Michael Cameron Krivor ARCHAEOLOGICAL INVESTIGATION OF AN EIGHTEENTH-CENTURY BRITISH MERCHANT VESSEL, CHUB HEADS CUT, BERMUDA. (Under the direction of Dr. Gordon P. Watts, Jr.) Department of History, April 1998.

The purpose of this thesis is to document the remains of a shipwreck lost on the reefs of Bermuda. Located by graduate students from East Carolina University's Program in Maritime History and Nautical Archaeology in 1992 off Chub Heads Cut, Bermuda, the site appeared to retain a significant amount of hull remains for analysis and study. The Bermuda Maritime Museum applied for and received a permit from the Receiver of Wreck to conduct a partial excavation of the site in 1993. The artifact assemblage documented during the investigation helped date the site to the mid- to late-eighteenth century. Little information exists concerning the construction of eighteenth century merchant vessels and the archaeological investigation of the site would lend valuable insight into the detail of merchant vessel fabrication. Evidence generated by the excavation and assorted artifact assemblage suggests that the hull remains were a British-operated vessel which likely foundered during the mid- to late-eighteenth century. Both the hull construction and artifacts suggest that the site may be the remains of a British merchant vessel used as a transport during the American War for Independence. More precisely, the site may represent the remains of a collier, a full-bodied vessel type used extensively during the War for Independence as a transport. This can be inferred by the construction of the hull as well as the artifact assemblage. The hull construction is similar to Site 44YO88, a British collier scuttled in 1781 in Yorktown, Virginia. Although identity of Chub Heads Cut site remains in question, the site is an important vestige of the maritime traditions of

Bermuda, Great Britain, and the United States, in addition to being associated with the events of the American Revolution. Because the hull remains embody the distinctive characteristics of an important vessel type a more intensive examination of the hull remains would undoubtedly contribute to a comprehensive understanding of that maritime heritage.

ARCHAEOLOGICAL INVESTIGATION OF AN EIGHTEENTH-CENTURY BRITISH MERCHANT VESSEL, CHUB HEADS CUT, BERMUDA

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INTRODUCTION

With the commencement of the American War for Independence, Britain began one of the largest trans-oceanic military transport operations ever undertaken.[1] In an attempt to protect the crown's interest in the North American colonies, Britain initiated a massive effort to build and support armies dispatched to quell the American rebellion. Since the war was to be fought on American soil the British could not count on supplies being available in the American colonies. Therefore, every soldier, horse, blanket, piece of ammunition, and rations had to be shipped across the Atlantic to support British troops.

Britain's navy was unfit for the conveyance of troops and supplies across the Atlantic. Although Britain possessed the largest navy of the period, most of the ships were designed for warfare. This lack of suitable cargo capacity prompted the crown to undertake the enormous chore of organizing a system to lease, hire, or buy transports capable of conveying necessities across the Atlantic.

British merchants involved in the coal trade along England's coastline, operated vessels ideally suited for transporting large amounts of cargo. Inspired by earlier Dutch designs, numerous merchantman were constructed specifically to carry large amounts of cargo, such as coal. Many used in the coal trade had basic definable characteristics such as bluff bows, full bottoms, and large, capacious cargo holds. Constructed with flat floors

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[1] David Syrett, *Shipping and the American War 1775-83: A Study of British Transport Organization* (London: The Athlone Press, 1970), 192.

and simple rigging patterns, they were also suitable for operation in shallow waters and river systems.[2] Many employed in the coal trade were referred to as "colliers."

Once hired by the British government, the value of transports became apparent. Besides being appropriate for the transportation of troops and supplies, they proved to be effective in maneuvering around many of the river systems of the North American colonies. Many were used extensively in the colonies to move troops from place to place, as well as in amphibious assaults. Spacious cargo areas prompted some to employ transports as a means of retaining prisoners of war and to carry invalids back to England when necessary.

Transports provided the backbone of England's attempt to quell the American War for Independence. However, very little is known about the specifics of their construction. Although the crown required that each merchantman hired into service be surveyed before being given contracts, their design and construction features were not recorded in detail.

During the 1992 fall field school in Bermuda, East Carolina University graduate students from the Program in Maritime History and Nautical Archaeology located what appeared to be the remains of a English transport dating to the mid- to late-eighteenth century. Initial investigation of the site indicated that the hull remains were English in origin and contained certain construction features consistent with known collier traits. The general framing pattern, flat floors, and heavy construction coincided with that of Site

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[2] John William Morris III, "Site 44YO88: The Archaeological Assessment of the Hull Remains at Yorktown, Virginia" (Thesis, Department of History, East Carolina University, 1991), 19-20.

44YO88, a known British collier excavated at Yorktown, Virginia. The artifact assemblage around the Bermuda site, as well as further documentation during the 1993 fall field school, helped confirm the site as British in origin dating to the mid- to late-eighteenth century. Investigation provided a valuable comparison to the extensive information gathered from site 44YO88 and other excavated hull remains such as *El Nuevo Constante*[3] and the *San Felipe*.[4] Excavation of the site helped gain new insight into eighteenth-century construction practices.

The British crown could not have carried out the campaign to win the War for Independence without the use of transports. Transports kept the supply lines for the British open across 3,000 miles of ocean. Without the Atlantic supply lines open, chances of suppressing the war were slim to none. The vital role these vessels played has gone largely unnoticed, and an examination of the historical and archaeological record helps gain an understanding of how transports were constructed and operated.

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[3] *El Nuevo Constante* was a English-built vessel originally named the *Duke of York* and sold to Cadiz merchants on March 14, 1764. The vessel was sold by Calverly and Benjamin Bewicke of London, one of a number of mercantile establishments with ties to Spain. Charles E. Pearson and Paul E. Hoffman, *The Last Voyage of El Nuevo Constante* (Baton Rouge: Louisiana State University Press, 1995), 15-16.

[4] The *San Felipe* was another English-built vessel that was operated by an British family (the Terry's) living in Spain. Charles D. Beeker and Stephen R. James, Jr., "Underwater Archaeological Investigations at the site of the 1733 Spanish Fleet Shipwreck Tentatively Identified as the *San Felipe*: An Indiana Field School" (Prepared for the Bureau of Archaeological Research, Division of Historical Resources: Tallahassee, Florida, 1995), 13.

CHAPTER I

PROJECT AREA, SITE LOCATION, DESCRIPTION, AND METHODS

Project Area

The Bermuda archipelago is located 568 miles directly south-east of Cape Hatteras, North Carolina in the Atlantic Ocean (Figure 1). Bermuda comprises of over 100 individual islands which form a hook-shaped line around the south-eastern edge of a solitary elliptical submarine platform. The platform represents the degraded summit of a volcano from the Triassic age.[5] The islands consist of a bank-atoll formation of eolian deposits of calcareous sand. The atoll was abraded by the lowered Glacial ocean and the remains were aggraded during the Postglacial period.[6] The islands comprise an area approximately thirteen miles in length with an elevation of 210 feet.

Site Location

The wreck site was located just beyond the outer perimeter of shallow reefs that extend approximately five miles seaward on the western side of the Bermuda archipelago. Chub Heads Light, the closest navigation reference, is 0.2 miles south-southeast of the wreck location (Figure 2). Geographical coordinates for the site are 32°18.387 North Latitude and 64°58.904 West Longitude.

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[5] Frederick R.C. Reed, *The Geology of the British Empire* (London: Edward Arnold, 1921), 187.
[6] William Morris Davis, *The Coral Reef Problem* (New York: AMS Press, 1969), 212-214.

Site Description

The surviving wreck structure was covered amidships by a sizable undisturbed ballast mound. The extremities of the hull lay in sand pockets on each side of the ballast. Both extremities were exposed, revealing the surviving elements of the keel, keelson, floors, half-floors, fillet pieces, exterior and ceiling planking, and elements of a light bulkhead. Factors affecting the hull remains were excessive storm surge conditions associated with a shallow reef environment, the initial foundering of the vessel, and past salvage efforts.

Water depth at the site was approximately 22-25 feet, and visibility ranged from approximately 75 feet to more than 120 feet on occasion. Current over the reef varied with the tidal cycle and averaged less than half a knot. Since the site is located offshore, very little sedimentation covered it. Due to the exposed environment and the minimal amount of sediment deposition, only a small portion of the hull remained above the turn of the bilge.

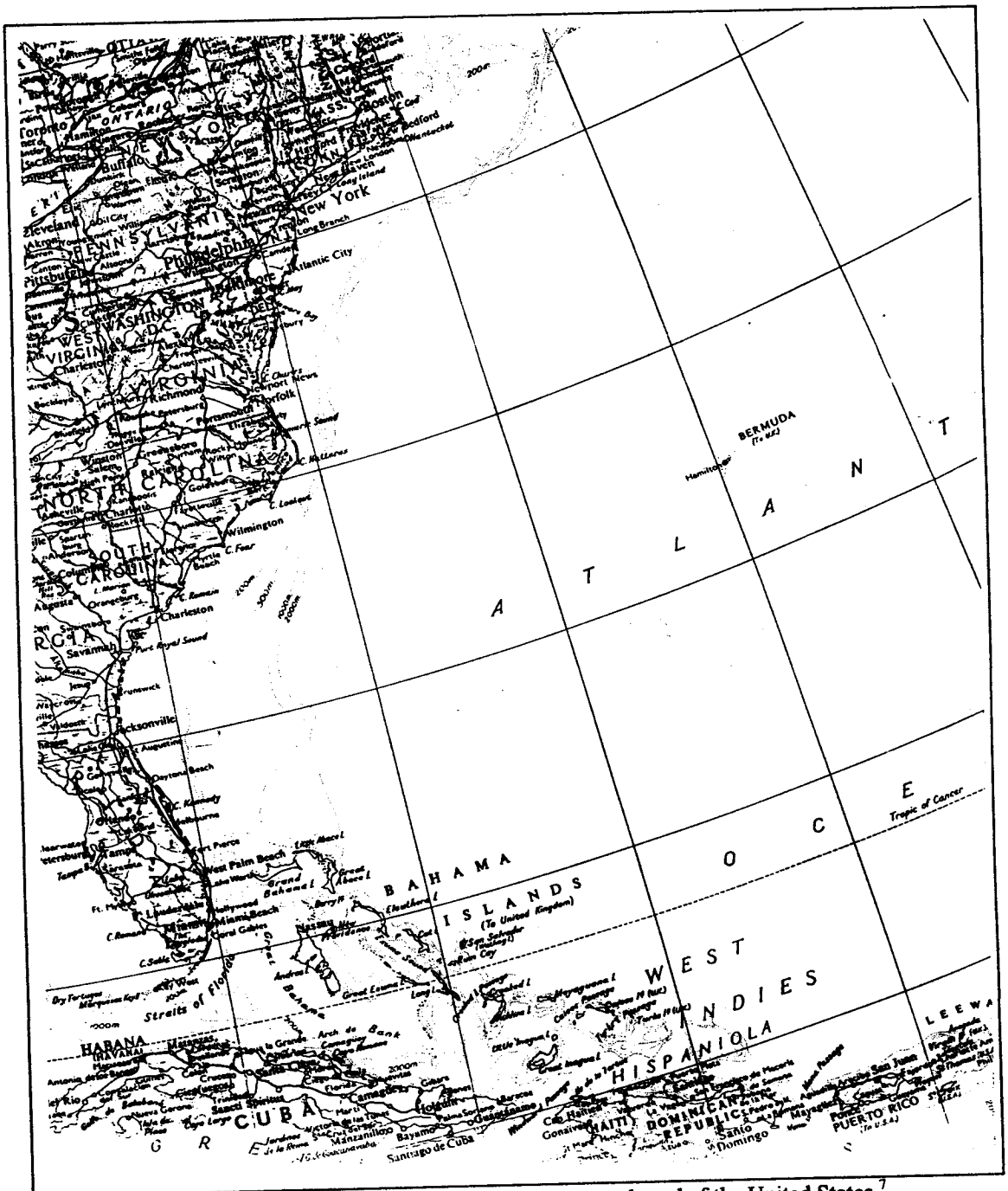


Figure 1. Map showing Bermuda in relation to the eastern seaboard of the United States.[7]

[7] As presented in The Times (in collaboration with John Bartholomew and Son Ltd.) *The Atlas of the World* (London: Times Newspapers Limited Printing House Square, 1972), 127.

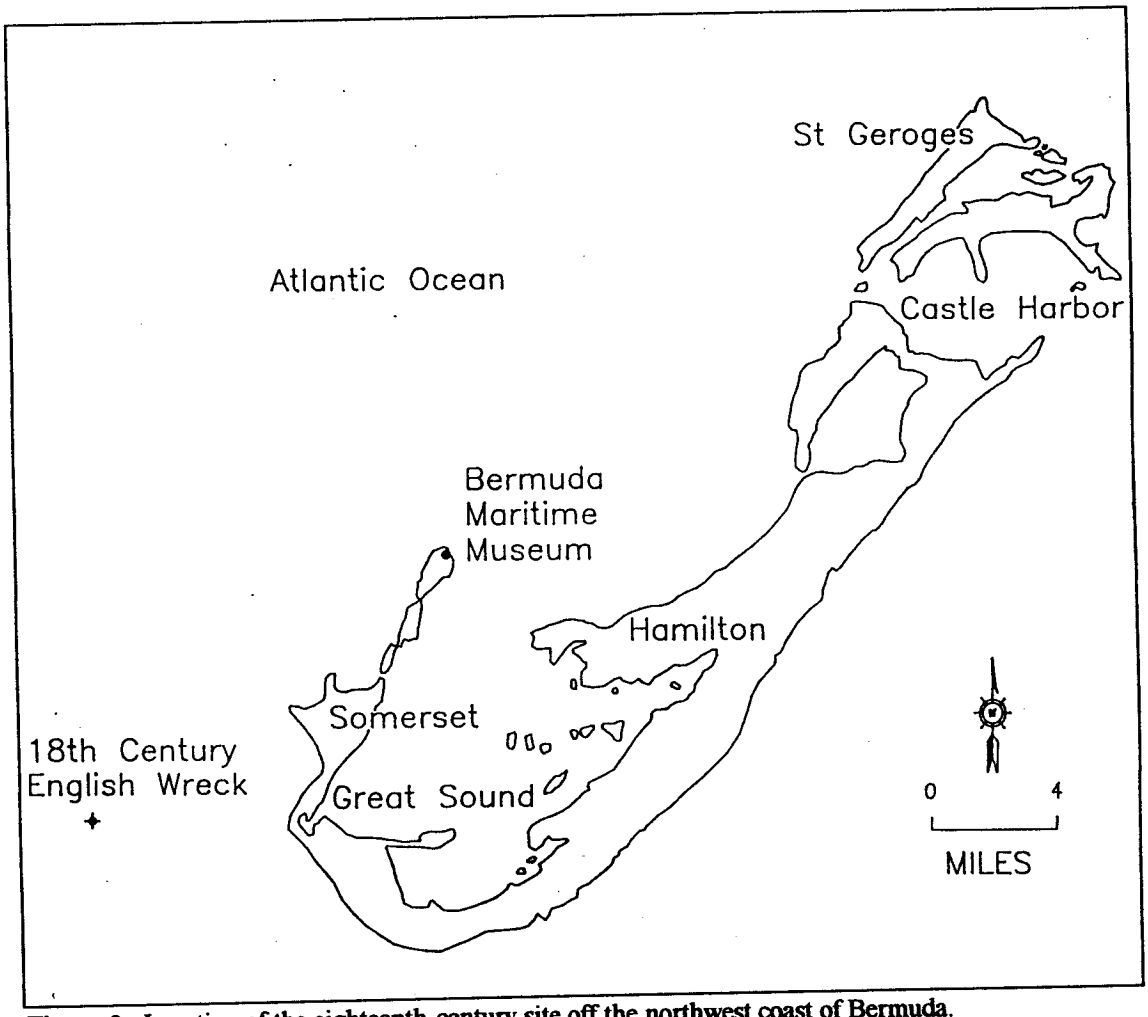


Figure 2. Location of the eighteenth-century site off the northwest coast of Bermuda.

Methods

The eighteenth-century site was one of almost 30 shipwreck sites located during the fall of 1992 by the staff and students of East Carolina University's Program in Maritime History and Nautical Archaeology. The survey methods included use of a EG&G 866 proton precession magnetometer linked to an EG&G Model G-866 marine sensor and divers on towboards to locate shipwreck remains along the reefs northeast of Chub Heads Cut, located off the northwest end of Bermuda. Briefly, the magnetometer is

an instrument that measures the intensity of magnetic forces. It measures (at the location of the sensor) and records both the Earth's ambient magnetic field and the presence of magnetic anomalies (deviations from the Earth's ambient background) generated by ferrous masses (such as iron commonly associated with historic shipwrecks). These measurements are recorded in gammas, the standard unit of magnetic intensity (equal to 0.00001 gauss). As the sensor passes through the magnetic field surrounding a ferrous mass, the strength, or intensity, of that anomaly is recorded (at 2-second intervals) on the stripchart printout of the magnetometer. The stripchart printout of the G-866 records data graphically, providing a record of both the ambient background field and the character and amplitude of any anomalies encountered. The ability of the magnetometer to detect magnetic anomalies, the sources of which may be related to submerged cultural resources, has caused the instrument to become a principal remote-sensing tool of marine archaeologists. Positioning for the survey was provided by a Navstar Differential Global Positioning System (DGPS).

Each site located during the survey was examined to collect sufficient data to support dating of the wreckage, establishment of a cultural affiliation, and an initial assessment of both significance and research potential. Exposed structural elements were documented using sketch maps and underwater photography. The position of each site was established and recorded using the DGPS.

Since the eighteenth-century site was determined to preserve a significant amount of architectural and construction data, the Bermuda Maritime Museum applied for

and subsequently received a permit from the Receiver of Wrecks to investigate and document the hull remains. That investigation took place during the 1993 field research semester carried out under the auspices of the Bermuda Maritime Museum and East Carolina University. Investigation of the wreck was carried out September 4-30, 1993. Once the site was relocated using DGPS, an on-site baseline was established to control data collection. The baseline consisted of a series of iron bars driven into the coral formations adjacent to the wreckage. A polyethylene line was deployed between those datum stations to serve as the major on-site reference. The 183-foot baseline was oriented along the axis of the keel and extended well beyond the surviving hull structure.

At the same time the baseline was being installed, the fore and aft extremities of the wreck were cleared of overburden. Those elements of the surviving hull structure had been previously exposed, and only a small amount of sediment covered the wreck. That material consisted of sand and coral residue and was readily removed using 4-inch water induction dredges powered by small centrifugal pumps. Because the area had already been partially salvaged, no undisturbed stratigraphy was found. Consequently, only the horizontal position was recorded for artifacts found within the confines of the hull, except for two casks found beneath the ballast and coral on the southern end of the wreck. The barrels remained relatively undisturbed, and their position within the hull had not been jeopardized. Each was mapped and documented *in situ*.

Once overburden had been cleared away a series of interlocking 1- and 2-meter rigid grid frames were positioned over those exposed portions of the wreck. The position

of the grid frames was established in relation to the on-site baseline. Within each grid, the exposed vessel structure was mapped using traditional X, Y, and Z coordinates (Figure 3). All fasteners and surface details were recorded to scale on the drawing. Each drawing was recorded on gridded mylar. Once a student had completed recording a grid square, the record was checked for accuracy and detail. When material within each grid was completely and accurately mapped, photographs were taken to enhance documentation and support production of photomosaics of each end of the exposed wreck structure (Figure 4).

Artifacts found during the work of clearing the hull were recorded and photographed *in situ*. With the exception of dozens of lead shot, all artifacts were recovered to facilitate dating and analysis of the wreck. Each artifact was catalogued and placed in a container for transportation to the Corange laboratory located in the Bermuda

Figure 3. East Carolina University graduate student recording the hull remains using a grid system.

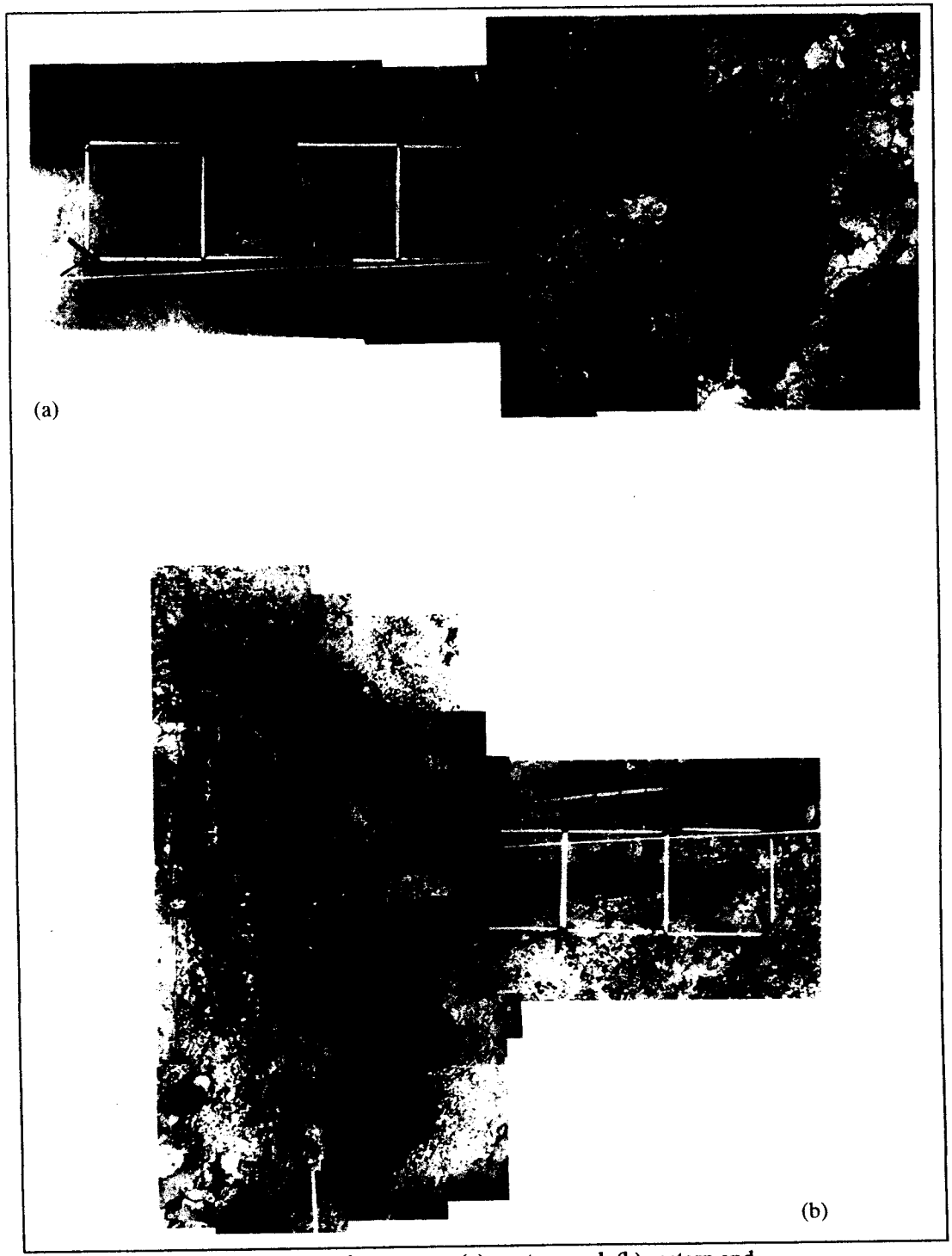


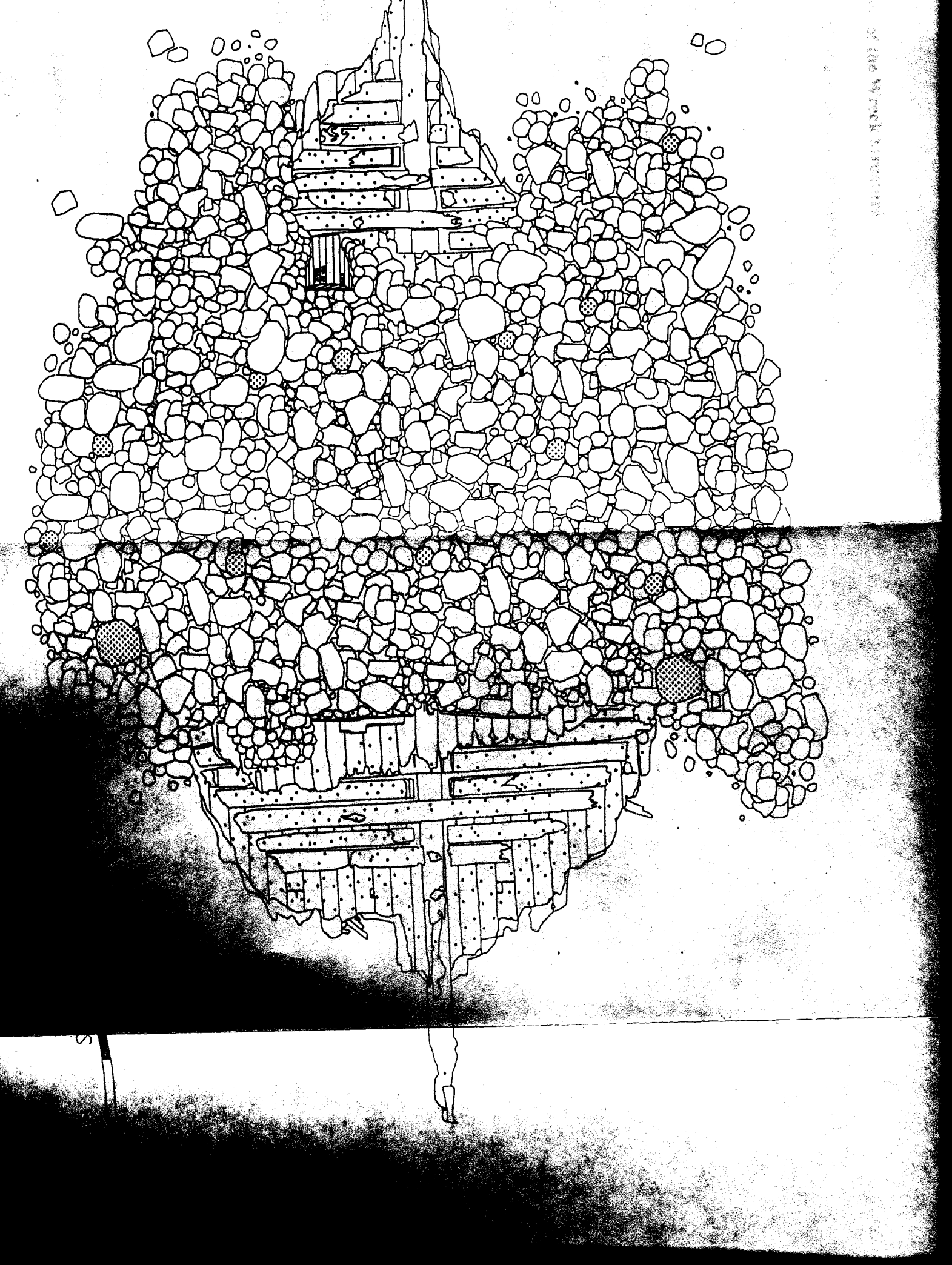
Figure 4. Photomosaic of the wreck structure: (a) western end, (b) eastern end.

Maritime Museum. All artifacts were placed in a stable environment until further conservation measures could be undertaken.

Once the mapping and photography were completed, the grid structures and baseline were removed. Dredges were then employed to pump sediment back onto the wreck structure to provide protection for the hull. A reconnaissance of the area around the wreck was also made to locate and identify additional wreck-related material. That survey identified a large scatter of artifacts, mostly ceramic and glass, associated with the wreck. No additional structural evidence was identified in the vicinity of the lower hull remains.

Following the completion of on-site research, artifacts recovered from the wreck were cleaned and documented in the Corange conservation facility. Historical research in several Bermuda repositories was undertaken to identify vessels lost in the area during the second half of the eighteenth century. That investigation included an examination of both primary and secondary sources. Information gathered by the survey were analyzed, and a plan of the wreck was developed using AutoCAD, a commercial computer-aided design program (Figure 5). Historical research was carried out in both Bermuda and the United States to generate data useful in supporting a preliminary assessment of the vessel. In Bermuda, that research focused on the collections of the Bermuda Maritime Museum, the Bermuda Archives, and the Hamilton Library. In the United States, initial research focused on collections at East Carolina University. At each repository secondary sources were examined and data collected to support the development of an historical context for

Bermuda in the late-eighteenth century. That research was designed to produce an historical background that could serve as a context for interpretation of the site. Shipwreck-specific material was also collected to facilitate identification of the wreck.



Description of the Wreck Structure

The surviving wreck consisted of a section of the lower hull below the turn of the bilge. As a complete excavation was not undertaken, only those portions of the wreck that had been previously exposed were documented. The exposed sections consisted of the keel, hogging piece, garboard strakes, hull planks, floors, futtocks, top and bottom fillet pieces, a short section of the keelson, the remains of a bulkhead, bilge ceiling, and limber planks. Hull remains were 69 feet 9 inches in length with a maximum width of 24 feet from the extremity of the remaining port planking to the extremity of the starboard planking on the north side of the ballast pile.

Keel

The remaining keel was 69 feet 9 inches in length. Both the eastern and western extremities of the keel were highly degraded. This degradation is likely attributable to long-term exposure in an underwater environment. A vertical scarph was located at the eastern extremity of the keel structure. Although a moulded dimension of the vertical scarph was impossible to establish, it was clearly in excess of 12 inches, and the sided dimension appeared to be 16 inches. The location of the vertical scarph suggests the position of the stem post. During the eighteenth century the English attached the stem post by means of a vertical scarph. The forward end of the keel was half-lapped vertically to the side of the stem post and then fastened from both sides with iron bolts driven trough

from either side. These bolts were then clenched over roves (washers).[8] The nature of the framing pattern at the ends of the hull remains and the location of the lower box valve[9] tend to suggest that the bow of the vessel was oriented east and the stern to the west.

Hogging Piece

The keel was overlaid with a deadwood, or hogging piece, that contributed to the formation the rabbet. The hogging piece measured up to 19 1/2 inches sided and 10 inches moulded. At the location of each floor the hogging piece was notched from 3/4 to 1 inch deep to seat the floor timber. The upper 2 to 4 inches of both sides of the hogging piece were also mortised from 1 3/4 to 2 inches deep at the location of each floor to accept the bottom fillets and form a limber.

