smithsonian Institution's National Museum of American History (NMAH) located and surveyed the wreck of the storied yacht under the first underwater archaeological permits issued by the State of Hawaii; excavations began in 1996 and continued in 1997 (Johnston 1996, 1997).

The 1997 Excavations

In-water activities in Hanalei Bay began on 7 July 1997 with the placement of mooring, site and perimeter reef buoys. Diving and excavation began on 9 July and ended on 2 August 1997. During this period, a total of 98.91 hours of bottom time were logged in the southwest corner of Hanalei Bay excavating, recording and backfilling the wreck site.

The 1997 excavations began by opening a new trench (E13) on the edge of the wreck site, adjacent to the border reef. After this trench was completed, trench E12, first opened at the end of the 1996 season, was reopened and studied in greater detail. During the last week of excavations in 1996, considerable numbers of hull timbers were discovered in this trench. These timbers, their adjacent hull structure, and the associated small finds were further investigated in 1997. One other trench (E14) was opened in 1997 adjacent to E12, principally on account of the E12 timbers extending into the area.

In some cases, smaller loose timbers were recorded and photographed in situ, then moved to the edge of the trench where all sides could be measured, recorded and photographed. In other instances, disarticulated hull timbers were raised and recorded on the deck of the research vessel. After recording, these loose timbers were moved into a section of trench E13 and redeposited for future research and/or recovery.

Twelve 1-yd.^{3} trenches were approved for the Smithsonian's 1997 excavations by local, state and federal agencies. However, only three trenches were opened, of which two (E13 and E14) were new and one (E12) was a reopened 1996 excavation. There were three reasons for the smaller number of trenches: (1) the off-season accumulation of an additional 5-6 ft. of sand overburden over the site due to winter storms, (2) the reopening of trench E12 from the prior season to record and document the finds in greater detail (particularly the hull timbers), and (3) a larger number of small finds in 1997 which slowed excavation.

Findings

The 1997 finds closely paralleled those from earlier seasons, with a few notable exceptions. As in prior seasons, modern materials were found mixed with historical artifacts, which, for the second season, included Native Hawaiian artifacts. Among the 1997 organics were bone, ivory, gourd, leather, rope and wood. Inorganics included fragmentary and intact ceramics, iron-content concretions, copper fasteners, hull sheathing and rail/bulwark edging, glass, lead and lithics.

As in prior seasons, all recovered artifacts were shipped in bay (salt) water to the NMAH in Washington, DC for further documentation and

Underwater Archaeology, 1998, 96-103.

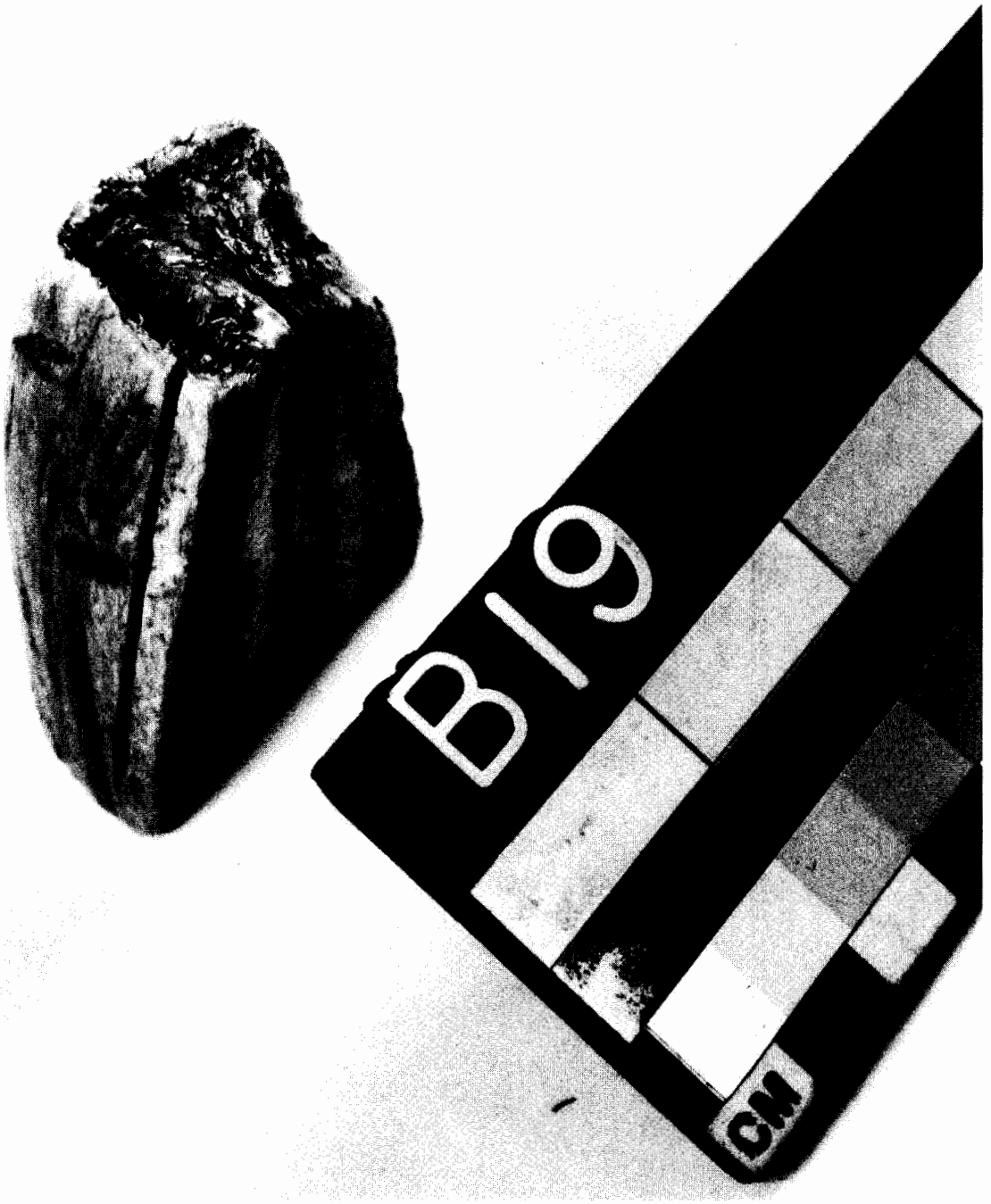

FIGURE 1. Section of carved ivory sperm-whale's tooth (B19). (Photo by Hugh Talman, courtesy of the Smithsonian Institution.)

treatment prior to their return to Hawaii. The results presented below are preliminary; further study is required before any firm conclusions are warranted.

Organics

Within the category of bone, small mammals and birds predominated among the nine specimens collected; one sample (B13) may be turtle or large fish. Two pieces of carved sperm-whale tooth ivory were collected; one is the partial tip of a tooth from a whale (probably female) more than 40 years of age (B19), and the other — a vertical section of the shaft and root (B20) — is not further typed (James G. Mead 1997, pers. comm.). All of the worked sides of both specimens are flat and undecorated; in addition, B19 has an auxiliary cut along one face (Figure 1). It is unclear whether these ivory artifacts were intended to be further carved into finished objects, or whether they were debitage from the original tooth which itself then would have been carved. Also recovered was another ivory artifact in the form of a small, intact finger ring (B21 and Figure 2). This has been identified tentatively as vegetable (rather than animal) ivory, the most likely source for which is the palm nut family originating in the western Pacific (William McClatchey 1997, pers. comm.).

The 1996 season revealed a few fragments of gourd, one of which was a large fragment of a worked bowl (MISC6; Johnston 1997:114-115). Several more small pieces of gourd were recovered in the 1997 season; however, none of them exhibited any clear signs of human workmanship. From these new finds it may be supposed that they may represent either a food source, small

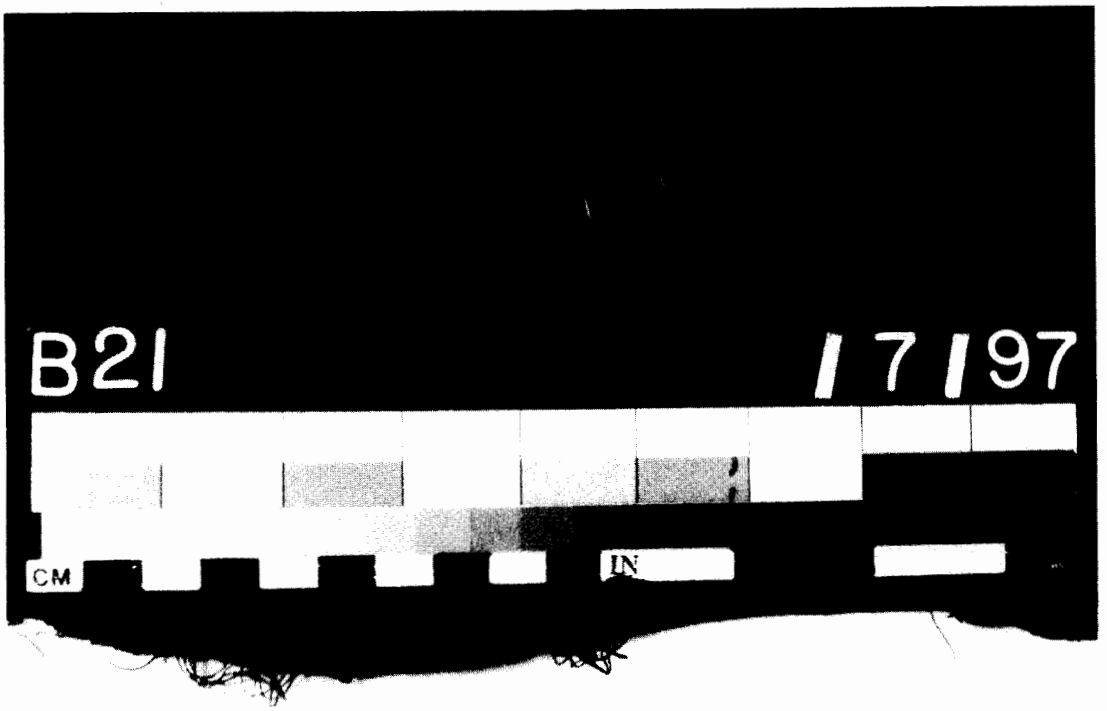

FIGURE 2. Intact ivory finger ring (B21), probably carved from vegetable ivory (palm nut). (Photo by Hugh Talman, courtesy of the Smithsonian Institution.)

FIGURE 3. Fragment of red-and-black painted furniture leg (W44), probably from a large, heavy table or bed. (Photo by Hugh Talman, courtesy of the Smithsonian Institution.)

fragments of containers that may have been abraded by the surrounding sand to the point where no evidence of workmanship is preserved, or possibly even dunnage.

