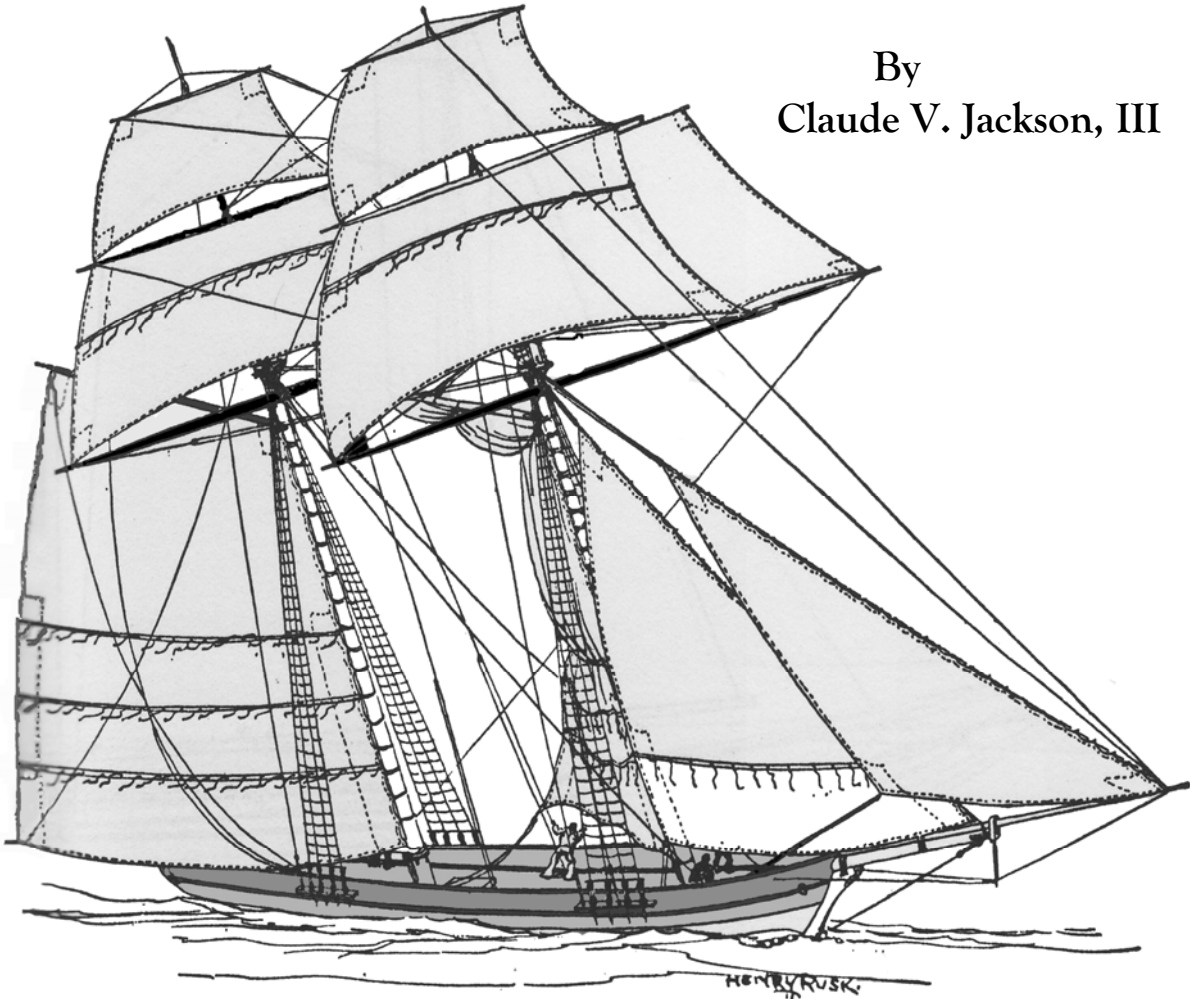


Historical and Archaeological Investigations of a Sunken Federal Period Vessel near Oriental, North Carolina

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INVESTIGATIONS OF A SUNKEN
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LIST OF TABLES

TABLE	PAGE
1. Monthly temperature and precipitation.....	47
2. Ranked wind speed.....	48
3. Stave measurements.....	194
4. Types of Cooperage.....	199
5. Sequence of Barrel Construction.....	199
6. Types and Dimensions of Cask Staves.....	202
7. Faunal Specimens by Type.....	211
8. Faunal Specimens by Count and Minimum Number.....	213
9. Botanical Specimens by Type.....	218
10. Botanical Specimens by Count.....	220

TABLE OF CONTENTS

	PAGE
List of Figures	vii
List of Tables	ix
 Chapter I. Commerce and Navigation on the lower Neuse River 1700 - 1835.....	 1
 Chapter II. Discovery and Archaeological Excavation of the Wreck at Otter Creek.....	 41
1. Discovery and Testing	41
2. Site Description.....	46
3. Site Environment.....	47
4. Objectives and Research Design.....	49
5. Description of the Work: 1988 Excavation.....	51
 Chapter III. Description of the Structural Remains.....	 61
1. Ship Construction Timber.....	64
2. Keel.....	69
3. Bow Assembly.....	72
4. Stern Assembly.....	73
5. Floors and Futtocks.....	76
6. Ceiling.....	79
7. Keelson.....	80
8. Bilge Pumps.....	84
9. Deck Beams/Knees/Pillars.....	92
10. Interior Construction.....	94
11. Planking/Caulking.....	102
12. Sheathing.....	104
13. Miscellaneous Pieces.....	110
14. Masting and Rigging.....	116
15. Fasteners.....	122
15. Ballast.....	137
16. Conclusions.....	138

TABLE OF CONTENTS CONTINUED

	PAGE
Chapter IV. Description of the Artifacts.....	151
1. Ceramics.....	151
Stoneware.....	151
Earthenware.....	156
Pipe Fragments.....	160
Ceramic and Pipe Discussion.....	163
2. Glass.....	166
Bottle.....	166
Pane.....	167
3. Metal.....	170
4. Wood.....	174
Mallet.....	174
Shingle.....	176
Plugs.....	178
Bungs.....	180
Cask Heads.....	181
Cask Hoops.....	186
Cask Staves.....	193
Cask Construction.....	196
Cask Discussion.....	202
5. Miscellaneous.....	204
6. Faunal.....	206
7. Botanical.....	216
Chapter V. Conclusions.....	228
Bibliography.....	242
Appendices:	
Appendix A. Wood Sample Analysis	
Appendix B. Ballast Stone Analysis	
Appendix C. Faunal Analysis	
Appendix D. Botanical Analysis	
Appendix E. Artifact Inventory	
Appendix F. Known Shipwrecks Located in the lower Neuse River near New Bern	

LIST OF FIGURES

FIGURE	PAGE
1. Map of the lower Neuse River vicinity	2
2. Graffenried's chart of New Bern in 1710.....	6
3. Port Districts of North Carolina.....	8
4. Moseley Map of 1733.....	10
5. Lands belonging to Farnifold Green, 1750.....	15
6. Collet Map of 1770.....	18
7. Mouzon Map of 1775.....	19
8. Price - Strother Map of 1808.....	25
9. Vicinity of Oriental, N.C., 1805.....	27
10. Location of the Otter Creek wreck, Oriental, North Carolina.....	43
11. Navigation map of the Otter Creek Area.....	44
12. Map of Otter Creek showing relationship of the wreck and proposed development.....	45
13. Excavation grid plan.....	50
14. Location of batter boards and mooring posts.....	52
15. Hull Structure, Otter Creek Wreck.....	62
16. Vessel similar to the Otter Creek Wreck.....	63
17. Perspective drawing showing excavated areas.....	70
18. Drawing of keelson scarf.....	71
19. Iron gudgeon found detached from wreck.....	75
20. Drawing of Forward and Aft maststeps.....	85
21. Leather boot from the bilge pump.....	89
22. Elm Tree pump box.....	90
23. Miscellaneous leather pieces.....	91
24. Moulded trim pieces.....	95
25. Door Knob assembly.....	96
26. Flat drawing.....	98
27. Mahogany paneling pieces.....	99
28. Towel rack end.....	100
29. Distribution map of coal.....	101
30. Sheathing sample.....	106
31. Lead patching.....	109
32. Rectangular piece showing two iron nails.....	111
33. Possible brace and wedge.....	112

LIST OF FIGURES CONTINUED

FIGURE	PAGE
34. Miscellaneous piece similar to wedge.....	113
35. Chock and grooved piece.....	114
36. Braces.....	115
37. Fragment of Double Block.....	118
38. Mast hoop.....	119
39. Mast hoop fragments.....	120
40. Bull's eyes.....	121
41. Trunnel wedges and sheave fragment.....	123
42. Sheave pins.....	124
43. Sheave pins and trunnel.....	125
44. Cordage fragment.....	126
45. Iron bolts.....	131
46. Spikes.....	132
47. Spikes.....	133
48. Spikes.....	134
49. Nails and spike.....	135
50. Hinges.....	136
51. Stoneware jug fragment.....	152
52. Stoneware ceramic fragments.....	154
53. Earthenware ceramic fragment.....	158
54. Pipe and stem bowl fragments.....	162
55. Bottle fragment.....	168
56. Button.....	172
57. Coin impressed button.....	172
58. Wooden mallet.....	175
59. Shingle.....	177
60. Plugs.....	179
61. Cask heads and bungs.....	183
62. Cask heads.....	184
63. Cask heads.....	185
64. Cask hoops.....	189
65. Possible overlapping hoop end.....	190
66. Distribution of cask components.....	191
67. Cask components.....	197
68. Distribution of Faunal and Botanical specimens.....	207

Chapter I

Commerce and Navigation on the lower Neuse River, 1700-1835

Investigations into the use and identity of the Otter Creek wreck began with a review of historical information about the lower Neuse River vicinity. The patterns of regional commerce during the eighteenth century were examined, as well as the types and number of vessels employed in the transportation of goods. Particular attention was given to determining property ownership near the Greens and Smith Creeks area, where the shipwreck was discovered. Findings revealed that the shipwreck may have been associated with descendants of the prominent Green family, among the first families known to have settled in the region.

Settlement of the lower Neuse River basin began along the eastern shoreline of present-day Pamlico county within the vicinity of the current town of Oriental, which was referred to as the "cradle of Neuse colonization" (Figure 1).¹ Among the early settlers in the area were William Powell, Richard Smith, Farnifold Green, Thomas Yeates, and Thomas Lepper. Several of the early settlers came from the Albemarle region, while others arrived by vessel from Virginia and Maryland. Between 1705 and 1711 at least 173 land grants were made along the Neuse and Trent Rivers.²

The earliest known land transaction in what is now Craven County was the 1702 purchase by William Powell of a tract on the

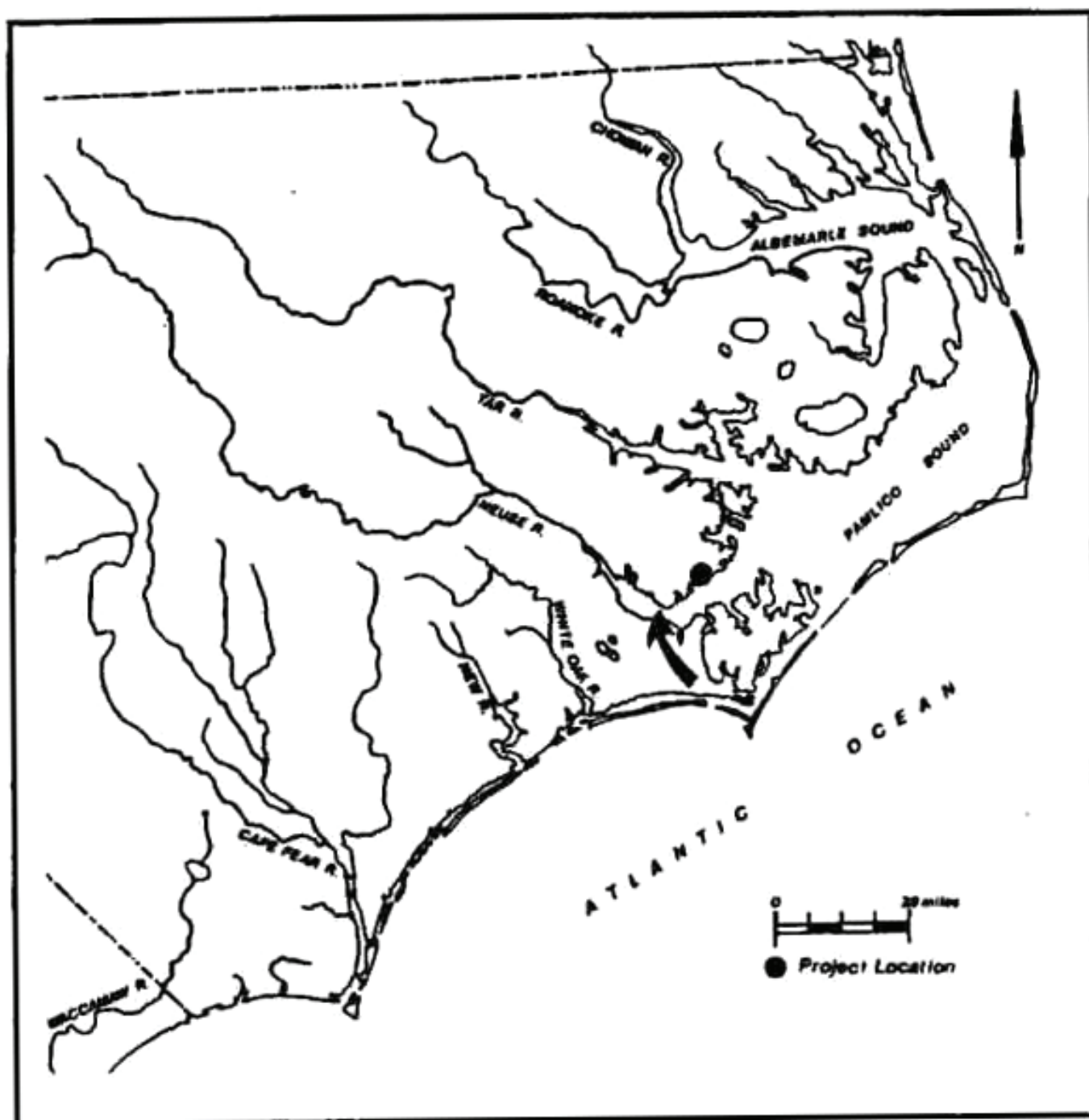


Figure 1. Map showing the lower Neuse River vicinity (arrow).

Neuse River.³ Powell was a shipwright by trade when he moved to the present Oriental area about 1703. It is possible that Powell continued his trade in this new location.⁴ Richard Smith is often referred to in early records as "Capt. Richard Smith," probably connoting either a military rank or that of a ship's captain.⁵

Farnifold Green may have been the most instrumental individual associated with the settlement of the present Oriental area.⁶ In 1707 he and his wife patented 1,700 acres of land between Greens and Smith Creeks where they established their "Green's Neck plantation." Farnifold Green purchased other tracts of land, including one of 640 acres "at Greens Point in Powells Creek in Neuse."⁷ Today Powell's Creek is known as Whittaker Creek and is located just east of the town of Oriental.

Along with his position as a prominent planter in the sparsely settled area, Green held the rank of captain in the Bath County militia.⁸ When Indian violence threatened the area in 1712, Green was appointed Commissary in charge of procuring and providing to the army needed supplies. What the army apparently needed most were large quantities of corn and other provisions.⁹ Green probably used his position as commissary to direct some shipment of goods by ships from the landings at his plantation on Greens Creek. Two years later, in a surprise attack, Indians killed Farnifold Green, one of his sons, a white servant, and two slaves. Green's plantation and home on Greens Creek were destroyed.¹⁰ In his will, written three years prior to his death, Farnifold Green stated that the "land in Greens

Neck whereon I now live" be passed on to his sons James and Farnifold II. His property remained in the hands of his descendants for more than a century.¹¹

Historical documentation (Figure 5) suggests that the house and property once belonging to Farnifold Green II were located on the peninsula of land where the Otter Creek wreck was discovered. This structure cannot be the original "Green's Neck plantation," as that dwelling was destroyed in 1714 at the time of the senior Farnifold Green's death, although this structure may have been built on the site of the original plantation. The renaming of creeks through time has added to the confusion. It appears that Farnifold Green II's house was located south of Smith's Creek. Today this tributary is referred to as Greens Creek.

John Lawson, an historian and naturalist, had been appointed in December 1700 by the Lords Proprietor to make a reconnaissance of the interior of Carolina. Upon completion of his survey in the spring of 1701, Lawson "built a House about Half a mile from an Indian town at the fork of Neus-River." The cabin was built on high ground near a creek that today still bears his name.¹² Others were soon to join Lawson building their cabins at this location.

In 1710, at the confluence of the Neuse and Trent Rivers, Christopher von Graffenried and Franz Michel, formerly of Bern, Switzerland, settled with twenty German families. Collectively referred to as the Palatines, the group of German immigrants and their Swiss leaders established a town on the Neuse and named it

New Bern.¹³ It was laid out in the shape of a cross, with two main streets, one running from the Neuse to the Trent, and the other from the point between the rivers inland along the peninsula.¹⁴ In addition to the twenty families in the town, Graffenried had others settle along both sides of the Trent River and its tributaries, Mill and Church Creeks. Of the 5,000 acres purchased by Graffenried for the town, 1,250 had previously belonged to Lawson.¹⁵ A map drawn by Graffenried shortly after the town's establishment notes the location of the town (Figure 2).

Only one vessel, the sloop *Returne*, is mentioned by name in connection with the settlement of New Bern. She was purchased by Graffenried's partner, Franz Michel for £200 for use in the West Indian trade. In early 1711 she was known to have made a voyage to Bermuda.¹⁶ In addition to the sloop *Returne*, Graffenried and Michael purchased a shallop for use on the coastal sounds and rivers.¹⁷

Prior to leaving for Europe to raise support for his struggling colony, Graffenried assigned title to the Palatines' land to Thomas Pollock as security for loans. When Graffenried failed to return with additional support for his colony, Pollock foreclosed on the loans and assumed title to the land.¹⁸ The colony managed to survive and prosper, finally surplanting the Smith and Greens Creeks area as the main settlement on the lower Neuse River.

Established as a precinct in 1705, the Neuse River area was called Archdale. It included all of the south side of the Pamlico River



Figure 2. Graffenried's chart of New Bern in 1710.

and all the inhabitants of the Neuse region. The name was changed to Craven around 1712.¹⁹ By 1720, there were 178 taxable individuals in Craven and the number had grown to 1900 by 1755.²⁰ Until 1730, New Bern was considered a part of the Port Bath District. From that date onward it was assigned to the Port Beaufort District²¹ (Figure 3). Present day Pamlico County was formed from portions of Craven and Beaufort Counties in 1872.

After a slow start, the commerce of New Bern continued to grow steadily as some of the vessels entering at Ocracoke and Beaufort made their way up the Neuse to the town. During 1739 and 1740, Port Beaufort annually entered thirty vessels.²² To aid the increase in navigation between New Bern and Ocracoke Inlet, a series of acts was passed in 1739 by the North Carolina General Assembly. Navigation aids and a system of pilotage were established. Vessels sailing to New Bern were charged six pence for every foot of water they drew. The money raised was applied toward improvements to navigation.²³

Around 1740 an inspection warehouse was established in New Bern, and a second inspection station was approved in 1743 at Francis Springer's ferry on the Neuse River.²⁴ A customs house was established in New Bern in 1746 and James Macklewean was appointed to receive duties on vessels loading and unloading at the Neuse River and New Bern.²⁵ A 1755 provincial legislature act established inspection points at New Bern, Clubfoot Creek, Lower Broad Creek, Hollinsworth's Landing on the Neuse, and Bush's

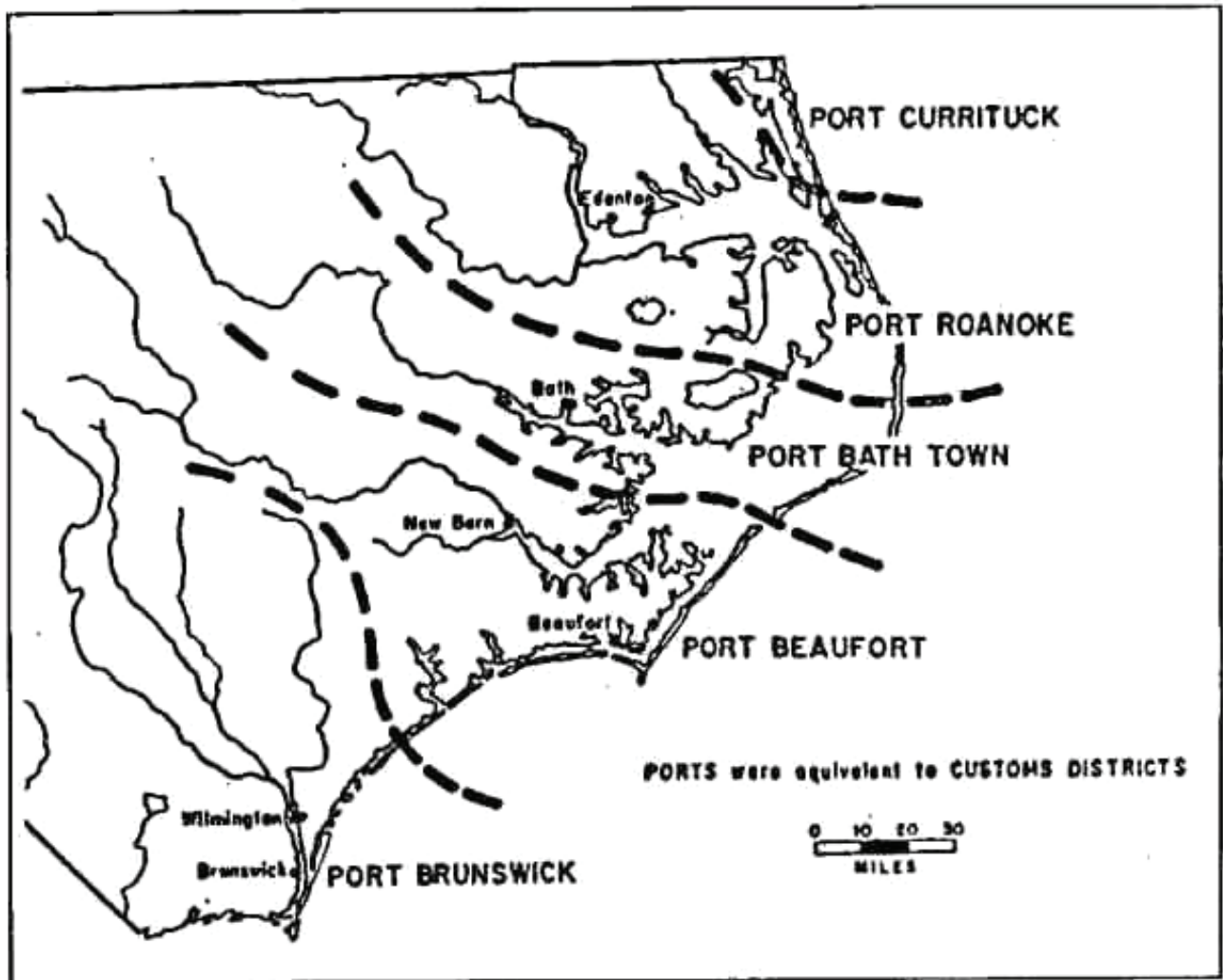


Figure 3. Port Districts of North Carolina. After Harry Roy Merrens. *Colonial North Carolina in the Eighteenth Century: A Study in Historical Geography*. (Chapel Hill: University of North Carolina Press, 1964), p. 87.

Landing on the Trent. Due to the high cost of maintaining the facilities the latter two were discontinued in 1764.²⁶ When Thomas Lovick, collector of customs at Beaufort, died in 1759, New Bern assumed the role of chief shipping center for Port Beaufort.²⁷ Trade was further enhanced in 1765 when New Bern was selected as the site of the capital for the colony.