Framing Pattern

The exposed framing pattern was consistent throughout the exposed structure and consisted of alternating floors and futtocks (Figure 6). The floors, made of oak, were randomly sided and measured approximately 12 inches sided and approximately 12 to 13 inches moulded near the keel. Underneath each floor, oak bottom fillet pieces, one on each side, had been installed to produce a hollow garboard and increase the deadrise of the hull. The sided dimension of each floor fillet roughly matched that of the associated floor,

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[8] David H. Roberts, ed., *18th Century Shipbuilding, Remarks on the Navies of the English and Dutch from Observations made at their Dockyards in 1737 by Blaise Olliver, Master Shipwright of the King of France* (East Sussex: Jean Boudriot Publications, 1992), 46.

[9] The lower box valve was found on the western end of the exposed wreck site. Its embedded position next to the keel suggests its original site of deposition at the time the vessel foundered. Lower box valves, associated with the pump assembly, were commonly located aft of the main mast. Thus placement of the lower box valve indicates that the bow was facing east and the stern was facing west.

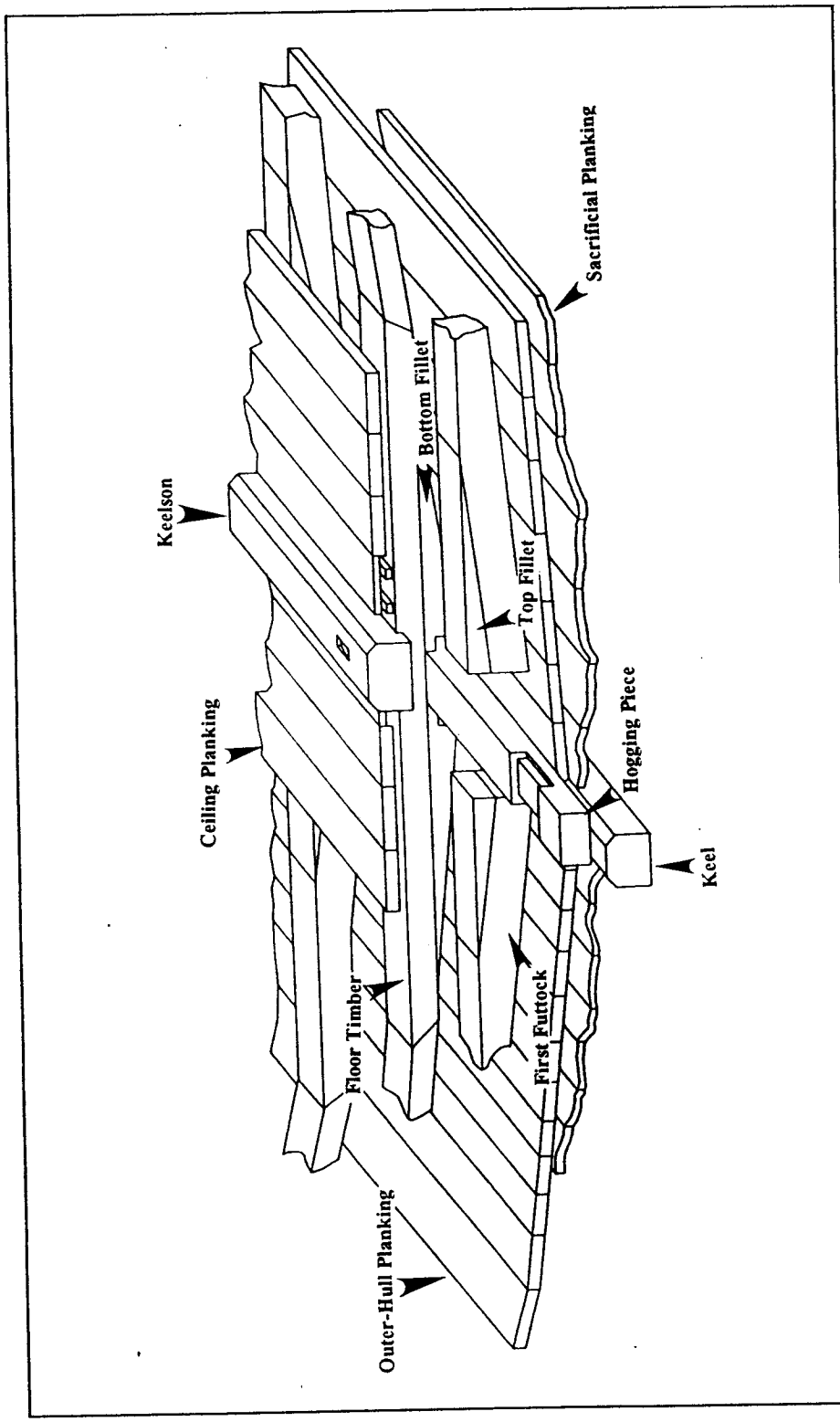

Figure 6. Perspective view of the lower hull structure.

and the moulded dimension was approximately 8 inches at its head throughout the exposed section of the hull. The length of the floor fillets ranged from 3 to 6 feet. The length of the exposed floors varied, ranging from 10 to 12 feet in length.

Between the floors were oak futtocks. Each futtock was offset from the hogging piece approximately 6 to 8 1/2 inches, and those exposed measured approximately 10 inches sided. The moulded dimension varied from futtock to futtock, but most measured between 4 and 10 inches sided at the head. Space between the floors and futtocks varied from 1 to 4 1/2 inches. Oak top fillets were positioned over each of the first futtocks. As was the case with the bottom fillet pieces, the top fillet pieces were sided in accordance with the sided dimensions of the associated futtock. The moulded dimensions of the top fillet pieces also varied in accordance with the moulded dimension of the associated first futtock. Those exposed at the site measured between 4 and 9 inches moulded. The length of the futtock fillet pieces ranged from 2 to 4 feet.

Only a small portion of two second futtocks was exposed at the wreck site. The two partial second futtocks were located on the north end of the wreck in the vicinity of the bulkhead. Their configuration suggested that the floors and second futtocks and first and third futtocks were joined by simple diagonal scarphs and held in place by one wooden treenail. The location of the scarphs between the floors and second futtocks and first and third futtocks were staggered to increase hull strength at the turn of the bilge. None of the visible scarphs were found with chocks.

Keelson

The floors of the vessel were secured by a heavy keelson. The only remainder of the keelson lay beneath the relatively undisturbed pile of ballast. Although very little of the keelson was exposed, it was possible to obtain measurements on the east end of the ballast pile. The keelson measured 18 inches sided and 12 1/2 inches moulded. The surviving extremity of the keelson exposed near the bulkhead was notched 1 to 1 1/2 inches to accommodate the floor timbers. At each floor the keel, hogging piece, floor, and keelson were fastened using 1 1/4 inch drift pins.

Hull Planking

Hull planking on the wreck was 3 inches thick. Strake widths varied from 11 7/8 to 12 1/4 inches. The garboard strake was approximately 8 3/4 inches in width. No accurate measurement of its thickness could be ascertained. Twelve strakes were recorded from the garboard strake to the extremity of the hull on the northern port side. Eleven strakes were recorded from the garboard strake to the extremity of the hull on the northern starboard side of the wreck. The hull planking was attached to the frames with wooden treenails, 1 1/2 inches in diameter, and intermittent iron spikes.

Sacrificial Planking

The hull planking was covered with a layer of horse hair, pitch, and a layer of sacrificial planking constructed from pine. The sacrificial planking was approximately 1 inch thick and roughly 10 inches in width. Sacrificial planking protected the hull planking from marine wood-borers such as Teredo worms (*Teredo navalis*). Prevalent in the warm

waters of the Gulf Stream, Teredo worms often wreaked havoc on unprotected vessels. Hull planking damaged by these wood-borers often resulted in a vessel unsuitable for sail. Sacrificial planking was a means of protecting a ship's hull from the damage of Teredo worms. Sacrificial planking was nailed to the exterior of the hull with a layer of tar/pitch, horse hair, and resin between the two layers to act as a deterrent to the wood-borers. Damaged sacrificial planking could easily be stripped away and replaced when necessary.

Bilge Ceiling

The bilge ceiling was observed on both extremities of the ballast pile. The bilge ceiling planks ran parallel to the keel and served as a solid cover over the frames. No spacing between bilge ceiling planks was observed. This tight pattern of ceiling planks added additional strength to the lower hull structure.

Ten strakes were noted between the keelson and the wale on the eastern port side and ten strakes were between the keelson and the wale on the eastern starboard side of the hull. The bilge ceiling planks averaged 3 inches thick and varied from 5 1/2 to 12 1/2 inches in width. Like the hull planking, the bilge ceiling was attached to the frames with wooden treenails, 1 1/2 inches in diameter, and intermittent iron spikes. The limber boards were 2 inches thick, 12 1/2 inches in width, and were supported by 1-inch-thick by 1 1/2-inch-wide battens that raised the limber boards to the height of the 3-inch-thick ceiling.

Bulkhead

At the east end of the wreck the remains of a light, non-structural bulkhead transversed the hull. Bulkheads were used to compartmentalize the interior of a vessel. The bulkhead was constructed from 1-inch-thick planks that were 10 inches wide. Remains of vertical stanchions employed to support the bulkhead were evident but obscured by undisturbed ballast within the hull structure. The bulkhead appeared to retain ballast.

Fasteners

The vessel remains were held together by a combination of copper drift pins, wooden treenails, and iron spikes. Copper drift pins secured the keel, hogging piece, floors, and keelson together. Although accurate length measurements of the drift pins could not be ascertained, they were 1 1/4 inches in diameter. All remaining drift pins had been peened over copper roves (washers). A number of cut copper drift pin heads were documented on site. These were most likely the heads of drift pins that were cut off before the drift itself was peened over the roves.

Wooden treenails were the main component holding the vessel together. The treenails, made of oak, were used to secure both outer and ceiling planking to their respective floors or futtocks. All treenails measured 1 1/2 inches in diameter. William Falconer, in his work titled *Universal Dictionary of the Marine*, describes treenails and their use as

> certain long cylindrical wooden pins employed to connect the planks of a ship's side and bottom to the corresponding timbers. The tree-nails are justly esteemed superior to spike-nails or bolts, which are liable to rust, and loosen, as well as rot the timber; but it is

> necessary that the oak of which they are formed should be solid, close, and replete with gum, to prevent them from breaking and rotting in the ship's frame. They ought also to be well dried, so as to fill their holes when they are swelled with moisture.[10]

The use of wooden treenails was one of the most prevalent and effective means of fastening a wood vessel. To insert a treenail a hole was bored through the outer planking, the frame, and ceiling planking. A treenail of suitable size was chosen, preferably the same diameter as the hole and about one foot longer. The treenail was then greased with tallow or tarred and driven in with a mallet. The treenail head was then wrapped with spun yarn to prevent splitting. The wood dowel was then cut flush on both ends and a treenail wedge was usually inserted in each end to tighten the seal of the treenail.[11]

A number of iron spikes were noted during the mapping of the hull remains. Although the majority of the hull planking was fastened to floors and futtocks using wooden treenails, periodic iron fasteners were found. These spikes were probably used as a secondary means of fastening the outer-hull planking to the floor and futtock arrangement as well as helping to secure the bilge ceiling.

Hull Modifications

A number of hull repairs/modifications were recorded on the outer hull. Two small rectangular wood patches (one measuring 8 inches by 5 inches, the other 7 inches by 3 inches) were documented on the east end on both the port and the starboard sides of the hull on the fourth strake out from the keel. These patches were visible due to a missing floor timber that otherwise would have obscured both patches from sight.

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[10] William Falconer, *Universal Dictionary of the Marine.* (Devon: Newton Abbott, 1780, Reprinted 1970), 298.

[11] Roberts, *18th Century Shipbuilding,* 368.

The placement of the patches appeared deliberate and, due to their small size, are not likely attributable to a repair job. Rather, the patches were most likely the result of an inspection by shipwrights at a Royal Navy shipyard. Transports hired by the Royal Navy during the war had to be inspected before being hired into service. Inspections included review of the ship's timbers, planking, masts, yards, and rigging. Hull condition was usually determined by drilling holes in the timbers and planking or by inserting a sharp instrument into various parts of the hull to determine if any degradation was present.[12] On August 8, 1775, Deptford officers deemed the *Liberty* unfit for foreign service as a transport after they had cut out several pieces in the lower frame. They found that several successive timbers on the starboard side were very decayed, damp, and defective.[13] It appears that the inspectors were very critical when examining vessels for hire. On November 30, 1775 officers inspected the transport *Unity*:

> We were very particular, as we always are in Cases of this kind in examining the Bottom, trying the Seams, Butts, and hidden Ends in several places, and after seeing such Works perform'd as appear'd to be necessary and the Bottom grav'd, we judged her in every respect fit for His Majesty's Service.[14]

Since the need for transports grew tremendously as the war persisted, it is likely latter inspections were not as thorough as those conducted when the war commenced.

The remains of lead sheathing, tacked over the keel on the western section of the hull, was also documented during the survey. Due to the small amount of lead remaining,

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[12]Syrett, *Shipping and the American War*, 108.

[13] Ibid.,109.

[14] Ibid.

it is not possible to determine its original purpose. It is possible that this lead sheathing helped seal the base of a pump well. Lead is a very soft, pliable metal, not likely to be used for any high-stress repair, such as a keel patch. Although the exact location of the pump box cannot be ascertained, the lead sheathing was located very close to the where the lower box valve was recovered.

Wood Analysis

Wood samples were taken from all major structural timbers and other miscellaneous wood objects found on site. The analysis of the wood samples was directed by Dr. Lee Newsom at the University of Southern Illinois' Center for Archaeological Investigations. The laboratory has a database of wood types from various vessels and vessel types from Europe and the New World. It was hoped that wood analysis would help determine the origin of the vessel (built of either European timber or New World timber). The results of the analysis (Table 1) show that the samples are not characteristic of a specific geographical source (Appendix A) . The types of wood identified from the Bermuda vessel can be found on both sides of the Atlantic.

Table 1. Wood sample analysis

Sample	Vessel Component	Wood Type
1	Keel	*Ulmus* sp., elm, European
2	Floor	*Quercus* sp., white oak group
3	Futtock	*Quercus* sp., white oak group
4	Top Fillet	*Quercus* sp., white oak group
5	Bottom Fillet	*Quercus* sp., white oak group
6	Keelson	*Quercus* sp., white oak group
7	Bilge Ceiling	*Quercus* sp., white oak group
8	Bulkhead	*Picea* sp., spruce
9	Hull Planking	*Quercus* sp., white oak group
10	Sacrificial Planking	*Pinus* sp., scotch pine
11	Treenail	*Quercus* sp., white oak group
12	Cask Stave	*Quercus* sp., white oak group

Overall, four types of wood were identified from the site - oak, elm, spruce, and pine. The majority of structural elements were constructed from white oak (*Quercus* sp., white group), except the keel, which was made of elm (*Ulmus* sp.). The British felt that white oak was the best wood for strength, stability, and endurance. Due to its slow growth rate, oak proved to be tough and durable and thus was the wood of choice for European and American shipwrights.[15] The bulkhead was the only item sampled made of spruce (*Picea* sp.); the sacrificial planking was the only item made of scotch pine (*Pinus* sp.). Wood identification is restricted for a number of reasons, as follows:

> Oak - It is not generally possible to identify oak wood to species. Because of inherent limitations to wood anatomy and lacking attendant reproductive parts or leaves, identification is basically restricted to the level of genus -- that is to 'oak' versus 'overcup oak', for example. Oak wood may, however, be classified within three broad anatomical categories, to wit: red, white, and live oak groups. Beyond that, it is essentially impossible to separate by wood anatomy oaks from different sides of the Atlantic; in other words, Old World from New World species.
>
> Pine - Pines world wide can be classified within seven broad anatomical categories. The pine from this site fits the *Sylvestris* anatomical group. Sylvestris group pines occur on both sides of the Atlantic, with *P. sylvestris* (Scots pine) being the major European species, in terms of timber production, and *P. resinosa* (red pine, Norway pine) the major North American species. Scots pine was originally introduced from Europe, probably during the colonial period, as a potential lumber source; it was soon abandoned for this purpose because of the superior qualities of native pines.[16]

It is difficult to distinguish between the anatomy of New and Old World species of white oak. However, the samples from the site appear to be closer to the European white oak (*Quercus robur*) than American white group species (*Quercus alba*).[17]

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[15] James Dodds and James Moore, *Building The Wooden Fighting Ship* (New York: Facts on File Publications, 1984) 13.

[16] Dr. Lee Newsom, personal communication, April 1994

[17] Ibid.

Bilge Sample Analysis

During excavation of the site, an aggregation of dense, organic material was recorded adjacent to the keel structure. Two samples were recovered from the site for analysis. The first was taken next to the keel underneath remaining bilge ceiling near the ballast pile. The second sample was recovered from the inside of the lower box that was found next to the keel on the west end of the site. The two samples were submitted to Paleo Research Laboratories in Golden, Colorado, for a pollen and macrofloral analysis (Appendix B). Four liters of each sample were packaged and sent for analysis.

The pollen and macrofloral analyses of the bilge samples indicate that the vessel was likely English in origin and could have previously been used in the coal trade. A majority of the pollen represents trees and plants found in England. The most common type of tree pollen recovered from next to the keel was pine (*Pinus*). From the lower box sample a number of pollen types were found in equal numbers. These were birch (*Betula*), oak (*Quercus*), and Australian pine/ironwood (*Casuarina*). Both samples yielded small amounts of alder (*Alnus*), hickory/pecan (*Carya*), and hazel (*Corylus*) tree pollen. All types of tree pollen are found in England except for the Australian pine/ironwood (*Casuarina*), which was probably introduced in Bermuda or the West Indies.[18]

A number of pollen types representing herbs and shrubs were found in both samples. The most notable types included Fabaceae (*Trifolium praetense*), or red clover.

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[18] Linda Cummings and Kathryn Puseman, "Pollen and Macrofloral Investigation of Two Bilge Samples from an Eighteenth Century English Shipwreck in Bermuda" (Paleo Research Laboratories, Denver, Colorado, 1995), 2.

Red clover was introduced into the New World from Europe. A high amount of Poaceae found in the samples indicate that the vessel was carrying a mixture of wild and cultivated grasses, such as wheat (*Triticum*) and oat (*Avena*). Combined with the presence of grass floret fragments and starch granules, these findings indicate that these grasses were being carried as food for animals onboard. The absence of grass stems in the samples would preclude these grasses as being used as packing material for breakable items.[19]

Coal residue was found in both the pollen and macrofloral records. Although coal residue can be expected to be found in many archaeological contexts (i.e., shipwrecks) due to the widespread use of coal during the eighteenth century, a unusually high amount of coal residue suggests that coal was the vessel's cargo at one point. The analysis of both samples showed that large amounts of coal residue were present in the samples. Both charred and uncharred coal fragments were found in both samples. Whether or not the presence of a high quantity of coal residue indicates the previous use of the vessel as a collier or simply as a cargo (used during the war) is unknown. A small number of insect leg and bug jaw fragments were noted in each of the samples. These fragments could not be positively identified.[20]

Animal Bone Analysis

A total of four animal bones were recovered during the excavation. These bones were submitted to Dr. Philip Armitage for identification. Dr. Armitage specializes in the identification of animal bones and used his own osteological collection and a number of

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[19] Ibid., 4.
[20] Ibid., 2.

references to complete the identification. Dr. Armitage's findings were submitted in a Level II/III report to the author (See Appendix C).

Two of the animal bones were from cattle (*Bos*). One piece was the medial surface or neck/blade of a scapula. The second bone was a portion of a rib shaft lacking the distal end (chopped through obliquely). Edges of this bone had been gnawed by rodents. The cattle rib and scapula were discarded remains of meat eaten onboard the vessel. The bones were likely from either salted beef or from fresh livestock brought on board.[21]

The remaining two bones were rat femurs. The femurs retained characteristics of the Asian brown (Norway) rat (*Rattus norvegicus*) rather than the black rat (*Rattus rattus*). Dr. Armitage conjectured that the Norway rat was not introduced into western Europe until the early eighteenth century. After their introduction (by Russian vessels involved in the Baltic trade), the larger Norway rats became the dominant species. Dr. Armitage speculates that the presence of the Norway rat femurs onboard the Bermuda vessel indicates that the site dates after the 1750s.[22]

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[21] Dr. Philip Armitage, "Report on Four Animal Bones Recovered from a Late-Eighteenth Century Vessel, Bermuda." (Level II/III Archaeozoological Service Report), 4.

[22] Ibid., 3-4.

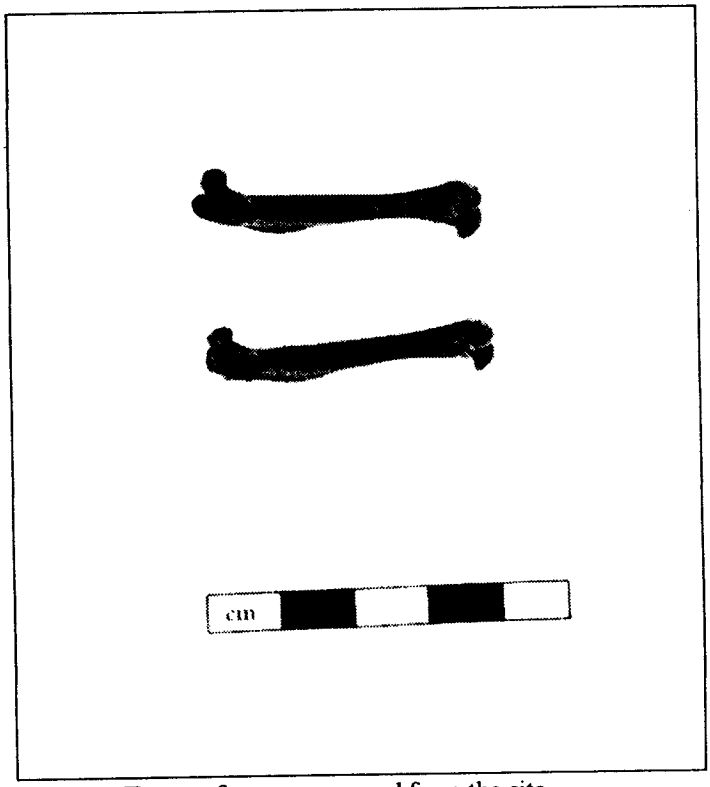

Figure 7. Two rat femurs recovered from the site.

Evidence documented during the excavation of the site suggests that the hull remains are British in origin. The construction of the hull is consistent with known British ship-building practices of the eighteenth century. The employment of large scantlings suggests that the hull was extremely well-built and designed for cargo carrying capabilities. Tight frame spacing, little deadrise, and heavy ceiling planking help to reinforce this conjecture. The methods of fastening the hull together as well as the use of sacrificial planking were both widely used during the eighteenth century. This evidence, incorporated with the historical record, suggests that the hull remains are those of a British merchantman from the eighteenth century. The similarities in the framing pattern between the Bermuda site and site 44YO88 (a known British collier) indicates that the hull remains

could be that of a collier. A high degree of coal residue found in the bilge samples helps strengthen this possibility.

CHAPTER 2

ARTIFACT ANALYSIS

One of the most valuable means of determining the date and nationality of the Bermuda site came from the artifact assemblage recovered from the site. Certain artifacts had diagnostic characteristics supporting classification of the site as British in origin dating to the second half of the eighteenth century.

Ceramics

Ceramic artifacts often embody pertinent diagnostic features that allow the researcher to accurately date the object within a particular time period. This proved to be the case with certain ceramic artifacts recovered from the Bermuda site. Although the ceramic assemblage was large, a number of ceramic shards were very helpful in determining the origin and date of the site.

Dry-Bodied Redware Ceramics.

A ceramic shard recovered from the Bermuda site was identified as dry-bodied redware. Its dark red color and remaining rim portion identified it as a portion of a teapot. Once the artifact had been cleaned of minor concretions, sprigged ornaments in rococo motifs were revealed. Floral rose patterns as well as the bust portion of Britannia (the rest of the teapot below her waist was non-existent) were uncovered (Figure 8). The Britannia

figure appeared to be holding a staff across her bust as a small-winged cherub places a crown upon her head.

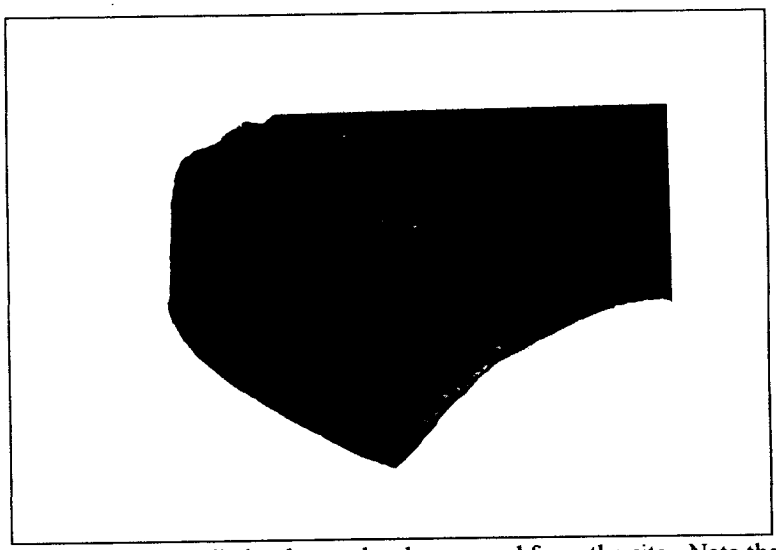

Figure 8. Dry-bodied redware shard recovered from the site. Note the rococo motif rose patterning

With its sprigged molded designs, rose patterning, and Britannia, the piece was likely produced in England. A chart, produced by Stanley South, provides valuable diagnostic dates on ceramics recovered from eighteenth-century British-American sites. The chart provides date ranges and median dates, allowing the researcher to narrow down dates on types of ceramics. South's date range for engine-turned unglazed red stoneware is 1763-1775, with a median date of 1769.[1]

Dry-bodied redware was initially produced in the Netherlands as an imitation of a similar product, a dry-bodied red stoneware, imported from Yi-hsing in China.[2] By the

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[1] Stanley South, *Ceramic Analysis Tools for the Interpretation of Eighteenth Century British American Sites* (to accompany a paper on "Evolution and Horizon as Revealed in Ceramic Analysis in Historical Archaeology") (Institute of Archaeology and Anthropology, University of South Carolina: Alfred A. Knopf, Inc., 1971), chart.

[2] Ivor Noël Hume, *A Guide to Artifacts of Colonial America* (New York, New York: Alfred A. Knopf, 1972), 120.

latter half of the eighteenth century, dry-bodied redware was being produced by many Staffordshire potters in England, with teapots being the most common type.[3] One of the more famous makers of dry-bodied redware was Josiah Wedgewood who produced pottery in the Staffordshire district of England during the eighteenth century.

Wedgewood manufactured his redware to appeal to the cheaper market. Often his redware, which he called "rosso antico," was adorned with beautifully designed decorations produced with brass dies. The use of brass dies resulted in a clean cut and highly artistic vessel. The more ornate pieces obtained some of the highest prices paid for ceramics during the period.[4] Such decorations adorning these redware teapots often included floral relief, pseudo-Chinese marks, or a crowned griffin inside a rococo cartouche underneath the figure of Britannia. Some surviving examples of redware teapots have the figure Britannia sitting next to a shield with the number "45" on it, referring to the forty-fifth edition of John Wilke's radical newspaper issued on April 23, 1763.[5]

Creamware

A total of 2 creamware shards were recovered from the Bermuda site. One was a small portion of a plate rim with a distinct "feather-edged" rim. Each "feather" consisted of six barbs (Figure 9). The distinctive white color had been grayed from its long immersion in salt water. There was no other relief or painted decoration on the shard.

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[3] Ibid.

[4] William Louis Calver and Reginald Pelham Bolton, *History Written with a Pick and Shovel* (New York, New York: The New York Historical Society, 1966), 249.

[5] Noël Hume, *Colonial Artifacts*, 121.

Reviewing sources concerning the feather-edged pattern, it appears that it was first produced around 1765. The popularity of the pattern seems to have diminished by about 1775, when it was replaced by a "royal pattern."[6] Stanley South's chart does not give a date range for the feather-edged pattern; however, he does include one for creamware in general (1762-1820), the median date being 1791.

The feather-edged design was considered one of England's greatest contributions to the art and technology of pottery.[7] Creamware was first produced during the early eighteenth century, and by the 1760s the English used fine white clays to produce ceramics with a white/buff body. The potters then used a liquid lead glaze that gave the ceramic ware a slightly yellow, sparkling finish. Creamware became one of the more prevalent types of ceramic used during the latter half of the eighteenth century.

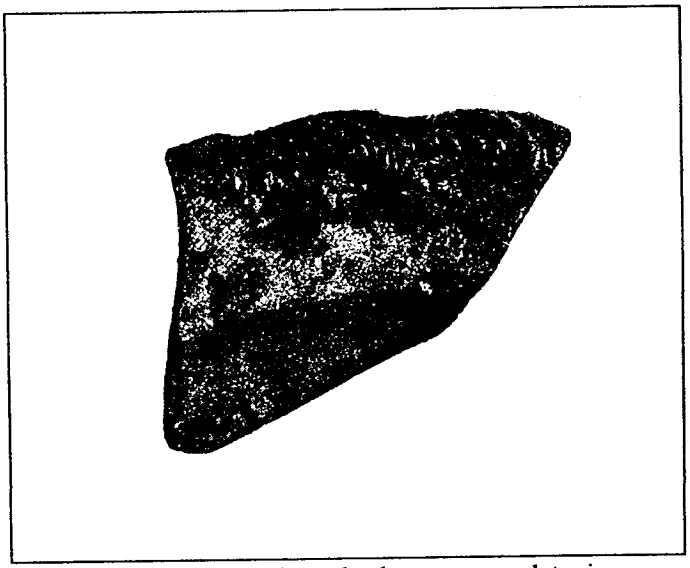

Figure 9. Portion of feather-edged creamware plate rim recovered from the site.

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[6] Ivor Noël Hume, *Pottery and Porcelain in Colonial Williamsburg's Archaeological Collections* (Williamsburg, Virginia: Colonial Williamsburg, 1969), 21.

[7] Donald Towner, *Creamware* (London, England: Faber and Faber, 1978) Foreword.

By the mid-1760s different plate-rim patterns evolved to complement the creamware's success. Such rims included the Queen's pattern, the shell-edged, and the feather-edged designs. Each design, made popular by mass production in England, became well known throughout the British Empire. Many factories in England during this period produced feather-edged plates, all very similar in design. Thus it is difficult to trace the maker of the recovered shard. A review of pictures of feather-edged plates from other collections revealed that most examples dated around 1770. By the 1770s cream-colored ware had largely replaced delft and white salt-glazed stoneware as the major ceramic export.[8]

White Earthenware

Toward the latter half of the eighteenth century, potters in England produced a number of distinctive plate rims, all very diagnostic to the time period. Such examples include the wavy-edged "royal ware" and the straight-sided octagonal plate. Both of these styles of plate rims were found on the Bermuda site (Figures 10 and 11).

