James Christopher Welliver Southerly CEDAR ON THE REEF: ARCHAEOLOGICAL AND HISTORICAL ASSESSMENTS OF THE EIGHTEENTH-CENTURY BERMUDA SLOOP, EXEMPLIFIED BY THE WRECK OF THE *HUNTER GALLEY*. (Under the direction of Dr. Bradley A. Rodgers) Department of History, June 2003.

The purpose of this thesis is to examine whether the remains of a shipwreck lost on the reefs, near Hogfish Cut, south of Pompano Flats, approximately 600 yards off the southwest shore of Bermuda represent a Bermuda sloop. The wreck, identified in the 1950s as the *Hunter Galley* by Bermuda salvage diver Teddy Tucker, perhaps represents the only identified Bermuda-built sloop in the archaeological record. Eighteenth-century merchants and mariners labeled the Bermuda sloop as one of the best sailing vessels of its time. Briefly examined by graduate students from East Carolina University's Program in Maritime Studies in 1997, the wreck site was revisited in 1998 for detailed mapping, partial excavation, and analysis in a joint East Carolina University and Bermuda Maritime Museum field project. Structural remains of the vessel are mostly limited to disarticulated timbers and planks. A small portion remains intact with broken framing attached to hull planking. Examination of the remains identified the framing and fastening pattern used, as well as wood specie for various structural components. Excavation units in the site area yielded an assortment of artifacts including ceramics, glass, organics, metal, and wood.

Both the hull construction and limited artifacts recovered during excavation suggest that the wreck is an early to mid eighteenth-century Bermuda-built vessel. This supports its identification based on documentary evidence as the *Hunter Galley*. Comparison to other archaeologically documented, eighteenth-century sloops, reveal

design elements that likely contributed to the high regard placed on Bermuda sloops versus their contemporaries. Regardless of a positive identification for the vessel remains, the detailed examination did allow for speculation concerning characteristics of a typical Bermuda sloop in the eighteenth century.

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James Christopher Welliver Southerly

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OF THE EIGHTEENTH-CENTURY BERMUDA SLOOP,
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My mother, Sharon Southerly, for supporting me and encouraging me over the years through the good and bad, joy and sorrow, and everything else a family goes through. My mother and father (in law), Nancy and Bill Welliver, who have made me feel like a son, rather than a son-in-law, for their support in so many ways, not the least of which was the Airstream Land Yacht where the majority of this thesis was written. All the family and friends who continually encouraged me. It is truly the love and support of friends and family that get us through in life.

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KATHY

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CHAPTER I

INTRODUCTION

A Bill of Protest, dated January 13, 1752, and signed by Master Clement Conyers, Mate John Conyers, and Mariner John Lea[y]craft recounts the last days of the Bermuda sloop *Hunter Galley*. On December 28, 1751 " . . . a certain sloop called the *Hunter Gally* . . ." sailed from St. Eustatius, in the Dutch West Indies, bound for Charlestown, South Carolina. All was well until *Hunter Galley* was hit with a hard gale at 25º45' North latitude by 64º46' West longitude. The storm " . . . disabled the Rigging and Sails of his . . . Sloop, lost one of his Men . . . lost his boat and stove one of his Top timbers, which rendered his . . . Sloop in a Defenseless Condition to proceed on . . . to Carolina." Knowing Bermuda to be the closest port for repair, Captain Conyers headed for the islands. On January 9, 1752, " . . . another Violent hard Gale of Wind of West South West . . ." hit the sloop. On January 10, Conyers sighted Bermuda. The condition of the vessel and the ferocity of the storm prevented *Hunter Galley* from reaching a sheltered harbor through the reefs of Bermuda, forcing Conyers to anchor near Hogfish Cut. "Knowing the Time of Year to be very precarious and his Vessell lying in a very Dangerous Place (incase bad Weather arose) . . ." Conyers " . . . sent on Shore to one of his [Bermuda] Owners to Assist him with an Anchor and Cable . . ." both of which he did not receive. As a result, " . . . on Saturday the 11th . . . the wind Increasing . . . his

anchors came [loose] and [he] was obliged to Cut away his Mast after which . . . *Hunter Gally* drove on the Rocks, Bulg'd and filled with water."[1]

Documents record the death of the Bermuda sloop, *Hunter Galley*, but what of its life? In cases like this, archaeological investigation and documentary research complement one another to answer such questions. Before it is possible to gain an understanding of the wreck, it is necessary to place the vessel in its historical context. The history of Bermuda provides the background to understand the historical climate in which the *Hunter Galley* sailed. An examination of eighteenth-century commerce and vessel types plying the waters during the time, place the *Hunter Galley* as the economic tool it was. A documentary study of what is known about Bermuda sloops sets the stage for the archaeological examination of the wreck.

The site examination begins, on what is assumed by Bermuda salver Teddy Tucker to be the wreck of the *Hunter Galley*, with an study of the wreck's current environment and the role that the environment likely played in the wrecking process itself. Beyond the environmental conditions and natural disturbances, information on the artificial disturbances that have occurred at the wreck site must be gathered. These disturbances, known as archaeological filters, may be exemplified by previous salvage or archaeological work, as well as random modern intrusions by snorkellers, sport divers, or events such as dredging, or anchor drags. With consideration of previous work on the site, actual archaeological work can be planned. Graduate students from East Carolina

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[1]Bermuda Government Archives. *Book of Deeds, Bills, and Protests, Etc., 1752-1760* (Hamilton, Bermuda).

University's Program in Maritime Studies conducted a detailed examination of the remains of the *Hunter Galley* during the 1998 Bermuda Fall Field School.

Subsequent analysis of field data allowed for an interpretation of the vessel remains and material culture associated with the wreck. While the vessel exhibited numerous similarities to other eighteenth-century colonial sloops, it was distinct in many ways. The artifact assemblage, while offering nothing exceptionally noteworthy or unique, served to support the identification as a British colonial sloop and to consistently date the wreck to the early to mid eighteenth century.

The eighteenth-century Bermuda sloop was acclaimed by contemporaries as the best sailing vessel of its time. Despite its popularity, no example had been found in the archaeological record. The discovery and subsequent confirmation through archaeological examination that the *Hunter Galley* was represented by the vessel remains discovered in the 1950s, and was Bermuda-built, provided a tremendous research opportunity. Beyond the confirmation that the vessel remains lying near Hogfish Cut was a Bermuda sloop; the challenge was to determine if it was possible to discover what made these vessels so desirable. While no single answer to the question can be given, numerous elements, when combined, offer some insight into why the Bermuda sloop was considered the best in the world.

CHAPTER II

BRIEF HISTORY OF BERMUDA

Effective archaeological interpretation cannot be done without endeavoring to understand the context of the observed material culture. For historical archaeology, this entails research into the social, political, and economic history of the regions and/or events associated with the archaeological record. Before it is possible to understand the Bermudian vessel and crew of the *Hunter Galley*, or its contemporary counterparts, it is necessary to understand the history and events that shaped their time. The development of Bermuda's eighteenth-century maritime economy, vessels, shipbuilding, commerce, and society, was driven by its various stages of colonial development.

Bermuda went through several distinct stages in its history. Once discovered, it became both a navigational aid and a navigational hazard to sixteenth-century mariners. After permanent settlement, in 1612 under the jurisdiction of the Virginia Company, Bermuda became one of England's most successful colonies in the seventeenth century. Run by the Virginia Company from 1612 to 1615 and then the Somers Island Company from 1615 to 1684, Bermuda attained a population of over 2,500 people, with six churches, nine forts, private land ownership, representative government, and tobacco exports surpassing the Virginia colony by 1625.

With the decline of tobacco prices in the 1630s, Bermudians changed their focus from tobacco cultivation to commodities better suited for inter-colonial trade with the highly dependent sugar islands of the West Indies and other developing colonies along

the Atlantic coast. Bermuda's independence grew with its relative isolation during the English Civil War to the point of succeeding in a *quo warranto* suit to abolish the Somers Island Company's charter in 1684. As a royal colony, Bermuda transitioned from an agricultural economy to a maritime economy. The independence and prosperity of Bermuda's maritime economy did not change until the events of the American Revolution forced the British Empire to take a more active hand in its overseas colonies.[1]

Discovery

Bermuda was not permanently colonized until the early seventeenth century, although it was well known to mariners a century earlier and was occasionally visited, by accident due to the islands' reefs. The Spaniard Peter Martyr recorded "La Bermuda" on a map in his *Legatio Babylonica*, published in 1511. The islands were likely named for Juan de Bermudez, a Portuguese captain of the Spanish ship *La Garza*. De Bermudez made at least eleven voyages to the new world between 1495 and 1519, and historians suggest that he discovered the islands on his 1505 voyage while commanding the ship *La*

[1] Walter Brownell Hayward, *Bermuda Past and Present* (New York: Dodd, Mead and Company, 1927); Michael J. Jarvis, "In the Eye of All Trade" (Ph.D. diss., College of William and Mary, 1998); Henry C. Wilkinson, *The Adventurers of Bermuda: A History of the Island From Its Discovery Until the Dissolution of the Somers Island Company in 1684* (London: Oxford University Press, 1958).

Garza.[2] Spanish historian, Gonzales Ferdinando d'Oviedo, who offered the first written account of the islands, writes of the "Island Bermuda, otherwise called Garza."[3]

An alternate date of 1503 is offered as the earliest sighting of the islands. This date is derived from an entry in the 1717 *Carte de la Novelle France*. Although Oviedo

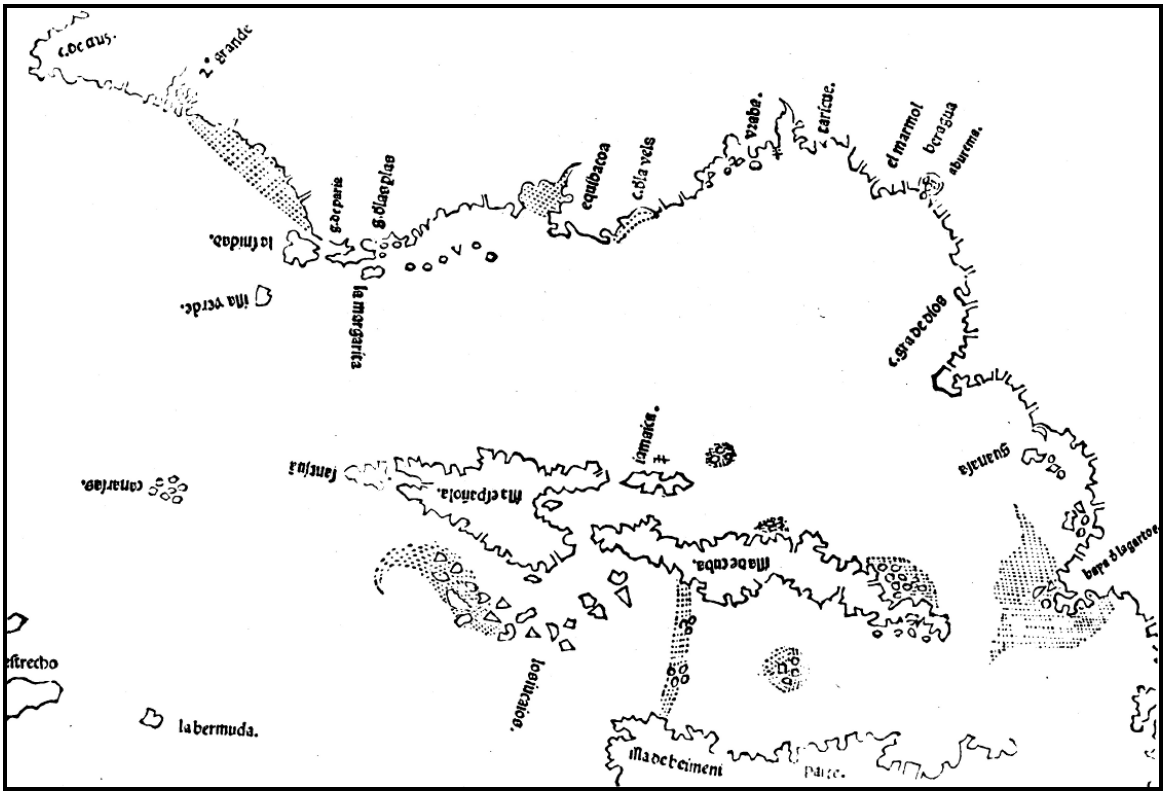

Figure 1 *Legato Babylonica* of Peter Martyr, 1511[4]

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[2] Jonathan Bream, "The Spanish Influence on Bermuda" *Bermuda Journal of Archaeology and Maritime History* 2 (1990): 15-24.

[3] Hayward, *Bermuda*, 7.

[4] Printed in Sir John Henry LeFroy, *Memorials of the Discovery and Early Settlement of the Bermudas or Somers Islands, 1511-1687, Compiled from the Colonial Records and Other Original Sources*, Reprint (London: Longmans Green, 1932), Vol. I.

and others attribute the discovery to Juan de Bermudez, if the 1503 date is accepted, it may have been Francisco Bermudez, captain of the *Santiago de Palos* on Columbus' 1502 expedition who first discovered the islands and gave them his name.[5]

In 1527, a Portuguese adventurer, Hernando Camelo, petitioned and received permission from King Philip of Spain to establish a colony on Bermuda, but his plans never came to fruition.[6] In 1538, Bartolome Carreno considered Bermuda as a potential colony, spending twenty-five days exploring the islands. He noted two good harbors, but the lack of fresh water and the porosity of the soil did not favor settlement. French privateers and pirates may have used Bermuda as a base of operations to attack Spanish shipping in the 1550s and 1560s.[7]

Henry May was the first Englishman to set foot on Bermuda in 1593. May was a ship's purser on the *Edward Bonaventure*, which foundered in the West Indies. Surviving the wreck, May was making his way home aboard a French vessel commanded by Monsieur de la Barbotière, bound from Laguna, Hispaniola, to Europe. Seventeen days after setting sail, on December 17, 1593, the vessel wrecked on Bermuda's northwest reefs. The mishap occurred because of the premature celebration with wine by

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[5] Jarvis, "Eye," 11n9.

[6] Hayward, *Bermuda*, 8.

[7] Jarvis, "Eye," 11.

the crew, once they thought they were beyond the reefs of Bermuda and at safe latitude to sail for home.[8]

May and the twenty-six French survivors spent the next five months on the islands. During this time he had ample opportunity to observe the local flora, fauna, and geography. Fearing their water supply would run low during the summer months, the survivors constructed "a smalle barke of some 18 tuns, for the most part with tronnels and very few nailes" out of the native Bermuda cedar. Rigging and sails were salvaged from the French wreck, and on May 11, 1594, May and his companions departed. They reached Newfoundland nine days later. May eventually reached Falmouth, England, on August 1, 1594. He recounted his experiences to Richard Hakluyt, who published this first English account of Bermuda in 1600.[9]

In 1603, a disabled Spanish galleon, commanded by Captain Diego Ramerez, put into Bermuda for repairs. The Spaniards subsisted on hogs, birds, fish, and oysters for three weeks while undertaking repairs. During their stay they made a rough map of the coast that was turned over to the Spanish crown with Ramerez's report, but King Philip showed no interest in establishing a colony there.[10]

In keeping with the reputation Bermuda had developed, the first English colonization of the islands was the result of a shipwreck. The *Sea Venture* sank after

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[8] Hudson Strode, *The Story of Bermuda*, (New York: Harcourt, Brace and Company, 1932), 25-26.

[9] Hayward, *Bermuda*, 9-10; Jarvis, "Eye," 14.

[10] Jarvis, "Eye," 16; Henry Wilkinson, "Spanish Intentions for Bermuda, 1603-1615," *Bermuda Historical Quarterly* 6 (1950): 48-49.

hitting the reefs to the northeast of the island, July 28, 1609, marking the beginning of continuous occupation of Bermuda and forming the basis for England's claims to the islands. The *Sea Venture* was the 250-ton flagship of a nine-vessel fleet carrying passengers and supplies to Jamestown. Commanded by two experienced seamen, Sir George Somers and Christopher Newport, the *Sea Venture* also carried a number of other historically notable figures: Sir Thomas Gates, Virginia's new governor, William Strachey, Virginia's new secretary, and John Rolfe, later famous for perfecting tobacco cultivation in Virginia and for marrying the Powhatan Indian princess Pocahontas in 1614.[11]

The 150 survivors spent the next nine months on Bermuda. The passengers and crew built two vessels from the native Bermuda cedar and salvaged materials from the *Sea Venture*. Robert Frobisher, an experienced shipwright, supervised the construction of the 80-ton ship, *Deliverance*. Somers supervised construction of a 30-ton pinnace, *Patience*. While the vessels were under construction, Somers, Gates, and other Virginia Company officials performed a detailed survey of the islands. They mapped shorelines and harbors, catalogued native plants, and assessed the islands' soils for growing crops. The company's assessment was favorable, and plans were made to return to Bermuda to establish a permanent colony.[12]

The vessels sailed for Jamestown, May 10, 1610, provisioned with live turtles, salted pork, birds, and fish. Only two members of the company were left behind:

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[11] Jarvis, "Eye," 19.

[12] Jarvis, "Eye," 22; Strode, *Bermuda*, 30.

Christopher Carter and Robert Waters. The reasons are unclear why they stayed behind. One account states that the men fled into the woods after a failed mutiny, not returning with other mutineers when immunity from punishment was promised. They could not be found when the winds were favorable for the vessels to depart and were left behind. Another account speculates that they, like many others, were reluctant to leave the comfort of the islands, and collaborated with Somers, to remain on the islands when the company departed to be returned for later.[13]

On May 23, 1610, Gates, Somers, Strachey, and 100 remaining colonists arrived in Jamestown. The situation in Virginia was critical, even with the supplies delivered from Bermuda. With the subsequent arrival of three relief ships commanded by the new governor, Lord De La Warr, plans were made to return to Bermuda for additional provisions. On June 19, 1610, Somers and Samuel Argall set sail for Bermuda. Separated by a storm, Argall could not find Bermuda and sailed instead for Newfoundland. Aboard the *Patience*, Somers eventually located the islands in early November. He died shortly after reaching Bermuda, presumably from food poisoning. His heart and entrails were buried in the settlement at St. George's, and his body was taken back to England for burial by his nephew Matthew Somers, who assumed command of the *Patience*.[14]

Somers ignored his uncle's orders to return to Virginia with supplies, instead choosing to sail for England to lay claim to Bermuda, and to return his uncle's body.

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[13] Hayward, *Bermuda*, 16-17; Jarvis, "Eye," 23-24; Strode, *Bermuda*, 30-31.

[14] Hayward, *Bermuda*, 19-20; Jarvis, "Eye," 25-26; Strode, *Bermuda*, 30-31.

Three men were left behind when Somers left for England, Christopher Carter, already resident, and two men from the crew of *Patience*, Edward Chard and Edward Waters.[15]

Somers' return to England was widely reported and his story, along with already published accounts by Strachey and Sylvester Jourdain, stirred considerable interest in Bermuda. During 1611, investors in the Virginia Company pushed for an official settlement in Bermuda. Profits in Virginia were not meeting expectations, pressing investors to locate a place where products such as olives and grapes could be produced. The reports of Bermuda's fertile soil and good climate appeared ideal.[16]

On March 12, 1612, King James I issued a new charter to the Virginia Company. The new charter extended the company's rights from within 100 miles of the coast to 300 leagues from the coast to encompass the Bermuda islands, and made the company structure more democratic for its investors.[17] Within two months, the Virginia Company had appealed to a new group of investors, formed an under-company for the express purpose of colonizing Bermuda, raised enough money to outfit a ship, and recruited its first group of settlers. The stage was set to begin the official colonization of Bermuda.

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[15] William Frith Williams, *An Historical and Statistical Account of the Bermudas From Their Discovery to the Present Time* (London: Thomas Cautley Newby, 1848), 16.

[16] Hayward, *Bermuda*, 20-21; David B. Quinn, "Bermuda in the Age of Exploration and Early Settlement," *Bermuda Journal of Archaeology and Maritime History* 1 (1989): 18.

[17] Williams, *Historical Account*, 17-18.

Colonization

The first colonists arrived in Bermuda on July 11, 1612, after eleven weeks at sea on the ship *Plough*. The newly appointed governor, Richard Moore, was already familiar with the islands as a survivor of the *Sea Venture*. The colonists landed on the southern side of Smith's Island cleared land, and set up temporary shelters. The settlement was soon moved from Smith's Island to St. George's Island, where Moore found good land and an ample supply of fresh water near a natural inlet for harboring boats.[18]

Moore's instructions as governor were to fortify the islands against potential attack by the Spanish. Work on the various fortifications curtailed the labor that could be devoted to agricultural pursuits. As a result, the first colonists suffered from a shortage of food and endured illness and disease.[19] Relief came when the first supply ship, *Elizabeth*, arrived in March 1613 bringing thirty colonists and much needed tools and equipment to the colony. In June 1613 a second ship, *Martha*, arrived with sixty more colonists and more supplies.[20]

The diligent pursuit of fortifying Bermuda was timely. In December 1613, two strange sails were sighted. Upon investigation, the Bermudian colonists deemed the vessels hostile, and subsequently fired on them from one of the forts. The vessels were

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[18] Hayward, *Bermuda*, 21-22; Jarvis, "Eye," 32-35; Strode, *Bermuda*, 32-34, Williams, *Historical Account*, 19-21.

[19] Hayward, *Bermuda*, 23; Strode, *Bermuda*, 33.

[20] Jarvis, "Eye," 37.

Spanish merchantmen endeavoring to take on fresh water and explore the islands they assumed to be uninhabited.[21]

While directing the construction of fortifications, and subsisting on the limited agriculture, Moore also attempted to establish tobacco as a cash crop for Bermuda. Using seeds from the tobacco grown by Carter, Chard, and Waters, a mature crop of tobacco was ready for export by 1614. The *Elizabeth* sailed with 170 pounds of pudding tobacco in January, and the *Margaret* sailed with 61 pounds four months later.[22]

When Moore's term as governor ended in 1615, Bermuda was a firmly established English colony. There was a town on St. George's with sufficient houses to accommodate 500 colonists, nine forts guarded the only two harbors open to ocean-going vessels, and tobacco was established as a profitable staple crop. Before Moore left Bermuda, he established a provisional government appointing six men to oversee the colony, in successive monthly terms, with a council of twelve men to assist in the overall management of colonial affairs.[23]

Moore's departure began what Jarvis termed the "Misrule of the Six." Three of the six provisional governors departed within a month, taking thirty-two colonists with them in a pirating enterprise that subsequently met with disaster. The three remaining governors proceeded to squander the colony's stores in a frenzy of drinking and revelry that devolved into general chaos in the ensuing months. Little or no work was done, and

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[21] Jarvis, "Eye," 39.

[22] Jarvis, "Eye," 39; Strode, *Bermuda*, 35.

[23] Jarvis, "Eye," 44; Strode, *Bermuda*, 35.

vessels bringing supplies had no commodities to load for their return voyage. Word of the idleness and corrupt management eventually reached London and the company's investors.[24]

In June 1615, King James I granted a new charter for a joint-stock company to a group of 117 investors designated "Governor and Company of the City of London for the Plantacon of the Somer Islands." The Somers Island Company replaced the Virginia Company, which surrendered, to the crown, its claim to Bermuda in 1614. The new company chose Captain Daniel Tucker, a veteran of colonial challenges and hardships from the Virginia colony, to be the new governor of Bermuda. He was commissioned in February 1616 and charged with restoring authority and order to Bermuda and subsequently making a profit for the company.[25]

Governor Tucker arrived in May 1616, taking control from the three remaining provisional governors, who were reluctant to relinquish leadership of the colony but ultimately submitted without armed conflict. Tucker declared martial law and re-established order. The colonists living in St. George's woke to a beating drum at dawn, worked until nine, had a break until three, and worked again until dusk. They worked clearing fields, felling trees, and planting crops Tucker had brought from England. The colonists were paid for their labor in coin, minted by the Somers Island Company and redeemable at the company magazine (storehouse). The coin was stamped with a hog on

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[24] Jarvis, "Eye," 46-47; Strode, *Bermuda*, 35-37.

[25] Jarvis, "Eye," 47-49; Strode, *Bermuda*, 38.

one side, in memory of the wild hogs found on the islands when first settled by the English. "Hog money" was the first coinage minted for any English overseas colony.[26]

During Tucker's rule as governor, Bermuda was divided into parcels for private land ownership. The Virginia Company sent Richard Norwood to Bermuda in 1613 to survey and subdivide the islands. The first phase of his survey divided the main island into eight parcels of 1,250 acres each. The second phase subdivided the parcels into fifty shares of twenty-five acres each. This division was done in narrow strips crossing the island from coast to coast so that each share had shoreline and upland, as well as good and bad soils for cultivation. These shares were issued to the company investors based on the number of shares they had purchased. The eight largest stockholders were assigned ten shares each, and the parishes were named after them. St. George's Island and approximately one-seventh of the remaining area was declared public land. This division of land into twenty-five acre shares inspired many Englishmen to invest in the company and emigrate to Bermuda. The division of land also affected the organization of the local government of Bermuda. Each of the eight parishes was a political sub-unit, represented by a councilor and four assemblymen.[27]

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[26] Jarvis, "Eye," 49-50; Strode, *Bermuda*, 38-39, Williams, *Historical Account*, 28-29.

[27] Jarvis, "Eye," 50-52; Strode, *Bermuda*, 41.

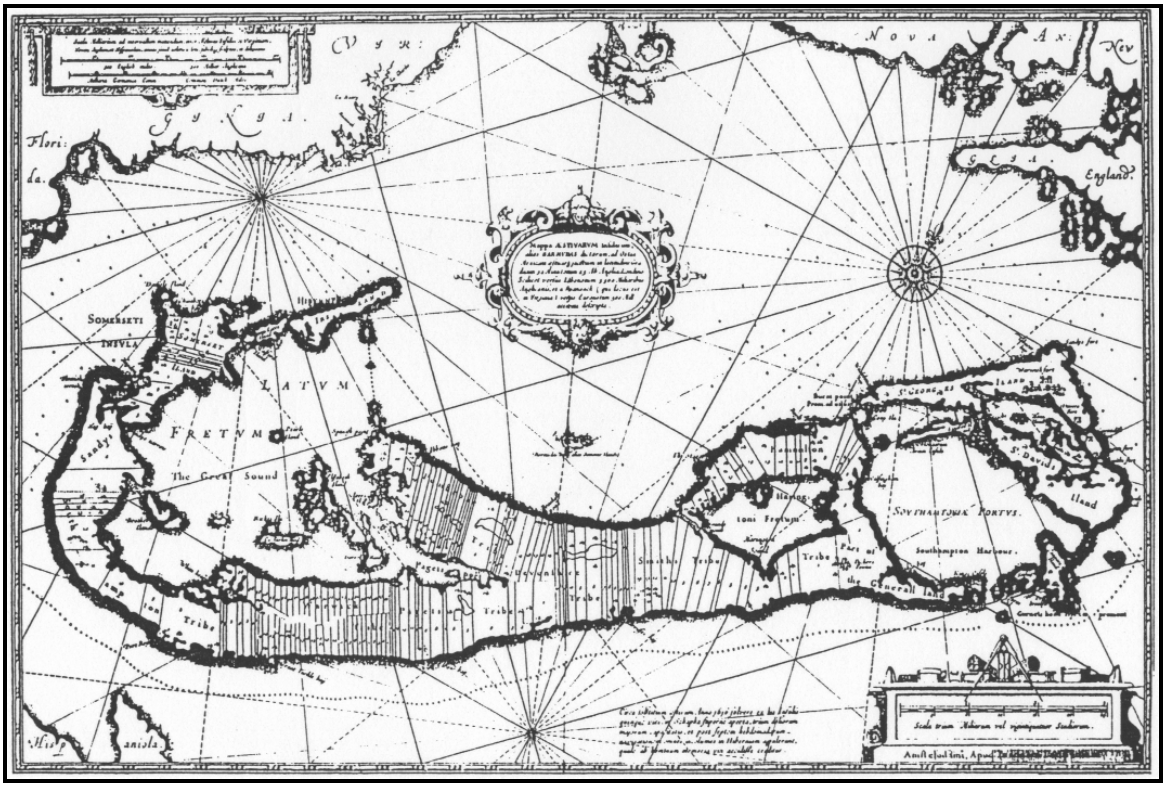

Figure 2 Map of Richard Norwood's 1616, 1617 survey

Tucker also sought means, other than tobacco, to generate a profit for the Somers Island Company. In an attempt to diversify Bermuda's agricultural base, Tucker sent a vessel to the West Indies for "Cattle, Cassadoe, Sugar Canes, negroes to dive for pearles, and what other plants are there to be had."[28] The vessel returned in August 1616, with plants that were successfully replanted and cultivated. Colonists fenced portions of the public lands of St. George's Island to protect the new crops from wild hogs and to

[28] LeFroy, *Memorials*, I:115-117.

establish cattle pastures. The vessel also carried "one Indian and a Negro, the first thes Ilands ever had."[29]

Trade with the West Indies for plants and commodities was only one of Tucker's maritime experiments in Bermuda. Harpooners sent to Bermuda by the company, explored the profitability of whaling during Tucker's tenure as governor. While they could locate and approach the whales that frequented Bermuda's coast from February to May, they were unsuccessful in taking any. Although unsuccessful, whaling was not abandoned. Norwood speculated that the expedition was unsuccessful because it was attempted in April, too late in the season. The colonists also had great hopes for the industry when two dead whales washed up on shore in the summer of 1617, yielding an abundance of oil and profit.[30]

Nathaniel Butler succeeded Tucker as Bermuda's governor, in October 1619. Butler assessed the state of the colony, summoned the councilors to St. George's to report the conditions of the individual parishes, and toured the islands' fortifications and public stores. Despite setbacks from an unseasonably late hurricane that destroyed the colony's entire tobacco crop for the season and a subsequent severe storm that devastated the winter corn crop, Butler pressed on with what he deemed most essential for the colony's safety and development.[31]

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[29] LeFroy, *Memorials*, I:115-117; Williams, *Historical Account*, 31.

[30] Jarvis, "Eye," 54-55.

[31] Jarvis, "Eye," 69-70.

Butler first addressed Bermuda's infrastructure. He provided for the colony's security by improving existing fortifications, constructing new ones, and adding ordnance. He directed colonists to construct bridges and highways to connect the islands. Three "large and strong" bridges were built measuring forty, fifty, and eighty feet. Butler also had his "Towne House" constructed in St. George's. This heavily built stone structure was set aside for public business where the courts and general assembly could meet.[32]

Noting the lack of adequate roads through the islands' forests, and the shortage of boats in the colony, Butler commissioned a Dutch ship's carpenter, Jacob Jacobson, a recent shipwreck survivor, to build new vessels for the conduct of public and private business in and around Bermuda. Jacobson built eight boats for Butler's use in conveying men and supplies to the islands' fortifications by the end of 1620.[33] Jacobson likely played a key role in the development of Bermuda vessels, specifically the Bermuda sloop.

Butler also addressed political and social issues during his tenure. He instituted a grand jury to hear bills and petit juries to decide civil and criminal cases. He called the first general muster of all able men instituting the first formal military training of the islands' militia since the early days of Governor Moore. He also called Bermuda's first general assembly in August 1620 comprised of himself, his council, the eight parish councilors, two elected "burgeoises" for each of the parishes, a secretary, and a clerk.

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[32] Jarvis, "Eye," 76-78; Strode, *Bermuda*, 44.

[33] Jarvis, "Eye," 71.

During their first meeting fifteen acts were passed, most dealing with improvements to the colony.[34]

Butler concerned himself with the church and public morality as well. The islands' two ministers refused to use the Book of Common Prayer, and could not agree about the liturgy. The governor settled the dispute by prevailing on the ministers to adopt the common liturgy of the islands of Jersey and Guernsey, personally translated from a French bible, from which the contentious portions were omitted. The liturgy selected by Butler was officially tolerated by King James, and used by French, Dutch, and Swiss Protestants. Butler also helped the ministers improve the general morality of the Bermuda colonists. The governor treated moral offenses as criminal offenses. Offenders were publicly disciplined via cages, stocks, and ducking-stools.[35]

At the end of Butler's three-year term as governor, he prepared to travel via Virginia to England, to personally present a list of grievances from the leading planters in Bermuda to the Somers Island Company in London. This exemplifies the positive working relationship that Butler developed in Bermuda and the stability that existed there. Butler left over 1,500 healthy colonists, well-stocked storehouses, ten forts mounting fifty-two cannon, and almost a hundred boats. First generation, native Bermudians were being born, colonists lived in "substantiall houses" rather than other impermanent structures, and a sense of permanence and connection to the islands was developing among the residents. In its first decade of settlement, Bermuda had formed a

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[34] Jarvis, "Eye," 71-73.

[35] Jarvis, "Eye," 75; Williams, *Historical Account*, 36.

cohesive colonial society, drafting its own laws, deciding cases in its own courts, and electing its own officials. By 1622, Bermuda was a mature colony of England, long before most of England's overseas colonies had even been founded.[36]

Tobacco Economy

When the first English colonists arrived in Bermuda, tobacco was already growing wild on the islands. The plants may have been left by Spanish shipwreck survivors in the sixteenth century. In 1603 when Spanish Captain Diego Ramirez stopped at Bermuda on his voyage home, he found tobacco growing near a camp made by earlier settlers. These settlers he believed to be a Spanish party wrecked on Bermuda in 1593. The tobacco John Rolfe experimented with in the Virginia colony may have originated in Bermuda. Rolfe spent ten months in Bermuda as one of the *Sea Venture* survivors before eventually reaching Jamestown.[37]

Bermudian colonists quickly perfected the techniques necessary to produce desirable and profitable tobacco for the European market. They exported tobacco to England long before it became a staple crop in the Chesapeake, and by 1618 it became the major crop and exchange item exported from the colony. It was not until 1624 that Bermuda's tobacco production was consistently exceeded, in quantity and value, by

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[36] Jarvis, "Eye," 85-90; Strode, *Bermuda*, 43-44; Williams, *Historical Account*, 37-38.

[37] Jarvis, "Eye," 100-101.

Virginia.[38] The type of tobacco produced in Bermuda was different from the tobacco sent to England from the Chesapeake and other English colonies. Bermuda tobacco was the preferred Orinoco strain, *Nicotinus tabacum* rather than *Nicotinus rustica* commonly found in North America. This difference can be attributed to early Spanish encounters with Bermuda in the sixteenth century.[39]

The importation of slaves contributed to the rapid productivity of tobacco agriculture in Bermuda. The slaves did not provide critical labor but critical knowledge. Before the arrival of black and Indian slaves to the island in 1616, tobacco cultivation was pursued on a trial and error basis with only marginal success. African and Indian slaves had the knowledge base to properly cure the tobacco, having participated in the cultivation of tobacco for much of the sixteenth century in Cuba, Hispaniola, and along the northern coast of Venezuela.[40]

During the 1620s Bermuda's tobacco production continued to grow and to define the islands' society. Successful tobacco planters formed Bermuda's elite in the early seventeenth century. The significance and dominance of tobacco in the economy is evidenced in an act passed by the Bermuda General Assembly in 1623. This act established the rates of pay for various tasks in pounds of tobacco, supplanting the hog money, first minted in 1616, as the preferred measure of economic value and medium of exchange. For example, master carpenters and joiners earned two pounds of tobacco per

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[38] Wesley Frank Craven, *An Introduction to The History of Bermuda* (Bermuda: Bermuda Maritime Museum Press, 1990), 87; Jarvis, "Eye," Appendices 3 and 5.

[39] Jarvis, "Eye," 100-101.

[40] Jarvis, "Eye," 102, 153-154.

day, while masons and tailors earned one pound per day. The issuance and use of hog money, by the Somers Island Company, was discontinued entirely in 1624.[41]

By the late 1620s the rapid increase in tobacco production in the Chesapeake and the related decrease in tobacco prices as the market became flooded, impacted heavily on Bermuda.[42] In 1629, Bermuda Governor Phillip Bell wrote to Sir Nathaniel Bell regarding the condition of Bermuda's tobacco production.

> And as for this island, 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 profit, especially so much tobaccoe now beinge planded 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 at all.[43]

By 1632 the soil in Bermuda was becoming depleted by the tobacco agriculture as well, despite fertilizers and crop rotation. The economy that had sustained Bermuda for its first twenty years as a colony was now failing.

In the 1630s Bermudians began to diversify the island's agriculture with crops other than tobacco, harkening back to the days of experimentation under Tucker. Oranges, lemons, pineapples, and potatoes were successfully planted. More cattle for

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[41] LeFroy, *Memorials*, I:304-305.

[42] John J. McCusker and Russell R. Menard, *The Economy of British America, 1607-1789* (Chapel Hill: University of North Carolina Press, 1985), 121. McCusker and Menard discuss the tobacco industry and tobacco depression in the Chesapeake in some detail in their chapter on the Upper South.

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

both meat and dairy were also brought into the islands. Pasture replaced tobacco fields.[44] The decline of Bermuda tobacco drove out many English investors in the Somers Island Company. Profits declined and many were not particularly interested in fruit and cattle. They sold their shares in the company, many of which eventually passed to Bermuda planters as a result of the new profits they realized from provisioning. During the late 1630s and early 1640s, the tobacco depression prompted many Bermudians to leave the islands. They emigrated to other colonies including, Providence, Virginia, St. Lucia, Barbados, and Trinidad.[45]

The challenges facing Bermuda because of the tobacco depression of the 1630s were compounded by the execution of Charles I in 1649 and the establishment of the Commonwealth under Oliver Cromwell. The English Civil War served to isolate Bermuda. The conflict in England disrupted the regular supply vessels sailing to Bermuda from England further affecting the economy. To resolve their supply problems, the Bermudians began full interactive trade with any ships calling in Bermuda, not simply re-provisioning them. They also began actively sending their own merchant vessels out, primarily to the Dutch West Indies, [46]

News of Charles II's proclamation as king reached Bermuda from Barbados, brought by a Bermudian mariner who was trading there. Official confirmation arrived a

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[44] LeFroy, *Memorials*, I:405.

[45] Jarvis, "Eye," 181, 184.

[46] J. C. Arnell, "The Medium of Exchange in Early Bermuda," *Bermuda Journal of Archaeology and Maritime History*, 3 (1991): 21-24.

few weeks later by the Somers Island Company.[47] This routing of news and information exemplifies the distance between Bermuda and England, compared to the proximity of Bermuda to other North American and Caribbean colonies. Bermuda's size, location, and the technology of the time prevented direct navigation to the islands from Europe. Official information from England could only reach Bermuda indirectly, emphasizing to Bermudians its remoteness from the crown.

After the restoration of the monarchy, England attempted to reassert its hold over its colonial trade and markets, in part, through the Navigation Acts. The Somers Island Company attempted much the same thing with Bermuda. The move from tobacco agriculture threatened the company's prosperity and authority over Bermuda. Bermuda had become a port of call for other English colonial vessels as well as foreign vessels for water, repairs, provisions, and other commodities during their relative isolation from England during the 1630s and 1640s. During the 1640s and 1650s, Bermudians Anthony Peniston and John Stowe built vessels out of Bermuda cedar for trade in the West Indies. The Somers Island Company tried in vain to maintain a trade ban, forbidding Bermuda boats from contacting vessels not formally entering the island's harbors. The Bermudians had already experienced a more stable and independent economy without the company and were reluctant to go back. The situation of the 1650s and 1660s spurred another wave of emigration from Bermuda to other colonies much as the tobacco

[47] Jarvis, "Eye," 249.

depression had two decades before. Bermudians left for Jamaica, New York, Carolina, and the Bahamas.[48]

Throughout the 1660s and 1670s conflict between the Somers Island Company and the Bermudians continued. The dispute centered on the change in Bermuda's economy, and the desire of the investors in the Somers Island Company to return to the conditions of the 1620s: control of Bermuda's tobacco, and more importantly, maintenance of a captive retail market on the island through their magazine (supply) ships. This ongoing dispute of company and colony culminated in a *quo warranto* suit against the company ordered on January 21, 1680, by the king. Bermudians finally achieved their independence from the company on December 16, 1684. King Charles II effectively dissolved the Somers Island Company by commissioning Richard Coney as the first royal governor of Bermuda ending the *quo warranto* suit.[49]

Maritime Economy

With the dissolution of the Somers Island Company in 1684 the stage was set in Bermuda for the move from an agrarian to a maritime economy. Bermuda had already moved away from its sole reliance on tobacco. The islands were a centrally located provisioning and repair point for intra-colonial trade from the Caribbean to Newfoundland. Bermudians began to ply the sea-lanes to and from the West Indies with locally built vessels. The outward migration of Bermuda colonists during the mid-

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[48] Jarvis, "Eye," 184, 284-287; Wilkinson, *The Adventurers*, 345.