Overland transportation was sparse in the region but continued to develop with the increased settlement. Improvements in the road system helped facilitate transportation of products from the interior region to shipping points located at New Bern or plantation landings. As early as 1710 a road had been laid out spanning the peninsula between the Neuse and Pamlico Rivers, from Wilkinson's Point on the Neuse to Durham Creek.²⁸ By 1733, a road linking Brunswick Town, New Bern, Bath, the Albemarle Sound and ultimately Edenton had been cleared (Figure 4). Road commissioners were ordered by the General Assembly in 1745 to provide and maintain landings on the Neuse and Trent Rivers for improving trade with the farms and plantations of the interior region.²⁹

Ferries provided the only means of crossing the broader expanses of water where bridges were not constructed. Most ferries were scows, piraguas, flats, or canoes, either rowed or sailed.³⁰ Two miles above New Bern, just below Bachelor's Creek on the south bank of the Neuse, was Graves' ferry, established around 1730 by Richard Graves. This crossing, which later was generally called Street's Ferry,

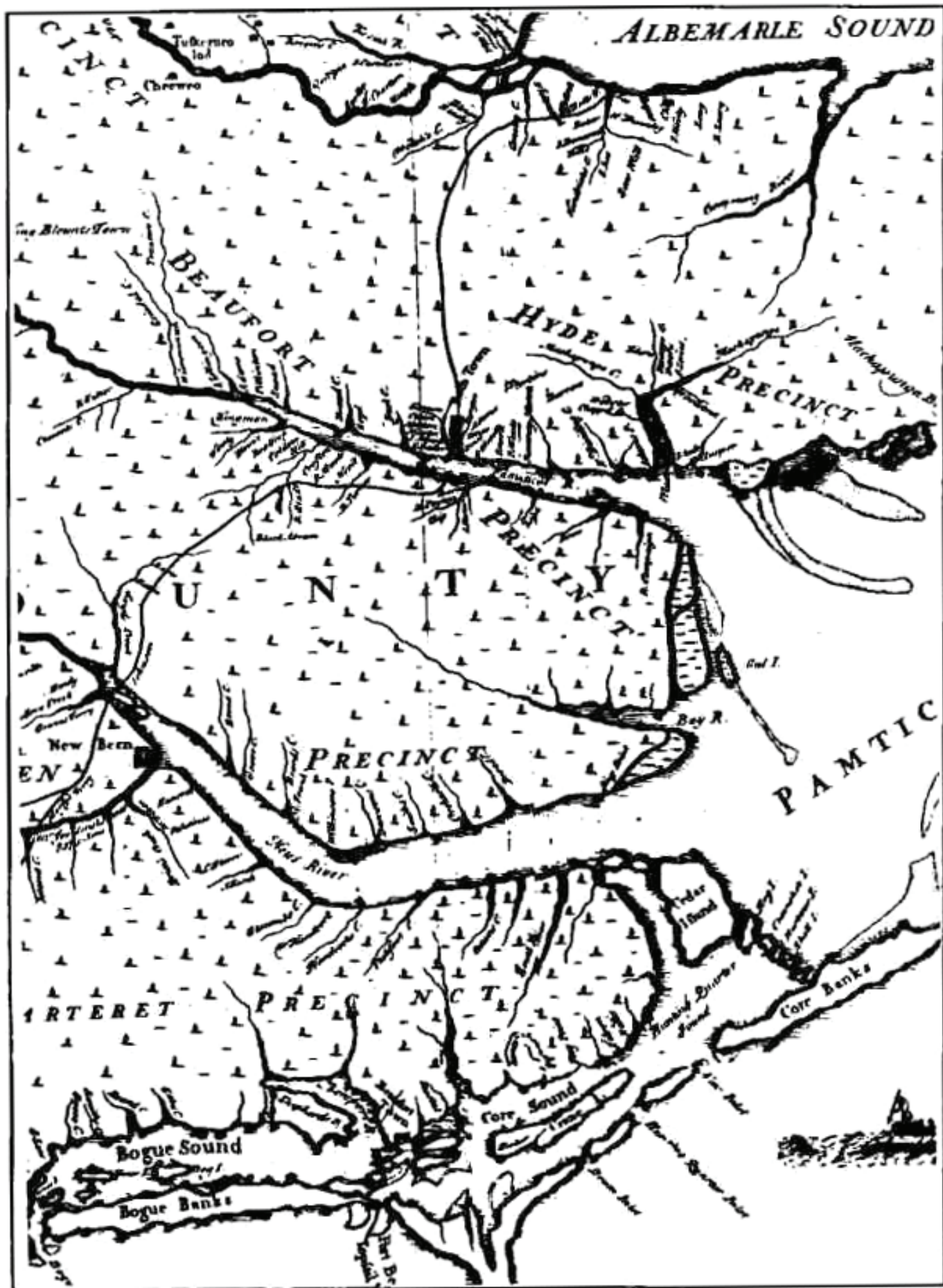


Figure 4. Moseley Map of 1733.

served as the primary south and east route to and from New Bern for many years and operated until the middle of the twentieth century.³¹

In 1739, John Bryan built the first ferry to operate across the Neuse River at New Bern.³² The Craven Court minutes reported ferries over Slocumb's, Hancock's, Dawson's, Clubfoot, and Adams' Creeks, as well as over some of the smaller streams of the county.³³ Bridges eventually replaced ferries over some of the smaller water courses, but no bridges are known to have been built over the Neuse River in the first half of the eighteenth century.³⁴

New Bern continued to develop in the 1750s and 1760s after it was questionably selected as the colonial capital in 1746. Wilmington served as the capital from 1754 to 1765 before the seat of government returned to its former location.³⁵ New Bern soon became a distribution point for travelers and goods arriving from other colonies and Europe. Agricultural products and naval stores produced on interior farms and plantations were transported to New Bern on the Trent, the Neuse, and the network of primitive roads from the interior. The upper Neuse proved too shallow for navigation by the large sailing vessels, although smaller and more maneuverable vessels, such as flats or pole-driven bateaux, provided New Bern with a link to farmers and traders of the interior.³⁶ Commercial growth began to develop around the capital. Between

1748 and 1754, the number of ships arriving at New Bern increased to eighty. A decade later, in 1764, the number had grown to 127 following the end of the Seven Years' War.³⁷

By 1750 New Bern's commerce surpassed that of Bath, Beaufort and the Bay River area. By the end of the colonial period New Bern was one of the three largest seaports in the colony, ranking between Wilmington and Edenton. Many of the ships conducting trade through the port of New Bern carried cargoes to New England and the West Indies.³⁸

Although it was a leading port there were certain physical limitations on the size of vessels that could call on New Bern. These were caused in part by depths of Ocracoke Inlet and the lower Neuse, through which all traffic had to pass. In order for ships to enter the Pamlico Sound and make their way up the Neuse to New Bern, they needed to pass over the Swash at Ocracoke Inlet, where a sand bar accommodated only 8 to 9 feet of draft.³⁹ A French traveler, passing through New Bern in 1765, stated that vessels of 200 tons burden could sail close to New Bern when loaded, adding that the river was only 9 feet deep. He also mentioned that "when vessels Draw more than this quantity, they are obliged to lighten into flats...."⁴⁰ Smaller vessels ranging from 20 to 50 tons could also call at plantation landings along the Neuse and Trent Rivers.⁴¹

Despite these limitations on vessel size, shipping commerce was brisk. A principal export was naval stores due to the local abundance and huge overseas demand. Exports from Port Beaufort

in 1764, mostly from Craven County, included 30,043 barrels of tar, 3,303 barrels of turpentine, 3,721 barrels of pitch, 1,279 barrels of spirits of turpentine, and 619 barrels of rosin.⁴² Between the years 1768 and 1772 nearly seventy-five percent of North Carolina's total exports of pitch, tar, and turpentine were sent through the ports of Beaufort and Brunswick. Port Brunswick accounted for half of the total.⁴³ The majority of naval stores were exported to Great Britain and the West Indies.⁴⁴

Exports also included other forest products such as ship masts, boards, planks, staves, heading, hoops, oars, and shingles. Only shingles, staves, and sawn lumber proved to be exported wood products of significant quantities.⁴⁵ In 1772 Port Beaufort exported 606,269 staves, nineteen percent of North Carolina's total; 530,800 shingles, nine percent; and 428,641 pieces of sawn lumber, or ten percent of the state's total export of this commodity.⁴⁶ Conversely, New Bern merchants offered a wide variety of imports for sale. A sample of imports included rum, molasses, brown sugar, wine, cider, salt, flour, bread, iron, cheese, beer, flax coffee and tea.⁴⁷

North Carolina exported a small quantity of tobacco in comparison to other producers like Virginia and Maryland early in the century, but by the end of the century surpassed them to become the leading tobacco producing colony. By 1773 all North Carolina ports combined accounted for 1,605,000 pounds of export tobacco.⁴⁸

Other goods such as corn, wheat, rice, indigo, processed livestock, pelts, furs, and deer skins accounted for only a small percentage of North Carolina exports during the eighteenth century.⁴⁹

It is likely that during the middle decades of the eighteenth century a large quantity of the goods shipped through the port of New Bern came from plantations located in the present-day Oriental area. Major landowners during this period included John and William Carruthers, William Bryan, Joseph Edmondson, William Vaughn, Benjamin Hall, William Thompson, John and Susannah Mill, George Whitaker, and the son of Farnifold Green (Figure 5).⁵⁰ Undoubtedly the plantations of these individuals had private river landings, although no mention of maritime activity or vessel ownership by these men could be found in the records.⁵¹

The location of creeks, such as Smith and Greens, near the mouth of the Neuse may have afforded refuge to vessels suddenly caught on the open water of the sound or river during severe weather conditions. A violent hurricane struck New Bern and the Neuse River area on September 6-7, 1769. The storm, which destroyed two-thirds of the town of New Bern, also caused devastation as far south as the Cape Fear River and as far north as Virginia. One witness to the storm from Brunswick described it as a "terrible gale of wind."⁵² The unidentified vessel discovered and recently excavated near Greens and Smith Creeks may have been

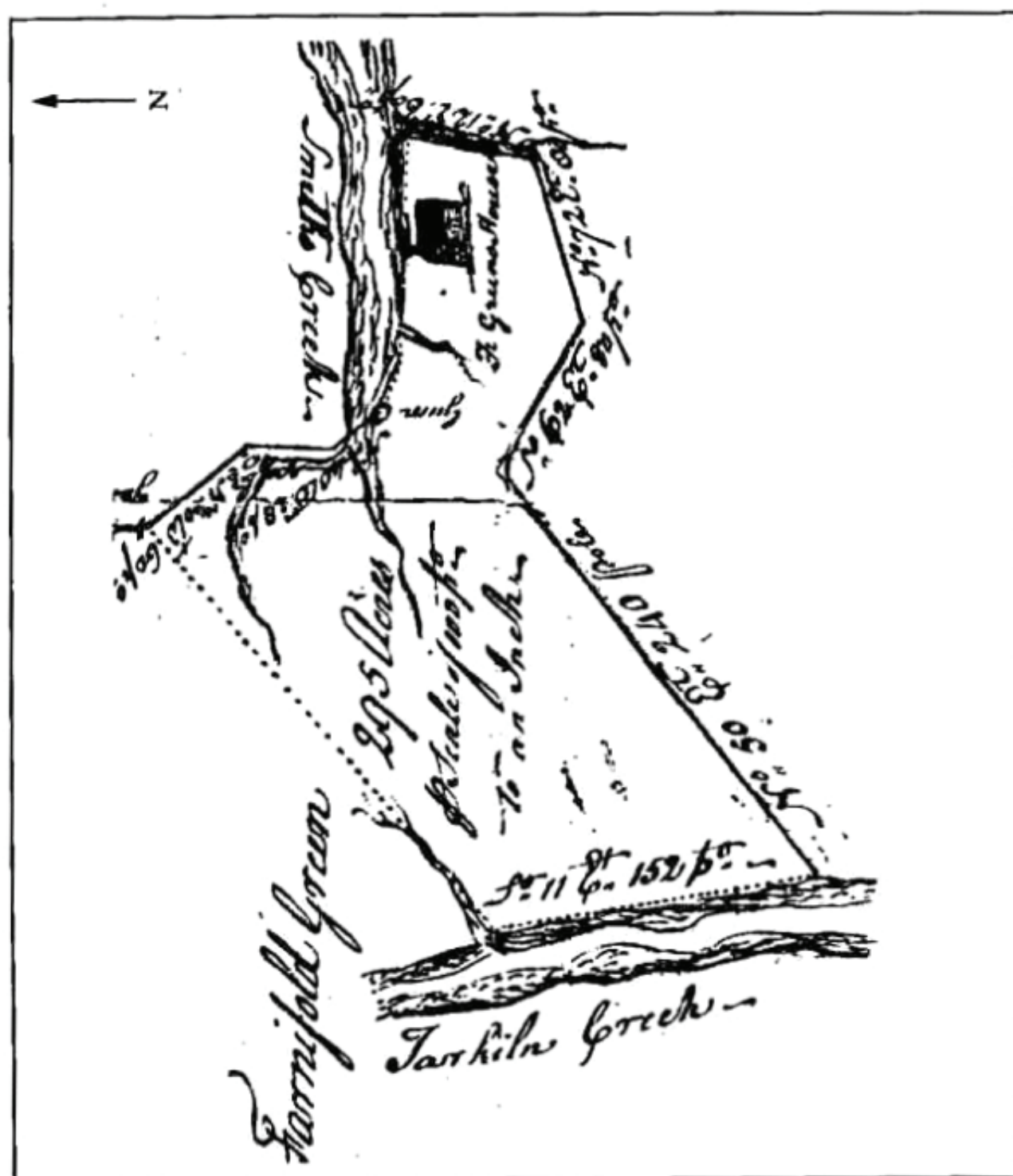


Figure 5. Lands belonging to Farnifold Green, 1750.

seeking refuge from such a storm. The ship, possibly having received severe damage from a storm, may have been abandoned at this location by her captain.

Despite setbacks from the 1769 storm to much of eastern North Carolina, New Bern citizens and merchants quickly rebuilt their losses. Trade resumed as soon as facilities were repaired or rebuilt and lost vessels were replaced. A year after the hurricane the schooner *Flying Fish* was identified with New Bern commerce when she was listed on the inventory of the estate of Benjamin Ardene.⁵³ When the *Flying Fish* was owned later by Philip Reilly & Company, and commanded by Capt. Dennis Dismount, the vessel conducted trade to Bermuda and the West Indies. The invoices and bills of lading filed by Captain Dismount in Craven County indicate that the *Flying Fish* traveled to the islands of Bermuda, St. Martin, St. Thomas, St. Croix, St. Vincents, and St. Kitts.⁵⁴ Another noteworthy vessel of New Bern was the 200-ton *Harmony Hall*, which regularly made voyages to French ports.⁵⁵ In August 1775, the *Harmony Hall* was driven ashore near New Bern during a violent storm.⁵⁶

Shipbuilding on the Neuse and Pamlico Rivers began shortly after the first European settlers arrived in the area, but did not become an important industry until after the Revolution.⁵⁷ Ship carpentry up to that time was principally applied to overhaul and repair.⁵⁸ As late as 1812 there was only a single ropewalk in the town to supply rigging for locally constructed vessels.⁵⁹

Maps of coastal North Carolina on the eve of the Revolution, (Figures 6 and 7) illustrate the growing importance of the region. At the battle of Moore's Creek Bridge north of Wilmington in early 1776, Colonel James Moore with the First North Carolina Continentals, along with the militia from the New Bern and Wilmington districts, defeated Scottish Loyalists. This battle, called the "Lexington and Concord of the south," kept the British from occupying the South at the beginning of the war.⁶⁰ The British occasionally managed to control access to the North Carolina sounds, although their presence was sporadic. A fort constructed in 1776 at Hanging Point, and later named Fort Caswell in honor of the governor, served to protect New Bern for nearly the entire war.⁶¹

The Revolution brought about some difficulties for New Bern merchants conducting trade, while at the same time providing new maritime opportunities for privateers in the region. Confiscation Acts passed after 1777 resulted in the loss of property by many Craven County loyalist merchants, although other New Bern merchants continued trading, primarily with the French West Indies, throughout the war.⁶² The General Assembly appointed Benjamin Hawkins in 1779 an agent in charge of obtaining military supplies at home and abroad. The following year it appointed three others, including Richard Caswell, commissioners "for the express purpose of carrying on a trade for the benefit of this State." The assembly empowered them to hire, purchase, and build ships, and to trade North Carolina products for arms and other military stores.⁶³



Figure 6. Collet Map of 1770.



Figure 7. Mouzon Map of 1775.

Trade increased as a result of the efforts to obtain military goods, and local shipbuilding prospered. The privateers *Betsey*, *Heart of Oak*, *General Caswell*, *General Nash*, and *Sturdy Beggar* were some of the most notable ships constructed at the port of New Bern to serve in the war. These and other fast sailing vessels were able to slip by the British blockade of North Carolina inlets and voyage to the West Indies or Europe, where they were able to exchange North Carolina products for the needed military goods, as well as luxury items.⁶⁴

John Wright Stanly, the most famous of the Revolutionary War ship owners, came to New Bern about 1773.⁶⁵ Stanly was probably the principal owner of the North Carolina sloops *Lydia* and *Success*, the brigantine *William*, and the privateers *Nancy* and *General Nash*. The *General Nash*, armed with twenty guns and captained by Stanly's brother, was a successful raider, taking two brigs in 1780 that proved to be "the most valuable prizes ever carried into a North Carolina port."⁶⁶ Stanly is supposed to have lost fourteen armed ships in addition to others burned at his wharves in New Bern during the war. He died in 1789.⁶⁷

The Provincial Council initially purchased and equipped three armed vessels for the protection of North Carolina: the *General Washington*, *King Tammany*, and *Pennsylvania Farmer*. Later, two row galleys were added to complete the state's navy.⁶⁸ The three sailing vessels were small, two-masted brigs, probably converted merchantmen.

New Bern was not directly affected by hostilities until late in the war. British Major James Craig, in the summer of 1781, marched from Wilmington with four hundred soldiers and the same number of loyalists. The rebel forces of Alexander Lillington, with 450 militia, and William Caswell, with 150 horsemen, failed to deter Craig and he occupied New Bern on August 19, 1781.⁶⁹ The British occupation of New Bern was brief, however, and hostilities in the south ended when General Cornwallis surrendered at Yorktown two months later.

The end of the Revolution brought about a major boom in trade for New Bern and shipbuilding accelerated after 1800. One contemporary observer remarked that the city's

foreign trade grew with dazzling rapidity, and the importance of these foreign relations left its impress upon every department of business. Shipyards sprang into existence as if under the touch of an enchanter's wand. New vessels of every grade and model were constantly going upon the stocks.⁷⁰

High praise for the importance of the shipbuilding industry of New Bern and the surrounding environs came from a local newspaper article on September 24, 1791:

There is not a place in America, perhaps there is not a country in the universe, where ship building may be conducted more conveniently than in the districts of Edenton and Newbern, in North Carolina, in this whole extent of one hundred and fifty miles nearly, by seventy or eighty, there are very few planters who do not live within ten miles of some water where ships may float. It is known that we have naval stores, and every foot of timber (live oak and cedar included) that is used in ship building: We have ship carpenters, and many of our citizens are sufficiently disposed to go to sea; we can build and navigate our own ships, &c.⁷¹

Shipyards that sprang up around New Bern at the turn of the century were for the most part small and only capable of building one or two ships of any size per year. Each shipyard would normally consist of a single construction site near an ample grove of timber, and a graded launching area into a stream or major river tributary.⁷²

Small schooners, sloops, and brigs were the primary types of vessels in use supporting New Bern's maritime commerce.⁷³ Of twenty-six vessels documented as built in New Bern and Craven County between 1783 and 1812, eighteen were sloops and schooners. During this same period North Carolina constructed 117 vessels, of which seventy-nine were sloops or schooners.⁷⁴ North Carolina-built sloops averaged 38 tons, 51 feet in length, 17 feet in the beam with a draft of 6 feet. Schooners averaged 71 tons, 64 feet in length, 19 feet in beam with 7 feet of draft.⁷⁵ A tally of 102 vessels that cleared from New Bern between January 7 and June 29, 1789 show that 33 sloops, 31 schooners, and one brig sailed to destinations along the Atlantic coast; ten sloops, 14 schooners, and 11 brigs sailed to the West Indies; and one schooner and one brig sailed to England.⁷⁶ New Bern attracted vessels from larger ports to the north and south. Of the 101 ships that entered New Bern between April 1 and October 1, 1787, forty-four were sloops, forty-three schooners, and fourteen brigs. They arrived from twenty-seven ports along the Atlantic coast, Great Britain, the Bermuda Islands and the West Indies.⁷⁷

By the end of 1794, New Bern ranked third in amount of registered tonnage, and enrolled and licensed tonnage, behind the port districts of Edenton and Wilmington. Vessels engaged in foreign trade were required to be registered, while those trading along the coast were only required to be enrolled and carry licenses. During 1794, 2,676 tons of shipping were registered in New Bern, while only 983 tons were enrolled and licenced. Six years later, New Bern had become the port with the second largest amount of shipping tonnage behind the port district of Edenton. New Bern now supported 5,443 registered shipping tons, and 1,285 enrolled and licensed tons.⁷⁸ In 1803 the port of New Bern led the other North Carolina port districts in shipping tonnage, however, the overall total had begun to fall to 5,116 registered and 1,512 enrolled and licensed tons. By 1811 the amount of shipping tonnage at New Bern had decreased further. Wilmington had surpassed New Bern, with slightly more tonnage in trade through its port than the 3,175 registered and 2,041 enrolled and licensed reported at New Bern.⁷⁹

In order to accommodate the increase in traffic during the late eighteenth century, the North Carolina General Assembly passed several laws affecting the maritime industry of the region. In April 1784 collectors were appointed to procure taxes at the various ports, as well as to establish the responsibilities of naval officers, custom officers, and shipmasters. Officials were appointed by the Assembly to improve the navigation of the waterways, regulate shipping in the state, and perform examinations of Ocracoke Inlet.⁸⁰

The Assembly also called for the regulation of pilots and the appointment of officers to maintain adequate markers at the Swash and the channels leading from Ocracoke to Washington, Edenton and New Bern. Beacons were to be placed at Ocracoke, Beacon Island, and Core Banks, as well as other points where they were deemed necessary for safety.⁸¹ A federal customs house was also established in New Bern, which had now grown in size to over four hundred houses and a population of about two thousand. By the end of the eighteenth century New Bern had become the largest town in the state.⁸² In 1793 the North Carolina General Assembly passed a quarantine act that authorized state ports to appoint and regulate port physicians to inspect inbound vessels.⁸³ Ships entering at New Bern were required to anchor at least one mile below the town and remain there ten days, unless they could prove to the physicians that they carried no disease.⁸⁴

Growth did not come without setbacks. New Bern was handed a severe economic blow when the North Carolina legislature decided in 1791 to move the state capital to Raleigh. In 1795 another major storm struck New Bern and "the highest tide ever known in the town" was recorded. One of the two ships that had remained in the harbor sank; the other capsized.⁸⁵

The Price-Strother Map of 1808 illustrates the growing development of the region after the turn of the century (Figure 8). The 1810 census indicated that the population of the county had risen to 12,676. Craven County was the leading producer of distilled



Figure 8. Price - Strother Map of 1808.

turpentine, as well as producing thirteen hundred tanned hides and forty-one thousand yards of cloth annually. The growing local shipbuilding industry in New Bern was advanced with the addition of a cut-nail factory, owned by Thomas Bissel, and John Snead's ropewalk.⁸⁶

The area of present-day Oriental, in contrast with New Bern, experienced only minor growth during the late eighteenth and early nineteenth centuries (Figure 9).⁸⁷ The majority of farms in the county remained fairly small. Larger plantations often had river landings from which to load crops and goods for market, and unload supplies brought down from New Bern.⁸⁸ Among the farmers and small planters in this area at the turn of the century were the Edmondson, Carruthers, Bateman, Shines, Valance, Dawson, Nelson, and Green families.⁸⁹

The War of 1812 produced temporary hardships for the maritime enterprises of New Bern. New Bern was, however, the only North Carolina town to outfit at least two privateers during the war in an effort to defend the North Carolina coast. One of these, the *Hero*, captained by Thaddeus Waterman, succeeded in capturing five enemy vessels. The better known of the two privateers was the *Snap Dragon*, captained by Otway Burns. In the first seven months of the war the *Snap Dragon*, built in 1808, captured ten vessels, 250 prisoners, and cargo valued at about a million dollars. The *Snap Dragon* was ultimately taken by the British sloop *Martin* in 1814.⁹⁰

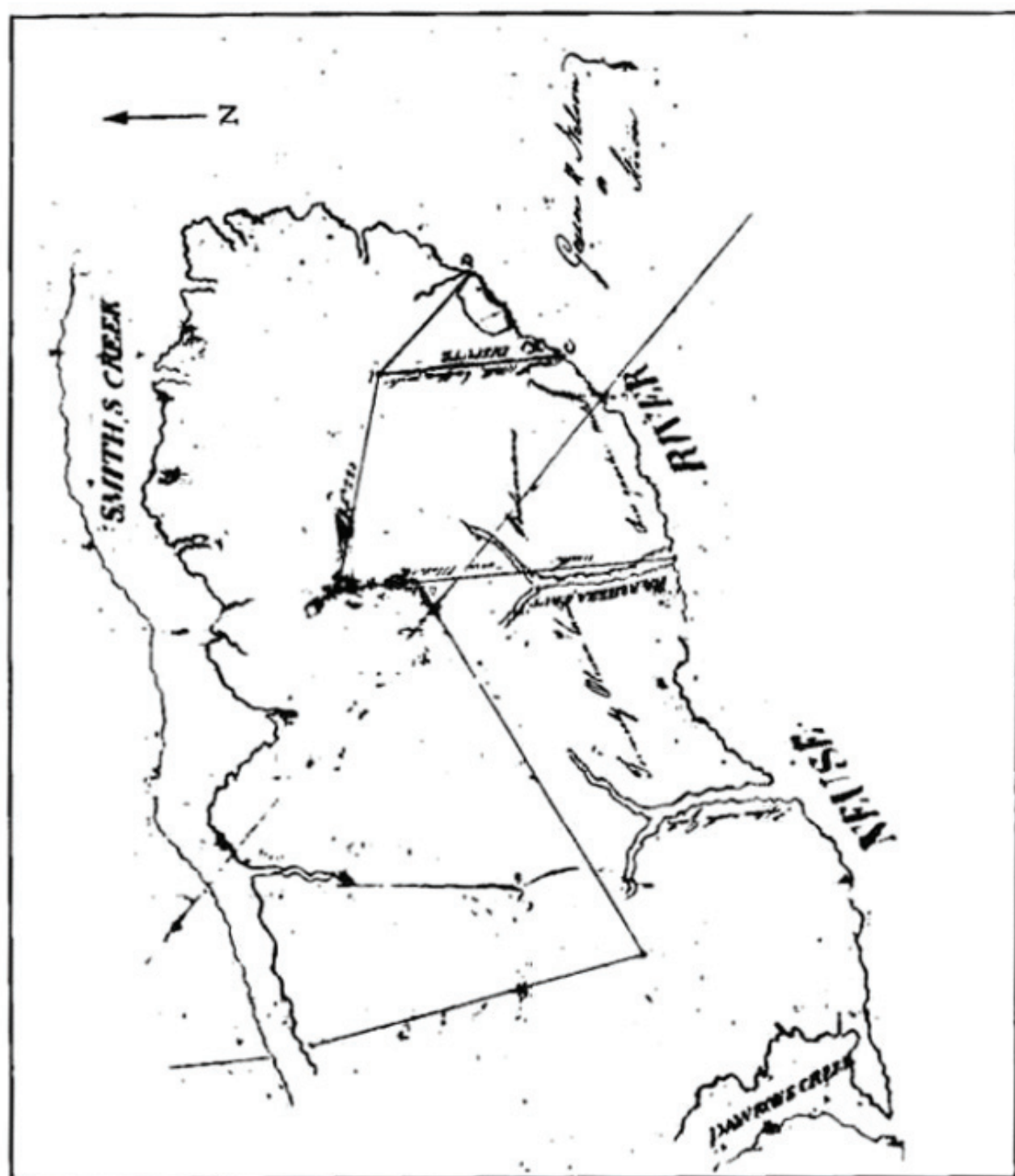


Figure 9. Vicinity of Oriental, N.C., 1805.

When hostilities with Britain were once again over, New Bern resumed a more aggressive inland maritime commerce. By 1820, on the Neuse above where sailing ships could venture, hand-propelled bateaux were being utilized to their practical geographical limits. For a vessel that was basically a huge canoe propelled by polemen, the amount and range of cargo carried by the bateau was surprising. Yet this relatively primitive form of transportation represented a bottleneck for trade between the coast and the interior.