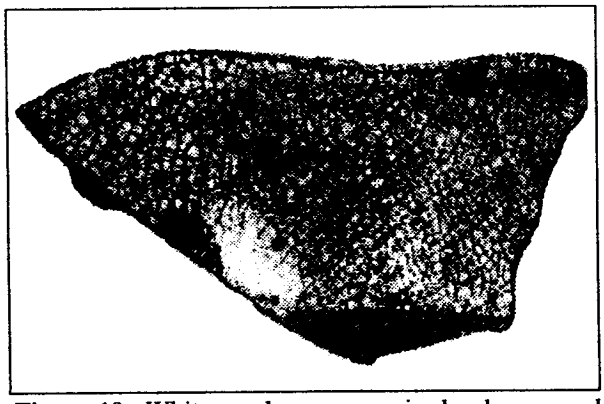

Figure 10. White royal ware ceramic shard recovered from the site.

[8] J. Jefferson Miller II and Lyle M. Stone, *Eighteenth-Century Ceramics From Fort Michilimackinac* (Washington D.C.: Smithsonian Institution Press, 1970), 42.

Although some examples of these wares had ribbed rims, it was also common to have a plain rim with no relief. The large number of potters in England who produced these styles of plates made their use very utilitarian and widespread. Royal ware, definable by its distinctive wavy rim, has been found at a number of colonial sites dating to the latter half of the eighteenth century. The same can be noted for the octagonal-style rim. Although a definitive time line cannot be noted for either of these styles, we know that they were being produced on a large scale by the end of the 1760s. The terminus ante quem on these two styles of pottery is rather vague, but we can tentatively date the

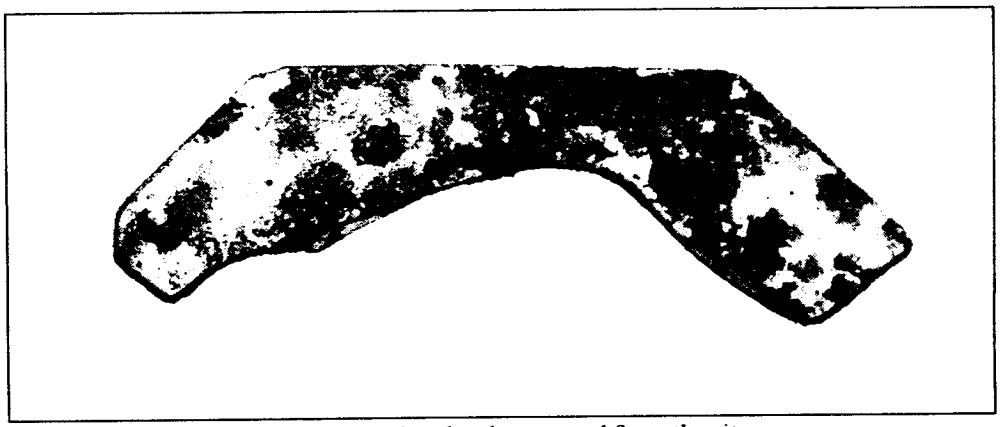

Figure 11. White octagonal plate rim shard recovered from the site.

wreck after the mid-1760s. However, establishing a terminus post quem for the site based on these ceramic objects is not as easy; the use of these styles could have persisted into the 1800s.

Many styles of ceramic wares were documented during the excavation of the Bermuda site. A number of shards retained diagnostic characteristics, allowing those

types of ceramics to be dated with a certain degree of accuracy. All of the types recovered from the site have been found in mid-late eighteenth-century colonial sites.

Glassware

The Bermuda site yielded numerous distinctive bottle bases, bottle necks, case gin bottle remains, and medicine bottle shards. Glassware remains found in an archaeological context are an excellent way to date a site. Throughout the eighteenth century, glass bottles were used for a variety of purposes. Dark green glass bottles (the most common type of the eighteenth century) were used mainly during the colonial period to transport wine, beer, rum, and other potables.[9] The earlier bottles of the eighteenth century were hand-blown and tended to vary greatly in shape as a result. For transportation purposes, these variations proved inefficient. By the 1750s, the invention of cylindrical brass molds enabled the consistent shaping of bottles so that the problem of stacking bottles in bins was no longer a problem. From then forward, practically all glass bottles were cylindrical and had long necks.[10] Although this style of bottle has been found in many shapes and sizes, there are common characteristics found in almost all bottles of this style. The material used was always a common greenish-black glass. Other features included inverted bases, high and usually bulging shoulders, and a tapering and often bloated neck.[11] Bottle types throughout the eighteenth century retained unique characteristics, including bottle lip, style of base, and base diameter.

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[9] C. Malcolm Watkins, *The Cultural History of Marlborough, Virginia* (Washington D.C.: Smithsonian Institution Press, 1970), 145.

[10] Ibid., 146-148.

[11] Calver and Bolton, *Pick and Shovel*, 259.

A number of bottle neck and lip fragments were recovered from the site (Figure 12). The bottle lip is a very identifiable feature of eighteenth-century bottles. The purpose of the bottle lip was to hold in the contents of the bottle. Usually a cork was placed into the mouth of the bottle, secured by a cloth over the top. This cloth was then tied down with pack thread of some sort around the bottle lip, and the entire top was then sealed in heated resin and pitch.[12]

String-applied bottle necks changed styles throughout the eighteenth century. These variations in bottle necks are diagnostic and allow the researcher to come up with

Figure 12. Three bottle neck/lip fragments recovered from the site.

a general idea about when the bottle was produced. The three cylindrical bottle necks recovered were compared to a typology chart created by Roger Dumbrell (the chart

[12] Watkins, *Marlborough, Virginia*, 145.

compares modifications in string-rim designs for English wines from 1640-1910). The bottle necks recovered from the site date between 1750 and 1790.[13] This would give a median date of about 1770. Dumbrell's chart shows a 1770-style string rim that looks remarkably similar to those found on the Bermuda site.

Two bottle neck remains found on the site had almost no neck and a wide-diameter mouth (Figure 13). These bottle necks appear to be the remains of two snuff

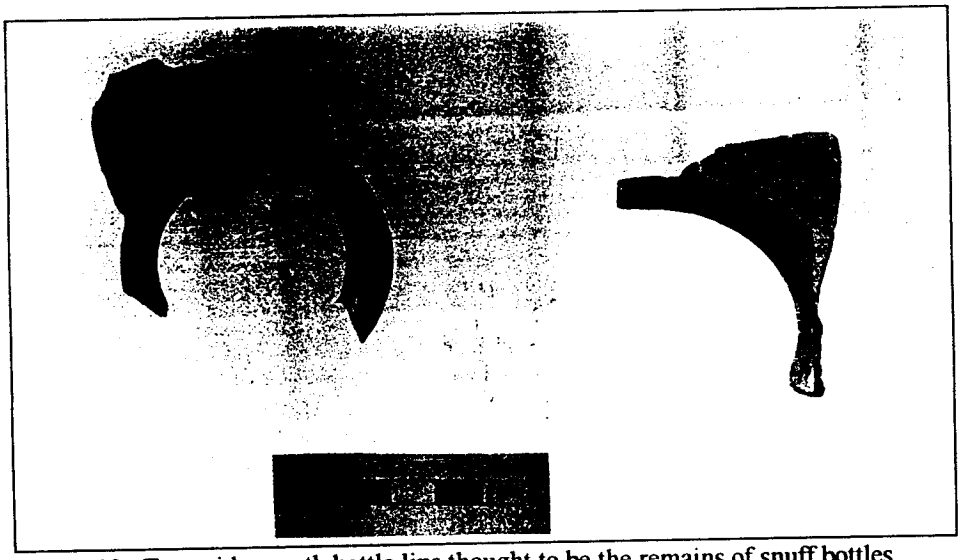

Figure 13. Two wide-mouth bottle lips thought to be the remains of snuff bottles.

bottles. C. Malcolm Watkins excavated a colonial site in Marlborough, Virginia and recovered the remains of a snuff bottle. Watkins noted that the bottle had a 2 1/4-inch-wide mouth, was 3 3/4 inches square, and was 7 inches tall.[14] Neither of the wide-mouthed bottle rims recovered from Bermuda was completely intact. One had a 2-

[13] Roger Dumbrell, *Understanding Antique Wine Bottles* (Suffolk, England: Baron Publishing, 1983), 38-39.

[14] Watkins, *Marlborough, Virginia*, 152.

inch-wide mouth, the other about a 1 1/2-inch-wide mouth. Both examples found on site resembled those found by Watkins.

Four square bottle bases were recovered that measured from 2 1/10 inches square to 3 6/8 inches square. The square bases likely represent the remains of case gin bottle bases or snuff bottle bases. Case gin bottles, identified by characteristic square bases, square sides, and short necks, were produced in large numbers during the eighteenth century. These square bottles were designed to be shipped in wooden boxes with a compartment for each bottle. Initially produced by the Dutch to ship gin, case gin bottles were used to transport a variety of potable goods, not just by the Dutch.[15]

Case gin bottles are easily discernible among colonial glassware. They commonly had square bases measuring 4 inches square and were usually 10 inches in height. This style of bottle did not taper in the body but incorporated a continuous dimension from base to shoulder. The bases, rounded on the corners, had a domed kick-up with a ring-shaped pontil mark. The neck of this bottle style was relatively squat and had wide string rings midway in their length.[16] Although this description gives some exact measurements, gin bottles varied in sizes. No record of ornamentation on the gin bottles has been found.

A number of cylindrical bottle bases were found on site. These bottle bases were made of the characteristic green-black glass, and each had an inverted base with the pontil mark. Comparing the diameter of recovered cylindrical bottle bases with other examples

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[15] Ibid., 150.
[16] Watkins, *Marlborough, Virginia*, 149.

from the time period, many features are datable to the latter half of the eighteenth century. Bottle base diameters diminished from about 5 inches during the 1750s and 1760s to approximately 4 inches in the 1770s and 1780s.[17] The bottle bases raised from the Bermuda site measured roughly 4 inches in diameter.

Glassware remains found on the Bermuda wreck site date from the mid-late eighteenth century. Bottle types and characteristics, as well as dimensions, fit those of other documented late-eighteenth-century colonial sites. Glassware typology charts have also confirmed that the bottle remains found on the site date to the late eighteenth century.

Metal Artifacts

Only a small number of metal objects were recovered from the Bermuda site. Metal objects recovered included three pewter buttons, over 100 pieces of lead shot, a candle holder, and a intact copper barrel hoop.

Pewter Buttons

The Bermuda site produced three pewter buttons (Figure 14). Each had a mold seam with a pronounced boss on the back where an iron wire shank was fastened to hold the button in place. The wire shanks were no longer present due to corrosion underwater. The buttons appeared to be coat buttons, common on clothing during the eighteenth century. Their uses were many, and some bore various decorations of nobility or military rank. The history of the button has not been well documented; however, a number of

[17] Ibid., 149.

traits are diagnostic to certain time periods. These traits include decoration, size of the button, and material from which the button is made.

Ivor Noël Hume states that a certain rule of thumb can be followed when dating coat buttons. Noël Hume suggests that early-eighteenth-century buttons were usually

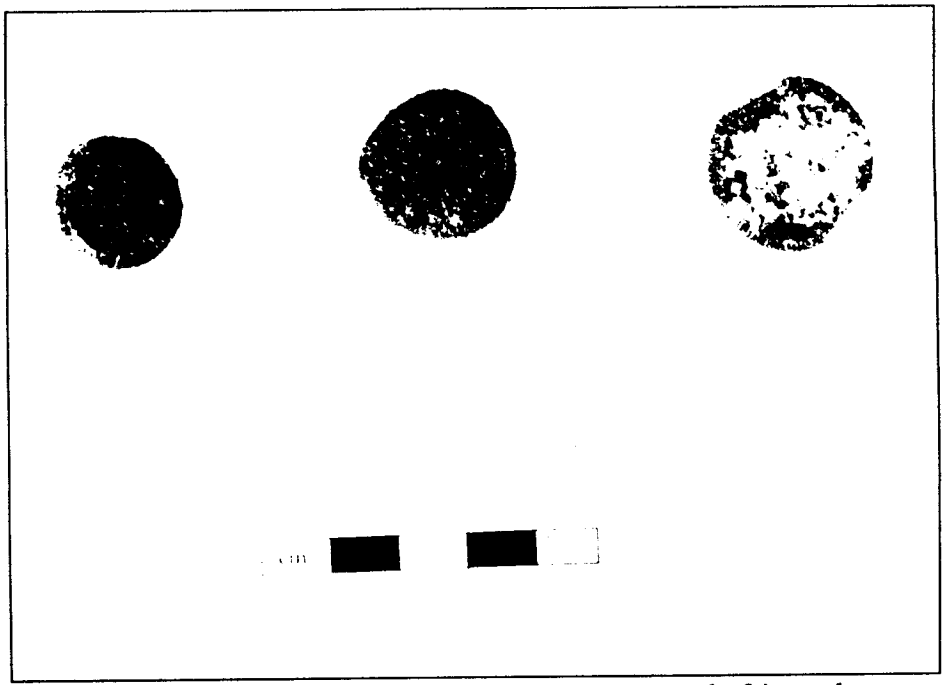

Figure 14. Three pewter buttons recovered from the site. Note the faint anchor pattern on the left and center buttons.

hollow-cast, made of white metal or brass, and were often embossed with a decoration, plain or gilded. By the latter half of the eighteenth century, buttons became larger as the century progressed and were more commonly flat and made of copper alloy.[18] Although these are broad guidelines, they are helpful in dating the buttons recovered from the Bermuda site.

[18] Noël Hume, *Colonial Artifacts*, 89-90.

Once cleaned, two of the three buttons had distinguishing anchor designs on their faces. Decorations have always been used to some extent on buttons, from simple carvings to elaborate depictions of royal figures. Certain forms of ornamentation can be easily traced to a distinct military regiment or time period. By the eighteenth century, military forces had begun identifying themselves with regiment numbers or crests depicting their service to the Crown. The anchor patterns are similar to those used by the British Marines during the second half of the eighteenth century.[19] The way the buttons were crafted fits the description of privates' buttons during the time period. They were made of white metal or pewter, and as a rule had iron wire shanks cast into a boss on the backs of the buttons.[20]

Lead Shot

A large amount of lead shot was recovered during the excavation (Figure 15). Lead shot a common type of ammunition used by both the English and the Americans during the eighteenth century. The size of shot varied greatly, depending upon the style and caliber of weapon. The shot recovered from the Bermuda site was of a unique caliber. After measuring all of the shot, they appeared to fit a .61-caliber weapon. This caliber weapon was developed in 1759 and used for many years afterwards by British naval forces.[21] American pistols of the period shot .45-caliber lead shot, much smaller than the English weapons.[22]

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[19] Calver and Bolton, *Pick and Shovel*, 122.

[20] Ibid., 99.

[21] George Neuman, *The History of Weapons of the American Revolution* (New York, New York: Bonanza Books, 1967), 210.

[22] Ibid., 208.

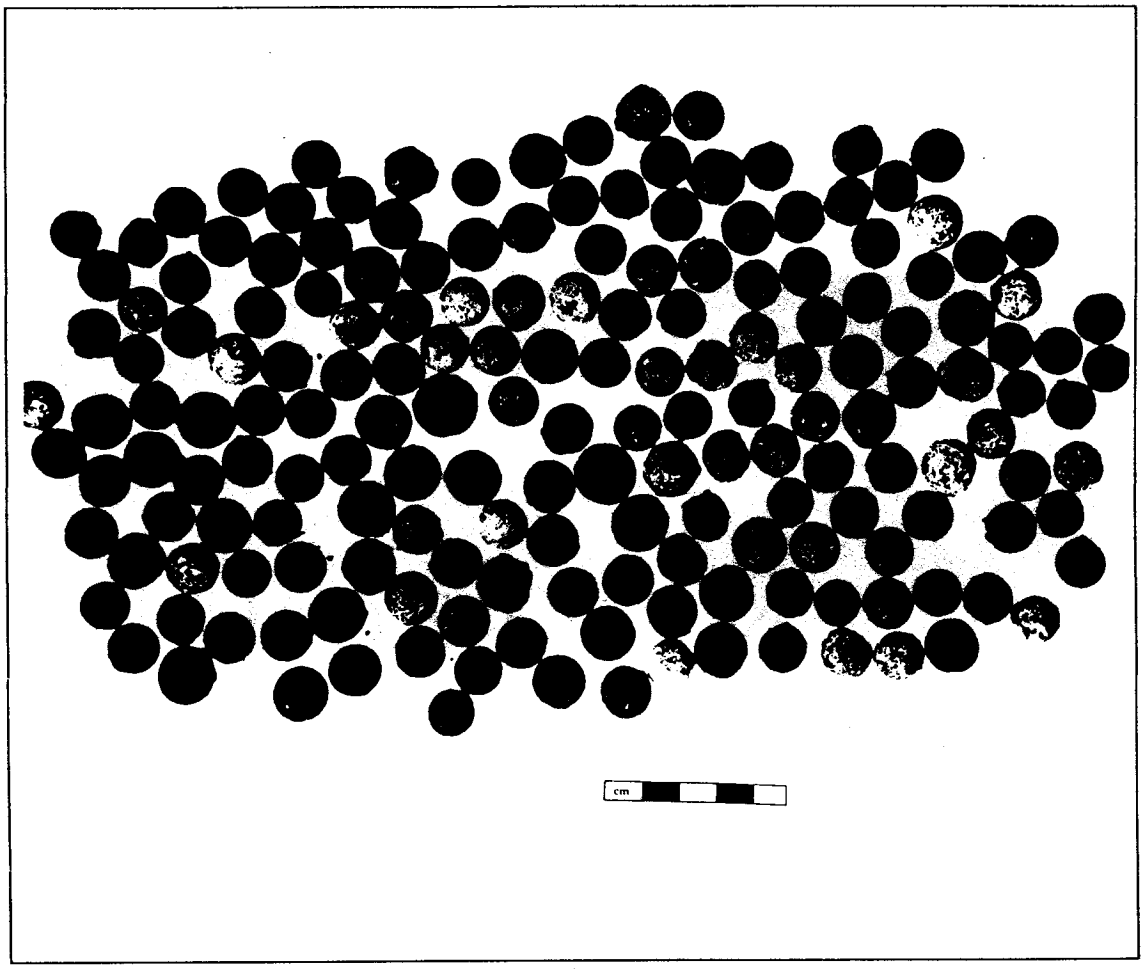

Figure 15. Lead shot recovered during the excavation.

Barrel Hoop

Another metal object found near the site was a complete barrel hoop. It is not known whether this hoop was a chime hoop (used to hold the ends of barrels together) or a booge hoop (used around the main body of the barrel). Found roughly 50 yards from the hull structure, this hoop could be intrusive to the site due to the large number of shipwrecks off the northwestern reefs of Bermuda. Close examination of the hoop determined that it could very well be associated with the site. It was made of copper and

had three broad arrows stamped on it (Figure 16). The broad arrow was stamped on all property belonging to the Royal Navy and Army.

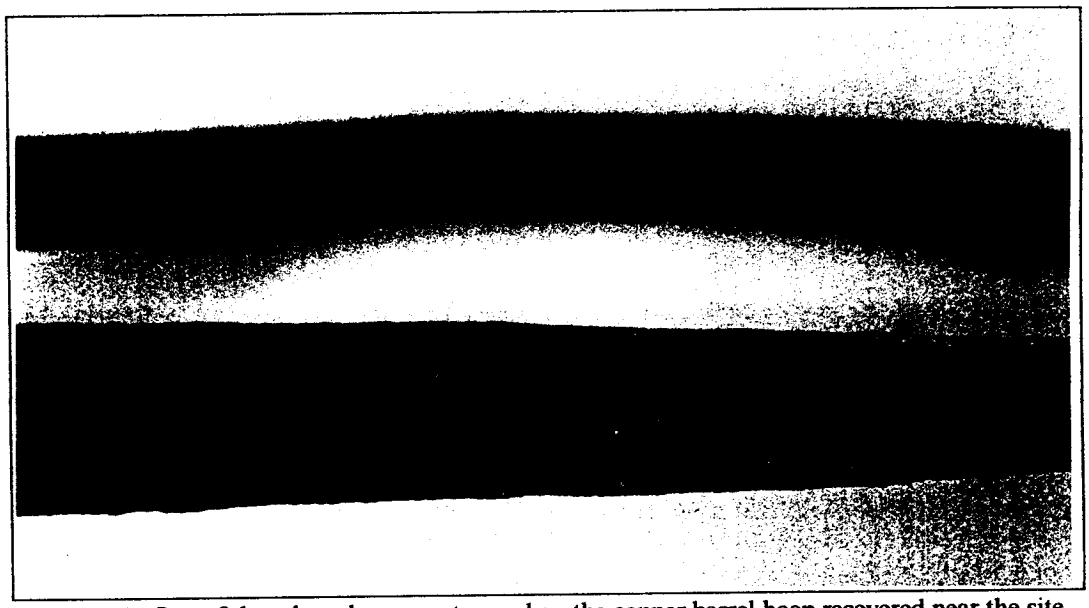

Figure 16. One of three broad arrows stamped on the copper barrel hoop recovered near the site.

Copper hoops were traditionally used on gunpowder barrels. Copper does not produce a spark if pieces of it are rubbed together, making it ideal for holding barrels of gunpowder together. It is likely that standard 100-pound gunpowder kegs used by the British military employed the use of copper barrel hoops.[23]

Wood Artifacts

Other than the hull remains, very little wood remained on the site. The small number of wooden artifacts recovered proved to be significant.

[23] George Pettengell, personal communication, November 1994.

Lower Valve

A circular wooden object, located next to the keel assembly at the west end of the hull remains, was found concreted in place by thick bilge material. After carefully clearing the bilge material away, the object was removed and taken to the Corange laboratory for analysis. The object was circular and had a hollow oval center. The outer edge of the object had a crescent-shaped indentation around its circumference. The top had two small square holes that had been slightly concreted over on each side of the hollow center. These two holes extended all the way through the object from top to bottom. A large amount of thick bilge material clogged the center of the valve. The material was sent to Paleo Research Laboratories for analysis (see Appendix A). The object has been identified as the lower valve from the vessel's bilge pump.

The purpose of the lower valve was to sit in the lower section of the bilge pump assembly, allowing bilge material and water to pass through by means of suction provided by the upper valve. The lower valve usually had a leather flap mounted on top with a lead weight. When in operation the upper valve assembly would pull water and bilge material through the lower valve assembly, with the leather flap and lead weight acting as a one-way valve. The bilge material, retained in the middle of the pump assembly, would then pass through an upper valve, where it was discharged from the pump and then overboard.[24]

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[24] Tom Oertling, personal communication, January 1995.

Lower valves often clogged easily and were designed to be removed by means of a large iron staple. The staple, attached through two holes on the outer edge of the valve, could be reached by means of a long hook and retrieved out of the pump assembly to be cleaned or examined. To prevent water and bilge material from seeping around the box and creating a loss of suction, a piece of cordage was wrapped around a groove cut on the outside of the box. The cordage, commonly flax, wool, or yarn, would swell once wet, creating a watertight seal for the valve.[25] The staple, leather flap, and lead weight were not found with the lower valve.

The lower valve recovered from the site represents a section of a "common pump." This style of pump, preceded by the burr pump, was the most widely used from the latter half of the sixteenth century through the nineteenth century. Although the chain pump replaced the common pump by the eighteenth century in most European countries, it was never a popular design for merchant vessels.[26]

Cask Remains

The remains of several wooden casks were uncovered during excavation. Although the remains of several casks were noted, only half of one cask remained intact. The barrel had nine staves intact and five pieces in the head. The barrel measured 3 feet 8 1/2 inches in length and was 2 feet 6 inches in width at the mid-section. The staves measured from 4 to 5 1/2 inches in width. The pieces in the head ranged from 4 to 5

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[25] Tom Oertling, "The History and Development of Ships' Bilge Pumps, 1500-1840" (M.A. Thesis, Graduate College of Texas A & M University, 1984), 35-37.

[26] Ibid., 80-81.

inches in width with notable double-beveled edges. The double-beveled edge of the extant head staves (which accepted the V-croze groove) indicates that the cask was constructed to hold a liquid.[27] Each of the staves was 1 inch thick. The barrel's position on site suggests its original storage location. Barrels were often stored in the hold areas, usually stacked on the bilge ceiling. Wood analysis revealed that the barrel was made of oak. Results of the wood analysis revealed stained wood cells taken from the interior of the barrel. The stained wood cells had a distinctive pink coloration, probably due to staining by the original contents of the barrel, possibly red wine.

George Pettengell, Master Cooper at Colonial Williamsburg, reviewed the dimensions of the barrel remains from the site. After comparing base diameter measurements and strake widths, Pettengell stated that the barrel remains were those of a 125-gallon "Pipe or Butt." These barrels were used during the late eighteenth century to haul red wine.

A series of numeric markings was noted on the inside of the exposed barrel (Figure 17). The markings, made with a race knife, were roman numerals. In no sequential order, the numerals probably represent a form of accounting of replacement staves. Individual staves often needed replacing; each had to be measured so that the new stave would fit. The markings could also represent staves that were re-used, as were many found on the 44YO88 site.[28]

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[27] Robert J. Burns "Bulk Packaging in British North America, 1758-1867: A Guide to the Identification and Reproduction of Barrels." Parks Canada Research Bulletin (Ottawa, Ontario), no. 208 (December 1983):1.

[28] John Broadwater, personal communication, February 1998.

wood block was no longer present but the iron shell of the sheave remained. A small section of rope was still attached to the sheave.

Since each object had very little iron remaining, it was decided to cast molds of the concretions. Each concretion was split in half and cleaned of any iron residue. Epoxy resin was mixed with carbon and placed in the hollowed-out concretions. After the resin to hardened each concretion was removed to reveal an exact replica of the object.

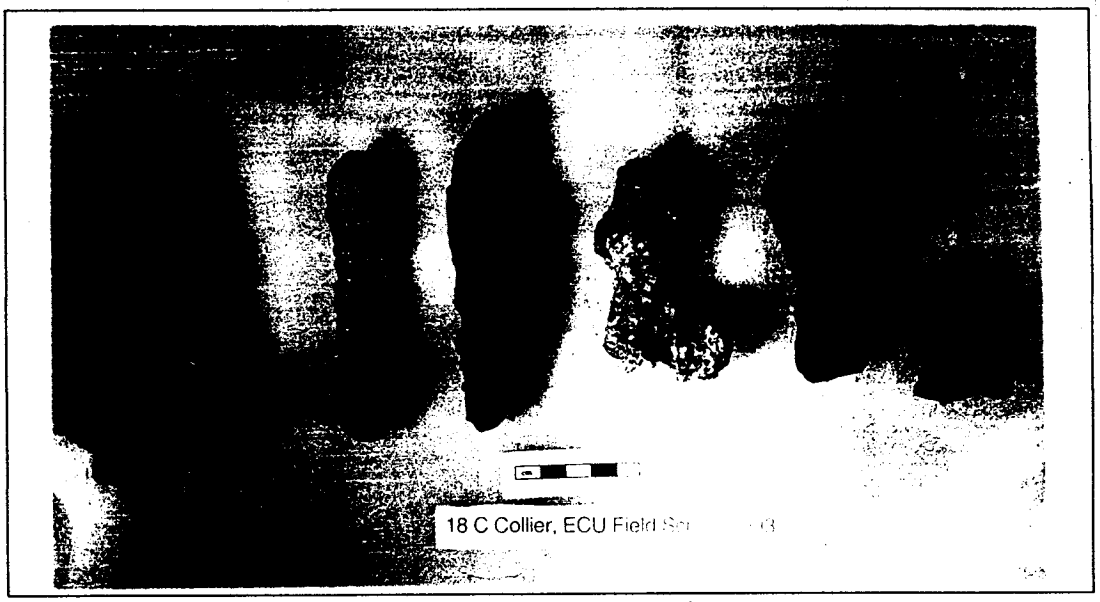

Figure 18. 6 of the 7 concretions recovered during the excavation.

The artifact assemblage suggests that the site is British in origin. The ceramic and glass shards recovered during the excavation help to confirm this hypothesis. However, the question remains whether or not the vessel was a transport when it foundered. The artifacts that indicate that it was a transport are the military buttons and the copper barrel hoop found near the site. Two of the pewter buttons had faint yet distinct anchor patterns on their faces. This pattern is similar to those used by the British Marines during the

American Revolution. The construction of the buttons is also consistent with those fashioned during the mid- to late-eighteenth century. The copper barrel hoop found near the site is another indication that the site represents a British transport. The presence of three broad arrows suggests that the hoop was the property of the Royal Navy and/or Army and the construction of the hoop is comparable to those used by the British for 100-pound gunpowder kegs during the eighteenth century. These artifacts suggest to some degree that the vessel was being used for some type of military operation. Coupled with the presence of transports around Bermuda during the last half of the eighteenth century and Bermuda's role in the war, it is possible that the hull remains represent a British transport. The hull construction also indicates that the vessel was used to carry large cargoes which was imperative during the War for Independence.

CHAPTER 3

HISTORY OF BERMUDA 1609 - 1800

Bermuda's history depicts the expansion efforts by England to colonize the New World and in doing so return a profit to the mother country. However, with the expanse of the Atlantic Ocean between them the British crown and a score of individual investors soon found that control over the islands was not going to be easy. The history of Bermuda exemplifies the complex nature of establishing a colony on a small group of islands approximately 2,500 miles from England and 500 miles from the North American mainland.

Due to its secluded location and lack of natural resources, Bermuda faced a number of problems other English colonies did not. Bermuda was heavily reliant upon Britain for necessities that the islands could not provide their inhabitants. As well England often placed Bermuda low on its priority list, and the islanders suffered the consequences. The inability of the islanders to rely on England forced them to trade with foreign markets in order to survive. By the time of the American Revolution, Bermuda's fidelity to the crown was questionable, even though its population was largely composed of loyalists. Britain, concentrating its efforts on the mainland colonies, did little to appease the needs of the islanders. As the war progressed, Bermuda became more valuable to the crown. The British needed a base of operations closer to the North American mainland to disrupt

American shipping. After nearly 150 years, England realized the value of Bermuda's location and began to develop the islands as a military base of operations.