At the very end of the 1996 season, a fragmentary section of painted wooden furniture was observed, recorded and reburied in trench E12 (Johnston 1997:113); one of the primary goals of the 1997 season was to recover this unusual find. During excavations, it and several other fragments from legs of the same piece were discovered and raised (W16, W31, W33, W39, W44-47). Together, these fragments should help to determine precisely what the original item of furniture was, the likeliest candidates at present being a large, heavy table or bed (Figure 3). Paint and wood samples are currently undergoing analysis; preliminary results indicate that it was made principally of white pine, with some spruce elements (Alden 1997). Other non-ship-related wooden finds include what appears to be a small, tubular fishing net float measuring 3-5/8 x 3/4 in. in diameter (W22), two beads or seeds (W41), wooden or cork bungs (W15, W40, W35), a

possible straight-edge or parallel-rule section (W32), and a length of wooden molding mitered at one end (W34). Ship-related organic finds (wood, rope, leather, etc.) are discussed below.

Inorganics

Fifteen ceramic specimens, including an intact brick, were recovered during the 1997 field season. Unlike previous seasons, preliminary analysis indicates that only the brick, which was part of a concretion (CON178), may date to the period of the wreck. The other 13 — all sherds — date from the mid- to the late-19th century, with one or two examples possibly as late as ca. 1910. English whiteware, Chinese porcelaneous stoneware, creamware, and two late 19th-century Japanese porcelains are represented, as are two kaolin tobacco-pipe stem fragments. Some of the Chinese specimens resemble those first appearing in Honolulu archaeological sites around 1850 (Susan A. Lebo 1997, pers. comm.) and may be related to the 1857 salvage of the wreck site by Native Hawaiian A. S. Nuuanu (Hunchback 1857; Lydgate 1919 [1991:22]).

The 1997 glass specimens numbered 26 examples — more than was recovered in the prior two seasons combined. As with the 1997 ceramics, most identifiable glass samples could not be associated positively with the ship wreck; a majority are from mid- to late-19th century liquor bottles, or modern beer and soda bottles. The one exception is a small glass bulb in a 1997 concretion (CON151), which matches another bulb from the fragmentary sand glass found in CON44 during the 1995 survey (Johnston 1997:118). The base of a small medicine or extract bottle of aqua-colored glass (probably dating to the mid-19th century [G50] was also recovered.

Nearly all of the 1997 metal finds are from the ship's hull (discussed below). One notable exception is a group of 26 lead musket balls, all from trench E12 up against the border reef. Fifteen of these were found in a single deposit beneath the ship's keelson, against the reef face. Associated with this cache and with several other lead musket balls, which uniformly measure 9/16 in. in diameter, were comparably sized river-rounded pebbles, samples of which also were recovered. A heavily concreted 4-in.-long hinge of yellow metal (brass?) with one corner and its pin missing was recovered, as were numerous fragmentary modern metal items.

Several lithic artifacts from the 1997 campaign add to the growing list of Native Hawaiian artifacts recovered from the wreck site. One is an oblong, rounded piece of basalt flattened on one surface, with what appears to be a channel worked around the rounded surface (MISC18); this may be a fishing net weight. MISC36 is a small, squared stone with flattened and ostensibly worked surfaces; one end is broken off and the other is pierced with a small hole. This too may be a fishing net weight. Another is in the form of a truncated trapezoid (MISC25); the small end and three of the sides are worked into flat surfaces. The fourth side is flattened but rough, and the larger end appears broken off. Ostensibly a burnisher or polisher, MISC27 is a triangular flattish stone (lava?) with rounded edges and several small, worked platforms on all surfaces. MISC30 is a small, hollowed rock (basalt?) flattened on the surface opposite the hole and measuring 3-3/4 x 3 x 2-1/4 in. Preliminary analysis indicates that this may be a kukui-nut lamp; the kukui (or candle) nut, from the Hawaiian state tree, is a small, chestnut-sized oily nut which provided a steady light after its husk was removed and the remainder burned.

Hull Structure and Rigging

Trench E12, containing the hull timbers discovered at the end of the 1996 season, was reopened at the outset of the 1997 campaign, and the timbers re-examined and further documented. Measured drawings of their features were prepared and included in a master site plan. Most timbers were excavated to their ends, which had not been possible in the prior season. As previously observed in 1996, all timbers had severely degraded and *teredo*-ridden surfaces, rendering recording

and interpretation difficult. The most significant structural member discovered in 1997 was a long, tapering timber, sheathed on three sides in 3/8-in.-thick lead, this fastened with 1-1/4-in. copper nails with large heads, that was found at the eastern side of E12. Measuring 6 ft. 3-3/4 in. long and 5 in. high on the sides, the feature's large end has a beveled tip; the smaller end terminates in a straight vertical end. The exposed wooden surface was too degraded to exhibit any features indicative of the original purpose of this construct; further research is likely to reveal that the lead formed some sort of protective shoe for the wood beneath. The taper, however, seems to preclude the most obvious interpretation as a rudder piece. The other lead artifact recovered from the hull structure comprises a crumpled "X" measuring 6 in. high and wide by 3/32 in. thick — a draft mark originally fastened to the stem or sternpost by copper nails, two of which are preserved (Figure 4).

Numerous fragmentary sections of copper hull sheathing also were recovered during 1997; all were smaller and in worse condition than those found in prior seasons, having degraded and corroded surfaces. None had any visible markings, and all were found dissociated from the strakes to which they were originally fastened. Similarly, several dissociated but intact copper spikes and nails were recovered; the former were presumably used to fasten timbers below the waterline, and the latter closely resemble the many hull sheathing fasteners found in earlier seasons. In addition, several unassociated treenails with two different

FIGURE 4. Crumpled, intact lead "X" with two nails still attached (L15): a marker fastened to the stem or sternpost indicating the ship's draft. (Photo by Hugh Talman, courtesy of the Smithsonian Institution.)

types of wedges also were recovered. One wedge type is the more common, with a thin, narrow wedge bisecting the treenail diameter; analysis reveals that they were made of spruce and white oak (Alden 1997). The other type comprises triangular-headed wedges centered in the treenail's end; these wedges were spruce (W25, W49) (Alden 1997) and may reflect repairs to the ship.

Three partial blocks associated with running rigging were recovered in 1997; the largest (MISC49), comprising half the block with its sheave and pin, measures 13 in. long x 9 in. wide. The next largest is an intact, hand-carved block measuring 5 x 3 x 2-1/4 in. (W51). The smallest (W37) is one side of a block lacking both its sheave and pin and measuring 3-7/8 x 3-1/8 x 7/8 in. with an oversized pin-hole diameter of 1-1/16 in. Too small to have been a part of the ship's running rigging, this little block may have been part of a small boat's rig. An intact, wooden sheave-shaped artifact also was recovered, but its rounded sides and unworn surfaces suggest that it is probably a thimble.

Three sections of wooden molding were recovered; two of white oak were thick, heavy, finished on all four surfaces and painted black (W28, W38). Probably sections of railing or bulwark, these were sectioned, recorded and redeposited. One long, beveled piece (W34) of a dense hardwood with remains of several small iron nails along its length (mentioned above), may have been a decorative molding from within the grand salon or another similarly decorated cabin; it may also have belonged to a piece of fine furniture.

The last category of ship-related finds is rope, similar to that recovered in previous seasons. The 1997 rope varies in diameter from 1-1/4 to 3/8 in. Hawser-laid samples were found, as well as some wormed and whipped examples. Many were found wrapped with leather for protection against chafing. It is not yet clear whether this rope or line was from the yacht's standing or running rigging.

Related Research

Research on various other aspects of the *Ha'aheo o Hawaii* artifact assemblage has been proceeding on several fronts. In 1997, a sample of a red coating noted on a long, thick strip of leather (MISC8) was sent to the Smithsonian's Conservation Analytic Laboratory for analysis. This leather strip was identified initially as chafing gear for heavy line aboard the ship (Johnston 1997:115). This was subsequently confirmed when samples of leather-wrapped rope were recovered. Originally thought to be the preservative red lead, the coating proved to be a red mercuric oxide pigment, better known as vermilion (Cunningham 1997). Lacking any preservative purpose, this vermilion must have been decorative.

Conclusions

Fewer ceramics were recovered during the 1997 campaign than in previous seasons, and neither they nor the 1997 glass were readily attributable to the period of the wreck. However, there was a clustering of both object categories in the 1850s, perhaps reflecting the 1857 salvage of the wreck. Another grouping of ceramics and glass from alcoholic beverage containers from the last quarter of the 19th century was also observed, for which no explanation is offered at present. Only a few new timbers were observed in trench E14, adjacent to the main group in E12 against the reef, perhaps indicating that the reef itself has protected the preserved timbers from the dynamic environment since 1824.

The nature of the site, which is buried beneath several feet of sand, precludes any conclusions being drawn at this point regarding the total extent of the site and its condition, beyond what remains have specifically been observed. As a result, another season of excavations is currently planned for the summer of 1998.

ACKNOWLEDGMENTS

The 1997 excavations of *Ha'aheo o Hawaii* were directed by Paul F. Johnston of the Smithsonian Institution's National Museum of American History. Project staff included Thomas J. Ormsby of the Smithsonian Institution, Lolly Vann of East Carolina University, and Richard W. Rogers and Robert Spielman of Haleiwa, Hawaii. Topside support was provided by Richard Drayton of Princeville, Hawaii, and Sandwich Islands Shipwreck Museum members John Dunn, Steve Gould, Ned Rogers and Angelique Spielman.

Support for the project was provided by the Princeville Hotel & Corporation, the Ship Stores Gallery of Kapa'a, Hawaii, the Salem Marine Society of Salem, Massachusetts, the Smithsonian Institution's Research Opportunities Fund, the National Museum of American History's Ship Plans Fund, Sunrise Diving Adventures of Kapa'a, and Hanalei Watersports of Princeville.

Special thanks go to Stephanie Reid of the Princeville Hotel. Debra Drayton, Elena Harrington and Michele Lewis of the Princeville Corporation also ensured the smooth operation of the excavations. Ralph Young of Hanalei Sport Fishing & Tours, and Doug Phillips of Na Pali Adventures also provided material assistance and advice. Susan Lebo of the Bishop Museum was kind enough to review the 1997 ceramics and glass, and J. Richard Steffy of Texas A&M University continues to share his encyclopedic knowledge of ship construction. From the Smithsonian Institution's Conservation Analytical Laboratory, Harry Alden and Mel Wachowiak consulted on the wood typing, Ron Cunningham analyzed the paint samples, and Camie Thompson conducted the x-ray analysis. From the National Museum of Natural History, James Mead reviewed the ivory specimens and Melinda Zeder and Storrs Olson analyzed the bone finds.

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PAUL F. JOHNSTON
NMAH-5010/MRC 628
SMITHSONIAN INSTITUTION
WASHINGTON, DC 20560

WIL NAGELKERKEN

Nineteenth-Century Dutch Pearlware Recovered in the Harbor of Curacao, Netherlands Antilles

Introduction

In connection with repair work on the quay wall of the Handelskade (Figure 1) in the harbor of Curacao, Netherlands Antilles, the bottom along the old quay wall was dredged out in the first half of 1993. This work created a 2-m wide trench approximately 1 m deep. During the excavation, numerous 17th-, 18th- and 19th-century historical artifacts were found. These artifacts were probably dumped into Saint Anna Bay as refuse by people living nearby.