[49] Hayward, *Bermuda*, 31; Jarvis, "Eye," 293-299, 309-312; Strode, *Bermuda*, 52-53

seventeenth century almost guaranteed that a former Bermudian lived in every colonial port. This yielded a vast network of trading partners and commercial agents through kinship ties.

The developed trading network is seen by examining the trading partners of two Bermudian merchants, Anthony Atwood and Francis Forbes during the latter part of the eighteenth century. Twenty-seven of their seventy-two trading partners were former Bermudians (37.5 percent) and four (5.6 percent) were direct blood relations. There were 16 of 34 in the Caribbean colonies, 8 of 18 in the southern colonies, 2 of 17 in the Chesapeake and middle colonies, and 1 of 4 in the northern colonies. The numbers also exemplify the emphasis of Bermudian trade with Caribbean ports, especially St. Eustatius where 12 of Atwood and Forbes' trading partners were located (almost 17 percent).[50]

Bermudians realized in the latter part of the seventeenth century that their agrarian economy was incapable of expanding. They were limited severely by the twenty square miles of their islands. Their budding maritime economy represented limitless opportunity. With a maritime trading economy, the size of their islands was irrelevant. Even before the settlement of the *quo warranto* suit and the dissolution of the Somers Island Company, the profits from provisioning, exporting "beef, port, fish, wax, honey, palmetto hatts, baskets and woodenware" to the West Indies exceeded the tobacco profits by 20 percent (£6000 v. £5000).[51]

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[50] These data are derived from general information provided in Appendix XI of Jarvis, "Eye," 793-794.

[51] LeFroy, *Memorials*, II:431.

Shipbuilding was a key element in Bermuda's developing maritime economy and the foundation of the colony's eighteenth-century economy. From the beginning of the *quo warranto* proceedings in 1679 to the beginning of Queen Anne's War in 1702, Bermuda expanded its merchant fleet from approximately one dozen small vessels to seventy sturdy ocean-going vessels. Bermuda manned its vessels with 170 navigators and 500 sailors (100 of whom were black or Indian slaves), and maintained it with 55 shipwrights and 5 blacksmith shops.[52]

The increase of ships in Bermuda paralleled an increase in shipping and commerce. Bermuda mariners developed a series of interlocking shuttle and triangle trade routes to exploit for profit and to satisfy the domestic needs of the islands. The primary destination and market for Bermuda vessels was the Caribbean. They would carry corn, flour, salted beef and pork, timber, and timber products from other North American colonies and livestock, cabbages, onions, potatoes, ducks, turkeys, furniture, and stone from Bermuda to the islands. On the return voyages the Bermuda vessels were laden with sugar, molasses, and rum from the sugar islands. The Chesapeake was the secondary destination for Bermuda trade. Vessels arrived in Virginia in the fall stocked with salt for the slaughtering season, trading for shipbuilding materials, corn, salt pork, and winter wheat. Salt was also the main commodity carried to the northern colonies of New York, Pennsylvania, and New England. Ships returned with flour, salt beef, iron, coal, specialty food items, and household commodities. Bermudians sailed to the Carolinas primarily for timber and naval stores, again bringing predominantly salt in

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[52] Jarvis, "Eye," 407, 412.

trade. In 1762, Bermudian vessels accounted for 10 percent of Charlestown, South Carolina's port traffic (in tonnage), bringing in 57 percent of all the salt imported that year.[53]

Merchants from various colonies also chartered Bermuda vessels. Emanuel Low & Co. of North Carolina hired the sloop *Bonadventure* for three months and thirteen days in 1709 for the sum of £131.5.6. By the 1740s it was common to see hired Bermudian vessels at ports in Ireland, Spain, and Portugal (not regular ports of call for Bermudian merchants), when working for North American colonial merchants. Such arrangements were very good for Bermudian vessels: earnings were preset, wages and victuals were typically paid in addition to the lease price of the vessel, and barring loss of the vessel at sea, there were no serious economic risks. Between 1742 and 1744 Robert Pringle of South Carolina, employed at least six Bermudian mariners to carry goods and correspondence between Charleston, Barbados, Bermuda, New York, St. Kitts, Jamaica, and the Bahamas including: Florentius Cox, Boaz Bell, James Hunt, James Tucker, Captain Cooper, Captain Beek, and David Conyers.[54]

Along with legitimate commerce came illicit trade and smuggling. Smuggling in Bermuda began in protest to the duty placed on tobacco by the Somers Island Company. The natural topography of the islands supported smuggling by providing numerous sheltered bays and coves to load and unload unseen by official eyes. The links formed

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[53] Jarvis, "Eye," 412-417; British Public Record Office, Colonial Office 41/6-7

[54] Walter B. Edgar, ed., *The Letterbook of Robert Pringle, 1737-1745*, 2 vols. (Columbia, SC, 1972); Jarvis, "Eye," 420-421.

with the Dutch West Indies in the 1680s continued to develop and by the mid eighteenth century had grown to a regular traffic in illicit goods intended for re-export from Bermuda to other British colonies.[55]

Bermudians mixed legitimate activity with illegal to cover themselves whenever possible. A typical scenario would be to sail from the Turks Islands with salt to trade for a cargo of food and provisions. The vessel then sailed to the British sugar islands, sold the cargo at a profit for cash and departed, "in ballast" for Bermuda or another British port. Rather than sailing for a British port, they sailed to the Dutch islands to purchase European manufactured goods with cash. They then returned to Bermuda, sailing to the west end, covertly offloading their cargo. The vessel then sailed around the islands, officially entering Bermuda at the east end with empty holds. Governor William Popple commented on "how easy it is for them to bring any quantity of European goods from those parts [West Indies] and so land them here [Bermuda]… By this means, they can take in what European goods they please, that have been Clandestinely imported here." "Bermuda sloops frequently trade with the Dutch at St. Eustatia and as the Dutch trade with the French, French commodities may clandestinely be imported into the West End … I do assure you shortly that we shall not send to England for any goods at all, everything to be had as St Eustatia brought new and sold at half the price . . ." This point is emphasized by the fact that in 1750 Bermuda ship captains exported more refined

[55] Jarvis, "Eye," 428, 436.

white sugar than they imported, something that should have been impossible given the fact that Bermuda neither grew nor refined sugar.[56]

Salt raking was also vital to the developing Bermuda maritime economy in the late seventeenth and eighteenth centuries. The process began in the 1650s and 1660s. The cattle and pork raised in Bermuda for export often died at sea. Butchering and then salting the meat was preferable. The climate in Bermuda was not conducive for salt production. It was too humid and therefore required too much valuable wood to evaporate seawater. The Bermudian mariners became familiar with the numerous uninhabited Caribbean islands and the developing trade routes during the outward migration in the mid seventeenth century. Some islands were ideal for making salt from seawater naturally by evaporation. Bermuda found a cheap and steady supply of needed salt. By 1680, salt raking was a significant enterprise, and Bermudians raked for export not just domestic consumption. By 1700, the focus for salt raking was almost exclusively on the Turks and Caicos Islands.[57]

The significance of salt raking for Bermuda was proven in 1710 when the Spanish came to the Turks Islands, taking possession of the salt ponds and making prisoners of the salt rakers. Bermuda responded with force of arms, recapturing the islands and re-

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[56] Jarvis, "Eye," 431, 437; William Popple to Board of Trade, 3 March 1749, PRO CO 37/13:74, 14:64-65, 67, 16:83-84.

[57] Jarvis, "Eye," 442-444.

establishing their claims to the salt ponds. Subsequent security and possession of the islands were guaranteed afterward by regular patrols by armed vessels.[58]

The salt raking process typically began in spring with a vessel carrying a double crew, half slaves, leaving from Bermuda. The white half of the crew was be dropped off at the Turks or Caicos with six months' provisions. The master and the slave crew then engaged in opportunistic trade between islands, turtle, whale, timber, or wreck, as appropriate, returning in the fall to the islands to collect the white crew and the salt. The vessel then sailed for the Chesapeake or Carolinas in time for the October/November slaughtering season.

The salt raking industry grew steadily during the eighteenth century with slaves replacing much of the white labor in the second half of the century. The Chesapeake colonies imported from Bermuda 6690 bushels in 1716, 8140 bushels in 1734, and 9730 bushels in 1750. These figures do not include the salt transported directly from the Turks and Caicos to Virginia. The industry reached its height in the 1780s when almost a thousand Bermudians went annually to the Turks and Caicos, between March and October.[59]

While shipbuilding, commerce, smuggling, and salt raking constituted the majority of Bermuda's efforts and annual earnings, the local maritime pursuits of fishing, whaling, and wrecking generated modest profits and provided training and experience for

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[58] Hayward, *Bermuda*, 33; Strode, *Bermuda*, 55; F. Whittington, *Bermuda – A Colony, A Fortress, and A Prison* (London: Longman, Brown, Green, Longmans, and Roberts, 1857), 66.

[59] Jarvis, "Eye," 414, 442, 455.

novice Bermudian sailors. Bermuda's local fishing industry provided a major component of the colonists' diet, eliminating the expense of importing large quantities of food stores for domestic consumption. While fishermen were considered inferior to Bermuda's deepwater sailors, the local fishing industry provided a source of skilled maritime labor for the expanding merchant fleet to draw upon.[60]

Bermuda's whaling industry was the oldest among the British colonies. Launched in 1617 by Governor Daniel Tucker with little success, it was suspended until 1664 when eighteen adult whales (likely humpback whales rather than the sperm whales hunted earlier in the seventeenth century) were killed. Whaling supplied the colony with necessary lamp oil and in good years, when there was a surplus, modest exports that often surpassed £1,000. It was not until the early eighteenth century when the New England colonies became active in North Atlantic whaling that Bermudians began to abandon whaling.[61]

Wrecking, the salvage of vessels that foundered on Bermuda's reefs, by fishermen and other locals offered significant profit to Bermudians. Not only did Bermudian wreckers receive a one-third share, plus expenses, for their efforts, but salvaged ship parts and fittings supplied the Bermudian shipbuilding industry. By reusing salvageable parts, shipwrights reduced their costs. During the first three-quarters of the eighteenth century over sixty vessels were lost on Bermuda's reefs. While many vessels offered only

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[60] PRO CO 37/19:182.

[61] Edward Schortman, "A Short History of Whaling in Bermuda," *Mariner's Mirror,* 55 (1969): 77-86; PRO CO 37/11:49, 12:162.

modest profits, some like the French ship *Jane and Cornelius*, carried valuable cargoes. The wine, cochineal, logwood, and money from the 600-ton ship were worth over £10,000.[62]

Privateering represented one final profitable enterprise for Bermudians in the early part of the eighteenth century. During the numerous conflicts of the period, declared and undeclared, Bermuda transformed portions of its merchant fleet to privateers. Bermuda privateers not only preyed on foreign vessels but also served as escorts to protect their own unarmed merchant vessels. Privateering offered the common sailor the opportunity to become wealthy through a successful foray. Conversely, he also risked working for nothing if no captures were made.[63]

During Queen Anne's War, Bermuda outfitted privateers to combat French privateers and to prey on French commerce. Between 1702 and 1706, Bermuda Governor Benjamin Bennett issued letters of marque to fifteen vessels including six ships, four brigantines, and five sloops.[64] In 1719 during the conflict against Spain, at least two large Bermuda sloops were converted to privateers, the *Hopewell* mounting eight guns and the *Devonshire* mounting ten guns. In the War of Jenkins' Ear, officially declared in 1739, Bermuda again converted sloops into privateers to prey on Spanish vessels and protect their own. By 1740, at least eight Bermuda privateers were actively

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[62] PRO CO 37/4:80, 107; Jarvis, "Eye," 461.

[63] Henry Wilkinson, *Bermuda in the Old Empire*, 63-65.

[64] PRO CO 37/7:26, 231.

hunting in the North American shipping lanes. Between the periods of active conflict, Bermuda merchants returned to their normal patterns of trade.[65]

By the latter half of the eighteenth century, Bermuda's maritime economy had matured and stabilized, while the rest of North America continued to change and grow. In the early 1700s, Bermuda's merchant fleet rivaled any in British North America, and Bermudians profited greatly by connecting the developing colonies. By the 1770s shipbuilding in other North American colonies had grown significantly, and the colonies themselves had grown as well. As the various colonial economies expanded and diversified, the volume of their exports also grew. This change favored larger square-rigged vessels, capable of transporting goods cheaper than smaller vessels like the Bermuda sloop. By the eve of the American Revolution, most merchants in the larger American ports had their own vessels and experienced masters and sailors. They no longer hired Bermudian vessels to carry their goods and actively competed against Bermudian shipmasters in speculative trade. While Bermuda continued to prosper, it began to lose ground competing against the larger, more diversified, more populated, and richer colonies evolving along the Atlantic coast.

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[65] Jarvis, "Eye," 469-474.

CHAPTER III

EIGHTEENTH CENTURY COMMERCE, SHIPS, AND SHIPBUILDING

Eighteenth-century vessels were international economic tools for their respective nations. To understand and interpret specific vessels, a general understanding of colonial commercial activity and the various vessel types of the time is necessary. The strengths and weaknesses of a particular vessel type only have meaning when measured against their contemporary counterparts, and the economic climate of the period. When these factors are examined and assessed it becomes apparent that sloops in general, and Bermuda sloops specifically, were the ideal commercial vessel for the early eighteenth century, remaining dominant until politics, economics, and technology changed.

Colonial Commerce

Fredrik Henrik af Chapman, in his *Treatise on Shipbuilding*, summarizes what was desirable in the design of a merchant vessel. "A merchant ship ought: (1). To be able to carry a great lading in proportion to its size. (2). To sail well by the wind, in order to beat easily off a coast where it may be embayed, and also to come about well in a hollow sea. (3). To work with a crew small in number in proportion to its cargo. (4). To be able to sail with a small quantity of ballast."[1] These criteria go hand in hand with the more modern economic analyses of eighteenth-century colonial commerce. Examining

[1] Fredrik Henrik af Chapman, *A Treatise on Shipbuilding*, trans. James Inman. (Cambridge, 1820), 187, quoted in David R. MacGregor, *Merchant Sailing Ships, 1775-1815, Their Design and Construction* (Watford, England 1980), 57.

the economic viability of colonial trade around the British Atlantic reveals several major determinants that affected the merchants' bottom lines.

The first cost consideration was the size of the vessel in question. Basic reasoning dictates that the larger the vessel, the more cargo it could carry per unit of time (a voyage) and, therefore, yield more profit. In colonial times this reasoning did not necessarily hold true. The larger the ship, the greater the risk of it leaving port under laden or of delaying in port to secure full lading. The small, scattered markets in the colonies of British North America also offset the money saving effect of the typically good ton-to-man ratio of large ships by increasing their necessary port time.[2]

Delays in port times were an important consideration as they were often quite lengthy. Not only were there delays due to the time necessary to find a cargo to fill the vessel to its capacity, but there was the factor of loading itself. The manual loading of bulk cargos could take days. In addition, there were simple economic considerations such as price haggling or waiting for a vacillating market price to stabilize. Port of Philadelphia records provide a representation of ship loading and unloading times in the eighteenth century. Because of to the size of the port, the availability of labor, and the prominence of the town in British North America, the port times represented in Philadelphia would likely be shorter than average for the colonies. An assessment of the average port times by vessel rig in the port of Philadelphia in 1749 and 1750 exemplifies

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[2] Ralph Davis, *The Rise of the English Shipping Industry in the Seventeenth and Eighteenth Centuries* (London, 1962), 72. Gary Walton, "Sources of Productivity Change in American Colonial Shipping, 1675-1775," *Economic History Review*, 20 (1967): 69.

how larger ships had considerably longer times in port. Ships waited 56.8 days, snows 50.6 days, brigs 41.6 days, schooners 25.1 days, and sloops only 20.9 days. Through the middle of the eighteenth century the time per ton ratio resulted in large ships operating at a cost roughly equal to that of a smaller ship. This ratio did not change until the 1760s, after colonial markets became more developed, when the cost per ton to operate a large ship was only two-thirds that of a ship half its size.[3]

A third cost determinant was the speed of a vessel. Speed was often more important than carrying capacity in colonial waters. This was attributed to the general lawlessness prevalent in many areas, particularly the West Indies. The danger of assault meant that a vessel had to be capable of outfighting or outsailing an attacker. Speed was generally the commercial answer to this dilemma. A fast ship did not lose cargo space to cannon and avoided the added expense of purchasing and maintaining ordnance. Manpower was another significant cost when adding ordnance to a vessel. Ordnance was not useful unless there was a crew large enough to serve the guns. Increased crew size equated to increased payroll or shares and increased victualling costs. Smaller vessels also proved preferable, as they were generally faster and could sail in waters where larger vessels could not.[4]

Overall speed of sailing vessels changed very little during the eighteenth century, although round-trip time on established trade routes did decrease. This decrease in trip

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[3] Davis, *English Shipping*, 73, 194. Walton, "Sources of Productivity," 76.

[4] P. C. Coker, *Charleston's Maritime Heritage, 1670-1865* (Charleston, SC, 1987), xv.

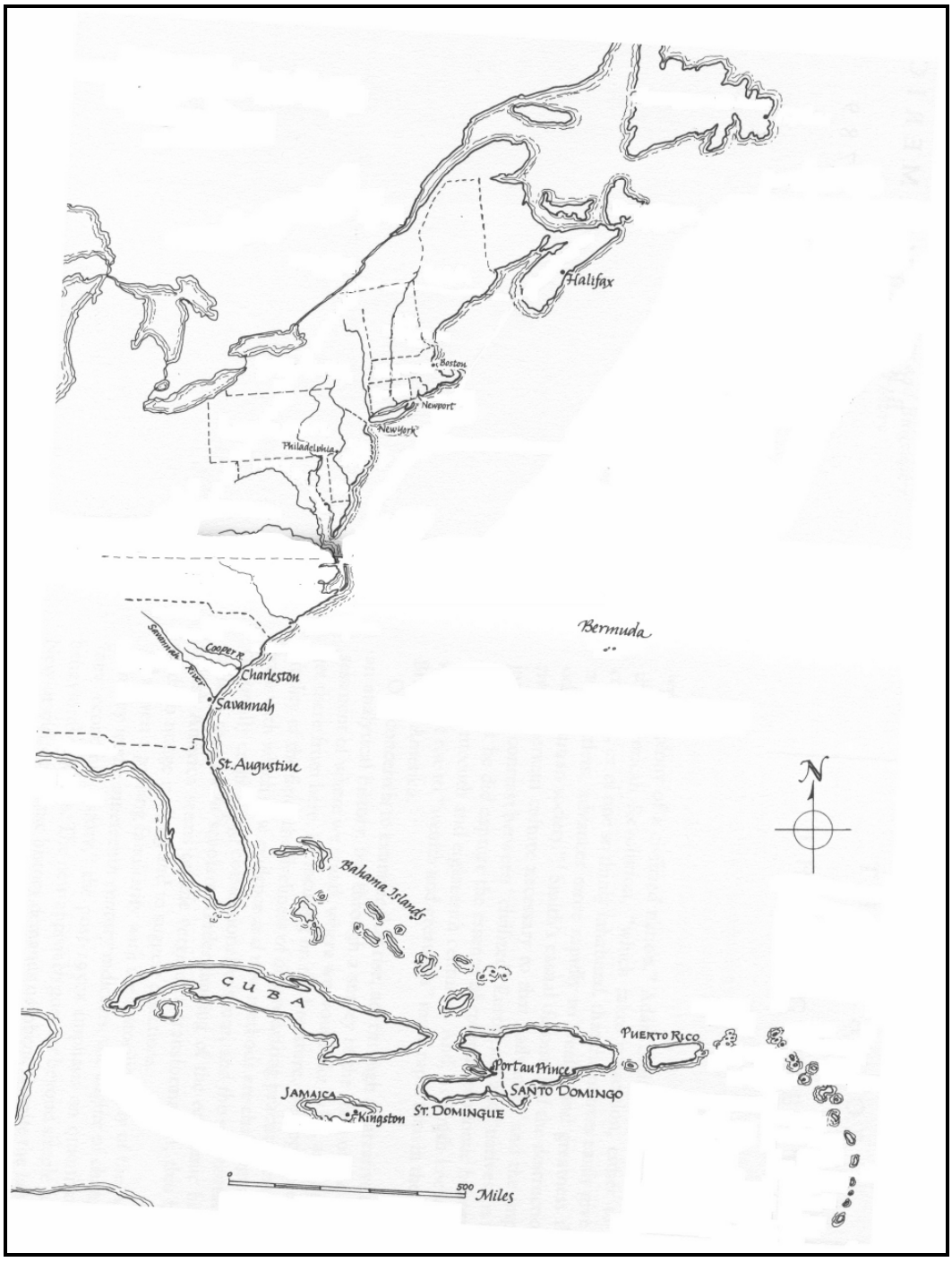

Figure 3 British North America during the mid-eighteenth century[5]

[5] Adapted from John J. McCusker and Russell R. Menard, *The Economy of British America, 1607-1789* (Chapel Hill, NC, 1985), 2-3.

time was caused by port time dropping by half from the 1690s to the 1760s, as markets and ports improved as mentioned previously.[6] Vessel speed was not as important or beneficial for larger merchantmen because they often convoyed for defensive purposes, and the convoy was only as fast as the slowest ship. Convoying compensated for the drawbacks of larger ships -- slow speed and poor maneuverability.[7]

While changes in these cost determinants affected the bottom line profitability of colonial merchants, the increase in productivity can be attributed to the decline of the risk of piracy and privateering in colonial waters in the eighteenth century. While the number of predators in the shipping lanes did not decrease, they actually increased with each subsequent conflict, the number of merchant vessels plying the lanes increased even more dramatically. The chance of a merchant becoming a prize, statistically declined. Insurance rates fell as safety increased and freight rates fell as well. As the cost of shipping for colonial merchants decreased, they were more willing to pass savings along to buyers. Rates per ton from New York to London fell by 50 percent, while New York to Jamaica rates fell by 6 percent from £5-10-0 to £3-10-0, and the Boston to London rates fell 43 percent from £3-10-0 to £2-0-0. Rates for tobacco from Maryland to London remained steady during the eighteenth century at £7-0-0, but the size of a hogshead doubled, while still being calculated at 4 hogshead/ton.[8]

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[6] Walton, "Sources of Productivity," 73-74.

[7] Joseph Goldenberg, *Shipbuilding in Colonial America* (Charlottesville, VA, 1976), 125.

[8] Gary Walton, " A Measure of Productivity Change in American Colonial Shipping," *Economic History Review*, 21 (1968): 268, 272.

Another consideration in cost determinants for the colonial merchant came from the maintenance and longevity of his ships. Estimates of durability vary, but barring mishap the life of a colonial vessel was less than twenty-five years. Contemporary reports assessed the longevity of colonial ships based on where they were built, as this determined the materials used in their building, and the materials used for construction primarily determined longevity. Ships built in New England, where oak, pine, and spruce were used, could last ten to fifteen years. In the southern colonies, where live oak and cedar were used, a ship could last twenty to thirty years. Vessels built of Bermuda cedar could last as long as fifty years.[9] Ship registers in the British Public Record Office allow the longevity of ships, based on where they were built, to be assessed more reliably than by personal accounts and opinions.

Age in Years	New England	Middle Colonies	Southern Colonies	Colonial Average	British Built Ships
0 to 3	51%	42%	46%	47%	27%
4 to 9	37%	50%	46%	43%	34%
10 and over	12%	8%	8%	10%	39%

Table 1 Percentage of Ships in Age Categories by Region of Construction[10]

Examining the percentages, vessels built in New England appear to have a better longevity than those built in the middle and southern colonies -- 12 percent versus 8

[9] Charles F. Carroll, "Wooden Ships and American Forests," *Journal of Forest History*, 25 (1982): 213. Jane Harris, "The Best in the World: The Bermuda Sloop of the 18th Century," *Bermuda Maritime Museum Quarterly*, 2, no. 4 (1989): 3. Marshall Smelser and William I. Davisson, "The Longevity of Colonial Ships," *American Neptune*, 30 (1973): 17.

[10] Smelser and Davisson, "Longevity," 18-19. Information in the table is derived from text and data provided by Smelser and Davisson.

percent each. In addition to having the highest percentage of old ships (10+), New England also has the highest percentage of new ships (0-3). While these data may seem to run counter to contemporary reports indicating southern-built ships have a greater longevity than New England-built ships, there is another variable not addressed in Smelser and Davisson's assessments. They gave no consideration to how long a particular colonial region had been building vessels. If New England had been producing large quantities of vessels for a period of time before middle and southern shipyards began building, it is reasonable that a higher percentage of their vessels would fall into the old ship classification. The percentages and ages of British-built vessels would seem to support this interpretation. The age trend seen in Great Britain is opposite to that of the colonies with nearly 40 percent of these vessels being ten years of age or older. These figures indicate a transition of shipbuilding from England to British North America. The percentage of new ships built in New England remained high because the northern colonies were still building large quantities of vessels to meet colonial and British demands.

Some final insight into vessel longevity can be derived from Lloyds' Register of Shipping. How long Lloyds gave a first class rating based on construction is a good indicator of the quality and perceived durability of a ship. In 1799, ships were given a first class rating for the following number of years based on where they were built: London/India - 13 years; southern United States - 12 years; Bristol, Liverpool, Quebec, Bermuda - 10 years; northern England, Wales, Scotland - 8 years; other U.S. ports - 6

years.[11] This information supports the conclusions drawn from Smelser's and Davisson's data, assessing the quality of southern-built over northern-built vessels.

A final determinant that affected the colonial merchants' bottom line was conflict during the eighteenth century. King George's War (1739-1748) briefly slowed commercial growth in the British Empire, especially in North America. Shortly thereafter, the Seven Years War (1756-1763), or the French and Indian War as it was known in North America, disrupted business again with military shipping demands, risk of capture, and privateering. The Sugar Act of 1764 and Stamp Act of 1765, enacted by England, further compounded the situation.[12]

Despite all the conflict and turmoil of the late seventeenth and eighteenth centuries, British North America and the West Indies experienced rapid trade growth. Overseas commerce made colonial life not simply possible but comfortable. Without the benefits of overseas trade, colonists in North America could not have earned enough capital to pass the subsistence level and afford imported manufactured goods from England. By the end of the seventeenth century, American colonists had satisfied the necessities of their lives and as they moved into the eighteenth century looked to increase

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[11] Davis, *English Shipping*, 375n.

[12] Converse D. Clowse, "Shipowning and Shipbuilding in Colonial South Carolina: An Overview," *American Neptune*, 46 (1984): 234. Geoffrey L. Rossano, "Launching Prosperity: Samuel Townsend and the Maritime Trade of Colonial Long Island, 1747-1773," *American Neptune*, 48 (1988): 37-43.

the conveniences of their lives. Intercolonial and transatlantic shipping and trade provided the means to achieve this end.[13]

In the seventeenth century, Englishmen of London, Bristol, and other port towns in England owned the majority of merchant ships and exerted considerable influence over the colonial trade. In the eighteenth century, colonial merchants in colonial ports began to take control from their counterparts in England. Colonial merchants had to consider two aspects of trade. First, the overseas trade with Britain and Southern Europe, and second, the intercolonial trade on the western side of the Atlantic Ocean. Initially, colonial demands for goods generated a strong transatlantic and supporting intercolonial trade network. Eventually, local merchants organized sources of supply for some of the commodities imported from England, effectively keeping the trade, and the profits, at home. As colonial demand grew greater, local suppliers succeeded in reproducing locally what was previously imported from Europe. Raw materials and unprocessed foods were the main goods imported and exported among the colonies, although some processed goods such as sugar, molasses, rum, fish, meats, and flour, and some semi-manufactured goods such as lumber and lumber products like pitch, tar, and turpentine were exchanged as well.[14]

Throughout the colonial period, 80 to 90 percent of the total colonial imports were manufactured and semi-manufactured goods. British North America was the recipient of a majority of England's exports in: linen (79.2%), iron nails (76.5%), Spanish cloths

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[13] Walton, "Sources of Productivity," 67. McCusker and Menard, *Economy*, 71, 281.

[14] McCusker and Menard, *Economy*, 79-85, 278-293.

(70.4%), cordage (65.6%), wrought iron (59.8%), printed cloth and linen (58.9%), wrought silk (57.2%), wrought copper (55.3%), and glassware/earthenware (47.9%).[15] In the other direction commodities exported from British America were numerous and varied but relatively limited. Foodstuffs and other primary resources made up a majority of the exports. New England's main exports consisted of fish, livestock, beef, pork, and wood products bound for the West Indies and whale products and potash bound for Great Britain. Main exports from the Upper South consisted of tobacco and iron bound for Great Britain and grain, grain products, and wood products bound for the West Indies. The West Indies' main exports consisted muscovado sugar, white sugar and rum bound for Britain, and rum and molasses bound for North America (the molasses to be distilled into rum in North America for re-export).[16] The imports and exports from the Lower South to Britain and the West Indies are described by James Glen in *A Description of South Carolina:*

> Maritime trade in colonial South Carolina centered on the port of Charles-Town. The Trade between South Carolina and Great Britain, on Year with another, employs Twenty-two Sail of Ships. Those Ships bring from Great Britain to South Carolina, all Sorts of Woollen Cloths, Stuffs, and Druggets; Linens, Hollands, printed Callicoes and Linens; Silks and Muslins; Nails of all Sizes, Hoes, hatchets, and all Kinds of Iron Wares; Bed-ticks, strong Beer, bottled Cyder, Raisins, fine Earthen-wares, Pipes, Paper, Rugs, Blankets, Quilts; Hats . . . Stockings . . . Gloves Pewter-dishes and Plates; Brass and Copper Wares, Guns, Powder, Bullets, Flints, Class-beads, Cordage, Wollen and Cotten Cards, Steel Hand-mills, Grind-

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[15] *Ibid.*, 284-286.

[16] James F. Shepherd and Gary M. Walton, *Shipping, Maritime Trade, and the Economic Development of Colonial North America* (Cambridge, 1972), 92. McCusker and Menard, *Economy*, 108, 130, 160.

> stones; Looking and Drinking-Glasses; Lace, Thread coarse and fine; Mohair, and all Kinds of Trimming for Cloaths, Pins, Needles, &c. In Return for these Commodities and Manufactures, there are sent from South Carolina to Great Britain, . . . Deer-skins . . . Furs, Rosin, Pitch, Tar, Raw-silk, Rice; . . . [and] Indigo . . .
>
> . . . Sixty Sail of Ships, Sloops, and Brigantines, . . . are employed in carrying on the . . . Trade between South Carolina and other Countries. [and colonies]
>
> The Trade between South Carolina and Jamaica, Barbadoes, the British Leeward Islands, the Island of St Thomas {a Danish Sugar-Colony}, and Curaso {a Dutch Sugar-Colony}. The Commodities sent . . . are, Beef, Pork, Butter, Candles, Soap, Tallow, Myrtle-wax Candles, Rice, some Pitch and Tar, Cedar and Pine Boards, Shingles, Hoop-staves, and Heads for Barrels. The Commodities sent in Return . . . are, Sugar, Rum, Melasses, Cotton, Chocolate made up, Cocoa-nuts, Negroe-Slaves, and Money.
>
> The Trade between South Carolina and New England, New York, and Pensilvania . . . sent . . . are tanned Hides, small Deer-skins, Gloves, Rice, Slaves . . . some Tar and Pitch. The Commodities sent in Return . . . are, Wheat-flour, Biscuit, strong Beer, Cyder, salted Fish, Onions, Apples, Hops.[17]

The sugar islands of the Caribbean were indispensable to the development of the mainland colonies of America, helping to develop intercolonial coastal trade. They provided a major market, other than England, for exports, and supplied goods to North America that were imported, processed, consumed, and re-exported. During the period from 1768 to 1772, 16.9 percent of maritime trade in the British Atlantic colonies was intercolonial. If the enumerated commodities of sugar and tobacco are eliminated from the calculations, intercolonial trade made up 40.6 percent of overall maritime commerce.

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[17] James Glen, *A Description of South Carolina* (London, 1761), 72-75. Reprint. Chapman J. Milling, ed., *Colonial South Carolina: Two Contemporary Descriptions* (Columbia, SC, 1951), 80-82.

Additional evidence of developing intercolonial trade is shown by the fact that of the £1,913,604 in exports from England to British North America, £470,400 (24.6%) were re-exported.[18]

Ship registers from four major colonial ports in the mid eighteenth century, Boston, New York, Philadelphia, and Charlestown, show the extent of intra-colonial commerce compared to trans-Atlantic trade (Table 2). Nearly three-quarters of the vessels passing though these ports are bound for, or coming from, other North American colonies. In addition to the number of ships clearing port showing the extent of transatlantic and coastal trade, evidence of the significance of local routes becomes apparent when the tonnages of goods entering and clearing North American ports is considered. Of the 481,551 tons of cargo entering and clearing colonial ports in 1768, 209,045 tons (43.4%) went to and came from the West Indies, while only 205,040 tons (42.6%) went to and came from Great Britain and Ireland.[19]

Trade Route	Boston	New York	Philadelphia	Charles Town	Colonial Average
North America & West Indies	80.3%	66.4%	78.7%	64.6%	72.5%
Great Britain	19.6%	33.6%	21.3%	35.4%	27.5%

Table 2 Destination of Ships in the mid-eighteenth century[20]

[18] McCusker and Menard, *Economy*, 108, 130, 145, 160. Shepherd and Walton, *Shipping*, 235.

[19] Shepherd and Walton, *Shipping*, 118-119.

[20] Glen, *South Carolina*, 41(49). McCusker and Menard, *Economy*, 196. Information for this table is compiled from data provided by these two works.

Importantly, this indicates that colonial America was becoming a consumer market for itself in addition to being one for England and the rest of Europe. Several reasons for preferring to trade within the colonies were that it was easier, faster, cheaper, and more reliable. Additionally, other colonies would accept colonial commodities as payment in part or in full for goods. It could, in effect, function as a barter economy when necessary or desirable.[21]

Ships and Shipbuilding

Shipbuilding in the colonies was a critical part of the economy. The abundant rivers, bays, and lakes, as well as the Atlantic coast, served as highways for commerce and communication and contributed to shipbuilding becoming a major colonial industry. Not only did shipbuilding provide the means to trade along the coast and with the West Indies, but ships themselves constituted the fifth largest export in British North America in the early 1770s.[22] Ships built in the colonies were considered English built by the Navigation Acts. Therefore, English owners suffered no penalty in purchasing them. A considerable amount of shipbuilding took place in early British America both within the continental colonies and outside the continent, mostly in Bermuda. Vessels built in Bermuda, specifically the Bermuda sloop, were recognized for their speed and grace and served as that colony's main export in the eighteenth century.[23]

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[21] McCusker and Menard, *Economy*, 289.

[22] *Ibid.*, 318-320.

[23] Davis, *English Shipping*, 66. McCusker and Menard, *Economy*, 320n.

Two events occurring beyond the colonies likely spurred English interest in the development of colonial shipyards. The first was the War of the League of Augsburg in the late seventeenth century. The English lost as many as four thousand vessels in this conflict. The second was the War of Spanish Succession. French privateers captured at least two thousand vessels during this war. These wars combined to give England a shortage of merchant vessels and ships of war.[24] Within the colonies, the abundance of readily accessible timber suitable for ship construction and naval stores, factored into the transition. By 1730, roughly 16 percent of English ships were colonial built. As the eighteenth century progressed, this figure continued to grow. By 1760, 25 percent of English ships were built in the colonies, and by 1775, 33 percent of the vessels on the British registry were listed as having been built in the colonies. These numbers represent nearly a 600 percent increase from the 400 colonial-built ships in 1700 to 2343 vessels in 1775.[25] British owned shipping dominated the transatlantic trade between Great Britain and the southern colonies and Great Britain and the West Indies. Colonial owned vessels dominated the inter-colonial coastal trade and trade between British North America and the rest of Europe.[26]

Shipbuilding in America carried on English traditions and practices, but colonial vessels were generally constructed faster and less expensively than vessels built in

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[24] Goldenberg, *Shipbuilding*, 31-33.

[25] Charles F. Carroll, "Wooden Ships and American Forests," *Journal of Forest History*, 25 (1982): 213. Jacob M. Price, "A Note on the Value of Colonial Exports of Shipping," *Journal of Economic History*, 36 (1976): 706.

[26] Shepherd and Walton, *Shipping*, 51.

England. The availability of resources, and cheaper cost of labor and resources, allowed colonial-built vessels to be constructed for £2 to £4 less per ton than a comparable British-built vessel. Another factor that contributed to the colonial shipbuilding industry was that shipwrights would accept payment from merchants by means other than cash. In the colonies, merchants often paid for their vessels in thirds. One third of the cost of the vessel was cash as security and for materials for the builder to get started. The second third of the construction cost was typically West Indian rum or sugar. The final third usually consisted of British manufactured goods.[27]

During early colonial times vessels were most often described by their hull type. As hulls became more and more similar in the seventeenth and eighteenth centuries, vessels began to be identified by the number of masts they had and their rigging. Fredrik Chapman divided the rigs of merchant ships as ship, snow, brigantine, schooner, and sloop in his 1768 work, *Architectura Navalis Mercatoria*. In general, a three-masted vessel was a ship. Ships mounted square sails on all three masts. Sometimes a spanker, a lateen or gaff rigged sail, would be used on the mizzen mast to allow for better steerage with a strong following wind.

A two-masted vessel could be a brig, brigantine, bilander, snow, schooner, or ketch. Brigs mounted square sails on both the main mast and the fore mast, and as with ships, often used a spanker below the square topsails on the main mast. A brigantine was one variation on the brig with a square sail on the fore mast and a fore and aft rigged sail on the main mast. A snow was another variation of the brig. It was designed as a brig

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[27] Goldenberg, *Shipbuilding*, 76-95.

with square sails on both the fore and main masts. Snows added a trysail mast, immediately abaft of the main mast, with a spanker on it. This allowed the square sails on the main mast to be raised and lowered without interfering with the set of the spanker. By 1800 the term snow was no longer in use; vessels of the type were simply referred to as brigs. It is likely that many vessels recorded as brigs in shipping registers before 1800 were actually snows. Bilanders were a final variation of the brig. They were square rigged on both the fore mast and the main mast, but rather than mounting a gaff rigged spanker on the lower main mast, a bilander had a lug sail spanker. Bilanders were not a common rig in British North America during colonial times.[28]

A schooner was gaff rigged on both masts, and there was a sharp rake to the masts. Some schooners, topsail schooners, carried an additional small square sail on the fore mast. The ketch was similarly rigged to a three masted ship but lacked the fore mast. It had a main mast amidship with a smaller mizzen mast positioned farther aft. Square rigged on the main mast, the rig in the mizzen mast varied. It was primarily the mast location that distinguished a ketch from brigs and brigantines. Sloops were single masted vessels. A sloop used a fore and aft rig on its mast with multiple jibs attached to the jibboom, extending from the bowsprit. Occasionally ocean-going sloops added a square topsail to improve open ocean sailing.[29]

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[28] Fredrik H. Chapman, *Architectura Navalis Mercatoria* (Stockholm, 1768), quoted in MacGregor, *Merchant Sailing Ships*, 19. Howard Chapelle, *The Search for Speed Under Sail, 1700-1855* (New York 1967), 97-100. Coker, *Charleston*, xii-xiv. Davis, *English Shipping*, 78. Goldenberg, *Shipbuilding*, 5. Millar, *American Ships*, 16.