Although the English did not colonize the islands until the early seventeenth century, Bermuda was well known to mariners throughout the sixteenth century. The first written account of Bermuda came in 1515 when Gonzales Ferdinando d'Oviedo visited the islands on board *La Garza*, a vessel commanded by Juan de Bermudez (after whom the islands were eventually named). Oviedo, who attempted to land on the island "to leaue in the Iland certaine hogs for increase," found he could not due to prevailing winds.[1] After this account, records indicate that the Spanish used Bermuda solely as a navigational marker. Once mariners sighted Bermuda, it meant that 32 degrees latitude had been cleared, and it was safe to head east toward home. Many mariners "shunned these islands as the last of their American perils, the successful clearance of which justified a relaxation of both vigilance and sobriety."[2]

In 1593, Henry May, an Englishman on his way to Europe from Hispaniola aboard a French vessel under the command of M. de la Barbotiere, shipwrecked on Bermuda due to pilot error. On December 17, the pilots and crew, thinking themselves clear of the islands, "demanded of him (Barbotiere) their wine of height, the which they had."[3] To their surprise, they had not cleared Bermuda, and their vessel struck a reef about seven leagues off the coast. May and 26 (out of 50) Frenchman survived, living on

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[1] Major-General J.H. Lefroy, *Memorials of the Discovery and Early Settlement of the Bermudas or Somers Islands 1515-1685* (London: Eyre and Spottiswoode Limited, 1932),1:2. Hereafter cited as *Memorials*.

[2] Henry C. Wilkinson, *The Adventurers of Bermuda* (London: Oxford University Press, 1958), 18.

[3] Lefroy, *Memorials*, 1:7.

Bermuda for five months until they fashioned a new vessel using native cedar. During this time, May made some useful observations concerning the islands' geography, flora, fauna, and food supplies. May and his companions, fearing that water supplies could run low during the summer months, departed Bermuda on May 11, 1594, for Newfoundland. Henry May eventually reached England on August 1, 1594, to tell his story of Bermuda, the first ever from an Englishman.

Although May's story was well received, Bermuda remained unsettled through 1600. Spain, interested only in Florida as a stopping point for returning galleon fleets, did not see the need to engage in any more colonization in North America.[4] England, preoccupied with the establishment and success of her mainland North American colonies, avoided the treacherous reefs of Bermuda altogether.

England soon discovered that the successful colonization of the North American mainland would not be easy. By 1608, "with starvation, disease, dissension, and Indian troubles within the colony...it was evident that drastic changes were needed."[5] The English decided it was imperative to reinforce their numbers in the mainland colonies and send out more emigrants and supplies.

From 1610 to 1612, private investors of the Virginia Company pushed to establish a settlement on Bermuda. The company began to turn its attention to other areas for profit as the Virginia colonies were not producing the amount of profit expected. The climate in Virginia confirmed that cash crops were not easily attainable, even though

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[4] Wilkinson, *The* Adventurers, 24.
[5] Ibid., 40.

experiments with tobacco cultivation proved promising. The prospect of a settlement farther south, capable of producing such products as grapes and olives, was in sight. Bermuda, apparently fertile enough to support such cash crops, appeared ideal.[6]

The original charter, obtained for the Virginia Company from the crown of England, included all islands within 100 leagues of the Virginia coastline. Since Bermuda was over 300 leagues off the coast of Virginia, King James I issued a new charter on March 12, 1612 encompassing the Bermuda islands.[7] The Virginia Company, upon receiving the charter extension, appealed to its investors to contribute to the establishment of a new colony on Bermuda. Once gathered, the new group of investors bought all titles, royalties, and prerogatives concerning the islands for £2,000 from the Virginia Company.[8] The new company decided after much debate to name Bermuda the "Somer Islands," after the late Sir George Somers.[9] By November 1614, all transfers of titles had been completed by the subsidiary company under the Virginia Company. Titled "The Governor and Company of the City of London, for the Plantation of the Somer Islands," the

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[6] David B. Quinn, "Bermuda in the Age of Exploration and Early Settlement," *Bermuda Journal of Archaeology and Maritime History* 1 (1989):18.

[7] William Frith Williams, *An Historical and Statistical Account of the Bermudas* (London: Thomas Cautley Newby, Publisher, 1848), 17-18.

[8] Wesley Frank Craven, *An Introduction to the History of Bermuda* (Bermuda: Bermuda Maritime Museum Press, 1990), 17.

[9] Sir George Somers was in charge of a fleet bound for Virginia in 1609. The fleet was hit by a storm en route and Somers' vessel the *Sea Venture* foundered on Bermuda. Somers, along with the colonists, found a wealth of food on Bermuda on which to survive while they built two vessels (the *Deliverance* and the *Patience*). Once the vessels were completed the colonists left Bermuda and continued to the Virginia colonies. Upon arrival, the new colonists found the Jamestown settlement in urgent need of help. Starvation and disease had ravaged the settlement. Somers, remembering the wealth of food on Bermuda, elected to return to the island and gather provisions for the colony on June 10, 1610. Upon returning to Bermuda with a small group of men, Somers died while gathering provisions. The remaining men left Bermuda, with Somers, and sailed to England to tell of the riches they had found on the island.

company comprised roughly 117 stockholders. Stockholders contributed various amounts of money that was combined in a common fund for the establishment of the Bermuda colony.[10]

Plans were then devised to send out the first colonists and establish the islands under British rule. With 60 emigrants and Richard Moore to act as governor, the *Plough* left England on April 28, 1612. After 11 weeks at sea the *Plough* arrived safely, beginning the true colonization of Bermuda.

Moore's first instructions as governor were to fortify the islands. With the help of the emigrants, Moore laid out a number of fortifications and batteries.[11] The attempts to fortify Bermuda were in response to the possibility of attack by the Spanish, who felt that Bermuda was still in their domain.

The Company was interested in exploiting any form of profit available from the islands. By 1618 tobacco became the major profit crop and exchange item from the colony. When the first supplies arrived in Bermuda on January 15, 1618 aboard the *Diana*, all of its contents were traded for 30,000 lbs. of good-quality tobacco.[12] This increase in production and profit very much excited the Company's investors back in England.

During the mid-1620s, Bermuda's tobacco production continued on the upswing.

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[10] Craven, *History of* Bermuda, 29.

[11] Wilkinson, *The Adventurers*, 60. Moore and the emigrants built Smith's and Paget batteries on St. George's Harbor, King's and Charles Forts overlooking the channel into Castle Harbor, Pembroke Fort on Cooper's Island, St. Katherine's and Gate's Forts at St. George's and Warwick Castle to protect the town and freshwater supply.

[12] Craven, *History of* Bermuda, 87.

Its production increased, and even though England demanded that the final product be sold only to English buyers, many settlers found ways to sell their product to other markets, like Holland, for a better price.[13] London buyers, on the other hand, continued to pay minimum prices for tobacco. With larger amounts of the commodity being produced in Virginia and other British colonies the market reached an unsurpassed low in 1629. In 1629 when Governor Phillip Bell of Bermuda wrote to Sir Nathanial Bell about the condition of the island's tobacco, he had this to say:

> And as for this island [Bermuda], the strength and vertue of the lande doth so much decreas and decaye daylye that in a shorte time it will be a very small value or profitt, especially so much tobaccoe now beinge planted and broughte home of better qualitie and from richer climates and plantacions, that I make a questione whither this will be worthe anythinge if vend [sold] at all.[14]

Due to the decline of arable land and better tobacco being grown in other colonies, Bermuda's tobacco production began to decline.

By the 1630s a continued slump in the tobacco market forced Bermudians to support themselves by expanding their trade routes. These routes included the West Indies, a major supplier of sugar, clothes, hardware, and rum. Bermudians began supplying cattle, pork, fish, and salt in exchange for such goods.[15] This new trade system between colonies began to upset investors in England. Fields previously used for tobacco production were now being used to raise cattle, decreasing profits returned to England.

With the commencement of the English Civil War in 1642, Bermuda experienced

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[13] Wilkinson, *The Adventurers*, 163-164.

[14] Vernon A. Ives, ed., *The Rich Papers: Letters from Bermuda 1615-1646* (Toronto: University of Toronto Press, 1984), 321.

[15] Wilkinson, *The Adventurers*, 96.

a period of isolation. The outbreak of the war caused a disruption in commercial shipping activities, affecting the regularity of supply vessels sailing to Bermuda.[16] That isolation, lasting for more than five years, severely affected the economy and the inhabitants of Bermuda. The irregularity of English shipping during this period allowed the Dutch to capitalize on Bermuda's remaining tobacco production by bartering for the crop in exchange for supplies needed by the Bermudians.[17]

After the Civil War, England attempted to gain back its hold over its colonial trade and markets. England imposed a series of Navigation Acts in 1651 stating that all "goods and commodities...imported into or exported out of any lands, islands, plantations, or territories"[18] under English domain were to be shipped solely in English-owned ships. Enforced during the next 10 years by colonial administrators, the Navigation Acts proved ineffective with regard to Bermuda. The islanders had already developed a strong trade with the Dutch. Thus they paid little heed to the Acts, much to the chagrin of the Somers Island Company.

By the late seventeenth century, Bermuda's economy no longer relied solely on its agricultural products. Bermudians found that it was possible to afford a modest living by increasing their shipping efforts from the islands. This expansion in private shipping interests received strong resistance from the company, but Bermudians had little respect for their counterparts in London and shrugged off any warnings.

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[16] J.C. Arnell, "The Medium of Exchange in Early Bermuda," *Bermuda Journal of Archaeology and Maritime History* 3 (1991): 21.

[17] Ibid., 24.

[18] Stephen B. Baxter, ed., *Basic Documents of English History* (Boston: Houghton Mifflin Company, 1968), 138.

The expansion of the North American mainland colonies into the Carolinas aided in the rise of Bermuda's shipping industry. It was not illegal for intra-colonial trade to occur except for goods on which the company had monopolies, including tobacco, cedar, and whale oil.[19] Colonists in the Carolinas offered such products as grain and beef in exchange for goods transported by Bermudian ships, most importantly rum from the West Indies. This increase in shipping and inter-colonial trade helped Bermuda gain autonomy from England by providing the islands with a more stable and independent economy. This allowed Bermuda to operate as a self-sufficient colony with less dependence on England.

By the 1680s the company had lost its zeal for effectively governing Bermuda. With only a handful of the original proprietors left and a large percentage of freeholders living on the islands, Bermudians felt that the company no longer had the right to regulate its actions. With Bermuda vigorously pushing to become an independent colony and the company unable to stand up to the pressure, the company's demise was imminent. Finally, in 1684, the Court of King's Bench rescinded the company charter through a *quo warranto* proceeding, allowing Bermuda to become a colony of the crown.[20]

In 1683, when Colonel Richard Coney arrived on Bermuda to take over as governor, he found little compliance during his stay:

> The colony was apparently one of anarchy: piratical visitors set all law at defiance, there was no Assembly, the Governor was at war with his Council, the Council refused to acknowledge his authority.[21]

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[19] Wilkinson, *The Adventurers*, 345.

[20] Walter Brownell Hayward, *Bermuda Past and Present* (New York: Dodd, Mead and Company, 1927), 31.

[21] Lefroy, *Memorials*, 2:514. Bermuda's first Assembly convened in 1620 under the direction of Governor Nathanial Butler. The Assembly's first order of business was to implement a colonial constitution. This constitution stated that Bermudians were occupants with the power to make their own

Under new colonial rule, and with the crown in control of the colony, the assembly resumed sessions on June 6, 1687.[22] Although the crown reinstated the assembly, Bermuda still had problems concerning visitors with little regard for the law.

In 1687, with the arrival of the next governor, Sir Robert Robinson, Bermuda organized its first militia. Robinson felt this action necessary to protect Bermuda from pirates:

> The strength was brought up to 780 in "fair readiness," with arms and ammunitions supplied to those who did not have any. Two troops of horse were also raised among the prominent Bermudians, and a watch was to be kept through the several tribes with three foot men well armed and a horseman in each tribe every night.[23]

The militia continued to expand into the 1690s with the initiation of the Militia Act. The Act proclaimed that every man between the ages of 15 and 60 was to report at every exercise with a musket and a cartouche box capable of holding 25 cartridges.[24] Along with a firearm, men were also required to produce a sword. Slaves were also to report for duty, and fines were initiated for those who did not conform to this new act.

Although the home-trained militia did not possess the professional training of English troops, they did help curb blatant acts of insubordinance. In 1701 Bermuda received some of the crown's troops after successive requests. The troops arrived under the direction of Lieutenant Robert Henley with two sergeants, two corporals, fifty

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laws as long as they were not contrary to those of the Mother Country. By 1677 the Assembly refused to operate under the auspices of the Company. With the Assembly in disarray the state of affairs in Bermuda declined to Anarchy.

[22] Hayward, *Past and Present*, 32.

[23] Rene Chartrand, "Notes on Bermuda Military Forces, 1687 - 1815," *Bermuda Historical Quarterly* 28, no. 1 (1970): 41.

[24] Ibid., 41.

privates, and one drummer.[25] This military presence kept ready during the war with France in 1702 and in 1715 when England went to war with Spain. After these two wars the military played a very small role in Bermuda's history until the American Revolution.

By the late seventeenth century Bermudians concentrated almost all of their attention on trade and shipping. One of the more profitable areas during this period was the salt trade. Many colonists sailed to the Turk's Islands with their slaves to engage in the production of salt. Colonists often gathered salt during the winter months, and when conditions became more favorable they would trade it to the mainland colonies in exchange for lumber, pork, corn, flour, and bread. During the off-season, trade concentrated on the West Indies where vegetables were bartered for rum, molasses, and textiles.[26] Bermudians were so serious about the salt trade that when the Spanish attempted to takeover the salt ponds in 1710, they responded with arms and recaptured their investment.[27] The salt trade continued, with substantial profit well into the eighteenth century, giving Bermuda an even more independent stance with regards to England. Shipping and the trade routes became so profitable that all aspects of agriculture on Bermuda were left to the slaves. To white landowners the act of cultivating the soil came second to the profits received from trade routes.[28] Most slaves worked with some aspect of sea-faring, yet a small number were assigned to cultivate the land.

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[25] Ibid.

[26] Ibid., 31-32.

[27] F. Whittington, *Bermuda - A Colony, A Fortress, and A Prison* (London: Longman, Brown, Greene, Longmans, and Roberts, 1857), 66.

[28] Wilfred Brenton Kerr, *Bermuda and the American Revolution: 1760 - 1783* (Hamden: Archon Books, 1969), 9.

It was well known that Bermuda possessed some of the finest cedar available for ship-building. Throughout the 1620s restrictions were placed on the cutting and exporting of the valuable cedar for fear of depleting the supply. Law number 115 of the Bermuda Company stated in 1622, "Neither shall they suffer any Timber, boards or Plankes, to be transported out of the said Ilands, without especiall warrant from the Governour and Company heere."[29] By the mid-eighteenth century, many Bermudians used this supply of timber to produce some of the most durable sloops and brigs found in North American waters. With this advance in shipbuilding and sailing came the knowledge of navigation.[30] It was these advances in shipbuilding and navigation skills that allowed Bermudians to concentrate their economic efforts toward the ocean by the mid-eighteenth century.

England continued to levy duties on whatever goods they could in order to keep some control over Bermuda. This became the responsibility of a customs collector and a number of searchers who were to examine the cargo of incoming vessels and levy duties accordingly.[31] Islanders held the customs officials and their levies in low regard, causing friction in the collection of such duties. Even with England's initiation of the Stamp Act of 1765 and the Townshend Duties of 1767, to help defray the debt of the Seven Years' War and the East India Company, Bermudians still refused to comply wholeheartedly.[32] This unruly relationship between local and government parties continued through the outbreak of the American Revolution in the 1770s.

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[29] Lefroy, *Memorials*, 1:204.

[30] Kerr, *American Revolution*, 3.

[31] Ibid., 7.

[32] Hereward T. Waltlington "William Browne, Esq. Governor of Bermuda 1782-1788," *Bermuda Historical Quarterly* 33, no. 3 (1976): 53.

Commissioned in 1764, Governor George Bruere attempted to curb much of the illicit island trade by issuing a proclamation directing all incoming vessels to proceed directly to St. George's (on the east end of Bermuda) for inspection. After the inspection vessels could proceed to other parts of Bermuda or to sea.[33] The colonists, utilizing Bermuda's geographical layout to their advantage, unloaded their supply vessels into small coves and bays away from the watchful eyes of the collectors. Thus some of the colonists succeeded in avoiding the collection of duties altogether.

Governor Bruere suggested that another port be opened at the center of Bermuda to monitor the comings and goings of local shipping. This idea seemed to be most logical since St. George's, the only port on the islands, was at the far east end. This left the rest of Bermuda unwatched to receive the illicit trade that the crown was trying so hard to stop. Bruere's idea was soon put to rest by wealthy merchants of St. George, the most powerful members of Bermuda's Assembly. These merchants did not favor the idea of a competitive port that could possibly endanger their monopoly. Bruere realized he had little say in the matter and dispatched a searcher to watch over the west end of the islands.[34] This did help deter illegal trade to some extent, but one man could do little, considering the size of the west end.

With the start of the American Revolution, Bermuda began a period of history during which its loyalty to the crown was severely questioned. In 1775, an embargo placed on all loyalist British colonies by the Continental Congress in Philadelphia severely

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[33] Ibid., 25.
[34] Kerr, *American* Revolution, 25.

threatened the well-being of Bermuda. The initiation of an embargo meant that Bermuda's carrying trade was in serious jeopardy, creating the more serious problem of starvation.[35] In a letter from Henry Tucker to St. George Tucker on May 29, 1775, Henry Tucker wrote:

> I must Answer That no people are more fond of Liberty than the Bermudians, but as they can be of no service to the Cause...our Situation is such that we lye intirely at the Mercy of Great Britain who shou'd we offend by such resolutions wd. undoubtedly distress us, which could effectually be done even to a famine....[36]

Bermudians were faced with an extremely complex situation: either appeal to England for supplies or look past England and appeal to the colonies in revolt for aid. The problem was not loyalty or disloyalty to the crown, the problem was starvation.

The Revolution affected all the colonies. Trade routes were interrupted, embargoes were employed, and vessels used for trade were hired or impressed for military uses. Bermuda felt the effects of the Revolution almost immediately. Bermuda was unable to procure any supplies from England because the islands had nothing to give in return. England's attention centered solely on the American colonies and not on the small archipelago of Bermuda. Unable to survive by trade routes alone and with little help from England, Bermudians had one option - appeal to the Continental Congress of Philadelphia for help.

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[35] Terry Tucker, "Reverberations in Bermuda of the American Revolutionary War," *Bermuda Historical Quarterly* 33, no. 1 (1976):10.

[36] William Bell Clark, ed. "Letter from Henry Tucker to St. George Tucker, May 29, 1775," *Naval Documents of The American Revolution* (Washington: U.S. Navy Department, 1964),1:566. Hereafter cited as *NDAR*. Henry Tucker stated that the British could starve the Bermudians by placing just two warships at each end of the island, thus preventing any vessel from landing on the island.

Unbeknownst to Governor Bruere, an appeal was taken to the Continental Congress by a number of Bermudians. The Continental Congress expressed interest in any available gunpowder reserves that would aid in the fight against England. It was known that 112 barrels of gunpowder lay unguarded in a royal magazine in St. George's, intended for use against the American revolutionaries.[37] If this commodity could be obtained, General George Washington felt that he could use his influence with the Continental Congress to grant the foreign sale of supplies to Bermuda.[38]

On August 14, 1775, the royal magazine in St. George's was broken into and emptied On August 19, 1775; Bruere issued a letter to all of H.M. ships concerning the incident. He believed that the gunpowder was bound for either Philadelphia or South Carolina and requested naval help.[39] The gunpowder, however, arrived safely into the hands of the American revolutionaries much to the chagrin of Governor Bruere.

On November 22, 1775 the Continental Congress replied that Bermuda appeared friendly to the revolutionaries' cause and should be able to obtain supplies necessary for home consumption and subsistence. Supplies were to be given in exchange for arms, ammunition, and salt.[40] The Continental Congress instructed a secret committee to outfit two fast sailing vessels with provisions to be sent to Bermuda. The vessels were to drop off the provisions, determine the state of the islands and the disposition of the inhabitants,

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[37] Ibid., 46.

[38] Hayward, *Past and Present*, 40.

[39] K.G. Davies, ed. *Documents of the American Revolution 1770-1783* , (Dublin: Irish University Press, 1976), 10:128.

[40] Kerr, *American Revolution*, 53.

and, if possible, purchase two sloops of war "for the service of the United Colonies."[41]

With contraband coming into Bermuda from the revolting colonies, a small group of Bermudian loyalists saw the opportunity for profit. Using small armed craft, these privateers roamed around Bermuda lying in wait for ships carrying illegal goods. This group of privateers succeeded in slowing the amount of goods imported by the revolutionaries and, more importantly, began capturing American vessels in the name of Britain. The Continental Congress, seeing these acts of aggression, considered the privateering acts hostile actions. By the autumn of 1778, the Congress issued revised regulations concerning the exportation of provisions. Bermuda, the first on the list as an excepted colony, was no longer regarded as such.[42]

Governor Bruere, well aware of the problems facing Bermuda, appealed strongly to Britain for assistance. Bruere felt he could trust no one, and he frequently admonished the citizens of Bermuda for their actions: "Our people here frequently persue a Schandalous and Villanous Enterprise, by going...in Search of Wreck Goods: a disgrace to the English flag...."[43]

Bruere was aware that many locals preyed on the misfortune of others, waiting for vessels of any nation to founder on the reefs of Bermuda. If a vessel foundered, locals would rush out to help the crew and passengers to safety - usually for a price. One instance occurred when the brig *Industry*, wrecked off the northwest reef in 1774. Bruere

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[41] Journal of the Continental Congress, June 6, 1776. William James Morgan, ed., *NDAR*, 5:398.

[42] Kerr, *Past and* Present, 88-89.

[43] George James Bruere, Governor of Bermuda, to Lord Dartmouth, August 20, 1775. William Bell Clark, ed., *NDAR*, 1:1194.

recalled, in a letter to Lord Dartmouth, how he "reported the[y] had Pumps and Rigging of a fine ship [the *Industry*] from Ireland Cutt away and Carried off, and the Hulk of the Ship being gott off, and towed into Harbour is now sold and Repairing.[44] It was actions such as these that Bruere abhorred.

In an attempt to attract the crown's attention, Bruere began pushing Bermuda's mild climate as the perfect place for troops to recover, "It may also be a Convenient place this winter, to recover the Sick and wounded of the Army, and here is a good Harbour for Frigats or Men of War...."[45] By January 1776, other British loyalists stressed the importance of Bermuda:

> Bermuda being situated in Lat. 32.25 N & Long 66.38 E...is an Island capable of great improvement & may be rendered of great importance in Time of War...There is in this island a spacious Harbour, capable of admitting Vessels drawing 18 or 20 Feet Water, having places convenient for heaving down careening & repairing...Wages are so moderate that ships may be repaired &c at a third of the expence of what they can in the West India Islands...The Climate and Temperament of the Air is so excellent that were there a Hospital erected for the Sick in the Navy & Army...that with no assistance from Medicines they will recover more within a few Weeks than they can in the West Indies....[46]

Although Bermuda was ideally suited in many ways for the recovery of English troops and the refitting of British vessels, Britain did not take advantage of Bermuda's location until later in the American Revolution.

The Continental Congress continued to allow a small amount of supplies to be shipped to Bermuda, but the acts of privateering continued to worsen. Replying to these continued actions, the Continental Congress resolved to rescind all privileges to Bermuda

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[44] Ibid., September 2, 1775, William Bell Clark, ed., *NDAR*, 1: 1298.

[45] Ibid.

[46] Thomas Lyttleton to Lord George Germain, January 27, 1776, William Bell Clark, ed., *NDAR*, 3:537.

on May 1, 1781.[47] Bermudians, still facing the threat of starvation, had little option but to look to England for support.

Many Bermudians viewed incoming goods from the American colonies as necessary for survival. Although happy to receive supplies from the American colonies, the large majority of Bermuda's residents remained fiercely loyal to Britain. Many were unhappy that they had been reduced to "the sad alternative of either submitting to the Distresses of Famine, or appealing to their [the American colonies] Humanity for Relief."[48] During the war, numerous letters were written by Governor Bruere, the Assembly of Bermuda, and various Bermuda residents to the King of Great Britain regarding the dire situation of Bermuda. Although provisions were short in coming from Britain, the crown often tried to station a vessel of war off Bermuda's coastline for protection.

Britain did attempt to keep some form of naval presence around the Bermuda during the American War for Independence. On April 2, 1777, Lord George Germain wrote to Governor Bruere and stated that the rebel naval force had been greatly reduced. Hence many of His Majesty's ships, being freed of service to the crown's army, would be available for Bermuda's protection.[49] On June 9, 1777 the sloop of war *Nautilus* arrived off Bermuda to aid in protecting Bermuda's coastline. Governor Bruere was expressly

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[47] Ibid., 90-91.

[48] Address of the Inhabitants of Bermuda to the King, April 26, 1777, William James Morgan, ed., *NDAR* 8:449.

[49] Lord George Germain to Governor George James Bruere, April 2, 1777, William James Morgan, ed., *NDAR*, 8:732.

relieved to see some support from the crown.

Bermuda was considered a passing point for homeward-bound trade from the West Indies, and Britain could not afford to lose too many vessels or supplies to rebel cruisers. Many vessels from the West Indies were convoyed as far as Bermuda and then allowed to proceed onward to Britain under less protection.[50]

By 1777, Britain was concerned with the safety of Bermuda. By stationing British naval vessels off the coast of Bermuda to cruise its waters, the threat of a rebel attack was lessened to a large degree. Even under the protection of Britain, American rebels still continued to land on Bermuda. One or two British vessels could by no means watch over Bermuda's entire coastline and prevent landings. On June 13, 1777 the brig *Fair American* and the privateer brig *Experiment* proceeded into Bermuda's western harbor. The vessels were fired upon by the fort at the entrance to the harbor to which the vessels fired back. The *Fair American* and the *Experiment*, preparing to attack again, noted that the fort had been abandoned. The vessels landed some men at the fort "took possession of it, demolished the embrasures, dismounted and spiked the Cannon, and destroyed the Carriages; and remained there six days."[51] This was the only attack by Americans to take place on Bermuda soil during the war.

As the war progressed, Britain began to view Bermuda as a necessary base in the western Atlantic. With the American colonies only a few hundred miles away from the

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[50] *Gazette of the State of South Carolina*, April 28, 1777, William James Morgan, ed., *NDAR*, 8:460.

[51] Ibid., 9:194.

shores of Bermuda, the islands were an ideal position for an English stronghold. Bermuda's strategic location would act as a base of operations to disrupt American shipping lanes.

By 1777, the British and Americans were shipping large quantities of stores and supplies by boat around the colonies. Boats were the fastest and most economical way to transport supplies within the colonies and to the Caribbean. Both sides preyed on each other's vessels at sea, hoping to strike a blow. Bermuda began to play the role of a rendezvous site for British vessels looking for American prizes. Americans soon began to feel the presence of the British at sea:

> I wish we were better Able to coape with the enemy at sea, for they have the Advantage of us greatly for they seem to take almost every thing. They have got Bermuda as a place of rendezvous, by which they have all the Advantage possible.[52]

Using Bermuda as a stopover, many Royal Navy vessels found the waters off Bermuda ideal for chasing and taking American prizes. Most American vessels taken were privateers themselves waiting around Bermuda in hopes of taking a prize on its way back to Britain. During the winter months of 1777, H.M.S. *Galatea* reportedly took more than 45 prizes in Bermuda waters.[53]

By the end of the American Revolution Bermuda had become a well-known sighting for many loyalists and soldiers returning home to England. By the 1780s Bermuda was a well-protected English stronghold and considered a valuable asset to

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[52] Isaac Smith to John Adams, April 10, 1777, William James Morgan, ed., *NDAR*, 8:308.

[53] Summary - May 1, 1777 to May 31, 1777, William James Morgan, ed., *NDAR*, 8:885.

England's presence in the Western Atlantic:

> There can be but little doubt that Bermuda will soon be made a second Gibraltar; it has everything in its favour for that purpose-her natural strength no one will dispute, and when proper fortifications are built, not all the power that can be brought against the place, would be able to reduce it. Her situation in the Atlantic, for affording shelter to British ships in a time of war, or such privateers as may cruise against the enemies of Great Britain, is well known....[54]

As Bermuda became more of a nucleus of British activity by the 1780s and trade routes reopened, Bermuda began to see more and more ship traffic around its waters. As Britain's interest in the West Indies, and to some degree the American Colonies, persisted toward the last quarter of the eighteenth century, Bermuda's location continued to provide an invaluable stopping point to all vessels traversing the Atlantic.

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[54] The Bermuda *Royal Gazette*, November 14, 1789 (Hamilton, Bermuda: No. 307): 4.

CHAPTER 4

HISTORY OF COLLIERS AND THE AMERICAN WAR FOR INDEPENDENCE

Archaeological evidence suggests that the site investigated could be the remains of British collier. The framing pattern and use of heavy, tightly-spaced scantlings are comparable to the those found on Site 44YO88, a known British collier. Coupled with the extensive use of colliers as transports during the American War for Independence and the presence of British transports around Bermuda during the war, it is conjectured that the hull remains may represent a collier-built transport.

To understand the development of the collier, one must look at the industry for which they were developed. Although metal use in England was widespread from the Middle Ages on, it did not commercially expand until the sixteenth and seventeenth centuries. During the reigns of Queen Elizabeth I and King James I, there was a general industrial growth within England, concerned mostly with the manufacture and use of metals. This industrial development involved the growth of various commodities, as well as technical improvements and organizational changes. English artisans began to work extensively with metals such as iron, copper, lead, and tin. As metal work became more extensive, its popularity and usefulness grew. Although this escalation has been overshadowed by the much larger Industrial Revolution of the late-eighteenth century,

there are signs of its existence. Such signs include growth of coal mining, shipbuilding, salt production, and glass manufacture.[1]

As England's uses for metal products increased, so did its demand for raw material, such as bar iron. Before the eighteenth century England relied heavily on imports from places like Sweden for almost half of its bar iron. However, England soon began to realize the economic importance of native manufacture and the possibility of manufacturing goods for exportation.

Coupled with the demand for raw material was the increasing demand for timber resources. The uses of timber were numerous; from shipbuilding to an increase in manufactured products and industry, wood continued to be a valuable commodity. The necessity for timber was not limited to England. Deforestation throughout Europe became evident as early as the fourteenth century, when Venetian lime and brick makers had their firewood rationed by town ordinances. The Norwegian government began to protect its timber resources before the end of the sixteenth century. In England and Scotland the timber shortage began to have serious consequences during the reigns of Queen Elizabeth and King James I. This necessity, brought about by an overall population growth and an increase in industry throughout both countries, created a high demand for wood supplies.[2]

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[1] J.U. Nef, *The Rise of the British Coal Industry*, (London: George Routledge and Sons, Ltd., 1932), 1:165-169.