Since this material was threatened by a new sheet pile wall being constructed by the Curacao Ports Authority, it was decided to conduct an archaeological survey of the project area. The Archaeological-Anthropological Institute of the Netherlands Antilles (AAINA) was contacted and permitted to conduct this research. In June and July 1993, underwater archaeology, financed by the Curacao Ports Authority and AAINA, was carried out. The bay floor in front of the old quay was examined for historical material during some 20 dives. The average depth along the Handelskade is about 9 m.

Fifty-four percent of the ceramic materials collected were English creamware and pearlware. Some similar material appeared to be from Maastricht, Holland. The Maastricht ceramics resemble English pearlware, in part because it was a Dutch copy. Many Maastricht wares had backmarks, making it easier to distinguish them from the English variety. A few additional Maastricht ceramics found during the 1994-1998 excavations of the Dutch frigate *Alphen,* which exploded and sank in 1778, are also included in this study.

TABLE 1
FORMS OF DUTCH PEARLWARE

Vessel Form	Number (N=36)	Frequency %
Bowl	12	33
Plate	8	22
Cup	4	11
Chamberpot	4	1
Saucer	3	8
Platter	2	6
Teapot	2	6
Pitcher	1	3

TABLE 2
FREQUENCY OF DUTCH PEARLWARE OVER TIME

Period	Number (N=36)	Percent %
1861-1870	4	11
1871-1880	9	25
1881-1890	11	31
1891-1900	7	19
1901-1910	1	3
1911-1920	1	3
1921-1930	3	8

Material and Methods

During June and July 1993, underwater archaeological research conducted by a team from AAINA recovered and analyzed historical artifacts disturbed during dredging. For control purposes, a 210-m long line was extended along the length of the quay 5 m from the bottom of the quay wall. This line was marked in 5 m increments. Recovered artifacts were cleaned, conserved and identified with date and location. They were then examined to determine the country of origin, functional use (form), nature of material, date, measurements and descriptions.

During November and December 1993, small excavations were conducted along the base line

Underwater Archaeology, 1998, 104-110.

and additional artifacts were collected using an airlift. During excavation of the frigate *Alphen*, historical materials were collected using an underwater pump.

Results

During both the 1993 Handelskade and the 1994-1998 *Alphen* excavation, some 36 dateable 19th-century ceramic artifacts from Maastricht, Holland, were collected. Table 1 shows the forms and frequency of vessels from Maastricht excavated in the harbor at Curacao, with the exception of a few chamberpots and a pitcher. Table 2 presents the various wares by frequency over time. All these artifacts had backmarks so it was possible to confirm their Maastricht origin and to accurately date them. The data in Table 2 shows that most of the Maastricht ceramics came from the time between 1870 and 1900 with a peak between 1881 and 1890. For dating Maastricht earthenwares found in Curacao, the work of Polling is essential (1993).

Discussion

Before pearlware became the fashion in England, other kinds of earthenware were used as dinner service in the 18th century. In the first half of the 18th century especially, the so-called English delft, made of a soft, yellowish clay covered with tinglaze, and comparable to the Delft

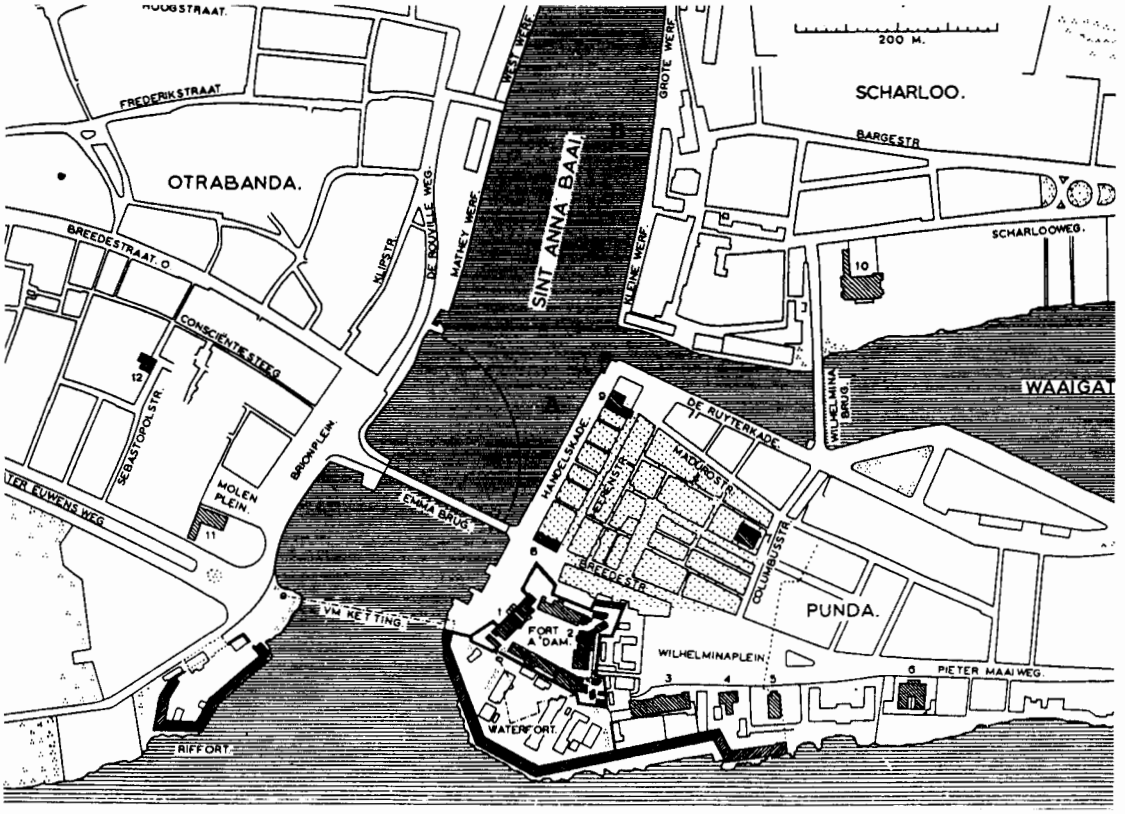

FIGURE 1. The harbor at Curacao: *a*, the location of the Handelskade; and *b*, the Dutch frigate *Alphen*.

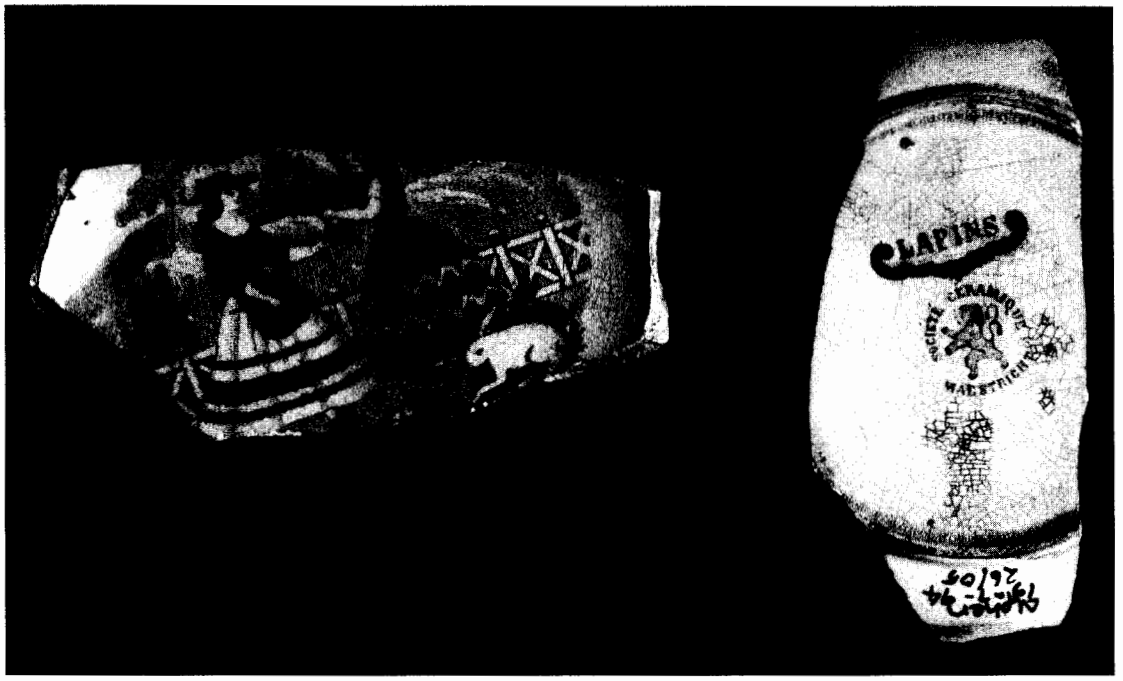

FIGURE 2. Left, pearlware saucer, base diameter 7 cm. Right, backmark *Société Céramique* (1870-1895).

earthenware used at that time in Holland, was popular. Although production of English delft continued until at least 1780, after about 1730 it became less popular due to production of much harder wares made of white stoneware covered with a clear saltglaze. This was popular during a short period between 1730 and 1770 and included plates, bowls, saucers, mugs, etc. Popularity declined because of the spectacular rise of cream-color dinnerware in the years after 1760. Most of this new ware was made in Staffordshire where a fine, white clay was used, covered with a yellowish leadglaze. After 1760, this creamware became England's most popular export product and a decrease in English delft and white saltglazed stone occurred. According to Miller, before creamware, earthenware was a "low status ceramic," whereas porcelain was a "high status ware" with a limited market (Miller 1984). Wedgewood, a creamware producer in Staffordshire, however, was able to produce creamware for all levels of the market.

The production of pearlware started in the 1770's, and around 1810 pearlware was the main dinner service. This bluish, white ceramic was invented by Wedgewood but,

> pearlware did not herald the demise of creamware, as the latter had of white saltglaze. Pearlware was, as Wedgewood had prophesied, a change rather than a substitute, and the two wares continued to be made together, sold together, and used together through the second decade of the nineteenth century. (Nöel Hume 1971:235).

After 1820, however, the domination of pearlware decreased as it was partly replaced by different forms of hard whitewares and semi-por-

celain. It is this so-called pearlware which influenced Petrus Regout of Maastricht and resulted in his production of Maastricht pearlware dinner service and other forms. In 1836 Petrus Regout founded an earthenware factory in Maastricht. In 1879, after the death of Petrus Regout, the partnership Petrus Regout & Company was created (Van den Berge 1977).

Van den Berge reports that, although in the beginning period of the Regout factories an intentional imitation of English pearlware occurred because it was in fashion at the time, it is too simplistic to continue considering Regout earthenware as just an imitation of the English pearlware (Van den Berge 1977:594). In contrast to the English ware, the Maastricht ceramics were marked with dateable backmarks, making it possible to distinguish the Dutch from the English ware. The total number of dateable Maastricht artifacts came to 36 and consisted of bowls, cups, plates, chamberpots, saucers, teapots, a platter with cover, and a pitcher.

In the Regout factory, the English manufacturing methods of models and patterns were initially used (Van den Berge 1977:590). Some English raw materials were also imported. Therefore it is difficult to distinguish unmarked English and Dutch pearlwares without backmarks. The problem is compounded when only body sherds are found.