To improve their position as a center for commercial activity, the merchants of New Bern adopted the idea of bringing a new type of vessel, the steamboat, to North Carolina. Recently developed steamboats had bothersome and even dangerous flaws in design and construction, yet some North Carolinians foresaw the usefulness of these maneuverable self-powered vessels for navigating inland waters.

Initial attempts of using steamboats on the Neuse River failed, however, when commerce could not provide support. Another reason for the lack of success of early steamboats in the New Bern area may have been continuing problems with navigation on the upper Neuse River and the failure of organizations intending to solve those problems. A major difficulty was the presence of countless snags and sawyers in the river. Some of these obstacles were trees that had fallen into the rivers and become lodged in the channels, but many were the result of widespread logging along the river banks. Woodcutters used the rivers as convenient places to dump

unwanted tree tops and limbs, which formed impassable barriers at many points.⁹¹ At other points on the rivers, shoals required the building of sluices, locks, or diversion walls called wing dams to deepen the water artificially. Some of the antebellum organizations devoted to improving the state's waterways had at least limited success in carrying out their plans.⁹²

Although navigation on the upper Neuse remained limited, increased vessel traffic on the Neuse below New Bern brought some needed improvements to navigation. One such improvement was the placement of aids to navigation, such as the Long Shoal Light Boat. In late November or early December 1828, a new light boat was launched at Wallace's shipyard adjacent to Sparrow's marine railway in New Bern. Some determined the ship to be "as fine a specimen of naval architecture as our country can produce."⁹³ A notice issued to mariners in early 1829 stated that a "Floating Light" was now stationed at the mouth of the Neuse River.⁹⁴

To accommodate marine traffic the city of New Bern was forced to improve facilities for dockage and new service industries were established. A "new county wharf" was constructed at the foot of Middle street in 1826.⁹⁵ In August 1828, Thomas Sparrow opened a marine railway or inclined plane near Union Point. The advantages of using this type of structure were generally becoming "understood and admitted" as an alternative method of careening ships. The marine railway was constructed to accommodate boats that navigated the waters surrounding New Bern.⁹⁶

During the late 1820s and early 1830s, New Bern's trade was mainly conducted with New York, Boston, Philadelphia, Baltimore, and Charleston.⁹⁷ Undaunted by the initial unsuccessful attempts to establish steamboat service at New Bern, sailing vessels continued to conduct, and even slightly expand, service through the port. A packet line, utilizing two 100-ton schooners, was established in 1824 between New Bern and New York, boasting of travel as fashionable and comfortable as on steamboats. As late as 1851 the establishment of a new packet line to New York utilizing three large schooners was announced.⁹⁸

By 1830 other packet service had been established from New Bern to Beaufort, Elizabeth City, and Norfolk.⁹⁹ However, on September 30, 1830 several sailing vessels, including the brig *Jane*, 164 tons; brig *Hannah*, 150 tons; schooner *Philadelphia*, 88 tons; and schooner *Eliza*, 67 tons, were offered for sale at public auction, likely as a result of the depressed economic situation of the town.¹⁰⁰ An account written in 1834 shows just how disastrous the economic situation had become: "Our town is full of idle, discontented people, whose vicious appetites seem to crave scandal for their daily food, the place is hardly fit for an honest man to live in; & the country seems to be so impoverished as to afford no business worth pursuing - The times seem to be evil indeed."¹⁰¹ By 1835 New Bern's economy was in a state of virtual collapse.

Wooden shipbuilding industry at New Bern progressively declined as a consequence of the economic hardship as well. Fewer

sailing vessels from economically depressed Craven County were engaged in trade and navigating the waters of the lower Neuse River.

The steady decline of New Bern's maritime traffic, especially in foreign trade, was attributed to the growth of Wilmington as a port. Wilmington benefited from the Wilmington-Weldon railroad, and the city's connection with the deep-water port of Beaufort.¹⁰² Several other factors during the second half of the nineteenth century contributed to the decline of New Bern. Improvements begun during the Civil War opened navigation further up river for steamboats. At the same time the construction of wooden sailing ships along the lower Neuse River declined as steam vessels became more dependable. New Bern never regained its prosperity of trade or maritime importance that it held during the eighteenth and early nineteenth century.

The Smith and Greens Creeks vicinity fell into a state of isolation for several years. Development of the area was slow, and not until about 1870 was a community called Smith's Creek finally settled near the confluence of Smith and Greens Creek. The small town later changed its name to Oriental.

Chapter I Endnotes

¹Alonzo Thomas Dill, Jr., "Eighteenth Century New Bern: A History of the Town and Craven County, 1700-1800," 8 parts, *North Carolina Historical Review*, Vol. XXII (1945) and Vol. XXIII (1946), Vol. XXII (1945), p. 8.

²Alan D. Watson, *A History of New Bern and Craven County*. (New Bern: Tryon Palace Commission, 1987), pp. 4-5.

³Craven County Deed Books, No. 78 and No. 81. Division of Archives and History, Raleigh, N.C.

⁴Dill, "Eighteenth Century New Bern," Vol. XXII (1945), p. 12.

⁵Weynette Parks Haun, Craven County North Carolina, County Court Minutes (Court of Pleas & Quarter Sessions), 3 vols. (Durham, N.C., Published by the author, 1978-1983), Vol. I, pp. 11, 21, 23.

⁶Wilson Angley, "A Brief Maritime History of the Oriental Area of Pamlico County," Research Branch, Division of Archives and History, North Carolina Department of Cultural Resources. Manuscript on file, Underwater Archaeology Unit, Kure Beach, North Carolina., p. 2.

⁷William S. Powell, ed., *Dictionary of North Carolina Biography*, 2 vols. (Chapel Hill: University of North Carolina Press, 1979 and 1986), Vol. II, p. 354; Dill, "Eighteenth Century New Bern," XXII (1945), p. 8.

⁸Powell, *Dictionary of North Carolina Biography*, Vol. II, p. 354.

⁹William L. Saunders, ed., *Colonial Records of North Carolina*, 10 vols. (Raleigh: State of North Carolina, 1886-1890), Vol. I, p. 879; Dill, "Eighteenth Century New Bern," Vol. XXII (1945), p. 311; and Powell, *Dictionary of North Carolina Biography*, Vol. I, p. 354.

¹⁰Saunders, *Colonial Records of North Carolina*, Vol. V, pp. 653-654; Powell, *Dictionary of North Carolina Biography*, Vol. II, p. 354; and Dill, "Eighteenth Century New Bern," Vol. XXII (1945), p. 312.

¹¹Will of Farnifold Green. Secretary of State's Wills, North Carolina State Archives, Raleigh, N. C.

¹²John Lawson, "A New Voyage to Carolina," ed. Hugh Lefler (Chapel Hill: University of North Carolina Press, 1967), Originally published in 1709, London, pp. xvii-xviii.

¹³Walter Allen Knittle, *Early Eighteenth Century Palatine Emigration* (Baltimore: Genealogical Publishing Co., 1970), p. 1.

¹⁴Vincent Todd and Julius Goebel, *Christoph Von Graffenried's Account of the Founding of New Bern* (Raleigh: Edwards and Broughton Printing, 1920), p. 63.

¹⁵Todd and Goebel, *Graffenried's Account*, pp.45-46, 63, 69.

¹⁶Christoph Von Graffenried, *Account of the Founding of New Bern*, edited by Vincent H. Todd (Raleigh: Edwards and Broughton, 1920), p. 287; Dill, "Eighteenth Century New Bern," Vol. XXII (1945), p. 174.

¹⁷Graffenried, *Founding of New Bern*, p. 379.

¹⁸Knittle, *Palatine Emigration*, pp. 109-110.

¹⁹David L. Corbitt, ed., *The Formation of the North Carolina Counties, 1663-1943* (Raleigh: North Carolina Department of Cultural Resources, 1950), p. 74.

²⁰Barbara M. Howard Thorne, ed., *The Heritage of Craven County, North Carolina*, 2 vols. (Winston-Salem: Hunter Publishing Co., 1980), Vol. 1, p. 8; Dill, "Eighteenth Century New Bern," XXIII, p. 53.

²¹Saunders, *Colonial and State Records*, Vol. 4, p. 169.

²²Dill, "Eighteenth Century New Bern," Vol. XXIII (1946), p. 66.

²³Saunders, *Colonial and State Records*, Vol. 4, p. 506.

²⁴Watson, *New Bern and Craven County*, p. 29.

²⁵Dill, "Eighteenth Century New Bern," Vol. XXIII (1946), p. 64;
Watson, *New Bern and Craven County*, p. 58.

²⁶Watson, *New Bern and Craven County*, p. 29.

²⁷Watson, *New Bern and Craven County*, p. 58.

²⁸Dill, "Eighteenth Century New Bern," Vol. XXII (1945), p. 476.

²⁹Walter Clark, ed., *The State Records of North Carolina*. 26 vols.
(Winston and Goldsboro: The State of North Carolina, 1895-1907), Vol
23, p. 223.

³⁰Alan D. Watson, "The Ferry in Colonial North Carolina: A Vital
Link in Transportation," *North Carolina Historical Review*, (1974), Vol.
LI, No. 3, p. 250.

³¹Thorne, *Heritage of Craven County*, p. 49.

³²Watson, *New Bern and Craven County*, pp. 32, 34.

³³Craven County Court Minutes, 1733, 1753, 1758, 1761.
Division of Archives and History, Raleigh, N. C.

³⁴Craven County Court Minutes, 1750; Watson, *New Bern and
Craven County*, pp. 32, 127.

³⁵Watson, *New Bern and Craven County* pp. 61-62.

³⁶Harry Roy Merrens, *Colonial North Carolina in the Eighteenth
Century: A Study in Historical Geography* (Chapel Hill: University of
North Carolina Press, 1964), pp. 149-150.

³⁷Alonzo T. Dill, "Political and Commercial Rise of New Bern," *The North Carolina Historical Review*, Vol. XXIII, (January 1946), pp. 47-48.; Dill, "Eighteenth Century New Bern," Vol. XXIII (1946), p. 66.

³⁸Watson, *New Bern and Craven County*, p. 57.

³⁹Watson, *New Bern and Craven County*, p. 57.

⁴⁰Franklin J. Jameson, ed., "Journal of a French Traveller," Part 1, *The American Historical Review*, Vol. XXVI, No. 4, (1921), p. 735.

⁴¹Watson, *New Bern and Craven County*, p. 57.

⁴²Saunders, *Colonial and State Records*, Vol. I, pp. 836-838, 873.

⁴³Merrens, *Colonial North Carolina*, p. 88.

⁴⁴Merrens, *Colonial North Carolina*, p. 90.

⁴⁵Merrens, *Colonial North Carolina*, p. 93.

⁴⁶Merrens, *Colonial North Carolina*, p. 96.

⁴⁷Watson, *New Bern and Craven County*, pp. 59-60.

⁴⁸Merrens, *Colonial North Carolina*, pp. 120, 180.

⁴⁹Merrens, *Colonial North Carolina*, pp. 108, 111, 125, 135, 180.

⁵⁰Margaret M. Hofmann, ed., *Colony of North Carolina, 1735-1775: Abstracts of Land Patents*, 2 vols. to date. (Weldon: Roanoke News Co., 1982 and 1984), Vol. I, pp. 445, 450, and 533 and Vol. II, pp. 44 and 636; Elizabeth Moore, *Records of Craven County*, (Bladensburg, Maryland: Genealogical Recorders, 1960), Vol. I, pp. 6,7,9,10; Saunders, *Colonial Records of North Carolina*, IV, pp. 953, 1044 and 1045 and V pp. 653-654; and Raymond Parker Fouts, comp. *Abstracts from the North Carolina Gazette of New Bern, North Carolina, 1751-1759 and 1768-1790*, 2 vols. (Cocoa, Florida: Gen Rec Books, 1983), Vol. I, pp. 65-66.

⁵¹Angle, "Maritime History of the Oriental Area," p. 10.

⁵²Tucker Littleton, comp., "Archaeological and Historical Survey of U. S. M. C. Base Camp LeJeune," Manuscript on file, University of North Carolina, Wilmington, 1981, p. A-4.

⁵³R.D.W. Connor, *History of North Carolina*, 2 vols. (Chicago and New York: Lewis Publishing Company, 1919), Vol. I, p. 53.

⁵⁴Connor, *History of North Carolina*, p. 53.

⁵⁵Watson, *New Bern and Craven County*, p. 132.

⁵⁶Underwater Archaeology Unit, Site files, North Carolina Underwater Archaeology Branch, Kure Beach, N.C.

⁵⁷"Journal of a French Traveler in the Colonies, 1765" *American Historical Review*, Vol. XXVI, No. 4, (1921), p. 735.

⁵⁸Dill, "Eighteenth Century New Bern," Vol. XXIII (1946), p. 74.

⁵⁹*Carolina Federal Republican*, (New Bern, N.C.), April 18, 1812.

⁶⁰William Powell, *North Carolina Through Four Centuries* (Chapel Hill: University of North Carolina Press, 1989), pp. 180-182.

⁶¹Connor, *History of North Carolina*, pp. 448-449.

⁶²Powell, *North Carolina Through Four Centuries*, p. 187; Watson, *New Bern and Craven County*, pp. 81-83.

⁶³Connor, *History of North Carolina*, pp. 448-449.

⁶⁴Connor, *History of North Carolina*, pp. 448-449.

⁶⁵Dill, "Eighteenth Century New Bern," Vol. XXIII (1946), p. 348; Watson, *New Bern and Craven County*, p. 87.

⁶⁶Dill, "Eighteenth Century New Bern," Vol. XXIII (1946), p. 348.

⁶⁷Watson, *New Bern and Craven County*, p. 87.

⁶⁸Watson, *New Bern and Craven County*, pp. 88-89.

⁶⁹Watson, *New Bern and Craven County*, pp. 89-90.

⁷⁰Emerson and Company, *Charles Emerson and Company's Newbern Directory*. (Raleigh: Edwards, Broughton and Company, 1880-81), pp. 31-32.

⁷¹*The North Carolina Gazette*, (New Bern, N.C.), September 24, 1791.

⁷²John G. B. Hutchins, "History and Development of the Shipbuilding Industry in the United States," F. G. Fassett, Jr., ed., in *The Shipbuilding Business in the United States of America*, 2 vols. (New York: Society of Naval Architects and Marine Engineers, 1948), Vol. 1, p. 16; John G. B. Hutchins, *The American Maritime Industries and Public Policy, 1789-1914, An Economic History*, (Cambridge: Harvard University Press, 1941), p. 105.

⁷³Watson, *New Bern and Craven County*, p. 132.

⁷⁴William Stuart Morgan III, "The Commerce of a Southern Port: New Bern, North Carolina, 1783 to 1789," *The American Neptune*, (1989), Vol. XLIX, No. 2, p. 35.

⁷⁵Richard Stephenson and William N. Still (compilers), "A Statistical Analysis of Interstate and International Vessel Construction in North Carolina" (Greenville: East Carolina University, 1977 to 1981).

⁷⁶"Account of Vessels and Cargoes Cleared from Newbern in Port Beaufort since December 1788" (January 7, 1789 to June 29, 1789) J[ames] Coor, Naval Officer, New Bern, N. C. Treasurer's and Comptroller's Papers, Box 5, Manuscript Room, North Carolina Division of Archives and History, Raleigh.

⁷⁷"Returns of Entries Made in the Collector's Office of [New Bern in] Port Beaufort" (April 2, 1787 to October 1, 1787), John Dawes, Collector, New Bern, N. C. Treasurer's and Comptroller's Papers, Port Beaufort, 1784 to 1789, Manuscript Room, North Carolina Division of Archives and History, Raleigh.

⁷⁸"Abstract of the Tonnage of the Shipping of the last day of December, 1794," Treasury Department to the United States House of Representatives, *Commerce and Navigation Records*, Vol. 1, H. Doc. 30, 4th Congress, 1st Session, 1796, p. 332.; Treasury Department to the United States House of Representatives, "Abstract of the Tonnage of the Shipping of the last day of December, 1800, " *Commerce and Navigation Records*, Vol. 1, H. Doc. 61, 7th Congress, 1st Session, 1802, p. 496.

⁷⁹"Abstract of the Tonnage of the Shipping of the Several Districts of the United States, and Recorded Vessels, on the last day of December, 1803," Treasury Department to the United States House of Representatives, *Commerce and Navigation Records*, Vol. 1, H. Doc. 96, 8th Congress, 2nd Session, 1805, pp. 585-588.; Treasury Department to the United States House of Representatives, "Abstract of the Tonnage of the Shipping of the Several Districts of the United States, and Recorded Vessels, on the last day of December, 1811," *Commerce and Navigation Records*, Vol. 1, H. Doc. 179, 12th Congress, 2nd Session, 1813, pp. 958-962.

⁸⁰Charles C. Crittenden, "Inland Navigation in North Carolina, 1763 to 1789," *The North Carolina Historical Review*, Vol. VIII, No. 2 (1931), pp. 145-154; Watson, *A History of New Bern and Craven County*, p. 133.

⁸¹Crittenden, "Inland Navigation in North Carolina," p. 133.

⁸²Dill, "Eighteenth Century New Bern," XXIII (1946), pp. 514-515 and 517-519).

⁸³William Stuart Morgan III, "The Commerce of A Southern Port: New Bern, North Carolina, 1783 to 1812," (M.A. thesis, East Carolina University, 1985), p. 61.

⁸⁴*The North Carolina Gazette*, (New Bern, N.C.) October 26, 1793.

⁸⁵Watson, *New Bern and Craven County*, p. 163.

⁸⁶Watson, *New Bern and Craven County*, p. 139.

⁸⁷Angle, "Maritime History of the Oriental Area," pp. 10-11.

⁸⁸Watson, *New Bern and Craven County*, p. 139.

⁸⁹Craven County Estates Papers, North Carolina State Archives, John Green and Farnifold Green folders; Moore, *Records of Craven County*, pp. 23, 25; Marion W. Hardy, *A Glimpse of Pamlico County* (Charlotte: Herb Eaton, Inc.; and Marceline, Missouri: Wadsworth Publishing Co., [1977]), p. 76; and Marion W. Hardy, *I Remember "Oriental"* (New Bern: A-1 Special Secretarial Service, 1975), pp. 8-10.

⁹⁰Watson, *New Bern and Craven County*, p. 122; David Stick, *The Outer Banks of North Carolina* (Chapel Hill: University of North Carolina Press, 1958), p. 83.

⁹¹Sloan, *Inland Steam Navigation*, p. 26.

⁹²Hugh T. Lefler and A. R. Newsome, *The History of a Southern State: North Carolina*. (Chapel Hill: University of North Carolina Press, 1954), p. 317.

⁹³*New Bern Spectator*, (New Bern, N.C.), November 22, 1828

⁹⁴*New Bern Spectator*, (New Bern, N.C.), February 28, 1829.

⁹⁵Craven County Court Minutes, August 1826.

⁹⁶*New Bern Spectator*, (New Bern, N.C.), August 23, 1828.

⁹⁷Watson, *New Bern and Craven County*, p. 263.

⁹⁸Watson, *New Bern and Craven County*, p. 263.

⁹⁹Watson, *New Bern and Craven County*, p. 263.

¹⁰⁰*New Bern Spectator*, (New Bern, N.C.), September 25, 1830.

¹⁰¹Letter from John Herritage Bryan to Ebenezer Pettigrew, New Bern, July 3, 1834, Sarah McCulloh Lemmon, ed., *The Pettigrew Papers*, 2 vols. (Raleigh: North Carolina Department of Archives and History, 1971), pp. 237-38.

¹⁰²Watson, *New Bern and Craven County*, p. 262.

Chapter II

Discovery and Archaeological Excavation of the Wreck at Otter Creek

Discovery and Testing

In December of 1986 the North Carolina Underwater Archaeological Unit (UAU), located at Fort Fisher, Wilmington, North Carolina received an application for a Coastal Area Management Act (CAMA) permit from Mr. J. Ken Davis. He proposed excavating a boat basin and access channel in Otter Creek in association with a residential subdivision located near Oriental, North Carolina (Figures 10 and 12).¹ The UAU responded to Mr. Davis' request by sending two UAU staff members to Otter Creek, formerly Horton Creek, to conduct a magnetometer survey and assess the area's potential for containing submerged archaeological resources.² During the course of the survey four magnetic anomalies were detected. Three proved to be either insignificant or unobservable, while the fourth, Anomaly D, proved to indicate the remains of a sunken wooden vessel of possible archaeological and historical significance.³ The UAU recommended that the vessel be further investigated to determine its extent, nature and condition, and that historical research be undertaken.⁴

The following May 14, Richard Lawrence and Mark Wilderamsing of the UAU and Geoffrey Scofield of the North Carolina Maritime Museum revisited the Otter Creek Wreck, now designated

0018NUR, the eighteenth site documented in the Neuse River drainage, to record the overall measurements, framing patterns and scantling dimensions of the wreck.⁵ They determined that the vessel was oriented with the bow pointed slightly towards the south shore of Otter Creek. The location and recovery of a gudgeon strap off the port side of the stern confirmed the orientation (Figure 12). The wreck's length was estimated to be fifty-eight feet from the aft side of the sternpost to the forward edge of the apron in the bow. No stempost was observed.⁶ Probing of the wreck through a thick deposit of sediment revealed large ballast stones on the floor of the hull forty feet forward of the stern on the starboard side.⁷ A small athwartship test trench was placed forty-two feet forward of the sternpost on the port side to expose the hull for measurements and documentation.⁸ Hull construction will be discussed in detail in Chapter 3. Characteristics of the ship's construction suggested that the wreck was a wooden vessel fastened with iron spikes and wooden trunnels, and probably dated to the late eighteenth or early nineteenth century. The UAU recommended further archaeological documentation of this vessel before the granting of a CAMA permit to Mr. Davis.

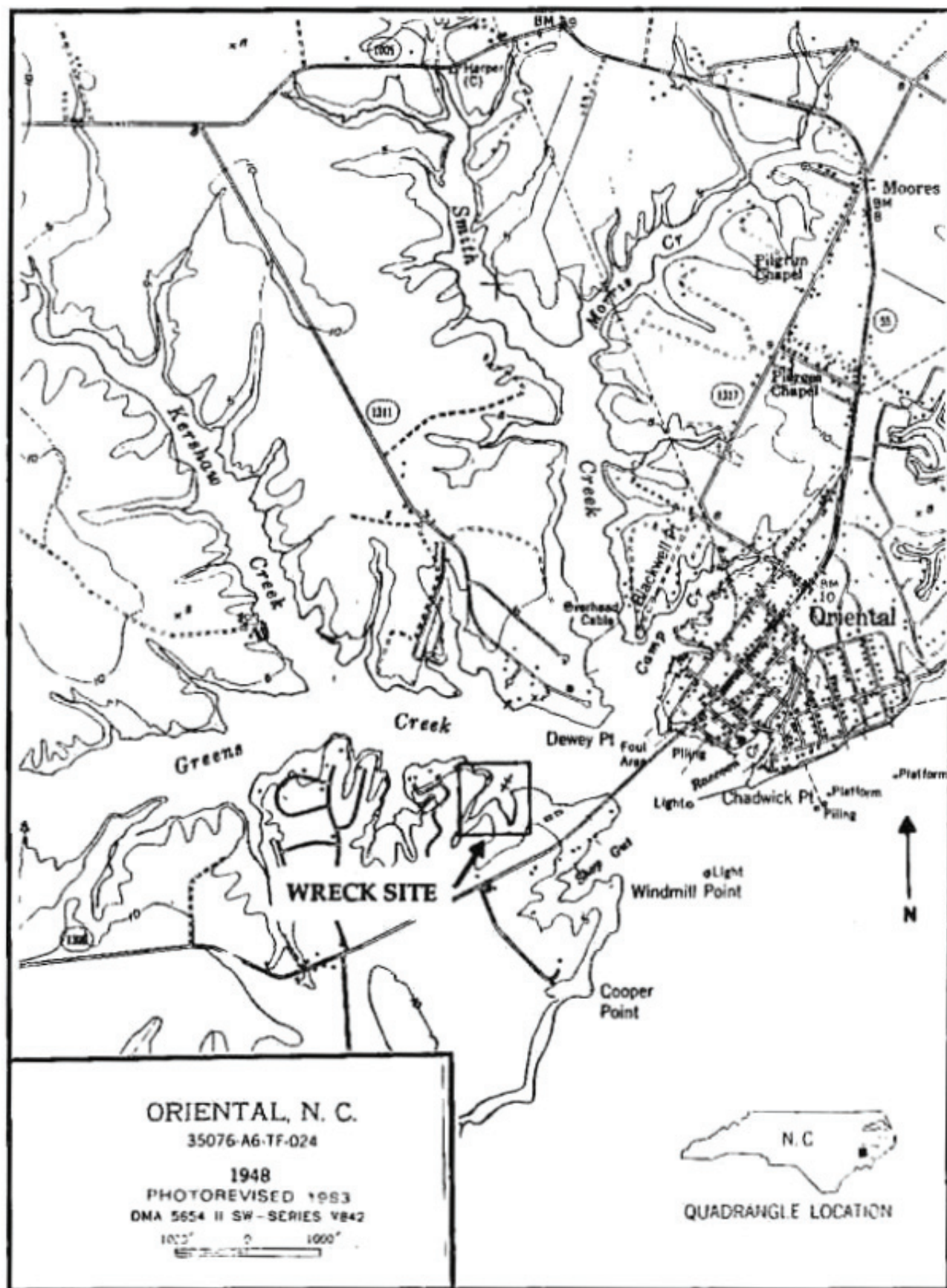


Figure 10. Location of the Otter Creek Wreck, Oriental, North Carolina.