[2] Ibid., 156-164.

As the demand for wood increased, so did its price. Inflated wood prices throughout England and Europe precipitated the desire for a suitable substitute, especially for firewood. The use of coal as an alternate source of fuel began to rapidly develop in England during the reign of Elizabeth I and continued to grow as wood sources continued to diminish. It was this overwhelming need for fuel that provided the impetus for England's advance into the coal industry.

England was able to develop its coal resources due to natural advantages, the largest of which were the abundant coal seams found throughout England. These seams were found in South Wales, Flintshire, Cumberland, Northumberland, Ayrshire, and along the sea at the Firth of Forth. Coal deposits were also found along five navigable rivers in England: the Wye, Severn, Tyne, Wear, and Trent. It was from these major seams that coal could effectively be extracted and carried by water to almost any part of the country. These natural advantages permitted England and Scotland to develop their coal industry earlier than other continental countries.[3]

The increase in coal mining directly affected and increased England's merchant shipping. Since coal seams were located close to waterways, the most effective and efficient means of transporting coal was by water. Preceding Elizabeth's reign, the total quantity of coal shipped by sea did not exceed 40,000 to 50,000 tons per year. Any coal destined for foreign ports was carried by foreign ships that also had their share in English

[3] Ibid., 133.

port consignments. The English government succeeded in eliminating many foreigners from coastwise and foreign trade by means of preferential duties.

In the seventeenth century some 1,600 vessels were employed in the coal trade. By 1700, the total number engaged in the coal trade had expanded from 3,000 to 4,000.[4] Although other branches of commerce increased shipping as well, the coal trade showed the most impressive growth rate.[5] Watercraft used in the transportation of coal were initially inefficiently designed for such a task. During most of the reign of Elizabeth, coal was transported in ordinary merchantman designed primarily for the transportation of cloth, corn, beer, and wine. These were often narrow, light of keel, and ill-adapted for the efficient transportation of coal. A suitable "collier" had "to be wide and heavy of keel, and so built as to hold the maximum quantity of coal and to be navigated with the minimum number of seamen - for every seaman added to the overhead costs of each voyage."[6]

By the Restoration many of the impractical merchantman had been replaced by the more efficient collier design. In 1592 the average coal cargo imported to London was 56 tons, which increased to 73 tons by 1606. By 1638 the average had almost doubled to 139 tons, and by 1701 had again increased to 248 tons.[7] The extraction of coal in Britain continued to grow and reached the level of one million tons long before any other product.

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[4] Ibid., 172-173.

[5] Other trades that also show increase during the sixteenth and seventeenth centuries include the Baltic timber trade, the French wine trade, the fishing trade, as well as increased traffic to India and America. Although these trades flourished, none could compare with the impressive growth rate of the coal trade.

[6] Ibid., 390.

[7] Ibid.

By the eighteenth century the volume of coal hauled in the holds of colliers was immense with London importing more coal than any other port in the world.[8]

Although colliers had distinctive characteristics, their size varied greatly. Most colliers built in Newcastle after 1625 carried from 200 to 300 tons of coal, and the average coal cargo from the Tyne in 1634 was approximately 150 tons. As the necessity for coal increased during the latter half of the seventeenth century, larger colliers were constructed upwards of 400 tons and appear to have reached their maximum size of about 500 tons by the eighteenth century. The construction of such large colliers was usually discouraged by customs officers. Larger vessels, after paying a small coastwise duty, could easily skirt over to places like France where a cargo of coal could be sold for higher profit.

The size of colliers appears to have been in proportion to the coal trade they supported. Colliers from the east coast of England (especially from Newcastle) tended to be much larger than those used on the west coast due to the quantity of coal to be shipped. The coal trade between Cumberland and Dublin used colliers that carried from 70 to 150 tons, whereas those from the west coast ports (other than Workington and Whitehaven) ranged from 30 to 40 tons at the end of the seventeenth century.[9]

One of the biggest advantages of colliers was the small number of men required to operate them. Although the size of colliers increased over time, the crew size remained relatively small. During the 1580s it took 10 men to operate a 100-ton coal carrying bark. By 1665, 10 men could effectively manage a 220-ton collier, and by 1703 the same

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[8] Roger Finch, *Coals from Newcastle* (Lavenham: Terence Dalton Limited), 67.
[9] Nef, *The Coal Industry*, 391-393.

number of men could operate a collier of 296 tons.[10] In comparison, an ordinary merchantman of the period, half the size, required from 10 to 15 seamen to sail. Colliers required fewer men in relationship to their tonnage than any other type of the period. This difference is attributed to improvements of the hull type and the simplicity of the rigging. Fewer seamen resulted in less overhead cost for each voyage.

Colliers, out of necessity, were heavily built and stoutly planked. These construction practices were initiated to protect the hull of the vessel. Colliers often had to ground themselves on a beach or river bank and unload their cargoes if there was no quay was available.[11] Horse-drawn carts were wheeled down the beach where the colliers would off load their cargo. The heavy, flat-floored construction helped keep colliers upright when grounded thus preventing any structural damage. Distribution overland from many ports was often expensive and time consuming.

The design of colliers was precipitated by earlier Dutch shipbuilding practices. During the fifteenth and sixteenth centuries the Dutch experimented with different designs to facilitate specific uses. This experimentation was initiated by a knowledge that earlier designs were overdone and inefficient. The Dutch began by experimenting with a more efficient fishing craft called a buss. From this pattern a series of new designs led to the development of the fluit (or fluyt) toward the end of the sixteenth century.[12] The fluyt was designed as a long distance cargo carrier and helped meet the specific needs of the period.

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[10] Ibid., 390-391.

[11] David R. MacGregor, *Merchant Sailing Ships 1815-1850* (Annapolis: Naval Institute Press, 1984), 49.

[12] Richard W. Unger, *Dutch Shipbuilding before 1800* (Amsterdam: Van Gorcum and Company, 1978), 26.

The design of the buss and fluyt proved to be extremely successful and thus prominently placed the Dutch as leaders in ship design.

During the seventeenth and eighteenth centuries Dutch shipbuilders concentrated on constructing optimum-sized watercraft designed for specific uses. Even though there were many different hull designs coupled with a variety of rigging, Dutch yards produced seagoing vessels with very similar measurements.[13] Many shipbuilders believed that large ships were slow, hard to maneuver, and had great draught, whereas smaller craft could not carry enough cargo and were easily swamped in foul whether. So the Dutch began building medium-sized vessels that helped the Dutch establish mercantile success over all other European seafaring countries. Sir Walter Raleigh once explained that the reason for the Dutch success in the mercantile arena was that they built watercraft to hold great amounts of merchandise and sail with few men for profit.[14] Another reason for the efficiency of the Dutch design was that they were lightly built and thus cheap to construct.[15]

During the early seventeenth century the ratio of ship tonnage per man was close to 20 to 1 on Dutch ships, whereas the English ratio was only 7 to 1. The Dutch were able to keep the ratio high by fully expanding on the fluyt design. This was accomplished by increasing the size without adding to the manning requirements and then stopping at the size that gave the maximum tonnage-to-man ratio.

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[13] Ibid., 44.
[14] Ibid.
[15] John Broadwater, personal communication, February 1998.

The fluyt design was not a radical innovation of the time. Rather, it was the product of a long series of improvements. As the Dutch became more interested in bulk carriage, a new series of superior designs emerged from Dutch yards (eventually culminating in the fluyt design). Perhaps the first in the series of innovations was the development of the buyscarveel. Not exclusively a Dutch design, the buyscaveel was designed not for speed but for its cargo-carrying ability. This design gave way to the more popular boyer. The boyer, first developed during the fifteenth century, was characterized as a "flat-bottomed, low-built, shallow draught vessel."[16] Initially developed as a river boat, the boyer was capable of going to sea by the sixteenth century. Ranging from 50 to 130 tons, the boyer reached its greatest popularity around the 1570s. Most were used on short runs in the Baltic and North Seas, while some were capable of longer voyages. Neither slow nor cumbersome, boyers allowed more transport room than any previous hull design. Compared to the quantity of merchandise carried, boyers required very few seamen to operate.

Although very popular, innovation and design changes replaced the boyers' reign by about the 1590s in favor of the vlieboot (or flyboat). The flyboat, like the boyer, was designed more as a bulk carrier than for speed. Flyboats were generally two-masted, with a square topsail on each mast, a square mainsail on the taller, forward mast, and a spritsail. Flyboats employed the a lateen sail on the mizzen to give the advantage of a combined rig.[17] The main usefulness of the flyboat was its shallow draught, which was achieved by

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[16] Unger, *Dutch Shipbuilding*, 35.
[17] Ibid., 36.

employing a squared stern and broad beam. Both of these features enhanced the cargo-carrying capacity. While generally small (rarely in excess of 100 tons), the flyboats were a very popular design. During the last decade of the sixteenth century a number of flyboats were recorded as having made the trans-Atlantic voyage from Spain to the New World.[18] However, most were used for shorter voyagers, and their greatest use was in the inter-coastal trade. The success of the flyboat was chiefly due to their shallow draught, ample cargo area, and use of the prevailing sail configuration. Perhaps the most popular of the small- and medium-sized bulk carriers, the flyboat was supplanted by the larger, more capacious fluyt.

During the era of the full-rigged ship, the fluyt become the prominent accomplishment of Dutch shipbuilding. Although not a radical departure from previous designs, the fluyt was more of a successful culmination of small alterations and innovations from past successes. The major innovation of the fluyt was its larger cargo-carrying capacity while still retaining a shallow draught. During the seventeenth century the fluyt became the renowned cargo carrier of its time.[19]

In order to understand why the fluyt was so successful, one must understand its design. Fluyts were cargo ships with flat bottoms and almost rectangular holds. They had full decks, while larger types employed half and poop decks at the stern. Most implemented an angular wing transom over the stern that became narrower toward the top. Below the wing transom was a distinct rounded stern, a design different from the

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[18] Ibid.
[19] Ibid., 37.

previously popular flyboat. The stern was thus "fluted," which may be where the name originated.[20] The hull design incorporated a low center of gravity, although the stern was still built high and narrow, enabling better handling under adverse conditions. In addition, the use of vertical stem and stern posts reduced drift while sailing and also allowed for greater cargo-carrying capacity.

Sail area for fluyts was relatively small. Although a smaller sail area meant a slower vessel, it also meant the need for fewer crew members. Fluyts were built first for cargo and last for speed. The fluyt had a foremast with one square sail. The mainmast supported two sails, the topsail being the smaller of the two while a spritsail helped forward. The Dutch also began using more blocks with their rigging to help keep the number of crew needed to sail minimal. By the sixteenth century the Dutch had become very proficient in their utilization of block and tackle to help control yards and sails. The efficient rigging of the fluyts helped seal their popularity for the next two centuries.

Another valuable asset of the fluyt design was its size. Averaging from 200 to 400 tons, fluyts never became too large. Dutch shipbuilders were effective in keeping down operating costs by keeping fluyts under 500 tons. Although fluyts were built up to and larger than 800 tons on occasion, "the optimum tonnage for inter-European and for many extra-European trades was in the range of 300 to 500 tons."[21]

By the mid-sixteenth century the fluyt had attained certain notoriety and had reached its zenith of technical change. For the next two centuries changes to the superior

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[20] Ibid.
[21] Ibid., 38.

fluyt design were small, and varying to fit the needs of the trade for which they were employed. Even though the Dutch builders initially believed that the fluyt design was perfect for all trades, minor improvements became necessary in order to improve efficiency. Aspirations for efficiency in different trades thus spawned a variety of designs all developed from the highly successful fluyt.

One such design that was an improvement on the fluyt was the noordvaarders. Used mainly in trade to the north, primarily with Norway, noordvaarders proved to be highly successful in the trade they supported. Although some were used to carry fish, most were used in the transportation of timber. Designed with a large hatch in the deck as well as hatches in the bow and stern, noordvaarders could be loaded with large amounts of wood. Noordvaarders retained the characteristic bluff bow and usually ranged in size from 150 to 160 tons.[22]

Other fluyts, widely utilized in the Baltic trade, were called oostvaarders, and were generally used to carry bulk items such as timber and grain. Due to the silting of river inlets in the Baltic, oostvaarders were designed with a shallower draught than noordvaarders. Ranging from 90 to 120 feet in length, oostvaarders were also larger than the fluyts used in the northern trade. Although oostvaarders had a notable tumblehome, they still retained the basic design features of a fluyt.[23] Other notable features included

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[22] Ibid., 45.

[23] Ibid., 46. These vessels were designed with an inflected tumblehome due to the method of measurement by toll collectors at the entrance (strait) of the Baltic Sea. The breadth measurement wass taken near midship at the height of the deck. Shipbuilders, in an effort to defraud toll collectors, made the bow and stern spacious in comparison to the width midship and also placed the deck higher. The tumblehome thus created a narrower deck that kept wind resistance down and crew sizes to a minimum.

being lightly built with short masts (and strikable topmasts and a high length-to-breadth ratio).[24]

Perhaps the closest relative of the English collier from the fluyt family was the Dutch katschip. The term "cat," which is Scandinavian in origin, is a collective term for a hull with a bluff bow, round stern, wing transom, straight stem, and no beakhead. Cats usually had only one deck (fluyts commonly had two) and were typically smaller than fluyts. The cat had a more box-like hull than the fluyt and a nearly flat bottom. With a sharp bilge angle and a straight stem and stern posts, the cat had a very shallow draught of only 3 to 5 feet. Cats were also recognizable because they did not have figureheads mounted on their bows.[25] Perfectly suited for the transportation of bulk carriage, cats often carried grain, wood, and salt around Europe. Small winches at the base of the masts necessitated even less manpower to operate. The use of pole masts enabled the yards to be raised or lowered from the deck so that no crew members had to go aloft. Used primarily in the inter-European trade, cats proved to be the most effective design as a low-cost bulk carrier.[26]

English shipwrights were able to examine many Dutch shipbuilding techniques closely after a series of Anglo-Dutch wars during the seventeenth century. These wars lasted from 1652 to 1654, 1664 to 1667, and from 1672 to 1674 respectively. During

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In 1669, the King of Denmark revised the method of measurement after becoming aware of the fraud. Afterwards oostvaarders were built with a more conventional hull design.

[24] Ibid., 45-46.

[25] Peter Kemp, ed., *The Oxford Companion to Ships and the Sea* (Oxford: Oxford University Press, 1993), 144-145.

[26] Unger, *Dutch Shipbuilding*, 48.

these wars both the English and Dutch were successful in capturing many enemy ships. During the first Anglo-Dutch war the English successfully captured or burned some 1,200 Dutch vessels.[27] Of those captured many were "low-value fluyts, herring busses, and the like...."[28] Many, were quickly assimilated into the English merchant fleet.

Conventional English shipbuilding produced ships more for strength and speed rather than economy. The Dutch designs challenged the more established English convention of ship design. With an increased knowledge of cargo-carrying capabilities, the English were able to expand transport proficiency by incorporating Dutch-inspired hull designs.

Colliers were built in a variety of locations. Some of the most prominent shipbuilding yards were located around Newcastle, Hull, West Stockwith, Great Yarmouth, Ipswich, Aldeburgh, Woodbridge, and Liverpool. Another location well known in the eighteenth century for the construction of colliers was in Whitby where "they build very good Ships for the Coal trade, and many of them too, which makes the town rich."[29] Though many were built in these locations, shipbuilding in England was extensive and not centered in any one locale.

The seamen who sailed these colliers were perhaps the most proficient, hardiest sailors of the time. During periods of war England turned to the coal trade more than any

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[27] Johnathan I. Israel, *Dutch Primacy in World Trade, 1585-1740* (Oxford: Clarendon Press, 1989), 210

[28] Ibid., 212.

[29] T.S. Willan, *The English Coasting Trade 1600-1750* (Manchester: Manchester University Press, 1938), 15.

other for the most daring seamen for its navy.[30] In fact, many seventeenth-century writers noted that the coal trade was the "chief nursery" for English seamen.[31] The men who sailed were accustomed to sailing in adverse conditions as well as among shoals and sand banks. In an age when science began to play a part in navigation, collier skippers "navigated as much or more by the smell of land and instinct than by science, and to them the use of charts and instruments was an almost unknown art."[32]

Colliers played an integral part in the expansion of industry and manufacture in England during the seventeenth century. Inspired by earlier Dutch designs such as the fluyt and the cat, colliers filled an important niche by helping expand the much needed coal resource of England. With the demand for timber high and prices to match, coal became a suitable substitute in many areas of industry and manufacture. Colliers continued to play a important role in the English economy through the eighteenth century culminating in the use of colliers as suitable transports during the American War for Independence.

Transports played a vital role in England's attempt to quell the American War for Independence. Many provided ample cargo space and large holds, thus becoming the workhorses of the British campaign across the Atlantic. Before the American Revolution, the British navy consisted almost entirely of warships, incapable of carrying sizable amounts of supplies for any significant distance. Although the Royal Navy had leased vessels previous to the war for use as transports, they had never undertaken such a

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[30] W.S. Lindsay, *History of Merchant Shipping and Ancient Commerce*, vol. 2 (New York: AMS Press Inc., 1965), 538.

[31] Nef, *Rise of the Coal* Industry, 238.

[32] Harold A. Underhill, *Deep-Water Sail* (Glasgow: Brown, Son, and Ferguson, Ltd., Reprinted 1955), 64.

monumental task. As the threat of revolution progressed, the British soon realized the logistical problem at hand. In order to fight a revolution across the Atlantic Ocean on American soil, all equipment, food, and troops would have to be transported across the Atlantic.

The crown had no option but to offer market rates to the private merchant sector that supported the carrying trade around Britain. With little time to build the necessary transports or the resources to buy them the crown attempted to lease or hire those capable of supplying and sustaining the British Army around the American colonies.[33] The preferred transports were the large, bulky colliers that had supported the English coal trade for many years previous to the American Revolution.

Although anxious to hire on as many transports as possible, the crown required that all merchant craft be surveyed before being hired into service. They were usually surveyed at the Deptford Shipyard near London, England, and were then dispatched to other ports for loading.[34] Once they passed the survey they were hired into service by the Navy Board, Ordnance Board, or the Treasury Board. The Navy Board was by far the largest and most important board during the American War for Independence. The Navy Board was responsible for transporting troops, clothing, naval stores, and other military supplies to America. After 1779 the job of transporting all provisions fell under the jurisdiction of the Navy Board. Each of the three boards attempted to hire its own transports independent of each other. This created inter-agency competition and difficulty

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[33] Morris, "Site 44YO88," 21-22.
[34] Syrett, *Shipping and the American* War, 41-42.

in obtaining necessary hull space. Each Board was required to have all decisions sanctioned by the British Cabinet. This complicated matters by slowing down hiring practices, creating a bureaucratic nightmare.[35]

Payment, based on capacity, seaworthiness, crew size, and provisions on board, was often on a monthly basis and varied with each Board. [36] The owners of the first transports hired in 1775 by the Navy Board were paid 10 pounds per ton per calendar month (Table 3). By 1776 this amount had been increased to 11 pounds per ton per month. In April of 1776 the crown offered owners over 12 pounds per ton per month for the use of their transports. By 1777 the amount had dropped back to 11 pounds per ton per month. The variation in payment reflects the Navy Board's need to hire private merchantman. As the war escalated so did the Navy Board's need for transports. When transports became difficult to acquire, the Navy Board had no choice but to raise the monthly payment.

Transports, a large number of which were colliers, were widely used during the war. Table 2 shows the number hired by the crown from 1775 through 1777. Between 1775 and 1777, the Royal Navy also acquired 48 transports in America (from December 1775 through June 1776), 35 transports from Amsterdam (in March of 1776), and an additional 6 from Hamburg in May of 1776.[37]

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[35] Ibid.
[36] Ibid., 23.
[37] Ibid., 670.

Table 2. Numbers, tonnage, and payment of transports acquired from 1775-1777[38]

When hired	Number of Transports hired	Tonnage	Rate per ton per month
1775			
October	20	5,621	10
November	4	1,763	10
December	41	14,080	11
1776			
January	41	9,819	11
February	95	23,140	11
March	32	8,455	11
April	8	1,916	11
May	10	2,632	12
June	15	4,370	12
August	7	2,046	11
September	1	249	11
December	33	9,458	11
1777			
January	30	8,379	11
April	1	377	11
May	4	1,040	11
June	1	352	11
July	1	402	11
TOTAL	**346**	**94,573**	

The crown initially opted to hire only English transports. It soon became evident, however, that foreign vessels were needed for service. On February 20, 1776, Lord Sandwich wrote to King George III requesting that the Navy Board be "directed to send an Agent to Holland as well as to Hamburg, as we have reason to believe that many transports may be got there...."[39] By April 19, 1776 some 15 transports from Rotterdam, Amsterdam, and Hamburg arrived at Deptford to carry horses to America.[40]

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[38] "An Account of the Transports taken up or contracted for since Septr. 1775 to Septr. 1777 describing Tonnage and what has been contracted to be paid for the same." William James Morgan, ed., *NDAR*, 9:679-670.

[39] Lord Sandwich to George III, February 20, 1776, William Bell Clark, ed., *NDAR*, 4:923.

[40] M. Garnier to Count De Vergennes, April 19, 1776, William Bell Clark, ed., *NDAR*, 4:1056.

Any watercraft with ample storage space and able to make the trans-Atlantic crossing was likely to be hired by the crown for the transport service. A 1777 list of 17 transports carrying provisions and stores for the King's Army in the West Indies gives the type of each transport, eleven were ships, four were brigs, and two were listed as snows. The ships, with an average tonnage of 299 tons, were the largest transports. The snows, with an average tonnage of 192 tons, were the second largest of the transport types. Brigs were the smallest of the transport type with an average tonnage of 166 tons.[41] Ships, snows, and brigs were not categorized on the basis of tonnage but rather solely by their rigging.

Collier transports often embodied characteristics that made them distinguishable among a fleet. Many had heavily-timbered flat floors with only a slight tumblehome. This design allowed them to carry large loads while at the same time draw very little water. This design was ideally suited for sailing the shallow waterways of the American colonies. Such craft often had very bluff bows and simple rigging for economy in number of sailors. Descriptions of transports during the war reinforce this portrait. In 1775 a letter from Count De Guines to Count De Vergennes, concerning the news from English ports, describes how "Large and shallow-draught merchantmen have been taken to carry arms...."[42] Vice Admiral Richard Lord Howe requested "One or more Vessels of a construction to draw but little Water and be at the same time capable of carrying heavy

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[41] "A List of Hired Transport Vessels having onboard Provisions and Stores &ca For the Use of the Kings Army and Navy employed in North America, which bore up for the West Indies, and put into St. John's Harbour Antigua" February 12, 1777, William James Morgan, ed., *NDAR*, 7:1180-1183

[42] Count De Guines to Count De Vergennes, December 15, 1775, William Bell Clark, ed., *NDAR*, 3:426.

Cannon...."[43] Howe took the *Grand Dutchess of Russia*, a 120-foot transport with a beam of 36 feet, for that purpose. He outfitted her with three 6-pounders, seven 24-pounders, 120 seamen, 30 marines, and two lieutenants.[44]

The British apparently used any available watercraft for transportation purposes. Brigadier General Andrew Buchanan received a report concerning the British troops onboard vessels on the Elk River on August 24, 1777. The report stated that the British had "many Transports with Troops, some with Horses and some with Hay. That the transports consisted of Ships, Snows, Brigs, Schooners, and Sloops."[45] The British Army and Navy also acquired vessels in North America to serve as transports, many of which were sloops and schooners.[46]

Since many transports were hired merchantmen, their tonnage varied greatly. They were constructed in various shipyards around England and northern Europe, and each differed in size and form due to each shipwright's design. During the early stages of the American War for Independence, the Navy Board tried to hire only those capable of carrying large amounts of supplies or troops. Although there was no set limit on the size hired, the Navy Board tried to keep them over 300 tons. Apparently, a number of smaller transports were seized by American privateers prior to 1776. On May 30, 1776 orders

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[43] Vice Admiral Richard Lord Howe to Phillip Stephens, April 23, 1777, William James Morgan, ed., *NDAR*, 8:408.

[44] Ibid.

[45] Brigadier General Andrew Buchanan to the President of Congress, August 24, 1777, William James Morgan, ed., *NDAR* 9:798-799.

[46] John Broadwater, personal communication, February 1998.

were given to the Navy Board surveyors that no transports were to "be taken up under 300 tons...to prevent the transports being taken by the small provincial privateers."[47]

As the war progressed, so did the urgency for more transports. A list of transports hired to carry the first Division of Brunswick Troops (including those for the Hannau Regiment) in 1776 consisted of 27 transports totaling 8,472 tons. The smallest of the group was the *Neptune*, with a tonnage of 179 tons. The largest transport of the group was the *Three Sisters*, with a tonnage of 469 tons.[48] In 1777 a list of hired transports carrying provisions and stores from the West Indies, in St. John's Harbour Antigua, consisted of 17 vessels. The combined tonnage equaled 4,117 tons. The smallest was the brig *Amity*, with a tonnage of 135 tons. The largest was the ship *Prince William*, with a tonnage of 458 tons.[49]

Many of the transports with bluff bows, flat floors, and large holds, were by no means the fastest sailing. Usually loaded down with troops, horses, ordnance, or food, transports were easy prey for faster sailing rebel cruisers and privateers. To capture a loaded transport meant a huge blow to the British and success for American rebels. In November of 1776, Captain John Paul Jones fell in with the 350-ton British transport *Mellish*. After a brief skirmish, Captain Jones took the *Mellish*. Upon boarding he found the *Mellish* loaded with clothing bound from London to Quebec. Captain Jones wrote,

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[47] *New York Packett*, May 30, 1776, William Bell Clark, ed., *NDAR*, 4:940.

[48] Lords Commissioners, Admiralty, To Captain Hugh Dalrymple, H.M.S. *Juno*, Spithead, March 28, 1776, William Bell Clark, ed., *NDAR*, 4:1004-1005.

[49] "A List of Hired Transport Vessels having onboard Provisions and Stores &ca for the Use of the Kings Army and Navy employed in North America, which bore up for the West Indies, and put into St John's Harbour Antigua" February 12, 1777, William James Morgan, ed., *NDAR*, 7:1180-1183.

"the loss of the *Mellish* will distress the Enemy more than can be easily imagined-as the clothing on board her is the last intended to be sent out for Canada this season...the situation of Burgoyne's Army must soon become insupportable...."[50] The loss of a transport into enemy hands was not taken lightly, and the British (as well as the Americans) did what they could to prevent such happenings.

The largest step taken to prevent transports from falling into enemy hands was to make sure none sailed alone, especially those carrying valuable cargo. Throughout the war the British tried to keep convoys in effect at all times. Transports sailing within a convoy provided enough of a deterrent to keep American cruisers and privateers away. Convoys consisted of numerous transports and a number of heavily-armed watercraft such as frigates or sloops. To remain in a convoy was of utmost concern with the British Admiralty:

> You are to be very attentive to the Ships and Vessels which proceed under your Convoy, and more particularly to the *Lord Townsend, Howe* and *Friendship* [Transports], keeping them together by every means in your power. And, on no account leaving them upon pretense of their not sailing fast enough to keep company with you, as we expect that, in the course of your voyage you accommodate your progress to the worst sailing Ship amongst them.[51]

The availability of transports, troops, supplies, or the time of year, usually dictated how large a convoy was assembled. In one instance, a convoy of 20 transports and victuallers were sent to New York under the protection of three frigates.[52] A larger convoy sailing

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[50] Captain John Paul Jones to the Continental Marine Committee, November 12, 1776, William James Morgan, ed., *NDAR*, 7:111-112.

[51] Lords Commissioners, Admiralty, to Captain William Cornwallis, R.N. March 18, 1777, William James Morgan, ed., *NDAR*, 8:683-684.

[52] Sir George Collier to Lord Sandwich, November 21, 1776, William James Morgan, ed., *NDAR*, 7:228-229.

from Cork in 1776 consisted of 5 ships of war, 26 transports, 8 army victuallers, 1 armed ship, 1 navy storeship, 1 hospital ship, and 3 ordnance vessels.[53]

Transports were ordered to stay under the protection of larger armed ships, especially while in American waters. Vice Admiral Richard, Lord Howe, Commander in Chief of His Majesty's Ships and Vessels, issued instructions in 1777 concerning the protection of transports while at anchor in American waters. These instructions, issued to all ships of war, expressed extreme caution to any unknown approaching watercraft, especially at night. No boat was to pass unexamined, and any that tried were to be forcefully detained. At least one third of the ships' crews were to be under arms at all times, and kept under constant readiness. Guard boats were to be on hand at all times to watch the fleet, and "watchwords" given daily to distinguish each other.[54] Howe's instructions indicate the importance of transports to the British during the American War for Independence.

During the course of the war, many transports became separated from the protection of armed warships. Most cases of becoming disengaged from a convoy were the result of bad weather. Those separated were left to fend for themselves, usually with instructions for a rendezvous point. However, a lone transport was often easy prey for cruising rebel privateers.

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[53] "A List of Men of War, Bomb, Bomb Tender, Transports, Ordnance Vessels, Victuallers &c, which sailed from Corke the 12th Febry 1776, under convoy of Commo Sr. Peter Parker in His Majesty's ship *Bristol*." February 12, 1776, William Bell Clark, ed., *NDAR*, 4:903.

[54] Vice Admiral Richard Lord Howe's Instructions for the Protection of Transports. June 8, 1777, William James Morgan, ed., *NDAR*, 9:70-73.

Transports were not completely helpless if left alone against rebel cruisers. After numerous transports had been taken by the American rebels, the Admiralty decided to arm many of the transports. The Admiralty thought it most important to arm those carrying ordnance in an effort to keep munitions out of American hands. The transport *Silver Eel*, carrying stores to Quebec, was armed with 14 guns "to enable her to defend herself against the Rebel Cruisers, in case she should by any unavoidable accident separate from the Convoy."[55] On one occasion a British transport, thinking the *Perseus* was a rebel privateer, fired 28 shots. Captain Elphistone, the British Captain of the *Perseus*, restrained from firing back until the misunderstanding could be cleared up. Elphistone later learned that the same transport had already taken three prizes.[56]

Of even greater concern for the Admiralty was the conduct of transport captains and their sailors. With a disregard for authority and orders, many transport crews did not care for convoy sailing. Their conduct on the open water accounted for a large number of separated transports during the war. In 1775 the ordnance transport *Nancy*, loaded with over 4,000 rifles, 100,000 flints, a 13-inch mortar, and a wealth of provisions, became separated from its British convoy and was taken by privateers. Vice Admiral Samuel Graves wrote about the conduct of the transport's crew and captain:

> for the Ignorance and Obstinacy of Masters of Merchant Ships in disobeying Signals will ever prevent a Convoy keeping together, and too often they part by design, which I greatly fear has been the Case of this Brig, and that the Pilot (who I hear is an American) has either betrayed the Master or enticed him to go in the promise of great Rewards.[57]

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[55] Philip Stevens to Christopher D'Oyly, Under Secretary of State, March 26, 1777, William James Morgan, ed., *NDAR*, 8:712.