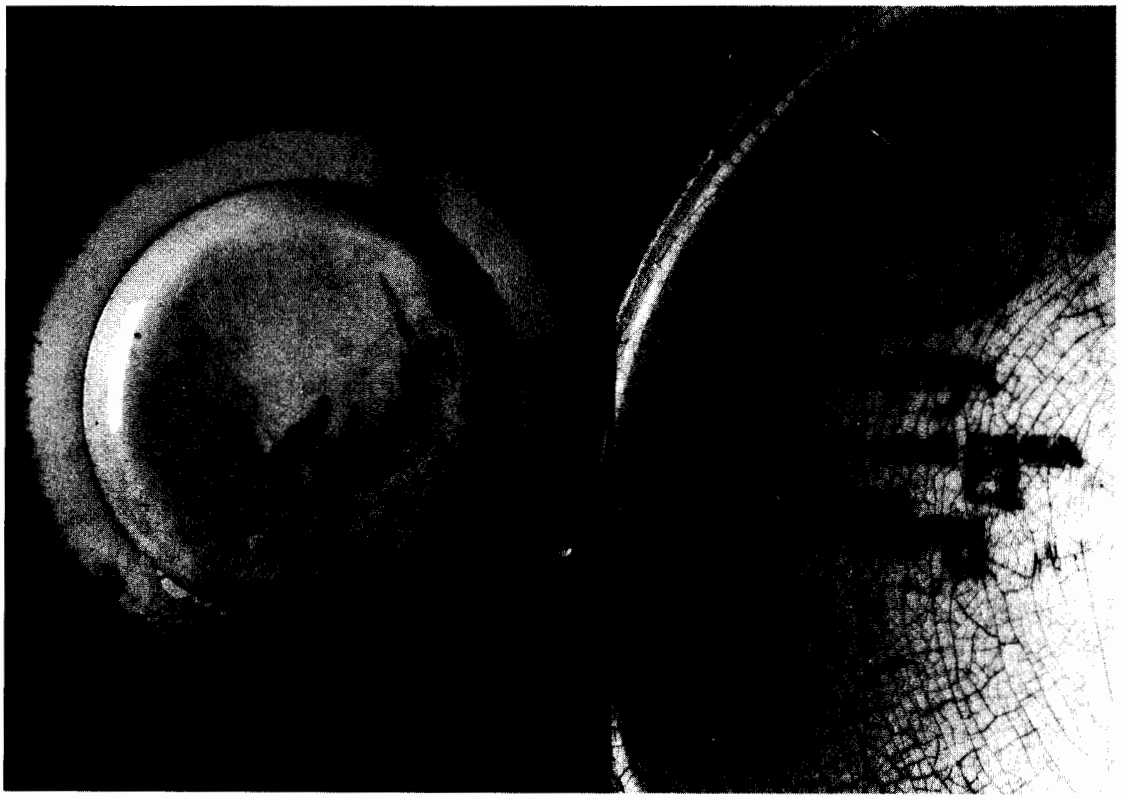

FIGURE 3. Left, pearlware plate, diameter 24 cm. Right, backmark double oval and blind mark *Z*. Intentional break below the first character *A* of the word *MAASTRICHT* indicates a date ca. 1880. Below the backmark is the same text in Javanese.

Decoration of the Maastricht earthenware included hand-painted, stamped and sponged patterns as well as transfer prints. English names were often added to accent the resemblance to English products (Van den Berge 1977:592).

During their existence, the two Regout companies used a number of backmarks (Polling 1993). From the beginning period until ca. 1850, little is known. It is likely that the so-called *boerenbont* patterns, a simple hand-painted earthenware, were made during this period. Only after 1850 were backmarks in color used. The trademark *sphinx* came into use after formation of Petrus Regout and Company in 1879. Among the factory stamps, two types can be distinguished: image stamps and blind stamps.

Image stamps are marks placed on the bottom under the glaze, in black or in the pattern color. Blind stamps are marks without color, pressed into the still soft clay before glazing. Most image marks and blind marks on the Maastricht wares found in Curacao come from Petrus Regout & Company, and Société Céramique (1863-1958), the G. Lambert firm (Polling 1993).

Table 3 shows the distribution of pearlwares with backmarks. Image stamps were present on 31 of the 36 vessels, sometimes in combination with small blind marks. On four artifacts, blind marks were found. No blind marks were exclusively found on Société Céramique vessels.

The most common mark was the Sphinx. This backmark was officially registered on 4 May

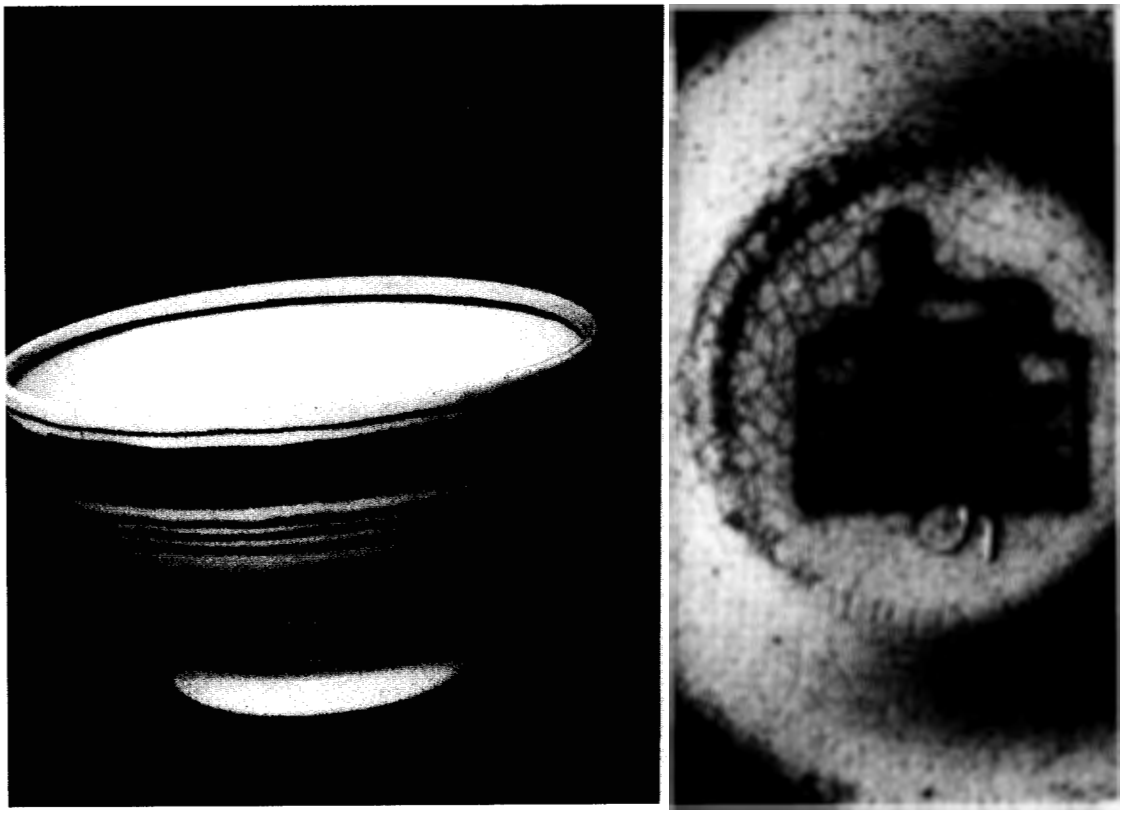

FIGURE 4. Left, pearlware bowl, diameter 9.2 cm. Right, backmark sphinx and blind mark *5*. Intentional break above the character *t* in the word *Petrus* indicates a date ca. 1894.

TABLE 3
IMAGE AND BLIND MARKS ON DUTCH PEARLWARE

Backmark Type	Number	Percentage (N=36) %
Sphinx	10	28
Double Oval	7	20
Société Céramique	7	20
Single Oval	3	9
Characters	3	9
Staffordshire Knot	1	3
Blind Marks	4	11

1883 and was used until ca. 1900 (Polling 1993). The double oval image with text inside the oval occurred on 20 percent of the marked vessels. The single oval with text is present in only 9 percent of the cases but it has the same text: P. Regout, Maastricht, A 1836. The year 1836 represents the founding date of Regout's factory. These backmarks were used from 1878 until the end of 1885 (Polling 1993).

On three vessels, all chamberpots, the initals: P. R., (Petrus Regout) in black color were found. These probably date to about 1880 (Polling 1993). In one case a backmark with the crowned Staffordshire knot was included with the marks: P. Regout Maastricht POMPEIA. Four vessels (11%) had blind marks without any other marking. In two cases, the blind mark was in the form of a double oval (one) and a single oval (one) with: P. Regout Maastricht. Between the two words, the number "10" was found on the double oval and a "0" occurred on the single oval. These backmarks date to between 1850 and 1870 (Polling 1993).

The Société Céramique existed between 1863 and 1958. Almost all Société Céramique marks use the standing lion (Figure 2). In Curacao these represent 20 percent of the total marked Maastricht vessels. Other small blind marks found in combination with backmarks had a single letter, either P, R, or Z, and a number, either a 1, 2, 3, 4, 5 or 8. The meaning of these codes is unknown.

A Javanese translation of the backstamp text was found on two plates and a saucer with the double oval backmark (1880-1882) and on the bottom of a bowl with the backmark sphinx (1896). The Javanese was probably added to ceramics planned for export to the former Dutch East Indies (Figure 3).

Sometimes the year of production is stamped on Maastricht wares but this was not seen on those recovered in Curacao. According to Polling's essential work (1993), the production year is given by a "score system," involving the use of the numbers 7, 8 or 9. On two plates dated to 1880 by another method, the backmark double oval and the blind mark "Z" were found associated with four horizontal dashes ("scores"). There is also another form of dating called "break and dot." In these backmarks, involving four different types of the sphinx, intentional breaks in the image were found. According to Polling (1993), the breaks in the image can be translated into dates based on what letter is above the break in the mark border (Figure 4). This brief presentation should help alert archaeologists to the presence and the dating of 19th-century Dutch ceramics in maritime sites.

ACKNOWLEDGMENTS

The work on which this paper is based was funded by the Archaeological-Anthropological Institute of the Netherlands Antilles, the Island Territory of Curacao, and the Curacao Ports Authority. The photographs were made by Interphoto C.V., Curacao. Funding to present an abbreviated version of this paper at the Conference on Underwater and Historical Archaeology during January 1998 was provided by the Prins Bernhard Fonds Nederlandse Antillen en Aruba, Banco di Caribe N.V. and the Antillean Airlines (ALM).

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WIL NAGELKERKEN
ARCHAEOLOGICAL-ANTHROPOLOGICAL INSTITUTE OF THE NETHERLANDS ANTILLES
JOHAN VAN WALBEECKPLEIN 6 B, CURACAO
NETHERLANDS ANTILLES

ANNE G. GIESECKE

The Abandoned Shipwreck Act 1988 to 1998

Introduction

The Abandoned Shipwreck Act (ASA) of 1987 became law in 1988; this review offers a then and now perspective. Current issues are briefly sketched in an effort to stimulate the reader's interest in helping to continue to improve shipwreck management. Issues are more complex today than in 1988, but the bottom line is that shipwreck management is much better now. A review of the 10 years that the Abandoned Shipwreck Act has been in place shows some commendable accomplishments. In 1988, the ASA clarified state entitlement to abandoned shipwrecks that are embedded, embedded in coralline formations, or eligible for inclusion in the National Register of Historic Places.