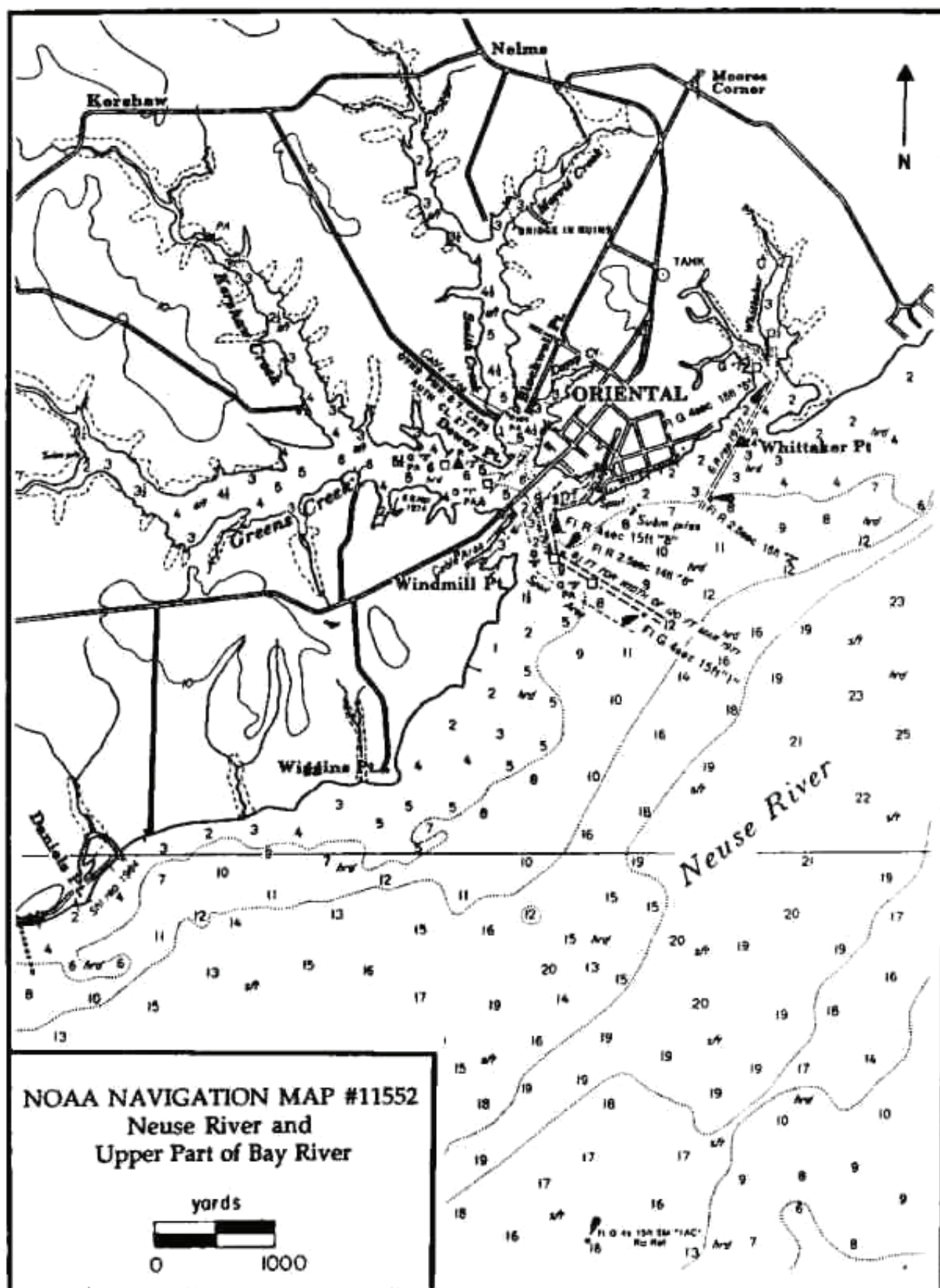


Figure 11. Navigation Map of the Otter Creek Area.

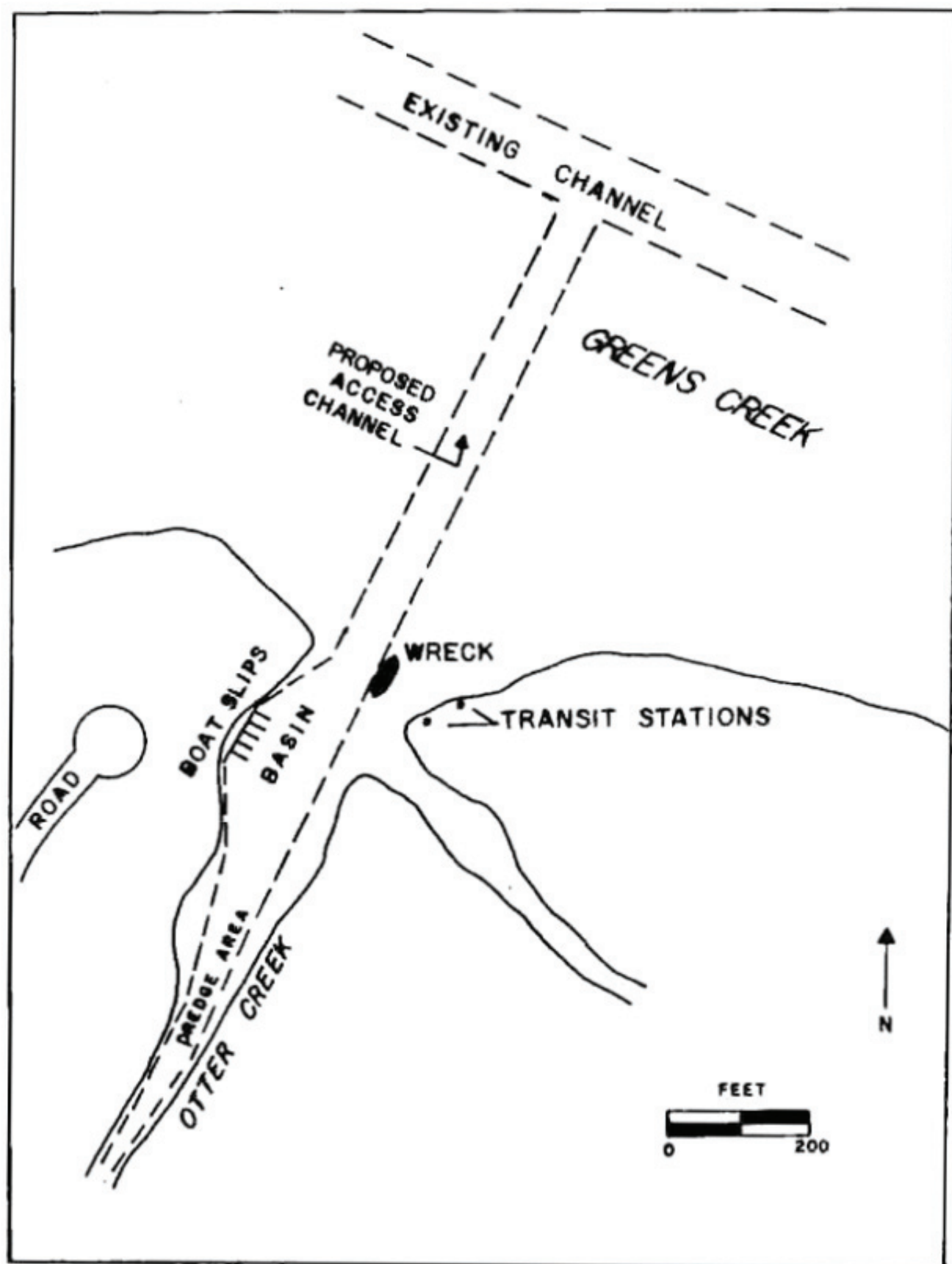


Figure 12. Map of Otter Creek showing relationship of the wreck and proposed development.

Site Description

The wrecked ship being investigated is located near the confluence of Otter Creek and Greens Creek, one-half mile west of where Greens Creek flows into the Neuse River. The town of Oriental is situated on the north side of Greens Creek at its junction with the Neuse River, about thirteen miles from where the river empties into the Pamlico Sound (Figures 10 and 11). The wreck lies about 150 feet from shore off the point of land directly south of the bridge. Here the property of Joe Gwaltney is being developed as the Goodwinds Estates. The shipwreck is in just four feet of water, partially buried with five feet of sediment above the keel. A thin layer of silt deposit covers several feet of soft packed clay. The anerobic sediments have preserved the ship's remains in remarkably good condition to a foot or two above the turn of the bilge. Exposed timbers above the sediment have long since decayed or been eaten away by wood-boring worms and other organisms.⁹ Frames and other timbers partially exposed at times above the sediment are severely riddled and decayed along their upper edges.

Site Environment

Warm water organisms flourish in these brackish waters, which average, as recorded at Ocracoke Inlet, 76 degrees during the summer and 45 degrees during the winter.¹⁰ Table 1 lists the average monthly air temperature and precipitation as recorded at New Bern.

Table 1.

Temperature and Precipitation Averages
New Bern, North Carolina.¹¹

Month	Temperature (F)	Precipitation (in.)
Jan	44.0	4.01
Feb	45.9	3.97
Mar	52.7	3.62
Apr	61.9	2.98
May	69.5	4.41
Jun	75.7	5.13
Jul	79.2	6.75
Aug	78.8	6.33
Sep	74.0	5.75
Oct	63.7	3.39
Nov	54.3	3.08
Dec	46.5	3.69

The numerous jellyfish that inhabit the creeks and sound posed an annoying problem during excavations. The divers had to wear full wetsuits or other protective clothing against the painful stings.

Water visibility does not exist deeper than a foot and all excavation was done by touch alone. The depth of the water generally remained constant with little tidal variation, except when occasional strong westerly winds forced a "blowout" of some water within the creeks.

On a yearly average winds within a few miles of the Atlantic shores and over Hatteras Islands rank from class 2 to class 4 (Table 2). The higher class 4 wind speeds are generally recorded on the eastward facing parts of Hatteras Island. Seasonally, this part of the Neuse River experiences class 3 winds during the winter, and lesser class 2 speeds during the summer.

Table 2.

Ranked Wind Speed¹²

Wind Speed (mph)	Wind Class
< 9.8	1
9.8 - 11.5	2
11.6 - 12.5	3
12.6 - 13.4	4
13.5 - 14.3	5
14.4 - 15.7	6
> 15.7	7

Winds tend to gain in strength during the morning and are generally strongest in early afternoon; then they decrease through the evening and remain relatively weak until dawn. The inland difference in daily wind speed ranges from three to five mph

between dawn and afternoon. Winds are most frequently from the southwest on a year-round basis, except in September and October when the prevailing wind changes to exactly the opposite direction and blows from the northeast.¹³

Objectives and Research Design

The objectives of the excavation on the Otter Creek Wreck were to document as much of the ship's structure as possible; to recover any associated artifacts that might help determine the vessel's age, name and history; and to evaluate the site's potential prior to the issuance of any CAMA permit. To accomplish this an athwartship trench and one parallel to the keelson would be dug, and limited excavation around the bow and sternpost would be conducted to provide the greatest amount of information in the two weeks available to the staff of the UAU for this project. To control horizontal provenience a 5-foot grid system was established over the wreck (Figure 13). All measurements would be taken in feet and inches to correspond to the units used in the construction of the ship.

Thirty feet forward of the sternpost a secured perpendicular line crossed the keelson for the purpose of guiding an athwartship trench. The trench excavation began at the exposed futtock ends on the port side and worked toward the keelson. Once the port side excavation began a second dredge was employed to begin digging the athwartship trench from the starboard side. A Hale fire pump equipped to handle two 3-inch induction hoses would be used for

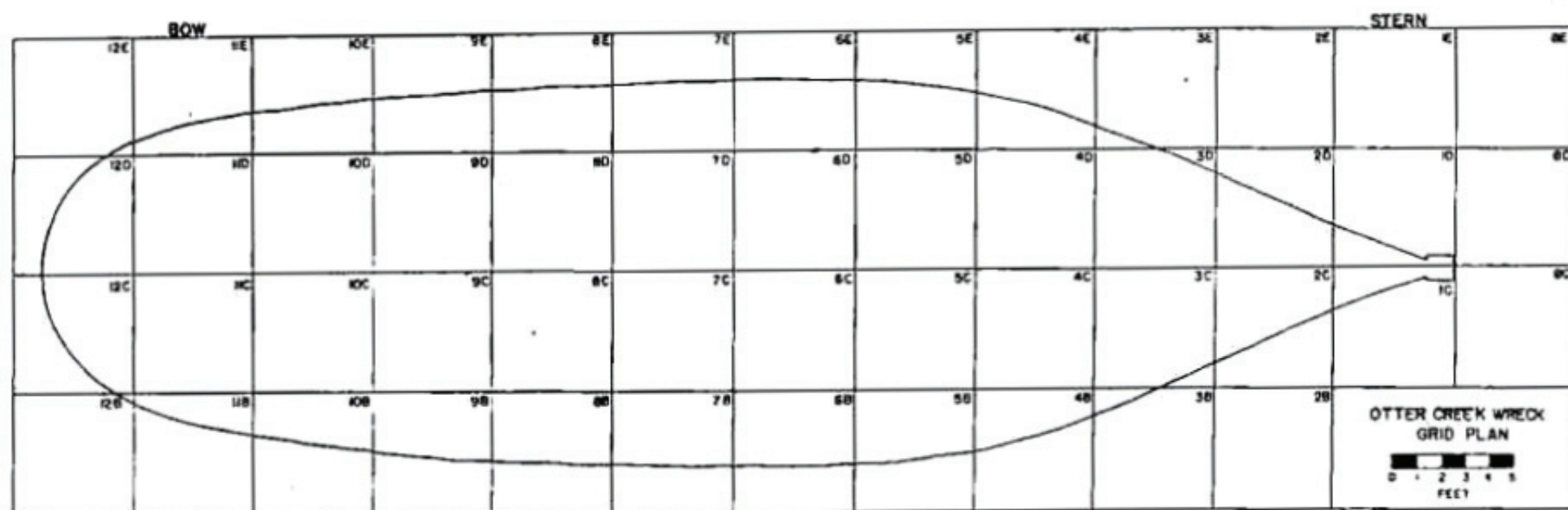


Figure 13. Excavation grid plan.

excavation. Removed overburden would be pumped to the surface and sluiced through 1/4-inch screens for small artifacts. Spoil would then drop through the water column and be deposited outside the wreck. All recovered artifacts would be kept wet and stored in plastic bags marked according to the square from which they had been recovered.

Description of the Work: 1988 Excavation

Scheduling and preparations delayed returning to the Otter Creek Wreck to conduct extensive excavations until late summer of 1988. A preparatory trip was made to the site on July 13-14, 1988 by the author and staff of the UAU to relocate the wreck and establish baseline points. The sternpost and forward limit of the wreck were relocated and metal rods were placed adjacent to either end of the ship to facilitate identification. Batter boards were then established twenty feet forward of the bow and twenty feet aft of the stern to provide adjustable ends for a baseline to be placed along the centerline of the vessel, and as a measure to indicate the gradient of the creek bottom (Figure 14). The batter boards comprised two 10-foot long, 3/4 inch diameter galvanized conduit rods, which were driven into the sediment six feet apart perpendicular to the long axis of the vessel until only a foot remained above the sediment. A horizontal bar was then attached to the rods and raised or lowered to the same level as the batter board on the other end of the ship. Leveling was accomplished by holding a fiberglass stadia rod

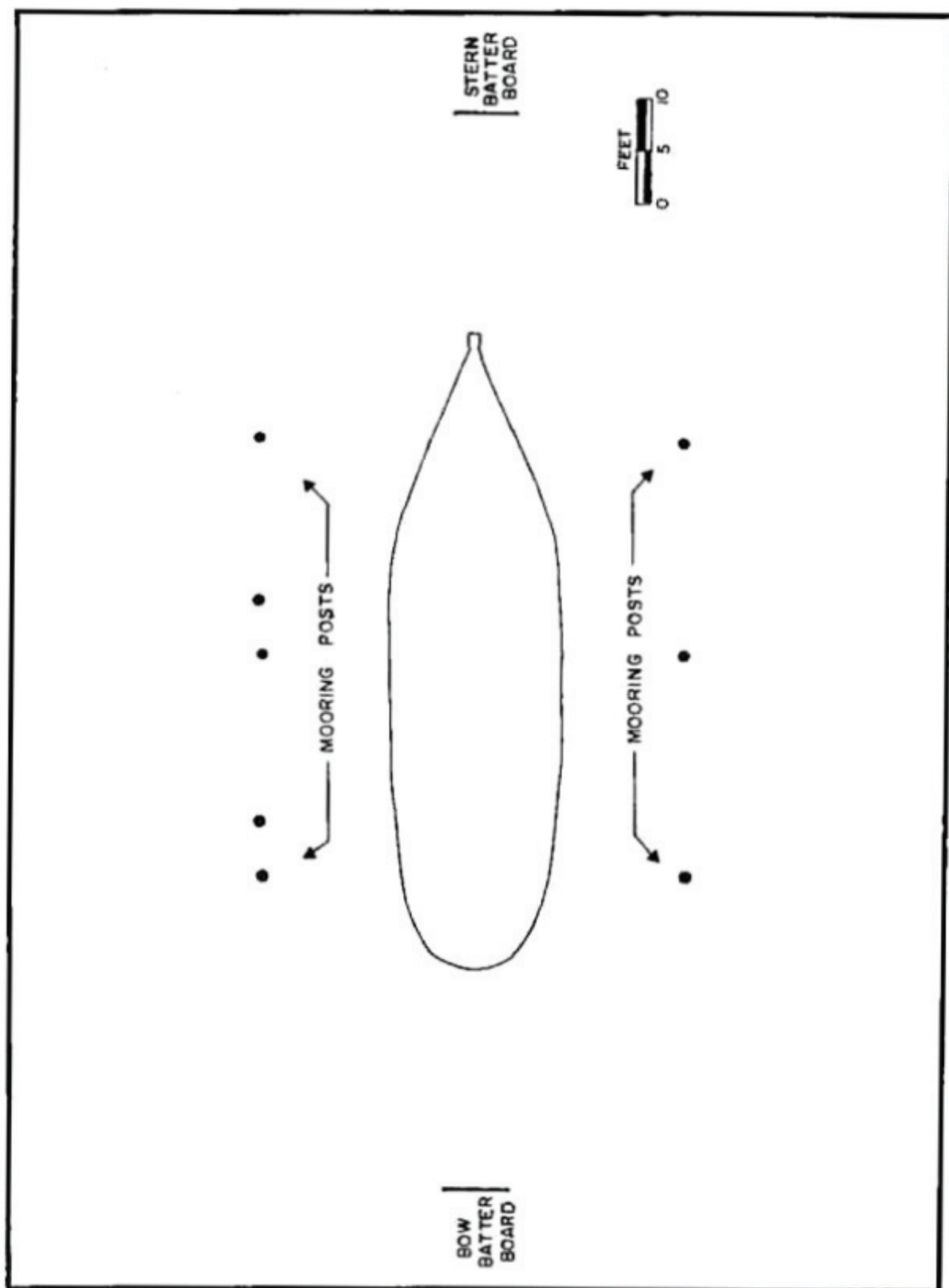


Figure 14. Location of batter boards and mooring posts.

vertically on top of the cross bar then sighting it in from a transit station ashore. The batter boards permitted a baseline to be attached and horizontally aligned over the keelson of the vessel. Elevation measurements of the creek bottom showed that it sloped downward only a few inches towards the stern of the vessel.¹⁴

One of the fortunate arrangements made concerning the excavation of the Otter Creek Wreck was the participation of a group of international students belonging to an organization known as Operation Raleigh. Operation Raleigh, a British/American project consisted of a multi-national group of students ranging in age from seventeen to twenty-four. The program was established by Britain's Prince Charles to develop youth leadership.¹⁵ This group, commonly referred to as Venturers, represented only a small number of the many foreign students participating in various Operation Raleigh projects throughout the United States. Twenty students and their four supervisors assisted in the excavation of the Otter Creek wreck and participated in a magnetometer survey of the waters around Oriental.

On August 7, Richard Lawrence, Mark Wilde-Ramsing, Leslie Bright and Julep Gillman-Bryan of the Underwater Archaeology Unit, as well as Geoff Scofield, curator at the North Carolina Maritime Museum and the author arrived to begin excavation of the wreck and conduct a magnetometer survey of the surrounding creeks. The Operation Raleigh students already had been on site for two weeks participating in a short but intensive diving course. On our first day

we established our own base camp and brought the work boats to the site. A 24-foot Privateer served as our dive boat and a platform for recording and depositing recovered artifacts and timbers. A 14-foot boat stationed permanently over the wreck contained the dredge equipment.

The following morning the twenty Venturers were broken into two groups, with one group receiving instruction about the magnetometer survey and the other learning about the excavation plan of the Otter Creek Wreck. The ten Venturers assigned to work on the wreck were more than needed, so only two Venturers and one of their supervisors assisted on the wreck each day. The others of this group were assigned either transit station or camp duties. The groups alternated daily between the tasks. Three of the UAU archaeologists normally worked with the group assigned to the magnetometer survey, while Richard Lawrence, Geoff Scofield and the author remained on the excavation crew.

After the briefing session students assigned to work on the excavation were given the task of placing six metal boat mooring posts around the wreck. Under supervision by one of the archaeologists, posts were driven almost completely into the sediment, then buoyed to mark their locations at 30, 50, and 70 feet forward of the stern batter board 20 feet either side of the keelson (Figure 14). A baseline tape was then secured to the batter boards, with the zero end of the tape at the stern board, and aligned over the midline of the ship. ¹⁶

Ashore, two transit stations were built for recording wreck measurements (Figure 12). Wooden posts, 4 x 4 inches in size, were secured into the ground at each predetermined location and similar height. To these posts were securely attached and leveled 12-inch square wooden platforms. The base attachment rings of the transits were then afixed to the platforms. This method allowed for the transits to be mounted daily at the same positions and height.

Working from both directions, removal of the two or three feet of sediment above the wreck in the 6-foot-wide athwartship trench took only a short amount of time. Some loose timbers and a few artifacts were the only objects recovered from the trench, while most of the ceiling within the athwartship trench remained intact.

Since the baseline tape had been attached to the batter boards twenty feet beyond the ends of the ship, some confusion arose in taking measurements and recording objects within the grid system. Use of the batter boards was then discontinued and the tape was attached to the metal rods adjacent to the ends of the ship, to correspond with the actual length of the wreck. All recorded data were adjusted to correspond to this change.

On completion of the athwartship trench, divers employed the dredges to begin excavation of a 2-foot wide trench along the keelson. Digging on the keelson trench began forward and aft of the exposed section of keelson in the athwartship trench.¹⁷ Materials recovered from the wreck or in the dredge surface screens were again kept separate according to the appropriate 5-foot grid

coordinates. Excavation on both sides of the keelson in either direction continued for the next few days. The process yielded some collapsed wooden structural elements, artifacts, and large ballast stones on top of the ceiling. Artifact density was greater in the stern area.

The forward end of the keelson excavation trench continued until it revealed two breast hooks in the deteriorated bow section.¹⁸ The aft end of the keelson excavation trench proceeded past the mainmast step, the bilge pump wells, and the stern knee, finally reaching the sternpost. With the excavation trench proceeding in opposite directions two further fence posts had to be placed into the sediment twenty-five and forty-five feet forward of the stern on the starboard side to secure the dredge workboat near the wreck (Figure 14).

Halting excavation in and around the deteriorated bow, the forward dredge was shifted to begin digging outside the vessel near the sternpost. The sternpost excavation hole did not encounter the rudder. One gudgeon strap had been recovered from the bottom sediment, while a lower deteriorated gudgeon was found attached to the lower sternpost. The stern pit continued until it reached the keel; then both the sternpost and the exposed keel were mapped. Excavators using the other dredge began widening the keelson trench within the narrow stern.

Mapping of the wreck proceeded with the two shore transit stations triangulating positions indicated by a team of divers. The first diver would locate the frame, ceiling plank, mast step, or whatever other component was to be mapped and hold the base of the fiberglass stadia rod in position. A signal would be given to the second diver on the surface holding the top of the rod vertical. That diver in turn signaled for the transit stations to record both the bearing and height. Both stations then relayed by walkie-talkie to the workboat that they had completed taking the recordings. A diver using a tape would record scantling and other smaller measurements by hand.

Upon completion of the sternpost excavation divers began clearing out the loose sediment that quickly was deposited within the trenches, to facilitate removal of the limber boards for inspection and recording of the framing patterns. Others started a pit outside the vessel on the starboard side fifty-three to fifty-five feet forward of the stern to document the keel, gripe and apron assembly. Five feet of sediment containing compacted oyster shells had to be removed below the hull to expose the forward section of keel. Once this was achieved one of the archaeologists mapped the exposed area of the keel.

On the last day of excavation wood and ballast samples were collected, field data were reviewed, and removal of excavation equipment, boats and camp materials was accomplished. Objectives of the project did not include recovery of the wreck. Sediments

rapidly filled the excavated interior of the wreck, so backfilling was not deemed necessary. Prior to departure archaeologist Richard Lawrence presented an overview of the project to the Venturers, including display and description of some artifacts recovered from the wreck.

Chapter II Endnotes

¹Mark Wilde-Ramsing, "Otter Creek Magnetometer Survey and Site Assessment, North Carolina," 1986 (report on file, North Carolina Underwater Archaeology Unit, Kure Beach, N. C.), p. 1.

²Wilde-Ramsing, "Otter Creek Magnetometer Survey," p. 1.

³Wilde-Ramsing, "Otter Creek Magnetometer Survey," pp. 1,3,5.

⁴Wilde-Ramsing, "Otter Creek Magnetometer Survey," p. 5.

⁵Mark Wilde-Ramsing, "Examination of the Otter Creek Wreck," 1987 (report on file, North Carolina Underwater Archaeology Unit, Kure Beach, N. C.), p. 1.

⁶Wilde-Ramsing, "Examination of the Otter Creek Wreck," p. 1.

⁷Wilde-Ramsing, "Examination of the Otter Creek Wreck," p. 2.

⁸Wilde-Ramsing, "Examination of the Otter Creek Wreck," p. 1.

⁹A description of the characteristics of the common *Teredo* worm, as well as other wood-boring organisms including shipworm species, marine gribbles, and wood piddocks can be found in the appendix titled "A classification and distribution of marine wood-boring organisms which may attack archaeological wrecks" following Wendy S. Robinson, "Observations on the preservation of archaeological wrecks and metals in marine environments," *The International Journal of Nautical Archaeology and Underwater Exploration*, Volume 10, Number 1 (1981), pp. 3-14.

¹⁰J.G. Newton, O.H. Pilkey, and J.O. Blanton, *An Oceanographic Atlas of the Carolina Continental Margin*, (Morehead City, N.C.: Duke University Marine Laboratory, 1971), pp. 47,49.

¹¹National Oceanographic and Atmospheric Administration, *Climates of the States* third edition, 2 vols. (Detroit: Gale Research Co., 1985), Vol. 2, p. 810.