[56] Journal of Ambrose Serle, November 28, 1776, William James Morgan, ed., *NDAR*, 7:316.

[57] Vice Admiral Samuel Graves to Philip Stephens, December 4, 1775, William Bell Clark, ed., *NDAR*, 2:1266-1267.

In an effort to lessen the chance of separation and misconduct, the Admiralty began sending Royal Naval officers on board transports:

> with Instructions to superintend the navigating them, to explain to their Master's the Convoy Instructions and Signals, and in case of separation to direct the Ships proceedings agreeable to the Rendezvous and Orders you may give them...to assist in defending them against the Cruisers of the Rebels in case they should be attack'd...."[58]

Numerous Royal Navy officers traveled on board transports to keep misconduct to a minimum. At one point Vice Admiral Howe ordered two armed English ships to lie close to New York after it had just been taken to prevent transports from landing "on Shore and plundering, which many of them appeared very ready to do."[59]

There were many complaints against transport captains and their crews during the course of the war. However, there were also praises for their work and sailing ability. Captain Charles Douglas, of the Royal Navy, led a fleet into Lake Champlain from Quebec during the fall of 1776. It was not possible, however, to sail all the watercraft directly into Lake Chaplain due to rapids at St. Terese and St. Johns. From July until October 1776, Douglas oversaw the transportation of over 30 armed watercraft into Lake Champlain. These were of all sorts and sizes and ranged from small bateaux, to long boats, to a 30-ton gondola, to larger three-masted warships. Transport crews helped in relaying over 20 shipwrights and 10 carpenters to Chambly to aid in building, reconstructing, and refitting

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[58] Lords Commissioners, Admiralty, to Captain James Hawker, H.M.S. *Mermaid*, Spithead, August 31, 1776, William James Morgan, ed., *NDAR*, 6:579-580.

[59] Journal of Ambrose Serle, On board H.M.S. *Eagle*, September 15, 1776, William James Morgan, ed., *NDAR*, 6:844.

vessels brought upriver piece by piece. This process of relay was extremely difficult due to prevailing currents and westerly winds.

On October 11, 1776, the British fleet sailed into Lake Champlain to meet the rebel resistance. Upon seeing the size of the British fleet, the rebels "ran into immediate and utter confusion, the moment a three-masted ship made her appearance being a phenomenon, they never so much as dreamt of."[60] The British fleet, after only two days, had taken Lake Champlain. In Captain Douglas' letters to Philip Stevens, he had nothing but praise for the crews of the transports who aided in the attack. Douglas stated that

> His Excellency the Commander in Chief of the Army and all the other Generals, are of the opinion that the Sailors of His Majesty's Ships and Transports, have (far beyond the usual limits of their duty) Exerted themselves to the utmost...did most generously engage themselves, to serve in our armed vessels.[61]

Douglas felt that the destruction of the rebel fleet on Lake Champlain would not have been possible without the seamen from the transports.[62]

The Navy Board, Ordnance Board, and Treasury Board used transports for their own specific needs and cargoes. Transports carried troops, ordnance vessels carried munitions, and victuallers carried food items. However, none were restricted to carry any one type of cargo and often carried any item provided there was room or an immediate demand. Therefore, victualling transports would often carry store goods, or Navy transports would carry ordnance for the Ordnance Board. Table 3 shows the variety of goods sent by transports from January 1, 1775 until November 3, 1775.

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[60] Captain Charles Douglas, R.N., to Philip Stevens, *Isis*, Quebec, October 21, 1776, William James Morgan, ed., *NDAR*, 6:1340-1341.

[61] Ibid.

[62] Ibid., October 23,1776, 6:1370.

Table 3: State of Artillery - Small Arms and Powder sent to America since 1st January 1775.[63]

Date:	Cargo:	Vessel (s):
March 25	A Company of Invalids to Newfoundland	The *Russia Merchant*
April 10	A Detcahment of Officers and Men for Boston - 1 Engineer, Cloathing, Flints, and 6 Light 3 Pounders - Boston	The *Charming Sally*
May 18	Tenst demanded by Colonel Cleveland - Boston	The *Friendship* Victualling transport
May 30	A Supply of Stores fro East Florida Including 430 barrels of Powder	The *Betsey*
July 22	Four Light 3 pounders and 300 Stand of Arms with Ammunition compleat for Virginia	The *Maria*, a Navy transport
July 24	Four Light 3 pounders and 3000 Stand of Arms with Ammunition for Quebec	The *Jacob* Navy transport
August 14	3000 additional Arms to Quebec with Ammunition	*Elizabeth* Navy transport
August 15	Four Companies of Artillery 12 Medium 12 pounders. 20 Wall Pieces. 3-13 inch Brass Mortars- and 8-6pounders with other articles of Col. Clevelands Demand dated 23rd June Boston	The *Baltick Merchant* The *Charming Nancy* The *Juno*
September 1	8000 Stand of Arms - 400 Carbines - Spare Carriages, Waggons, Harness and other Articles in part of Colonel Clevelands Demand Boston	The *William* The *Willamson* The *Nancy* The *Three Brothers*
October 5	Six Medium 6 pounders - 5000 Stand of Arms with Ammunition for North Carolina, Intrenching Tools, Mantelets and sundry Stores Demanded by Capt. Montresor per order of General Gage for Boston	The *Russia Merchant*
October 14	500 Stand of Arms and Ammunition for North Carolina, the remainder of	The *Hope*

[63] "State of Artillery - Small Arms and Powder sent to America since 1st January 1775." November 3, 1775, William Bell Clark, ed., *NDAR*, 3:341-342.

	Stores Demanded by Capt. Montresor. 1600 Carbines to Compleat Col. Clevelands Demand, Spare Carriages & ca.	
October 28	Iron Ordnance, Shot, Powder & Stores for the Fleet, 1000 Stand of Small Arms and Barrack Bedding for 3 Regiments. Halifax	The *Charming Sally*

Note that the victualling transport *Friendship* carried tents, as demanded by Colonel Cleveland, to Boston, and note the number of Navy transports carrying ordnance. Although this table lists mostly ordnance, it demonstrates the variety of goods carried by the transports during the American War for Independence.

Transports carried a wealth of other goods and supplies besides troops, provisions, and ordnance. Needing sustenance during the winter months, the British had no option but to ship supplies of hay from various ports to keep horses alive. On one occasion, the transport *Jupiter*, carrying forage from the Bay of Fundy, "was set on fire by Lightening in Boston Bay...and entirely consumed."[64] Another transport laden with guns on deck used hay to cover the guns in an attempt to lure enemies close enough, making escape impossible.[65] All clothing for troops came over on board transports, as did other necessities such as coal. The British had very little option but to bring from England or neighboring loyalist colonies every item needed to quell Revolution.

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[64] Vice Admiral Samuel Graves to Philip Stevens, *Preston*, Boston, November 30, 1775, William Bell Clark, ed., *NDAR*, 2:1202.

[65] Stephen Moylan to William Watson, Plymouth, December 5, 1775, William Bell Clark, ed., *NDAR*, 2:1285.

Upon arrival in America, transports were used in a variety of ways. Due to the high amount of navigable river ways throughout the North American colonies, transports were employed extensively to aid in troop deployment. In Virginia, Captain Andrew Hamond wrote that "on Account of the Navigable Rivers of this Country, there is no part of the continent where ships can assist land operation more than in this."[66] The British used the wealth of navigable rivers to their advantage by deploying troops directly on shore and then retrieving them. Using this as an advantage, the British Army was able to escape on numerous occasions due to "the Number of creeks, Rivers, and Guts that make into it, all of which are Navigable for almost any ship...."[67]

The importance of transports in maneuvering troops around American waters during the war has gone largely unnoticed. Many of the transports were ideally suited for sailing the shallow waterways, prevalent along the east coast of North America. Simple rigging made them easier to handle in narrow river systems and those with a shallow draught meant that many could carry large loads, such as troops and ordnance, into shallow water. The heavy construction also allowed them to be grounded at any time with relatively little damage. Admiral Howe understood the value of the transports in American waters and made preparations "for the further Appointment of them, [as] the Exigencies of the Services dependent on the future Motions of the Army may require."[68]

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[66] Captain Andrew Snape Hamond, R.N., to Hans Stanley, *Roebuck* in Virginia, August 5, 1776, William Bell Clark, ed., *NDAR*, 2:68.

[67] Colonel George Weeden to John Page, Camp Haerlam Highths, October 10th, 1776, William James Morgan, ed., *NDAR*, 6:1200.

[68] Vice Admiral Richard Lord Howe to Philip Stevens, *Eagle* off New York, March 31, 1777, William James Morgan, ed., *NDAR*, 8:231.

Transports became the backbone of numerous British assaults. On August 22, 1776 over 15,000 British troops were landed in Gravesand Bay, New York with the aid of transports. Admiral Howe believed that "the Diligence and Utility...of the Transports on that Occasion, too much Commendation cannot be bestowed."[69]

On November 25, 1776 Admiral Howe instructed Commodore Sir Peter Parker to proceed by sea with ships of war and transports to the rebellious colony of Rhode Island. Parker was to patrol various harbors and bays of Rhode Island, burn and destroy any rebel vessels taking refuge there, and claim any ships or cargo rightfully owned by the British. On December 7, 1776, transports landed troops in Newport, Rhode Island to take possession of the town.[70]

Transports performed other tasks for the British as well due to their versatility. The ease of maneuvering up river systems allowed transports to be used to gather necessities, such as water, and on occasion to harass the enemy. Captain Andrew Snape Hamond of the Royal Navy used two transports to carry empty water casks up the Potomac River to have them filled with fresh water "and at the same time harass, and annoy the Enemy by landing at different places."[71]

Besides housing troops for long periods of time, transports were also used to hold prisoners of war when necessary. The British housed a group of French prisoners on

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[69] Vice Admiral Richard Lord Howe to Philip Stevens, *Eagle* off Bedlow's Island, New York, August 31, 1776, William James Morgan, ed., *NDAR*, 6:373-374.

[70] Journal of H.M.S. *Experiment*, Captain James Wallace, December 7, 1776, William James Morgan, ed., *NDAR*, 7:397.

[71] Narrative of Captain Andrew Snape Hamond, H.M.S. Roebuck, July 15 to August 15, 1776, William James Morgan, ed., *NDAR*, 6:172.

board a group of transports because there was no room in town to house them. The prisoners were kept on board until their transportation back to Europe was arranged.[72]

Life on board transports was not pleasant. Some transports due to their flat-bottomed construction and bluff bows, did not cut the water as well those with a sharper hull design. Transports rolled excessively in heavy seas, making life on board a horrendous experience. Major Charles Stuart wrote to his father stating that he was "on board a miserable transport with 30 officers...."[73]

Passages at sea were often foreboding and very lengthy. One convoy of 12 transports carrying John Burgoyne's Regiment of Light Horse arrived in New York, on October 3, 1776, after having "been 10 weeks and three days on their passage, having parted with one of their ships, and lost about 40 horses."[74] One transport had been at sea for over two months before arriving off the coast of America during the middle of winter. Unable to enter any port without first communicating with a British vessel, the transport remained offshore "for three weeks, with only six men fit for duty, the rest being frost bitten, or sick through fatigue (having, besides, had the misfortune to lose one, washed overboard)...."[75] The transport was finally taken into Boston Harbor.

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[72] Commodore William Hotham to Marquis De Bouille, Governor of Martinique, Preston off New York, September 9, 1777, William James Morgan, ed., *NDAR*, 9:901.

[73] Major Charles Stuart to his father, The Earl of Bute, November 29, 1776, William James Morgan, ed., *NDAR*, 7:325.

[74] Journal of Ambrose Serle, H.M.S. *Eagle* off New York, October 3, 1776, William James Morgan, ed., *NDAR*, 6:1118.

[75] Letter from a Captain of an English Transport to his owners in London, Boston, January 17, 1776, William Bell Clark, ed., *NDAR*, 3:834.

Besides the natural elements and confinement for long periods, transports also had problems carrying enough supplies for cruises. Long periods at sea drained food and water supplies to the point that rationing became necessary. If animals, especially horses, were on board, they were the first to be taken off the ration list. As a result the British lost a large number of horses in transit. One letter from an American in Chestertown, Maryland states, "...Our Bay Side abounds with dead Horses from the [British] Fleet...."[76]

For troops on board transports, the greatest problem was scurvy. One convoy of Hessian troops from England to America lost some 10 to 12 soldiers from scurvy.[77] The British had not figured out how to combat scurvy, and its effects took toll on troops making the passage from Northern Europe to America.

Many transports that had been in American waters for long periods were ordered back to England for refitting when not obligated to American exercises.[78] Once transports were repaired and refitted, they were sent back to America as needed. During the early years of the war, many transports landed their troops or supplies once they arrived and were then quickly sent back to England for more cargo. This heavy use of transports was in direct relationship to the heightened state of the war as time progressed. One transport crossed the Atlantic in early winter and suffered severe damage to the hull and rigging:

> We have split several of our sails, and the rest are much worse for wear. All our running rigging is bad; our ropes cracked like glass, and we broke our main topmast backstay; and

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[76] William Paca to Samuel Chase, Chestertown, Maryland, August 26, 1777, William James Morgan, ed., *NDAR*, 9:821.

[77] Vice Admiral Richard Lord Howe to Philip Stevens, Eagle off Staten Island, August 14, 1776, William James Morgan, ed., NDAR, 6:183.

> all our rigging is much damaged...You had better, if any of your ships should come out, get higher freight, for the loss, in wear, is greater than I expected....[79]

The British Admiralty took care of all necessary repairs for hired or leased transports during the war. Thus, the Royal Dockyards were often overloaded with new ships being built as well as those in for repair.

Transports were used extensively in carrying troops, invalids, and loyalists back to England, as well as to other colonies. As many soldiers were wounded, the need to take invalids back to England increased; it was the responsibility of the transports to convey them.[80] Numerous loyalists within the American colonies also used transports to haul themselves, families, and belongings back to England or to more friendly colonies as the war continued. The job of taking troops, invalids, and loyalists to safe havens was almost as big an operation as getting troops and supplies from England to America.

Used in every aspect of warfare, transports were ideal for the British campaign. By far the most numerous of the types used, transports varied in size and construction. Although variations existed, some common characteristics arise out of most transport descriptions. Many were bluff bowed, with straight sides and tightly spaced flat floors, and heavily constructed throughout. These characteristics created a spacious square cargo hold capable of carrying cargo in sizable quantities. Many transports used during the war were built in England, but some were hired to the British as needed from other northern

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[79] Letter from a Captain of an English Transport to his Owners in London, Boston, January 17, 1776, William Bell Clark, ed., *NDAR*, 3:835.

[80] George Jackson to Vice Admiral Molyneux Shuldham, Boston, Admiralty Office, March 16, 1776, William Bell Clark, ed., *NDAR,* 4:977.

European countries such as the Netherlands and Germany. The almost generic construction of the transports had long been used by the Dutch, the design "borrowed" by other seafaring European communities.

CHAPTER 5

INVENTORY OF SHIPWRECKS OFF CHUB HEADS CUT 1766 - 1800

The wreck located at Chub Heads Cut was a heavily framed, flat-floored vessel, characteristic of a merchantman dating to the last half of the eighteenth century. The artifact assemblage corroborates that the site dated to this time period and was likely English in origin. Therefore, historical research concentrated on a search of records that might identify the Chub Heads Cut wreck based on the available archival evidence from 1766-1800.

Historical research indicates that British transports frequented the waters of Bermuda from the start of the American War for Independence through the end of the eighteenth century. Their heightened presence around American colonies and Bermuda was a direct result of the war. Most accounts of transports in Bermuda refer to vessels transporting troops, provisions, or supplies. Bermuda provided a place to resupply before sailing back to England or on to other colonies. It is likely that number of transports foundered off Bermuda. Almost all historical records list foundered vessels according to their rigs (brigantine, brig, or snow).

Protest records and newspaper articles confirm the presence of transports in Bermuda waters. The Bermuda *Royal Gazette*, first published in 1784, printed numerous

accounts of transports stopping at Bermuda.[1] The likelihood that a transport foundered off Bermuda is high. Transports were prevalent and widely used during the second half of the eighteenth century. The following account records the number and type of watercraft to have passed in sight of the east end of Bermuda from January 1 to June 30, 1791: "3 ships, 11 brigs, 5 schooners, and 9 sloops - in all 28."[2] The most numerous type to frequent the waters off Bermuda in this account was the brig. Although many colliers during the eighteenth century were brigs, the most common were ship-rigged.[3]

From 1775 to 1800 some 27 documented founderings off the northwest reef of Bermuda occurred. Those that foundered included schooners, brigs, brigantines, ships, and sloops. Table 4 gives the name, type, date, and general location of those known to have foundered in the area of Chub Heads Cut. Out of 26, 11 were brigs, 7 were ships, 7 were brigantines, 1 was a schooner, and 1 was a sloop. Much of the information concerning the various wreck incidents are limited and therefore difficult it is to discern the final disposition of each vessel.

The excavation provided no diagnostic artifacts that allowed a positive identification of the hull remains. This is often the case with shipwrecks and especially when working in a area rich in cultural debris. However, those artifacts documented suggested an English origin dating between the 1760s and 1800.

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[1] A review of all available *Royal Gazette* newspapers from 1784 through 1800 produced a number of brief accounts of transports within Bermuda waters. Over 14 separate accounts of "transport" vessels stopping in Bermuda were recorded. Previous to 1784 records often listed vessels by their rig and not by purpose. Therefore, it is difficult to discern whether a vessel reported as a brig was a hired transport or a merchantman.

[2] *Royal* Gazette, July 2, 1791, No. 389., 4.

[3] John Broadwater, personal communication, February 1998.

Table 4. Vessels documented to have foundered or run aground off the north-northwest reef of Bermuda.

Number	Name	Type	Date	Location	Source
1.	*Adventure*	schooner	1775	--	Protest Records
2.	*Adventure*	brig	1784	North Rock	*Royal Gazette*
3.	*Barnada*	brig	1789	West End	*Royal Gazette*
4.	*Bermuda Packet*	brigantine	1779	West End	Protest Records
5.	*Blasius*	brigantine	1783	West End	Protest Records
6.	*Campbell*	ship	---	---	Protest Records
7.	*Clark*	brig	1795	North Side	*Royal Gazette*
8.	*Cyclops*	brig	1786	North Side	*Royal Gazette*
9.	*Elizabeth*	brigantine	1777	West End	Protest Records
10.	*Fame*	brig	1787	Northwest Breaker	*Royal Gazette*
11.	*Happy Mary*	brigantine	1776	---	Protest Records
12.	*Hercules*	brigantine	1783	West End	Protest Records
13.	*Industry*	brig	1774	Northwest Breaker	Protest Records
14.	*Lord Amherst*	armed ship	1778	West End	Protest Records
15.	*Lord Donegal*	brig	1784	West End	*Royal Gazette*
16.	*Mark Antonie*	tartan(?)	1777	North End	Protest Records
17.	*Minerva*	ship	1795	West End	*Royal Gazette*
18.	*Nancy*	sloop	1779	---	Protest Records
19.	*Nancy*	brig	1785	West End	*Royal Gazette*
20.	*Nancy*	brig	1795	West End	*Royal Gazette*
21.	*Neptune*	brig	1785	West End	*Royal Gazette*
22.	*Nuestra Seigniora*	ship	1778	Northwest Side	Protest Records
23.	*Penn. Packet*	ship	1784	---	Protest Records
24.	*Royal Adam(?)*	brigantine	1779	---	Protest Records
25.	*Three Brothers*	brig	1797	West End	*Royal Gazette*
26.	*Triumph*	ship	1783	West end	Protest Records
27.	*Vier Vriendon*	brigantine	1783	North End	Protest Records

Accounts of founderings are often brief and give little information concerning the exact location and extent of damage incurred. Coupled with the small number of diagnostic artifacts and hull remains, a positive identification of this vessel remains speculative.

Vessel Histories

Adventure: The *Adventure* was a schooner that foundered on September 26, 1775. The *Adventure* was on its way from South Carolina to St. Christopher's (West Indies) when it ran aground off Bermuda. The schooner apparently made it off the reef and safely to port in Bermuda.[4]

Adventure: In March 1784, the brig *Adventure* struck the reef on the North Rock "about three leagues from land, and soon after filled with water."[5] The brig, under the command of Captain Lyons, was on its way from Norfolk, Virginia to Antigua. It was loaded with lumber, corn, flour, and a number of passengers. After the *Adventure* struck the reef, all passengers and crew made it safely ashore. The account from the *Royal Gazette* states that a large portion of the cargo was saved but that the brig was entirely lost.[6] *Lloyd's Register* lists a brig named the *Adventure* that appears to be the same lost off Bermuda. The *Register* lists it as a single-decked brig, rated at 110 tons, with a draught of 10 feet. It was built in America in 1774 and was listed in 1783 as being insured for a voyage to Antigua, under the command of one W. Lion.[7]

Barnada: The brig *Barnada* struck the reef off the west end of Bermuda in early August 1789. It was bound from Philadelphia, Pennsylvania to Havana, Cuba with John Edwards as the Master. The cargo consisted of flour and plantation stores. The brig sank

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[4] Composite Volume of Deeds, Bills, Bonds, Protests, Grants, Bermuda 1766-1779. Accession No. 595-1., 343. Hereafter cited as Composite Volume.

[5] *Royal Gazette*, March 27, 1784, No. 11., 4.

[6] Ibid.

[7] *Lloyd's Register*, 1783.

almost immediately after striking the reef, and all the crew was saved after the incident.[8] It is unclear whether the *Barnada* was ever raised or salvaged. *Lloyd's Register* did not list an insured brig under this name.[9]

Bermuda Packet: The *Bermuda Packet* was a brigantine sailing from London, England on a voyage from Spithead, New Jersey, to Bermuda. Protest records indicate that the *Bermuda Packet* struck off the west end of Bermuda on March 8, 1779.[10] Records do not indicate whether she sank or made it safely into port after striking the reef.

The *Bermuda Packet* does appear in *Lloyd's Register*. Listed in 1779 as a brig, she was built in 1774 in Nova Scotia and rated 100 tons. The brig was single decked with a 9-foot draught. Under the command of R. Penniston, the *Bermuda Packet* was insured to make runs from London to Bermuda.[11] However, the *Bermuda* Packet remains on the *Register* lists through 1781. It is likely that the *Bermuda Packet* did not founder on March 8, 1779 but merely sustained damage off the northwest reef.

Blasius: The brigantine *Blasius* ran onto the reef off the west end of Bermuda on November 14, 1793. The *Blasius* began its voyage in Bordeaux, France, sailed to Hispaniola and was returning to Ostend, Denmark when it struck off the west end of

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[8] *Royal Gazette,* August 15, 1789, No. 294., 4.

[9] *Lloyd's Register* was referenced for each vessel listed as having sustained damage or to have foundered off the northwest reef of Bermuda. Each name was referenced for the five years preceding the date of wreckage. If names were not found, or if the vessel type, captain name, and voyage did not correspond with those of the composite volumes, the vessel was discounted. If certain correlations existed, they are referred to in the text.

[10] Composite Volume; 1766-1779., 520.

[11] *Lloyd's Register,* 1779-1781.

Bermuda.[12] It is not clear what the fate was after it struck off Bermuda. *Lloyd's Register* does not list any vessel named the *Blasius*.

Campbell: A ship named the *Campbell* struck the rocks in an unknown area off Bermuda in 1770. The ship was sailing from the Cape of Virginia to Scotland and it is unclear what happened after it sustained damage off Bermuda.[13] No listing for the *Campbell* appears in *Lloyd's Register*.

Clark: The *Clark* was a brig that ran onto the rocks off the north end of Bermuda in the middle of January, 1795. Sailing from Newhaven, Connecticut the *Clark* was bound for St. Vincent's in the West Indies carrying a cargo of horses and oxen. Most of the cargo was saved by boats from shore.[14] The fate of the brig is unknown. *Lloyd's Register* has no listing for the *Clark*.

Cyclops: On March 6, 1788 the brig *Cyclops* ran onto the rocks off the north end of Bermuda at about 9 o'clock in the evening. Under the command of Captain Williamson, the *Cyclops* was bound for St. Eustatia, West Indies from New York and was laden with tobacco, lumber, and provisions. Near Bermuda a gale of wind picked up, and the *Cyclops* immediately filled with water. The crew attempted to save her until the morning, when they were relieved by boats from shore. A gale again picked up, making any salvage attempts impossible. Very little of the cargo was saved, and the *Cyclops* was completely lost.[15] *Lloyd's Register* does list a *Cyclops* during the same period. However,

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[12] Composite Volume, 1781-1786, Vol. 1., 29-31.
[13] Ibid., 1766-1779, 213.
[14] *Royal Gazette*, Bermuda, January 24, 1795, No. 575, 4.
[15] Ibid., March 11, 1786, No. 113, 5.

no similarities exist between the two, and it is likely that the insured *Cyclops* was not the one which foundered off Bermuda.

Elizabeth: The Brigantine *Elizabeth* was bound for St. Johns River, Florida when she struck offshore of St. Johns. The crew began pumping water, and the pumps began pulling large amounts of tar (bilge material?) up with the water. On June 30, 1777, the *Elizabeth* ended up on the west side of Bermuda.[16] It is not clear what happened to the *Elizabeth* after it ran aground.

Lloyd's Register listed a number of vessels named the *Elizabeth*. However only one was insured to make a run to St. Johns, Florida. Built in England in 1752, she was listed as a snow and rated at 140 tons. The *Elizabeth* was owned by R. Clark and Company, commanded by J. Russel, and had a draught of 11 feet. The *Elizabeth* was insured in 1776 to make a voyage from London to St. Johns, Florida.[17]

Fame: Toward the end of February 1787, the brig *Fame* ran onto the rocks near the northwest coast of Bermuda. The brig was bound to Antigua from Virginia with provisions and lumber. The *Fame*'s home port was in Scotland, and James Taylor was the acting master. Apparently a large swell was blowing at the time, and the *Fame* quickly went to pieces. The crew got in a lifeboat and were picked up by a fishing boat from shore. The cargo was totally lost.[18] *Lloyd's Register* lists no insured brig with the name *Fame*.

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[16] Composite Volume, 1766-1779, 424.

[17] *Lloyd's Register*, 1776. The source of the *Register* did not retain a copy of the 1777 *Register*. However, the same *Elizabeth* does not appear in the 1778 *Register*.

[18] *Royal Gazette*, March 3, 1878, No. 164, 4.

Happy Mary: The brigantine *Happy Mary* ran aground on March 20, 1776 bound from Cape Franceva (?) to Marseilles. No other information was found concerning the *Happy Mary*.

Hercules: On December 3, 1783 the brigantine *Hercules* struck the reef off the west end. Bound from Philadelphia, Pennsylvania to St. Croix, West Indies the *Hercules* was left and later recovered by local fisherman.[19] No additional information concerning the *Hercules* was found.

Industry. The *Industry* was purchased by the Royal Navy in 1765 to be used as a transport. Under the command of Captain John Lowes, *Industry* was headed from Limirick, Ireland to Virginia when it struck the northwest reef on April 14, 1774.[20] Three days later, once the brig had been salvaged, a survey crew determined that it was impossible to refloat the *Industry* and that the ballast could not be salvaged. The dimensions of the *Industry* were 83 feet 9 inches length on deck, 24 feet 7 inches extreme breadth, 12 feet 8 inches depth of hold, and 222 tons burthen.[21] The *Industry* was rigged as a brig, employed flat floors, full ends, and a long parallel body, all traits of a collier.

Lord Amherst: The *Lord Amherst* was built in River, England in 1764 and belonged to Durand and Company. Hired into service by the crown in 1776 the *Lord Amherst* made its first voyage carrying provisions to the West Indies on December 24, 1776. The ship was under contract to the Royal Navy for a period of 18 months.

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[19] Composite Volume, 1781-1786, 103.
[20] Ibid., 1766-1779, 297.
[21] David R. MacGregor, *Merchant Sailing Ships 1775-1815* (Annapolis: Naval Institute Press, 1980),137-147.

During its stay in the West Indies, the *Lord Amherst* was part of a squadron under the command of Vice Admiral Clark Gayton. The *Lord Amherst* was armed and ordered to assist in convoy protection but missed a rendezvous with the *St. Andrew* and the *Marian* in Pensacola, Florida.[22] After missing the rendezvous, the *Lord Amherst* was ordered to Jamaica to join up with Gayton's squadron.[23]

The *Lord Amherst*, a 600-ton armed ship under the employment of the British crown, foundered off the west end of Bermuda on February 19, 1778. The ship was completely lost after it ran onto the reef. Under the command of Captain Hartwell, the *Lord Amherst* contained invalid soldiers presumably on their way back to England. Citizens from the west end of Bermuda assisted in saving the invalids, but only for a price. When the payment received did not match the expectations of the citizens, they promptly arrested Captain Hartwell. Governor James Bruere and the customs collector had to obtain securities to procure the captain's release. The *Lord Amherst* appears to have been salvaged by local Bermudians who sold some of the rum and indigo cargo, splitting the proceeds. Private salvage operations were common in Bermuda during this period, much to the chagrin of ship owners and the Bermuda government.[24]

The *Lord Amherst* is, in all probability, not the ship excavated during the 1993 field school. The *Lord Amherst* was rated at 600 tons and a draught of 17 feet. *Lloyd's*

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[22] Clark and Milligan to William Knox, May 29, 1777, William James Morgan, ed., *NDAR*, 8: 877-878.

[23] Vice Admiral Clark Gayton to Phillip Stephens, July 24, 1777, William James Morgan, ed., *NDAR*, 9:329.

[24] William Kerr, *Bermuda and the American Revolution: 1760-1783* (New Jersey: Archon Books, 1969), 72.

Register lists the ship as having three decks and carrying twenty-four 9-pound guns and eight 6-pound guns.[25] The hull remains excavated during the fall of 1993 would not have been rated at 600 tons and would likely not have had three decks.