[29] *Ibid.*

Colonial built ships used in North American trade and trade to the West Indies were, on the whole, small. Despite their size, small vessels, like the sloop and the schooner carried a majority of American commerce.[30] Through the examination of ship registers from the ports of Boston, Philadelphia, Annapolis, Charleston, and Bermuda during the mid-eighteenth century, it is possible to get a perspective on the significance of small vessels in colonial commerce. During this period, sloops represented 36.2 percent of the vessels. Schooners were 23.8 percent, brigs were 13.9 percent, ships were 13.2 percent and snows were 12.9 percent.[31] The preference for sloops and schooners is readily apparent from the available numbers. Sloops are approximately three times as common as the larger colonial vessel types. Combined with schooners, vessels of similar size and design, they represent 60 percent of the merchant vessels trading in colonial American ports. Looking at a single port for a broader span of time results in much the same conclusions. For the port of Charles Town from 1734 to 1780, sloops constituted 23.1 percent of the vessels. Schooners were 40.1 percent, brigantines were 13.1 percent, ships were 11.0 percent, and snows were 6.2 percent of the total number of vessels. While in this instance schooners were more popular than sloops, taken together as they

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[30] Millar, *American Ships*, 6. Price, "Value of Colonial Exports," 705.

[31] Figures are derived from the compilation of information provided in the appendices of Goldenberg, *Shipbuilding*, 131-255. Goldenberg's figures were taken from numerous primary sources, mainly ship registers. Bermuda figures are derived from the Bermuda shipping register from 1750.

commonly are in analyses, sloops and schooners constituted 63.2 percent of merchant vessels.[32]

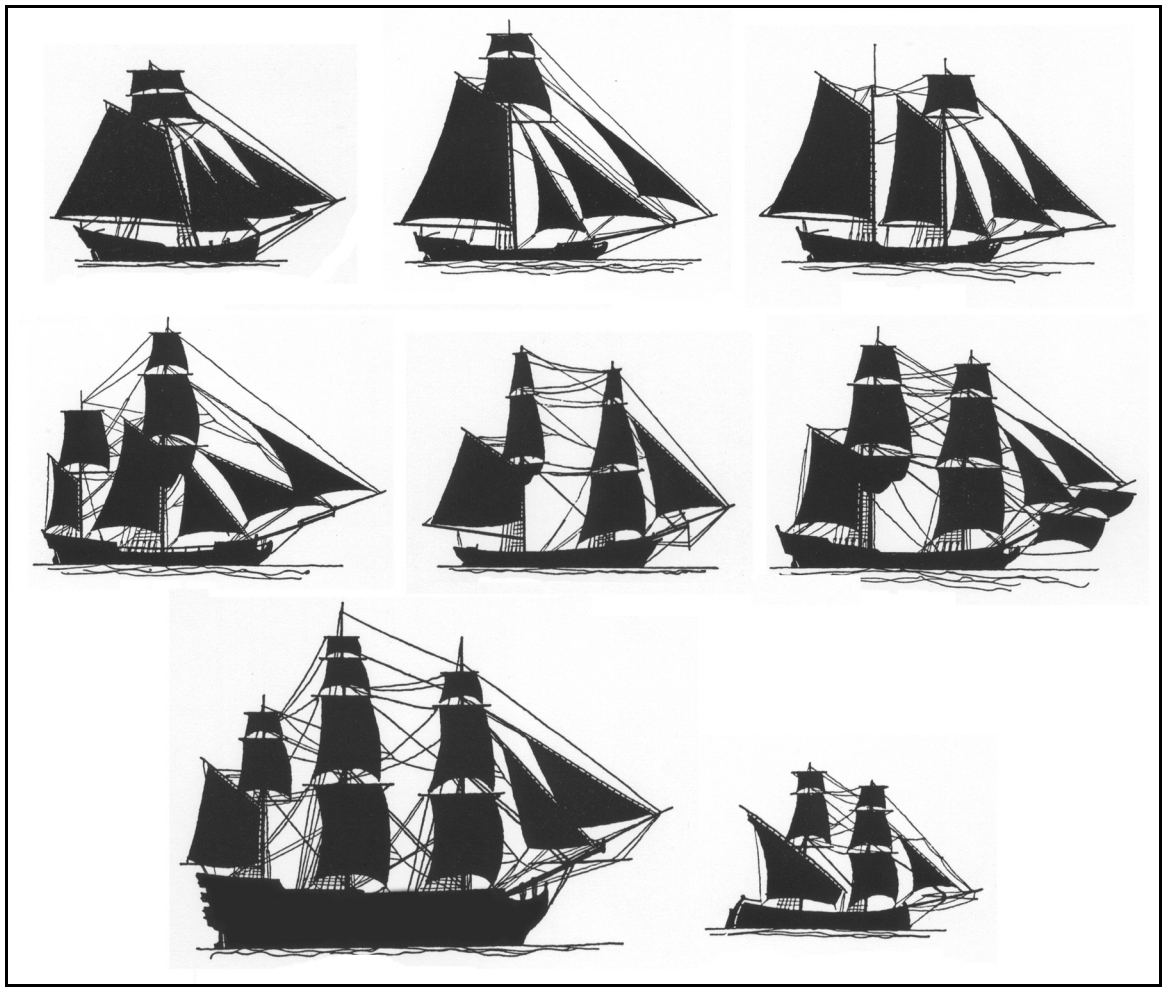

Figure 4 Colonial vessels (L-R, T-B) Bermuda Sloop, American Sloop, Schooner, Ketch, Brig, Snow, Ship, Bilander[33]

[32] R. Nicholas Olsberg, ed., "Ship Registers in the South Carolina Archives, 1734-1780," *South Carolina Historical Magazine*, 74 (1973): 189-299. Numbers were derived by examination of the data contained within the abstracts.

[33] Edgar L. Bloomster, *Sailing and Small Craft Down the Ages* (Annapolis, MD, 1940).

Sloops

Small vessels, sloops could be found trading between the West Indies and virtually all British colonial ports.[34] By 1714, the sloop made up a major portion of the Massachusetts merchant fleet. Because most of the Rhode Island trade was coastal and with the West Indies, Newport merchants rarely employed vessels larger than sloops. Connecticut merchants used sloops almost exclusively as their trade mirrored Rhode Island's. Connecticut shipbuilders actually specialized in sloop construction. The New York merchant fleet consisted almost entirely of colonial built sloops for the first third of the eighteenth century. In the South, colonial merchants favored small sloops and schooners as well. They were the most numerous vessels in North Carolina. The sloop was the most popular with Charles Town shipbuilders, and was the most commonly seen vessel there for the first half of the eighteenth century. West Indian ship owners relied heavily on sloops as well, which were typically no larger than sixty feet in length.[35]

As the eighteenth century progressed, schooners eventually vied with sloops for the coastal shipping niche with the sloop losing its dominance as the vessel of choice in favor of the schooner. The transition probably resulted from manpower concerns, and therefore crew size and operating costs. By dividing an equal sail area between two masts, the schooner decreased the size of individual sails. The smaller sails were much

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[34] Davis, *English Shipping*, 281.

[35] Coker, *Charleston*, xiv. Goldenberg, *Shipbuilding*, 40-52. Joseph Goldenberg, "Names and Numbers: Statistical Notes on Some Port Records of Colonial North Carolina," *American Neptune*, 29 (1969): 156. Millar, *American Ships*, 5.

more manageable and could, for the most part, be handled from the deck with lines by only a few men. Schooner sails and rigging were also lighter and less bulky than that of the sloop, not costing the vessel as much valuable space to carrying spares in the sail locker.

Massachusetts favored the schooner over the sloop after the 1730s, as did New Hampshire. Rhode Island and Connecticut relied almost exclusively on the sloop, and Pennsylvania favored and used sloops over schooners by two to one. In the southern colonies sloops were preferred, but the transition to schooners was made in the mid-eighteenth century.[36]

As the numbers of vessels in colonial America increased in the 1740s and 1750s, most were schooners and sloops for the coastal trade. In 1769, there were 447 vessels built in the colonies. One hundred and fifteen (25.7%) were topsail vessels (ships, brigs, and snows). The remainder, 332 (74.3%) were sloops or schooners. It should be noted that 14.2 percent of the sloops and schooners were built in Bermuda, second only in number to Massachusetts at 29.2 percent. Also many small craft, primarily sloops and schooners, were never registered in compliance with the Navigation Act of 1696, or they were registered years after their construction.[37] This would yield even higher percentages of sloops and schooners in the colonies than documents indicate.

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[36] Goldenberg, *Shipbuilding*, 78-79.

[37] Clowse, "Shipowning and Shipbuilding," 221-235. Price, "Value of Colonial Exports," 707.

The sloop came to the colonies as an evolution of Dutch-built coasting vessels and by the mid 1690s it displaced most other small coastal sailing craft. Sloops were the smallest ocean-going trading vessels of the time, and approximately 25 percent of these vessels were armed. They typically mounted six to fourteen guns, six-pound or smaller, along the main deck. During the eighteenth century there were two basic types of sloops: small coasters ranging from 20 to 40 tons and larger West Indian traders over 50 tons.[38] The coasting sloop used a simple fore and aft rig consisting of a gaff rigged mainsail, a staysail, and one or more jibs. The West Indian trader added to this one or two square topsails to improve open water sailing with a following wind. In both varieties, the bowsprit was steeved up at an angle with a long jibboom attached to allow more jibs to be used. This arrangement gave the sloop extensive sail area for its size making it exceptionally fast. The hull itself was built with fuller lines for long cargo voyages and with finer lines for fast inland trade and smuggling. For example, New England built sloops had a reputation for a large cargo capacity and shallow draft. They were built with little deadrise and the sides were tumbled home like larger vessels.[39] In 1744 Captain Peter Warren reported to the Admiralty about colonial vessels. He was impressed with sloops built in Rhode Island and Bermuda, especially for their sailing qualities. He recommended that the Royal Navy seek large vessels built in Boston, 20 to 24 guns, 6th

[38] Coker, *Charleston*, xiv. Goldenberg, *Shipbuilding*, 39, 77. Millar, *American Ships*, 16.

[39] Bloomster, *Small Craft*, 189. Goldenberg, *Shipbuilding*, 77, 81. Millar, *American Ships*, 5, 21.

rate frigates built in New York or Philadelphia, and armed sloops built in Bermuda or Rhode Island.[40]

Bermuda Sloops

The Bermuda sloop was a superior vessel for colonial commerce. It was the key element to economic ventures and prosperity, family partnerships within Bermuda and abroad, and many personal fortunes for eighteenth-century Bermuda merchants.[41] An eighteenth-century account of Bermuda provides a contemporary view of the vessel that everyone was so impressed with. "For upwards of a century past they have also build [sic] ships at the Bermudas, that are not to be equalled for swiftness and durability, and are in great request, especially for privateers. They are made of a kind of cedar, called by the French, Acajon. They have endeavored to imitate them at Jamaica and in the Bahama Islands, . . . but these ships are and must be far inferior to their models."[42] The renown that the Bermuda sloop enjoyed can be attributed to a combination of factors. First and foremost was the use of Bermuda cedar (*Juniperus bermudiana*) for a substantial portion

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[40] Julian Gwyn, "Shipbuilding for the Royal Navy in Colonial New England," *American Neptune*, 48 (1988): 22.

[41] Michael J. Jarvis, "In the Eye of All Trade" (Ph.D. diss., College of William and Mary, 1998), 324.

[42] Abbé Raynal, *A Philosophical and Political History of the Settlements and Trade of the Europeans in the East and West Indies* (Edinburgh, 1792), quoted in Walter B. Hayward, *Bermuda Past and Present: A Descriptive and Historical Account of the Somers Islands* (New York, 1910), 55.

of the construction. Second was the design of the Bermuda sloop itself, which varied somewhat from other sloops during the eighteenth century.

The superior qualities of the Bermuda cedar gave Bermuda-built sloops definite advantages over other colonial sloops. Bermuda cedar has a high resin content that means several things for shipbuilding. The shrinkage of the wood as it dries, or cures, is minimal. The average shrinkage for Bermuda cedar is around 10 percent, compared to almost 40 percent for American white oak. Because of this, Bermuda cedar requires no seasoning and can be used green. This eliminated much of the overhead and monetary investment for shipbuilders as they did not have unseasoned, curing wood, taking up valuable space and tying up assets. Green wood, versus cured wood, is also considerably easier to work (sawing, bending, and fastening), reducing labor costs.[43]

In 1735, botanist Phillip Miller noted "the extreme bitter taste in the Resin with which this Tree abounds … the worms do not eat the Bottoms of the vessels built with this Wood, as they do those built with Oak … vessels built with cedar are much preferable to those built with any other sort of Timber, for the use of the West India Seas"[44] The shore side cedars with their natural crooks and bends provided ideal compass

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[43] Jarvis, "Eye," 359.

[44] Phillip Miller, *The Gardener's Dictionary: Containing the Methods of Cultivating and Improving the Kitchen, Fruit, and Flower Garden, as also the Physick Garden, Wilderness, Conservatory and Vineyard*. 3 vols. (London: 1735), s.v. "*J. bermudiana*." Cited in Jarvis, "Eye," 358.

timbers for construction, and the tall and straight inland cedars provided timber for planking and other hull parts.[45]

The rapid growth rate for Bermuda cedar, almost a foot per year, made it a quickly renewable resource. In his 1735 work Miller also notes "in their native country [*Juniperus bermudiana*] will grow to be large enough for ship timber in 20 years from seed, as I have been credibly informed by several persons who have lived there many years."[46]

Bermuda cedar is also considerably lighter compared to American or English oak.[47] Thus Bermuda cedar vessels that were comparable structurally to their oak counterparts were roughly two-thirds the displacement weight.[48] This allowed heavier cargoes to be carried as a merchant vessel. If carrying standard cargoes, a merchant vessel was lighter, and therefore, worked and sailed better in slight winds. More and larger cannon could be mounted if acting as a pirate, privateer, or gunboat.

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[45] Harris, "Best in the World," 3.

[46] Miller, *Gardener's Dictionary*, cited in Jarvis, "Eye," 360. Jarvis also notes that cedar trees, planted at Andrew Trimingham's house after Hurricane Emily hit Bermuda in 1986, had grown to over 15 feet and most were perfectly straight when he observed them 11 years later in 1997.

[47] The specific gravity of Bermuda cedar (*Juniperus bermudiana*) is significantly lower than that of American white oak *(Quercus alba*). When calculated, a cubic foot of cedar has an average weight of thirty pounds, while a cubic foot of oak has an average weight of forty-four pounds. The resulting application of Archimedes' Principle of weight, volume, displacement, and buoyancy, yields a drastic increase in the carrying capacity of vessels built of Bermuda cedar versus comparable vessels built of oak.

[48] Hoadley, *Identifying Wood*, 103, 159.

A tangible measure of the durability and high regard for Bermuda cedar can be seen by examining the Lloyd's table of years assigned to each kind of wood. This table shows the expected length of time a particular species of wood would last in a given element of ship construction. Pencil cedar, a common name used for Bermuda cedar, is overall the third best category of wood available for ship construction. Lloyd's rates East India Teak the highest with sixteen years of durability across the board. Rated second is English, African and Live Oak with twelve years across the board. Bermuda cedar averages ten years nine months across the board, varying between ten and twelve years for individual elements.

						Timbers					Ceiling							Plank			Deck		
Kind of Timber	Keel	Stem and Stern Post	Apron, Etc.	Deadwoods, Transom	Floors	1st Futtock	2nd Futtock	3rd Futtock	Top Timbers	Keelsons	Lie Flat	Bilge	Side	Clamps	Beams	Knees	Hooks	Garboards	Bottom	Side	Covering	Locks	Upper
English Oak, Live Oak	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
Pencil Cedar (Bermuda Cedar)	10	10	10	10	10	10	10	10	10	10	12	12	12	12	12	12	12	12	12	10	10	10	10
Mahogany	9	9	9	9	9	9	9	9	9	9	10	10	10	10	9	9	9	12	10	10	10	10	10
North American White Oak	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	7	8	12	12	8	8	8	8
Pitch Pine (Hard Pine), Juniper (Eastern Red Cedar)	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	12	12	10	10	10	10
Red Cedar, Philippine Island Cedar (Spanish Cedar)	-	7	7	7	8	8	7	7	7	8	8	8	8	8	7	7	7	12	12	8	7	7	7
Rock Maple	10	-	-	-	8	-	-	-	-	-	5	5	-	5	-	-	-	8	8	6	6	6	6
Yellow Pine	8	4	4	4	-	-	-	4	4	4	-	-	-	-	4	4	4	6	6	5	5	5	5
Beech	-	-	-	-	7	6	-	-	-	-	-	-	-	-	-	-	-	12	12	6	-	-	-

Table 3 Excerpts taken from Lloyd's Table of Years Assigned to Each Kind of Wood[49]

[49] Charles Desmond, *Wooden Ship-Building*, (New York, 1919). Reprint (Vestal, NY, 1984), 18.

Most maritime historians accept that the vessel design of the Bermuda sloop likely came from the ships of the Caribbean buccaneers that the Bermudians encountered while engaged in the salt trade. The Dutch West India Company used sloops extensively in the Caribbean in the 1650s, and Jamaicans appear to have adopted the Dutch sloop rig design during the 1660s.[50] Howard Chapelle asserted that emigrants from Jamaica introduced the technology of the Caribbean sloop to Bermuda in the 1670s when the island became deforested. Recent research by Michael Jarvis forwards the argument that the design of the Bermuda sloop is not an import from the Caribbean, specifically Jamaica. Jarvis argues first that there is little evidence of Jamaica becoming deforested during this period. In fact, he believes there was an excess of shipbuilding materials on the island as fields were cleared for sugar plantations. This clearing is likely Chapelle's deforestation. Secondly, Jarvis notes the presence of widespread deforestation in Bermuda during the 1670s and 1680s, when the supposed Jamaican emigrants arrived. Therefore, they would not have found the "abundant growth of light red cedar" claimed by Chapelle. Finally, extensive documentary research conducted by Jarvis, searching Bermuda records, found no individuals coming to Bermuda from Jamaica. His research seems to indicate that there were no emigrants. Jarvis maintains that the flow was actually reversed with Bermudians going to Jamaica. The conclusion is that the Bermuda sloop and Bermuda rig developed from the boat building tradition of seventeenth-century Bermuda (Figure 5) and the design emulated by Caribbean shipbuilders in Jamaica, and

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[50] William A. Baker, *Sloops and Shallops*, (Columbia, SC, 1987), 54. Howard Chapelle, *The Search for Speed*, 65.

other ports, when they observed the superiority of the vessel. Indeed, the observations of the French traveler Abbé Raynal were correct, that inferior imitations of Bermuda sloops were built in Jamaica and the Bahamas, while the assumptions made by Chapelle were likely incorrect.[51]

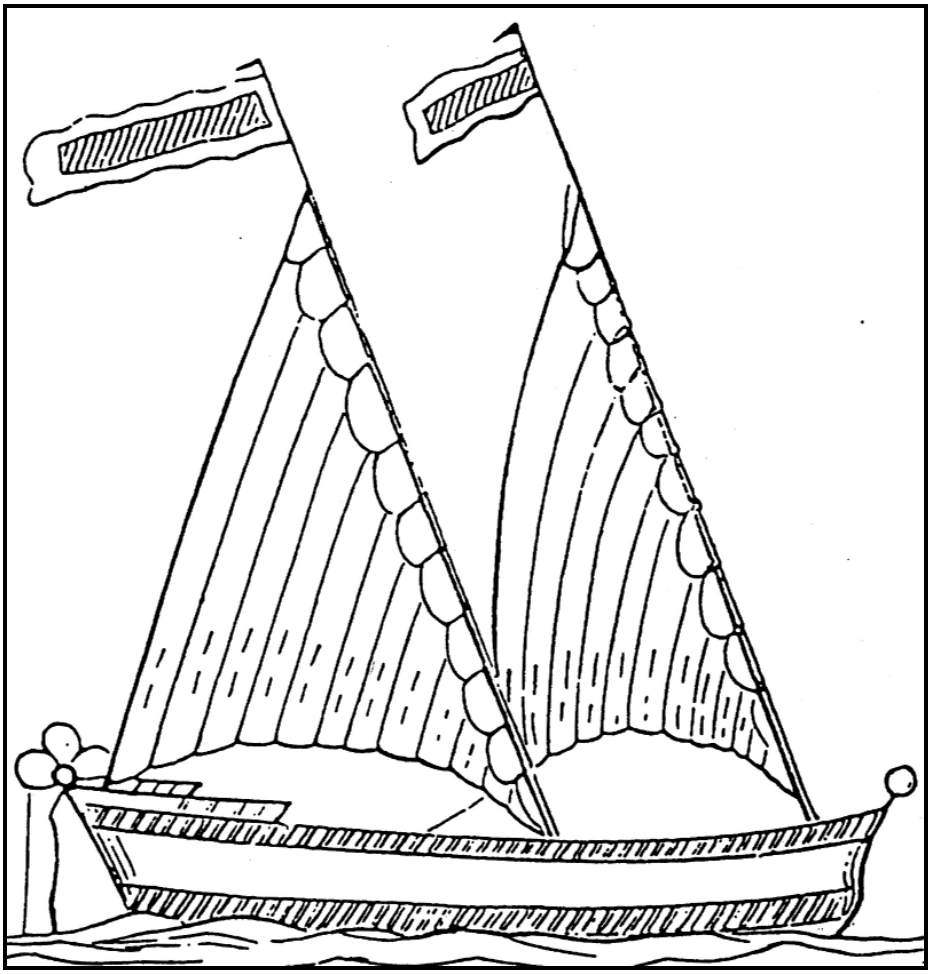

Figure 5 Bermuda boat of 1670[52]

[51] Jarvis, "Eye," 365n66. Abbé Raynal quoted in Hayward, *Bermuda*, 55.

[52] John Hardy, *A Description of the Last Voyage to Bermuda in the Ship* Marygold, *Samuel Pensax Commander* (London, 1671), 7.

Bermuda had a wide variety of local boat designs in the seventeenth century, and produced very few ocean-going vessels prior to the 1670s. As shipbuilding and maritime endeavors became more prominent during the late seventeenth and early eighteenth centuries, Bermudians began designing vessels suited for the open sea. They preferred smaller vessels like sloops, to other larger craft, for their speed and sailing properties. A sloop could outrun foes, overtake prey, penetrate shallow waterways and inlets, navigate narrow and winding channels, and reach almost any port in the Atlantic despite unfavorable wind conditions. It was an ideal colonial trading vessel that could be adapted for privateering, smuggling, or general shipping.[53]

In this vessel, Bermudians designed a fast, weatherly vessel that required minimal materials to build and minimal manpower to sail. Bermuda sloops averaged about forty feet in length. The dimensions were dictated by the age and size of the cedar used in its construction. The trees used rarely reached heights over fifty feet. As the eighteenth century progressed, Bermuda supplemented its timber supply with imports from New England, the Chesapeake, the Carolinas, and the West Indies. Vessel sizes increased as a result, but Bermuda vessels were still smaller than comparable vessels built in other colonies.

The keel of the Bermuda sloop was deeper at the stern giving excellent rudder control. The hull had a sharp deadrise, full bow, and transom stern. There was very little freeboard and a rise in the deck from amidships aft, often ending with a low quarterdeck.

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[53] Jarvis, "Eye," 365.

The stem and sternposts both had a considerable rake, as did the single mast. The mast was roughly 15° off vertical, shifting the center of gravity back along the keel and allowing extensive use of head sails without fear of driving the head under. The bowsprit was long, highly steeved and extended even further with a jib boom. It was set at 90° to the mast making it less vulnerable during high seas. This also kept it out of the water when the vessel was heeled forward and over with the wind. The main boom was also quite long extending well behind the stern. The vessel had a tall main mast and a short topmast with a gaff rigged mainsail, staysail, two yards with small square topsail, and typically three jibs. Some Bermuda sloops carried flying jibs, spritsails, watersails, ringsails, and boomsails in their sail locker to adapt the rig for the best sailing in any wind conditions.[54]

The light, durable nature of the cedar combined with the sharp-lined hull and sail design made the Bermuda sloop fast for its size, maneuverable, and able to sail very close to the wind. Close-hauled a Bermuda sloop could approach 4 points into the wind, an angle less than 45 degrees, while the average square rigged vessel could only achieve 6 points into the wind, 60 degrees. Their sailing properties meant less effect from ill wind conditions during voyages, shorter port times waiting for favorable winds to leave, less wear and tear and maintenance on rigging as fewer tacks had to be made against the wind, shorter passage times, and ultimately more frequent voyages.[55]

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[54] Bloomster, *Small Craft*, 99. Coker, *Charleston*, xvi. Harris, "Best in the World," 2-4. Jarvis, “Eye,” 366-367. MacGregor, *Merchant Sailing Ships*, 92.

[55] Jarvis, “Eye,” 368.

Bermuda sloops were so popular with eighteenth-century mariners from the West Indies, North America, and Europe that foreign slaves and servants were often sent to Bermuda to apprentice with the shipbuilders. In 1757, Bermuda Governor William Popple boasted that "our vessels, being able to turn to Windward much better than any other vessel, can get in at any time of the year to Virginia, New York, Boston, and Carolina when the others cannot and by our Neighborhood to those colonies can in a few days gett [sic] any quantity" [of goods or commodities].[56]

During the eighteenth century, Bermuda produced an average of 60 vessels a year with a peak output of 100 vessels a year on the eve of the American Revolution. They typically carried low volume, high value cargoes such as rum, sugar or smuggled manufactured goods. The lack in size was made up in the frequency of voyages. The smaller hold size was better for cargo stowage as well. Cask and barrels were not stacked as high, relieving stress on the lower containers that caused leaks or container damage. Bermuda sloops were favored vessels for passengers. The frequency and speed of voyages appealed to travelers. The shorter passages meant less time to endure seasickness and the confined spaces onboard ship. Faster voyages also provided less chance of spoilage for perishable cargoes.[57]

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[56] British Public Records Office Colonial Office 37/18:179, William Popple to the Board of Trade, 18 April 1757.

[57] Bloomster, *Small Craft*, 99. Coker, *Charleston*, xvi. Harris, "Best in the World," 2-4. Jarvis, "Eye," 371-372. MacGregor, *Merchant Sailing Ships*, 92.

No plans existed for Bermuda sloops before Swedish navel architect Fredrik Henrik af Chapman obtained a draft of a one hundred thirty ton Bermuda sloop in England some time in the 1740s. He printed the draft in his *Architectura Navalis Mercatoria* (Stockholm, 1768) plate LVII. Bermuda sloops were built "by the eye" without plans. Despite this fact, the hull design reached its mature form around 1715 and remained the same, with only slight variations, through the century. The most notable change was the gradual increase in overall size.

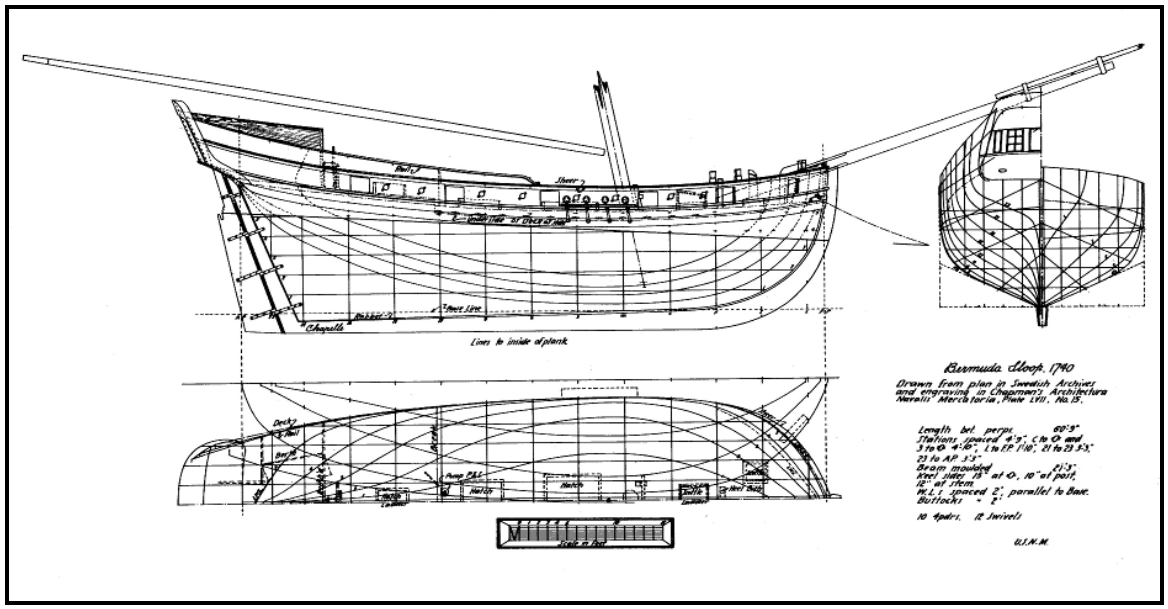

Figure 6 Chapman's Bermuda Sloop redrawn by Chapelle[58]

[58] Chapelle, *The Search for Speed*, 67.

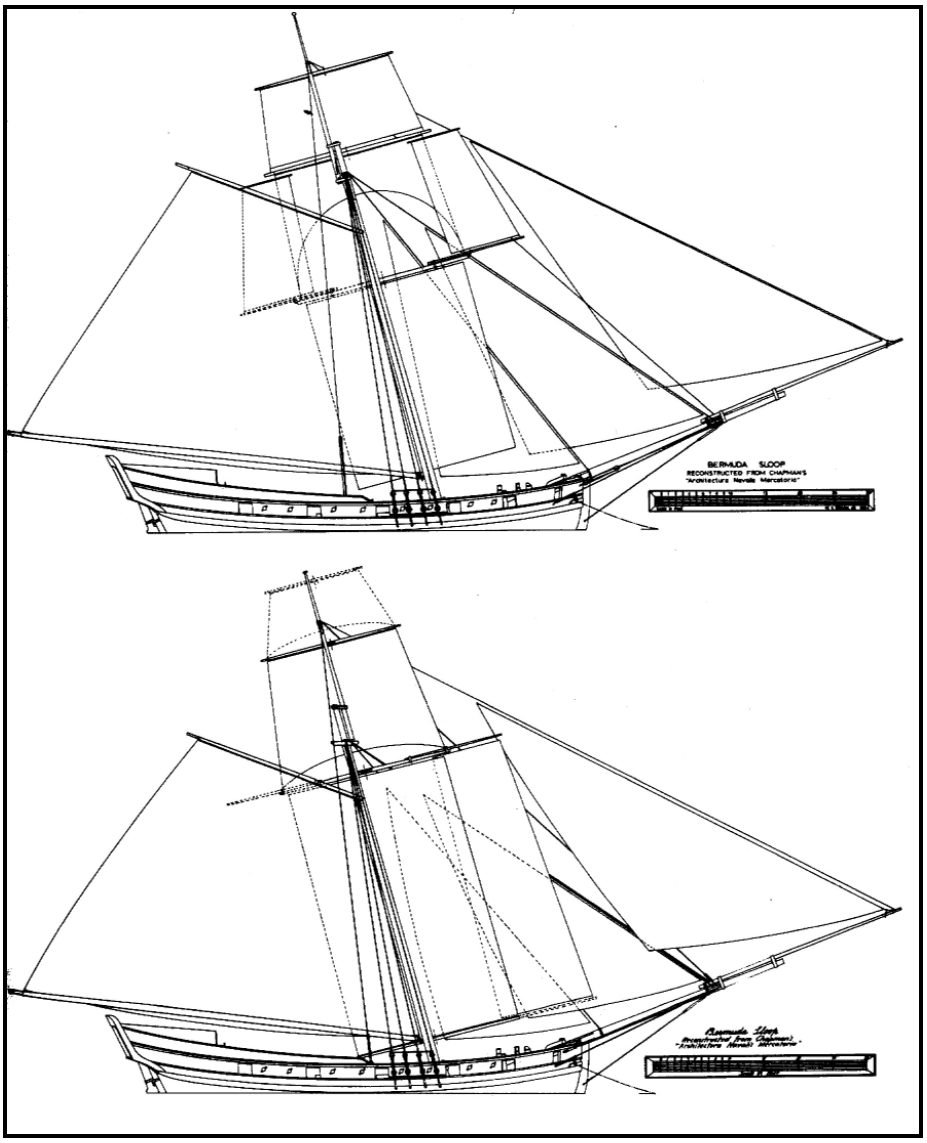

Figure 7 Two possible sail plans for Chapman's Bermuda Sloop[59]

At the beginning of the eighteenth century, Bermuda had an active trading fleet of seventy vessels including "four ships of about 100 tons, six brigantines from about forty

[59] Chapelle, *The Search for Speed*, 69.

to sixty tons, and sixty sloops from thirty to above forty tons."[60] Bermuda sloops constitute 85.7 percent of the fleet. By 1734, Bermuda-built craft actively trading increased by 129 percent to ninety vessels with eighty-six sloops, one schooner and three snows.[61] During this time the sloop reached is dominance as a vessel design for Bermudians, constituting 95.6 percent of their trading fleet. By 1750, the trading fleet had grown by another 128 percent to 115 vessels but had become more diversified to meet the demands of an evolving colonial market. In 1750 there were eighty-one sloops, eighteen brigs, fourteen schooners, one ship, and one snow. The dominance of the sloop was beginning to wane, giving way to other vessel types, as it comprised only 70.4 percent of the active trading fleet.[62]

Overall, Bermuda sloops were ideally suited for Caribbean and intra-colonial trade within British North America. The properties of Bermuda cedar made them resistant to rot and toredo worms in warm waters. It also made the sloops two-thirds the weight of comparable oak vessels, allowing for heavier cargoes to be carried, or lighter winds to propel the vessel. The design of the Bermuda rig allowed for navigation of narrow channels and shallows, and made windward destinations easier to reach. The sharp lines and expansive sail area made them fast sailers capable of avoiding pirates, privateers, or ships of war. The corollary was also true. They made excellent pirating and privateering vessels and gunboats. Their light weight allowed for ordnance

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[60] PRO CO 37/3, Edward Randolph to the Lords of Trade, Nov. 15, 1700.

[61] PRO CO 41/6.

[62] PRO CO 41/6.

disproportionate to their size, and their maneuverability and speed allowed them to overtake their prey. The small size of the Bermuda sloop also meshed well with the underdeveloped colonial markets during the eighteenth century. They were the perfect economic and military tools for the time.

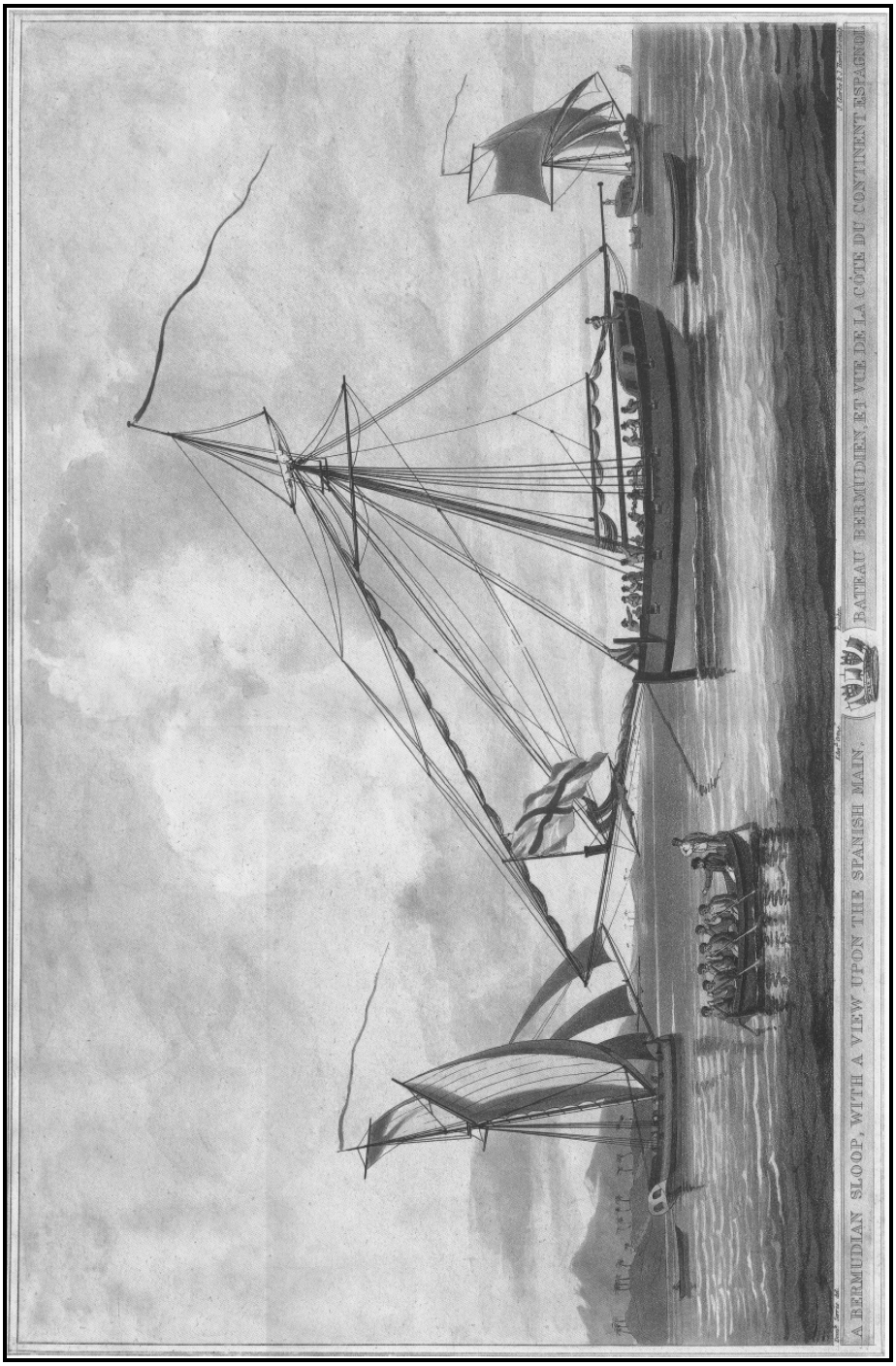

Figure 8 1807 engraving "A Bermudian Sloop, with a view upon the Spanish Main[63]

[63] Bermuda Press Limited, photo of the 1807 original by Dominique Serres, n.d.

CHAPTER IV

ENVIRONMENTAL SETTING AND SITE DESCRIPTION

Over time an archaeological site becomes an integral part of its environment. This is especially true for shipwrecks that typically become artificial reef habitats. Understanding the environmental setting of a wreck site contributes significantly to understanding and interpreting the wreck itself, offering the researcher insight into the wreck's location, the conditions of the wrecking process, and the reason for the wreck's state of preservation. The *Hunter Galley* was attempting to pass a dangerous reef system, through a channel that was difficult at the best of times, in the worst season possible. Thus the environment contributed directly to the *Hunter Galley*'s demise.