What we have seen since 1988 is that states with shipwreck programs in place before the law was enacted were able to enhance their programs. States that valued their underwater resources found that, with the increased legal certainty afforded by the ASA, they could put more money into programs for interpretation and protection and less into litigation. States with little interest in their shipwreck resources prior to 1988, conversely, maintained this indifference. Here, "state" is meant to include states, territories and possessions of the United States. Indeed, the fear of ASA opponents that states would go into the treasure hunting business to the loss of both resource protection and free enterprise proved unfounded. A primary function of the legislative debate proved to be the education of states and the general public about the value of the resource base. Some examples of the improved condition of the management and protection of submerged cultural resources follow.

In 1988, only 27 states had laws specifically addressing their underwater resources. Now, all states have evaluated their legal systems as they apply to underwater resources and, where necessary, have modified their laws. Only 18 state laws allow compensation for private sector recovery; notably 13 of those were in place before 1988. All states now include underwater resources in their state historic-preservation plans. In 1988, only 36 underwater sites were listed in the National Register of Historic Places, now there are 577. In 1988, only Florida had a state underwater park; now dozens of states have parks.

As to the cost of litigation, where states previously faced 30 to 40 salvor/admiralty claims a year before the ASA, the last seven years have seen the admiralty system deal with only three states and four cases. A selective chronology of critical events in the history of the ASA is shown below.

Chronology

In 1236, the English government developed the basis for what is today's admiralty law to reward salvors who recover ships, cargos, and lives from peril at sea with a payment from the vessel owner. In the 1960's, SCUBA equipment made underwater areas accessible to a broad range of people. George Bass and Peter Throckmorton began working to have shipwrecks recognized as legitimate archaeological sites. In 1960-1961, sport divers put two sites in Lake Champlain on the list of National Historic Landmarks: the American Revolutionary War ships sunk at Valcour Bay and the War of 1812 warships sunk at Plattsburg Bay.

In 1963 Colorado became the first state to pass a law specific to the ownership of abandoned shipwrecks on state submerged lands as part of a review of their water rights legislation. That same year, gold coins washing up on a Florida beach led to the discovery of the 1715 Spanish Plate Fleet. Four years later, Florida passed a law to manage shipwrecks.

In 1971 Mel Fisher and his company, Treasure Salvors, Inc., discovered the *Atocha* from the

Underwater Archaeology, 1998, 111-114.

1662 Spanish Plate Fleet. Seven years later, in 1978, Mel Fisher's company Cobb Coin, Inc., claimed the 1715 Spanish Plate Fleet in federal court. The following year, bills were introduced in the U.S. Congress to give the federal government ownership of shipwrecks buried in state land. Archaeologists largely settled their debate over the scientific merits of nautical archaeology and refocused their attention on the fight with salvors over cultural values and life-style issues.

In 1982, ownership of the *Atocha* was awarded to Treasure Salvors, Inc., by the Supreme Court because it sank beyond Florida state waters. At virtually the same time, the U.S. District court for the Southern District of Florida awarded ownership of the 1715 Plate Fleet to Cobb Coin, Inc., threatening the viability of state law. Anne Giesecke then drafted the Abandoned Shipwreck Act to decide the conflict of jurisdiction between the federal court and state governments in favor of the states.

In 1983, the U.S. Congress became the forum for resolving this conflict. Archaeologists and salvors continued their debate but did not control or own the resource as do the court and states. Anne Giesecke helped bring sport divers into the debate separate from salvors and archaeologists. Testimony was collected from groups representing about 2 million sport divers, about 200 underwater archaeologists and the few salvors.

In 1985, Dr. Robert Ballard proved new technologies and located the RMS *Titanic* sunk in 1912. Concerns were expressed about the management of shipwrecks in international waters as the era of deep-water technology and discoveries began. The *Titanic* Maritime Memorial Act of 1985 was passed in an effort to respect the integrity of the shipwreck.

Then in 1987, the *Central America*, which sank in 1857, was discovered. Concerns were raised about the management of shipwrecks in the deep waters of the United States beyond state waters. The Abandoned Shipwreck Act of 1987 subsequently became law in 1988. Abandonment was defined using the traditional admiralty standards — passage of time and a lack of effort to maintain ownership. The National Park Service published its "Guidelines" for the management of shipwrecks in 1990. In litigation between the salvors and the insurance companies over the *Central America,* the federal court determined in 1992 that abandonment can only be found on the basis of an express renunciation of ownership — affirmative abandonment — and that technological possession of the wreck rather than physical possession is valid.

Discussion

Clearly, shipwrecks are now recognized as valuable cultural resources. Unfortunately, the law and management of shipwrecks have become a microcosm of the debates over greater social issues driven by coastal crowding and changing technology. The debates fall into three categories: environmental, technological, and territorial (property rights).

Environmental Management

The ASA was written because the states needed title to shipwrecks to control excavation of state land for any purpose. The states already had clear jurisdiction over the recovery of all natural resources including sand, gravel, minerals, oil and gas, and fishing including trawling. Treasure hunters were dynamiting coral reefs to look for wrecks and using prop-wash to blast sand; in the process they were destroying fragile fish-nursery areas. State resources were also threatened by the dredging of endangered species habitat, such as turtle nesting beaches, and by the dredging of recreational beaches, which endangered small children.

The state, as a land manger representing the public good, regularly balanced multiple-uses of the state's resources. The court, as an after-the-fact actor, is not in a position to be a land manager. Shipwreck resources cannot be managed in isolation from surrounding water and land environments. Current clean water legislative initiatives at the federal and state levels will highlight

submerged lands and probably increase impact as well as protection. In 1988, the problem could be defined narrowly as a near-shore jurisdictional conflict. Today, the integrated problems of environmental management and development on a global scale are better appreciated and have substantially complicated the situation.

Technology

The technology issue has two components. The first is the availability of technology and the consideration of whether a wreck is abandoned if technology is unavailable for its location and recovery. The second involves the possession of a shipwreck by telepossession rather than by physical possession. Search and recovery technology is changing very fast. The traditional admiralty interpretation held that once a shipwreck was abandoned, ownership could not be reactivated.

Today we must consider that technology is available if it meets five criteria. (1) It must be commercially available, not just experimental. (2) It must also have cultural acceptance — for example, cloning humans does not. (3) The risk to human health and the environment must be acceptable. The Spanish diving bell of the 16th century was used to recover shipwrecks to a depth of 100 ft. (30 m), but the loss of life would be unacceptable today. Likewise, the use of prop-wash to move sand to the detriment of the environment and possibly the cultural value of the shipwreck is also unacceptable. (4) Furthermore, cost must be reasonable; that is, the technology should not be limited exclusively to national governments. (5) Finally, the technology must be available in a particular jurisdiction. The limitations of technology transfer and a broad range of trade sanctions may make technology unavailable. Perhaps a general rule for determining the availability of technology could be that if it costs less than $1 million and the expected loss of life is less than one in a million, then the technology can be considered available.

In the case of the *Central America*, the admiralty court introduced a new twist. They accepted possession on the basis of the electronic documentation of the wreck in lieu of actual in-hand recovery of ship and cargo. Telepossession is an interesting concept given our ability to manipulate technology for both public and private gain.

Property Rights

Traditionally, a shipwreck was considered abandoned if time passed and no effort was made to recover the wreck. The concept of affirmative abandonment for non-government ships was introduced in the *Central America* case. The definition of abandonment is still the most serious challenge to the ASA to date. During the last 10 years the ASA has with stood arguments that it is unconstitutional and a variety of challenges in several state courts. Currently, the United States Supreme Court is reviewing the case of the *Brother Jonathan*. The shipwreck was located by a salvor and claimed in federal court in 1991. The salvor, Deep Sea Research Inc., won lower court decisions to the effect that the 1865 wreck was not abandoned and belonged to them. The salvor bought the wreck from insurance companies, which had insured parts of the wreck. In short, it was concluded that the insurance companies had not "affirmatively abandoned" the shipwreck. The State of California argued that they were not obligated to show abandonment in a federal court.

Title under the ASA is dependent on the wreck being abandoned. The Supreme Court will probably clarify what, precisely, this constitutes. A traditional admiralty interpretation suggests that ownership be severed by the passage of time, the failure to maintain adequate documentation of ownership, and the failure to declare the asset for financial purposes. Implications of the court decision for the property rights of states, individuals, insurance companies and salvors are major.

Treasure salvors often talk about property rights and free enterprise. However, treasure salvors do not make money from abandoned shipwrecks. One fellow probably made a profit in the 1950s and another in the 1980s, but they are the

exceptions and neither one was in the United States. Salvors argue for preservation of their life-style. Government has no social, legal or moral responsibility to preserve the salvor life-style. Government has a responsibility for protecting tolerance and free enterprise, not free lunches.

Conclusion

We cannot legislate values. We can legislate rules which direct behavior. Environmental and archaeological resources are managed at the most local level. An individual decides to dig a hole or not to dig a hole. The Abandoned Shipwreck Act and state laws implementing management programs protect many sites and expand the public's understanding of the value of these resources. The Abandoned Shipwreck Act is not an end point but an important success in the process of governance.

ANNE G. GIESECKE
1001 WILSON BLVD.
ARLINGTON, VIRGINIA 22209

ROGER C. SMITH

Discovery, Development, and Interpretation of Florida's Earliest Shipwreck: A Partnership in Research and Historic Preservation

Introduction

Discovery of the Emanuel Point Ship in 1992 finally dispelled a silly Florida myth that only treasure hunters and divers find shipwrecks and that archaeologists only want to appropriate these sites for themselves. In this case, the wreck was discovered during a pilot survey of Pensacola Bay conducted by the Florida Bureau of Archaeological Research to develop a regional inventory and management model for shipwrecks (Spirek et al. 1993). At Pensacola, we sought to locate and assess submerged sites in a broad range of aquatic environments and over a chronological context that spanned eight periods of Florida's maritime history (Franklin et al. 1992).

Granted, we were assisted in these explorations by information supplied by local divers and fishermen. In fact, over three-quarters of the more than 45 sites studied by the Pensacola Shipwreck Survey were already known as "shipwrecks" or as fishing obstructions. We soon learned that approximately half of the watercraft had been abandoned, rather than wrecked. Although the project was called a "shipwreck survey," it more accurately should have been termed a sunken vessel survey. However, the early Spanish vessel we found by electronic prospecting was a real shipwreck, lying undisturbed for centuries on a sandbar where no one dives and where no fishermen recorded obstructions.