Lord Donegal: On February 9, 1784 the *Lord Donegal* was enroute from Belfast, Ireland to Virginia loaded with passengers and various cargo. After being at sea for almost six weeks, the *Lord Donegal* arrived off Bermuda and foundered off the west end of the islands. The brig went down quickly, but all the crew and passengers were saved. Captain William Campbell, who was the captain, put himself under the protection of the store owners Messrs. Jennings, Tuckers, and Co. in St. Georges.[26] The *Lord Donegal* was totally lost, but a good deal of the cargo was saved.

Apparently a number of goods salvaged were not returned to Captain William Campbell soon after the *Lord Donegal* foundered. An article in the *Royal Gazette* describes the problem of looting by local Bermudians that took place after the *Lord Donegal* foundered:

> These are to require all persons that have taken any Goods, Tackle or Apparel, from the wrecked Brigantine, *Lord Donegal*, William Campbell, Master, from Ireland, and now lying on the Rocks off the west end of these islands; or that have in their possession of such Goods, Tackle, or Apparel to have them sent forthwith to the Customs House...otherwise if discovered, the concealors of such will be prosecuted with the utmost severity.[27]

This problem of looting before ships could be properly salvaged, and goods returned to the rightful owners, was a ongoing problem off Bermuda.

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[25] *Lloyd's Register*, 1778.
[26] *Royal Gazette*, February 14, 1784, No. 5, 1-4.
[27] Ibid.

Lloyd's Register lists the *Lord Donegal* as a brig built in 1764 in Southampton, England and rated at 120-tons with a draught of 11 feet. Owned by Marvel and Co., the *Lord Donegal* was surveyed in Belfast in 1784 and had a single deck.[28] The *Register* lists the brig under the command of J. Cambell in 1784.

Mark Antoine: The *Mark Antoine* is listed in the Composite Volume of Protests as having foundered off the north end of Bermuda around July 19, 1777. The *Mark Antoine* was sailing from St. Eustatia, West Indies to Philadelphia, Pennsylvania.[29] No other records were found concerning the *Mark Antoine.*

Minerva: In April 1795, the snow *Minerva*, under the command of Captain John Arnot, wrecked off the west of Bermuda. Sailing from Portsmouth, Virginia bound for the West Indies, the *Minerva* was carrying staves, heading, and various other articles. After striking rocks off the west end the rudder was broken off, and the *Minerva* soon filled with water. During the night the *Minerva* drifted off the rocks, and a score of Bermudians attempted to retrieve the snow into harbor. However, the wind was blowing off shore, and the rescue attempt failed. Any articles and cargo that could be salvaged were retrieved. The *Minerva* was armed with ten 6-pound guns when it wrecked off Bermuda.[30]

The *Minerva* first appears in *Lloyd's Register* in 1789 as having been constructed in Bristol, England in 1785. The *Minerva* was rated at 202 tons and was

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[28] *Lloyd's Register*, 1784.
[29] Composite Volume, 1766-1779, 413.
[30] *Royal Gazette*, April 11, 1795, No. 586, 4.

owned by Finlay and Company. Under the command of J. Gibson, the snow was surveyed in Greenock, England (in 1789) and used for trade to Virginia. The *Minerva* was listed as being a sheathed with wood and had a 15-foot depth of hold when fully loaded.[31]

In 1790-1791 the *Minerva* was under the command of D. Coulhard and was owned during these two years by Greenaway. Whether or not Greenaway was connected to Finlay and Company is not known (the *Minerva* was owned again by Finlay and Company from 1792 to 1795). The vessel continued sailing to Virginia and Ostend during this time. The *Minerva* was again surveyed in Greenock, England in 1791. By 1793 the *Minerva* was again under the command of J. Gibson and owned by Finlay and Company.

Royal Navy records indicate that the *Minerva* was employed by the crown from 1793 to 1794. The records indicate that the *Minerva* was rated at 200 tons and was armed with 10 guns and 28 men while in service. Naval records, however, indicate that the *Minerva* in service to the crown was built in 1787 (the *Minerva* owned by Finlay and Company was listed as being built in 1785).[32] This discrepancy in dates could be easily attributed to false or misleading historical records or a misprint. It is unclear whether the *Minerva* hired by the crown is the same as that owned by Finlay and Company. Both were rated at 200 tons and both carried 10 guns when armed.

Nancy: On April 29, 1779 the sloop *Nancy* ran aground in an unknown area off Bermuda bound from Jamaica to Bristol.[33] Records do not indicate whether the *Nancy*

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[31] *Lloyd's Register*, 1789.

[32] David Lyon, *The Sailing Navy List: All The Ships of the Royal Navy Built Purchased and Captured 1688-1860* (London: Conway Maritime Press, 1993), 265.

[33] Composite Volume, 1766-1779, 529.

made it safely into port or foundered off Bermuda. *Lloyd's Register* lists many vessels named the *Nancy* during this period however none were listed sailing from Jamaica to Bristol in 1778 or 1779.

Nancy: The brig *Nancy* foundered off the west end of Bermuda on December 29, 1784 and was under the command of Captain Wallace. Bound to Tobago from Virginia, and loaded with lumber and other supplies, the *Nancy* stranded almost immediately. Only a portion of the cargo was recovered.[34] No other information concerning the *Nancy* was located.

Nancy: During December of 1795 another brig named *Nancy* ran aground off the west end of Bermuda. The *Nancy*, commanded by Captain Mitchel, was bound for Jamaica from Philadelphia carrying a supply of flour and other various provisions. In a heavy gale the brig struck the rocks off shore and quickly went to pieces, however, all crew members were saved

Only one *Nancy* was found in the *Lloyd's Register* under the command of a Captain Mitchell. *Lloyd's* lists the *Nancy* as a brig, constructed in Chepst. Drp. (?) in 1757, rated at 130 tons. The *Nancy*, single decked with a draught of 11 feet, was owned by Oxenham and in 1794 was insured to make a voyage from Rotterdam to Bristol.[35] Whether this is the same *Nancy* that foundered in Bermuda is not known.

La Nuestra Seigniora de la Mercedes y San Joseph: This Spanish ship hit the rocks off the northwest end of Bermuda on March 13, 1778. Under the command of

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[34] *Royal Gazette,* January 1, 1785, No. 51, 4.
[35] *Lloyd's Register,* 1794.

Captain Francisco Havier de Emanuel, *La Nuestra Seigniora* was sailing from the Bay of Honduras to Cadiz, Spain. Although the type of cargo is not known, it was apparently salvaged afterwards.[36] No listing of the ship was found in *Lloyd's Register*.

Pennsylvania Packet: On November 13, 1784 a ship named the *Pennsylvania Packet* ran into trouble off Bermuda. Sailing from London, England to Philadelphia, Pennsylvania the ship was carrying a cargo of salt.[37] The location where the *Pennsylvania Packet* encountered problems is unknown, and it apparently did not run aground. Records indicate that the bilge pumps were clogged with salt, and the crew could not prevent the ship from filling with water. It is not known whether the hull or cargo was recovered or salvaged. *Lloyd's Register* made no mention of the *Pennsylvania Packet*.

Royal Adam: On March 13, 1779 the brigantine *Royal Adam* struck the bank near the Isle of Whale enroute from Portsmouth, England to Bermuda.[38] Whether or not the *Royal Adam* made it safely into port is unknown and no other information was found concerning this vessel.

Three Brothers: In January of 1797 the Brig *Three Brothers* ran aground off the west end. Upon striking the rocks the brig lost its rudder. In attempt to save the *Three Brothers* from further damage, the crew deployed the anchors to hold it in place. The next day the *Three Brothers* cut all anchors loose in an attempt to reach shore. Having taken on a large quantity of water, and after numerous salvage attempts, the crew was obliged to

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[36] Composite Volume, 1766-1779, 477.
[37] Ibid., 1781-1786, 232.
[38] Ibid., 1766-1779, 516.

abandon the *Three Brothers*. None of cargo, including cattle, pork, livestock, corn, and other goods, was saved. The cargo was uninsured (and would have therefore not have been listed in *Lloyd's Register*), much to the dismay of the owner and captain George Brown of New Haven, Connecticut.[39]

Triumph: The ship *Triumph*, sailing from Philadelphia, Pennsylvania to Martinique struck the rocks off the west end of Bermuda on July 3, 1783. At the time the *Triumph* foundered it was carrying 18 guns.[40] *Lloyd's Register* lists one ship with the same name. The *Triumph* was an 80-ton brig built in Spain in 1780, single-decked, with a draught of 8 feet. The *Triumph* was owned by D. Sale, commanded by Captain Hutchinson, and was insured by *Lloyd's* to make a voyage to London in 1782.

Vier Vriendon: The brigantine *Vier Vriendon* struck the rocks off the north end of Bermuda on May 30, 1783 while sailing from Ostend to St. Thomas, West Indies.[41] No other information was located.

Archival and historical records indicate that a variety of founderings occurred off the northwest reef of Bermuda during the latter half of the eighteenth century. Although none were listed specifically as a transport, accounts only identify the vessels by their rigging and not by their purpose. Therefore it is possible that one of those listed above was being used as a transport when it foundered.

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[39] *Royal Gazette,* January 14, 1797, No. 668, 4.
[40] Composite Volume, 1781-1786. Pg. Unknown.
[41] Composite Volume, 1781-1786. Pg. Unknown.

The historical record indicates that transports did frequent the waters around Bermuda. A review of all Bermuda *Royal* Gazette newspaper articles from 1784 to 1800 reported at least 14 accounts of "transports" visiting the islands. Considering that the *Royal Gazette* was not published until 1784 it is likely that the actual number of transports visiting Bermuda previous to 1784 was much higher.

CHAPTER 6

ANALYSIS AND CONCLUSIONS

Excavation of the hull remains off Chub Heads Cut provided valuable insight into both the historical and archaeological records. Although very little of the hull remained above the turn of the bilge, enough was present to add to the aggregate body of knowledge concerning eighteenth-century merchant shipbuilding practices. Excavation of the site also provided additional insight into cargo of the period. By reviewing the artifact assemblage, it is possible to reach some conclusions about shipboard life during the mid-late eighteenth century.

Excavation of the site also revealed information concerning the vessel's construction. The exposed remains appear to be those of a moderate-sized English merchantman. Although few diagnostic features were present at the site (stem or stern assembly, upper works, or decking), enough of the hull remained to sanction some conclusions. Hull remains consisted of a keel, keelson, floor timbers, offset first futtocks, outer-hull planking, and ceiling planking.

Exposed intact hull remains exhibit characteristics of eighteenth-century ship construction practices. Although merchant shipbuilding differed from yard to yard, certain practices were common and are described in some detail in works on naval and merchant ship construction during the eighteenth and nineteenth centuries. Such works include

David Steel's *The Elements and Practice of Naval Architecture* (1805), William Hutchinson's *A Treatise on Naval Architecture* (1794), and Mungo Murray's *A Treatise on Shipbuilding and Navigation* (1765). Besides historical records, numerous examples of eighteenth-century shipbuilding practices have been examined in an archaeological context. Comparison of historical records and archaeological site information helps strengthen the possibility that the Bermuda site was an English-built vessel dating to the mid- to late-eighteenth century.

The hull remains represent a heavily constructed merchantman with a tight framing pattern and flat floors, creating very little draught. Although the bow and stern sections were absent from the site, it is possible to make some comparisons with other known English vessels from both the historical and archaeological record. John William Morris III's thesis, "Site 44YO88: An Archaeological Assessment of the Hull Remains at Yorktown, Virginia," describes the construction of a British collier used during the American Revolution. The collier *Betsey* was a 176 32/94-ton brig with an overall length of 73 feet 1 3/4 inches and a beam of 23 feet 7 1/4 inches. David Steel describes the measurements of a 170-ton collier in his 1805 work, *The Elements and Practice of Naval Architecture.* The collier was 75 feet 9 inches overall in length with a beam of 22 feet 11 inches.[1] The Bermuda site had an overall preserved length of 69 feet 9 inches (the stem and stern section were absent) and a preserved width of 24 feet. From comparison of the

[1] Morris, "Site 44YO88," 75.

overall beam measurements, it is apparent that the Bermuda vessel was larger than both the *Betsey* and Steel's 170-ton collier.

It is possible to estimate the overall size of the vessel excavated in Bermuda. Although the keel was not complete, it is probable that a fair amount of the keel was still present at the site. The length of beam recorded (24 feet) was probably close to the widest beam measurement indicated by the presence of wales which were evident on both the port and starboard sides. Beam measurements were normally taken as the maximum width at the mid-ships bend (or master couple), not counting the thickness of the wales. The practice of many ship-builders during the eighteenth century was to make the overall keel length approximately 3 times the beam, and the depth of hold was to be 6/10 of the beam.[2] This ratio provided a well-proportioned vessel and was loosely applied as a standard rule.

Assuming that the length of beam recorded (24 feet) is close to the maximum beam, an approximate dimension (length and tonnage) of the vessel can be made. If we multiply the beam (24 feet) by 3, we receive an overall keel length of 72 feet. Taking 6/10 of the beam gives us a depth of hold of 11.52 feet. A keel length of 72 feet is plausible, considering that 69 feet 9 inches of the keel remained at the site. The remains of a vertical scarph at the northernmost portion of the keel and the decrease in frame length at the westernmost exposed section of keel are other indications that most of the overall keel length is present.

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[2] William Hutchinson, *A Treatise On Naval Architecture* (London: Conway Maritime Press, 1970), 35.

Conclusions concerning the overall tonnage is speculative, considering the lack of hull remains. However, a rough estimate of tonnage is possible and helpful in gaining an idea of what type of transport the vessel was. The length between perpendiculars is slightly longer than that of the keel. In the case of the *Betsey*, the keel length was 68 feet 2 1/2 inches overall, and the length between perpendiculars was 73 feet 1 5/8 inches.[3] If we take the probable keel length of the Bermuda vessel as 72 feet and add about the same distance (as the *Betsey*) to get a estimated length between perpendiculars (72 feet + 5 feet = 77 feet between perpendiculars), it is possible to make an estimation of tonnage. Using the official standard for computing tonnage of merchant vessels during the American Revolution,[4] it is possible to gain an estimated tonnage, burthen of the Bermuda site:

$$\text{Tonnage, burthen} = \frac{(L - 3/5B) \times B \times B/2}{94}$$

$$= \frac{(77 - 3/5\,(24)) \times 24 \times (24 / 2)}{94}$$

$$= 191.795 \text{ tons}$$

This tonnage is an approximation and should not be considered exact. Taking into account the variability in the equation (considering the lack of a complete keel and lack of perpendiculars) it is possible that the hull ranged in tonnage from approximately 170 tons to slightly over 210 tons.

Examination of the scantlings allows certain conclusions to be reached concerning the type and origin of the hull remains. The keel measured 19 1/2 inches sided

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[3] Morris, "Site 44YO88," 50-51.
[4] Ibid., 50.

with a molded dimension of 10 inches. The *Betsey*'s keel measured only 14 1/2 inches sided and 13 1/2 inches depth. The keel was constructed of elm which the British commonly used for keel and keelson construction. Its unique grain and pliability in submerged instances made it a favorite among British shipbuilders for areas where the wood was constantly exposed to water, such as the keel.

The framing pattern of the Bermuda vessel is another strong indicator of the vessel's origin. The exposed framing pattern of the Bermuda vessel consisted of alternating floors and futtocks. Floors were positioned over the keel, whereas futtocks were offset from the keel. This pattern in framing existed throughout the exposed portion of the site and did not alternate. No longitudinal fasteners were observed between frame or futtock arrangements. Each frame and futtock was independent of the others and was attached to the outer hull by treenails and intermittent iron spikes. All frames and futtocks extant at the site were made of oak, an extremely durable and tough, wood type used extensively by shipwrights.

This method of framing has been noted in several excavated examples and was a prevalent means of framing in the eighteenth and nineteenth centuries. The first historical account of offset-first futtocks was written by Sir Henry Mainwaring in a marine dictionary he wrote in 1621.[5] *El Nuevo Constante* is an example of a vessel framed in the same manner. *El Nuevo Constante* was English built and later purchased by Spanish merchants in Cadiz in 1764. The vessel employed both offset first futtocks and fillet

[5] Ibid., 79.

pieces. The vessel also used wooden treenails and iron spikes to attach the hull planking to the frames. Much of the wood used to construct *El Nuevo Constante* was of the same type as that of the Chub Heads Cut hull.[6]

In a synopsis of eighteenth-century framing patterns (in an archaeological context) it has been suggested that offset-first futtocks progressed closer to the centerline (under the keelson) as the eighteenth century progressed.[7] Morris *et al* reviewed a number of hull remains (including the Bermuda site) and hypothesized that the archaeological record does confirm this hypothesis but, they said, with countless exceptions.. Whereas those from the early eighteenth century had offset-first futtocks set well away from the centerline, those dating to the end of the eighteenth century had offset-first futtocks almost butting up to one another near the centerline. The Bermuda site had first futtocks offset from the hogging piece by only 6 to 8 1/2 inches possibly suggesting a date from the last half of the eighteenth century.

Fillet pieces recorded on the site were associated with both frames and futtocks. The utilization of fillet pieces in ship construction was not uncommon during the eighteenth century. Fillet pieces mounted below frames were used to attach the garboard strakes. Fillet pieces mounted on top of offset first futtocks allowed for a stronger hull by

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[6] Charles E. Pearson and Paul E. Hoffman, *The Last Voyage of El Nuevo Constante* (Baton Rouge: Louisiana State University Press, 1995), 119-127.

[7] John W. Morris III, Gordon P. Watts, and Marianne Franklin, "The Comparative Analysis of 18th-Century Vessel Remains in the Archaeological Record: A Synthesized Theory of Framing Evolution." In Underwater Archaeology Proceedings From the Society For Historical Archaeology Conference. ed. Paul F. Johnston (Uniontown, Pennsylvania: Transvision, Published for The Society for Historical Archaeology, 1995), 125-133.

compensating for the distance between compass timbers and allowed for flat flooring with very little deadrise.

This style of framing, infrequently noted in historical records, has been observed more frequently in the archaeological record. The *Betsey* employed an almost identical pattern of alternating top and bottom fillet pieces.[8] Fillet pieces were also noted in the excavation of the English-built *El Nuevo Constante*.[9] English vessels were not the only to employ the use of fillet pieces. Morris states that in 1978 a Dutch East Indiamen, excavated off Cape Town, South Africa, had pine fillet pieces.[10] The use of fillet pieces permitted more flexibility in useful timbers when constructing a vessel by allowing smaller timber pieces to be utilized. This modification to ship construction seems to have become more apparent as timber supplies in European countries began to dwindle.

Only a small portion of the keelson protruded out of the ballast pile on the northern extremity of the exposed structure. The rest appears to have eroded due to environmental factors or to have been removed in past salvage efforts. The exposed portion of the keelson was 18 inches sided and 12 1/2 inches molded and was made of oak. The collier *Betsey* retained a keelson with a sided dimension of 14 3/8 inches, and its molded dimension varied with the run of the hull (its maximum molded dimension was 18 5/8 inches).[11] Common practice was to attach the keelson to the floors by large copper or

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[8] Morris, "Site 44YO88," 80.

[9] Pearson, *El Nuevo Constante*, 124. Pearson states that "Several chocks possibly used as filling pieces between frames were recovered. In at least one instance it appeared that a chock was fitted under a floor frame between the frame and the hull planking . Recovered chocks were made of oak as well as a softwood that appears to be pine." Pearson is using the word "chock" instead of "fillet."

[10] Morris, "Site 44YO88," 80.

[11] Ibid., 64-65.

iron drift pins that were driven through the keelson, and the frames, into the keel assembly. The keelson added a strong structural element to the vessel by binding together all the frames to the keelson and keel. Both the Bermuda site and the collier *Betsey* retained very similar keelson construction features.

Remains of a stanchion step were found on top of the keelson at the easternmost extremity of the keelson. Stanchion steps allowed for vertical stanchions to be placed on the keelson as a means of support. Stanchions helped to support the lower deck and deck beams and could be removed quickly to allow for easier loading and off-loading of cargo. Once the cargo was in place, the top of the stanchion was positioned and the lower end hammered into place. Stanchion steps were usually shaped arcs to allow for easy removal and replacement of the stanchions. The stanchion step on the Bermuda site was 6 inches length with an arched depth of 1/2 inch to accept the foot of the stanchion. Removable stanchions were a common means of adding support to upper works over the keel assembly.

The size of the existing bilge ceiling indicates that the hull was built to accept heavy cargo loads. The 20 remaining ceiling planks from both the port and starboard sides were tightly spaced, adding to the structural integrity of the hull. No gaps or spaces were noted between the exposed ceiling planking. The planks ranged in size from 5 1/2 inches to 12 1/2 inches in width and were all uniformly 3 inches thick. Overall, the ceiling planks were larger in width than those found on the *Betsey* and on the average 1/2 inch thicker.[12]

[12] Ibid., 70.

The 485-ton English-built merchantman *San Felipe*, excavated in 1992 and 1993, had slightly larger ceiling planks. The planks averaged from 8 inches to over 14 inches in width, with an overall thickness of 4 inches.[13] Ceiling planking on the English-built *El Nuevo Constante* averaged between 6 inches to 8 inches in width with a thickness of only 3 inches.[14] This is surprising, considering that *El Nuevo Constante* was a 450-ton vessel. Although the Chub Heads Cut hull was much smaller in size, its ceiling planking were the same size if not larger than that of *El Nuevo Constante*. The ceiling planking on all of these English vessels were made of oak except for *El Nuevo Constante* which had pine (*Pinus* sp.) planking.

Outer-hull planking documented at the wreck site was sizable, in relation to the tonnage of the vessel. This is a indication that the vessel could have been a collier. The outer-hull planking was 11 7/8 inches to 12 1/4 inches in width and 3 inches thick. The *San Felipe* and *El Nuevo Constante*, both considerably larger vessels (485 and 450 tons respectively), had hull planking that was 12 1/2 inches to 13 1/2 inches in width, with a thickness of 4 inches.[15] All had outer-hull planking made of oak.

Sacrificial planking recorded at the wreck site was common during the eighteenth century and was used to protect the hull planking from Teredo worm damage prevalent in the warmer waters of the West Indies and the southern American colonies. A

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[13] Charles D. Beeker and Stephen R. James, Jr., "Underwater Archaeological Investigations at the Site Of The 1733 Spanish Fleet Shipwreck Tentatively Identified as the *San Felipe*: An Indiana Field School"(Prepared for Bureau of Archaeological Research, Division of Historical Resources: Tallahassee, Florida, 1995), 27.

[14] Pearson, *Constante*, 125-127.

[15] Ibid., 127 and Beeker, "The *San Felipe*," 27.

layer of tar and horse hair located between the hull planking and the sacrificial planking served as an extra barrier against Teredo worm damage. The sacrificial planking was Scotch pine (*P. Sylvestris*), a type of wood indigenous to northern Europe and commonly associated with European ship construction. Wood sheathing was the traditional means of protecting vessels from Teredo damage until the development of copper sheathing. Copper sheathing replaced sacrificial planking as a more effective deterrent against marine wood-borers by the 1790s.[16] However, due to the cost of copper sheathing, it is likely that it was not employed extensively on merchant vessels until the nineteenth century.

Wood treenails were a common means of fastening a hull together during the eighteenth century. Treenail diameter often indicated the overall length of a vessel. Although the Bermuda hull was likely no longer than 100 feet in length, it employed unusually large treenails (1 1/2 inches in diameter) usually associated with vessels 150 feet in length. The ratio for treenail diameter was commonly 1 inch in diameter for each 100 feet of length.[17] Therefore, a vessel with treenails 1 1/2 inches in diameter was commonly 150 feet in length. The *Betsey*, with an overall length of 73 feet 1 3/4 inches, also retained oversized treenails (1 1/8 inches in diameter).[18] Both used treenails made of oak, common for English-built watercraft of the eighteenth century. Oversized treenails were

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[16] Redfield, A.C. and B.H. Ketchum, eds., *Marine Fouling and Its Prevention*, Prepared for Bureau of Ships, Navy Department by Woods Hole Oceanographic Institution, Woods Hole, Massachusetts (Annapolis, Maryland: United States Naval Institute, 1952), 224. The process of "rolling" plates of copper, tin, and other metals was patented in 1728. The first vessel to be plated in copper sheathing was the *Alarm* in 1761-1763. The success of the copper sheathing spread and the use of copper as an anti-fouling surface was born. It was not until the late eighteenth century that its use became common

[17] Pearson, *Constante*, 124.

[18] Morris, "Site 44YO88," 70.

probably used to provide more strength and durability, allowing them to carry large cargoes.

The artifact assemblage recovered during the excavation reinforces the possibility that the vessel was operated by the British and likely foundered during the mid- to late-eighteenth century. Ceramic pieces recovered were all English style and date to the mid- to late-eighteenth century. Dry-bodied redware, feather-edged creamware, and coarse earthenware were all fairly common English ceramics produced after 1750. By the second half of the eighteenth century, these types of ceramics were used in England as well as the American colonies. Mass production of such wares made them accessible to all social levels and, therefore, were widely distributed. The types of ceramics uncovered at the Bermuda site have been found in many colonial-period sites dating to the latter half of the eighteenth century.

Glassware recovered also indicates that the site dates to the latter half of the eighteenth century. Green glassware, like that found on site, was mass produced by the eighteenth century and has been found in many colonial sites. More specifically, measurements from bottle fragments and bottle-lip style strengthen the case that the vessel carried goods between the 1770s and the 1790s. Four inch bottle bases were typical during the 1770s and 1780s as were the string-applied bottle necks found at the site. Case gin bottles, snuff bottles, and blue-green medicine bottles were also common during the latter half of the eighteenth century.

Metal artifacts recovered from the site appear to be English in origin. Pewter buttons were common by the latter half of the eighteenth century. Faint anchor patterns found on two of the buttons are almost identical to those used by the British Marines during the latter half of the eighteenth century. It is not surprising to find buttons of this type on site, considering the large number of military personnel being transported around the American colonies and Bermuda during the latter half of the eighteenth century. The buttons' mold seam construction and wire shank backing indicate that they are from the latter half of the eighteenth century.

Lead shot recovered from the site is another indicator that the vessel was being used by the English. The diameter of the shot suggests that it would have matched the bore diameter of English naval pistols used after 1759. American military forces commonly used smaller-caliber shot for their pistols.

The copper barrel hoop found near the hull remains is also British in origin. The use of the broad arrow stamp to denote property of the Royal Navy or Army is a clear indicator. Copper barrel hoops were used to reinforce wooden gunpowder kegs. Copper, when struck against other metal, will not spark, making it an ideal choice for gunpowder kegs.

The remains of several casks also help date the site. Measurements of the most intact cask affirm that the cask was a 125-gallon "pipe" or "butt." This size of cask was commonly used during the latter half of the eighteenth century to carry red wine. Results

of the analysis of wood samples, taken from the cask confirm that the cask's content was most likely red wine.

Evidence suggests that the vessel investigated during the 1993 East Carolina University Field School off Chub Heads Cut could have been collier-built vessel dating to the last half of the eighteenth century. The archaeological record indicates that the vessel was of extremely heavy construction and was built to carry heavy loads. Indications from the site as well as comparisons to other known colliers and English-built vessels corroborate these findings. The historical record also indicates that transports did frequent the waters off Bermuda and did sink in the general area of the site.

Further historical and archival research may help shed light on the identity of the vessel investigated. Although records in Bermuda have been thoroughly covered, it may be possible to conduct further research into all the vessels known to have foundered off Chub Heads Cut. Other repositories (perhaps in England) may be helpful in providing additional information. This information may include specifics on construction, overall size, and use during the American Revolution.

Although the identity of the Chub Heads Cut site remains in question, the wreck should be considered important to both the history of Bermuda and British maritime history. British transports were potentially one of the more common types of craft to ply the waters off Bermuda during the last half of the eighteenth century. In accomplishing its design role, the Chub Heads Cut Wreck likely made a contribution to one or more regional or international operations. Whereas the site cannot be linked to any historical

event or significant persons, the hull remains embody the distinctive characteristics of a vessel type that served an important and multifaceted role in British eighteenth century maritime heritage. A more intensive examination of the hull remains would undoubtedly contribute to a more comprehensive understanding of that maritime heritage. The Chub Heads Cut site should be considered significant in this respect and should be protected under Bermuda maritime policy.

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APPENDIX A: WOOD SAMPLE ANALYSIS

POLLEN AND MACROFLORAL INVESTIGATION OF TWO BILGE SAMPLES FROM AN EIGHTEENTH CENTURY ENGLISH SHIPWRECK IN BERMUDA

By

Linda Scott Cummings
and
Kathryn Puseman
Paleo Research Laboratories
Denver, Colorado

Paleo Research Labs Technical Report 94-66

Prepared For

Bermuda Maritime Museum
Mangrove Bay, Bermuda
and
Michael Krivor
Program in Maritime History
and Nautical Archaeology
East Carolina University
Greenville, North Carolina

March 1995

SIU

Southern Illinois University at Carbondale
Carbondale, Illinois 62901-4527

Center for Archaeological Investigations
Faner 3479
Mailcode 4527
618-453-5031

18 April 1994

Mr. Michael C. Krivor
Program in Maritime History
& Nautical Archaeology
Department of History
East Carolina University
Greenville, North Carolina 27858-4353

Dear Mr. Krivor:

I have completed, as follows, the wood identifications for the ship structural elements that you collected in conjunction with your research on the 18th century vessel found off Chubbs Head Cut, Bermuda. Four distinct genera were identified, including elm, oak belonging to the white anatomical group (explained below), pine belonging to the scotch pine group (see below), and spruce. None of these provide a clear or definitive indication of geographic origin, however there are indications by anatomy and overall species distributions, as I will explain shortly, that corroborate the probable British origin for the ship.

To this end, I need to clarify certain aspects of the wood anatomical analysis. First, the oak genus (*Quercus* spp.) includes numerous species that cannot be separated on the basis of cell structure because of inherent limitations to wood anatomy. Nevertheless, oak wood may be classified generally to three broad anatomical categories: red, white, and live oak groups (the latter with characteristics associated with tropical and Mediterranean climates). Beyond the tripartite classification, it is essentially impossible to separate by wood anatomy oaks from different sides of the Atlantic (in other words, Old World from New World species). Even so, based on experience and observations about differences in form and arrangement of the latewood pores, I usually attempt to classify specimens as nearly as possible to major European and American species used in ship construction. Thus, I have classified the wreck oak samples according to the generally recognized anatomical groupings described above (which are based primarily on American species), as white group oak. However, as I indicated, the specimens in my judgment approximate by anatomy more closely European *Quercus robur*, for example, than the major American white group species (white oak, *Quercus alba*). Using an

anatomical key for west-European woods resulted in a direct match with *Quercus robur* (and see attached description). Note that interestingly the woody tissue from the barrel stave is fairly uniformly stained pink. There is no indication that the staining is biological in origin (as from fungi penetration or other types of damage); perhaps the unusual coloration resulted from contact with the barrel contents (?perhaps wine?).