Geography

The islands that form Bermuda are a remote outpost of civilization in the North Atlantic Ocean. With the exception of St. Helena, Bermuda is the most remote of all the Atlantic islands from the mainland of the Western Hemisphere. Situated at roughly the same latitude as Charleston, South Carolina, the closest land to Bermuda is Cape Hatteras, North Carolina, 568 miles to the west-northwest.[1] Yet Bermuda's location is not as remote as would initially appear. It sits at what could be considered the crossroads

[1] The easternmost extent of Bermuda is Great Head on St. David's Island 32°22'10"N, 64°38'10"W. The westernmost extent is near Wreck Hill 32°16'50"N, 64°53'45"W. The exact position of the Commissioner's House at the Royal Navy Dockyard, Ireland Island, is noted on a stone set into the front of the building and reads Latitude 32 19' 45" North, Longitude 64 51' 25" West, and is dated 1836.

of British North America and the Caribbean, ideally suited for trade. If a circle of 1000-mile radius were extended out from Bermuda, the entire east coast of North America is included from Newfoundland to the tip of Florida and extending into the Caribbean to include the Bahamas, Cuba, Hispaniola, and the Leeward Islands.

During the age of sail, prevailing winds and currents typically brought vessels returning to Europe to within thirty leagues of Bermuda. One contemporary French account notes, "In spite of so many dangers it is safer to raise the island [Bermuda], and the best navigators always do so unless prevented by an untoward turn of events, such as frequently happens at sea."[2] Another account comments on Bermuda's role in the intercolonial trade. "The islands are very convenient for trade between the English North American colonies and the West Indies is concerned. Ships making this voyage pass them on their way, so to speak, or at lest do not have to divert much to take on supplies if this is necessary."[3]

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[2] Nicholas Louis Bourgeois, *Voyages interessans dans différentes Colonies françaises, espanoles, anglaises, &c.* (Paris: J.F. Bastien, 1788), reprinted in "Two 18th Century French Accounts of Bermuda" *Bermuda Journal of Archaeology and Maritime History,* 7 (1995): 11.

[3] Jacques Nicholas Bellin, "Description of the Bermudas of Sommers Islands," Chapter in *Description Geographique des Isles Antilles Possédées par les Anglais* (Paris: Didot, 1758), reprinted in "Two 18th Century French Accounts of Bermuda" *Bermuda Journal of Archaeology and Maritime History,* 7 (1995): 5.

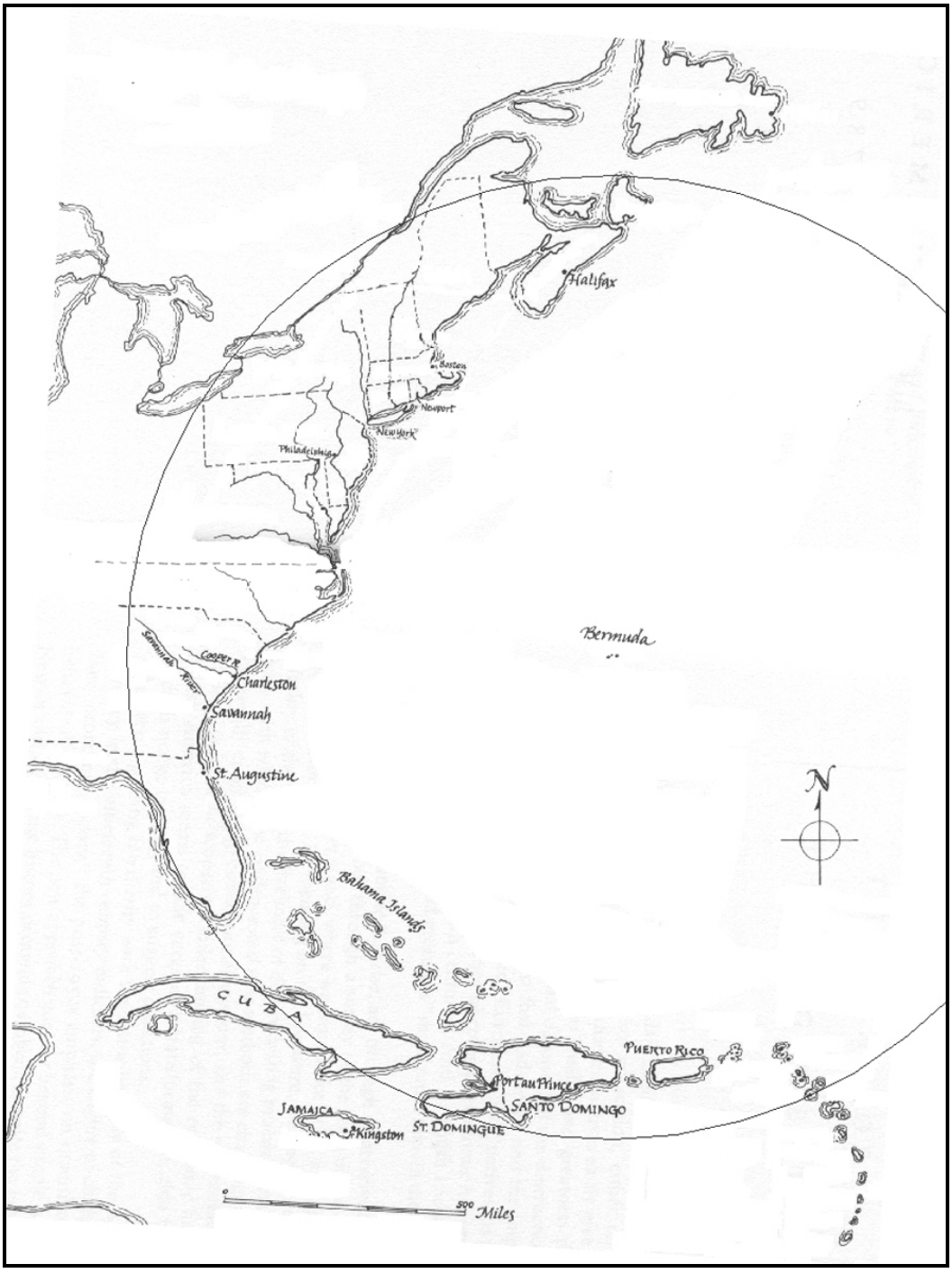

Figure 9 One thousand mile radius circle around Bermuda[4]

[4] Map is adapted from John J. McCusker and Russell R. Menard, *The Economy of British America, 1607-1789* (Chapel Hill, NC, 1985), 2-3.

Geology

Bermuda consisted originally of 173 individual islands or islets. Over the years, construction, development, and destruction have reduced the current number of islands to 138. Twelve bridges and a causeway now join the six principal islands. Prior to the bridges, which date to the twentieth century, ferries were used at most crossings, some no more than rowboats. The remainder of the smaller islands are located within the sounds and harbors, and just off the north and south shores of the main islands.

Bermuda sits on an elliptical submarine platform of volcanic basalt that rests some 560 feet below sea level. This platform is the eroded summit of a Triassic age volcano. During the fluctuations of sea level from the Eocene to the Pliocene (some as much as 270 feet), the volcanic mount underwent episodes of exposure and submersion. This allowed the deposition of sand and soil, along with the formation of limestones and marine calcareous rocks. The change of sea level to its present state some 10,000 years ago left much of the Aeolian bank atoll just underwater. The modern exposed islands form the southeastern edge of the elliptical plateau. If sea level were to drop as little as 60 feet, Bermuda's roughly 20 square miles of land area would become 230 square miles.[5]

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[5] Frederick R.C. Reed, *The Geology of the British Empire* (London: Edward Arnold, 1921), 187-189.

Climate

The climate of Bermuda is sub-tropical. Warm air and currents from the Gulf Stream that pass between Bermuda and the North American continent produce an average mean temperature of 70°F. Rainfall is heavy and generally distributed throughout the year, averaging 58 inches annually. Winter extends from November to early March with temperatures averaging 62°F and winds predominantly from the west. Spring extends from late February to the end of May and is characterized by mild temperatures, regular showers, and light wind from the south and the west. Summer sets in the beginning of June and is known for its oppressive humidity and occasional long droughts broken by violent thunderstorms. Summer temperatures average 80°F, typically peaking in August. The weather turns milder again in September and continues until the cold season sets in again in November.[6] William Strachey provides a contemporary account of the climate in his seventeenth-century work.

> These islands are often afflicted and rent with tempests, great strokes of thunder, lightning, and rain in the extremity of violence … In August, September, and until the end of October we had very hot and pleasant weather; only (as I say) thunder, lightning, and many scattering showers of rain (which would pass swiftly over and yet fall with such force and darkness for the time as if it would never be clear again).[7]

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[6] Alexander G. Findlay, *Description of the Bermudas or Somers Islands; with Nautical Directions*, (FRGS: 1864), reprinted in part in "Navigating to Bermuda in the Late 18th and 19th Centuries," *Bermuda Journal of Archaeology and Maritime History*, 9 (1997): 80-81. Philippe de Kerhallet, *Considérations Générales sur L'Océan Atlantique*, (Paris: Depot General de la Marine, 1860), reprinted in part in "Navigating to Bermuda in the Late 18th and 19th Centuries," *Bermuda Journal of Archaeology and Maritime History*, 9 (1997): 73-74.

Few autumns pass without a hurricane or tropical storm, and it is common to have numerous violent squalls during the winter season. Heavy dark clouds, and thunder and lightning, precede these squalls. With the rains come continually shifting and gusting winds and rough seas with seemingly random breaking waves. This continues for twenty to thirty minutes, followed by a similar period of dead calm before beginning again.[8]

Flora and Fauna

The warm climate, ample rainfall, and fertile soils of Bermuda allow for a variety of plant and animal life. The islands were initially extensively forested. The trees were dominated by a unique variety of cedar (juniper) that eventually played a significant role in colonial development. "They [the islands] are full of shaws of goodly cedar, fairer than ours here in Virginia."[9] Some of the other common species of trees encountered in Bermuda include the buttonwood, mangrove, mulberry, palmetto, prickly pear, wild olive, and yellowwood. "Likewise there grow great store of palm trees [palmetto], not the right Indian palms … nor those kind of palms which bear dates, but a kind of

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[7] William Strachey, "A True Reportory of the Wreck and Redemption of Sir Thomas Gates, Knight, upon and from the Islands of the Bermudas: His Coming to Virginia and the Estate of that Colony Then and After, under the Government of the Lord La Warr, July 15, 1610." Reprinted in *A Voyage to Virginia in 1609: Two Narratives*, (Charlottesville: University Press of Virginia, 1964), 20-21.

[8] Findlay, *Description of the Bermudas*, 81.

[9] William Strachey, "A True Reportory", 24.

simerons or wild palms."[10] "Other kinds of high and sweet-smelling woods there be and divers colors, black yellow and red, and … A kind of pea of bigness and shape of a Catherine pear … full of many sharp subtle pricks (as a thistle) which we therefore called a prickle pear."[11]

When Europeans first came to the islands they discovered wild hogs, left there by the Spanish, a wide variety of birds, and tortoises.[12] Strachey describes in his narrative:

> Fowl there is great store: small birds, sparrows fat and plump like a bunting, … robins of divers colors, … white and gray heronshaws, bitterns, teal, snipes, crows, and hawks, … goshawks and tassels, oxbirds, cormorants, bald coots, moor hens, owls, and bats in great store. And … swan [and] A kind of web-footed fowl there is, of the bigness of and English plover or sea mew … russet, with white bellies.[13]

The tortoises of the islands provided significantly for the first settlers. "The tortoise is reasonable toothsome, wholesome meat … and one tortoise would go further … than three hogs. One turtle feasted well a dozen messes, appointing six to every mess."[14]

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[10] *Ibid*., 24.

[11] *Ibid*., 26.

[12] R. Rich, *Newes From Virginia*, (London: Edward Allde, 1610). Reprinted (New York: Scholars' Facsimiles & Reprints, 1937). "And then on shoare the Iland came, Inhabited by Hogges: Some Foule and Tortoyses there were"

[13] William Strachey, "A True Reportory," 30.

[14] *Ibid*., 33.

The shores, bays, and reefs of Bermuda also host a plethora of aquatic life. Hundreds of species of fish, sharks, rays, dolphins, lobsters, sea turtles, and even migratory whales can be found around the islands.

> The shore and bays … afforded great store of fish, and that of divers kinds … angelfish, salmon peal, bonitos, sting ray, cabally [cod], snappers, hogfish, sharks, dogfish, pilchards, mullets, and rockfish, … from under the broken rocks crevises [crayfish] oftentimes greater than any of our best English lobsters, and likewise abundance of crabs, oysters, and whelks. … whales we have seen hard aboard the shore followed sometime by the swordfish and the thresher.[15]

The diversity of Bermuda's flora and fauna likely evolved from its reefs and its relative isolation. Ocean currents, migratory fowl, and seafowl, attracted to the fish around the reefs, introduced a variety of seeds to the islands. These took root and developed into unique and distinctive species, like the Bermuda cedar. As the flora proliferated, the soils changed and allowed other species to grow, eventually supporting the islands' fauna.

Reefs

The reefs around Bermuda form an ellipse that extends approximately twenty-five miles east-northeast by west-southwest and have a width of ten to twelve miles. They are composed of limestone, sandstone, and calcareous clay on which grow a wide variety of corals. While presenting a formidable obstacle and threat to mariners at sea, the reefs provide protection to the islands during storms and hurricanes, and form the myriad of

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[15] *Ibid*., 27-29.

protected bays and landlocked harbors where ocean-going ships could safely moor. The channels and harbors were only discovered and charted though persistent exploration after the islands were first colonized. Regardless of maps and charts, Bermuda's reefs regularly claimed vessels throughout history. With the exception of a few narrow and often intricate entrances, the Bermuda reefs form an almost impenetrable line over which no vessels can pass.[16]

The outer borders of the reef are shallower than inside the reef. Many sections have less than three feet of water covering them varying to ten to fifteen feet in other locations. These shallows are achieved rapidly, with the oceans depths changing from over 5,000 feet to the outer breakers and shoals of Bermuda in less than a mile. Long Bar is off the southwest side of Bermuda and extends six miles west southwest from the shore. Turning northeast the reef is known as Chub Head and lies roughly nine miles from shore. The outer reef then turns east-northeast toward North Rock, which is always above water and lies some twelve miles north-northwest of the nearest land at Catherine Point. From North Rock the reef runs east and then east-southeast ending in Mills' Breaker, which is exposed during low water and lies some six miles northeast of Catherine Point.

The low elevations of Bermuda and the distance of the outer reef from shore means that unsuspecting vessels can be on the shallows without ever coming in sight of land when approaching from any direction other than southeast. Numerous navigational accounts advise to steer well south of Bermuda's latitude to ensure that it may be

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[16] Findlay, *Description of the Bermudas*, 84-85.

approached from the southeast side where the outer edge of the reef is less than a half-mile from shore. Sailing directions to Royal Navy vessels approaching Bermuda issued by Rear Admiral George Murray in the late eighteenth century state:

> As the Breakers extend from 3 to 4 and 5 Leagues off in the East, West and North sides of the Islands, great care must be taken to make them to the Southward. The prevalent winds being from some Western point, it is best, for that reason, to make them from the South West … The only danger on the South side of the Island is the South West Breaker … The South side lies West South West and East North East nearly, and has no other danger more than ½ a mile off and that generally visible. It may be navigated with safety one mile off. … run from the Westward, in Lat. 32° 05' North; and from the East, in Lat. 32° 14' North.[17]

Even knowing the entrances and channels was no guarantee of safety in Bermuda, illustrated by the commentary by Captain C.V. Penrose of HMS *Cleopatra*, dated 24 March 1795, written to Rear Admiral George Murray. "The entrance to Castle Harbour is very narrow and crooked. It has often been used by Frigates and Sloops, but I think it very dangerous, and can only be run in or out of, with very particular Winds. … The entrance to St. Georges Harbour, over a Bar, where at high tides there is in some places 18 feet [of] water. Sloops … may run in with ease, but from the narrowing and winding of the Channel, I would never wish to see a large Ship attempt it."[18]

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[17] George Murray, "Memorandum for Ships making the Islands of Bermudas," (Admirals Despatches, Adm. 1, v.493, 24-25). Reprinted in "Navigating to Bermuda in the Late 18th and 19th Centuries," *Bermuda Journal of Archaeology and Maritime History*, 9 (1997): 72-73.

[18] C.V. Penrose, "Captain Penrose to Admiral Murray – 1795" (Admirals Despatches, Adm. 1, v.493, 11-19). Reprinted in "Navigating to Bermuda in the Late 18th and 19th Centuries," *Bermuda Journal of Archaeology and Maritime History*, 9 (1997): 66-67.

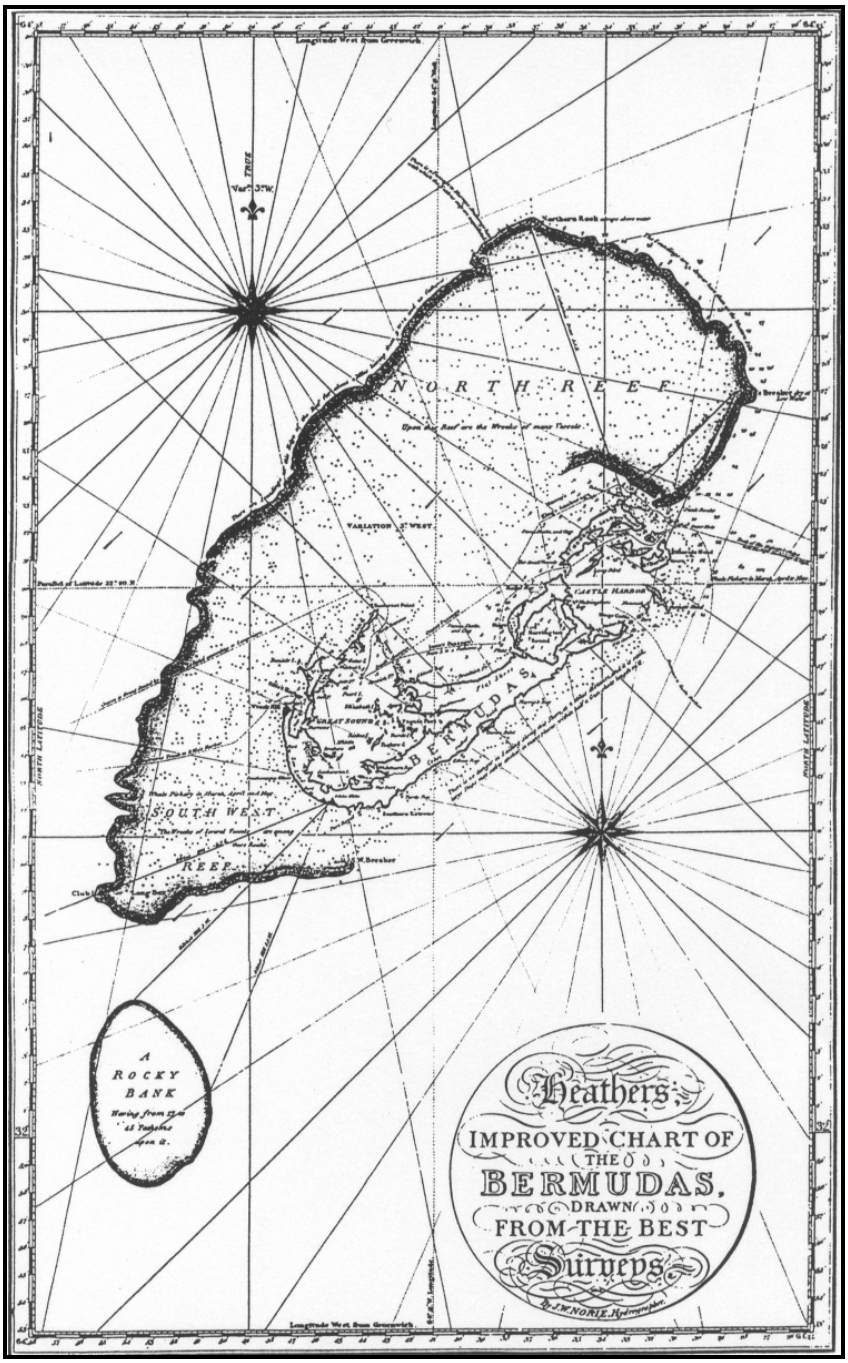

Figure 10 1814 Chart of Bermuda Reefs[19]

[19] John W. Norie, "Heather's Improved Chart of the Bermudas, Drawn from the Best Surveys," 1814 based on Lt. Thomas Hurd's 1790-92 survey, cited in Michael J. Jarvis, "In the Eye of All Trade" (Ph.D. diss., College of William and Mary, 1998), Figure P-2.

Channels

Despite the extent of Bermuda's shallows, there are a few channels through the outer reef that offer at least some measure of safety in approaching the islands. The principal entrance to the interior of the reef is the Narrows, often referred to as Hurd's Channel after Thomas Hurd who with three slaves surveyed Bermuda's waters. This channel begins at the extreme eastern edge St. George's Island and runs northwest past the island before turning westward into Murray's Anchorage. Just south of the Narrows is the channel over the Bar into St. George's Harbor, described above by Captain Penrose.[20]

Proceeding counterclockwise, Mills' Breaker Channel is just north of the Narrows. It proceeds southwest towards the Narrows and is only used by Bermudian vessels. At the extreme north of the outer reef are the North Rock Channels, referred to as Northeast Channel and Northwest Channel. Heading due south through the reef, these channels were known historically to only a few pilots and seldom used. Northeast Channel was supposedly one of the best through the outer reef but it was narrow and difficult to navigate at its entrance.[21]

Blue Cut is the first channel on the west side of the reef. It heads east-southeast toward Ireland Island but historically could only be used by small vessels as it was exceedingly narrow, intricate to navigate, and only eight feet deep in certain locations. Chub Cut is the next channel southward on the western reefs. Like Blue Cut it is also

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[20] Findlay, *Description of the Bermudas*, 85.

[21] *Ibid*., 85-86.

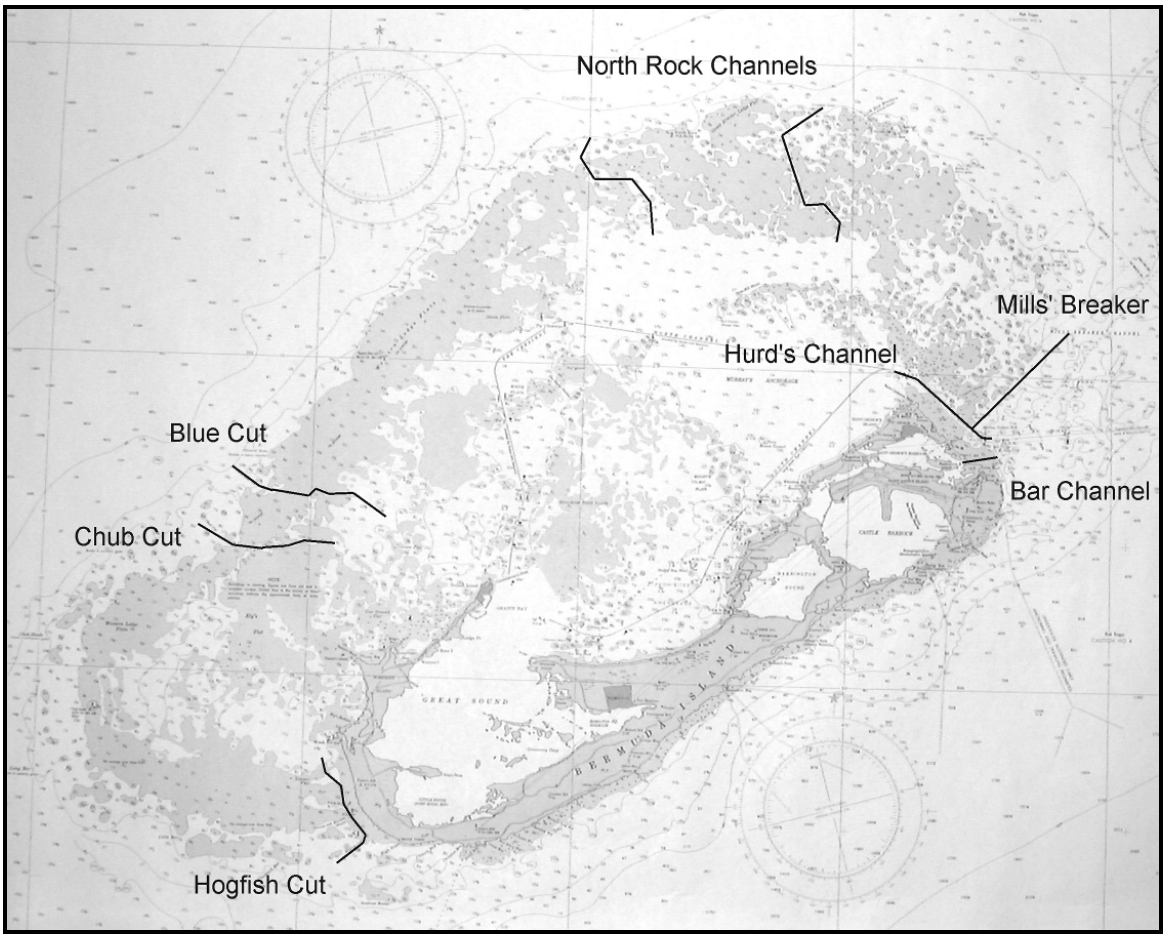

Figure 11 Historical channels through Bermuda's reefs[22]

narrow and dangerous to navigate. It passes first south-southeast toward Wreck Hill then east to Ireland Island. On the southwest side of the reef is Hog Fish Cut. It is described as the most convenient channel at the west end of the islands. The cut runs northeast through the outer reef then turns northwest running along the shoals. While reputed to be the best channel at the west end it still offered considerable risks. "The passage is so narrow that is does not afford sufficient space for vessels to tack in, and when passage

[22] Map derived from current nautical navigation chart of Bermuda.

through them shall be attempted, it must be without a change of tack. These difficulties are felt more especially in winter season, when winds are generally unfavorable [NW being a headwind] for passing the Kitchen Shoals."[23] From Hog Fish Cut vessels can pass into Ely's Harbor, near Wreck Hill, or continue northeast to Ireland Island. It is through Hog Fish Cut that *Hunter Galley* proceeded, in January, during the winter season, before being wrecked on the shoals.

Site Description

The wreck of the *Hunter Galley* is located between 500 and 600 yards off the southwest shore of Southampton Parish, Bermuda, roughly between Whitney Bay and West Whale Bay Beaches, overlooked by the Port Royal Golf Course. This is north of Hog Fish Cut where it passed through the outer reef, and south of Pompano Flats. Geographical coordinates for the site are 32° 15' 30" North Latitude and 64° 52' 37" West Longitude. The site area was located generally within three coral heads. The only intact vessel structure, a section of hull with first and second futtocks attached to hull planking, was just north of the southern most coral head. Disarticulated timbers, including floors, futtocks, and planks, were strewn in a northeasterly direction to a maximum distance of 100 feet away. Three concentrations of ballast stone were on the site. One small pile, located just west of the articulated hull remains, the largest pile approximately thirty feet north, marking the western edge of the site area, and a third smaller pile, fifteen feet east of the northern end of the large ballast pile. The site was

[23] Findlay, *Description of the Bermudas*, 86-87.

exposed regularly to the storm surge conditions associated with Bermuda's shallow reef environment but it appeared that the nearby coral heads offered some measure of protection from the scouring effects.

Water depth at the site was consistently twelve feet, with visibility ranging from a milky five feet to more than one hundred feet. Current varied with the tides but was minimal during good weather. When the weather deteriorated, visibility went to its minimum and there was a strong periodic surge across the site, which when combined prevented effective work. The bottom was comprised of medium to fine sand, making excavations easy to conduct but problematic to maintain due to slumping. Small areas of turtle grass were scattered around the site but did not encroach on any excavated areas. Aquatic life at the site was sporadic and infrequent other than one persistent and curious parrotfish.

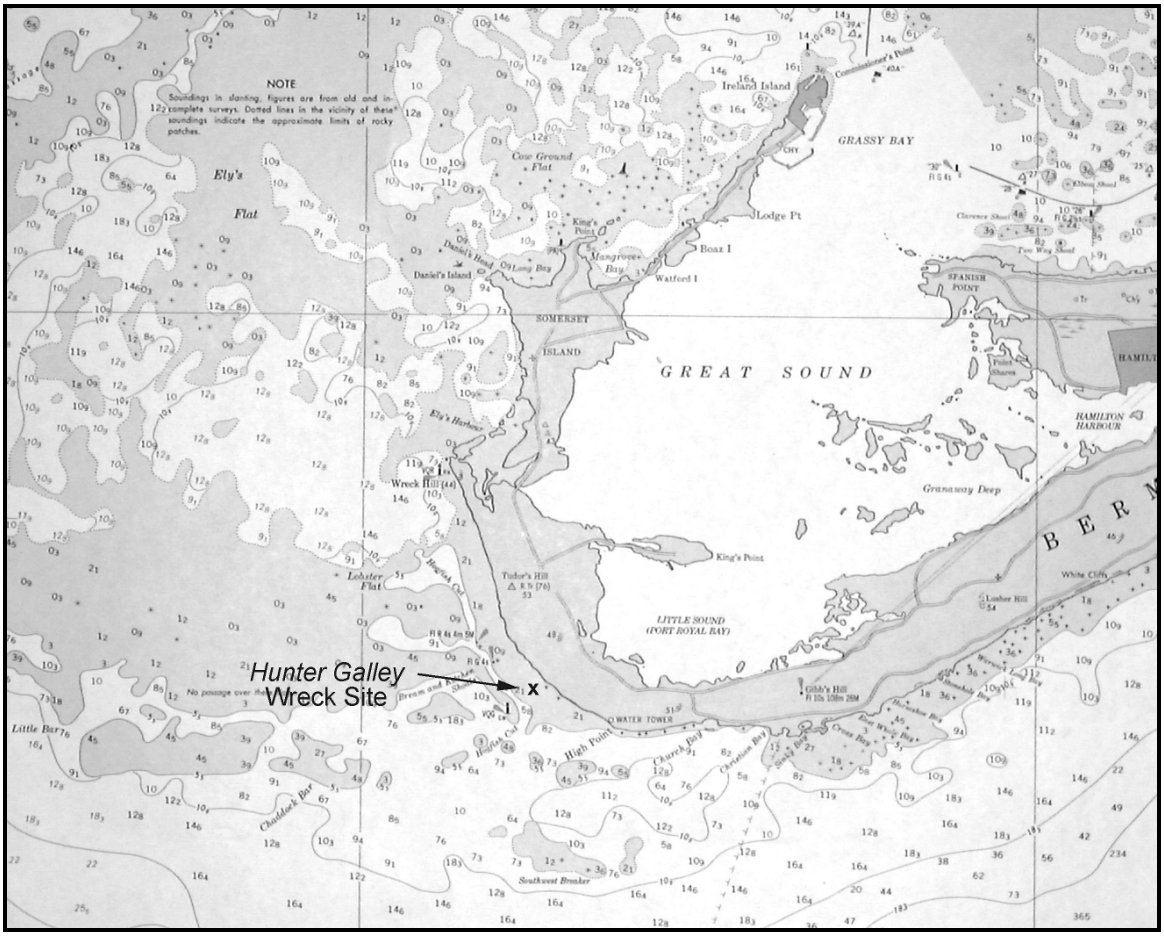

Figure 12 Location of the *Hunter Galley* wreck site[24]

[24] Map derived from current nautical navigation chart of Bermuda.

CHAPTER V

PREVIOUS RESEARCH

To effectively do an archaeological investigation, it is necessary to know what artificial disturbances, or archaeological filters, have occurred at the site prior to conducting research, as these filters can affect the chosen methodology, and subsequent interpretation of artifacts and site features. The archaeological investigation of the 1998 East Carolina University Bermuda Fall Field School was not the first time the wreck site of the *Hunter Galley* had been examined and disturbed. There are three documented investigations of the wreck site prior to the detailed field research conducted by ECU in September 1998. As the general location of the site is also provided on a local "shipwreck map" and in several popular publications sold in Bermuda, there have likely been many undocumented visits by snorkellers and sport divers.

Teddy Tucker, 1950s

In the 1950s Bermuda salvage diver Teddy Tucker located the remains of the wreck that he subsequently identified as the *Hunter Galley*. Located near Hogfish Cut, south of Pompano Flats, off the southwest shore of Bermuda's Southampton Parish, Tucker identified the wreck based on documentary research in the Bermuda archives as a colonial sloop. While there is no documentation of the fieldwork that Tucker did, several assumptions can be made with a large degree of confidence. First, the 1950s excavation efforts were designed for the rapid recovery of interesting items of material culture rather

than systematic mapping and careful recovery of the vessel remains and any associated material culture. This method of excavation and survey yields a wreck site that has been disturbed artificially, not just naturally and, therefore, the context and distribution of artifacts may not be accurate to the original wreck or indicative of the wrecking process. Second, there were no monetarily valuable items on the wreck site, as no items have appeared over the years in public or private collections as being associated with the wreck of the *Hunter Galley*. This lack of collectibles may also indicate that because of the proximity of the wreck site to shore and the relatively shallow depths, that it was subject to contemporary salvage efforts, although there is no documentation that such activity took place. A souvenir "Wreck Map" prepared by Teddy Tucker is the only formal documentation of his work at the site. The map includes "Hunter's Galley, 1752." A popular guide to dive sites in Bermuda by Daniel and Denise Berg also marks the general location and identifies the American sloop *Hunters Galley* [sic], and is based largely on Tucker's investigation.

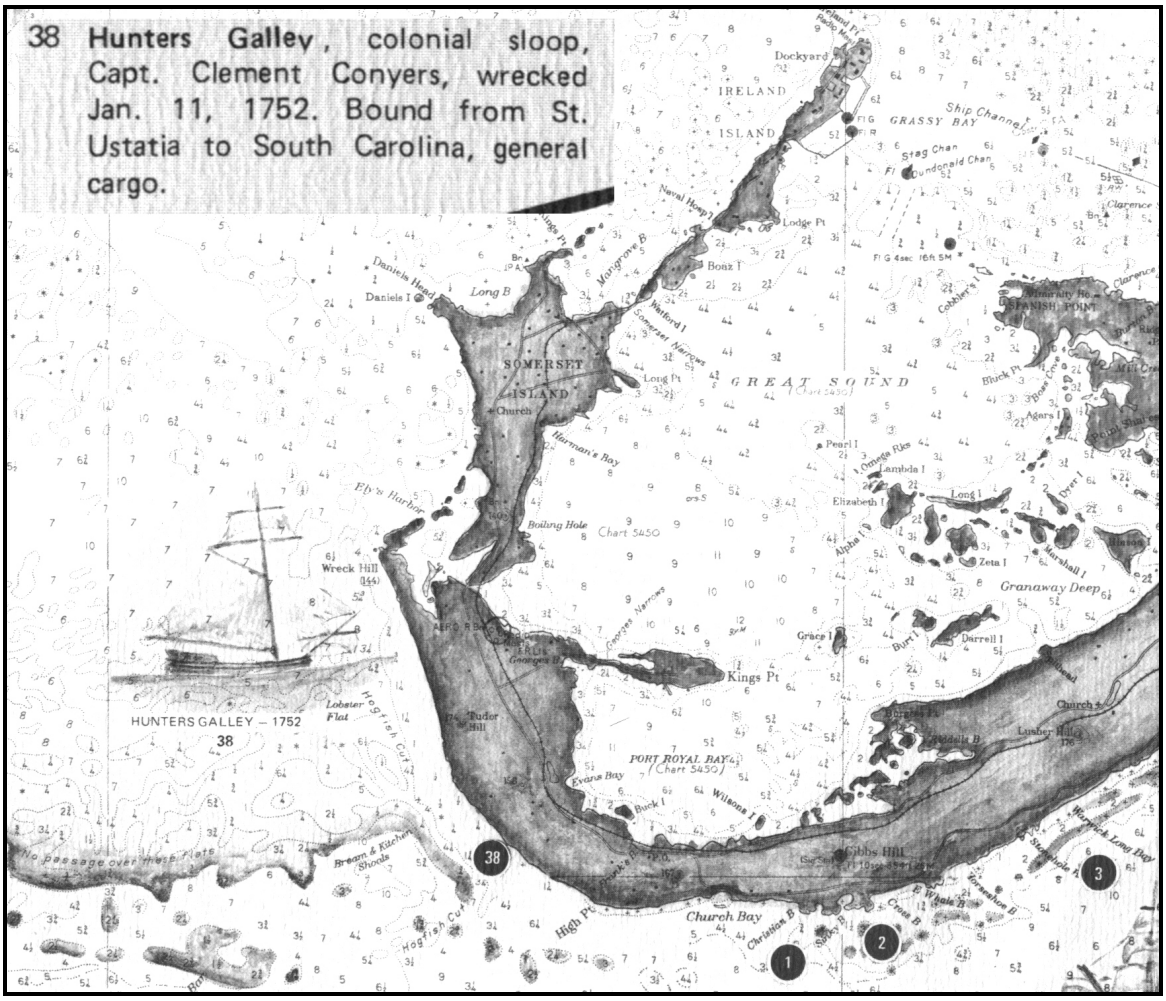

Figure 13 Tucker's documentation of the *Hunter Galley*[1]

Franklin Pierce College, 1974

Professor Edwin S. Dethlefsen and a mixed group of students and volunteers from Franklin Pierce College in New Hampshire examined the wreck again in May and June of 1974 as an experiment in underwater archaeology. Their stated goal was to further an

[1] Bermuda Shipwreck Treasure Map drawn by Teddy Tucker and sold in Bermuda.

archaeological survey of Bermuda's wrecks and to develop a unique program of training in historical archaeology. The group selected *Hunter Galley* believing it was "a wreck beyond endangerment – one that would be at once so disturbed, picked-over, and 'insignificant' as to be impervious to our [their] mistakes."[2] They admittedly had inexperienced personnel and minimal equipment. None of the project participants were experienced divers. They relied on a local dive operator to provide diving instruction and supervision of operations, and only half of the field crew had experience in terrestrial archaeological techniques.

The wreck site was estimated to be approximately 130 feet by 80 feet in extent. There was a north-south oriented ballast pile at the east end of the site, and a portion of the vessel's bottom, with more ballast located farther to the west. No visible artifacts were noted other than hull remains and ballast stones.

A ten foot grid consisting of stakes and string was established for horizontal reference, as would be done on a terrestrial archaeological site. Problems with establishing the grid and maintaining it were noted, and the work was limited to surveying the grid areas and a superficial excavation around two major features noted, the intact hull structure, and a large timber presumed to be the keelson. Additional difficulties were cited with diver inexperience reducing visibility because of bottom disturbance, and logistical problems of coordinating dredge excavation operations with mapping. Ill placed dredge outflow often combined with the current to eliminate all

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[2] Edwin S. Dethlefsen *et al*., "The *Hunter Galley*: An Exercise in Undergraduate Historical Archaeology," *Beneath the Waters of Time: The Proceedings of the Ninth Conference on Underwater Archaeology*, ed. J. Barto Arnold, III (Austin: Texas Antiquities Committee, 1978), 223.