Situated in shallow water off Emanuel Point in the eastern portion of the bay, the site initially was detected by magnetometry, which signaled the presence of a wrought-iron anchor buried at the edge of a low mound of ballast stones (Smith 1994). Test excavations at the center of the ballast pile revealed the ship's mainmast step and associated architecture (Spirek 1995). Field specimens of organic materials and botanical remains demonstrated an unusual state of preservation. A growing collection of clues suggested that the ship had been Spanish and that it grounded violently on the sand bar sometime in the 16th century. Broken apart and gradually deteriorating, the ship offered a home to generations of shellfish that lived and died among its timbers and stones, creating a compact matrix of shell and sediments that capped its grave and provided a natural protection from storms, occasional fishermen, and modern shrimpers.

Two excavation campaigns in the midships, stern, and bow have revealed that the lower hull of the ship is articulated from stempost to sternpost, although portions of the port side were damaged, possibly during the wrecking event. The rudder and its fastenings are present, as well as a substantial portion of the starboard bow, which apparently collapsed and quickly was buried under protective sediments along with the anchor (Cozzi, this volume). From inside and outside the hull, thousands of objects and specimens have been collected, including European and Native American ceramics, Old World and New World botanical and faunal remains, wooden tools, stone and lead ammunition, copper galley wares, as well as remains of insects and rodents that inhabited the bilge during the vessel's sailing career (Bratten 1995, this volume; Scott 1995; Wells 1995). Careful analysis of these materials has confirmed that the ship was a large Spanish vessel, and that it sailed to Florida probably from Mexico during the middle of the 16th century.

Ongoing exploration of the Emanuel Point Ship over the past five years (1992-1997) has taught us many lessons. The location of the site is a fortunate one — just off Pensacola's historic district, in plain view from the bay bridge that conveys thousands of commuters and visitors daily.

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We decided that, since the shipwreck is a significant publicly-owned resource, its location should be marked with a prominent buoy and the public invited to become participants in its investigation, development and interpretation. A partnership was formed with the University of West Florida and the Historic Pensacola Preservation Board toward those ends.

During the course of field and laboratory work, the site was opened up to a wider world. The partnership gradually expanded to include local historical and archaeological societies, scores of businesses and civic groups, and an army of volunteers of all ages. Two field schools and a program of graduate student internships brought students from as far away as California and Canada. Local sponsorship allowed us to invite other professionals to visit the project and assess its progress in return for sharing their own discoveries during evening public lectures. As the site revealed its secrets, the Emanuel Point Ship began to receive national and international attention, helping to foster a local pride on the part of Pensacola's residents.

Another lesson we learned is that archaeologists should strive to let their sites speak for themselves. By carefully recording the features, collecting and cleaning artifacts, then comparing these with similar finds made by others, we allowed the shipwreck to reveal its secrets and gradually tell its own story. For example, when it first dawned on us that the vessel dated to the 16th century, we realized that a likely candidate for its identity was a ship of Tristán de Luna, whose fleet wrecked at anchor in the bay during a hurricane in 1559. The local press realized this, and soon we were asked in many ways, and on many occasions, to confirm our discovery as a "Luna Ship." Today, we can safely say that the Emanuel Point Ship was one of the larger vessels in Luna's fleet — not because it is what people want to hear — but because the evidence we gathered, when laid out for everyone to see, allowed a consensus of the professional and public interpretations.

Archaeological Evidence

The expedition of Tristán de Luna is a forgotten chapter in the history of Spanish colonization. Under his command, a fleet of 11 ships embarked from Mexico in 1559 to establish Pensacola, a colony that would secure the northern frontier of New Spain for the crown (Priestley 1936). Aboard the ships were 1,000 colonists and servants, 500 cavalry and foot soldiers, and 240 horses. Equipped with livestock and agricultural and construction tools, the settlers disembarked at Pensacola, only to suffer a hurricane that destroyed all but three ships in the harbor, some of which had not yet been unloaded (Priestley 1928). This catastrophe doomed Luna's colony, which was abandoned in 1561. Pensacola was forgotten by Spain until 1698, when a permanent *presidio* finally was established.

Archaeological evidence that the ship belonged to Luna's fleet gradually accumulated with each new find. An initial date range for the site was obtained by comparing the anchor with those found on other shipwrecks. Its shape and size correspond most closely with anchors recovered from the Spanish ships wrecked in 1554 on Padre Island, Texas (Arnold and Weddle 1978:224-228) and from an earlier wreck on Molasses Reef in the Turks and Caicos Islands (Keith 1987). Architectural features of the ship's central hull, particularly the mainmast step and pump assembly, are typical of 16th-century Iberian construction and similar to those of the Highborn Cay wreck in the Bahamas, which dates to the first decades of the 16th century (Smith et al. 1985; Smith 1993). They also are similar to the Western Ledge wreck in Bermuda that dates to the last decades of the century (Watts 1993). The mast step and pump assembly are even more similar to the whaling galleon *San Juan*, which sank in Labrador in 1565 (Grenier 1985, 1988).

Evidence of violent wrecking was revealed with the discovery that the ship's central-hull frames were sheared apart on the port side, ap-

parently by repeated heavy pounding on the sandbar during a severe storm. In the bilge near the port pump, a small carving was found among scraps of wood apparently left by carpenters, either when the ship was built or during a subsequent repair. Whittled from a piece of fir, the silhouette of a ship displays the classic features of a mid-16th-century Spanish galleon with high stern and forecastles, a heavy overhanging beakhead in the bow, and a gallery around the stern. These hallmark nautical characteristics are identical to those seen on a votive model dating to 1540 in the collections of Madrid's Museo Naval (Figure 1).

A growing collection of ceramic sherds helped date the site more precisely. By far the majority are from Spanish olive jars of the Middle Style (1580-1800) defined by Goggin (1960) based on paste characteristics and sherd thickness. However, based on rim style they appear to be of an earlier variety noted by recent researchers on mid-16th-century shipwrecks (Avery 1993; Marken 1994). Based on his comparative study of olive jar rim shapes from well-dated shipwrecks, Avery suggested that Middle Style olive jars can be dated as early as 1554 (Avery 1997:223). Furthermore, rimsherds from the Emanuel Point collection are unlike those from the 1588 Spanish Armada and later sites (Martin 1979; Marken 1994), providing a preliminary *terminus ante quem*, a date before which the Emanuel Point Ship came to Pensacola. In addition, a number of lead-glazed coarse earthenware sherds recovered from the site include two diagnostic types, Melado and El Morro, as well as Spanish majolica of at least two styles. Date ranges for these types have been established in archaeological contexts at St. Augustine and Santa Elena as well as other colonial sites in the Caribbean area (Deagan 1987).

The Luna expedition was outfitted in Mexico. A connection with the Central Valley of Mexico was established with the discovery of six distinctive Aztec pottery sherds of a type called *negro grafitto sobre rojo pulido* (Noguera 1975:187).

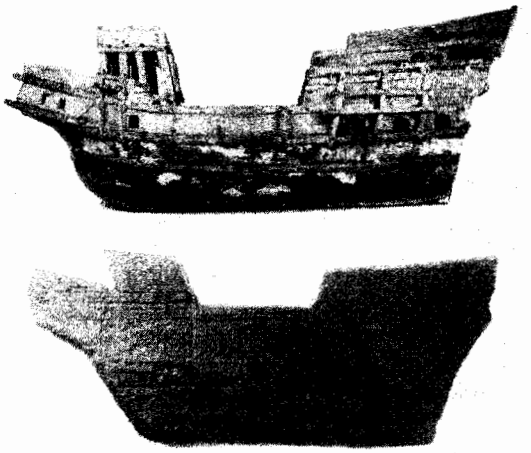

FIGURE 1. *Top*, Galleon model dated 1540 in the Museo Naval in Madrid. *Bottom*, Emanuel Point silhouette carving shown at same size.

Ceramics of this type were produced by a specific group of native potters until 1576 when plague struck their community at Cualtitlán near the former Aztec capital of Mexico (Barlow 1951). Another clue was the discovery, in the ship's bilge, of the remains of hide beetles (*Dermestes maculatus*) known to attack stored leather goods and other animal products (Hinton 1963:265). These shipboard stowaways may have accompanied a cargo, perhaps cow hides, exported from Mexico in large quantities by the mid-16th century.

During one voyage the vessel carried a different cargo to the New World — more than 250 ml of mercury have been collected from the ship's bilge. Used to extract silver from its ore, quicksilver was carefully controlled by royal monopoly, and the first permit to import mercury into Mexico for mining was issued by the crown in 1556 (Haring 1964:158). This discovery established another connection with Mexico and provided the first *terminus post quem*, a date after which the Emanuel Point Ship could have arrived in Pensacola Bay.

At the stern, next to the ship's rudder, an encrusted breastplate was found. This fragile piece of armor has been dated to 1510 based on similar examples in European collections (Eaves 1995). Perhaps the most surprising artifact to provide another *terminus post quem* is a small copper coin, identified as a *blanca* of Henry IV, minted in Spain between 1471 and 1474. Similar *blancas* have been found at La Isabela, established on Hispaniola in 1494, and at San Salvador, Bahamas (Stahl 1992). By the 1550s, this late medieval coin had little negotiable value. Perhaps its provenience aboard the ship was that of a keepsake, or more likely, it may have been present among ballast loaded from a dump of recycled stones.

Discussion

To illustrate the relationship of these artifacts as clues for dating of the Emanuel Point Ship, a chronological chart was developed (Figure 2). General beginning and ending dates for the occurrence of similar materials on archaeological sites were plotted along a time line for visual reference. Three important time markers — 1492, the date after which European artifacts appear in the Americas; 1554, the date of shipwreck materials from the Padre Island fleet; and 1588, the date of shipwreck materials from the Spanish Armada — have been added to place the Pensacola shipwreck into a chronological perspective.