¹²Dean Deharpporte, *South and Southeast Wind Atlas* (New York: Van Nostrand Reinhold Co., 1984), p. 70.

¹³Albert V. Hardy and Jessie D. Hardy, "Weather and Climate in North Carolina," *Agricultural Experiment Station Bulletin 396*, (Raleigh: North Carolina State University, 1971), p. 25.

¹⁴Underwater Archaeology Unit, "Daily Log of the Otter Creek Shipwreck Excavation, Oriental, North Carolina" (on file, North Carolina Underwater Archaeology Branch, Kure Beach, N.C.), p. 4. Hereinafter cited as UAU Daily Log.

¹⁵"International Group Coming to Oriental to Examine 300-Year Old Sunken Vessel," *The Pamlico News*, Oriental, N.C., 16 March 1988.

¹⁶UAU Daily Log, p. 9.

¹⁷UAU Daily Log, p. 15.

¹⁸UAU Daily Log, p. 20.

Chapter III

Description of the Structural Remains

Beneath the mud of Otter Creek lies an estimated fifteen to twenty-five percent of the hull, listing six degrees to port. The extant length measures 58 feet including the bow and stern rake (Figure 15, foldout). The maximum extant measurement of the beam is 16 feet and occurs at frame number fourteen.¹ At the beginning of the nineteenth century the average length/beam ratio of 3.2 to 1 was common in small merchant vessels.² The Otter Creek vessel would have been approximately 100 tons and had a draft of 9 feet.³ The vessel was likely single decked, possibly with a raised poop. The hold space would have been approximately 6 1/2 feet deep. The presence of two mast steps indicates that the vessel may have been rigged as a schooner or brig. A schooner rig is the most likely based upon the presence of mast hoop fragments from nearly all excavation units. The fore-and-aft rig was mostly used for merchant vessels, while square sails, such as on a brig, were more common on armed merchantman or naval vessels. Figure 16 illustrates a vessel believed to be similar to the one excavated at Otter Creek.



Figure 16. Vessel similar to the Otter Creek Wreck.
(MacGregor 1988:102)

Ship Construction Timber

The amount of timber necessary for the construction of merchant ships near the end of the eighteenth century has been calculated at just over one load of timber, about equal to one ton of lumber, for every ton of shipping.⁴ The "load," used as a measurement of timber, was fifty cubic feet, or the equivalent of six hundred American board feet.⁵ In Britain in 1804 the cost of straight oak timber ranged from four pounds three shillings to seven pounds sixteen shillings per load according to its size. Oak of average dimensions cost about seven pounds per load.⁶ Dodds and Moore, in their publication *Building the Wooden Fighting Ship*, state that merchant vessels were constructed on basic lines with fewer decks and less reinforcement than naval vessels. They also give a figure for merchant ships of 1 to 1 1/2 loads of lumber per ton of vessel.⁷ The wooden hull of a merchant sailing ship, not needing to be as rigidly constructed as that of a naval vessel, proportionally weighed less and was considered to displace 1/3 as much water as a warship of identical dimensions.⁸

There is little debate on the best species of wood used in ship construction. Oak, slow to mature, was an exceptionally strong wood highly regarded by many shipwrights as the best material for most structural elements. According to the *Lloyd's Register* for rating of woods used in ship construction, English oak had a high lifetime expectancy rating of twelve years, as did the live oak found in the southeastern U.S. Other oaks, such as Baltic oak, rated at seven

years, and North American white oak, rated at six years, rank far less in useful life expectancy.⁹ The Otter Creek wreck is almost entirely constructed from white oak (Appendix A).

English shipwrights often obtained their oak from the southern counties, particularly Sussex, Surrey, Hampshire and Kent. Oak from Sussex appears to be slightly superior to the others, while imported oak, mainly from the Baltic region and North America, was only used as a last resort.¹⁰ Oaks were normally felled between eighty and one hundred and twenty years of age and between 15 and 18 inches in diameter. Growth beyond this time was liable to decay the heartwood.¹¹ Compass oak, needed for its grain strength in the use of knees and other curved pieces, was the most difficult timber to obtain.

Prior to 1804 the British navy used only a select range of timber types for ship construction. Oak, with some elm, beech, and fir were used for the hull, while fir, pine and spruce were mainly used for the masts.¹² Elm, second in use in ship construction to oak, was advantageous in two ways: it had a tightly spaced grain that was useful for holding fastenings, and was not susceptible to rot when constantly immersed in water. Its disadvantage was that it did not have the strength of oak. Elm was occasionally used for the keel and garboard planks, but rarely for pieces above the waterline.¹³ Fir trees, tall and straight, were sometimes used for masts, spars, decking and hull sheathing. In the early nineteenth century larch became an alternative to oak for planking.¹⁴ According to Robert

Albion, European larch is similar to the American species. While originally an Alpine tree it was not used in shipbuilding until about 1820. Its advantage was that it took only fifty or sixty years to reach maturity, much less than the average one hundred years for oak to mature. The timber was found to be durable, tough, strong, and comparatively light compared to other species. It could also somewhat resist attack and destruction from the shipworm, and would not corrode iron like oak did.¹⁵ Nearly all of the foreign timber used by the British navy before 1804 was imported from the Baltic or America. Its use, however, was limited to times of emergencies when local seasoned European oak was not available.¹⁶

American timber proved to be of a very high quality, although live oak, while nearly equal to European oak, was never fully utilized by English shipbuilders. White and red pine and some oak were grown in New England, while pine was abundant in the South. White oak was distributed along the entire eastern coast, except for northern Maine and the Florida peninsula.¹⁷ A distinction cannot be made between European and North American white oak. Albion makes the point that the Americans often used white oak in most ships that they built for sale, while using live oak from the South for their own best vessels.¹⁸ The well known American Revolutionary gunboat *Philadelphia* is constructed almost entirely of white oak. Lignum vitae, needed for the use of blocks, sheaves, pulleys and other high wearing pieces, came from the southern states and Central America.¹⁹

The availability of a large quantity of good timber often determined the location for ship construction. In the building of any wooden vessel a large amount of timber is wasted due to flaws or rot. Basil Greenhill, a leading British expert on ship construction, claims in his work *The Evolution of the Wooden Ship* that as much as one-third of all timber in its rough shape was lost in the siding and squaring process of forming planks, frame-pieces, beams and knees.²⁰ He further states that seventy-five per cent of the dressed timber was used for the framework or skeleton of wooden sailing ships, while the other twenty-five per cent went for the construction of knees, fillings, and planking of the hull.²¹

One of the inherent properties of wooden ships was their susceptibility to dry rot. Albion lists four principal causes leading to the origin and spread of dry rot in ships - the use of unseasoned timber, or certain foreign woods, improper construction, and a lack of ventilation.²²

The English climate of alternating periods of wet and dry weather contributed to the spread of dry rot. The American climate was less conducive to the problem. Sapwood was more prone to rot. It was found that oak cut in the winter when the sap was not flowing yielded better quality building material.²³ While most sources seem to indicate that winter cut wood is best, one source states the opposite viewpoint:

An old belief still given wide currency is that winter-cut lumber is more durable than summer-cut lumber. The belief is based on the erroneous assumption that in winter, "the sap is down," while in the summer, "the sap is up," in the living tree. The only sound objection to

summer-cut lumber is that logs are more likely to deteriorate if left exposed to high summer temperatures that may accelerate checking and attack by insects and decay fungi. Reasonable precautions, particularly prompt sawing after felling, and good piling and seasoning methods, remove the danger of such damage to summer-cut material.²⁴

Seasoned wood, especially oak taking up to three years to cure, was preferred to green timber for ship construction. Seasoning allowed time for the sap to dry out and lessen the overall change in shape that could be harmful in the construction of wooden ships. Seasoned timber was not always available, however, and an owner might require the construction of a vessel before stock lumber could cure. Green timber was more prone to rot, but had the advantage of being easily bent.

Iron, used in conjunction with wood, is also suspected of contributing to the spread of dry rot. As Dodds and Moore state, iron fasteners were replaced with more expensive copper ones as a partial solution to this problem, and this would not of been done unless it was warranted.²⁵ While dry rot caused numerous problems to the interior of a vessel, decay of wooden hulls from the *teredo*, or ship worm, posed the greatest external problem for ships operating in warmer climates. This problem was finally overcome by the use of various forms of sheathing, which are discussed later in this chapter.

Keel

The length of the keel on the Otter Creek wreck measures 49 feet 3 inches as measured from the outside of the sternpost to the stem scarf nib at the rabbet line. Due to the limited excavation below the vessel it could not be determined if the keel is made up of a single member or from multiple pieces.²⁶

If the keel was composed of two or more members scarfed together they would likely have been bolted and clinched.²⁷ Figure 17 presents a perspective of the excavation. Wood sample analysis indicated that the keel was constructed out of white oak (Appendix A). Dimensions of the keel where accessible measured 12 inches amidships, sided 10 inches forward and 9 inches aft, with a parallel moulding of 12 inches. Attached to the underside of the main keel was a false keel molded 3 inches and sided the same dimension as the main keel. No wood identification was made for the false keel.

The forward end of the keel was jointed to the gripe with a nibbed scarf made in the horizontal plain that measured 2 feet 5 inches in length (the term "nibbed" scarf being interchangeable with the European term, "plain" scarf). The aft top nib of the scarf was partially obscured by the remaining planking, but both nibs measured 4 1/2 inches in height (Figure 18). The keel rabbet line occurred 10 inches above the bottom of the keel, not including the false keel.²⁸

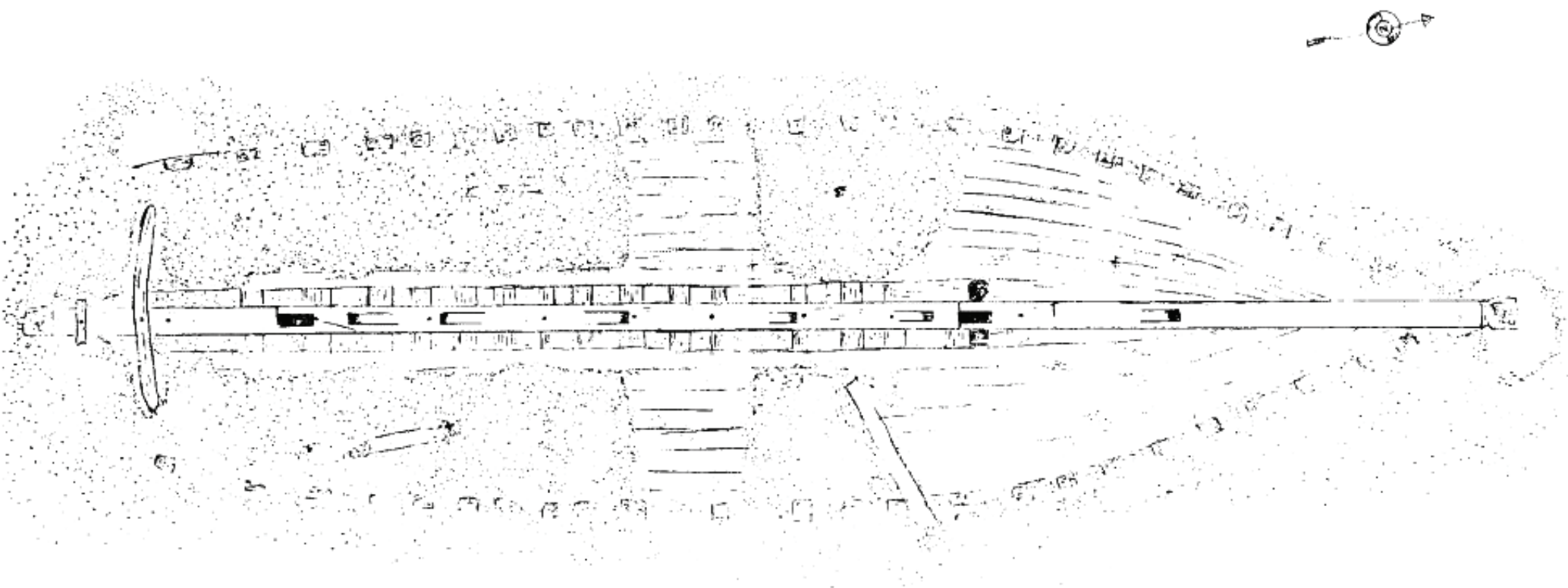


Figure 17. Perspective drawing showing excavated areas.

On merchant vessels the garboard rabbet was often taken out of the middle of the keel to prevent its canting should the vessel ground.²⁹

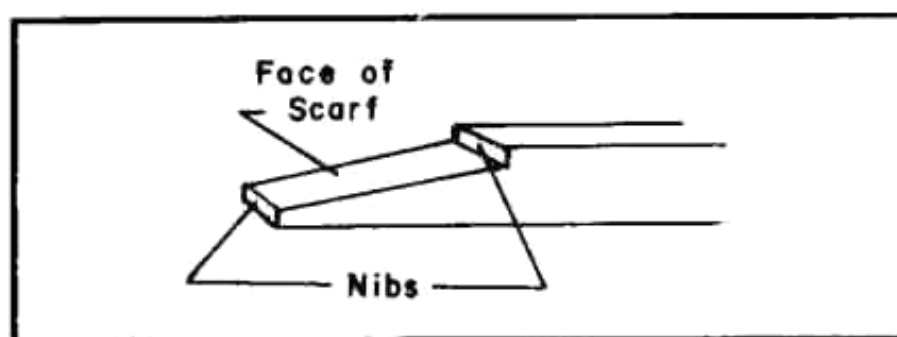


Figure 18. Drawing of keelson scarf.

The remains of two iron gripe plates, or straps were observed let into the keel and gripe scarf on each side. The complete length of the plates measured 12 inches, the width was 4 inches, and the thickness could not be ascertained. Two iron bolts per side held the gripe plates vertically in position aft of the forward scarf nib³⁰ (Figure 15).

The plates were usually bolted through according to the *International Maritime Dictionary*.³¹ Gripe plates serve to strengthen the forward scarf in this area in the event of grounding, and against the constant pressure applied by cutting through the water.

Bow Assembly

The remaining bow rake measures 8 feet 2 inches from the extreme forward face of the apron to the afterside of the gripe scarf nib. No other portion of the stem was found. The gripe measurement, taken at the forward end of the keel, was 12 inches moulded and sided 10 inches (Figure 15).

The apron was found to bear directly against the aft face of the gripe and may have served as a functional part of the fore deadwood. It is scarfed on its aft end to the keelson (Figure 15). The lower part of the apron and fore deadwood were obscured from observation by the planking and ceiling, so constructional details of this area were unavailable without disassembly.³²

Falconer's description of the apron provides an insight into how it might have been constructed:

As the apron is composed of two pieces scarfed together, and used to support the scarf of the stem, it is necessary that the scarf thereof should be at some distance from that of the stem. It is formed of the same thickness with the heel of the stem: but its thickness is equal throughout. Sometimes the piece immediately under the apron forms a curve, of which the horizontal part covers the dead wood, whilst the vertical part corresponds with the inside of the stem, to which it is lashed, making the commencement of the apron.³³

A wood sample taken from the apron identified it as white oak (Appendix A).

Two breasthooks were found attached to the after side of the apron. The forward breasthook had all but deteriorated with just 12 inches of its athwartship length remaining. The slightly lower and nearly complete aft breasthook measured 9 feet along its

athwartship length and was fastened to the keelson at its midpoint with one iron bolt. A fore-and-aft measurement at the center line is 5 inches with a thickness of 5 inches.³⁴ Falconer describes the typical configuration of breasthooks:

The breast-hooks are strongly connected to the stem and hawse-pieces by tree-nails, and by bolts driven from without, through the planks and hawse-pieces, and the whole thickness of the breast-hooks, upon whose inside those bolts are forelocked, or clinched, upon rings. They are usually about one-third thicker, and twice longer than the knees of the decks which they support. The fore-side of the breast-hook, which is convex, is formed so as to correspond with the place in which it is stationed,...that part of the bow...accordingly, the branches, or arms, of the breast-hooks, make a greater angle, as they are more elevated above the keel, whilst the lower ones are more incurvated, and are almost figured like the crotches.³⁵

It could not be determined whether the center bolt holding the lower breasthook was indeed driven through from the outside of the vessel as stated in the construction method described by Falconer, but no treenails or clinching of the bolt upon rings to secure it in place were observed. Bolting from the outside would no doubt be more difficult to accomplish with the vessel having to be high enough off of the ground to place and drive the long bolts.

Stern Assembly

The remaining length of the sternpost measured 3 feet 6 inches from the top of the keel to the sedimentation line, and raked aft six degrees. The lower gudgeon was located 2 feet above the foot of the sternpost. Fore-and-aft measurement of the sternpost was 16 inches with a distance from the aft side of the sternpost to the rabbet line of

12 inches. Siding taken on the aft side measured 9 inches.³⁶ White oak was used in the construction of the sternpost (Appendix A).

An iron gudgeon was found still attached to the sternpost, 2 feet up from the foot of the sternpost. A second disassociated wrought iron gudgeon was recovered from the aft end of the wreck on the port side (Figure 19). It measured 17 inches in length, and 2 inches in width, and was flared by an inch to curve around the outer planking where rabbeted to the sternpost. The flared gudgeon measured from 7 1/2 to 10 inches across, corresponding to the dimensions of the sternpost at this location. A measurement taken of the diameter of the pintel opening in the gudgeon indicates a pintel diameter of no more than 2 1/2 inches. Attachment of the gudgeon to the sternpost was accomplished by two, 1/2 inch diameter bolts fastened one per side, and a single square spike that measured 3/8 by 1/2 inch attached on the shoulder of the gudgeon. Only limited construction details of the stern deadwood could be made since removal of the ceiling was not undertaken.

Beginning directly behind the aft mast step was a stern knee that measured 16 feet long to the inside of the sternpost and was sided the same as the keelson. One pillar slot located in the forward end of the knee was similar in size to others found on the keelson (See Keelson section for further description).

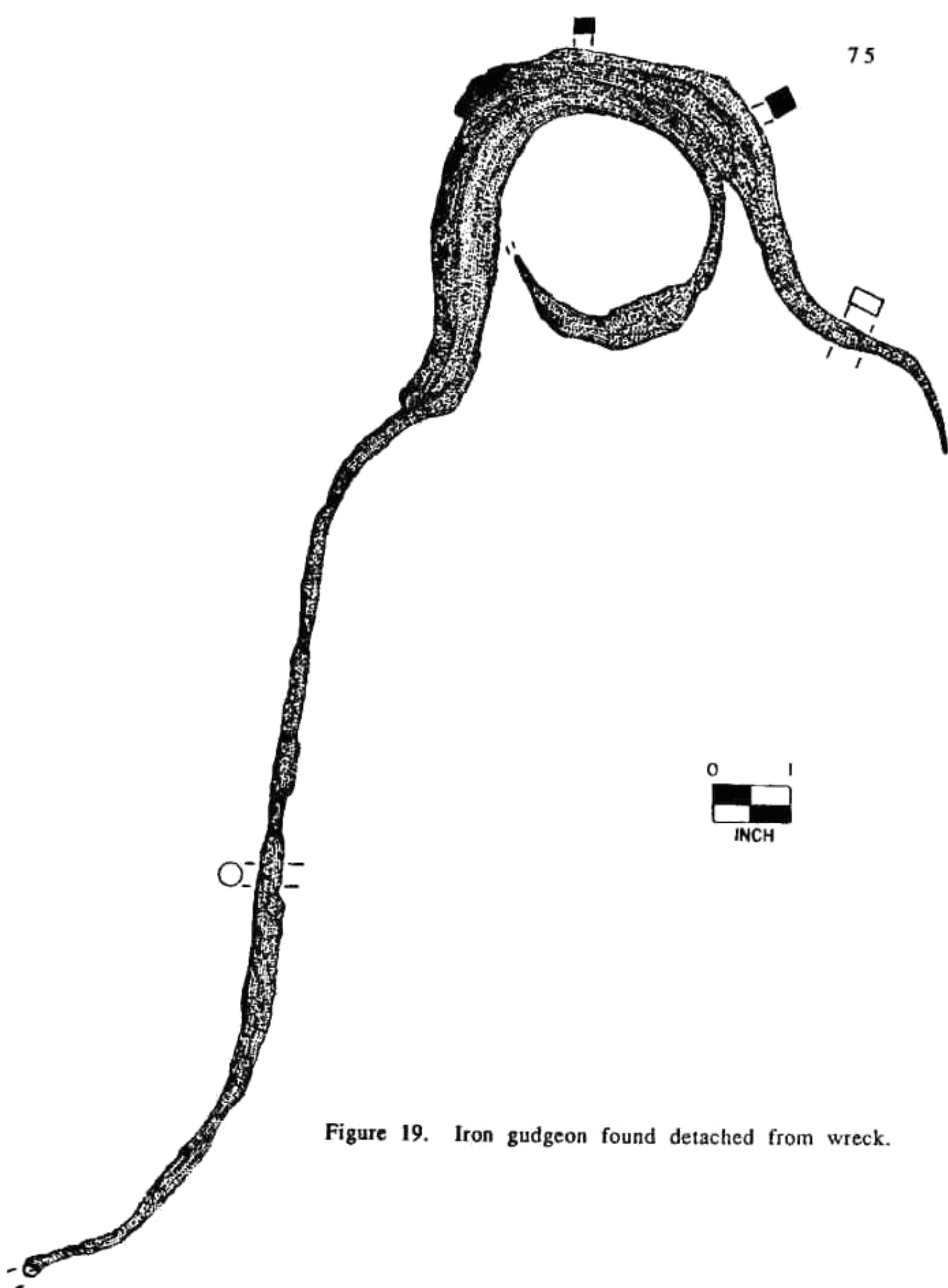


Figure 19. Iron gudgeon found detached from wreck.

Floors and Futtocks

Sixteen floor members were only accessible for documentation where limber boards were missing. Exposed floors are numbered from the bow to the stern in consecutive order (Figure 15). Molded dimensions varied from 12 to 13 inches and siding from 6 to 13 inches. Placement of the floors was random on the keel with room and space varying from 1 foot 3 inches to 3 feet 3 inches. Lengths of floors could not be ascertained due to the ceiling.³⁷

Floors and futtocks on the Otter Creek wreck were constructed of white oak (Appendix A). Frames were similarly identified as being made of white oak on the Yorktown wreck, a British merchant vessel sunk during the Battle of Yorktown in 1781.³⁸

Limber holes in the shape of inverted "V"s were cut into the underside of each floor 1/2 inch either side of the keelson. Falconer, however, states that limber holes in merchant ships were generally cut square, in addition to being placed very near the keel.³⁹

Futtocks were placed directly forward of the floors with no space between floor and futtock. Often in vessels of all sizes the floors and lower futtocks were almost solid across the bottom. Along the topsides the frames would generally become distinctly separate.⁴⁰ It was generally the case that frames were tapered and floor timbers reduced in size on either side of the keel, and each futtock also tapered toward the top.⁴¹

All documented futtocks, except one, stopped short of the centerline by an average of 13 1/2 inches. The exception passed

under the keelson at the forward mast step mortice. This practice appears consistent with construction of merchant vessels during this period. The construction of the frames in this manner would allow more water to accumulate in the bilge, and thus keeping it away from cargo.⁴² Molding of futtocks measured 12 inches at their heels; siding could not be taken due to the in-place ceiling. The heels of the futtocks were beveled upward by an inch more at the top of the futtocks than on the lower edge.⁴³ It was not possible to determine whether the individual members of each frame were butt jointed or if chocks were used. In order to avoid the weakness incurred at each of these locations, butt joints, if used, would be spaced as far apart as possible on each floor and futtock, and from being aligned with the butt joints of the adjacent frames. Often butt joints would end up being aligned at the turn of the bilge due to the construction of the vessel at this point. Floor and futtock were sometimes bolted or pegged to each other to increase unit strength on lighter vessels, although rare on larger vessels. Pegging of nearly every floor and futtock was found on two South Carolina wrecks: the Brown's Ferry vessel of 1740, and the Mepkin Abbey wreck sunk during the early nineteenth century.⁴⁴ Whether pegging of floor and futtock was used on the Otter Creek wreck is unknown.

On the Yorktown wreck every other square frame had a floor lying across the keel, but the other 1st futtocks stopped short of the keel and were fastened only to inner and outer planking.⁴⁵ The

Yorktown wreck is of single frame construction, although possessing lower futtocks between frames, while the Otter Creek wreck has double framing.

On the privateer *Defence*, sunk in Penobscot Bay in 1779, double frames of floor timbers and futtocks are found at intervals of 4 or 5 feet. Located between these are "mould frames" and intervening frames that do not cross the keel.⁴⁶

Frames of the Otter Creek wreck located in the stern and bow may have been canted. The construction of these frames within the stern, which determined its shape, were obscured from view. Within the bow, where they were likely to have been, decay had destroyed any visible sign of cant frames.

Greenhill describes the likely arrangement for cant frames:

Unlike the square frames, with their timbers placed athwart the keel and disposed vertically, the cant timbers, while still keeping their sides vertically disposed, had to be gradually inclined one by one as they were positioned in the form of a quarter circle to meet the stem-post, the side of which lay in a fore and aft direction. The cant timbers were fastened to the keel and the deadwood with bolts which secured their heels on opposite sides of the ship. These bolts were placed alternately high and low to avoid the structural weakness resulting from a line of bolt holes. Cant frames did not have floors, of course, but their futtocks were made up in the same fashion as that used in the building of square frames. Consequently, there would be only one timber between two consecutive butts in the same line, but this was compensated for by the greater length of the futtocks, the timber for which could be more easily obtained owing to the reduction in curvature of the transverse section of the vessel at her extremities. The cant frames of the after body, abaft the furthest after square frame, were disposed in a similar manner to those at the bow.⁴⁷

Ceiling

Nearly all of the ceiling exposed by the excavations in the stern and athwartship trench was in place. The widths of the ceiling planks ranged from 8 to 11 inches and lengths from 16 to 20 feet, with butt joints consistently between each of the boards. A single ceiling board from the port side forward recovered for documentation revealed that the ceiling was attached to the floors and futtocks by iron spikes and trunnels in a random pattern, generally with one per frame. This broken specimen measured 14 feet 5 inches long, by 10 3/4 inches at its maximum width, by 2 inches thick. The underside of this piece of ceiling clearly showed deep across-grain grooving that would facilitate curving the piece atop the floors and futtocks. At 7 feet 5 inches from the aft butt end of the ceiling plank, adze marks are spaced about every foot until reaching the forward end. The adze was not lipped and had a slight curvature to its 4-inch cutting edge. It had been swung at approximately a 30 degree angle to the surface of the ceiling. On burying the cutting edge of the adze into the surface of the wood, up to 3/4 of an inch in some areas, the shipwright levered the adze with a forward motion, splitting the wood along its grain approximately 2 inches. The use of this method helped relieve the rigidity of the wood and make it easier to bend.⁴⁸

Use of pitch pine for ceiling planks began during the late nineteenth century in Britain after a shortage of oak occurred. Pitch pine for deck planking also occurred at this time in America due to

the scarcity of oak.⁴⁹ Wood sample identification of the Otter Creek wreck ceiling indicated its construction from white oak (Appendix A). Similarly, ceiling documented on the Yorktown wreck was made of white oak.⁵⁰

Limber boards varied from 5 to 8 inches in width. No length measurements were recorded. A wood analysis identified a limber board from the Otter Creek wreck as being made of white oak (Appendix A).