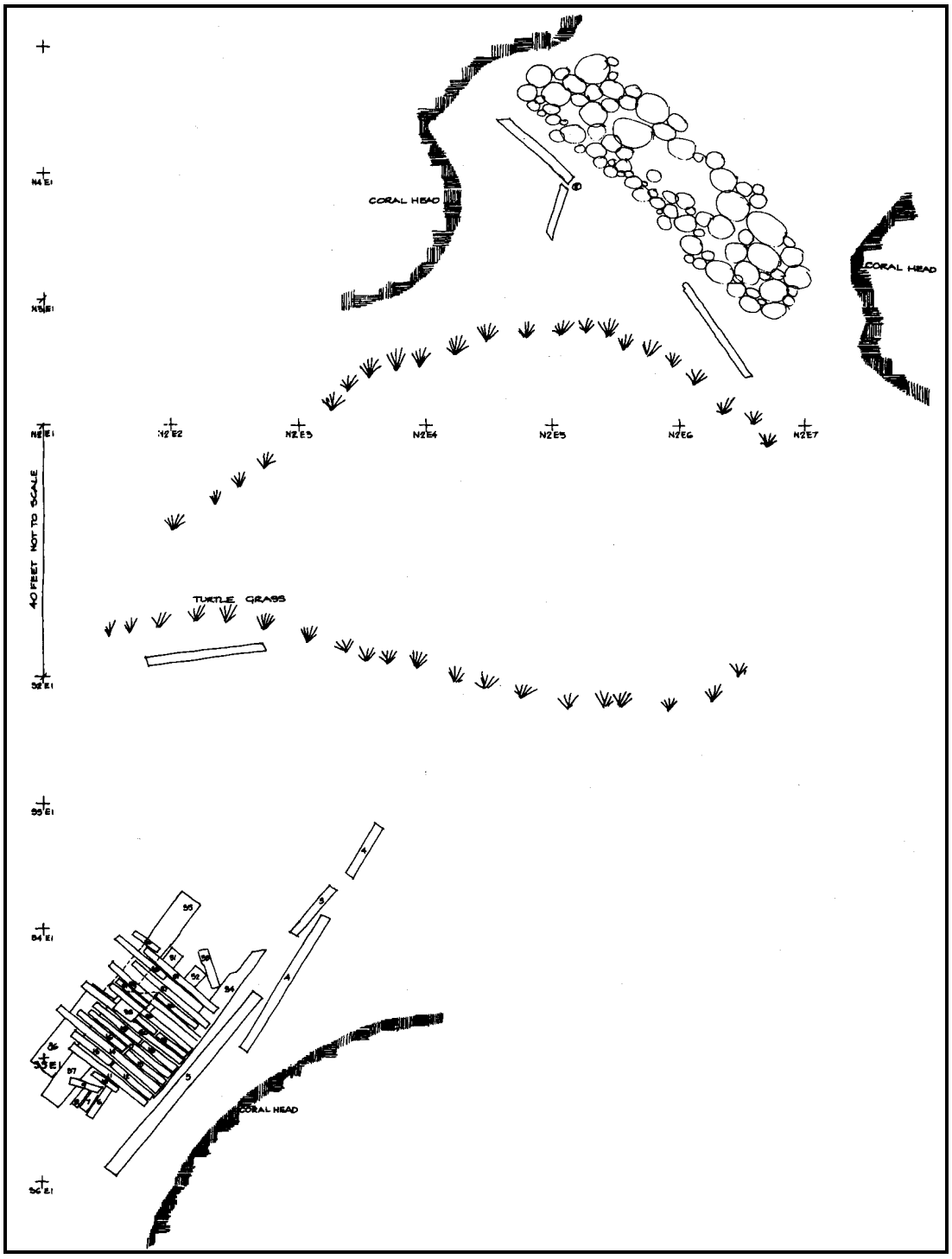

Figure 14 Dethlefsen Map 1974[3]

[3] *Ibid*., 226.

visibility on the site. Despite all their difficulties, the Dethlefsen crew did generate a site map and recover cultural materials.

The portion of hull near the vessel bottom contained the only articulated timbers. It was described as "consisting of first and second futtocks laid edge-to-edge with bottom sheathing associated with a portion of a large timber 5.7m [18'8"] long."[4] The larger timber was assumed to be a portion of the vessel's keelson. No detailed information was provided on individual timbers, although most were numbered on the site map. General information gave timber dimensions ranging from four inches by five inches to seven inches by nine inches. Planks were described as being two inches thick and ranging from eight inches to twelve inches wide.[5]

Most of the other artifacts discovered were recovered from the area just west of the north-south oriented ballast pile along the eastern extreme of the site. The Dethlefsen site map shows what appears to be several disarticulated timbers and possibly a rigging block in that area. They report recovering rigging and running gear including a block of oak and lignum vitae, three iron hooks, iron spikes, and numerous concreted iron fittings. Also discovered but unsuccessfully recovered, except for the served ends, was a coil of three-quarter inch hemp line. The team recovered and identified ceramic material including sherds of Rhenish stoneware, salt-glazed Staffordshire stoneware, Chinese export porcelain, lead-glazed redware, Delftware, and four pipe stem fragments with inside diameters of 5/64" and 6/64". Dethlefsen's crew also recovered nineteen bones or

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[4] *Ibid*., 224.

[5] *Ibid*., 224-225.

bone fragments. Some of these were identified and included two pig, three cow or large sea mammal, one horse tooth, two human teeth, and three other human bones. The remaining bones were not identified.[6]

In addition to field research, the Dethlefsen team also conducted some documentary research in the Bermuda Government Archives. They uncovered the bill of protest that described the last voyage of the *Hunter Galley* and the details of its sinking, but found little else. While engaged in as second field project on a different wreck site in 1975, the researchers had time to investigate the *Hunter Galley*'s officers as listed in the bill of protest. They found information indicating that Clement Conyers, John Conyers, and John Lea[y]craft continued as mariners into the latter part of the eighteenth century.[7]

The overall result of the Dethlefsen fieldwork was to further disturb the archaeological record for subsequent research, beyond the salvage efforts of Tucker in the 1950s, and to create more questions than answers. The Dethlefsen team stated themselves that their work was a good example of "how not to excavate a shipwreck!"[8]

East Carolina University, 1997

The next archaeological examination of the *Hunter Galley* wreck site occurred in 1997 as a part of the East Carolina University fall semester field research class. The goal of the 1997 field season was twofold. The first and primary goal was to survey and

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[6] *Ibid*., 225.

[7] *Ibid*., 226.

[8] *Ibid*., 227.

locate a shipwreck site suitable for detailed archaeological analysis. The previous field season in Bermuda concluded the archaeological investigation of the Stonewall Wreck, and a new site was necessary for archaeological training and educational purposes. The secondary goal of the 1997 field school was to revisit the known shipwrecks, discovered in previous surveys, as well as wrecks that were popular Bermuda dive sites to obtain accurate coordinates for the sites for eventual inclusion in a geographic information system (GIS). While the known coordinates for most of the wreck sites were relatively accurate, the East Carolina University Maritime Studies Program had recently purchased a Global Positioning Satellite (GPS) system that utilized its own differential transmitting station. The use of this Differential GPS system allowed for coordinates that were accurate to the meter level.

The wreck site of the *Hunter Galley* was one of the known wrecks the 1997 field school revisited. Divers obtained DGPS coordinates and made a cursory examination of the wreck remains. Several weeks later while in the Bermuda Government Archives, a student researcher noticed in the 1749 shipping register that the sloop *Hunter Galley* was Bermuda built in 1747.

As a result of this discovery, the 1997 field school relocated the *Hunter Galley* wreck site during the last few days of the field season. Divers conducted reconnaissance mapping of the exposed vessel remains and closely examined the timbers and planking. The closer examination of the wood confirmed that it was what appeared to be Bermuda cedar. As the 1997 field season was near an end, no additional work was possible at the

wreck site and no disturbance could take place without permission from the Bermuda government.

Figure 15 ECU Reconnaissance Map 1997, drawn by Richard Fontanez

CHAPTER VI

FIELD RESEARCH

The documentary evidence and the cursory archaeological evidence found by the 1997 East Carolina University - Bermuda Field School generated considerable interest. There are ample descriptions of sloops in the documentary record, even a draft of a 130 ton Bermuda sloop from some time in the 1740s.[1] Several colonial period sloops have also been examined archaeologically, but no examples of Bermuda sloops have been found in the archaeological record. Given this information, researchers at the East Carolina University Maritime Studies Program and the Bermuda Maritime Museum determined that the *Hunter Galley* wreck site warranted a more detailed archaeological examination. The Bermuda Maritime Museum obtained a permit from the Receiver of Wreck to investigate and document the hull remains and site area of the *Hunter Galley*. The investigation was conducted as a part of the 1998 East Carolina University - Bermuda Field School under the auspices of the Bermuda Maritime Museum. If the vessel's identity was correct, and it was an eighteenth-century Bermuda-built sloop, construction details found through a more thorough archeological investigation could lend insight into what differentiated Bermuda sloops from other contemporary colonial sloops.

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[1] This draft is by Swedish naval architect Fredrik Henrik af Chapman and printed in his *Architectura Navalis Mercatoria* (Stockholm, 1768). This draft, however, does not provide any construction information and is for a sloop of considerably larger size than most listed in the shipping registers of the mid-eighteenth century. This tonnage discrepancy may be because of the various and inconsistent means of determining tonnage in vessels during the period in question.

Objectives

A detailed examination of the shipwreck remains would serve two purposes. First, it could potentially verify Tucker's identification that the vessel was the *Hunter Galley* and built in Bermuda (as the documentary records indicate) rather than the mainland American colonies. By taking wood samples from the vessel, to determine if the primary wood present was Bermuda cedar, and by examination of the associated material culture, the origin and time period of the vessel could be determined. Second, it would document the vessel's construction for comparison to other eighteenth-century sloops already examined archaeologically. It would also allow a comparison of the construction details to the various historical documents describing Bermuda sloops and their qualities and virtues as small colonial trading vessels. By doing a comparison, the design elements that distinguished the Bermuda sloop from other colonial sloops could possibly be determined.

What made Bermuda sloops, and Bermuda-built vessels in general, so desirable in the eighteenth century? Was there some unique design element or construction technique used in building Bermuda sloops? Documentary sources do not make any real distinction. Was it simply the superior qualities of the wood used? As previously noted, Bermuda cedar, unlike oak, which was the common shipbuilding material of the time, did not shrink or warp, required no seasoning, and was naturally resistant to rot.[2] Examination of the structural remains of the *Hunter Galley* could allow these questions to be answered. The resulting information is presented in the subsequent chapter.

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[2] Jane Harris, "The Best in the World: The Bermuda Sloop of the 18th Century," *Bermuda Maritime Museum Quarterly*, 2:4 (1989): 3.

With the broad, overall goals of the project defined, the specific details and objectives for the fieldwork could be set. The *Hunter Galley* project objectives are summarized below.

1. Relocate the wreck site and determine its extent
2. Establish a datum and means of accurate spatial reference
3. Conduct detailed mapping of articulated hull structure
4. Record the positions of any disarticulated hull structure
5. Conduct detailed mapping of disarticulated hull structure
6. Excavate to locate any additional hull remains or buried artifacts
7. Take wood samples from all timbers for species identification
8. Recover and document all artifacts found
9. Conserve or return and rebury all artifacts once recorded
10. Rebury the site to insure future preservation

With the specific objectives set for the field crew, field supervisors considered the appropriate means to achieve the desired goals.

Methodology

All field operations were staged off of two small outboard boats, the twenty-four foot Privateer, R/V *Malabar*, and the twenty foot Privateer, R/V *Viper*, owned and maintained by the Bermuda Maritime Museum. All diving from the boats was done using open-circuit SCUBA with compressed air. Scientific divers used approved personal dive gear and eighty cubic foot aluminum tanks from the museum dive locker. Given the shallow depth of the site, staying within the no decompression limits established by the U.S. Navy dive tables, and being able to transport a sufficient number of tanks for daily diving was not a planning issue. Divers established a temporary mooring at the site to allow for consistent location of the boats in relation to the wreck

and to eliminate the danger of a dragging anchor adversely impacting the wreck site or the nearby coral heads.

Four foot, or longer sections of half inch rebar functioned as datum points with polypropylene line deployed between points for reference. All mapping on the site tied into two or more of these datum points by triangulation. A two-meter square grid system allowed detailed mapping of specific areas. The rigid grid squares, constructed of angle iron, could be leveled independently of one another on the legs to allow for any relief on the site. Divers used a cross bar and plumb-bob to take accurate X, Y, and Z measurements and map all details for the hull remains, including but not limited to fasteners, joints, tool marks, and damage. A secondary diver double-checked all detailed scale drawings done on gridded Mylar once completed by the primary diver. Two or three-diver teams did broader site area mapping with members of the team double-checking angles and measurements as they worked.

Excavations used a four-inch water induction dredge powered by a five horsepower Honda water pump. R/V *Viper* served as the surface platform for dredging operations, being anchored near the excavation area rather than on the mooring because of the dispersed nature of the hull remains, and being positioned to ensure minimal disturbance to overall site visibility from the dredge outflow. Removal of significant overburden was done directly with the dredge intake hose, while cleanup and excavation near artifacts was conducted more carefully by hand fanning sand and sediments into the intake hose. Outflow from the dredge was screened through a quarter inch mesh to catch any cultural material not observed and retained by the excavator on the bottom.

Field supervisors recorded cursory information on the artifacts recovered during excavation prior to placing them in a container for transportation to the Corange conservation laboratory at the Bermuda Maritime Museum. All artifacts stayed in wet storage until researchers could do measured drawings and photographs during weather days when field operations could not take place. The Corange lab retained for conservation, the fragile artifacts that would likely not survive being reburied on site, as well as unique artifacts. Because of the cost and time of conservation, divers returned all other artifacts to the site in their sealed and labeled artifact bags for reburial at the end of the project. Artifacts were left in labeled bags to ensure that if any future work on the site is done, the researchers could easily identify them as disturbed cultural material. Photo and video documentation at the site was consistently done as dictated by field operations. This included pre-disturbance documentation, photos and video of the methodology in process, and documentation of the site and its environs once fieldwork was completed before reburial.

The principal investigator regularly converted and entered mapping work into AutoCAD, a computer assisted drawing program. This regular conversion of map data from paper to digital format provided an excellent means to recheck information recorded in the field. If discrepancies in the data or inconsistencies surfaced in the digital conversion, researchers could return to verify the measurements and correct the errors in data collected. Using a CAD program such as AutoCAD also allowed for easy data manipulation and assisted in assessing and planning daily activities and tasks on the site.

Fieldwork

Fieldwork for the *Hunter Galley* project was conducted between September 4, 1998, and September 30, 1998. Although there were twenty-seven days for the 1998 field season, weather conditions limited actual fieldwork to only twelve days. Toward the end of the project, the weather forced modifications to the planned methodology. Six additional "weather days" were spent working various aspects of the project including doing measured drawings and taking photographs of all artifacts and doing archival research.

Dr. Gordon P. Watts, Jr., directed the archaeological fieldwork with the supervisory assistance from Clifford Smith of the Bermuda Maritime Museum and the author. Steve Brodie of the East Carolina University Diving Safety Office supervised diving operations for the project, assuring that all work conformed to the stipulations and guidelines set forth for scientific research diving by the American Academy of Underwater Sciences. Seven graduate students from the ECU Program in Maritime Studies and one intern from the Bermuda Maritime Museum performed most of the actual field and lab work.

Work began September 4 to relocate the wreck site. The DGPS coordinates recorded during the 1997 field school were used to navigate to the immediate area of the wreck. Divers in snorkel gear then reconnoitered the area on towboards. This method of visual survey, common to Bermuda because of the shallow depths and clear water, quickly relocated the articulated portion of the wreck site. Once located, additional divers conducted a detailed reconnaissance of the site vicinity using both snorkel and

SCUBA. The site was more exposed than when last visited in 1997. Researchers found the articulated portion of the hull remains completely exposed down to the hull planking, with several disarticulated timbers leading away toward the northeast. Divers also noted three concentrations of ballast; one located near the articulated remains, a larger one approximately thirty feet to the northeast, and another smaller one some fifteen feet east of the extreme northern end of the largest pile. With the current condition of the site assessed, specific plans could be made for the excavation documentation.

An intervening weather day allowed the crew ample time for equipment preparation and to plan work on the site. On September 6 the mooring at the site was anchored in and work began on the baseline. A triangular baseline was laid with the primary datum being located just off the articulated remains in the southwestern extreme of the site area. The legs of the triangle extended to the northeast, angled to enclose the ballast piles and all exposed disarticulated timbers. Intermediary support points were added to each of the reference lines to keep them as stable as possible with the currents and surge. Once the primary reference lines were in place, two sections of the two-meter square mapping grid were positioned and secured over the articulated portion of the wreck site. With much of the site preparation work done, exposed vessel remains were cleaned off by hand fanning and video was taken of the entire area.

After several bad weather days, work commenced again September 10 and extended through September 13 before the weather deteriorated. Detailed mapping began on the articulated portion of the hull remains once divers secured the mapping grid in place. Cross lines were added between reference line points for excavation trenches and to

facilitate detailed mapping. The web of reference lines was eventually extended by connection of an additional reference point, placed beyond the existing lines to the northeast. A one-meter wide and one meter deep survey trench was excavated from Point B to Point D through and under the primary ballast pile looking for cultural material and any additional intact hull remains. When no hull remains were located, the trench was extended roughly perpendicular from Point D to Point C. While survey excavations were being done, detailed mapping was taking place on the articulated remains and disarticulated timbers were being triangulated in to grid points.

Once the locations of disarticulated timbers had been recorded, divers moved them outside of the reference lines to the south to where two additional two-meter square mapping grids were set up for detailed mapping. Timbers were moved one at a time under the mapping grid for detailed drawings to be done for the top, bottom, and one side. With mapping complete on the articulated section of the wreck, the drawings were verified and photographs taken. Two additional survey trenches were excavated, first from Point D to Point G and then from Point D to the newly established Point H beyond the northeast side of the reference lines.

Fieldwork on the site resumed September 22 after some time off for the crew, several weather days, and two days of work on another site. Detailed mapping of disarticulated timbers continued, and a survey trench was extended from Point G toward Point A and the articulated hull remains. September 23 and 24 were additional weather days with work being done by the crew in the lab documenting recovered artifacts. Student researchers were also sent to do additional background research in the Bermuda

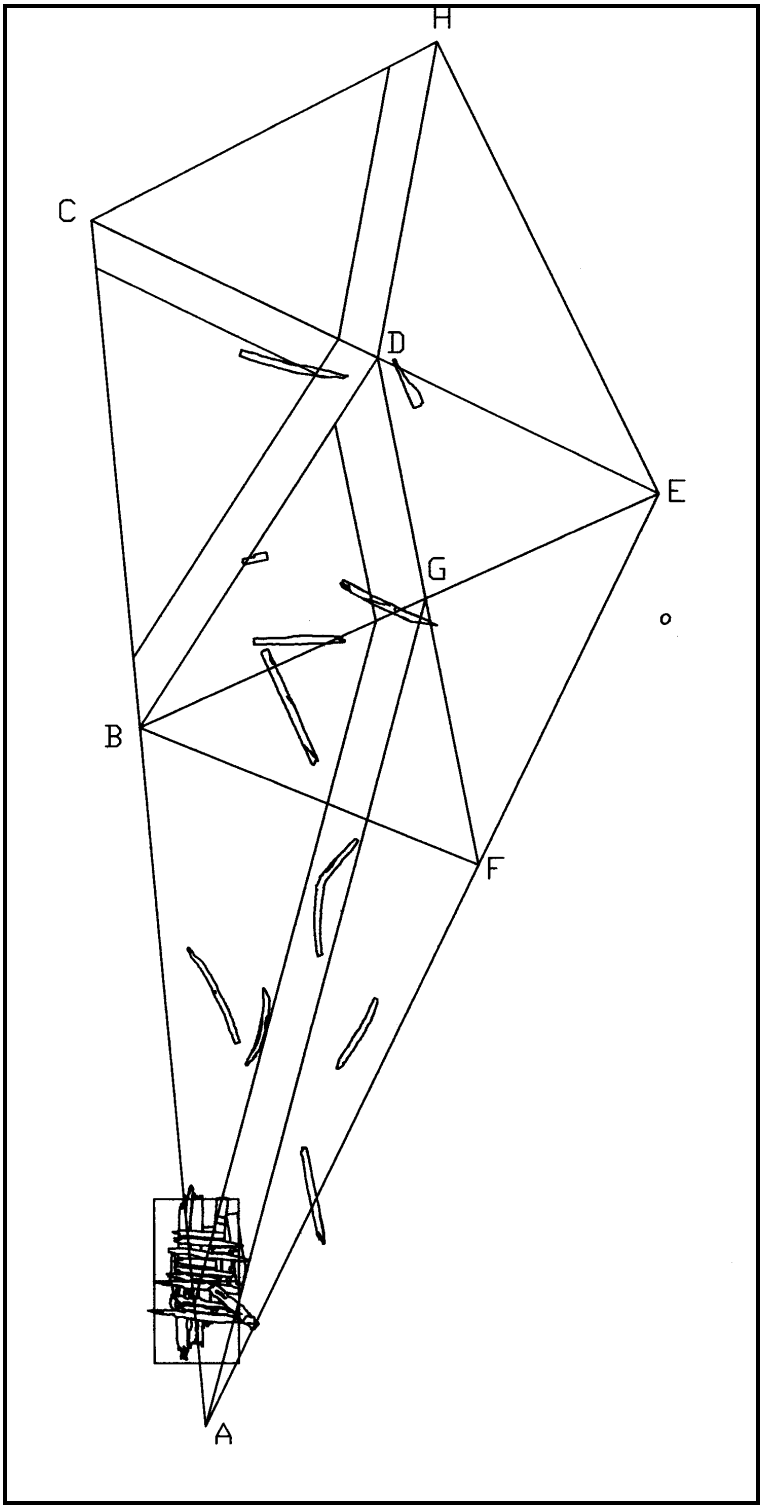

Figure 16 Reference points and lines, mapping grid, trenches, structural remains, 1998

Archives. September 25 conditions were still marginal with rough seas and poor visibility. Because of time constraints, project supervisors made the decision to recover the disarticulated timbers and transport them to the keep pond at the Bermuda Maritime Museum. Once there the mapping grids were set up on land adjacent to the keep pond. Timbers were removed from the water, placed under the grid, and mapped in detail before being returned to the water. Wood samples were also taken at this time from each timber, and a permanent tag number attached. Once detailed mapping was completed the timbers were returned to the site, September 28, reference lines were removed, and the site was buried for protection. Two days later the crew returned to the site to inspect the coverage of the site and to bury the artifacts not being kept. A close examination was done around a rigging block that was located early during the project near Point E. After partial excavation it was found to be an intact fiddle-block with hemp line still attached. The decision was made to recover the block and return it to the lab. After careful excavation, the block was wrapped, secured, and returned to the Corange conservation lab. Because of time constraints, no analysis was done on the block. It was placed in wet storage for future study and eventual conservation.

CHAPTER VII

VESSEL REMAINS AND ARCHAEOLOGICAL COMPARISON

The existing vessel structure of the Bermuda sloop *Hunter Galley* is a scatter of disarticulated timbers and planking between three areas of ballast stone. While the dispersed nature of the wreck does not allow the calculation of original dimensions, nor the determination of certain design elements, information on construction details, such as framing and fastening techniques, framing patterns, and wood types used can still yield considerable information for archaeological comparison to other colonial period sloops previously examined.

The only reference to the size of the *Hunter Galley* comes from the port records of Bermuda listing its entry from South Carolina on June 20, 1749, and clearing again on July 27, 1749, bound for Barbados. The *Hunter Galley* was listed as a sloop of 40 tons, armed with 5 guns. It entered Bermuda with a crew of ten, departing with a crew of nine.[1] Bermuda sloops of the period varied considerably in size, the largest being the *Ann* (55' keel, 23' beam, 10.5' hold, 141 tons) and the smallest being the *Endeavor* (29' keel, 13' beam, 5' hold, 20 tons). The average-sized sloop from the 1743 Bermudian fleet was 39.51' keel, 18.3' beam, 8.24' hold, and 67.66 tons.[2] Extrapolating from the

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[1] British Public Record Office, Colonial Office 41/7.

[2] Michael J. Jarvis, "In the Eye of All Trade" (Ph.D. diss., College of William and Mary, 1998), 772. Jarvis derives the average sloop from a sample of 92 vessels from 1743 in the powder duty list records. From Jarvis' average, a keel to beam to hold ratio was derived. Using a spreadsheet, the approximate dimensions of the *Hunter Galley* were determined based on the tonnage formula used in Bermuda as established in 1703 by the

average dimension ratios, it is assumed that the *Hunter Galley*, listed at 40 tons, measured approximately 35' keel, 16' beam, 7' hold.

Articulated Structure

The only intact portion of the vessel's hull is a section of four side strakes still fastened to the adjacent futtocks, approximately fourteen feet long and five feet wide. The hull planking is consistently one inch thick and varies in width from 10 inches to 11.5 inches. Several of the planks are rebated for fairing over the frames. The futtocks are likely fragments of the first, second, and third, and have an average sided dimension

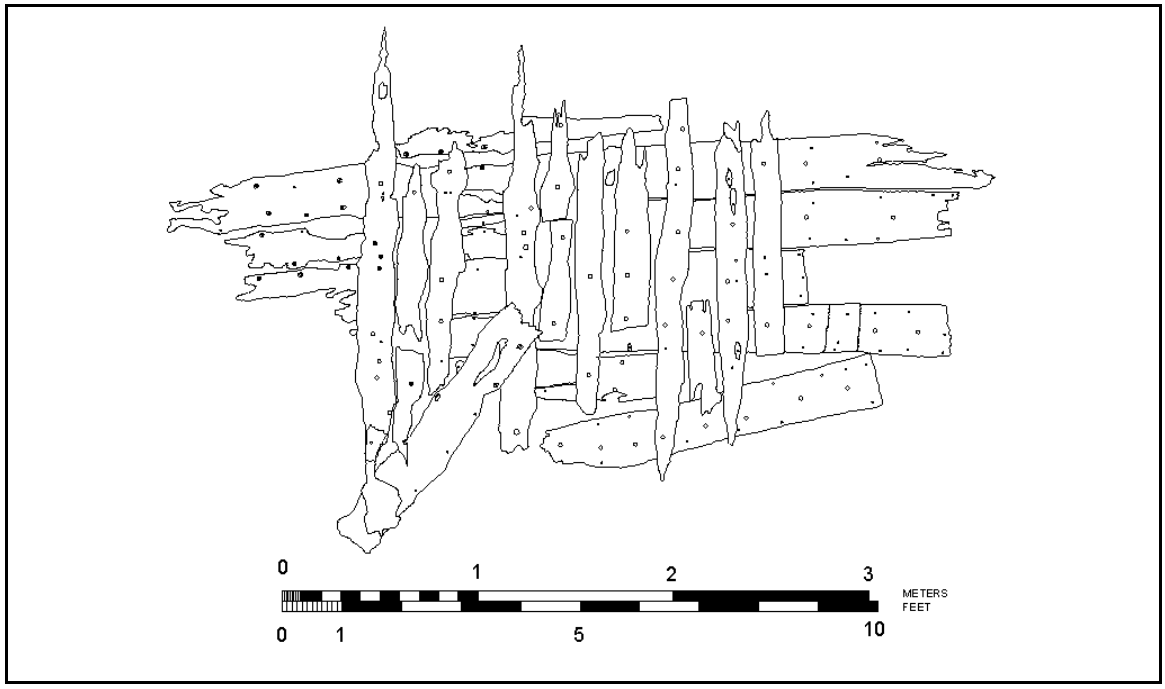

Figure 17 Articulated Section of Hull

Powder Duty Act [K x B x H ÷95]. This formula varies from the general formula used during the eighteenth century, established by Parliament in 1695 [K x B x ½ B ÷ 94].

of 6.6 inches, an average moulded dimension of 5.6 inches, and fall on 16 inch centers. The hull planking is attached with a nail-treenail-nail pattern to each futtock. This changes at the ends of the planks to a two or three nail line with no treenail, presumably to ensure no splitting of the wood near its end. The nails are ¼ inch square and the treenails vary from ¾ inch to 7/8 inch in diameter.

Floors

One intact floor (Timber #1) was located on the site. It measures 9'10" tip to tip, 8 inches sided, and 7 inches moulded at its maximum. It is cut on the underside ½ inch deep to fit a keel 8 inches sided, with two limber holes (1 ½ and 1 3/8 inches wide, both 1

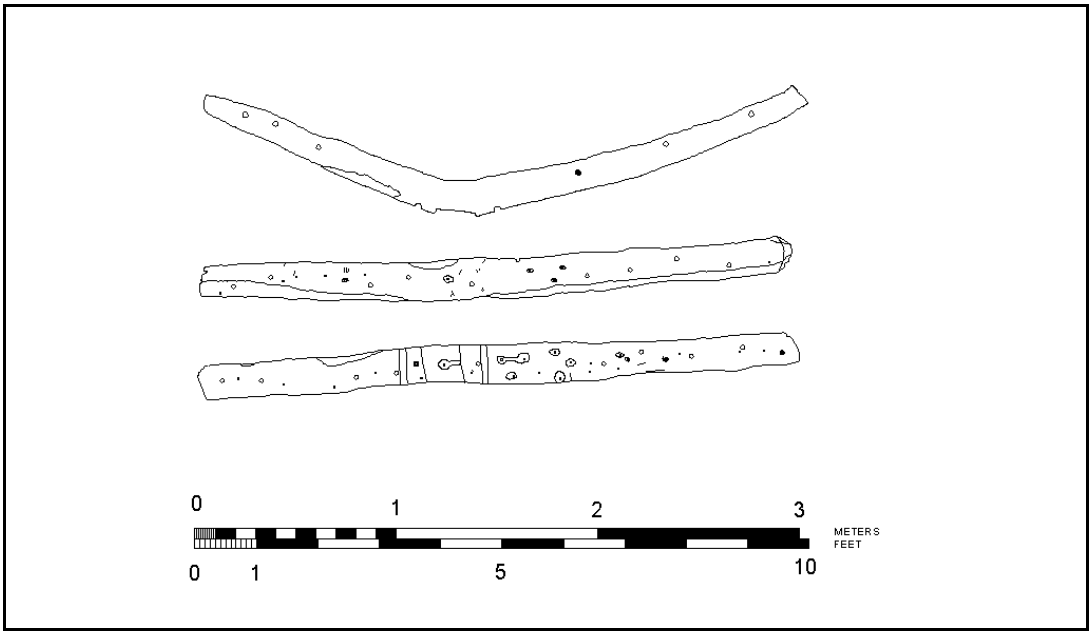

Figure 18 Timber #1, Intact Floor, Central American mahogany

inch deep) 3 inches to either side. The rounded limber channels appear to have been chiseled out with a gouge rather than sawn. Three treenails per side pass laterally through the floor for attachment to the first futtocks. Numerous nails and treenails are located top and bottom, remnants from the hull and ceiling planking. The angle of deadrise for the floor is approximately 20 degrees. The remains of an iron drift pin passes through the floor immediately above the keel cutout, and was presumably the attachment point for floor to keel and keelson. Wood analysis identified the species as Central American mahogany (*Swietenia* sp.)

A second floor (Timber #5) was broken at the point where it would cross the keel. It measures 6'5" in length, is 7 to 8 inches sided, and 6 to 6.5 inches moulded. A limber

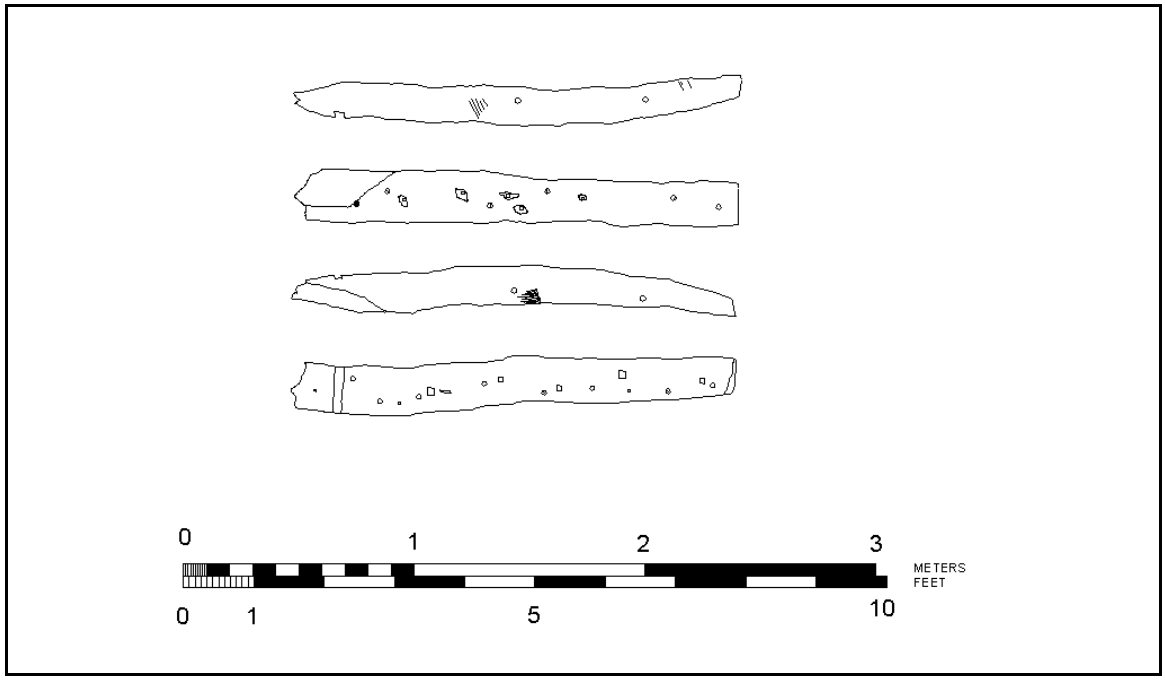

Figure 19 Timber #5 Broken Floor, Central American mahogany

hole 1.5 inches wide and 1 inch deep is cut in the underneath side approximately 4 inches from the keel rebate. Two treenails pass laterally through the floor as attachment points for the first futtock. Nails and treenails are present top and bottom from hull and ceiling planking. The curvature of this floor corresponds exactly with Timber #1 and was likely a nearby framing member. Wood sample analysis also identified this as Central American mahogany (*Swietenia* sp.)

Keelson

No definite keelson was located at the *Hunter Galley* wreck site although, upon analysis, Timbers #2 and #3 may be broken fragments of the keelson. Timber #2 is

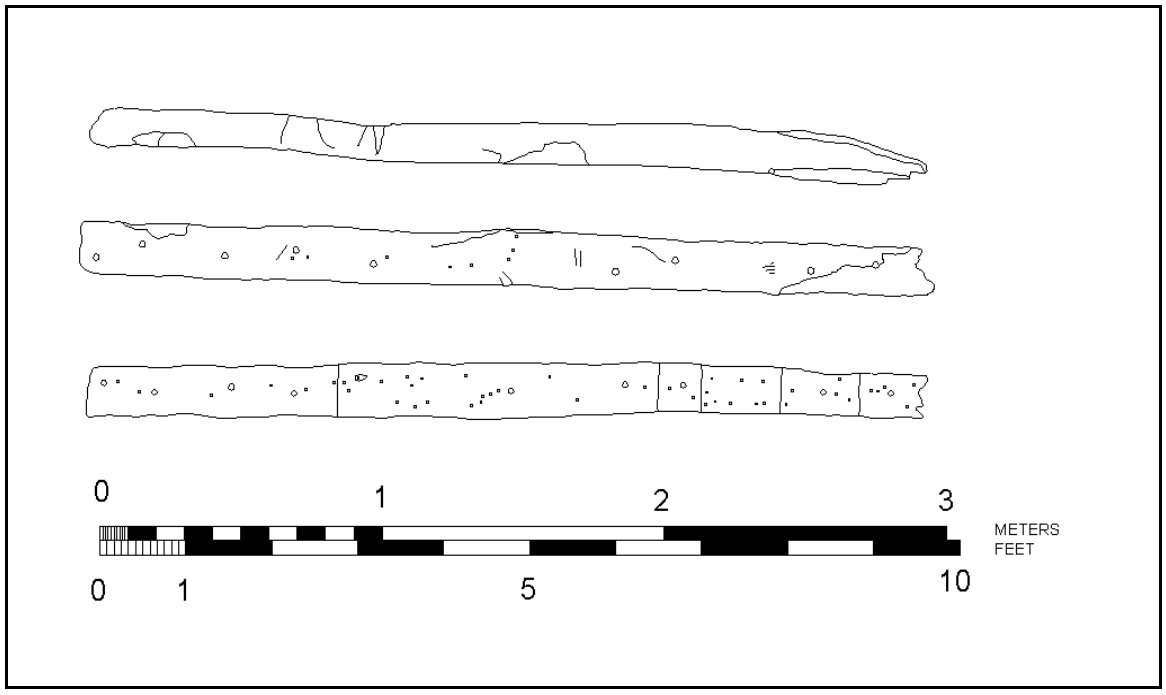

Figure 20 Timber #2, Keelson Section, Bermuda cedar

consistently 7 ½ inches sided, approximately 6 inches moulded, and a straight 9'9" long. Given the estimated beam of the *Hunter Galley* at 16 feet, a timber of this length and straightness would have to cross the keel, if it were a floor. There is no evidence of notching, or through fastening in the appropriate location, for attachment to the keel as a floor. There are also no lateral treenails that would allow attachment to the first futtocks. All the treenails pass through the timber vertically as would be appropriate for a keelson overlying floors to attach to a keel. Scarring is present on one side consistent with attachment to frames. There is also a disproportionate distribution of nails on the timber. One side has only 8 nails while the other has 46 nails.

Timber #3 is 7 ½ inches sided and 5 ½ to 6 inches moulded. It measures 7'2" in

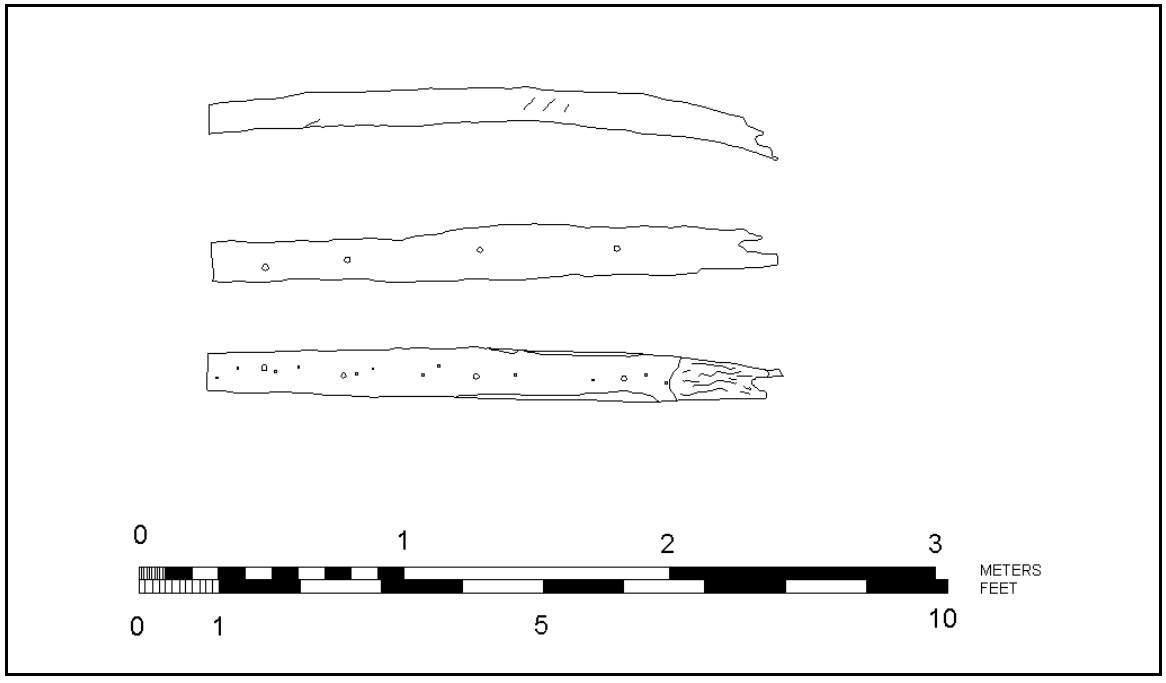

Figure 21 Timber #3, Keelson Section, Bermuda cedar

length and shows only a slight upturn in curvature at one end. Like Timber #2 there is no evidence of lateral through fasteners for attachment of floor-to-futtock or futtock-to-futtock. It also has the discrepancy of nails from one side to the other, none on one side and 11 on the other. Wood sample analysis identifies the species of both timbers as Bermuda cedar (*Juniperus bermudiana*).