Emanuel Point olive jar sherds are a recently recognized transitional form between Early and Middle Styles. By the 1580s, this form disappeared; the 1588 Spanish Armada carried true Middle Style olive jars, characterized by a different rim shape. Columbia Plain majolica found on the shipwreck is of the early variety, dating to the first half of the 16th century. Similarly, Isabela Polychrome majolica, prevalent on most

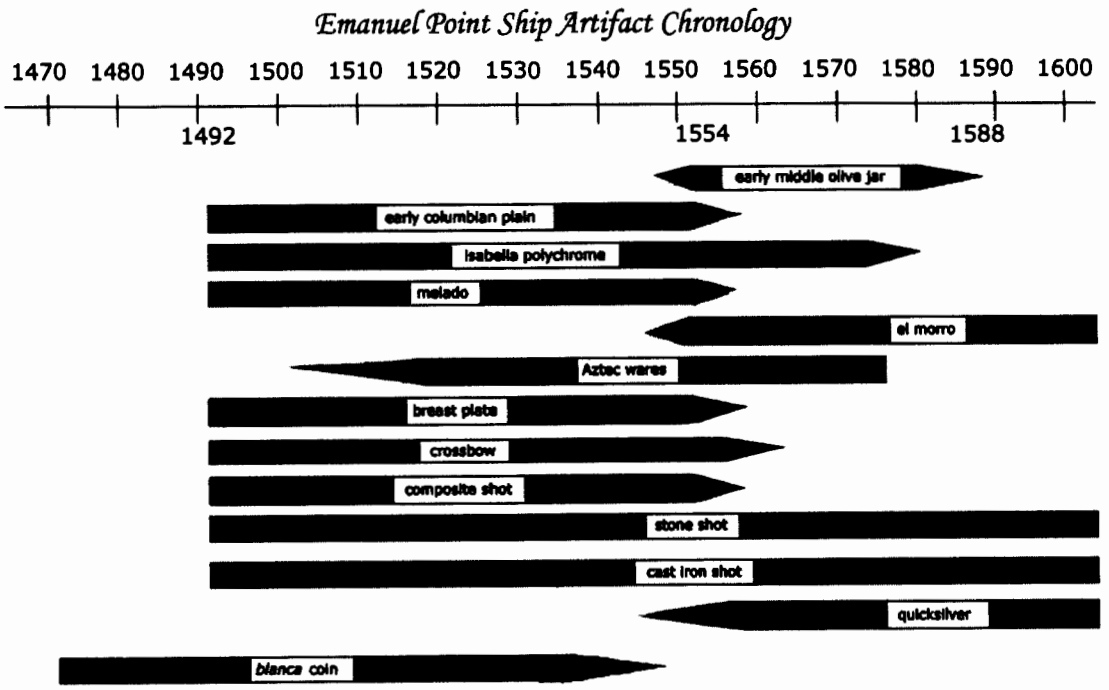

FIGURE 2. Chronological chart of Emanuel Point Ship artifacts.

early Spanish sites in the Americas, declines in frequency after 1550 but is still found at St. Augustine and Santa Elena, both founded after 1565. Lead-glazed Melado earthenwares found on the shipwreck are time markers for the early 16th century since they are absent from St. Augustine and Santa Elena. El Morro earthenware, however, occupies a later context on Spanish sites, beginning in the middle of the 16th century and continuing until the 18th century. Less well understood are the Aztec ceramics found at the stern of the shipwreck. A native Mexican redware tradition apparently influenced by colonial Spanish demands, this pottery is thought to have been made by potters who stopped producing in 1576.

The breastplate was dated to 1510, but by the middle of the 16th century this type of body armor generally had been replaced in Spanish America by padded-cloth armor, becoming the standard issue for garrisons in St. Augustine and Santa Elena. Similarly, military use of the crossbow declined during this period.

An important *terminus post quem* for the shipwreck is the presence of mercury. Although small quantities were found during recent excavations at La Isabela, quicksilver was not imported in any quantity to the New World until 1556, when it was required for a new silver amalgamation process. Finally, there is the copper coin minted in the early 1470s. This Old World coin would have been replaced in the colonies after large numbers of coins began to be minted in Mexico City in 1535

Conclusion

The discovery, development and interpretation of Florida's earliest shipwreck were made possible by a partnership between governmental and academic research institutions, and the public and private sectors. For an exercise in public shipwreck archaeology and historic preservation, Florida is an appropriate proving ground, given the state's legacy of treasure hunting and commercial salvage. In 1995, the Emanuel Point Ship was placed on the National Register of Historic Places. Concurrently, a full report of the findings of the first excavation campaign was released to the public and circulated among academic and private participants for review (Smith et al. 1995). In the same year, a search for archival documentation on the Tristán de Luna expedition took place in Spain. Sponsored by the City of Pensacola, and under the supervision of Denise Lakey, the project collected copies of over 160 documents, many of which are as yet unstudied by scholars (Lakey 1996). They now await further research and eventual translation and publication. In 1996, a major exhibit of artifacts with a full-size replica of the stern portion of the wrecksite and rudder was opened to the public in Pensacola's historic district. The following year, the shipwreck received a world wide web page, featuring a guided tour of the site and its contents (http://www.dos.state.fl.us/dhr/bar/ep). In January 1998, a major article on the Emanuel Point Ship appeared in *Archaeology* magazine, concurrent with the symposium published in this volume (Smith 1998).

Perhaps the most important lesson learned has been that there is no need to excavate the Emanuel Point Ship in its entirety to learn its secrets and to interpret its role in history. With completion of the second campaign of excavations in December 1997, less than one-half of the site has been opened for examination, yet a substantial portion of the ship's architecture has been recorded and a remarkable collection of its contents has been recovered for analysis, conservation and display. Sometime in the future, if there are additional research questions that only the site can answer, further excavation of this important and well-preserved cultural resource can perhaps be justified.

ACKNOWLEDGMENTS

In addition to Marianne Franklin, John Morris, and Michael Williamson, staff of the Pensacola Shipwreck Survey included James Spirek, Della Scott-Ireton, and Charles Hughson, who discovered the Emanuel Point Ship. Together with Dr. John Bratten, who created a conservation laboratory to treat artifacts from the site,

they conducted the first campaign of excavations. In addition to Dr. Bratten, the second campaign included J. Cozzi, Keith Plaskett, and David Pugh. Students who have worked on this early Spanish site include Janet Bancroft, Jason Burns, Stuart Derrow, Andrea Fossum, Brad Himour, James Hunter, Sandra Johnson, Sheryl Kennedy, Bill Kerr, Shea McLean, Philip Mitchell, Kyle Mueller, Beth Padgett, Brenda Rhodes, Michael Scafuri, Ty Seale, Jinkey Smalley, Clifford Smith, Monti Sommer, Lucas Spalding, Juliet Tatum, Greg Townsend, Solomon Wahrhaftig, Jenna Watts, Debra Wells, and Sean Williams. Amy Mitchell and Jeff Lockwood helped to teach the first field school in 1993. Funding for research was provided by the Florida Division of Historical Resources, the Florida Coastal Management Program, the City of Pensacola, and Fiesta of Five Flags Association, Inc.

Additional support for the research was obtained from a number of national and local businesses, including Autodesk Inc., Basic Chemicals Inc., Bell Steel Company, The Boat, Bogan Supply Company, Inc., Brown Marine Service, Inc., Building Supply Center, Byfield Marine Supply, E&B Boat Gear Discount Marine, Epson America, First City Paint & Decorating, Florida Drum Company, Inc., Gulf Coast Dive Pros, Inc., Gulf Power Company, Johnson Supply Company, Killinger Marine, Inc., Lamar Advertising Company, Licon, Inc., McMahon and Associates, Monsanto Company, Pensacola Hardware Company, Pensacola Rubber and Gasket Company, Pitt Slip Marina, Renfroe Pecan Company, Soule Marine Enterprises, Inc., SunBank of West Florida, T-Square Reprographics, West Marine, W. R. Taylor & Company, and Ye Olde Beef & Ale House.

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ROGER C. SMITH
BUREAU OF ARCHAEOLOGICAL RESEARCH
DIVISION OF HISTORICAL RESOURCES
TALLAHASSEE, FLORIDA 32399-0250

KC SMITH

Luna's Legacy in the Classroom: The Emanuel Point Ship Resource Packet

Introduction

After the site has been backfilled, tools washed and put away, and divers gone home, underwater archaeologists know the project is far from over. They have artifacts to analyze and conserve, a final report and a book to write, and educational materials to prepare for classroom teachers.

What was that last thing I mentioned? The part about resources for teachers?

Unfortunately, too few underwater archaeologists add the development of an educational component to their list of tasks to bring the project to closure.

Terrestrial archaeologists are far ahead of their waterlogged colleagues in recognizing this need and responsibility. In the past decade, alliances among researchers, teachers, interpreters, and museum educators have resulted in several hundred books, curriculum guides, games, simulations, and other resources. Many of these teach young people about archaeology in general, others focus on specific sites as examples of past cultural experiences.

Several factors prompted the emergence of these teaching materials. Preeminent has been the recognition by teachers that archaeology is a valuable and viable educational vehicle — one that is ideal for teaching knowledge and learning skills in all subject areas. Literally thousands of classroom educators in the United States have found ways to incorporate the discipline into their instructional strategies, despite the fact that archaeology is mandated in virtually no official curriculum in the nation. The resources developed cooperatively by archaeologists and educators are helping to ensure that precollegiate students receive both accurate information and meaningful educational experiences.

Terrestrial archaeologists in federal agencies also have been proactive in the development of public education initiatives in response to 1988 amendments to the Archaeological Resources Protection Act. However, the greatest incentive has been the realization that public awareness about archaeology helps diminish wanton destruction of sites. Involving members of the public, of all ages, in the processes of the discipline leads to an appreciation of the value of cultural resources and a sense of stewardship regarding their protection.

It would be inaccurate and unfair to suggest that underwater archaeology has added nothing to the compliment of resources for teachers. However, researchers have been slow to seek ways or take advantage of opportunities to extend their findings to children. Since no research has been done on this phenomenon, I can only speculate about the reasons. One factor no doubt deals with access. Underwater archaeologists probably have less contact with school groups than their land-based colleagues because teachers generally cannot bring students to an underwater project as they can with terrestrial sites. Aside from occasional visits to classrooms or conservation lab tours, maritime researchers have fewer opportunities to learn about the pedagogical needs of students and teachers. On the other hand, there seems to be less demand and expectation from educators for information about underwater projects. Lacking the visual and tactile associations that can be made at terrestrial sites, teachers may perceive that information available from submerged resources is transitory and remote. They also may be unfamiliar with technological or cultural details, or with the techniques of underwater archaeology, and therefore feel unequipped to present these topics to students.

A small but growing number of underwater archaeologists, interpreters, and museum educators have embarked on a crusade to demystify nautical archaeology and maritime history for both

Underwater Archaeology, 1998, 122-127.

teachers and students. They recognize that these domains, rather than being transitory and remote, in fact can enhance classroom instruction, educational curricula, and the student learning process. Because the materials and programs that they develop often focus on local legacies and traditions, they use concepts and resources that are both appreciable and accessible. This, in turn, helps young people comprehend the larger roles that waterborne enterprise played in the development of populations and cultures, as well as the issues that confront preservation of maritime sites.

In association with Emanuel Point project staff, the Museum of Florida History is developing an educational packet to help teachers and students explore the cultural, temporal, and technological significance of this site. These print and electronic materials are a logical extension of less formal public outreach that the shipwreck survey and shipwreck project considered indispensable from the onset. Before I describe these materials, it will be useful to explain how they fit into the larger context of precollegiate underwater archaeology resources.

Precollegiate Programs

"Hidden Beneath the Waves" is a multicomponent kit that is sent into schools. It was developed in 1992 by Mark Wilde-Ramsing (1995) of the North Carolina Underwater Archaeology Unit and staff from the Cape Fear Museum in Wilmington. Eighth-grade teachers attend a day-long instructional session before they borrow the kit for four to six weeks. Local maritime history and concepts of underwater archaeology are introduced with videotapes and discussion, then reinforced when student teams compete in a "Maritime Quiz Bowl." During the "Cape Fear Exercise," student teams use documents, library research, community resources, and other creative devices to investigate six shipwrecks based on actual sites in the area. The kit's cornerstone activity, the "Mystery Wreck Exercise," involves research at three classroom stations, where students analyze artifacts, interpret geographical and cartographic information, and map a scale model to identify a wreck.