Spruce and elm, in this case, are identifications restricted to the genus level. Species belonging to both genera are widely distributed in the northern hemisphere on both sides of the Atlantic, and are not generally further separable by anatomy. A computerized search of possible matches for the spruce specimen (bulkhead) turned up two Old World and five North American species as likely candidates.

Finally, regarding the pine specimens (sheathing and sacrificial planking): these belong to the dentate pine section, and the sylvestris group within that section (see below). Sylvestris group pines include several important timber species, probably the two most widely known are *P. resinosa* (red pine or Norway pine), from northeastern North American, and *P. sylvestris* (scotch pine), native to northern Europe. It seems likely that your specimens are scotch pine, given its long association with European ship construction (see attached from Peterson 1980), however red pine was probably widely sold and traded by the Eighteenth Century (used in construction, cabinetry, and boat-building [Peterson, 1980:52]), making it also a likely possibility for the identification.

The individual wood identifications from the Chubbs Head Cut wreck are as follows.

1. One-half floor:	*Quercus* sp., white oak group; very well developed growth rings (fast grown timber, probably exceptional growth conditions).
2. Footwale:	*Quercus* sp., same as above, including observations on growth rings.
3. Top filler:	*Quercus* sp., same as above, including observations on growth rings.
4. Treenails:	*Quercus* sp., same as above, including observations on growth rings.
5. Sheathing:	*Pinus* sp., section *Diploxylon, Sylvestris* group.

6. Keel(?):	*Ulmus* sp., elm.
7. Exterior planking:	*Quercus* sp., indeterminate group (specimen too degraded for more definitive group determination).
8. Garboard strake:	*Quercus* sp., white oak group.
9. Barrel stave:	*Quercus* sp., white oak group; note that the cell structure is stained pink, perhaps from wall penetration by substances stored in the barrel.
10. Sacrificial planking:	*Pinus* sp., same group as above no. 5, note ubiquitous penetration of cell structure by black pitch/resinous substance.
11. Bilge ceiling:	*Quercus* sp., white oak group.
12. Bottom filler:	*Quercus* sp., white oak group, nicely developed growth rings, as above indicated for samples 1-4.
13. Bulkhead:	*Picea* sp., spruce.
14. Keelson:	*Quercus* sp., group indeterminate (specimen too degraded for more definitive group determination).
15. Floor	*Quercus* sp., group indeterminate, as above.

Please do not hesitate to call for clarifications or any questions you may have.

Best regards,

Lee Newsom

Lee Newsom, Ph.D.
Curator

APPENDIX B: POLLEN AND MACROFLORAL INVESTIGATION OF TWO BILGE SAMPLES FROM AN EIGHTEENTH CENTURY ENGLISH SHIPWRECK IN BERMUDA

INTRODUCTION

Two bilge samples from an eighteenth century English shipwreck off the coast of Bermuda were submitted for pollen and macrofloral analysis. Analyses concentrated on identifying remains present for the purpose of substantiating an English origin of this vessel and the presence of coal residue.

METHODS

A chemical extraction technique based on flotation is the standard preparation technique used in this laboratory for the removal of the pollen from the large volume of sand, silt, and clay with which they are mixed. This particular process was developed for extraction of pollen from soils where preservation has been less than ideal and pollen density is low.

Because the samples appeared to contain coal, they were mixed with 5% KOH, then screened through 150 micron mesh. The samples were rinsed until neutral by adding water, letting the samples stand for 3 hours, then pouring off the supernatant. A small quantity of sodium hexametaphosphate was added to each sample once it reached neutrality, then the beaker was again filled with water and allowed to stand for 3 hours. The samples were again rinsed until neutral, filling the beakers only with water. This step was added to remove clay and additional coal residue prior to heavy liquid separation. Zinc bromide (density 2.1) was used for the flotation process. The samples were mixed with zinc bromide while still moist, immediately after centrifugation to remove the dilute hydrochloric acid and water. All samples received a short (10 minute) treatment in hot hydrofluoric acid to remove any remaining inorganic particles. The samples were then acetolated for 3 minutes to remove any extraneous organic matter.

A light microscope was used to count the pollen to a total of 100 pollen grains at a magnification of 500x. Pollen preservation in these samples varied from good to poor. Comparative reference material collected at the Intermountain Herbarium at Utah State University and the University of Colorado Herbarium was used to identify the pollen to the family, genus, and species level, where possible.

Pollen aggregates were recorded during identification of the pollen. Aggregates are clumps of a single type of pollen and may be interpreted to represent pollen dispersal over short distances, or the actual introduction of portions of the plant represented into an archaeological setting. Aggregates are normally included in the pollen counts as single grains. No aggregates were observed.

Indeterminate pollen includes pollen grains that are folded, mutilated, and otherwise distorted beyond recognition. These grains are included in the total pollen count, as they are part of the pollen record.

The macrofloral samples were recovered from the material remaining in the 150 micron mesh pollen sieve. This material was dried, then passed through a series of graduated screens (US Standard Sieves with 2mm, 1mm, 0.5mm and 0.25mm

openings) to separate charcoal debris and to initially sort the seeds. The contents of each screen were then examined. Charcoal pieces larger than 1mm in diameter were broken to expose a fresh cross-section and examined under a binocular microscope at magnifications up to 140x. The material which remained in the 2mm, 1mm, 0.5mm, and 0.25mm sieves was scanned under a binocular stereo microscope at a magnification of 10x, with some identifications requiring magnifications of up to 70x. The material which passed through the 0.25 mm screen was not examined. The coarse or heavy fractions also were examined. Macrofloral remains were identified using manuals (Martin and Barkley 1973; Musil 1978; Schopmeyer 1974) and by comparison with modern and archaeological references. Remains were recorded as charred and/or uncharred, whole and/or fragments.

DISCUSSION

A late eighteenth century English vessel was excavated off the coast of Bermuda. This vessel exhibited characteristics of a "collier", a vessel used in the coal trade in England prior to the American revolution. Numerous British ceramic sherds were recovered from the vessel that date to approximately the mid-eighteenth century. Pollen and macrofloral sampling was undertaken on two samples (Table 1) recovered from the bilge next to the keel and the bilge from a foot valve to substantiate a British origin for the vessel and to microscopically confirm the presence of coal residue. Coal residue was noted in both the pollen and macrofloral records. Processing the pollen samples was hindered by the large amount of coal residue in the bilge samples. Coal fragments also were recovered in the floated portion.

The pollen record yielded a wide variety of pollen. Of the pollen representing trees, Pinus (Figure 1, Table 2) was the most abundant in sample 1 from the keel. In sample 2 from the foot valve, Betula, probable Casuarina, Pinus, and Quercus pollen frequencies were nearly equal. In addition, small quantities of Alnus, Carya, and Corylus-type were recovered from either or both of the bilge samples. Casuarina pollen was introduced from trees growing in Bermuda, while the rest probably represents a European origin.

Pollen types representing herbs and shrubs were varied and generally occurred in small quantities. Pollen types of note include Fabaceae and Fabaceae Trifolium praetense-type. Trifolium praetense (red clover) is naturalized in the New World from Europe, and in this context, probably represents introduction into the bilge samples from England.

Poaceae pollen was divided into four size categories. The small pollen grains (36 microns and less) represent wild grasses. The medium-size Poaceae pollen grains (38-44 microns) may represent the Hordeum (barley) group. Starch granules produced by barley exhibit a central hilum and a cross under cross polar illumination. Starch granules with a central hilum and exhibiting a cross under cross polar illumination were observed in these samples. The medium-size grass pollen may also include some of the smaller Avena (oat) pollen grains, since they are noted to be greater than 40 microns with a mean annulus greater than 10 microns (Moore et al. 1991:100). Poaceae pollen grains measuring 40 and 44

microns in diameter with annulus measurements of 10-11 microns were noted. Avena (oat) produces solid starch granules with a weak cross under cross polar illumination, as does Triticum (wheat). Solid starch granules exhibiting a cross under cross polar illumination were noted in these samples. The large Poaceae grains (50-54 microns) exhibited an annulus of 12 microns. These pollen types probably represent either Triticum (wheat) or Avena (oat). The Poaceae X-large category measures 60 microns with a pore diameter of 18 microns. This measurement is on the large end of the scale for Triticum (wheat), although the annulus is larger than is normally noted on wheat pollen. While the pollen grain diameter is small for Zea mays, the pore diameter is appropriate for Zea mays. Zea mays produces a starch granule with a central hilum that exhibits a cross under cross polar illumination. This type of starch granules were noted in both bilge samples. The starch granules recorded could not be identified positively as Zea mays and may represent Hordeum (barley).

Other than Zea mays, the only other possible New World crop represented in the bilge samples is represented by Solanaceae pollen. This pollen type was not consistent, however, with the size and morphology of common vegetables of this family such as tomato. Therefore, it probably represents a weedy plant.

A few foraminifera were observed in the bilge samples. The forms reported in this study were all planispiral (coiled on a single plane) and may represent the same genus. "Most foraminifera are marine and benthic, although a few genera are planktonic and some ... inhabit fresh water" (Boersma 1978:33). At least some of the foraminifera have an inner lining composed of chitin (Loeblich and Tappan 1965:61-63) or tectin (Boersma 1978:26). Since tectin also occurs in pollen, it is not surprising to recover these inner layers of foraminifera in pollen samples. Unfortunately, the inner layers, while preserving evidence of interior chambers, are not considered diagnostic for genus level identification. Test (outer wall) mineralization usually involves "the attraction of the calcium ion from sea water by the amino acids in the protein template", which then attracts the carbonate cation (Boersma 1978:26). Study of foraminifera comprises a separate field of study from palynology and is often used to reconstruct marine temperature, as well as to identify geologic time period.

A small quantity of probable bug jaw fragments and insect leg fragments also were recovered with the pollen from the bilge samples but could not be identified to a more specific level. Total pollen concentration was very similar between the two samples. It was not particularly high, but sufficient to yield pollen counts.

The macrofloral remains recovered from the bilge samples consisted mainly of Poaceae floret fragments and charcoal fragments (Tables 3 and 4). Both samples contained grass floret fragments, which are the papery coverings that make up the "chaff" of a grass seed. These floret fragments may represent either wild or cultivated grasses. Betula, Pinus, and Quercus charcoal suggests that birch, pine, and oak wood was burned. These three trees are common European types (Johnson 1973). Quercus dominated the wood and charcoal record, suggesting that oak was commonly used on this ship. Both samples also contained coal and tar fragments, insect fragments, pebbles, sand, and shell fragments. A probable piece of coral was present in sample 1 from the keel.

SUMMARY AND CONCLUSIONS

Pollen and macrofloral analyses of bilge samples from an eighteenth century shipwreck recovered remains consistent with a European origin, as well as confirming the presence of coal. The majority of the pollen recovered represent plants and trees that grow in England. The large quantity of Poaceae pollen appears to represent a mixture of wild and cultivated grasses. These pollen, coupled with the presence of starch granules and grass floret fragments, suggests that wild and cultivated grasses were carried on this ship, perhaps as food for animals being transported. In the absence of identifiable grass stems, it is less likely that grasses were used as packing material for breakable items. Betula, Pinus, and Quercus charcoal fragments represent birch, pine, and oak trees, all of which have European species. The macrofloral samples also contained several grass floret fragments, coal fragments, and tar fragments.

TABLE 1
PROVENIENCE DATA FOR SAMPLES FROM A LATE-EIGHTEENTH CENTURY BRITISH VESSEL FOUND OFF BERMUDA

Sample No.	Provenience	Analysis	Pollen Counted
1	Bilge sample next to keel	Pollen Macro	100
2	Bilge sample from foot valve	Pollen Macro	100

TABLE 2
POLLEN TYPES OBSERVED IN SAMPLES FROM A LATE-EIGHTEENTH CENTURY BRITISH VESSEL FOUND OFF BERMUDA

Scientific Name	Common Name
ARBOREAL POLLEN:	
Alnus	Alder
Betula	Birch family
Carya	Hickory, Pecan
Casuarina	Australian pine, ironwood
Corylus	Hazel
Pinus	Pine
Quercus	Oak
NON-ARBOREAL POLLEN:	
Apiaceae	Parsley/carrot family
Anacardiaceae	Sumac family
Asteraceae:	Sunflower family
Artemisia	Sagebrush
Low-spine	Includes ragweed, cocklebur, etc.
High-spine	Includes aster, rabbitbrush, snakeweed, sunflower, etc.
Cheno-ams	Includes amaranth and pigweed family
Cyperaceae	Sedge family
Fabaceae	Bean or Legume family
Fabaceae *Trifolium praetense*-type	Red clover
Lamiaceae	Mint family
Poaceae	Grass family
Rosaceae	Rose family
Solanaceae	Potato/tomato family
STARCHES:	
Hollow Starch	
Solid Starch with X	

Scientific Name	Common Name
Starch with Hilum	
SPORES:	
Monolete	
Trilete	

TABLE 3
MACROFLORAL REMAINS FOR SAMPLES FROM A LATE-EIGHTEENTH CENTURY BRITISH VESSEL FOUND OFF BERMUDA

Sample No.	Description	Part	Charred W	Charred F	Uncharred W	Uncharred F
1	FLORAL REMAINS:					
	Poaceae	Floret				6
	Unidentifiable plant tissue					X
	CHARCOAL/WOOD:					
	Pinus	Present		1		2
	Quercus	Dominant		2		4
	Unidentifiable	Present				1
	NON-FLORAL REMAINS:					
	Coal					X
	cf. Coral					1
	Insect					403
	Pebbles					X
	Sand					X
	Shell					3
	Tar					X
2	FLORAL REMAINS:					
	Poaceae	Floret				19
	Unidentifiable plant tissue					X
	Small pieces of wood					X
	CHARCOAL/WOOD:					
	cf. Betula	Present				1
	Pinus	Present				1
	Quercus	Dominant				6
	Unidentifiable	Present		2		
	NON-FLORAL REMAINS:					
	Coal					X
	Insect					63
	Pebbles					X
	Sand					X
	Shell					1
	Tar					X

W = Whole
F = Fragment
X = Presence noted in sample

TABLE 4
INDEX OF MACROFLORAL REMAINS RECOVERED FROM A LATE-EIGHTEENTH CENTURY BRITISH VESSEL FOUND OFF BERMUDA

Scientific Name	Common Name
FLORAL REMAINS:	
Poaceae	Grass family
CHARCOAL/WOOD:	
Betula	Birch
Pinus	Pine
Quercus	Oak

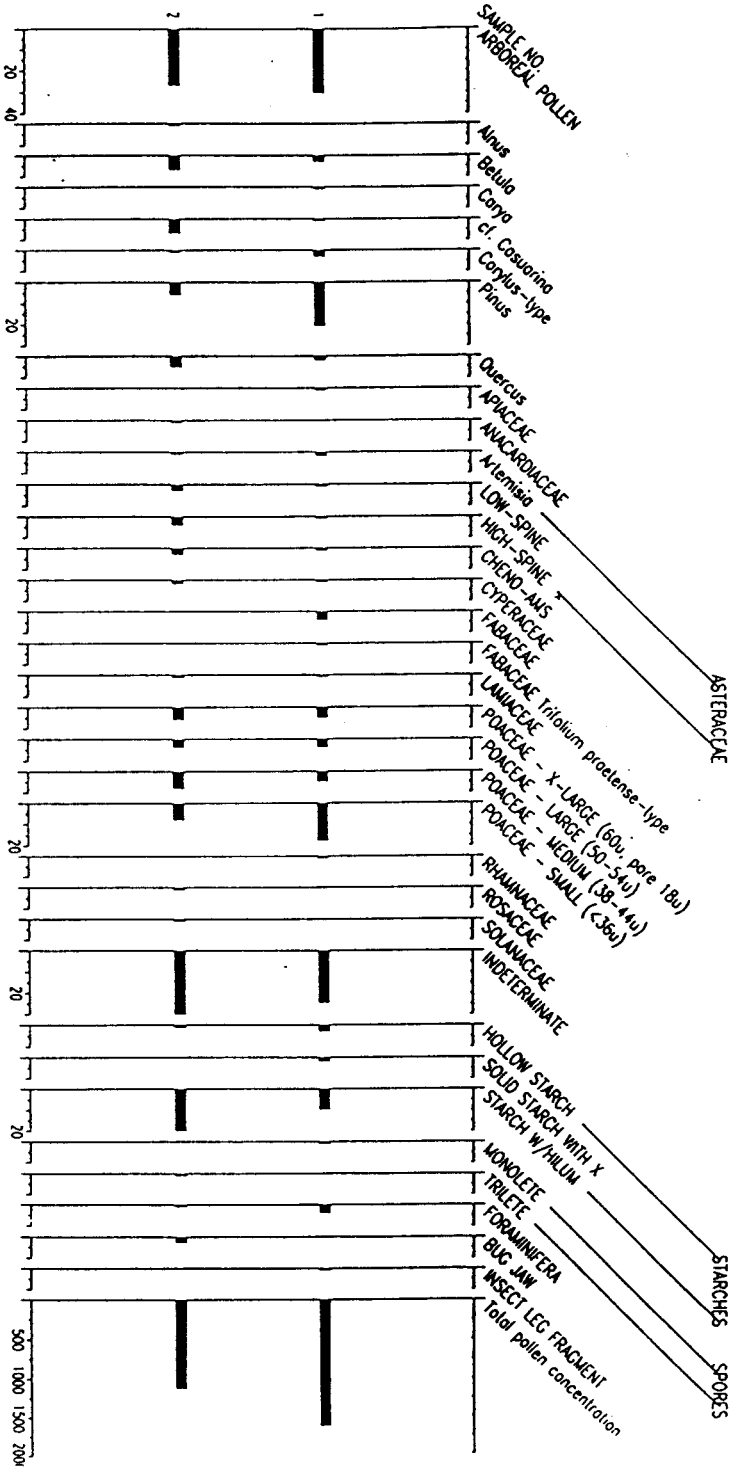

FIGURE 1. POLLEN DIAGRAM, SAMPLES FROM A BRITISH VESSEL, BERMUDA.

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APPENDIX C: REPORT ON FOUR ANIMAL BONES RECOVERED FROM THE SHIPWRECK OF ? LATE-EIGHTEENTH CENTURY ENGLISH VESSEL, BERMUDA

Archaeozoological Service Report
Level II/III archival report
(not intended for publication)

DECEMBER 1993

REPORT ON FOUR ANIMAL BONES RECOVERED FROM THE SHIPWRECK OF ? LATE 18TH CENTURY ENGLISH VESSEL, BERMUDA 1993

Prepared for:

Michael Krivor,
Dept.Maritime History and
Nautical Archaeology,
Eller House,
East Carolina University,
Greenville,
NC 27858
Tel. (919) 757 6097

By:

Philip L. Armitage,
1972 Roseate Lane,
Sanibel Island,
Florida 33957

LEVEL II/III REPORT

late 18th cent.shipwreck/
Bermuda/ Michael Krivor

THE ANIMAL BONES

1. INTRODUCTION

1.1 Bone elements/species identification

Four bone elements were submitted for identification.

None of the elements bears any distinctive registration/ provenance number.

Identification of these bones was undertaken using the author's modern comparative osteological collection. Reference was also made to Getty (1975, 2 vols.).

The results of the identifications are given below (section 2, catalogue).

1.2 Condition of the elements

Apart from the one intact rat femur, all the elements are incomplete (anciently broken). Considered overall,however, the state of actual preservation is remarkably good.

Apart from the piece of cattle scapula (shoulder blade) which is brown stained,all the elements are dark (black) stained presumably as a result of immersion in the bilge water (!?).

One element, the incomplete (= slightly broken) rat femur has a small patch of iron concretion at the proximal end.

1.3 Evidence of butchery

Only the cattle rib exhibits evidence of butchery in the form of a cut through the distal end of the shaft made either by means of an axe,cleaver, or heavy butcher's knife.

1.4 Measurement

Measurements (in mm) were taken of the intact and almost intact rat femora using dial calipers, following the method of von den Driesch (1976).

THE ANIMAL BONES . cont. 2

2. CATALOGUE

2.1 cf. Bos (domestic) cf. cattle

skeletal element	description
scapula	piece of medial surface of neck/blade
rib	portion of shaft lacking distal end (chopped completely thru,obliquely) also missing proximal articular end (head & neck) (anciently broken); edges of bone exhibit numerous tooth scrape marks that are characteristic of rodent (cf. rat) gnawing

2.2 Rattus norvegicus Norway rat

femur *	left,complete;epiphyses just fused/fusing measurements (mm): greatest length (GL) = 39.5 greatest length from caput femorus (head)(GLC) = 37.96 greatest breadth of distal end (Bd)=7.76
femur **	left,complete except for the greater trochanter (anciently broken);epi.just fused measurements (mm): GL = - ; GLC = 38.22; Bd = 7.2

SPECIES DETERMINATION:

* diagnostic feature:depth of trochanter tertius greater in R.norvegicus cf. R.rattus ,with outer edge more "rounded"

** diagnostic features in this specimen indistinct but overall stout/robust appearance compares well with intact specimen, and proximal shaft shows "twisting" cf.R.norvegicus

THE ANIMAL BONES cont. 3

3. INTERPRETATION/DISCUSSION

3.1 Victuals

Clearly the cattle rib and cattle scapula are discarded remains of meat eaten on board - representing either salted beef rations and/or fresh beef from livestock carried/slaughtered on board (or, perhaps, fresh beef purchased/consumed whilst the ship was in port).

3.2 Vermin

Rats were commonplace on European sailing ships voyaging to the New World and so the discovery of their skeletal remains in a shipwreck off Bermuda comes as no great surprise ! Identification of the femora as Rattus norvegicus, however, has important implications for dating this wreck, as discussed below:

Before the arrival in western Europe, sometime during the early 18th century, of the Asian brown (Norway) rat Rattus norvegicus , the only commensal rat species to be found in Britain (and throughout continental Europe) was the black (ship) rat Rattus rattus first introduced during the Roman period (see Armitage et al 1984, Armitage 1994 in press). Early on in the 18th century - circa 1720s according to Pennant (1776 vol.1: 116) the brown (Norway) rat was introduced into Britain supposedly in Russian ships from the Baltic (see Twigg, 1975:22), and by the end of that century had largely replaced R.rattus as evidenced by Bewick's observation in his General History of Quadrupeds published in 1790 (Bewick, 1790 reptd. 1980: 411-413);

"... the Black rat... was formerly universal here [in Britain] ..but is now very rarely seen, having been almost extirpated by the large brown kind, generally distinguished by the name of the Norway rat. This formidable invader is now universally diffused through the whole country..."

Given the marked decline of R.rattus (black rat) and the ascendancy of R.norvegicus in the latter half of the 18th century, Atkinson (1973) concluded that the chances of Norway rats boarding European ships [at this period] were, in consequence, "considerably greater than those of the ship rats. The 'ship rat' of that period was [therefore] often, although not necessarily always, R.norvegicus"

In view of the above history of the Norway rat, and given the Bermuda shipwreck is indeed English, it follows, then, that the presence on board of R.norvegicus (Norway rat) (as evidenced by the rat femora) clearly indicates that this vessel must be later in date than, say, c. 1750s - thus confirming the provisional dating of 1765-1790 !

THE ANIMAL BONES cont. 4

3.2 Vermin cont....

The record of R.norvegicus on this particular Bermuda shipwreck makes an important contribution to our understanding of the change over in species of rat on European shipping in the late 18th/early 19th centuries. As Atkinson (1973) pointed out, this faunal transformation aboard ships is still largely conjectual and very poorly documented. Certainly there are numerous extant contemporary late 18th/early 19th century mariners records which make mention of the presence of rats on board European sailing ships, but very rarely are these specific as to what species of rat (or rats) is involved. Two examples may be quoted to demonstrate the vagueness of such eyewitness accounts:

First, the log of HMS Mentor (formerly the American privateer Who's Afraid) reveals that while on station off the Florida coast in 1780, the crew found their spare sails "eat [sic] by the rats" (Servies, 1982:128).

Second, William Richardson serving on board the fourth-rate warship HMS Tromp (then operating as a troop transport) in the year 1802, recorded that the ship "was much infested with rats" (Childers, 1970:197).

An interesting exception to the generality of eyewitness accounts concerning rats in shipping is that of mariner Jacob Nagle, who, in 1795, while sleeping on board a tender berthed at London docks, was "bothered by "large Norway rats" that were "numerous and ravenous" (see Dann, 1988:189).

Apart, then, for Nagle's direct reference made to Norway rats, there seems to be a paucity of specific documented evidence for this species on board ships during the period under review, and the archaeological record provided by the Bermuda shipwreck therefore provides irrefutable proof of their presence. It would of course be nice to know whether R.norvegicus was indeed the sole rat species present on board the Bermuda ship, or whether there were black rats also - as was the case for the 1781 Yorktown shipwreck Betsy which yielded skeletal remains of both species in the ratio 3 Norway rats: 1 black rat (see Armitage, 1993).

THE ANIMAL BONES cont. 5

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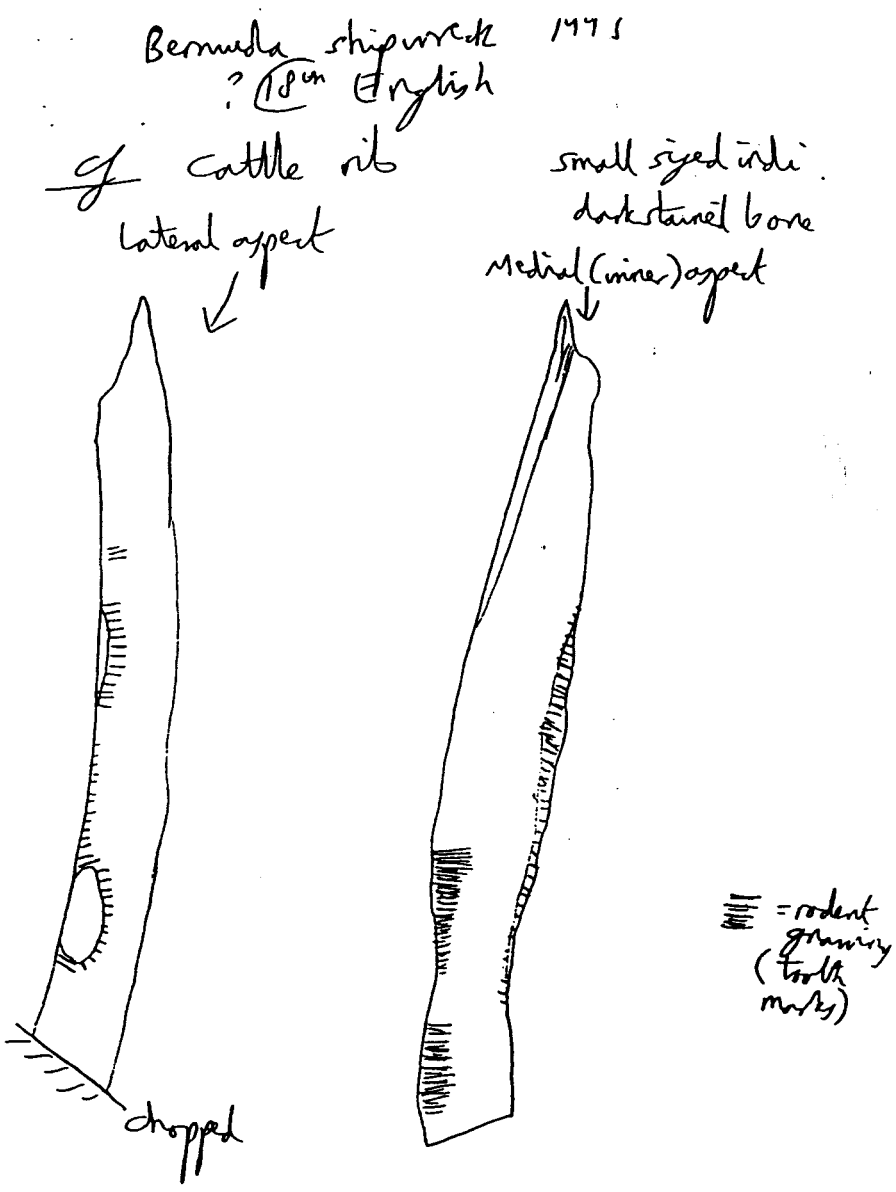
Bermuda shipwreck 1995
? 18th English
cattle rib
lateral aspect
small sized indiv.
dark stained bone
medial (inner) aspect
= rodent gnawing (tooth marks)
chopped

APPENDIX D: LETTER FROM GEORGE PETTENGELL, MASTER COOPER AT COLONIAL WILLIAMSBURG

Telephone: 804-229-1000

The Colonial Williamsburg Foundation

P. O. BOX 1776
WILLIAMSBURG, VIRGINIA 23187-1776

February 17, 1995

Michael Krivor
Program in Maritime History
and Nautical Archaeology
Eller House
East Carolina University
Greenville, NC 27858

Dear Michael:

I am in receipt of your letter of January 30, 1995, regarding the investigation of the remains of cask pieces from an 18th-century English shipwreck off Bermuda.

I shared your letter with the site coopers at Colonial Williamsburg, soliciting their opinion from the photographs you left me last November. The coopers were in agreement with the statement I made to you regarding the dimension of the cask and its probable original use. The coopers were noncommittal with the purpose of the Roman numerals cut on the inside of the photographed cask. Those knife cuts will remain simply conjecture until a more logical purpose is given. Wine casks of the pipe size are still being identified with race knife markings found, particularly in the head pieces and on the outside surface of the casks. The casks were coming into the "Port of London," St. Katherine Dock, into the second quarter of the 20th century. One could read from those markings the owner and shipper and cask destination.

As regards to further reading on cooperage and the making of coopered containers, I recommend two sources of information. The Cooper and his Trade, by Kenneth Kilby, and "The Coopers' Craft" video. This video was made from a 35mm movie produced by Colonial Williamsburg Foundation in 1966. That year Colonial Williamsburg invited a master cooper to the Foundation as a consultant and to train their employees at the hand craft. This video has been used at the Foundation as a standard documentary on the coopers' craft ever since.

Casks were the cargo containers of the earlier centuries and were as versatile in use as in construction. Construction methods can be modified to the adapted use of the container. The quality of the container will depend on cask use. Poorly made cooperage was the standard for shipping the tobacco crop from Virginia in the 17th and 18th centuries.

Good luck with this project and success in the future.

Sincerely,

George Pettengell

George Pettengell
Master Cooper