The 1974 fieldwork conducted by Dethlefsen and his team, noted a portion of a large timber 18'8" long that they presumed to be part of the keelson. It is assumed that Timbers #2 and #3 were once a single piece representing the remains of Dethlefsen's keelson. The specie is consistent, as are the fastenings and dimensions. The two timbers were found in immediate proximity to one another and their combined length is only 21 inches shorter than the keelson noted in 1974, a reasonable loss in length as a result of breakage and erosion over 24 years.

While these two timbers are presumed to be fragments of the *Hunter Galley's* keelson, the conclusion is not absolute. The dimensions and general characteristics of the timbers also present the possibility of them being part of the stern deadwood of the vessel.

Futtocks

Five disarticulated futtocks were found at the wreck site. Timber #6 is 6'4" long, 6 inches moulded, and 8 inches sided. It has treenails and nails top and bottom, and two lateral treenails. Diagonal tool marks are apparent on the side of the frame in two

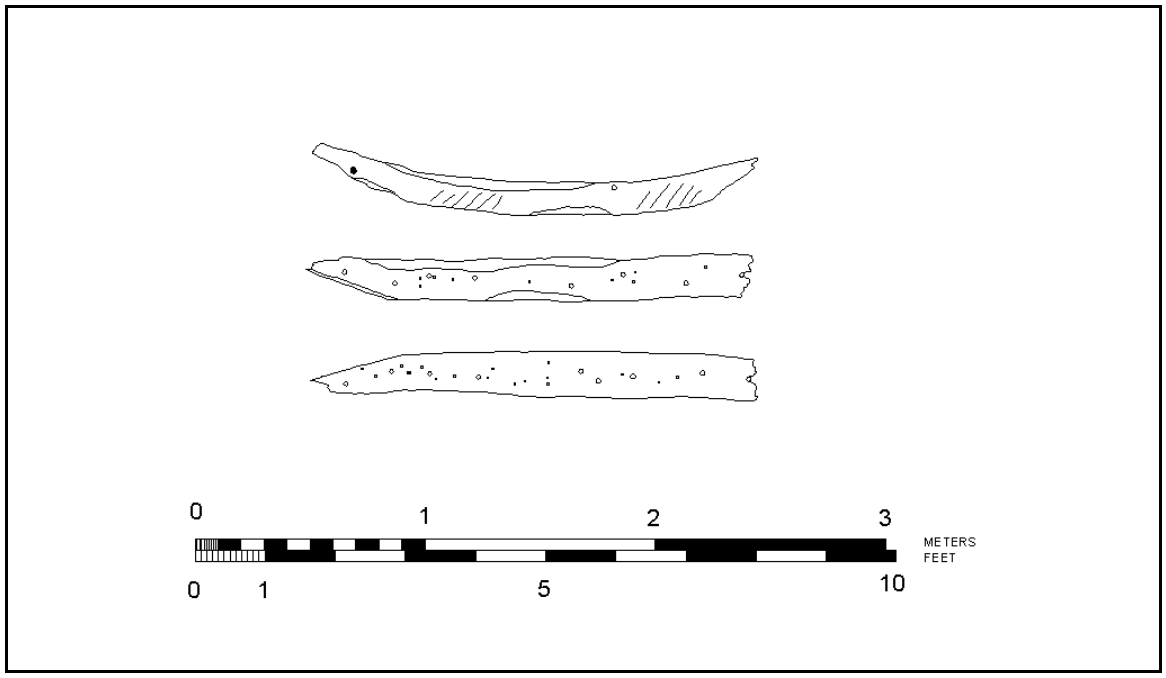

Figure 22 Timber #6, Futtock, Spanish cedar

Figure 23 Timber #7, Futtock, Spanish cedar

different areas. No clear fastening pattern can be determined from this futtock. Wood sample analysis identifies the species as Spanish cedar (*Cedrela* sp.).

Timber #7 is 8'6" long, 6 inches moulded, and 7 ½ inches sided. There are treenails and nails, top and bottom, with no clear fastening pattern. Two lateral treenails pass through the timber for framing. One small area on the top has longitudinal tool marks, and additional tool marks are around a crack in the timber. As tool marks are seen here, this damage was present prior to the wrecking process. Wood analysis identifies the species as Spanish cedar (*Cedrela* sp.).

Timber #9 is 7'11" long, 5 ½ inches moulded, 7 inches sided, and degraded by teredo damage at both ends. Two lateral treenails pass through the futtock, and numerous nails and treenails are on top and bottom. The nail-treenail-nail fastening pattern observed on the articulated section of hull planking can be seen here on the futtock bottom. Extensive scarring and tool marks are present on the top surface as well as inscribed characters. The first line reads MCLXXIV. Converted from roman numerals this reads 1174. The second line reads NOS, or if read inverted SON. The significance of these characters is unknown, and there is no indication whether the inscription occurred before construction, during the vessel's active life, or after the wrecking process from more modern intrusion. Wood sample analysis identifies the species of this futtock as Spanish cedar (*Cedrela* sp.).

Timber #10 is 8'3" long, 5 ½ inches moulded, and 7 inches sided. Four lateral treenails pass through the futtock, two at either end for fastening to other framing members. Nails and treenails are present on top and bottom. The bottom, outer side of

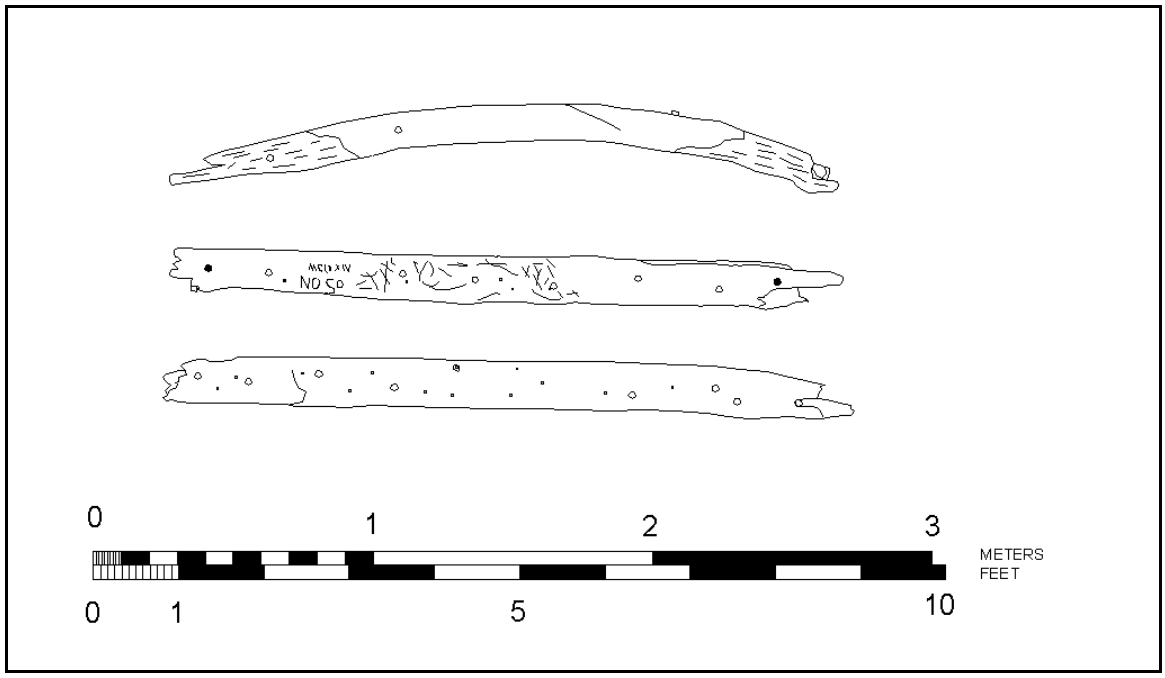

Figure 24 Timber #9, Futtock, Spanish cedar

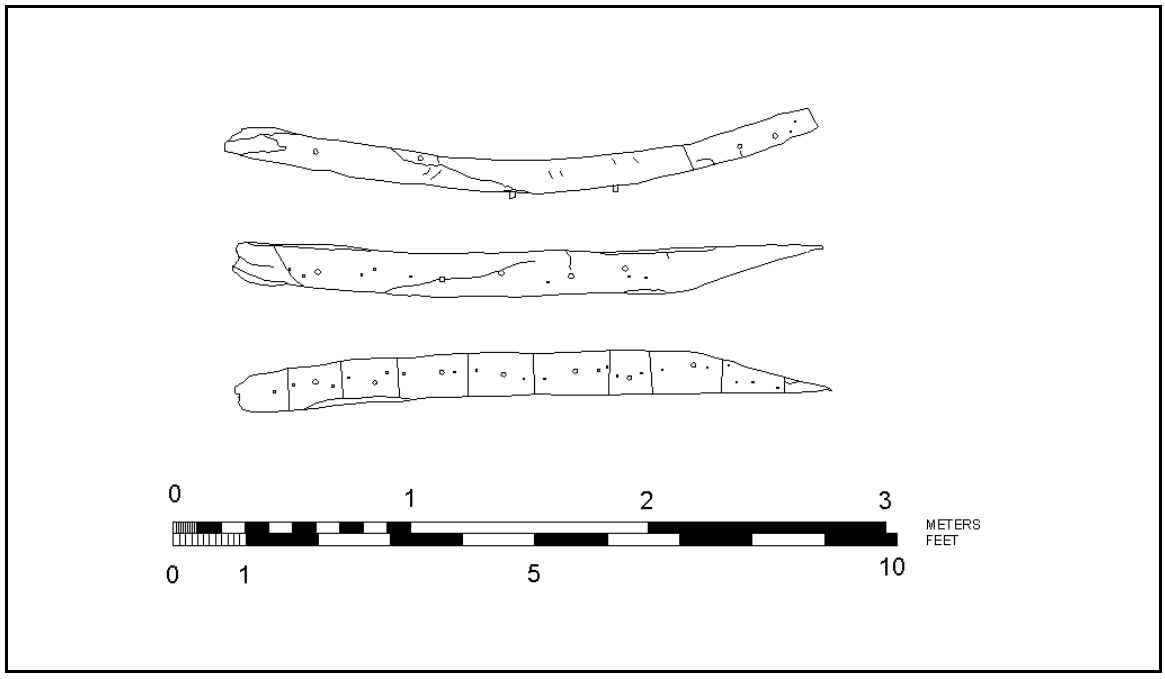

Figure 25 Timber #10, Futtock, Spanish cedar

this futtock shows scarring from the hull planking, and clearly indicates the nail-futtock-nail fastening pattern. The width of the hull planking, based on the scarring is inconsistent, ranging from 7 inches to 12 inches wide, although all use the same pattern. There are a few scattered tool marks on the side and a small one on the top. Wood analysis also identifies this timber as Spanish cedar (*Cedrela* sp.).

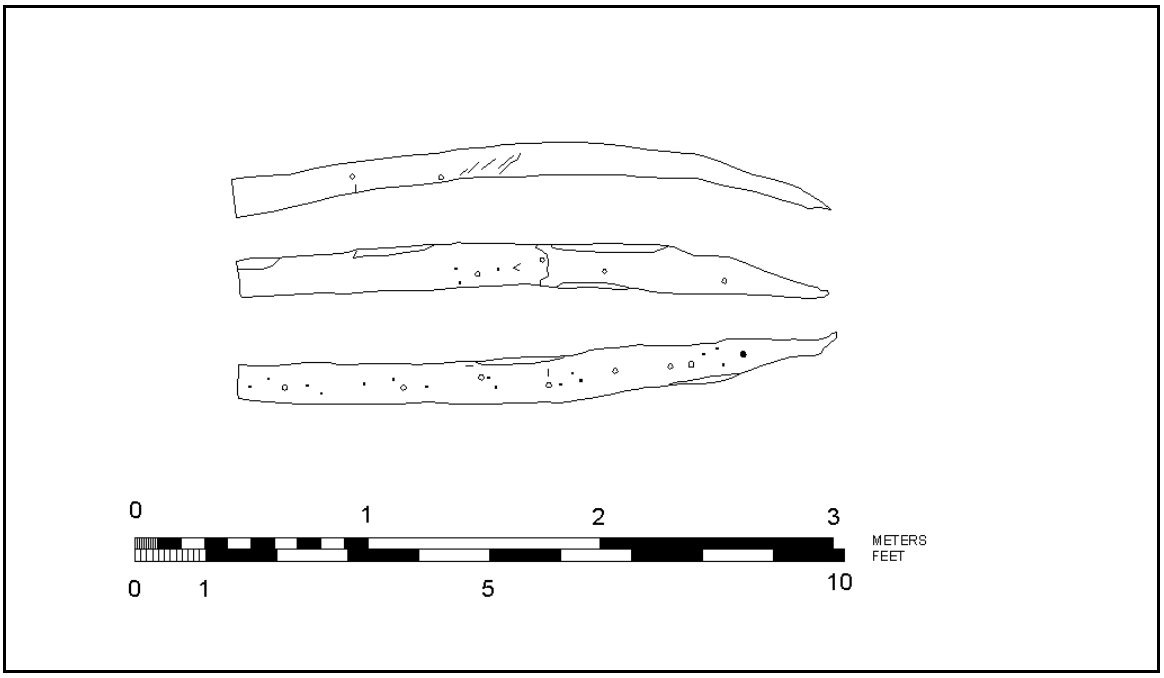

Figure 26 Timber #11, Futtock, Central American mahogany

Timber #11 is 8'4" long, 6 inches moulded, 7 ½ inches sided, with one end tapering more than comparable timbers. Two lateral treenails pass through toward one end with tool marks near both. There are few fasteners on the top of this futtock, four treenails and three nails. The bottom has more, eight treenails and fifteen nails, and exhibits the nail-futtock-nail fastening pattern for the hull planking. Wood species

analysis differentiates this futtock from the others observed. It is Central American mahogany (*Swietenia* sp.) like the two floors.

Hull Planking

Four samples of hull planking were discovered at the wreck site, other than the planking in the articulated section of hull: two smaller pieces and two sizable planks. Timber #4 is 2 feet long, 7 inches wide, and 1 inch thick. This piece has one treenail centrally located and three nails along the edge. Wood analysis identifies it as Central American mahogany (*Swietenia* sp.). Timber #8 is 4'2" long, 10 ½ inches wide, and 1

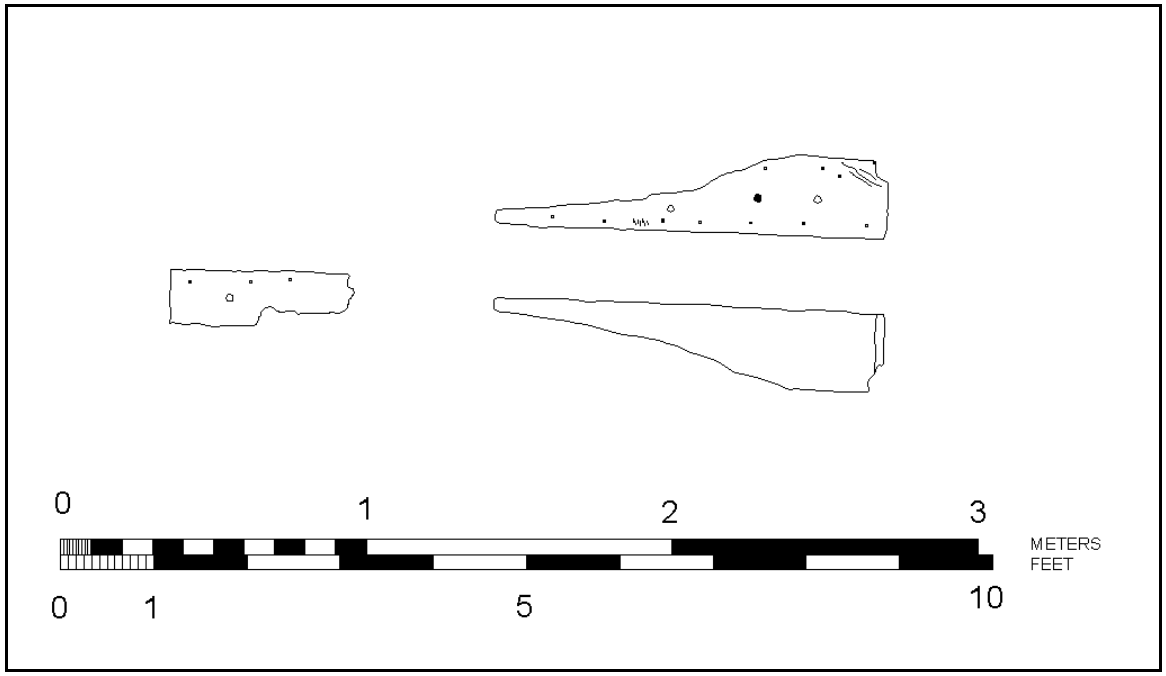

Figure 27 Timber #4 Central American mahogany and #8 Spanish cedar, Hull Planking

inch thick. While small like Timber #4, this plank offers more information, having three treenails centrally aligned, and nails along the edge exhibiting the nail-treenail-nail attachment pattern. There are also two areas showing tool marks on one side. Wood sample analysis identifies this plank fragment as Spanish cedar (*Cedrela* sp.).

Timber #12 is 10'5" long, 9 inches wide, and 1 ¼ inches thick. The width and thickness vary slightly along its length with one finished end and one broken. The fastening pattern of nail-treenail-nail is clearly seen on this plank along its length. The finished end has two nails and no treenail, the same as observed in the articulated remains. Scarring on the planking is also present from the framing and indicates a framing size of 6 ½ inches to 8 inches. Wood analysis identifies the species as Spanish cedar (*Cedrela* sp.).

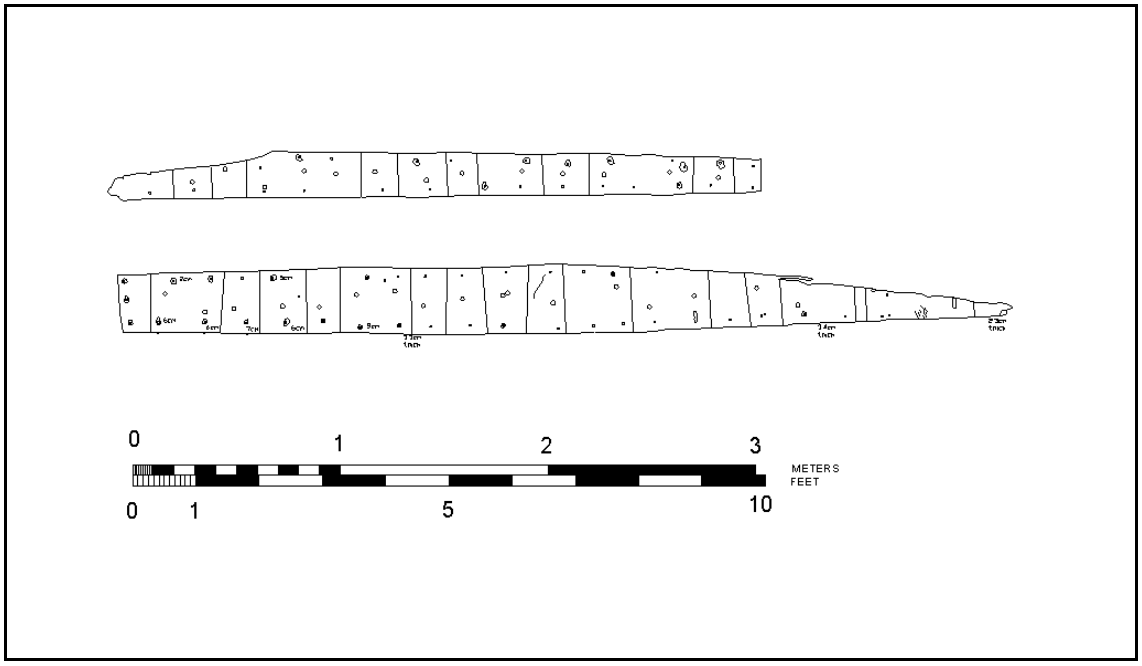

Figure 28 Timber #12 (top) Spanish cedar and Timber #13 (bottom) Central American mahogany, Hull Planking

Timber #13 is 14’2” long, 13 inches at its widest, and varies between 1 and 1 ½ inches thick. The nail-treenail-nail fastening pattern is again clearly shown on this plank, and it has three nails on the finished end with no treenail. Scarring from the framing indicates a frame size between 6 ½ inches and 8 ½ inches. The wood analysis identifies the species of this plank as Central American mahogany (*Swietenia* sp.).

Fasteners

The majority of fasteners on the vessel were ¼ inch iron nails and 7/8 inch wood treenails. Two instances of larger iron fasteners were found. The first is on Timber #1. The concreted remains of an iron drift pin pass through the floor directly over the notch for the keel. The second instance is an iron pin passing laterally through two futtocks, the second and third, in the articulated section of hull. This appears to be the only instance of an iron fastener used in that manner, with wooden treenails found in all other cases. The wood treenails were predominantly round, although several were recovered during excavations that were hexagonal and smaller. Wood sample analysis was done on treenails from Timbers #6 and #10, both disarticulated futtocks. Both treenails were identified as being Bermuda cedar (*Juniperus bermudiana*).

Overall

While the vessel remains of the *Hunter Galley* are by no means complete, or even extensive, there are enough key elements to allow commentary on the design of Bermuda sloops. The most important aspect that needs to be addressed is the wood type present in

the construction of the vessel. Based on documentary accounts, it can be assumed that a Bermuda sloop would be constructed out of Bermuda cedar. Wood analysis from the *Hunter Galley* indicates that while Bermuda cedar was an element in the ship's construction, Central American mahogany and Spanish cedar were also vital components. The use of tropical woods combined with a native Bermuda species, makes this vessel archaeologically unique and lends support to its identification as a Bermuda-built vessel. Other contemporary vessels used primarily white oak, with the occasional inclusion of maple, pine, beech, and live oak.[3]

Timber #	Maximum Moulded	Maximum Sided	Framing Type	Wood Type
1	7	8	Floor	*Swietenia*
5	6.5	8	Floor	*Swietenia*
6	6	8	Futtock	*Cedrela*
7	6	7.5	Futtock	*Cedrela*
9	5.5	7	Futtock	*Cedrela*
10	5.5	7	Futtock	*Cedrela*
11	6	7.5	Futtock	*Swietenia*
2	6	7.5	Keelson?	*Juniperus bermudiana*
3	6	7.5	Keelson?	*Juniperus bermudiana*
4			Plank	*Swietenia*
8			Plank	*Cedrela*
12			Plank	*Cedrela*
13			Plank	*Swietenia*
6			Treenail	*Juniperus bermudiana*
10			Treenail	*Juniperus bermudiana*

Table 4 Compiled Details of *Hunter Galley* Timbers

[3] Amy M. Mitchell, "A Comparison of Wood Used in Eighteenth-century Vessels" (M.A. thesis, East Carolina University, 1994), 200.

By the mid-eighteenth century, Bermuda shipbuilders, while still relying heavily on Bermuda cedar, were also using imported woods from other colonies to supplement their shipbuilding materials. Many of the preferred woods came from Central America and the West Indies. In 1750, Bermuda imported and consumed 65,750 feet of pine board, 4300 feet of pine plank, 202 feet of cedar board, 4000 feet of oak board, 970 feet of oak plank, 7080 feet of mahogany board, 25,546 feet of mahogany plank, and 125 parcels of ship timber from the West Indies.[4] Based on this documentary evidence, it would not be unusual to find a Bermuda vessel, built in 1747, constructed from a combination of wood, all known for their excellent shipbuilding properties.

The framing pattern of the *Hunter Galley* can be discerned from the section of articulated hull structure. The pattern of long futtocks alternating with, and being separated by, short futtock assemblies fits with the middle-style double-frame type described by Morris et al., in their comparative analysis of eighteenth-century framing evolution.[5] The futtocks were not attached to each other, with the exception of one long futtock at the northern extremity of the articulated section that was attached to the adjacent short futtock by a ½ inch diameter iron pin. While the offset of the first futtock from the keelson is unknown for the *Hunter Galley*, the double frame arrangement and the average moulded dimension being less than the average sided dimension, corresponds to other vessels, specifically other sloops in the early to mid-eighteenth century.

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[4] Jarvis, "Eye," 785.

[5] John W. Morris, III, Gordon P. Watts, Jr., and Marianne Franklin, "The Comparative Analysis of 18th-Century Vessel Remains in the Archaeological Record: A Synthesized Theory of Framing Evolution." *The Proceedings of the Twenty-sixth Conference on Underwater Archaeology*, 1995.

The Bermuda sloop uses a fastening pattern of nail-treenail-nail for hull planking on each frame. The ends of hull planks are also double or triple nailed depending on width rather than having a treenail close to the end to risk splitting. This fastening pattern differentiates Bermuda sloop construction from other British construction during the eighteenth century. English shipwrights planked their ships using two treenails per frame. It also rules out the possibility of the vessel being of French or Dutch construction. French shipwrights planked with one treenail and one nail per frame, and Dutch shipwrights with two treenails and occasionally the addition of a nail on each frame.[6] The remains of treenails and fasteners driven horizontally through the futtocks near finished ends to attach an associated floor or futtock, suggest the method of construction was based on loft frames and involved a whole molding technique.[7] The presence of multiple fasteners at some fastening points also suggests that refastening may have been necessary.

While no ceiling planking survived, fasteners on the inner surface of the floors and futtocks indicate a random fastening pattern. Futtocks that could represent top timbers indicate that the inside of the hull was not planked all the way to the underside of the deck. The fastener size, consistently ¼ inch, also suggests the inner ceiling planking was of similar dimension to the outer hull planking.

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[6] Blaise Ollivier, *18th Century Shipbuilding: Remarks on the Navies of the English & the Dutch from Observations made at their Dockyards in 1737*. Reprint. (Rotherfield, England, 1992).

[7] Gordon P. Watts, Jr., personal communication with author.

Comparable Sloops

Archaeological investigations have taken place on four other shipwrecks identified as eighteenth-century sloops over the past twenty years. The British Army sloop *Boscawen*, built in 1759, was discovered in 1983 near Ticonderoga, New York. Excavated in 1984 and 1985, extensive documentation took place on this hastily built military vessel.[8] In 1987, sport divers discovered the remains of a vessel in the North East Cape Fear River six miles north of Wilmington, North Carolina. The North Carolina Underwater Archaeology Branch investigated the "Rose Hill Wreck" in 1988, identifying it as an early to mid eighteenth-century sloop, likely built in the northeastern American colonies. Its construction made it suitable for both coastal and ocean-going trade.[9] The Clydesdale Plantation vessel was one of nineteen vessels discovered in the Savannah Back River during a 1991 survey carried out by Tidewater Atlantic Research for the United States Army Engineer District, Savannah, Georgia. Excavated in the summer of 1992 it was a small coastal sloop, common in the middle and later eighteenth century, built in the South for riverine and coastal trade along the southeastern American colonies.[10] The Readers Point vessel, located in St. Ann's Bay, Jamaica, and excavated

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[8] Kevin Crisman, "The construction of the *Boscawen*," *Bulletin of the Fort Ticonderoga Museum*, 14 (1985): 356-370.

[9] Mark U. Wilde-Ramsing, et al., *The Rose Hill Wreck: Historical and Archaeological Investigations of an Eighteenth-Century Vessel at a Colonial River Landing Near Wilmington, North Carolina.* (Kure Beach, NC: N.C. Dept. of Cultural Resources, 1992).

[10] Frederick Hocker, "The Clydesdale Plantation Vessel Project: 1992 Field Report," *Institute of Nautical Archaeology Quarterly*, 19:4 (1992): 12-16.

and examined in 1994, was identified as a mid to late eighteenth-century, New England built sloop whose design made it suitable for ocean-going trade.[11]

The *Boscawen* measured 70 feet in length and 22 feet in beam, with a length on keel of 65 feet. The keel is 10 1/2 inches sided, and 14 inches moulded, narrowing at the stern. Floors are inconsistent in size ranging from 8 1/2 to 10 inches sided and 7 to 12 inches moulded. Similarly, futtocks measure from 4 to 8 inches sided and 7 to 10 inches moulded. The keelson is 53 feel long, 10 inches sided, and varies from 6 inches moulded at the bow to 10 inches moulded at the stern. It is through bolted to every other floor. The hull planking varies from 11 to 15 1/2 inches wide but is consistently 2 inches thick and fastened to the frames with iron spikes and treenails. All of the vessel components are white oak (*Quercus alba*) with the exception of some of the treenails that are white ash (*Fraxinus Americana*).[12]

The remains of the Rose Hill wreck measure 61 feet 9 inches in length and 16 feet in beam with a length on keel of 54 feet 6 inches. The keel averages 8 inches sided and 15 inches moulded. Floors average 11 inches sided and 10 1/2 inches moulded and are consistently spaced on 22 inch centers. The first futtocks fill the space between floors and are not fastened at any point. The futtock dimensions match the floors at 11 inches sided and 10 1/2 inches moulded. The keelson is incomplete but measures 10 inches sided by 12 inches moulded and is fastened through the floors with ¾ inch iron drift pins

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[11] Gregory D. Cook, "The Readers Point Vessel: Hull Analysis of an Eighteenth-Century Merchant Sloop Excavated in St. Ann's Bay, Jamaica" (M.A. thesis, Texas A&M University, 1997).

[12] Crisman, "*Boscawen,*" 356-370.

randomly along the length. The hull planking varies in width greatly, depending on its location, but the representative sample examined measures 12 1/2 inches wide and 2 3/8 inches thick. The planking is attached by two treenails on each frame, with ¼ inch square iron nails spaced at roughly five foot intervals (presumably to hold the planks in place while being fastened with treenails). The keelson, some frames, and treenails are white oak (*Quercus alba*), while other frames are beech (*Fagus grandifolia*), and the hull planking is red oak (*Quercus rubra*).[13]

The Clydesdale Plantation vessel is estimated to be 45 feet in length and a beam of perhaps as much as 20 feet. The keel is 8 inches sided and 10 inches moulded. Floors are 6 inches sided and 5 inches moulded, while futtocks average 5 inches sided and 4 inches moulded. Framing is uniformly 24 inches on center. The keelson is 7 inches sided and only 6 inches moulded. The hull planking is 1 1/2 inches thick and averages 11 inches wide. The planking is attached to the framing with nails and randomly spaced treenails. The keel, keelson and planking of the Clydesdale vessel are southern yellow pine (*Pinus* sp.) while the frames are live oak (*Quercus virginiana*) and white oak (*Quercus alba*). The treenails used in the vessel construction are bald cypress (*Taxodium distichum*) and hemlock (*Tsuga* sp.).[14]

The Readers Point vessel remains are 56 feet 6 inches in length and 14 feet 3 ½ inches beam, with a remaining keel length of 42 feet 5 inches. The keel is 9 5/8 inches sided and 10 7/8 inches moulded. The floors average 9 ½ inches sided and 10 inches

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[13] Wilde-Ramsing, *Rose Hill*, 37-46.

[14] Hocker, "Clydesdale Plantation," 12-16.

moulded. They are each attached to the keel on 22 inch centers with an iron drift pin 1 inch in diameter. First futtocks average 8 7/8 inches sided and 8 ½ inches moulded while second futtocks average 6 ½ inches sided and 6 inches moulded. Floors and futtocks are joined together with horizontal treenails at every third floor. The remaining keelson extends 36 feel 11 inches and is 10 7/8 inches sided and 9 5/8 inches moulded. The hull planking is 2 inches thick and varies in width from 8 inches to 18 inches. The planking is attached with treenails only but researchers did not determine any fastening pattern. All of the wood components of the wreck are white oak (*Quercus alba*) with the exception of the keel, which like the Rose Hill wreck is maple (*Acer* sp.).[15]

Vessel	*Boscawen*	Rose Hill	Clydesdale	Readers Point	*Hunter Galley*
Length x Beam	70' x 22'	61' 9" x 16'	45' x 20'	56' 6" x 14' 3"	35' x 16'
Keelson	White Oak	White Oak	S. Yellow Pine	White Oak	Bermuda Cedar
Frames	White Oak	White Oak & Beech	Live Oak & White Oak	White Oak	Spanish Cedar & Central American Mahogany
Planking	White Oak	Red Oak	S. Yellow Pine	White Oak	Spanish Cedar & Central American Mahogany
Treenails	White Oak & White Ash	White Oak	Bald Cypress & Hemlock	White Oak	Bermuda Cedar
Framing on Center	Varied	22"	24"	22"	16"
Fastening Pattern	Iron Spikes & Treenails	2 Treenails & Periodic Nails	Nails & Random Treenails	Treenails (2?)	Nail/Treenail/Nail
Average Moulded	9.5	10.5	5	10	6
Average Sided	9.25	11	6	9.5	7.5
Moulded v. Sided Dimension	M > S	M < S	M < S	M < S or M = S	M < S

Table 5 Comparison of the *Hunter Galley* with other eighteenth-century sloops

[15] Cook, "Readers Point," 47-55.

Summary

Comparison of the *Hunter Galley* with other eighteenth-century sloops show notable similarities and distinct differences. One vessel was built for military service, while the others were designed for merchant use. The comparison not only offers a summary but illustrates the diversity of the sloop rig and vessel design during the colonial period.

The *Boscawen* is not a good example for comparison because it was built for a dramatically different purpose from the other vessels examined archaeologically. It was built for military service on Lake Champlain, and therefore, more heavily constructed (moulded > sided), and more hastily constructed (inconsistent frame spacing, unfinished frames, and iron fasteners rather than more time consuming treenails). It also did not see open-ocean use.

The Rose Hill wreck and the Readers Point wreck are very similar in almost all aspects. The overall size of the vessels is nearly identical, and both are constructed primarily of oak, with a maple keel and the moulded and sided dimensions are very close. Frame spacing for both is 22 inches on center, although the Rose Hill wreck is more heavily framed with no true open space between framing pairs. The hull fastening pattern is also the same, two treenails per plank on each frame (this is implied on the Readers Point vessel). While Rose Hill dates to the early eighteenth century and Readers Point to the late eighteenth century, both were likely constructed in the northern colonies for plantation and intercolonial trade.

The Clydesdale Plantation wreck is obviously of southern construction based on the wood types present in the vessel. It is smaller in size and lighter of build. Framing members are roughly half the dimensions of the Rose Hill and Readers Point wrecks, although the spacing is comparable at 24 inches on center. The Clydesdale Plantation vessel was likely used for river and close coastal trade in the southern colonies, not venturing far to sea, if at all. Its light construction permitted access to shallow areas and hard to navigate passages.

The *Hunter Galley* bridges the design gap between the Rose Hill/Readers Point design and the Clydesdale design. Smaller than the Rose Hill and Readers Point vessels, it is still sturdily constructed, using mahogany and cedar. The use of woods, with roughly two-thirds the specific gravity of the colonial mainstay of white oak, factors greatly into the Bermuda sloops' performance, yielding an increase in carrying capacity and maneuverability. The smaller framing members (moulded and sided) are balanced out by the closer frame spacing (16 inches on center). The result is a small to medium size sloop with the shallow draft and sailing benefits of the lightly constructed Clydesdale vessel, suitable for use in light winds, narrow passages, and shallow bays, sounds, and inlets, with the heavier durability of the Readers Point and Rose Hill vessels, suitable for ocean-going intercolonial trade. The rot resistant and teredo resistant properties of Bermuda cedar, Spanish cedar, and Central American mahogany are also perfectly suited for use in the tropical, saltwater environment of the Caribbean. The high resin content makes the use of sheathing and sacrificial planking unnecessary. This offers reduced weight, increasing the carrying capacity, and a fairer hull with less drag, yielding better

sailing properties over comparable oak vessels, sheathed with a layer of sacrificial pine. It is likely that this combination of virtues contributed to the high regard given to Bermuda sloops for their speed and longevity versus other colonial sloops.

CHAPTER VIII

ARTIFACTS

As with any archaeological site, the systematic recovery and identification of material culture (artifacts) is a vital aspect of analysis and interpretation. It not only provides a means to determine the period of activity for a site temporally, for shipwrecks it often allows for the identification of a particular nationality of the vessel thereby assisting in its identification. The *Hunter Galley* site artifact assemblage consisted of sixty-two individual artifacts (lab numbers 051-301 to 051-362), not including samples of ballast stone, and five general artifact categories: metal, including concretions; ceramics, including pipe stems and brick; organics, including bone, leather, and hemp line; wood, not including hull timbers and planks; and glass. As previously noted all artifacts discovered were collected and transported to the Corange Conservation Laboratory at the Bermuda Maritime Museum for analysis.

Metal

The most predominant artifacts collected from the wreck site were concreted iron fasteners. The concretions were observed to be of two general sizes. The larger concretions averaged 4 inches long with a head diameter of 7/8 inches. Individual concretions varied ±5/8 inches in overall length and varied in head diameter by ±¼ inches. Examination of the remaining metal within a sample of the concretions indicates wrought iron fasteners with an approximate length of 3 ¾ inches with a ¼ inch shank and

square rose head. These measurements are consistent with the nails still present in the ships timbers and planking. Ten of the larger fasteners were discrete concretions while others, seven and two respectively, were part of a larger concreted mass of fasteners.

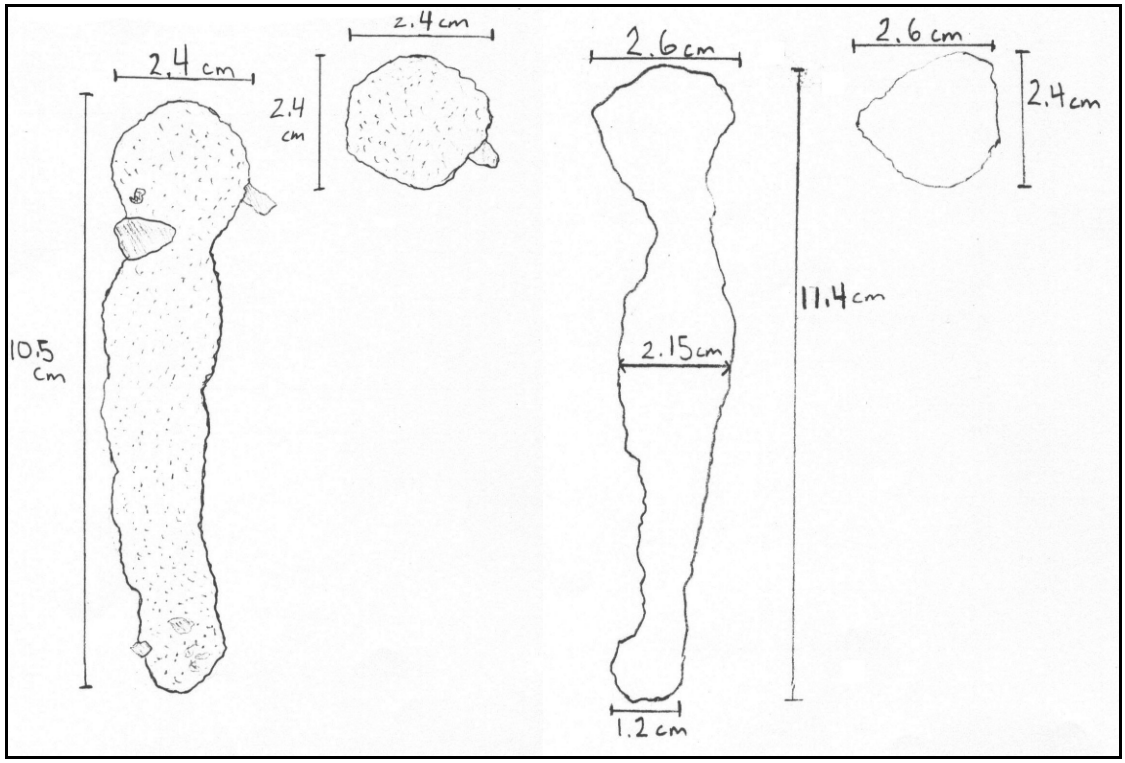

Figure 29 Concreted Iron Fasteners (051-351 left, 051-356 right)

The smaller concretions averaged 3 ¾ inches in length, with no discernable head and an average width of ¼ inch. Upon closer examination of the remaining metal within these concretions appear to be wrought iron nail fragments. Two of the fastener fragments were discrete concretions while others, two and four respectively, were part of a larger concreted mass of fasteners.