The Lake Champlain Maritime Museum offers a program called "Digging, Diving, and Documenting: The Process of Nautical Archaeology" that engages students in activities at the museum. These activities are augmented by teacher-led, pre- and post-visit activities in the classroom. Designed for grades four to twelve, "Digging and Diving" was developed in 1993 by Laurie Eddy (1997; Nobles et al. 1995) and other museum staff. After a video introduction, students are divided into three groups that rotate among stations. Activities aboard the full-scale gunboat replica, *Philadelphia II,* emphasize archaeological context and ship architecture. At the Nautical Archaeology Center, students learn about local maritime history and archaeological methods through an exhibit and a conservation lab tour, where they assist with various tasks. Additional hands-on experiences are provided by the "Shipwreck Simulator," a wooden rowboat, over which a grid has been suspended. Student teams map grid squares, examine artifacts and scatter patterns, and record construction details, after which they share and assess their findings.

Across the continent, a different shipwreck simulation has been developed by Marco Meniketti (1990, 1991; Nobles et al. 1995). Initiated in 1988 as a day-long workshop for eight-to-thirteen year-olds, the "Shipwreck in a Bottle" program was expanded into a semester-long strategy that Meniketti used while teaching at a public school attended largely by inner city youths. The simulation's emphasis on reading, writing, measuring, drawing, comparative analysis, and computer work provided unique learning opportunities for these students. The central component is a scale-model galleon made of wood and matte board, adorned with artifacts and hardware, that is sunk in a tank of water. As they learned about archaeological theory and method through discussion and audio-visual media, students also observed the vessel's deterioration. Ultimately, they had to identify the ship from among five

candidates, using documents, research, and a mock excavation that occurred after the wreck was buried and the tank drained.

Pam Wheat (1996) of the Texas Historical Commission developed lesson plans and other resources relating to the La Salle Shipwreck Project. An electronic newsletter, called *Journeys,* on the World Wide Web offers more than sixty pages of information and activities. Each theme-based newsletter contains six regular features, including background information for teachers and students, activity ideas, supplemental resources, an e-mail link to ask questions, information about careers, and teaching tips for educators. Wheat also presents teacher workshops to further explain the archaeology of the site and facilitate use of the materials keyed to state curriculum standards.

In Galveston, the Texas Seaport Museum (1995) teaches secondary-level kids about underwater archaeology and seafaring through its half-day "Maritime Mystery." A videotape and introduction by nautical archaeologist Tom Oertling, who helped develop the program, and a tour of the 1877 sailing ship *Elissa,* set the stage for the primary activity — documenting a re-created shipwreck in the museum. Teams map grid squares, record and analyze artifacts and hardware, and assemble a site map to identify the wreck and the cause of its sinking from among three scenarios. A final group discussion challenges participants to draw conclusions about the ship, cargo, and crew, and the process of underwater archaeology.

Excavation of the slave ship *Henrietta Marie* near Key West, Florida, gave rise to a provocative traveling exhibit and several sets of educational materials. One kit was prepared by the Mel Fisher Maritime Heritage Society (Barringer 1996), which sponsored the excavation and the exhibit. Augmented by eight history- and archaeology-based posters, this classroom packet focuses more on culture than archaeology, using maps, illustrations, activity sheets, and hypothetical narratives by three children in England, Africa, and Jamaica impacted by the transatlantic slave trade. A second set of materials, published by Prentice-Hall (1997), includes a teacher manual, student workbook, and supplemental reader. Multidisciplinary readings and activities that are creative and academically sound provide information about underwater research methods as well as historical details about the site.

In Louisiana, *El Nuevo Constante,* a late 18th-century galleon, is presented to students through a classroom traveling kit that includes both history- and science-based activities. Using real and replicated artifacts from the site, illustrations, and documents, students interpret details about the vessel, its cargo, and life at sea (Nobles et al. 1995). The only other commercially produced resource is a module by Delta Education, Inc. (Mathewson 1995), that uses marine archaeology to teach concepts of science and promote scientific literacy. *If Shipwrecks Could Talk* includes 11 hands-on, classroom activities that teach students about the ocean, currents, buoyancy, pressure, and other principles using ships, navigation, artifacts, and wrecks as the media.

As we near the end of our tour of precollegiate underwater archaeology resources, I will mention briefly a summer camp that I have presented annually since 1989 through the Museum of Florida History for 12-to-16 year-olds. "From Dugouts to Doubloons: The Maritime Heritage of Florida" is a week-long program of class and field experiences that acquaints kids with Florida's maritime traditions, introduces the techniques of underwater archaeology, and strives to instill a sense of stewardship for underwater sites. The agenda changes every year, but it always includes hands-on activities relating to ship construction and navigation, a visit to a conservation lab, exploration of museum exhibits, mapping exercises on a simulated site, and field experiences on shallow-water wrecks (Smith 1991).

Here and there, other resources exist. The "JASON Project" in the Great Lakes included several components relating to ships and archaeology within a larger environmental science curriculum (National Science Teachers Association 1990). *Galleon* (Tillema 1980) and *Clipper* (Day 1982),

two simulations produced by Interact, deal with seafaring but not archaeology. *Amazon.com* —an Internet bookstore — lists about 50 fiction and non-fiction titles for kids relating to shipwrecks, underwater archaeology and treasure hunting.

I have taken the time to describe these programs, not so much to introduce the Emanuel Point materials as being revolutionary — because, in fact, they will be very straightforward, but more to point out that these are virtually all the precollegiate resources do exist. Collectively, they suggest a variety of creative alternatives for making underwater archaeology and the results of individual projects accessible to teachers and students. The media to accomplish this can be as simple as a few lesson plans produced with help from a local teacher, or as elaborate as an exhibit or hands-on simulation developed in consort with a museum. Moreover, virtually every underwater project has a built-in mechanism — its conservation laboratory — that can serve as a starting point. Consider for example, the strategies that Emanuel Point staff and its companion agencies have used to share the Emanuel Point wreck with civic and student groups.

From the onset of research in Pensacola, project staff organized public lectures, classroom programs, and other opportunities for adults and youths to learn about the site. In addition, a partnership was established with the Historic Pensacola Preservation Board, which administers numerous historical museums in the community. The Board also created an exhibit about the shipwreck and helps sponsor the Emanuel Point conservation lab. Among other efforts, Board personnel developed a program that hosted as many as 1,000 youths, from grades four to twelve, in a single month. When the students arrive, they are divided into three groups and rotated among activities. Each group was given a half-hour tour of the shipwreck exhibit, a slide presentation about the site, and a tour of the conservation lab. In addition, a pre-visit lesson plan was sent to teachers to help them prepare their kids for the experience.

The Emanuel Point Materials

Building on this and other models of precollegiate resources, the Museum of Florida History is now developing a six-week classroom unit using the Emanuel Point site as a focal point for teaching Florida history, underwater archaeology and heritage preservation. As with other terminal tasks of the research, this is a project that is very much in progress. The timeline includes development of lesson plans and supporting resources through June, an in-service session in July to prepare a small group of teachers for classroom testing of the materials in the fall, revisions and distribution by the end of the year.

Initially, the materials will be available through World Wide Web pages produced by the Division of Historical Resources (DHR), the Museum's parent agency, which already include an extensive component about the Emanuel Point Ship. The Museum also will seek funding to publish hard-copy versions, which are very important. Despite the prevalent sense that all knowledge now is accessible through the Internet, educators have made it clear that they still need conventional resources because many classrooms in the state cannot and do not rely on electronic outlets for information and learning experiences. Printed copies of the Emanuel Point packet will be disseminated through the Florida Heritage Education Program (FHEP), a larger DHR initiative to provide teaching materials, workshops, in-service sessions, and grants to Florida's educational community. Currently, more than 20 lesson plans dealing with state heritage and historical events are available through the program.

The outline for the Emanuel Point packet includes several criteria viewed as fundamental to the content of the materials. Foremost is the need to tie activities to the Sunshine State Standards, a curriculum framework that specifies what students should know and be able to do in various subject areas at the end of four points in their academic career — grades two, five, eight, and twelve. Most states have similar guidelines, and

teachers adhere to them assiduously as they plan classroom strategies, so materials that help to meet these requirements are welcomed and well used.

In addition, rather than focusing solely on the Emanuel Point wreck or historic Pensacola, the packet must have statewide applicability to ensure its appeal and utility for teachers outside north Florida. Activities also must be multidisciplinary in nature, not only to represent the various facets of underwater archaeology, but also to facilitate cooperative instruction among teachers of different subjects.

Finally, it is important that materials incorporate the heritage education concept, an approach to teaching emphasizing the use of primary sources — from documents, artifacts and structures to oral history, folklore and art. Heritage education also stresses the use of local resources as a starting point for teaching kids about the past, on the premise that appreciation of immediate traditions improves their ability to comprehend larger patterns of history and culture.

To meet these criteria, the overall theme of the packet, targeted at middle school audiences, will be Florida's first Spanish period, which extended from 1513 to 1761. The Emanuel Point Site will serve as the primary cue for student exploration of colonization and settlement in general, and for the investigation of underwater archaeology as a source of information about the past in particular. Modeled unabashedly on the exceptional *Henrietta Marie* materials produced by Prentice-Hall, the six-week unit will be divided into three segments, each organized around a central question, or theme, for students to explore. These questions include: Why did Spaniards settle Florida? How do underwater archaeologists recover the past? And what secrets does the Emanuel Point shipwreck have to share?

Each segment will include six activities to guide student inquiry and discovery. For example, a lesson entitled "Creating A Colony" will ask students to speculate about the people, supplies, and ships that were necessary for a colonial venture and then compare their ideas with documentary evidence. In the second segment, lessons entitled "A Wonderful Discovery" and "Meet the Team" will introduce students to the Emanuel Point wreck and the people and techniques involved in its excavation. In the final segment, activities such as "A Matter of Construction" and "Learning from the Finds" will explore ships and shipbuilding of the era and the processes of artifact analysis.

Collectively, the 18 activities will guide students through the study of an era of Florida's history, the discipline of underwater archaeology, and the Emanuel Point shipwreck as an example of both. Strategies for assessment, which is the measurement of student assimilation of course content, will offer students several options, such as preparing a brochure, slide show, play, or classroom exhibit dealing with the topics that they have examined.

In final printed form, the Emanuel Point Resource Packet will consist of three components. A student workbook will provide background readings, vocabulary lists, and "food for thought" concepts that link a particular lesson to other subject areas. A supplemental reader will offer information and materials that are related, but not specifically addressed in a particular activity — for example, an essay about electrolysis or a poem from the period. A teacher guide will contain lesson plans and suggestions about how to present the unit as a whole. These components will be organized similarly on the web pages, albeit formatted differently.

Conclusion

In many ways, the resource packet in development is simply a standardization of the educational media that always have been part of the Emanuel Point agenda. If the endeavor seems bold, it is one that is necessary, given the significance of the Emanuel Point Site to both Florida and U.S. history. No less important is the fact that it will add to the small number of resources about underwater archaeology available for precollegiate audiences. I hold the hope as well

that these materials will inspire others to add the development of educational resources to their list of mandatory project products.

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KC SMITH
MUSEUM OF FLORIDA HISTORY
500 SOUTH BRONOUGH STREET
TALLAHASSEE, FLORIDA 32399-0250