Keelson

The keelson was made from two lengths scarfed together. A wood species identification was not undertaken for the keelson. It is likely to have been constructed of white oak, as are nearly all of the other structural members of this vessel. One source, however, indicates that pitch pine may have been better suited for use in a keelson, since it had good longitudinal strength and could withstand occasional soaking in bilge water, which was inevitable.⁵¹

Large straight timbers capable of being formed into a keelson was often not available, so the keelson generally had to be scarfed to reach the needed length. The placement of scarfs was not random based on the lengths of available timber. Certain factors needed to be taken into consideration in their placement. Falconer's Dictionary refers to this:

The scarfs are, if possible, disposed clear of the main and fore-mast, and likewise the main hatch, as the scarf may be injured by accidents in lowering goods and heavy matters.⁵²

Vertical scarfs were more common on the keel, while horizontal scarfs occurred more often on the keelson. Vertical scarfs found on the keelsons of French and Dutch vessels continued into the nineteenth century.⁵³

The keelson molded edge measures between 11 1/2 inches and 12 inches with siding ranging between 13 and 14 inches. The molded length had been cut straight and fitted to lie parallel with the top of the keel. The underside of the keelson had been notched to let down over the floors by 1 inch.⁵⁴ One-inch notching of the lower side of the keelson to fit over the floors also occurs in three British built vessels: the *Charon*, built in 1778; a vessel in the York river sunk during the 1781 Battle of Yorktown; and the *Victory*, built in 1769.⁵⁵ On the early-nineteenth-century Mepkin Abbey Wreck in South Carolina notching of the keelson was also found. On this wreck the notches were deeper amidships and of a lesser depth forward. The maximum depth of the notches was 1 3/4 inches.⁵⁶ Regarding notching of the keelson Falconer states:

In order to fit with more security upon the floor-timbers and crotches, it is notched about an inch and a half deep, opposite to each of those pieces, and thereby scored down upon them to that depth, where it is secured by copper-bolts. The pieces of which it is formed are about two-thirds of the breadth and thickness of those of the keel.⁵⁷

Similarly, an eighteenth-century account indicating that the keelson is scored to 1 1/2 inches can be found in a Mungo Murray's work, *A Practical Treatise on Ship-Building and Navigation* published in 1764.⁵⁸

On the Otter Creek wreck iron instead of copper bolting placed in auger holes was used to fasten the keelson to the floors. Only ten fasteners were found down the centerline of the vessel; they were located in most cases in every other floor. The description given by Falconer of fastening the keelson, or kelson states:

As every floor-timber is bolted through the keel, and every other through the kelson and keel together, it requires that the middle of the scarfs of the kelson be disposed over a floor-timber, that is designed to be bolted through the kelson.⁵⁹

Bolting found in the British warships *Charon* and *Victory* show 1 1/4 inch bolts placed through alternate floors. This practice was changed to bolting through every floor and the keelson, in addition to a bolt through a floor and keel after 1800.⁶⁰ It is likely that this practice also began shortly thereafter for merchant vessels. The 48-foot Mepkin Abbey Wreck, a river trading vessel of South Carolina that sank in the early nineteenth-century, shows what is likely a transition between the two methods of bolting every other floor, and bolting every floor. On this wreck "the keelson was through-bolted to the keel at every floor timber from the bow to amidships and every second floor timber from the amidships frame to the stern...."⁶¹

Several of the iron 3/4 inch bolts on the Otter Creek wreck were unusually placed off center with some not passing through the center of the floors as would be the most logical practise of securing the keelson to the floors. Each bolt had been placed in an auger hole. It was not determined whether all of the bolts passed through the keelson and floors and into the keel. This, however, would be a

common practise in the construction of eighteenth-century wooden sailing vessels. The upper end of the bolts had been clinched over onto the keelson. No washers had been placed on the bolts before they were clinched.

At the forward end the keelson is scarfed to the apron. From there the keelson extends 27 feet aft in two sections until it is covered by the bilge ceiling, but its length is assumed to continue until it butts into the sternpost. Ceiling planks were, however, not removed to confirm this logical building method. Both scarfs occur over supportive floors. A practice not seen on the Otter Creek wreck is found on a sunken merchant vessel located in the Northeast Cape Fear River, known as the Rose Hill Plantation wreck, in which the keelson stops short of the sternpost.⁶² This practice was discontinued around 1750.⁶³

Nibbed scarf joints were used to fasten the two lengths of keelson together, as well as to fasten the keelson to the apron. The two scarfs, however, had been cut in differing planes; the forward keelson/apron scarf had been cut vertically, and the two sections of keelson were horizontally scarfed. The length of the forward vertical scarf measures 3 feet and the horizontal scarf of the keelson pieces measures 5 feet. Both scarfs have 3-inch cut nibs.⁶⁴ The vertical forward scarf has a ratio of 3-1, while the scarfed keelson pieces have a length-to-width ratio of 5-1.

Unusual in their placement were the two masts steps over the keelson scarfs (Figure 15). The forward step was placed on the

extreme end of the keelson, while the aft step measured 27 feet 6 inches from the mast step center to the forward end of the keelson. Measurements of the forward mast step mortice are 16 1/4 inches long, 6 inches wide, 5 1/2 inches deep at its forward end and 1 inch deep aft. The depth of 5 1/2 inches continues over the slot length for 7 inches then steps up 1 1/2 inches and slopes up to meet the 1 inch depth aft (Figure 20a). The aft mast step mortice measures 15 inches long by 6 inches wide and 5 1/4 inches deep⁶⁵ (Figure 20b). A building contract for the British-built 119 foot *Albion*, launched in 1818, called for the main mast to be stepped on the scarf.⁶⁶

Five notches for pillar placement were observed in the keelson spaced along its length (Figure 15). A sixth notch is located on the stern knee. Lengths range from 1 foot 3 inches to 1 foot 9 inches; all are 5 1/4 inches wide and 1 1/4 inches deep at their lowest point. From the lowest end the slots slope up over their length to the upper surface of the keelson to facilitate placement of the pillars. The forward two pillar slots slope downward toward the bow, and the aft three pillar slots on the keelson, and one on the stern knee, slope downward toward the stern. Insertion of the pillars would have been from amidships towards the ends of the vessel.

Bilge Pumps

Evidence shows that two bilge pumps had been fitted in this vessel. Between floors fifteen and sixteen two holes, or wells, were cut in the ceiling, one either side of the keelson for the location of

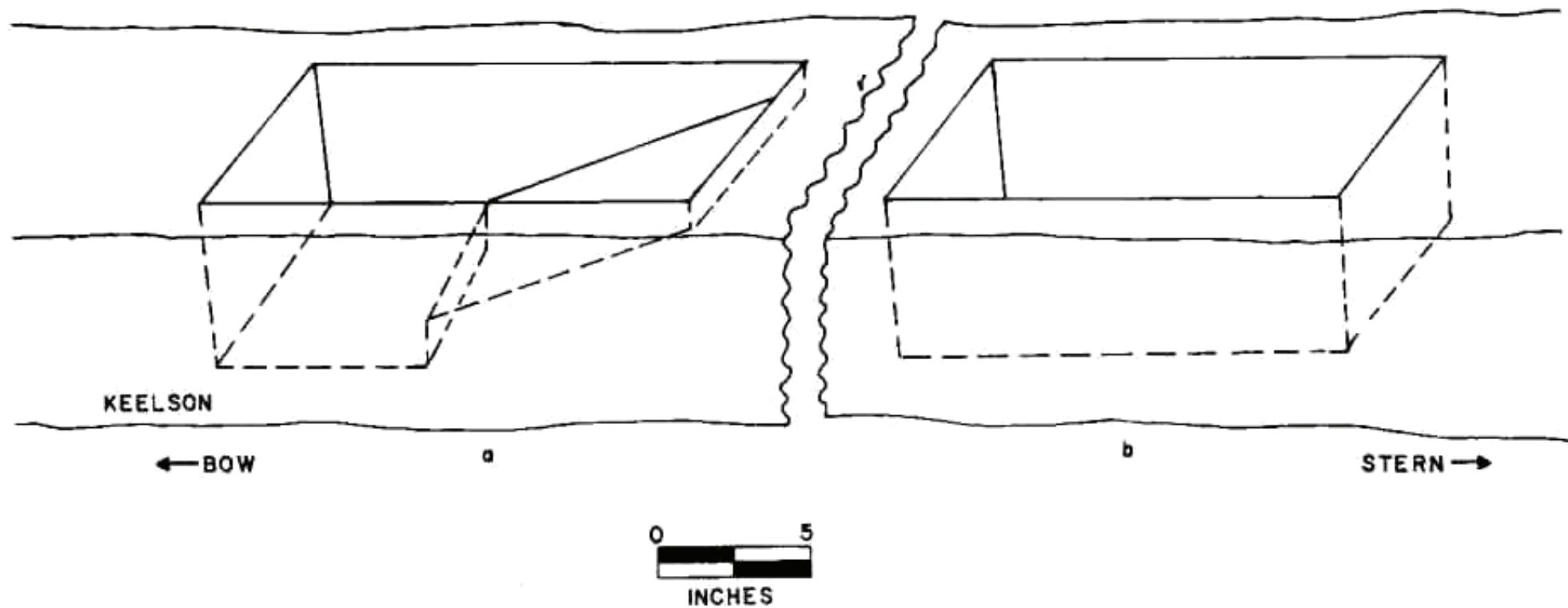


Figure 20. Drawing of (a) Forward and (b) Aft mast steps.

wooden suction pumps (Figure 15). The main mast step is located on the keelson between the two pump wells. Each well was placed directly against the keelson and measures 9 inches at its greatest width. Pump wells were placed between frames, and for at least the port well between the futtock end and keelson. This placement of the pump wells did not necessitate notching the floors, thus weakening the vessel at this point.⁶⁷

The ceiling had been cut at the starboard pump well to secure around an octagonally shaped pump tube. A similar octagonally shaped wooden pump fashioned from a single oak log and bored to 3 inches diameter was documented on the *Defence*, an American privateer built in 1778 and scuttled a year later.⁶⁸ A wooden bilge pump has also been documented on the Rose Hill Plantation Wreck, a large sloop of approximately 103 tons located in the Northeast Cape Fear River, and thought to have been sunk during the British occupation of Wilmington in 1781.⁶⁹ On the Rose Hill wreck what remains of one pump shaped out of a rough log measures 7 1/2 inches in diameter with a 3-inch bore. Its placement is on the starboard side of the vessel considerably forward of the main mast step. Part of what may be a second bilge pump tube was found separated from the wreck. The placement of the second pump has not been confirmed. Common placement of the main pumps would have been aft of the cargo hatch and opposite or slightly forward of the main mast and would occur near the deepest point within the ship.⁷⁰

Possible remains of the pump casings were found in the port well of the Otter Creek wreck. Additionally, what may be the leather pump boot once secured around the base of the movable box was found in the starboard well (Figure 21). The boot was secured around the pump box with at least eleven nails as indicated by holes in the leather piece. A nail, 1 1/4 inch in length, remained attached to the leather boot (Figure 49b). Two other holes in each of the opposite corners were probably used to secure the lower end. A leather boot is similarly shown on an Elm Tree pump located at the North Carolina Maritime Museum (Figure 22). Other leather pieces, possibly part of a pump valve or boot were located in the general stern area (Figure 23).

A Treatise on Naval Architecture, by William Hutchinson, gives a contemporary account on the use of a leather piece on the interior works of the suction pump:

After all the commendable trials of late that have been made to improve ships pumps, yet the lead and wood sucking pumps are in general use, even in capital merchant's ships, therefore I shall endeavour to detail the principles they act upon,...they have two round boxes with valves, made to fit the chamber of the pump, the lower box at the bottom of the chamber, continues fast, the upper one is leathered round, the outside spreads to fill the chamber.⁷¹

A hollowed out octagonal log less than 9 inches in diameter formed the tube. Generally the tube would have been encased in a wooden structure, sometimes referred to as the rose box, of short planks to protect the tube. It would be accessible near the keelson for repair and cleaning of the pump or strainer within the bilge.

In describing wooden pumps found aboard fishing schooners of the nineteenth century Howard Chapelle states:

The wooden pump barrels rested on either side of the keelson, its thickness, or width, apart. Usually the barrels were 2" to 4" further apart at the life rail than they were at the keelson. These wooden pumps were effecient, so had lasted, little changed, since colonial times, though iron brakes (or "heavers") had been used extensively in America before 1800.⁷²

Evidence of an iron brake was not found. Little of the pump remained and any iron parts have likely corroded. Working the common suction pump was limited to about five minutes at a spell before the men using them got exhaausted, while it is stated that men using a chain pump could go for half an hour at a time.⁷³

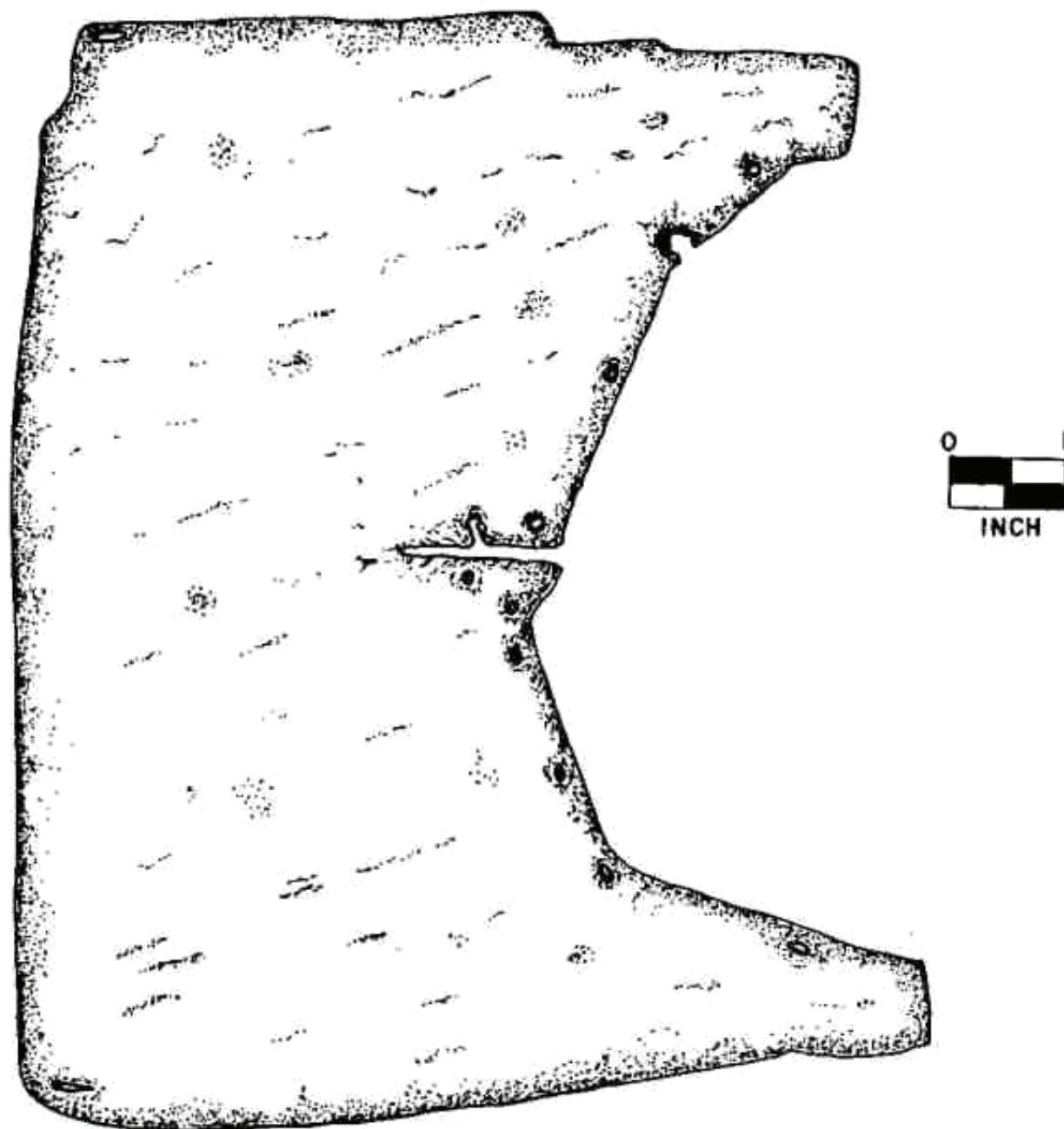


Figure 21. Leather boot from the bilge pump.

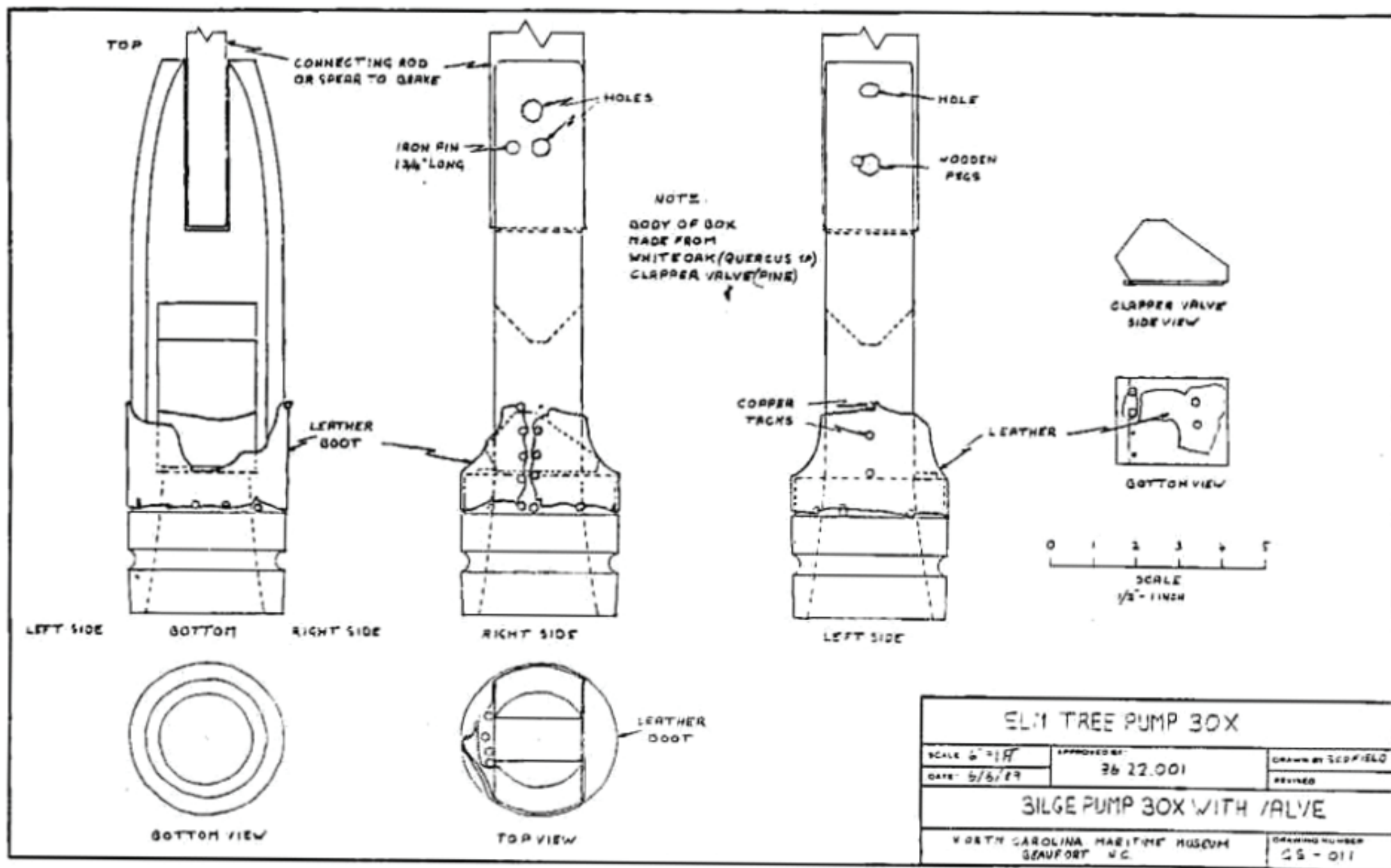


Figure 22. Elm Tree pump box.

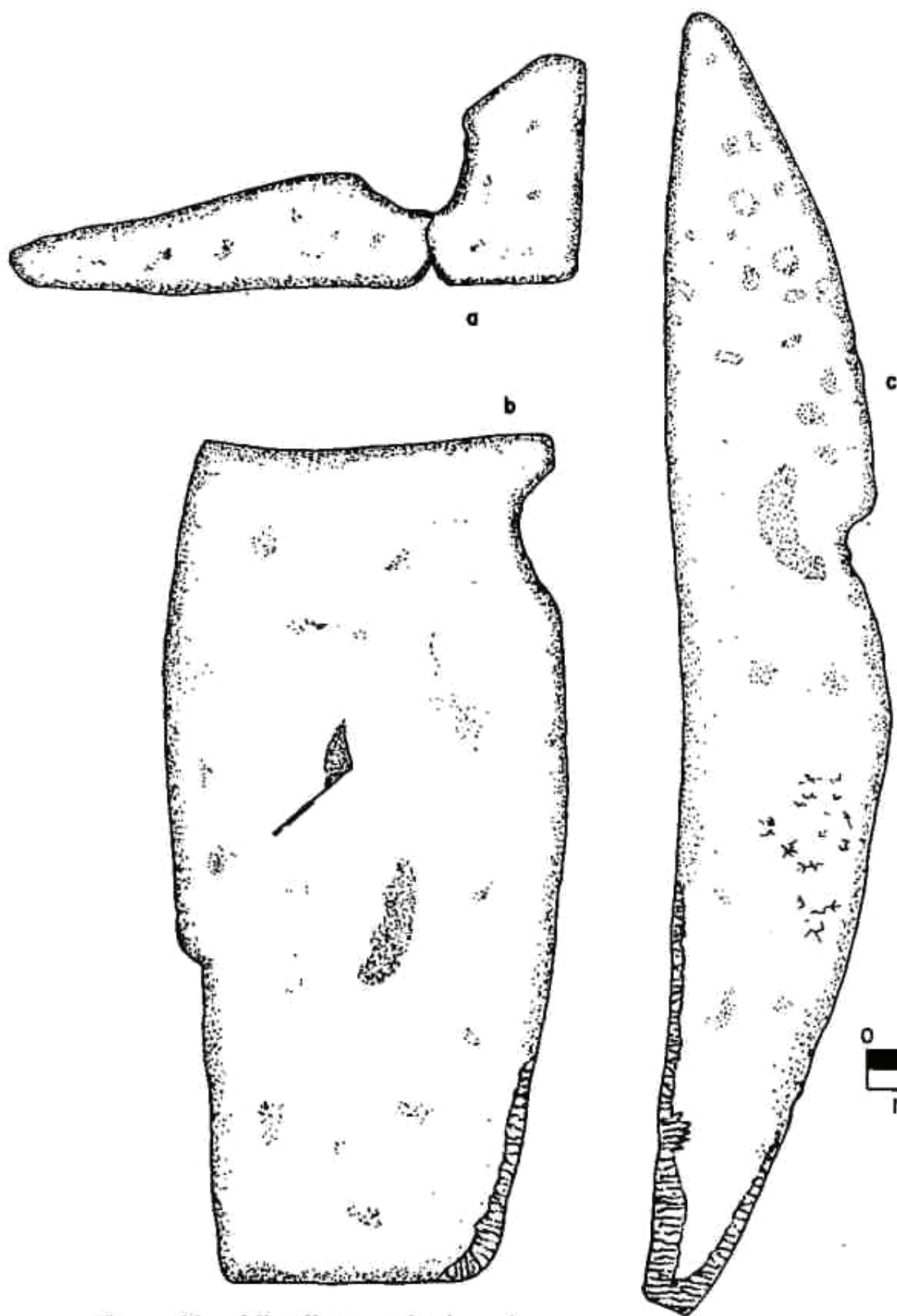


Figure 23. Miscellaneous leather pieces.

Deck Beams, Knees, and Pillars

What is believed to be a deck half-beam was excavated from unit 5C. The half-beam measured 5 1/2 feet in length and may be one of two beams that form the deck width of the ship. One end of the deck half-beam has been notched, possibly to rest on a beam shelf, while the other end appears to have been cut to butt join another beam at the midline of the vessel. Two such beams butt joined together would produce a deck width of 11 feet. The beam is moulded 3 1/2 inches and sided 4 inches and cambered by 1 inch over its length to allow either rain or seawater to run off of the deck through the scuppers. The upper surface of this half-beam shows the placement of two parallel rows of alternately spaced fasteners used to attach the decking to the beam. Twelve fastener locations, spaced from 2 1/2 to 9 1/2 inches, are visible. The average spacing between fasteners measured 4 1/2 inches. Horizontal oak lodging knees would have attached the beams to the frame heads, and vertical knees attaching the beams through their lower surfaces to the beam shelf and planking inside the vessel.⁷⁴

Although the beam shelf was missing, Greenhill gives a description of its likely construction.