While abundant on site, there is no effective means to date wrought iron nails. They were common during the seventeenth and eighteenth century and continued to be used even into the nineteenth century, although cut nails were coming into use during the last decade of the eighteenth century.[1]

One large concreted iron fastener was recovered, that appears to be some variety of spike or drift pin. The concretion measured 9 inches in length with a head diameter of 2½ inches and 1½ inches thickness. The concreted shank was 1½ inches thick and when mechanically cleaned near the head showed an actual shank diameter of approximately 1 inch.

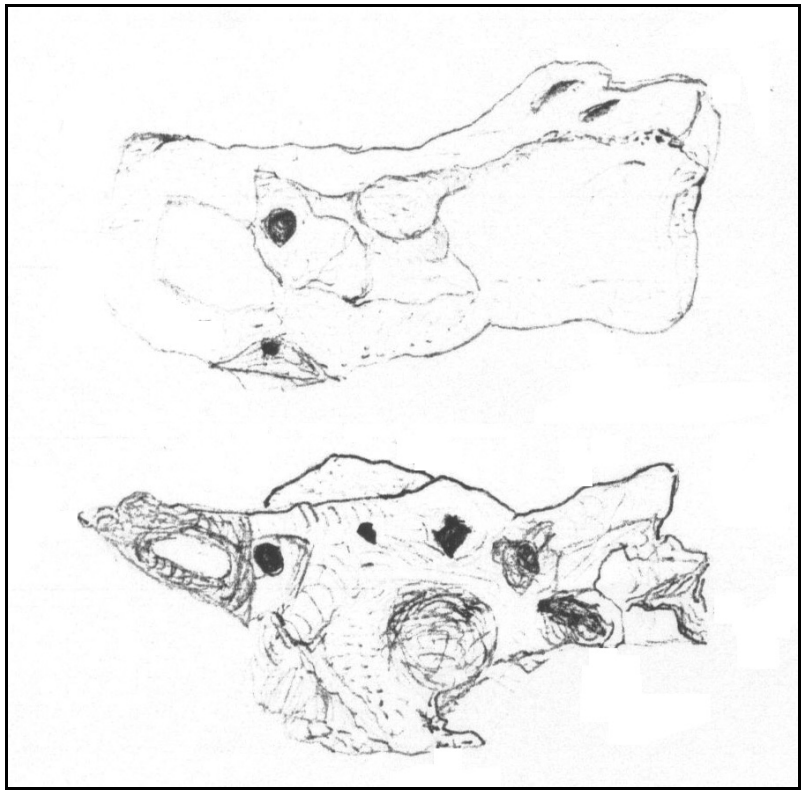

Figure 30 Unidentified metal fastener or clasp (051-345)

[1] Ivor Noel Hume, *A Guide to Artifacts of Colonial America* (New York, 1969), 252.

A final metal artifact (051-345) was a piece of lightly concreted iron. Its purpose and function have not been determined, but the supposition is that it is some variety of fastener or clasp. Being iron it is not likely that it would be a clothing fastener except in the most rudimentary form. While most hardware on small boxes and the like were made of brass it is possible that iron would have been used in a utilitarian piece.

Artifacts recovered from previous archaeological work by Dethlefsen in 1974 are reported as three iron hooks, iron spikes, and numerous concreted iron fittings. None of these are described in detail and even if they were, would not likely prove temporally diagnostic.

Ceramics

Ceramics typically are some of the most temporally diagnostic artifacts that can be recovered on an archaeological site. A limited number of ceramics were recovered from the alleged *Hunter Galley* site. One fragment of ceramic (051-327) had a yellowish glaze with a dark brown streak. Close examination and comparison to ceramic ware types indicate that the fragment is lead glazed slipware likely of the English Staffordshire variety. Ornamental slipwares generally used light colored clay having a buff or yellow body and were decorated with combed lines of iron oxide or manganese under a clear to pale yellow glaze.[2] Staffordshire slipware was typically made from a light colored clay, yellow or buff mixed with pink. A white slip was applied, which typically turned yellow when glazed, and

[2] *Ibid.*, 134.

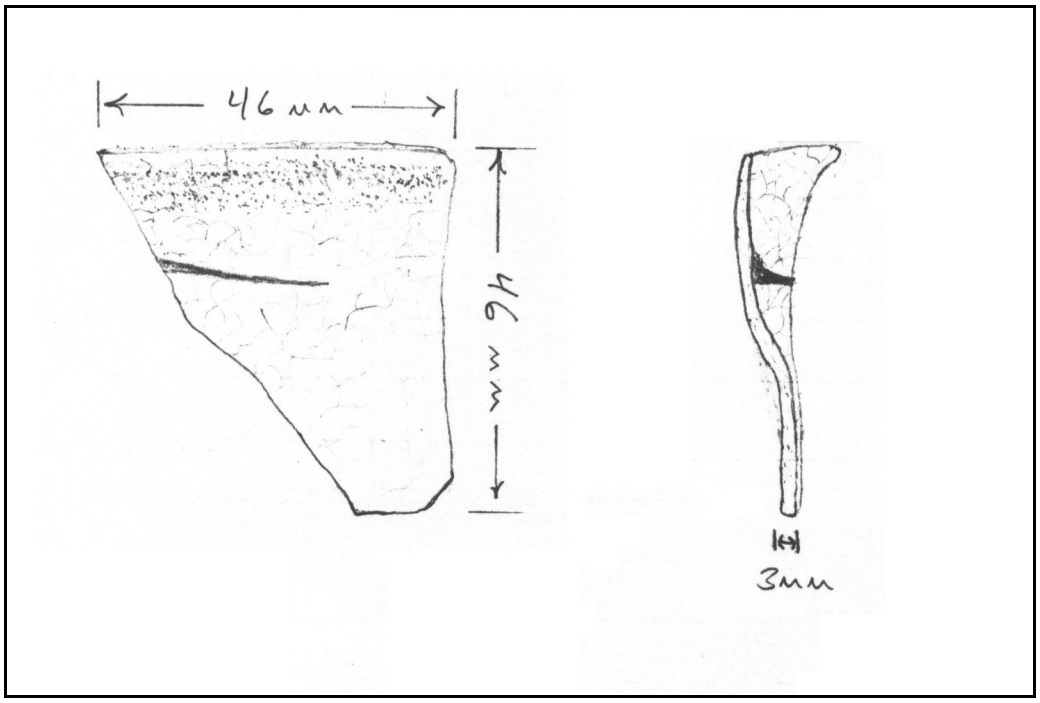

Figure 31 Staffordshire ornamental lead-glazed slipware (051-327)

then black or brown slip was painted over the white.[3] There are numerous types and variations of Staffordshire ceramics. Combed and marbleized patterns, as well as a molded painted relief variety are common on eighteenth-century sites in America and the West Indies.[4] While a mean ceramic date cannot be determined using Stanley South's formula, South does provide a date range and median date for the ceramic type. Lead glazed slipware has a median date of 1733 with a range of circa 1670 to 1795.[5] This date correlates with the dates for the *Hunter Galley* of 1747 to 1752.

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[3] *Ibid.*, 135.

[4] *Ibid.*, 136-7.

[5] Stanley South. "Evolution and Horizon as Revealed in Ceramic Analysis in Historical Archaeology," Chapter 17 in *Historical Archaeology: A Guide to Substantive and*

A second ceramic fragment (051-342) was an abraded red-bodied coarse earthenware. No glaze was evident on the piece, although giving the saltwater conditions and exposure it is feasible that the glaze had all flaked off.

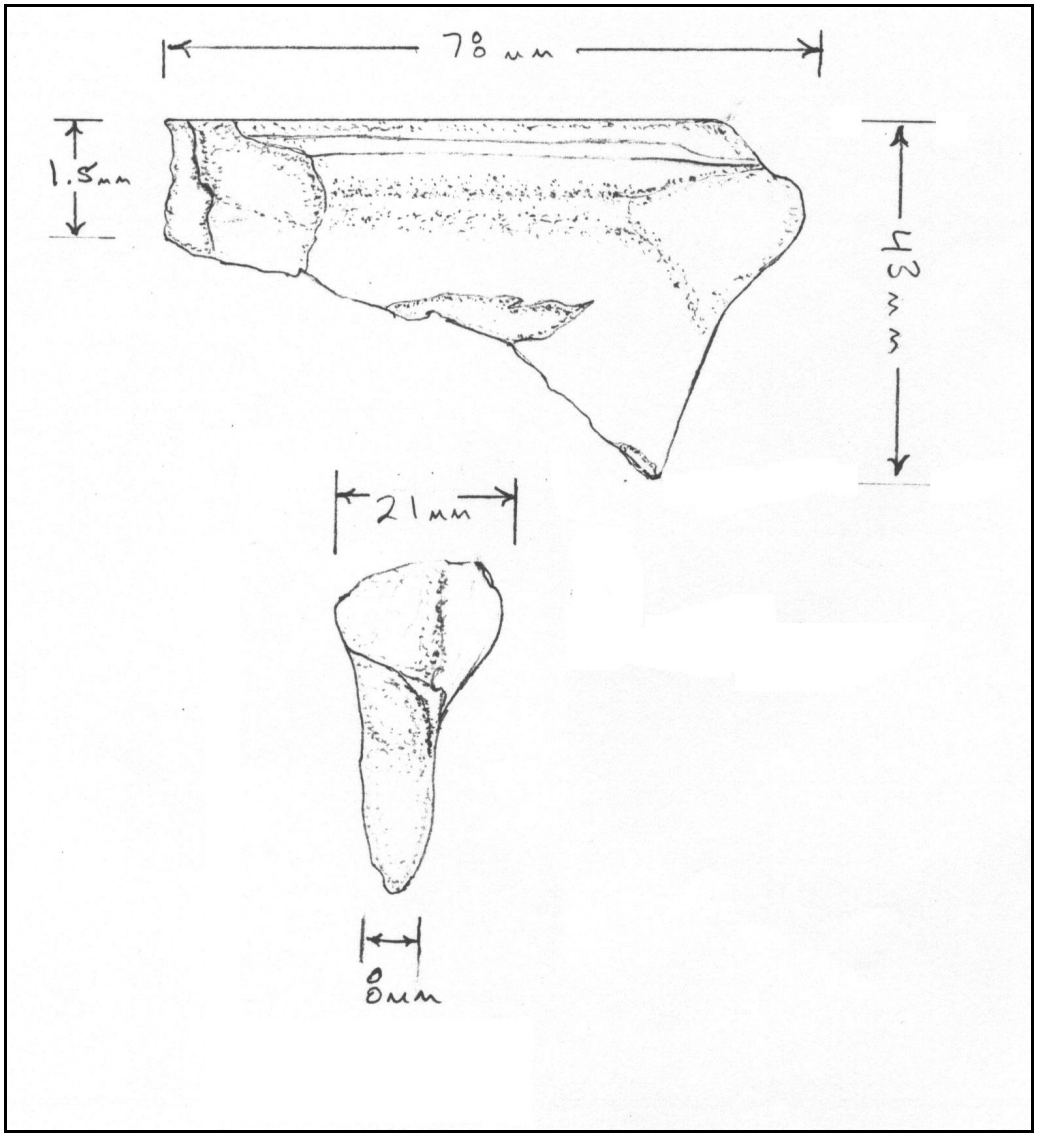

Figure 32 Red-bodied coarse earthenware rim sherd (051-342)

Theoretical Contributions, ed. Robert L. Schuyler, (Farmville, NY: Baywood Publishing Company, 1978), 72.

The piece appears to be a rim fragment with a rolled lip. While not providing a useful date range, coarse red-bodied earthenwares were common in the eighteenth century in many different forms, usually as utilitarian vessels such as chamber pots.[6]

The most prominent ceramics found at the *Hunter Galley* site were olive jar fragments (051-328 to 051-331) and an olive jar rim and shoulder (051-332). Olive jars represent one of the most prevalent ceramic traditions from Spanish colonial sites and shipwrecks in the Americas.[7] Given the fact that the *Hunter Galley* was involved in inter-colonial trade between British North America and the West Indies, where numerous European colonial governments, including Spain, held power, it is not unexpected that an olive jar be found associated with the wreck site. Ivor Noel Hume notes there are many variations of size of olive jars in the West Indies and most examples from British sites and shipwrecks date to 1745-1780.[8] Olive jars were used primarily as storage and shipping containers for liquids and small victuals. As Mitchell Marken observed, their shape was "highly suited for storage and shipboard transport over rough waters. Their rounded form maximizes structural integrity and tier incurvate sides fit nicely against a curving hull. The small opening makes for an easy closure with minimal airspace."[9]

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[6] Noel Hume, *Artifacts*, 146.

[7] Mitchell W. Marken, *Pottery from Spanish Shipwrecks 1500-1800* (Gainsville: University Press of Florida, 1994), 41.

[8] Noel Hume, *Artifacts*, 144.

[9] Marken, *Pottery*, 43.

John M. Goggin established a general chronology for olive jars, in his 1960 work.[10] The Early period dated from circa 1500 to 1580. The Middle period ranged from the last half of the sixteenth century (1562-1600) to the last half of the eighteenth century (1750-1800). The Late period dated to the last quarter of the eighteenth century and later (1780-1850...).[11] Goggin also defines three common vessel shapes from the Middle Period. Shape A is "a large egg-shaped vessel." Shape B is a "medium-sized, compressed egg-shaped vessel." Shape C is "a small, pointed egg-shaped vessel."[12] While Goggin's work provided a general framework it did not offer a means for detailed temporal analysis. This came later with a more detailed classification system developed by Mitchell W. Marken. Marken continued the use of vessel shapes for analysis, categorizing them as Types A, B, and C. To this he added six different types of rim design. Marken determined that rim design served as a temporal indicator for olive jars.[13]

The three body fragments from the *Hunter Galley* site do not provide any solid temporal diagnostic information, but they do exhibit classic olive jar traits. Fragment 051-329 is triangular, 5 inches long and 6 inches wide. It shows evidence of turn marks on both the exterior and interior, more prevalent on the interior. Fragment 051-330 is triangular, 4.68 inches long and 3.9 inches wide. It has a pinkish-tan paste with a light

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[10] John M. Goggin, *The Spanish Olive Jar: An Introductory Study*. Papers in Caribbean Anthropology, vol. 62 (New Haven, CT: Yale University Publications in Anthropology, 1960).

[11] *Ibid.*, 23-24.

[12] *Ibid.*, 12-13.

[13] Marken, *Pottery*, 50.

greenish glaze on the exterior and clear on the interior. Fragment 051-331 is triangular, 5.67 inches long and 5.28 inches wide. It is heavily concreted with only a small section of tan colored paste exposed.

Figure 33 Olive Jar body fragments (051-329, 051-330)

The olive jar rim and neck fragment exhibits a similar light greenish-brown exterior glaze with a clear glaze on the interior. It has a pinkish-brown to grayish paste. The rim type is a doughnut shaped half-circle that corresponds to Marken's definition of a subtype of his Type 3 rim. A Type 3 rim is "a doughnut-like, thickened rim with a semi-triangular shape, formed with the pal of the potter's hand . . . a semi-circular version . . . may be interpreted as a subtype.[14] Examining the extensive collection of olive jars from two 1724 shipwrecks, the *Tolosá* and *Guadalupe*, Marken observed "the rims of the Type B olive jars all have a distinctly rounded and smoothed appearance. A general stylistic difference, although the Type B olive jars all exhibit Type 3 rim construction, is

[14] *Ibid.*, 50.

the more pronounced half-circle rim form in contrast to the semi-triangular appearance of earlier examples (seventeenth century)."[15] There is only a single instance of a Type 3 semi-circular rim on any other body style than Type B. One vessel found on the St. John's, Bahamas Islands' wreck has a semi-circular Type 3 rim with a Type A shape. The vessel was noted to be crudely formed and dramatically irregular in its lower section.[16] Taking the vessel from the St. John's Bahamas wreck as a singular anomaly, it is presumed that the vessel form for the olive jar recovered from the *Hunter Galley* wreck site is a Type B shape, defined as a ½ arroba botija by Marken.

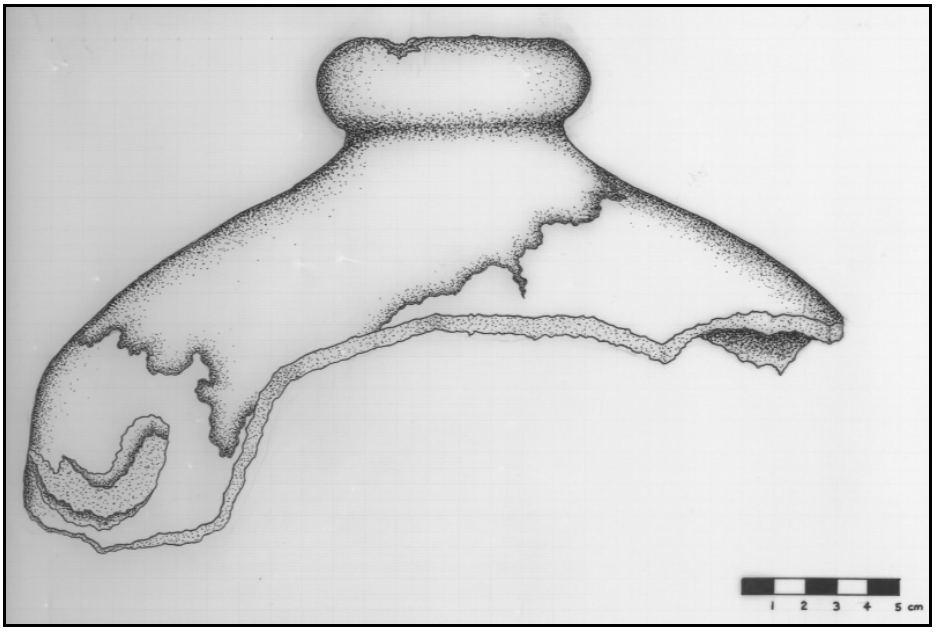

Figure 34 Profile view of olive jar rim and neck (051-332)

[15] *Ibid.*, 98.

[16] *Ibid.*, 53.

The olive jar rim and shoulder (051-332) has a rim diameter of 8.7cm, a neck diameter of 7cm, and an overall diameter of 24cm. These measurements correspond closely with a 1724 profile given by Marken. Extrapolating from this correlation, the overall height of the *Hunter Galley* olive jar was likely 28cm.

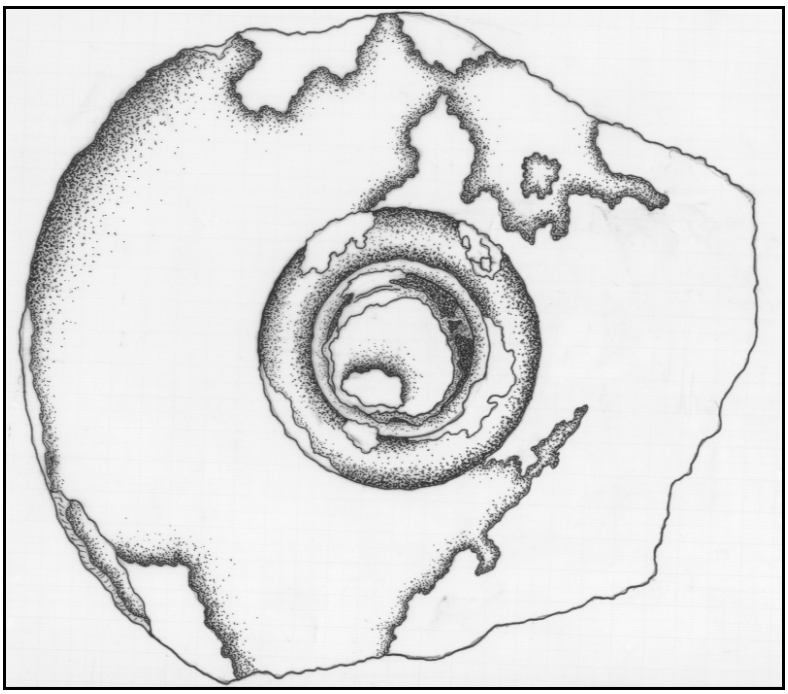

Figure 35 Top view of olive jar rim and neck (051-332)

The olive jar rim and shoulder fragment (051-332) can be summarized with the classification and dating system Marken devised as follows. It is a Type B vessel, a ½ arroba botija, dating to the early eighteenth century. It has a Type 3 rim of the semi-circular sub-type. It has no marks on the rim, neck or body, is glazed, and exhibits sharper angles on the shoulders rather than the more rounded shoulders of earlier periods.

The average volume is calculated at 5.10 liters.[17] While the numerous examples used to define the classification date to 1724, the form and design, common early in the eighteenth century, could easily persist into the middle part of the eighteenth century, the time period of the *Hunter Galley*.

Previous work on the site recovered numerous ceramics although there is little detail provided other than general ware type. In some instances the ware type provided by Dethlefsen is in itself ambiguous. A general examination of the ceramics recovered by the 1974 archaeological work can supplement the ceramics collected during the 1998 archaeological investigations and contribute to the overall temporal analysis.

Dethlefsen identified Rhenish stoneware as one of the ware types recovered from the site. He does not state whether it is brown or gray stoneware. This omission leaves the possibility of dates from the mid-sixteenth century through the late eighteenth century.[18] While this provides a good *terminus post quem*, archaeological evidence indicates that Rhenish stoneware lost favor in England and America in the 1760s and was not imported after the American Revolution.[19]

Another generic description is Dethlefsen's salt-glazed Staffordshire stoneware. There were many varieties of white salt-glazed stoneware from Staffordshire, but their overall date range does correspond to the eighteenth century (1715-1805) with a mean date of 1756. The lead-glazed redware listed by Dethlefsen, falls within the overall

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[17] *Ibid.*, 130.

[18] South, "Ceramic Analysis," 72.

[19] Noel Hume, *Artifacts*, 283.

category of lead glazed slipware. This provides a date range of 1670 to 1795, with a median date of 1733.[20]

The delftware found on site was likely plain white delftware, as it was not described in any more detail to express color or decoration. Plain white delftware has a date range of 1640 to 1800 with a median date of 1720. Decorated delftware dates generally to the seventeenth and eighteenth century. A final ware type identified in the 1974 investigation was Chinese export porcelain. Overglaze enameled Chinese export porcelain as well as underglaze blue Chinese porcelain have a date range from 1660 to 1800 with a median of 1730.[21] These ware types provide somewhat wide temporal ranges and they often represent a generic categorization for archaeologists. South terms these as "catch all" and, therefore, reflect less sensitive temporal data. In at least one case, Brunswick Town, North Carolina, he notes that a more accurate date can be obtained by not using these ware types in temporal analysis.[22] Nevertheless, the date ranges do incorporate the time period that the *Hunter Galley* was active and could feasibly be associated with the wreck.

Pipes

Divers recovered two pipe stems from the wreck site during excavation. The first stem was 3 5/16 inches long with an outside diameter of ¼ inch. It was grey-white clay

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[20] South, "Ceramic Analysis," 72.

[21] *Ibid.*, 72.

[22] *Ibid.*, 71-72.

with blackened/brown discolorations. A unique feature of this stem was its decoration. Near one end were alternating bands carved into the clay. The second stem was 1 ¾ inches long with a tapering outside diameter of 5/16 inches to ¼ inches. Two small cut marks were noted near the wider end. This stem was white clay, discolored gray.

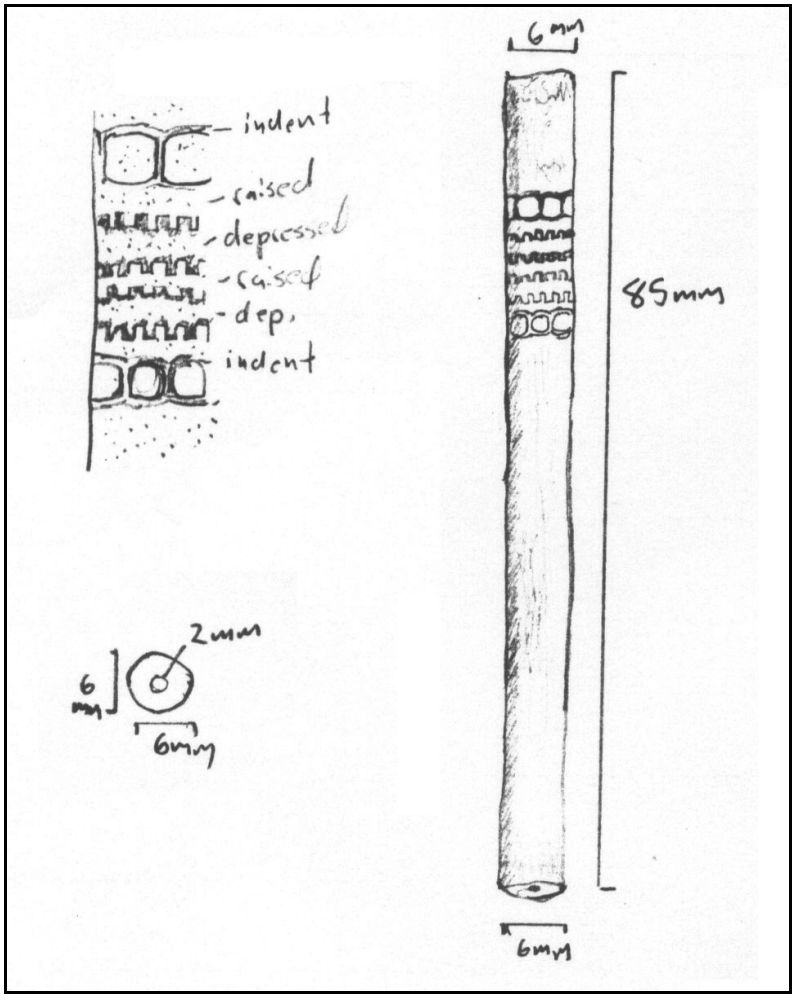

Figure 36 Longer pipe stem fragment showing carved details (051-319)

Both stem hole diameters measured 5/64 inches. Based on the "Harrington Theory" method of dating pipe stems established by J. C. Harrington of the United States National Park Service in 1954, the bore diameters yield a *terminus post quem* of 1680, and a *terminus ante quem* of 1800. Harrington's chart indicates that approximately seventy percent would cluster in the range of 1710 to 1750.[23] By using the straight-line linear regression formula that Lewis R. Binford calculated from Harrington's chart a date of 1740.55 is derived.[24] While basing a date, or date range, on two pipe stems is not statistically sound, indeed Harrington states that applying his chart to a single pipe stem "would be unwise, on the whole, as well as statistically unthinkable,"[25] it does lend support to the date range being derived for the wreck site from an overall artifact analysis.

Dethlefsen's group recovered four pipe stems during the 1974 archaeological work. They are identified as being 5/64 and 6/64 inches in diameter but he does not provide the quantities of each diameter. Applying Harrington's chart to the combination of the two sized yields a date range from 1650 to 1800 with 81 percent of the pipe stems falling between 1680 and 1750.

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[23] J.C. Harrington, "Dating Stem Fragments of Seventeenth and Eighteenth Century Clay Tobacco Pipes," Chapter 15 in *Historical Archaeology: A Guide to Substantive and Theoretical Contributions*, ed. Robert L. Schuyler, (Farmville, NY: Baywood Publishing Company, 1978), 64. Noel Hume, *Artifacts*, 298.

[24] Lewis R. Binford, "A New Method of Calculating Dates from Kaolin Pipe Stem Samples," Chapter 16 in *Historical Archaeology: A Guide to Substantive and Theoretical Contributions*, ed. Robert L. Schuyler, (Farmville, NY: Baywood Publishing Company, 1978), 66. Noel Hume, *Artifacts*, 299.

[25] Harrington, "Stem Fragments," 64.

Brick

Four brick fragments and two pieces of mortar were found and recovered from the wreck site. Artifact 051-321 was dark red brick, roughly spherical, with numerous pits. It also was flecked with a white substance, possibly inclusions from when it was manufactured. Brick fragment 051-322 was also dark red in color but denser than the previous sample. Horizontal striations were also evident upon close examination. Fragment 051-323 appeared to be a corner piece from a brick and exhibited a dark red surface and a brighter red on what would have originally been the interior of the brick. A small portion of mortar was still attached, and one outer edge has a smooth greenish-black area that appears to be a glaze. Richard Neve explains the presence of a glaze on bricks in his builders' dictionary from 1736 where he describes the three categories of brick. "The first and best sort for lasting are those which lie next the Fire, and have, as it were, a Gloss on them, which proceeds from the Salt-petre inherent in them, which by the Violence of the Fire, runs and glazes them; these are called *Clinkers*."[26] Artifact 051-324 is a dense yellowish brick fragment, slightly pitted but indistinguishable other than by color. The mortar pieces, 051-325 and 051-326, were pitted and grey with small quartz inclusions. Both were soft and in a fairly fragile state.

While brick is often a common artifact found on archaeological sites, single bricks and brick fragments do not offer much diagnostic information. The majority of bricks were manufactured with local clays although brick of yellow or buff color are often referred to as Flemish or Dutch brick and dated generally to the seventeenth century

[26] Richard Neve, *The City and Country Purchaser's and Builder's Dictionary* (London, 1736) quoted in Noel Hume, *Artifacts*, 81.

although they continued to be used into the eighteenth century as well.[27] The brick carried onboard ship would likely have been associated with the galley area. While brick was sometimes a cargo or carried in ballast during colonial times, it was not very profitable based simply on its volume to weight ratio. Bricks could also prove hazardous if carried as a saleable variety of ballast, as they were likely to absorb water, especially if moderate to poor quality, and could affect the stability and sailing ability of a vessel.[28] As the brick fragments are not temporally diagnostic nor geographically diagnostic, since the travel of a ship could allow the brick carried onboard to come from any variety of locations, they did not prove useful for analysis of the *Hunter Galley* site.

Organics

Saltwater ocean conditions are not very conducive to preservation of organic materials. However, once buried in a relatively stable sand bottom, they will reach a state of equilibrium that allows them to endure. All of the organic materials from the *Hunter Galley* wreck site were recovered from bottom excavations. The types of artifacts recovered included bone, leather, hemp, and wood.

Excavations exposed ten bones or bone fragments during the 1998 field investigation. Two bones (051-310 and 051-311) exhibited thickness and curvature consistent with skull fragments. These were identified as fragments of a pig skull. Two bone fragments (051-312 and 051-313) were too degraded to be identified or associated

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[27] Noel Hume, *Artifacts*, 82-83.

[28] *Ibid*., 82.

with any particular anatomical part or species. Three bone pieces (051-314, 051-315, and 051-339) were identified as being fragments of pig rib.

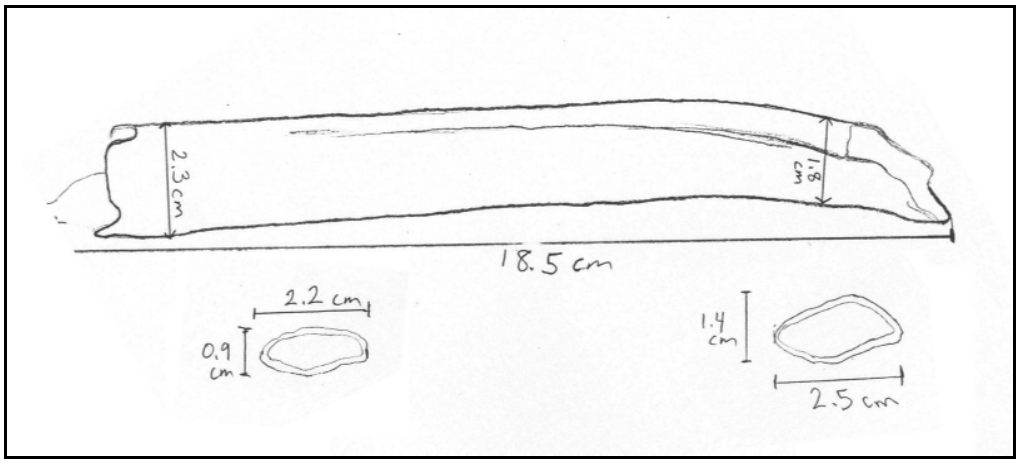

Figure 37 Pig rib fragment (051-339)

Of the remaining three bones, two were highly degraded but still identifiable as a scapula and a segment of pelvis. The final bone, another pelvis fragment, was in good condition for measurement and comparison. Like the other bones recovered it was identified as coming from a small pig.

Nineteen bones or bone fragments were recovered during the 1974 Dethlefsen project. While details were not provided, identifiable bones included: two pig, three cow, one horse tooth, two human teeth, and three other human bones.

While not temporally diagnostic, the presence of bone can provide some insight into the dietary intake of the sailors. Varieties of salted pork and beef were likely included in the ships victuals, and the possibility exists the small live pigs were carried onboard as a source of fresh meat. The presence of a horse tooth is curious, and the

presence of two human teeth would seem to offer commentary on the oral hygiene, or lack there of, for the men onboard. It is the presence of three unidentified human bones that opens an entire realm of speculation. No lives were lost in the wrecking process of the *Hunter Galley*, and the one sailor that was lost on its final voyage was swept overboard during the initial gale that struck the vessel.

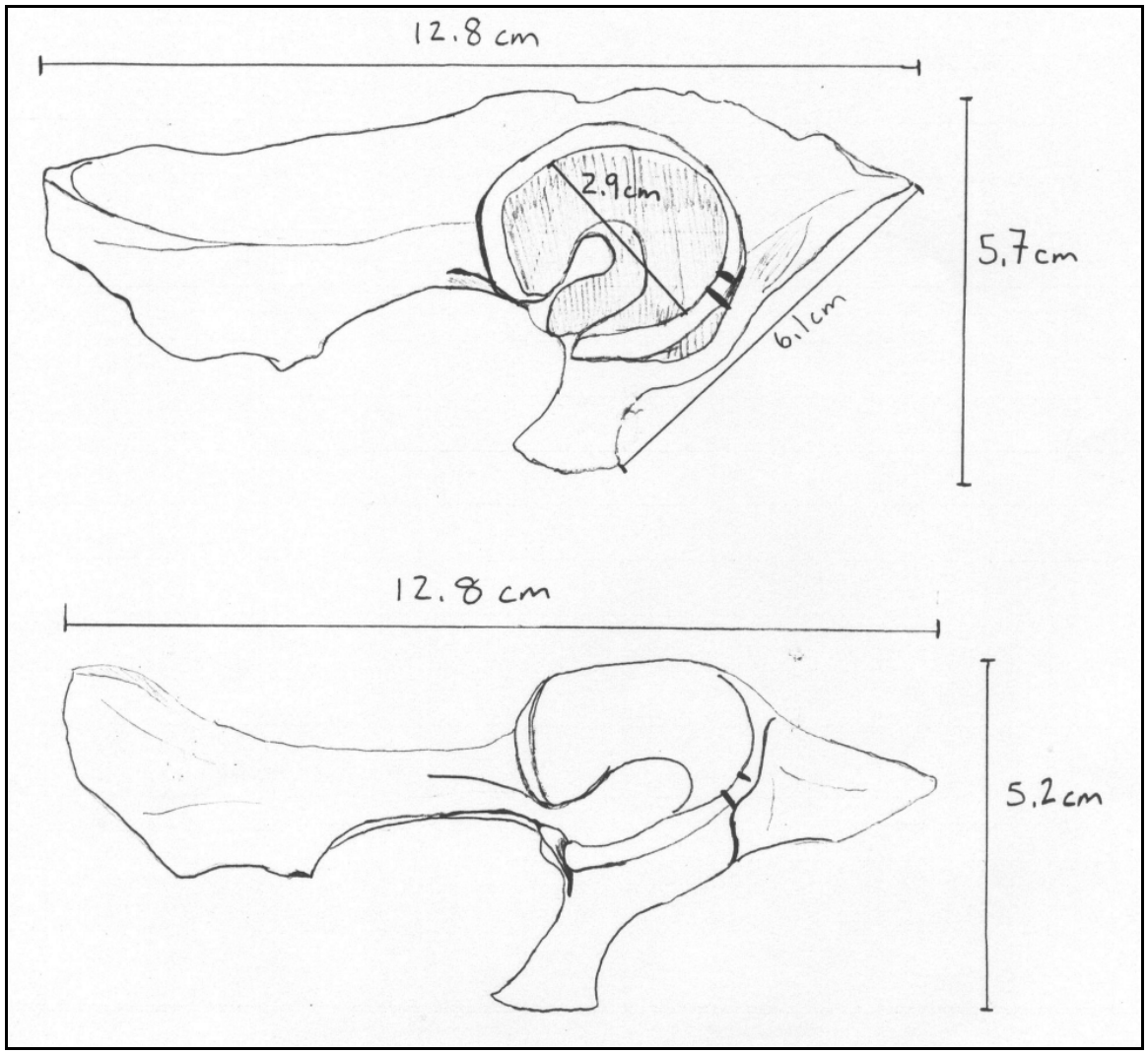

Figure 38 Pelvis fragment from a small pig (051-317)

A section of thick, tanned/cured leather was recovered during the 1998 excavations. It was trapezoidal in shape roughly fifteen inches by twenty-three inches and 3/8 inches thick. No discernable tool marks were found, and there was no indication of use or function. Due to its fragile organic nature the leather piece was retained at the Corange Conservation Laboratory in wet storage.

Another fragile organic retained in the conservation lab were two pieces of one and one half inch diameter, right laid, three strand hemp rope. The first piece was seven inches long and the second was four and one third inches long. Both were partially served with eighth inch diameter tarred marline. During the 1974 Dethlefsen fieldwork an entire coil of three-quarter inch diameter hemp line was discovered but it disintegrated during their attempt to recover it.