Beam shelves, the topmost member in the inside lining of the vessel on which the transverse deck beams rested. It was traditional to bevel the lower edge to reduce by sight its ungainly thickness. The ideal beam shelf went down one side of the vessel in one complete length, but pitch pine of such length was growing hard to find so scarfs became inevitable. The scarf ratio was at least three to one, sometimes a little more, and through bolting would be continued, as well as additional fastenings through the scarfs, down through the beam shelf's width.⁷⁵

A displaced wooden knee was recovered from the Otter Creek wreck and documented. It had an extant measurement of 22 inches along one face and 26 inches along the perpendicular face. The maximum width through the bend measured 14 inches with a thickness of 4 1/2 inches. The knee had been attached with three iron bolts. Two of the bolts passed through the knee, one per side, while the center bolt did not. The bolts along the curve of the knee are placed 10, 15 and 19 inches from one of the deteriorated ends.

Between the years 1771 and 1796, Gabriel Snodgrass, surveyor to the Honourable East India Company since 1757, made the suggestion that larger wooden vessels substitute iron knees instead of those made of wood. This reduced the need for compass timber, weight and saved space.⁷⁶ Ship construction expert David MacGregor states that it was not until the end of the Napoleonic Wars that a great shortage of compass timber to the British fleet necessitated a change to the use of iron knees.⁷⁷ Greenhill gives a date of the 1820s for their appearance.⁷⁸ American-built wooden vessels also began the change towards iron knees during the first half of the nineteenth century. This process was the first step away from all wooden ships to the use of iron as the common construction material.

The placements of pillars are indicated by the location of slots in the keelson. The pillars would not have had a mortise and tenon construction as found on some ships of the period, but simply slid into place in each of the shallow slots. One example of this type of arrangement could be found on warships of the eighteenth century

where pillars or stanchions also tended to be positioned fairly close to the midline of the vessel in order to keep the gun decks clear to allow room for the recoil of the guns.⁷⁹ Pillars found on board merchant vessels could have the supports spaced along the midline of the vessel, or paired to either side.

Interior Construction

What appears to be a painted or stained bulkhead plank was recovered off of the wreck from units 3C-D. The piece measures 7 feet 4 inches in length with a width of 5 1/2 inches. This apparent bulkhead fragment 3/8 inch thick with a slight 1/4 inch bevel to a fine point along its length may be pine. On one side all but the bevel has been stained or painted black. It is likely that the beveled edge was overlapped by another piece. The bulkhead found intact on board a British merchant vessel sunk at Yorktown in 1781 ran horizontally with the bottom plank running across the entire breadth of the ship.⁸⁰

Two molded trim pieces, similarly stained black, may also be a part of the bulkhead, or cabin design. The fragment shown in Figure 24a came from unit 5C and has one beveled edge. Two nail holes are present - one circular at the point of fracture, and another 1/8 inch square. Figure 24b is unprovenienced and shows a finished moulded edge. One small nail hole is present. The captain's quarters were sometimes built along the lines of deck beams.⁸¹ Stanchions, upright pieces of timber, would have been used to support the bulkhead.⁸²



Figure 24. Moulded trim pieces.

There is an indication that a door might have led into a cabin. A door knob assembly was recovered from unit 4D. (Figure 25). The assembly comprised an oval knob made of brass, 1 1/2 inches wide, an attachment plate also of brass and of the same width, and a square shank made of iron. The length of the shank indicates that the door would have been at least 3 inches thick. The brass plate was attached to the door with four nails. The recovery of a hinge (Figure 50b) may also indicate the likelihood of a cabin door.

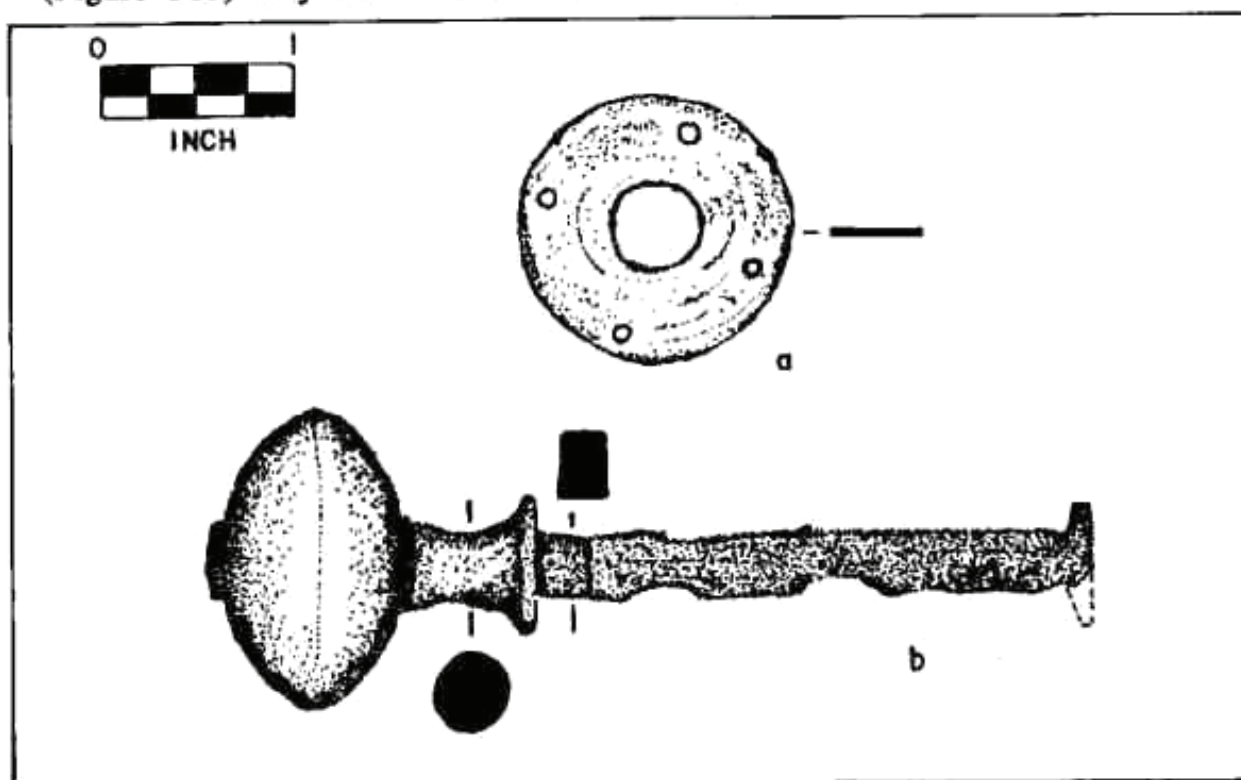


Figure 25. Door knob assembly.

If the door knob assembly did not come from the cabin door it may have been attached to a locker, probably located within the cabin or a storage compartment. An opposing door knob may have

been detached from the assembly, but the single knob is more likely to indicate access to a locker or compartment, and not a door intended for passage from either direction. A "flat", or thin board showing fastener attachments may also represent the top or side of a locker (Figure 26). Iron nails were used to attach the flat in what appears to be a parallel double-row pattern along the center. The specimen measures $3/4$ inch thick.

Two pieces of mahogany paneling $1/8$ to $1/4$ inch thick indicate the likely presence of a cabinet (Figure 27). Both panel pieces came from unit 3C. One piece has a slight groove $1/8$ inch from one end with the reverse side slightly tapered on each end (Figure 27a). This likely indicates that the piece fit into an edging or frame. The second panel piece is also tapered on both ends and contains a single tack hole near one end (Figure 27b). Interior furnishings are further illustrated by the presence of one end of a towel rack recovered from unit 4D. (Figure 28). The piece measures $6\ 7/8$ inches long by 2 inches tall.

Nine brick fragments and 180 pieces of coal, 5.59 pounds (2.54 kg) scattered in the ends of the vessel suggest the presence of two stoves on board (Figure 29). Merchant wooden sailing ships generally carried a brick cooking stove in the forward part of the ship aft of the fore mast. Within the captain's cabin, located in the stern, a second, smaller stove was not uncommon. It is unlikely that the coal represented cargo.

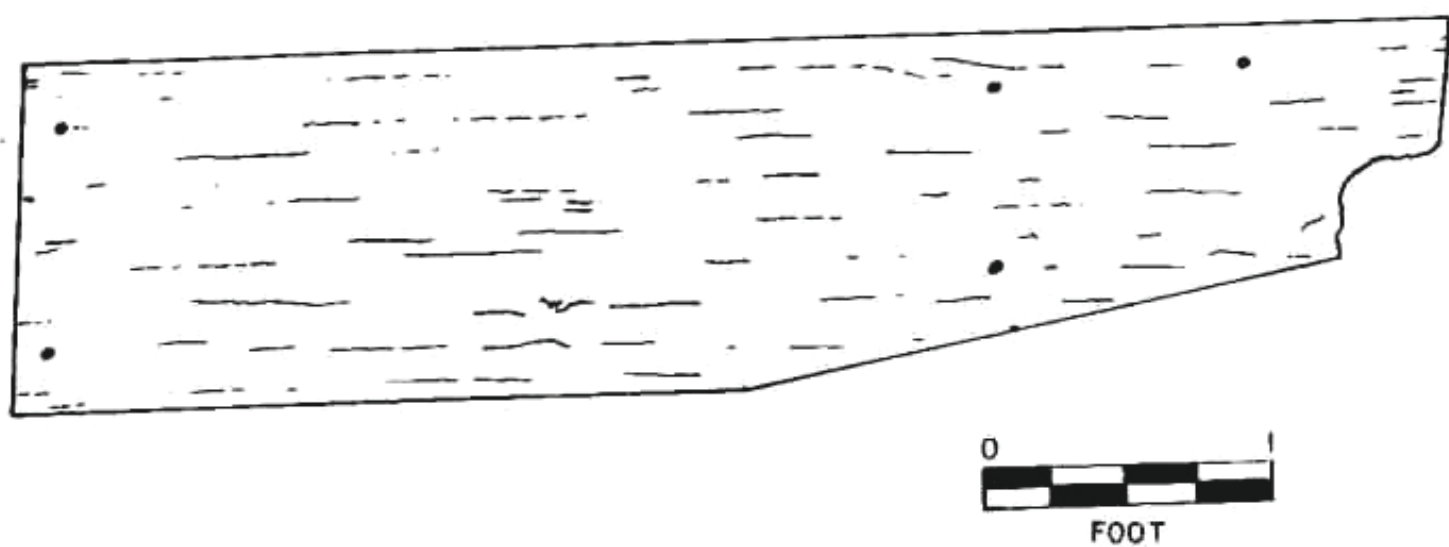


Figure 26. "Flat" drawing.

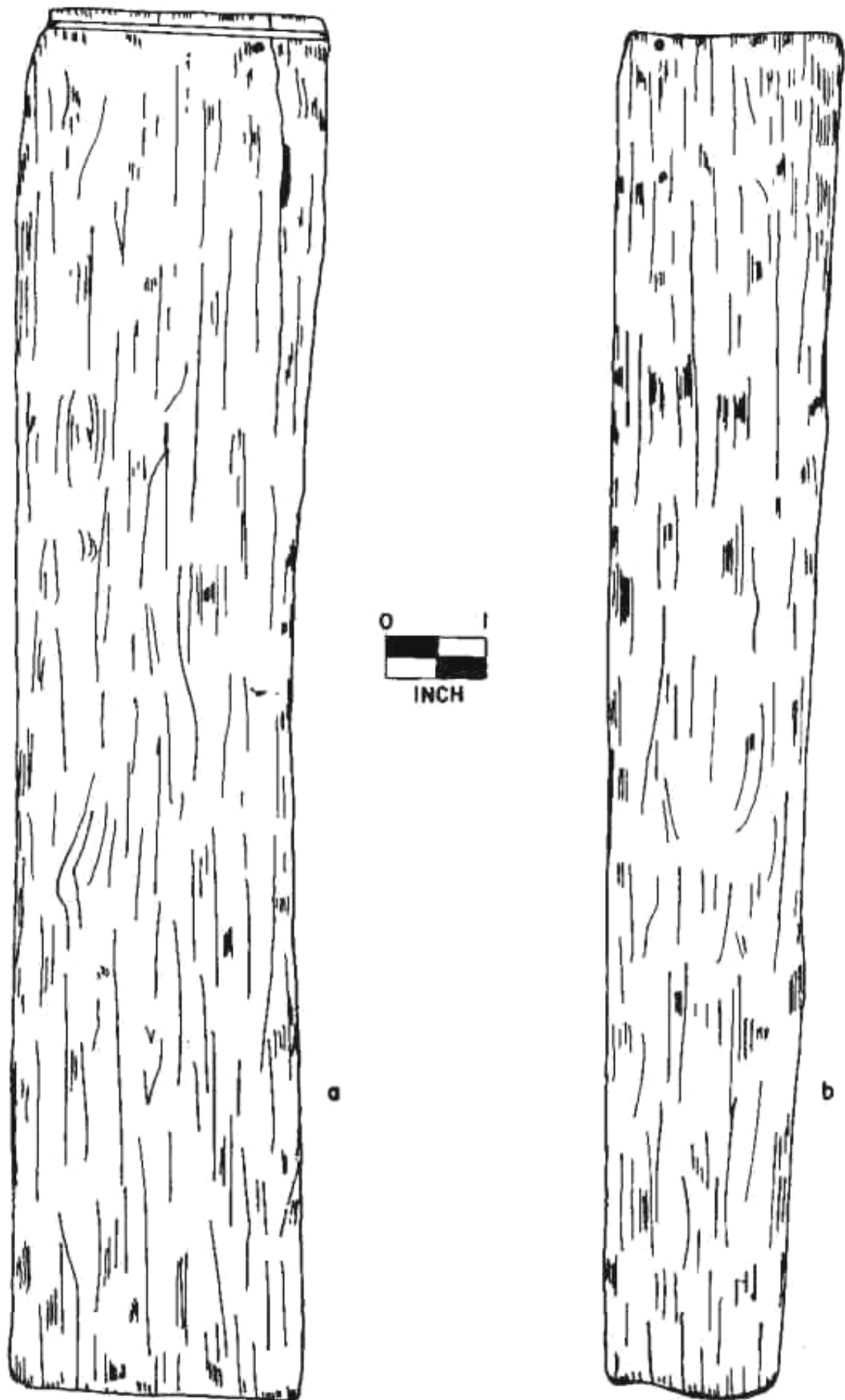


Figure 27. Mahogany paneling pieces.

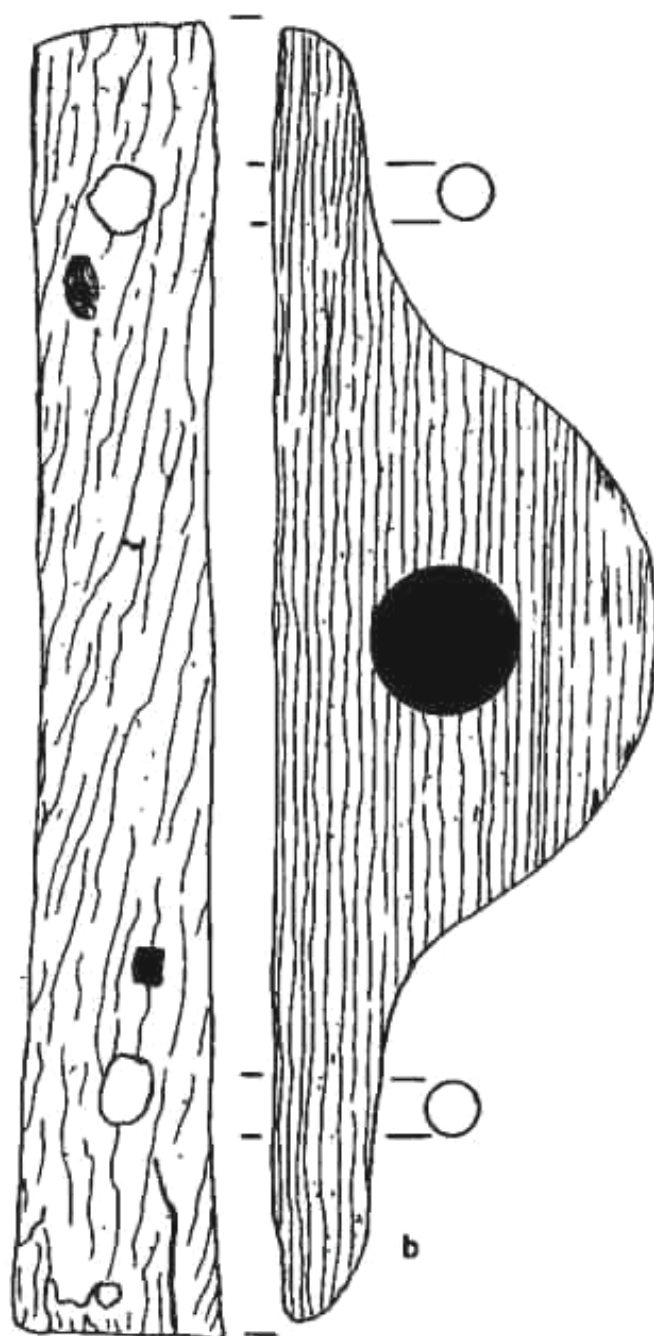


Figure 28. Towel rack end.

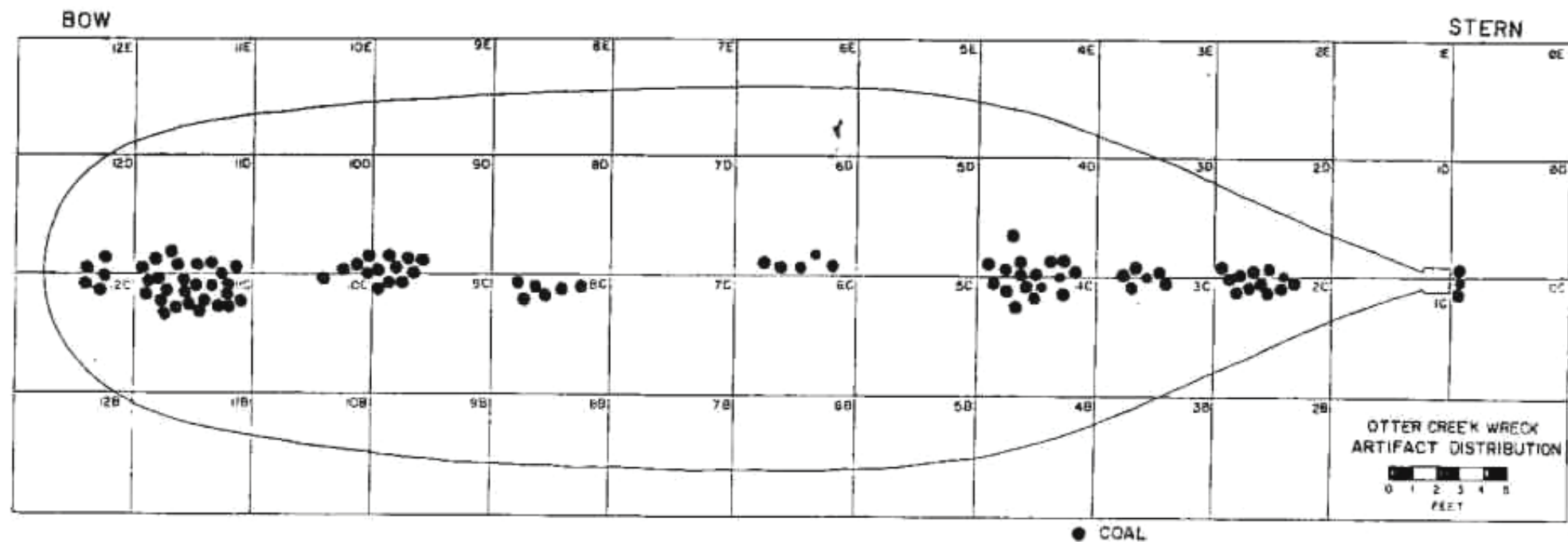


Figure 29. Distribution map of coal.

Planking and Caulking

Outer planking, 2 inches in thickness, had sprung loose on either side of the sternpost.⁸³ Measurements of the lengths, widths, and fastening patterns were not recorded, but analysis showed the material to be white oak (Appendix A). The term "plank" was ordinarily applied to sawn wood between 2 and 8 inches thick. Larger pieces, greater than 8 inches, were considered "timber," while pieces thinner than the plank, less than 2 inches, were called "deals." Planking thicker than 4 inches is referred to as "thickstuff."⁸⁴

Evidence from what is thought to be a small merchant vessel sunk during the Revolutionary War in New Jersey, but used for trade in southern waters, indicates that "the exterior planking...is 2 to 2 1/2 inches thick and varies between 10 and 13 inches in width."⁸⁵ English shipwrights sometimes used elm boards 10 inches wide and a standard 2 inches thick for outer planking. Outer planking of white oak was found on the 1781 Yorktown wreck.⁸⁶

The shaping and cutting of planks was perhaps the most complicated process in building a ship. The building process is described:

Planks would be cut out at the sawpit from squared baulk pitch pine and from English oak or elm. It is obvious that the shaping of the planks of a wooden ship was a highly skilled job, since the linear distance around the frame from the keel to the deck level amidships was always very much greater than the same distance measured up the outer face of a frame three-quarters of the way forward of aft; and it was greater again than the total height of the stem and the sternpost, where each successive run of planking was necessarily terminated. Since for reasons of strength each strake (that is, each run of planking from bow

to stern) had to be continuous (though each could be made up of a number of seperater planks), the strakes therefore had to be wide amidships, tapering away progressively fore and aft.⁸⁷

The shaping of the planks had to be made in such a way that would allow for a space between the joints to be caulked. To accommodate this:

The edges of the planks were also bevelled one-eighth of an inch to the centre line of thickness of all fairing faces to allow the oakum thread to be driven in to ensure a watertight hull - this was the caulking. They were also bevelled at their edges because they had to lie snugly together on the inside for the first half-inch or so of their inch-and-a-half or two inches of thickness, and then present an open seam on the outside into which the caulking could be driven.⁸⁸

The importance of properly caulking ships cannot be overstressed. Many ships were lost due to leaks, or when poorly caulked vessels "burst their seams." The application of oakum is described:

...sealing the seams between the planks with oakum - hemp fibre held in position with tar on the outside. Caulking... not only rendered the vessel watertight, but because by squeezing the planks together tightly and holding them in tension once it was wet and had expanded it added to the rigidity and strength of the vessel. During caulking it was very important to allow for expansion of the planks when wetted.⁸⁹

Old and discarded rope, often tarred, was unpicked to make the oakum for caulking. Untarred cordage, known as white oakum, was also used. It was essential that no rotten cordage be unpicked and used for caulking.⁹⁰

No measurements were, unfortunately, recorded for the garboard plank in the Otter Creek vessel. Planks of a fuller thickness would normally be found up to the turn of the bilge and on the

sheers, to reinforce the vessel in the areas that would be exposed to rubbing and grounding. The overall thickness in these areas amounted to 1/2 inch more than for the rest of the hull.⁹¹

Planks were sometimes attached to the frames with bolts or rose-headed or chisel-pointed nails. Wooden treenails of English oak, crosswedged to increase their holding strength, were often used below the waterline. Above the waterline wrought iron nails could be used.⁹² One source describes the placement of the fastenings:

Fastenings for planking were driven on every frame [that is, a double frame], two per frame section. The fastenings were staggered alternately to prevent a split in the line of grain. Boring preceded the nailing, and, when driven, the nail head would be stopped and pelleted with a wood pellet.⁹³

Sheathing

Sheathing was found on the Otter Creek wreck sprung loose in the stern area. A section of sheathing taken from near the sternpost on the starboard side was submitted for analysis and determined to be pine (Appendix A). Half-inch fir was also used as a common sheathing material for ships.⁹⁴ Fir has the disadvantage of not being easily bent. Shorter pieces for the sheathing may then have had to been used. A sheathing sample with measurements of 12 1/4 inches in length, 3 1/4 inches in width, and 7/8 inch in thickness with a finished edge was recorded (Figure 30). Two square nail holes, 1/4 inch on a side, show how the sheathing was attached. No iron staining was found on the sheathing piece. Falconer indicates that

sheathing could be attached with either iron or copper nails.⁹⁵ Copper nails were normally reserved for use with copper sheathing to prevent reaction between the two metal types.

Several methods to prevent the destruction of wooden ship hulls from the *teredo*, or ship worm were tried over the centuries. The method in common use in Europe during the 1770s was to pay over the bottom with materials containing poisonous substances such as sulphur, then seal it with a soft wood sheathing also coated. The sheathing was expected to be sacrificial to the worms, while the poisonous substance between hull and sheathing partially deterred the worm from attacking the hull.⁹⁶ The only evidence of *teredo* destruction was found on the upper frame ends occasionally exposed above the mud.

Wooden sheathing had the disadvantage of often becoming fouled by weeds and barnacles, reducing the speed of the vessel. The solution to this problem came when copper plating was first tried as a sheathing on a vessel in 1758. In this case, however, the copper sheathing was attached with iron fasteners resulting in an electrolytic coupling detrimental to the iron. When copper fasteners were used in conjunction with the copper sheathing, electrolytic coupling did not occur. Copper sheathing was found to prevent worms from eating the ship, did not foul as quickly as wooden sheathing, and would quickly become the standard sheathing material on warships and larger merchant vessels.⁹⁷

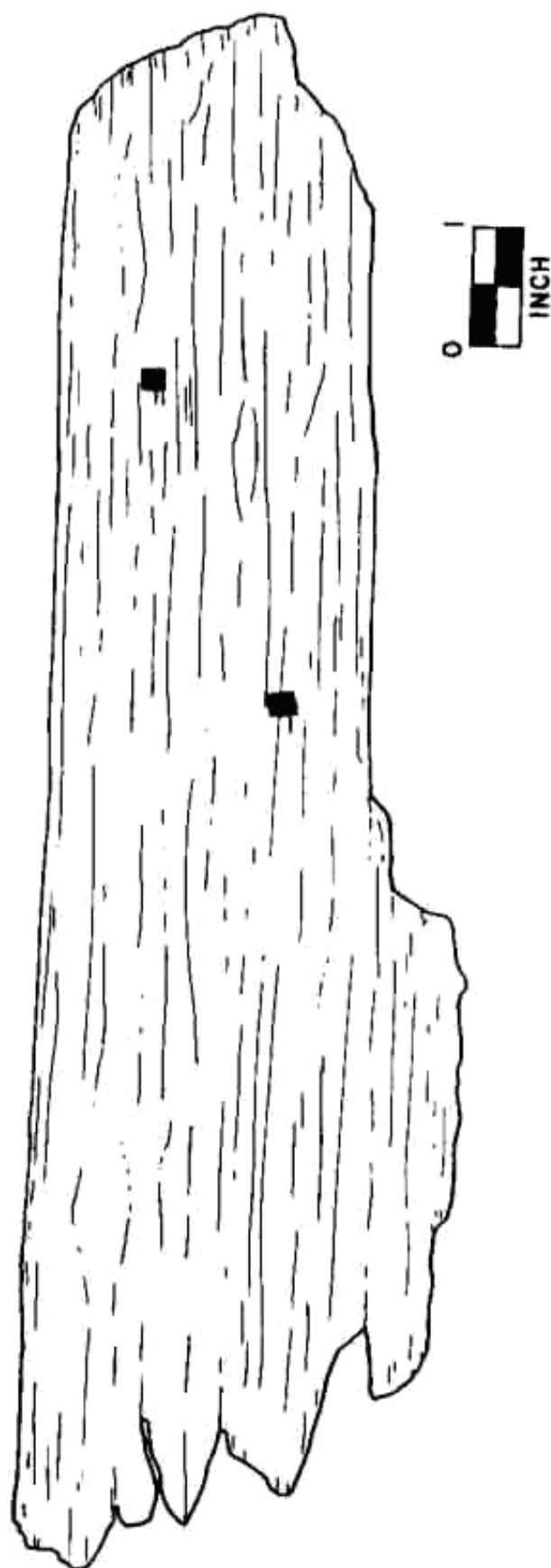


Figure 30. Sheathing sample.