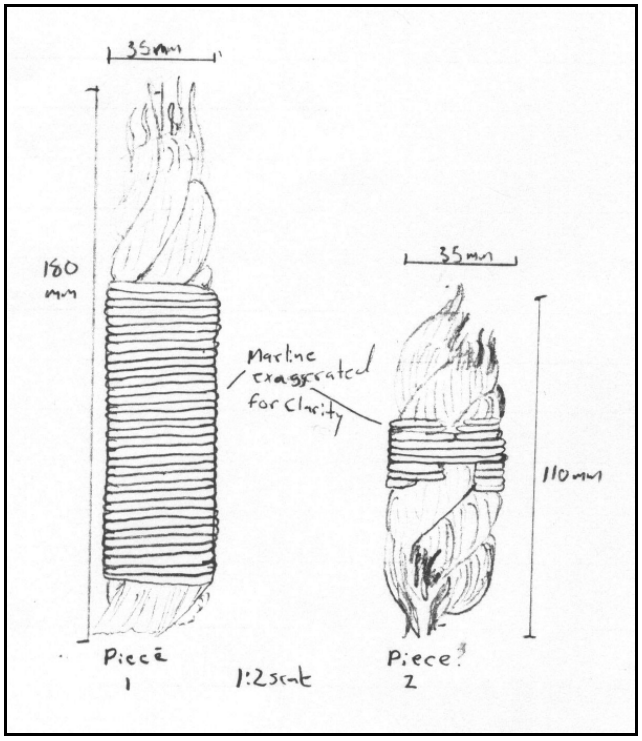

Figure 39 Served hemp line recovered from site (051-301)

Wood

A small selection of wood artifacts, not directly associated with primary ship architecture (framing, timbers, and planks), was discovered during excavation on site. Five treenail fragments were recovered. Two treenails (051-303 and 051-340) were rounded and approximately 7/8 inches in diameter. One treenail (015-305) was four sided, 1 inch by 1¼ inch. The remaining two unassociated treenails were hexagonal in shape averaging approximately 5/8 inches across.

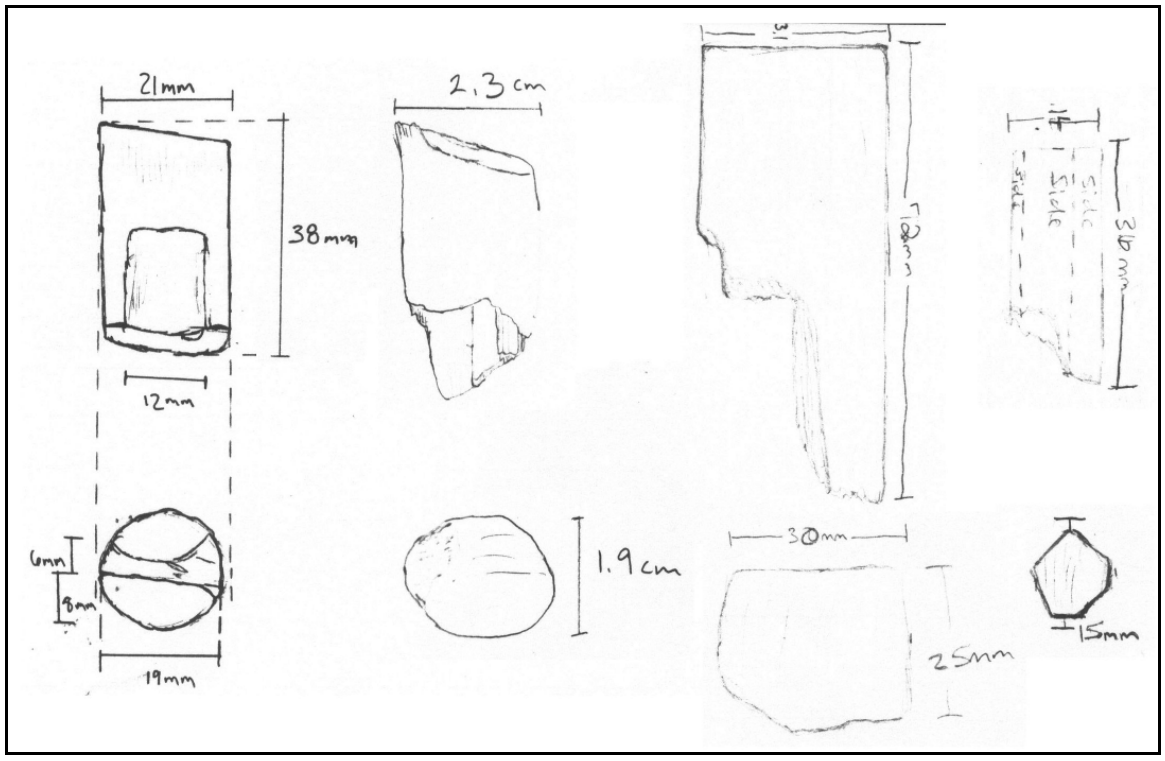

Figure 40 Treenail fragments L-R (051-303, 051-340, 051-305, 051-306)

A wooden bung piece was that would have plugged an access hole in a cask, or barrel was excavated from near the ballast pile. The bung was 2 1/2 inches in diameter at

its widest, tapering down to a minimum diameter of 1 5/8 inches in diameter. Its overall length was 3 inches. The bung was smooth along the top and the upper (wider) half, and showed evidence of cracking along the bottom and the lower (narrower) half. This is presumed to be scarring or wear from its insertion into a cask head. The measured diameter at the top of the wear marks indicates a two-inch diameter hole in the barrel.

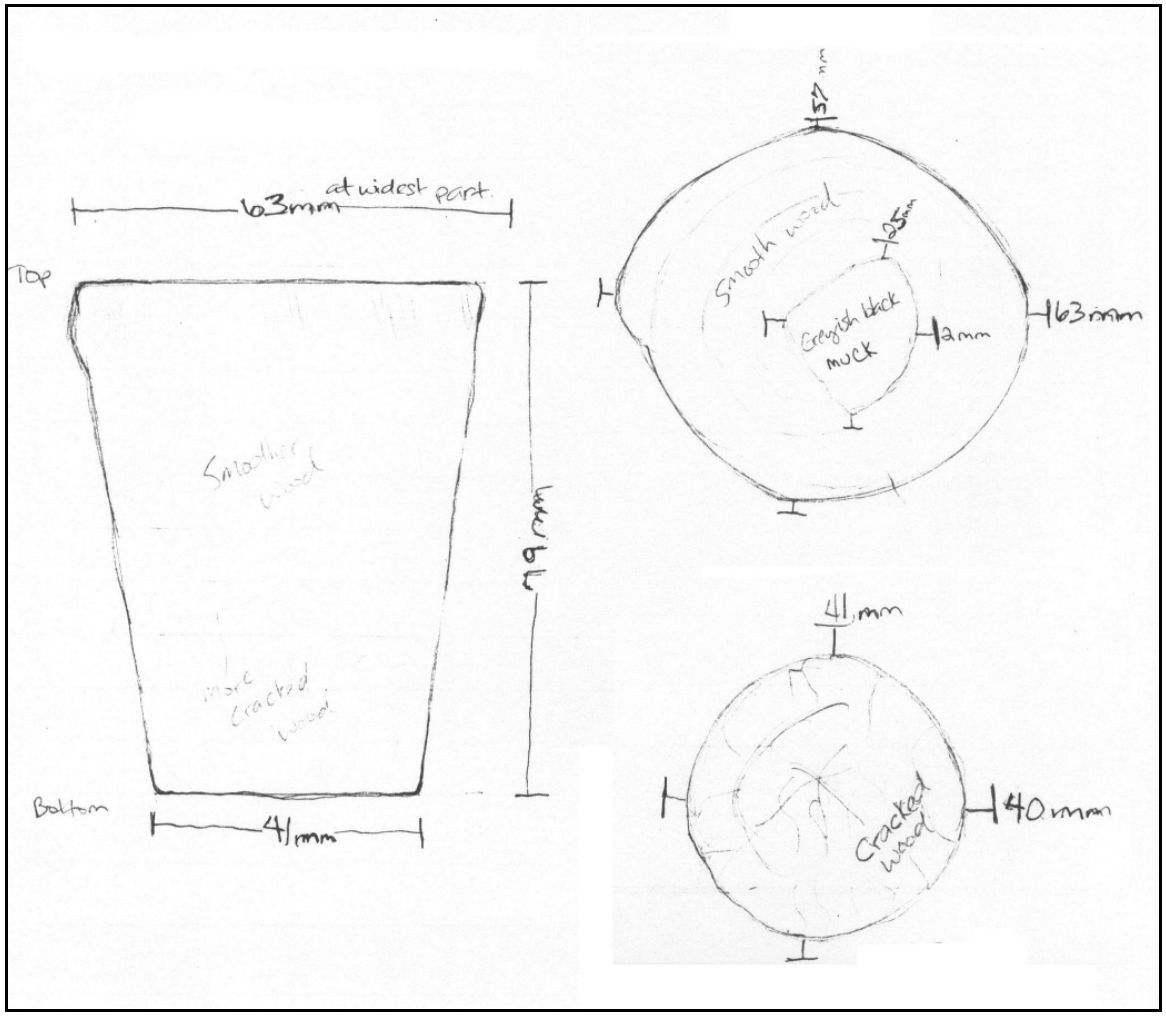

Figure 41 Wooden Barrel Bung (051-308)

A final small wood artifact recovered from the wreck site was a broken section of planking. This fragment was 5 inches wide, 15 ¼ inches long overall, and 1 ¼ inches at its thickest. There was a rounded indentation on one side of the plank with a maximum width of 1 inch and a maximum depth of ¼ inch. The wood was identified as Central American/Spanish mahogany (*Swietenia mahogoni*). Spanish mahogany grows throughout the Caribbean and Central America and was well known for its use in shipbuilding.[29]

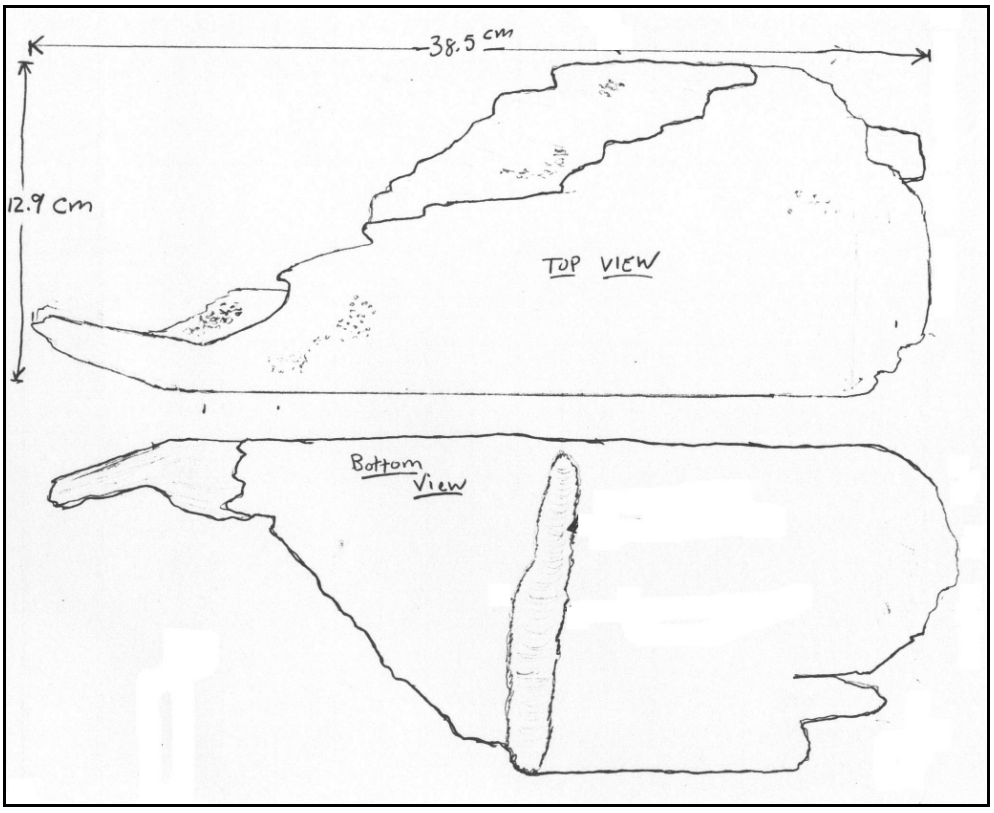

Figure 42 Small section of Spanish Mahogany Plank (051-309)

[29] Amy M. Mitchell, "A Comparison of Wood Use in Eighteenth-Century Vessels," (M.A. thesis, East Carolina University, 1994), 81.

Glass

The *Hunter Galley* site yielded a small sampling of glass artifacts (051-333 to 051-338). Glassware found archaeologically typically provides an excellent means to date a site. The majority of the fragments recovered were dark-green bottle glass, typically identified as wine bottles. English "wine" bottles were introduced in the mid-seventeenth century and were used extensively through the mid-nineteenth century. They were used primarily to transport wine, beer, rum, and other potables during the colonial period.[30] These cylindrical bottles went through both major and minor changes in the shape and size of the neck, shoulder, body, and base over their two hundred years of dominance as a container.[31]

Three of the dark-green bottle glass fragments recovered (051-333, 051-334, 051-336) were small body shards and could offer no temporally diagnostic information. All were devitrified and water eroded. The fourth bottle fragment (051-338) was an intact rim, neck, and the beginnings of the shoulder. Many researchers have established chronological guides using bottles from datable archaeological context or bottles with dated or datable seals attached.[32] The problem with these illustrated chronologies, as

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

[31] Noel Hume, *Artifacts*, 60. Olive R. Jones, *Cylindrical English Wine and Beer Bottles 1735-1850*, (Ottawa: National Historic Parks and Sites Branch Environment Canada – Parks, 1986), 9-11.

[32] Rees Price, "Notes on the Evolution of the Wine Bottle" *Transactions of the Glasgow Archaeology Society*, 6:1 (1908): 116-125. E. Thurlow Leeds, "On the Dating of Glass Wine-Bottles of the Stuart Period" *The Antiquary*, 50 (1914): 285-290. Francis Buckley, "Old English Glass. The Development of the Bottle" *Glass*, 8 (1931), 322-324, 333. E.

pointed out in Olive R. Jones' work, is that it is difficult to match bottle fragments recovered from archaeological excavations to the illustrations. The illustrations also typically depict individual examples and have no measurable representation of a continuous evolution of form and design. Jones offers a linear regression formula for estimating the age of cylindrical English wine bottles, similar in theory to that offered by Binford for pipe stems, and South for calculating a mean ceramic date from an archaeological site. Jones devised her formula from a sample of 211 bottles of known date. When the formula is applied to the sample bottles and the results compared to known dates, it yields and standard error of 7.7 years for whole bottles, 11.2 years for neck fragments, and 16.5 years for bottom/base fragments.[33]

When the neck fragment age estimate formula is applied to the sample recovered from the *Hunter Galley* wreck, the following results are obtained.

Measurement	Code	Coefficient	Value	Coeff. x Value
Constant	X0	1740.0	1	1740
Bore Diameter	X2	-1.1332	19	-21.5308
Finish Height	X7	1.7357	10	17.357
Neck Diameter 1	X8	2.0156	23	46.3588
Lip	X23	2.1880	4	8.752
Lip Indicator	X24	-20.2960	2	-40.592
Calculated Date				1750.345

Table 6 Bottle measurements and data calculation

Thurlow Leeds, "17th and 18th Century Wine-Bottles of Oxford Taverns" *Oxoniensia*, 6 (1941): 44-55. Ivor Noel Hume, "The Glass Wine Bottle in Colonial Virginia" *Journal of Glass Studies*, 3 (1961): 91-117, and "Glass in Colonial Williamsburg's Archaeological Collections" *Colonial Williamsburg Archaeological Series*, 1 (1969). Helen McKearnin and Kenneth M. Wilson, *American Bottles & Flasks and Their Ancestry*, (Crown Publishers, New York: 1978).

[33] Jones, *Bottles*, 161-168.

When the standard error if factored in, the date range for the bottleneck fragment is 1728-1773, with a 95 percent confidence factor. The mean date of 1750 falls within the known dates for the active period of the *Hunter Galley*.

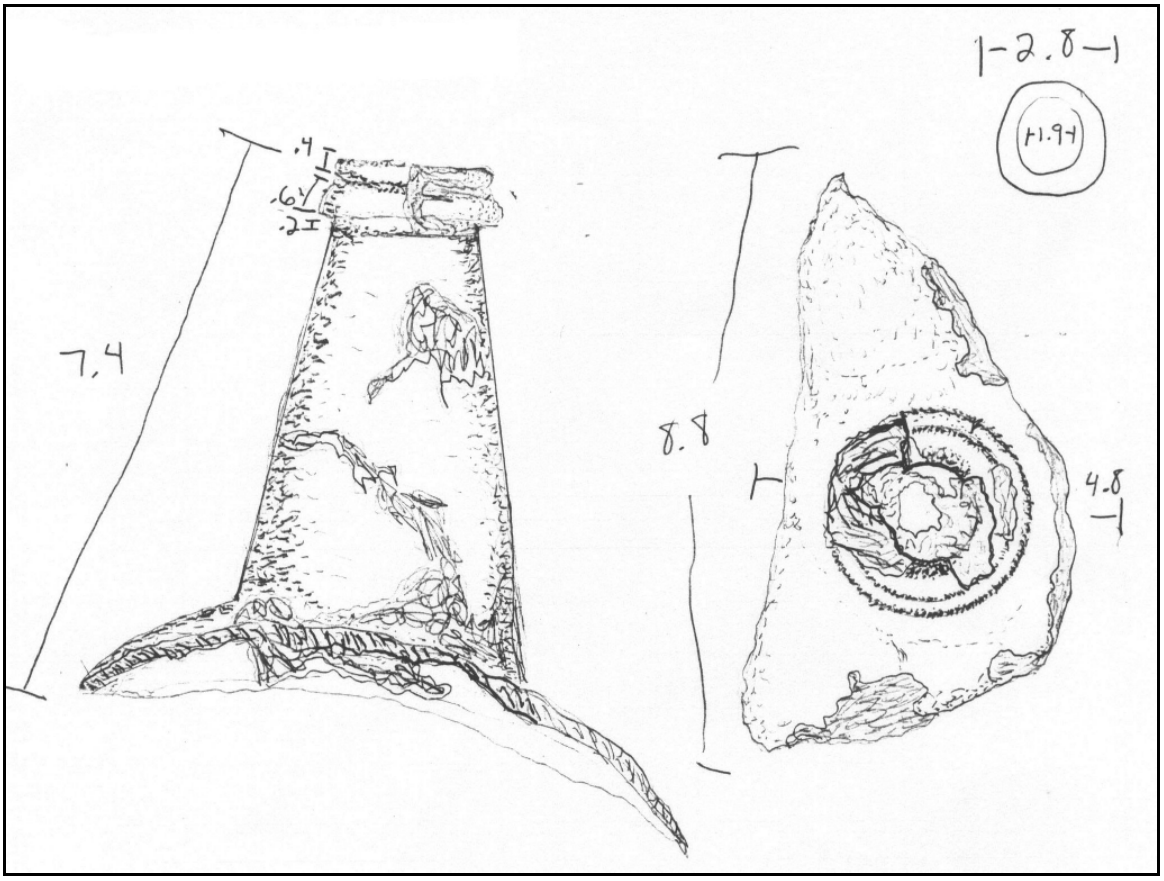

Figure 43 Dark-green glass wine bottleneck fragment (051-338)

One square bottle base (051-337) was recovered during excavations. It was clear glass, molded with a width of at least 2 ½ inches, and a domed bottom. This base is likely the remains of a case gin bottle. Case bottles were designed to be shipped in wooden boxes with a compartment for each bottle, and were characterized by square

bases up to four inches across, heights up to ten inches, and short necks with wide string rings. Their bases typically had rounded corners, a domed kick, and ring shaped pontil mark. Initially produced by the Dutch to ship gin, they were produced and used in large quantities during the eighteenth century to transport a wide variety of potable goods.[34]

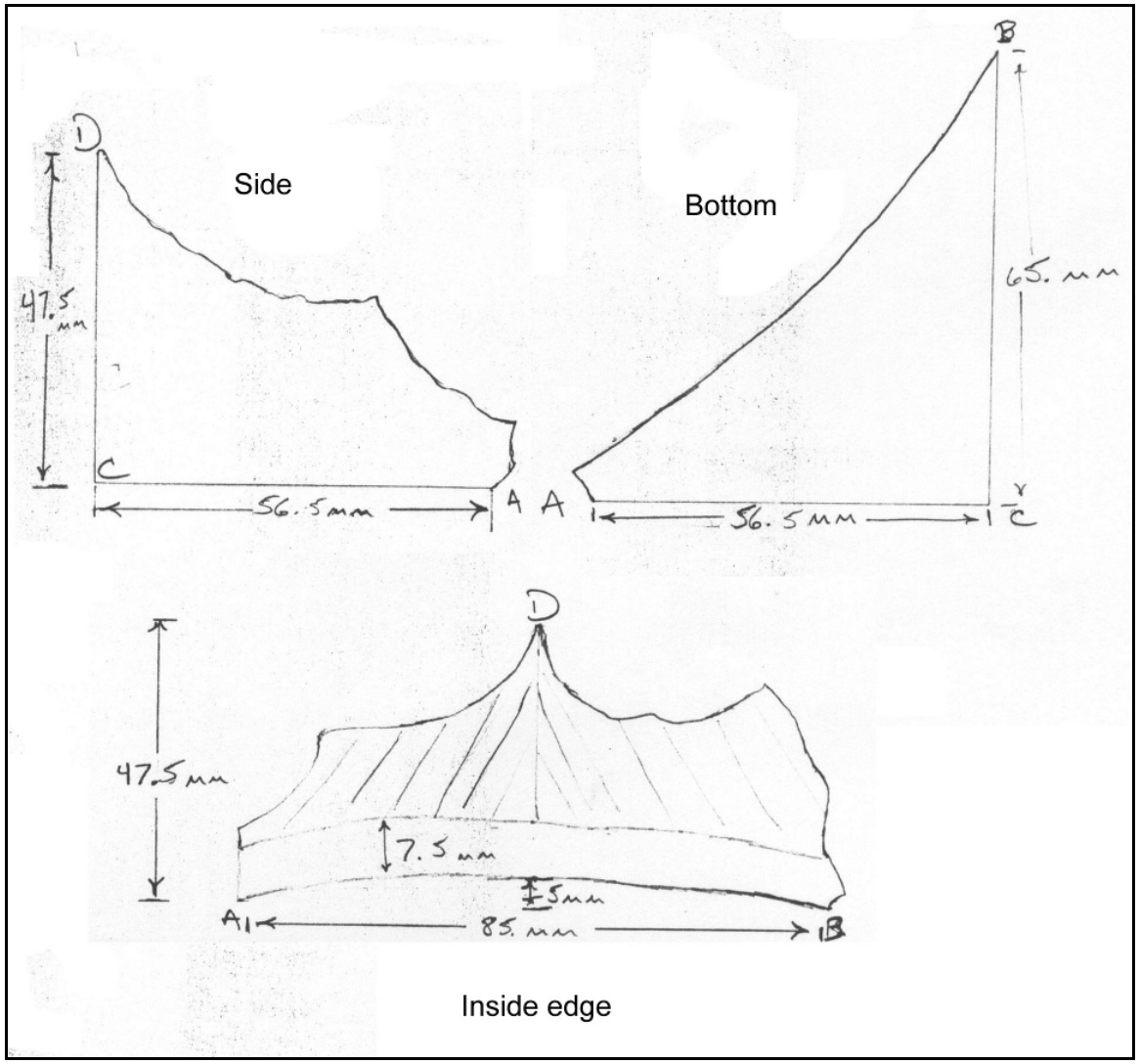

Figure 44 Case bottle base fragment (051-337)

[34] Watkins, *Marlborough*, 149-152.

A final glass artifact recovered from the site was a fragment of a glass pharmaceutical bottle. The fragment was light green in color, 1/8 inch in thickness, and would have been eight-sided. English pharmaceutical glassware was manufactured from the late sixteenth century onward and it is commonly found on colonial period archaeological sites.[35] Beginning in the early seventeenth century, small green bottles were molded with four to eight sides, and a short neck with a rolled lip.

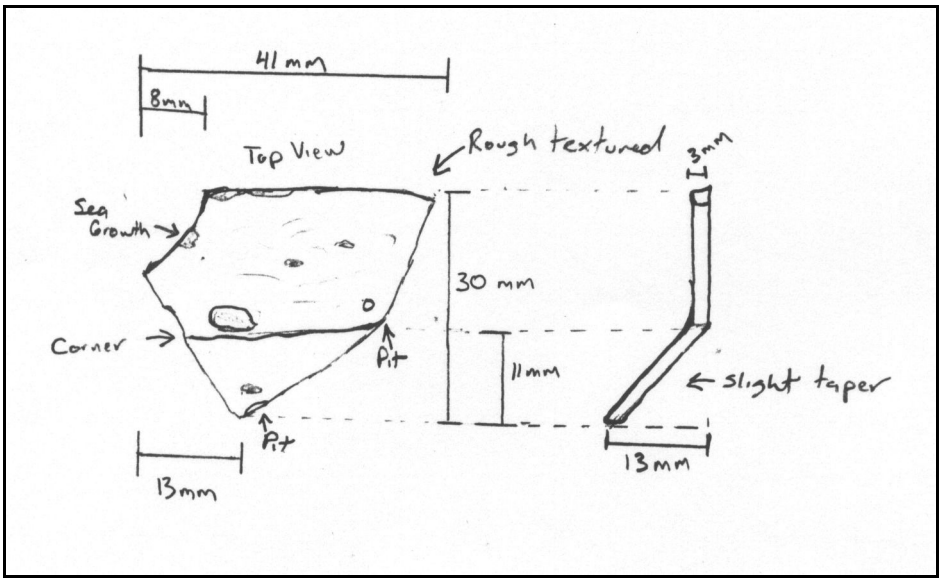

Figure 45 Pharmaceutical bottle fragment (051-335)

Summary

The artifact assemblage from the *Hunter Galley* site is not extensive, but the artifacts recovered do provide some good analytical opportunities and a consistent temporal window. The amount of previous disturbance at the wreck site, and the fact that

[35] Noel Hume, *Artifacts*, 72.

the wreck site location served as an anchorage somewhat limits the overall interpretive value of the recovered artifacts. Despite this fact, temporally diagnostic artifacts, including ceramics, pipe stems, olive jars, and wine bottles, consistently date to the second quarter of the eighteenth century.

The artifacts indicate a British colonial association. The fact that common colonial artifacts were recovered also indicates that the wreck represents a typical vessel of the period. Faunal evidence indicates that beef, and pork, presumably salt-cured, was being carried onboard, and likely constituted a portion of the crew's dietary intake, and the wine and case bottle fragments supports the consumption of some variety of potent beverage. One question that arises and cannot be explained is the presence of three unidentified human bones recovered by the Dethlefsen field crew in 1974. As they were listed as unidentified, perhaps the explanation lies in their misidentification as human bone. A second question is the presence of a Spanish olive jar. This could indicate that the *Hunter Galley* was actively engaged in trade with other nations' colonies despite the illegality. Documentary research previously cited also supports this interpretation.

CHAPTER IX

CONCLUSIONS AND RECOMMENDATIONS

The research data suggest that the wreck located off the southwest shore of Bermuda could be the remains of the Bermuda sloop *Hunter Galley*. The geographical location, historical documentation, and archaeological examination, combine to make a compelling case. Regardless of whether the wreck is the *Hunter Galley*, the fragmentary structural remains represent a small vessel built with Bermuda cedar and do provide the first archaeological evidence of a Bermuda built vessel.

While the evidence that exists in the archaeological and historical record regarding the *Hunter Galley* is not extensive, it is sufficient to reach some general conclusions and to offer one possible explanation for the high regard placed on Bermuda sloops during the eighteenth century. Ultimately, as anticipated, it was not a single trait, but a combination of factors that made the Bermuda sloop such an exceptional vessel for its time.

First and foremost was the use of Bermuda cedar (*Juniperus bermudiana*) for a substantial portion of the construction. Bermuda cedar, unlike oak, did not shrink or warp, required no seasoning, was naturally resistant to rot, was roughly two-thirds lighter, and was exceptionally durable. While the high resin content made Bermuda sloops ideal for the warm, toredo infested waters of the Caribbean, the lighter weight gave them a greater carrying capacity and the ability to sail in light winds that would leave another vessel becalmed. Even as the eighteenth century progressed and Bermudians

supplemented their timber supplies for ship construction, favor was given to the light, strong, and rot resistant woods found in the Caribbean.

Second was the design of the Bermuda sloop itself, which varied somewhat from other sloops during the eighteenth century. The design of their sloop rig allowed for navigation of narrow channels and shallows, and made windward ports easier to reach. Their sharp lines and extensive sails made them fast, maneuverable sailers, capable of sailing close to the wind. Their smaller size was also well suited to the developing colonial markets of the Caribbean and British North America.

The *Hunter Galley*, itself was slightly smaller than the average Bermuda sloop with a hypothesized size of 35' keel, 16' beam, and 7' hold, for its forty tons, five guns, and nine to ten man crew. Wood specie analysis served as the primary archaeological confirmation that the *Hunter Galley* was Bermuda-built. Bermuda cedar, Central American mahogany, and Spanish cedar were all vital elements in the vessel's construction. This combination makes *Hunter Galley* unique in the archaeological record and precludes its construction elsewhere, as Bermuda cedar was not an exported commodity for shipbuilding during the eighteenth century.

While the discernible framing pattern fits within the established eighteenth-century framing evolution, the vessel's fastening pattern of nail-treenail-nail for hull planking on each frame and plank ends double or triple nailed, differentiates it from other British construction techniques and other colonial sloops examined archaeologically. The use of smaller than average size framing members, resting on an 8 inch sided keel and balanced out by closer than average frame spacing, resulted in a vessel lightly

constructed but of heavy durability, capable of deepwater sailing. The use of comparably sized hull and ceiling planking also lent strength to the vessels overall design.

Associated artifacts consistently date the vessel to the second quarter of the eighteenth century, closer to the mid-eighteenth century. The artifacts indicate a British colonial affiliation, and the presence of typical colonial items suggests a common sailing vessel for the period.

Beyond the design elements that made the Bermuda sloop an exceptional sailing vessel for the time other factors contributed to its reputation for speed. Smaller holds yielded shorter port times, which allowed more frequent voyages. Four or five trips per year from a port was much more impressive than two for a larger vessel. Port times were also shortened for Bermuda mariners by having advance notice of the local market. This set them above other colonial sloops. Masters often had outbound cargoes already arranged by family relations when they entered port. The periodic emigration from Bermuda during the later half of the seventeenth century almost assured a trusted relative or family friend to do business with in every colony by the early eighteenth century.[1]

The *Hunter Galley* wreck site has likely yielded as much recoverable information as possible at its current level of archaeological investigation. The dispersed nature of the site with disarticulated timbers and three distinct ballast piles indicates a high degree of disturbance both naturally and from previous work on the site. Further excavation at the site could yield additional ship structure and artifacts, but these components would be

[1] Michael J. Jarvis, "In the Eye of All Trade" (Ph.D. diss., College of William and Mary, 1998). Jarvis discusses this network and the mercantile effects in various sections of his work.

deeply buried, based on test excavations conducted during the 1998 field season, and unlikely to offer any additional, significant information. Unless sufficient interest and funding can be generated in Bermuda for the recovery, stabilization, and display of the timbers and outer hull section of the *Hunter Galley* at the Bermuda Maritime Museum, it is recommended that the site be left as is. Periodic checks of the wreck site should be made to ensure the timbers and artifacts remain buried and protected from natural and artificial disturbance.

The *Hunter Galley* represents a typical Bermuda sloop from the mid-eighteenth century. An average-size, armed sloop, it engaged in established shuttle and triangle trade routes for the period. The vessel exemplifies the Bermudian network of the early eighteenth-century, owned in part by Charleston merchants for a period of time, but sailed by Bermuda mariners.

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APPENDIX A

TRANSCRIPTION OF *HUNTER GALLEY* PROTEST

To all to whom this Present Writing or Instrument of Protest shall Come or may come Greeting.

These are to Certifie that this 13th day of January 1752 Before me personally came and appeared Clement Conyers late Master of a certain Sloop called the Hunter Gally and Solemnly Deposed on the Holy Evangelist of Almighty God that he sailed with said Sloop under his Command from the Island of St. Eustatia on the 28th day of December last bound for S Carolina; but when he was the Latt: of 25°45' Northely Longt of 64°46' West he met with a hard Gale of Wind which very much disabled the Rigging and Sails of his said Sloop, lost one of his Men and by using his utmost Endeavors to save the men he lost his boat and stove one of his Top timbers, which rendered his Sd Sloop in a Defenseless Condition to proceed on her Voyage to Carolina, he therefore was obliged to Endeavor for these Islands being his nearest Port to repair the damage Sd vessell had sustained and on Thursday the 9th of this month January having another Violent hard Gale of Wind of West South West and Imagining that his Vessell might be drove on the Rocks of these Islands he was obliged to Crow'd all the Sail he could to prevent such Doing could make underway he could to the Southward being then in the Lattd: of 32°21'/ and by this Endeavoring to get out of his Lattd he split his sails so as to make them almost useless. On Fryday the 10th of Jan: saw the Island of Bermuda but not being able to get into the Harbour that day was obliged to come to anchor at Hogfish Cutt. Where he moored Sd Vessell in the best manner he could. Knowing the Time of Year to be very precarious and his Vessell lying in a very Dangerous Place (incase bad Weather arose) he therefore sent on Shore to one of his Owners to Assist him with an Anchor and Cable but was not supply'd wth them and in the Night of the sd10th Jan: the wind began to Blow very hard at S.W. and on Saturday the 11th: Jan: the wind Increasing could get no Assistance

from the Shore his anchors came --- and was obliged to Cut away his Mast after which his said Sloop Hunter Gally drove on the Rocks Bulg'd and filled with water. And in like manner also appeared John Conyers Mate and John Leaycraft a Mariner off and belonging to said Sloop Hunter Gally who likewise solemnly declare that all what the above Clement Conyers hath before deposed is True. Wherefore the said Clement Conyers for himself and his Mariners, Owners, freighters, and All others whom it doth or may Concern does Solemnly Protest against the Matters afores^{d} And all Damages occasioned or Sustained thereby as also against all Cost, Delays, Disappointments, Expenses, and other Matters and things which Can or May Lawfully be Protested Against, in as cargo and Ample manner as the same can or may be Done by Law or Form. And Perserving in the said Protest the s^{d} appearers have here unto set their hand the day and year first above Written

Clem:^{t} Conyers
John Conyers
John Leaycraft

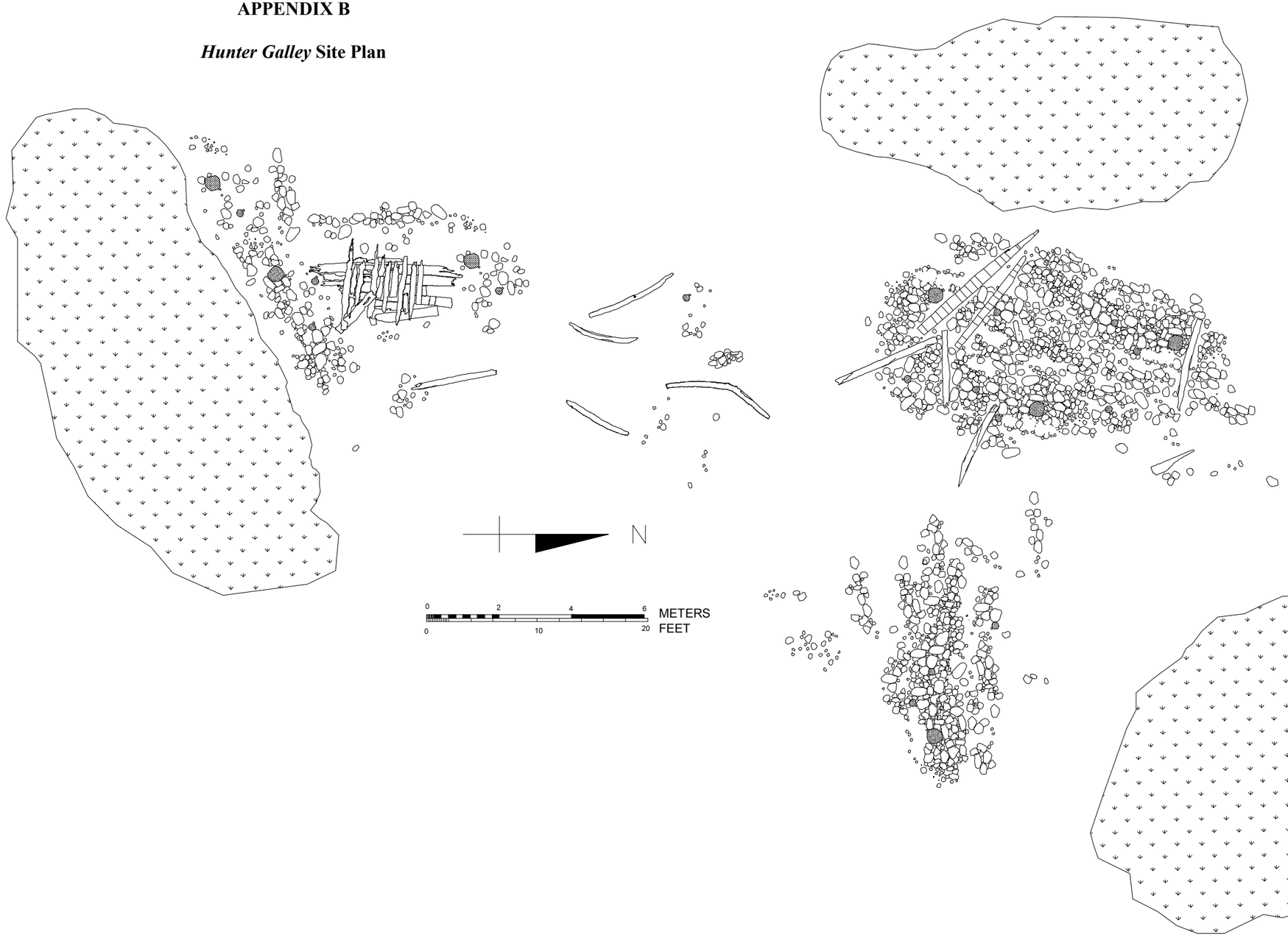
This Done and Protest before me the President and Vice Admiral afores^{d} In witness whereas I have hereunto set my hand and Caused the Publick Seal of these Islands to be affixed the day and year above Written By his Honors Command

Fran:^{ces} Jones

Jacob Wright Dept Secretary

APPENDIX B

Hunter Galley **Site Plan**



APPENDIX C

HUNTER GALLEY ARTIFACT SUMMARY TABLE

Artifact Number	General Description
051-301	Hemp Line
051-302	Leather
051-303	Trunnel Piece
051-304	Wood Fragment
051-305	Wood Fragment
051-306	Trunnel Piece
051-307	Seed
051-308	Wood Bung
051-309	Wood Board
051-310	Bone, Pig Skull Fragment
051-311	Bone, Pig Skull Fragment
051-312	Bone, UID
051-313	Bone, UID
051-314	Bone, Pig Rib Fragment
051-315	Bone, Pig Rib Fragment
051-316	Bone, Pig
051-317	Bone, Pig Pelvis
051-318	Bone, Pig
051-319	Pipe Stem - Long
051-320	Pipe Stem - Short
051-321	Brick Fragment
051-322	Brick Fragment
051-323	Brick Fragment
051-324	Brick Fragment
051-325	Brick Mortar
051-326	Brick Mortar
051-327	Lead Glaze Slipware
051-328	Olive Jar Fragment
051-329	Olive Jar Fragment
051-330	Olive Jar Fragment
051-331	Olive Jar Fragment
051-332	Olive Jar Rim/Shoulder
051-333	Glass, Green Bottle
051-334	Glass, Green Bottle
051-335	Glass, Pharm. Bottle Frag
051-336	Glass, Green Bottle
051-337	Glass, Case Bottle Frag
051-338	Glass, Bottle Rim/Neck
051-339	Bone, Pig Rib Frag
051-340	Trunnel Piece
051-341	Glass Fragment
051-342	Coarse Red Earthenware
051-343	Iron Fastener
051-344	Knife, Tableware
051-345	Buckle/Fastener
051-346 to 051-362	Concreted Iron Fastener