Regarding the types of sheathing used on merchant ships and naval vessels, it is interesting to note the comment made about sheathing in Falconer's 1815 edition:

It consists of a number of fir boards or deals of fir, or what is far preferable, sheets of copper, which last is always used in the royal navy, as well as in the East India Company's service, and is coming into general use in the merchant-service, as all transports are sheathed with copper.⁹⁸

Falconer also gives the following statement that presents the unusual combination of using copper over wooden fir sheathing for merchant ships at that time.

Sheathing boards are of fir plank, from 3/8th to 7/8th of an inch thick, used principally in the bottom of merchant-ships, before the copper-sheathing is applied.⁹⁹

It is unknown how often this dual method of applying copper sheathing over fir planks on ships below the waterline was used.

Examples of pine sheathing such as that found on the Otter Creek wreck have also been recorded at other late-eighteenth-century wrecks. Thin pine sheathing was recorded on the Yorktown wreck, a British merchant vessel sunk during the siege of Yorktown in 1781.¹⁰⁰ A layer of 1/4 inch pine sheathing was also found fastened over a coating of pitch and animal hair applied to the exterior planking of a Revolutionary War merchant vessel discovered in New Jersey.¹⁰¹

A packing of hair or fiber was found between the outer planks and the sheathing on the Otter Creek wreck. Goat and cow hair,

mixed with tar, was often used to coat ship's bottoms and as a caulking between planks and sheathing.¹⁰² However, no funds were available for analysis of the hair or fibre caulking from the Otter Creek wreck.

Sheathing would normally be attached to the hull using $3/4$ to $2\ 1/4$ inch nails with polished and countersunk heads to prevent the adhesion of weeds.¹⁰³ On the Ronson ship, an early-eighteenth-century vessel found in New York, the number of nail holes in the outer planking caused by resheathing the hull every three to four years was counted. This method allowed the archaeologists to calculate that the ship had been used in the southern trade for twelve to fifteen years.¹⁰⁴

Two pieces of what may be lead patching, or tingles, were recovered from the wreck (Figure 31). One thin triangular-shaped piece (Figure 31a) came from unit 8D. A second piece $1/16$ inch thick was found in the stern area (Figure 31b). Neither piece shows attachment holes. Their use is speculative, but they may be fragments used for hull patching or draft numbers. Two small non-sheathing pieces of lead were also recovered from unit 6C. Their use is unknown.

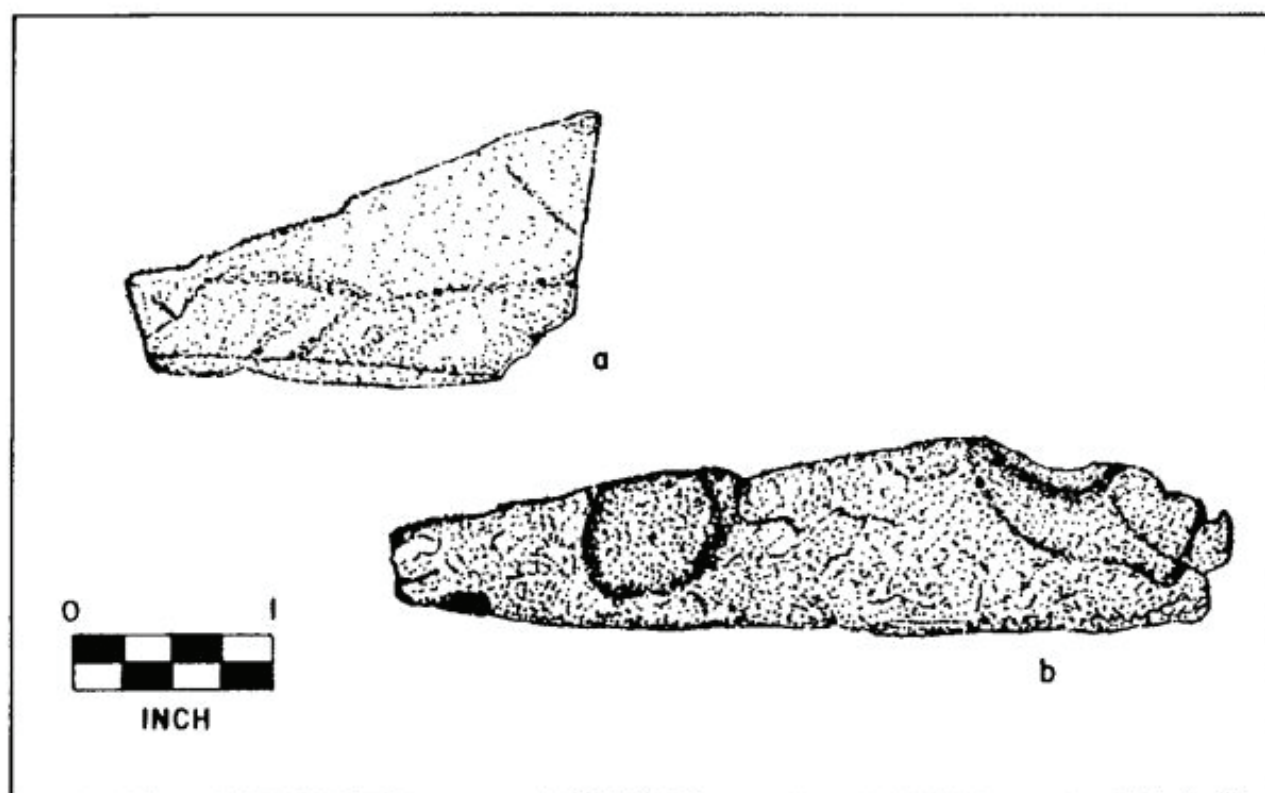


Figure 31. Lead patching.

Miscellaneous Pieces

Several pieces of wood unidentifiable as to their function on board this ship were documented. (Figures 32, 33, 34, 35).

Figure 32 shows a complete rectangular specimen fastened with two iron nails. It was recovered from unit 8D.

The object shown in Figure 33a may have been used as a wedge or chock. It was found in the athwartship trench on the port side of the keelson. The specimen in Figure 33b exhibits only a single fastener hole and three shallow channels (*teredo*?) across its width. It was found in unit 4C.

A triangular shaped specimen illustrated in Figure 34 had been secured with two bolts or trunnels at one time. Its appearance is similar to a wedge, and it was recovered from unit 4D.

The object in Figure 35a was likely used as a chock between two beams or frames. It has a greater than 3 inch by 3 inch notched shape. A single trunnel hole passed through one edge. It came from unit 5C.

The weathered specimen shown in Figure 35b was found in unit 7C. It has a 3/16 inch wide groove around one edge. The specimens in Figure 36 both from the stern area were likely used as braces. Specimen (a) is notched and attached with a single nail fastener. Specimen (b) displays two iron nail fastener holes.

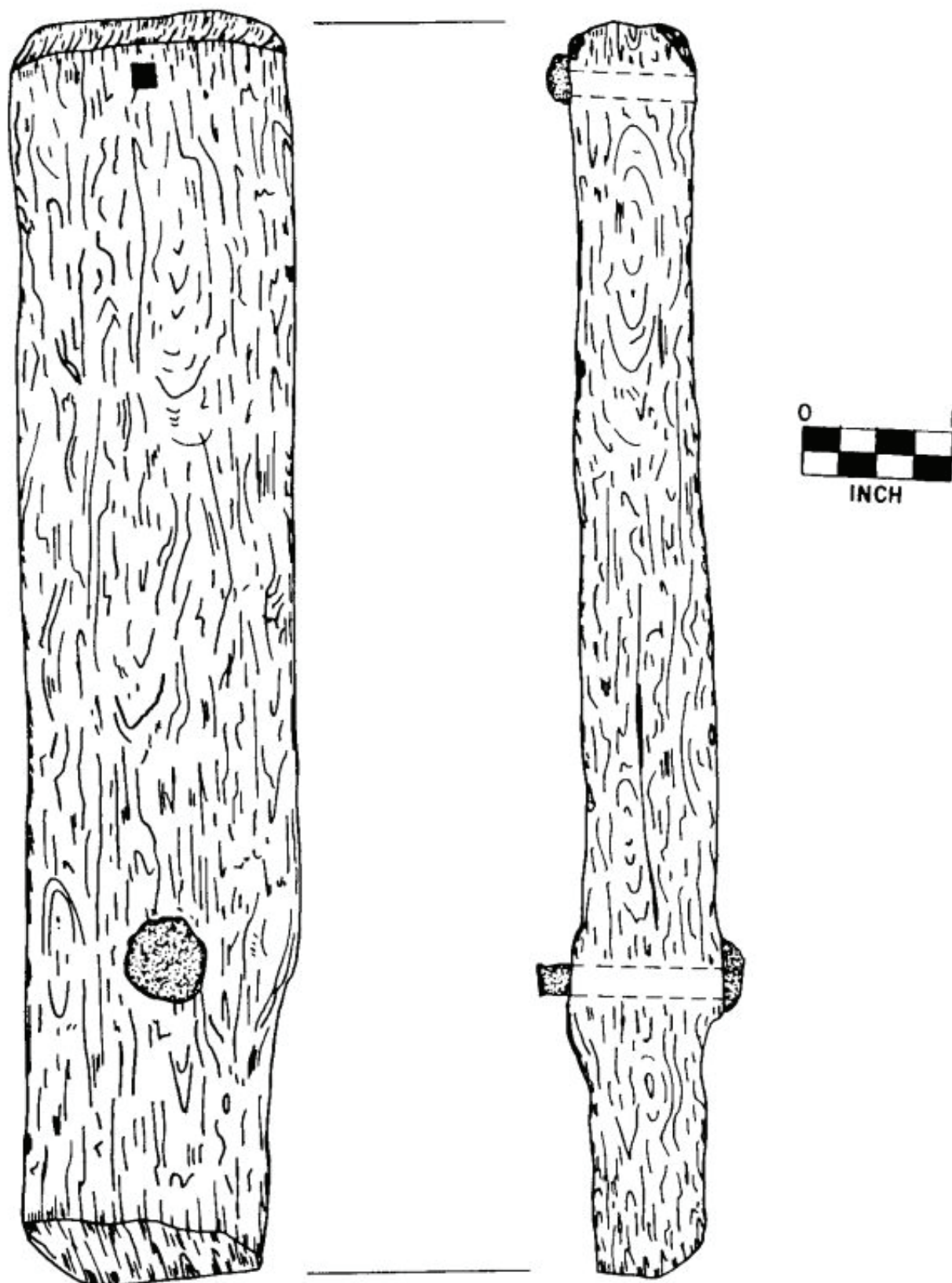


Figure 32. Rectangular piece showing two iron nails.

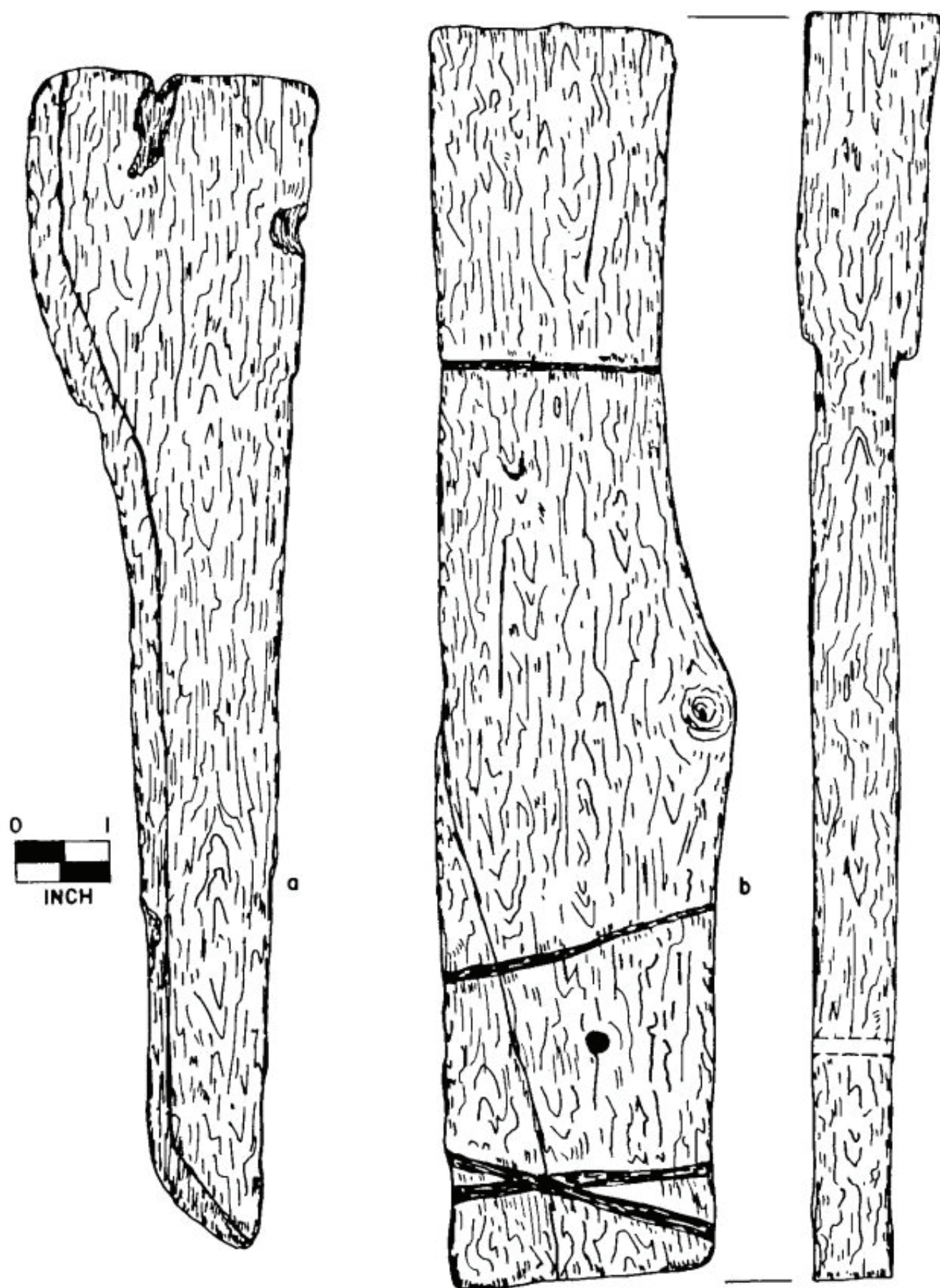


Figure 33. Possible (a) brace and (b) wedge.

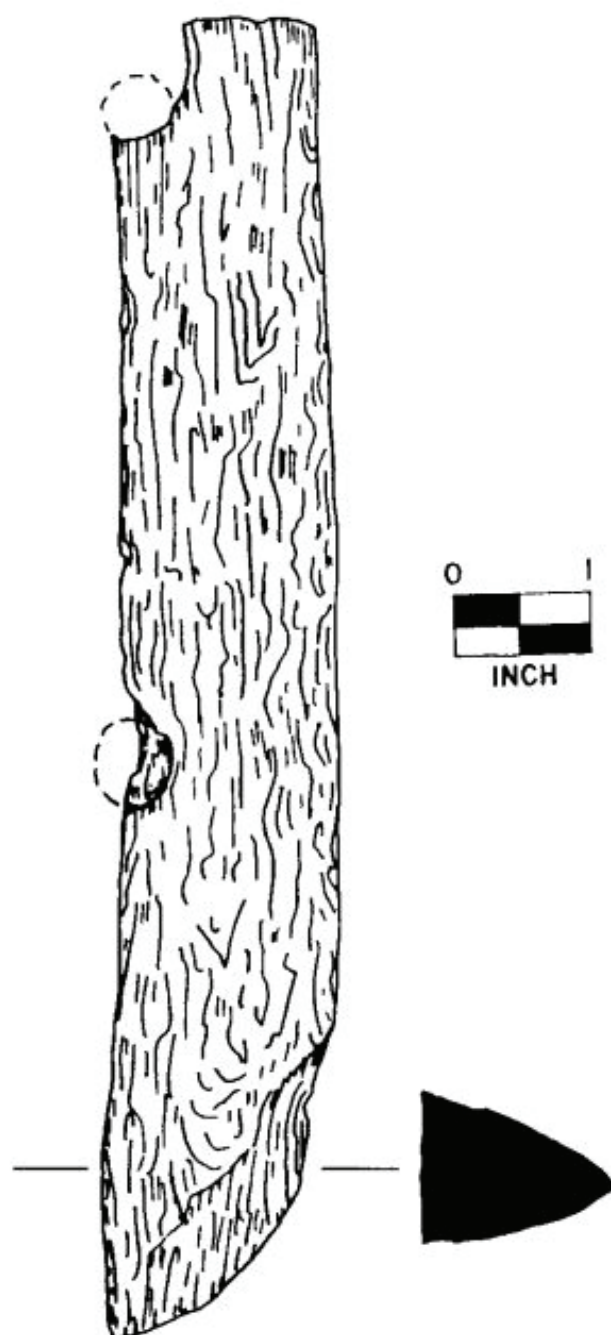


Figure 34. Miscellaneous piece similar to wedge.

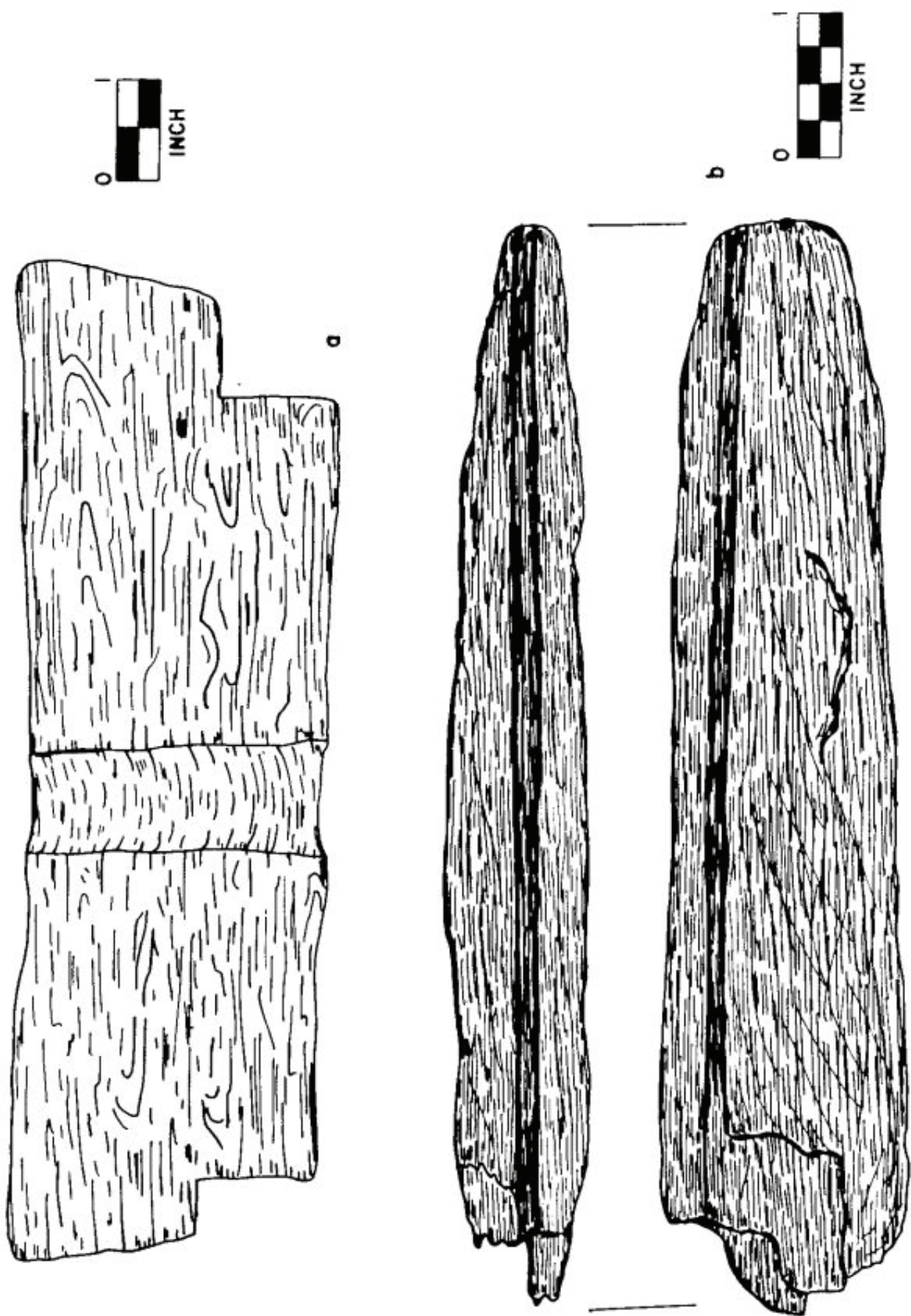


Figure 35. (a) Chock and (b) grooved piece.

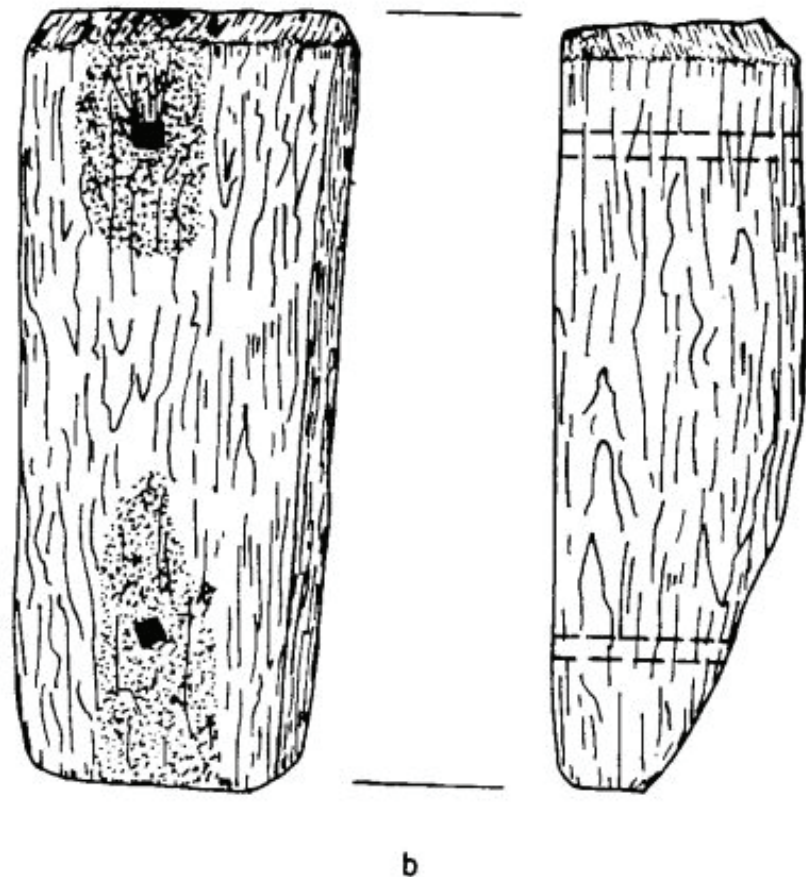
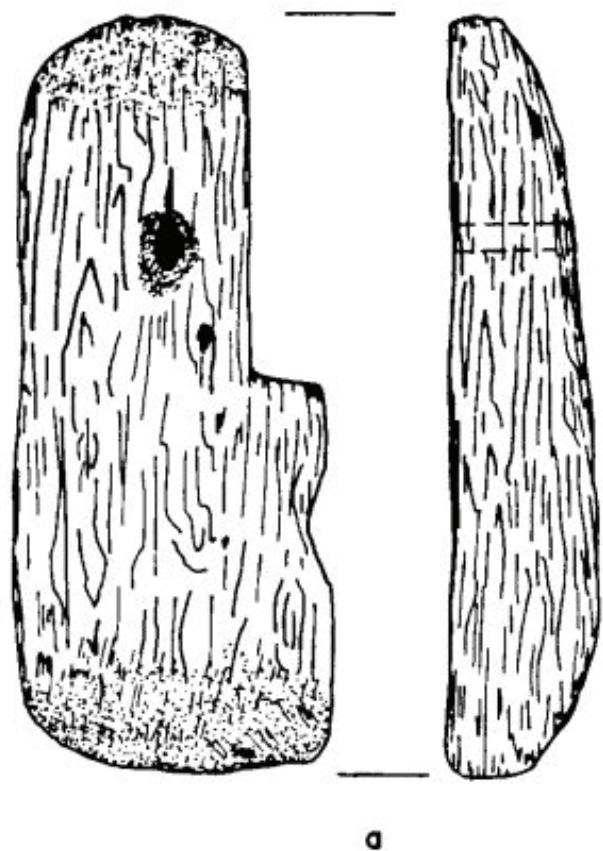


Figure 36. Braces.

Masting and Rigging

Evidence indicates that the Otter Creek wreck had two masts. Only one double block fragment (Figure 37), several sections of mast hoops (Figures 38, 39), and other rigging elements such as bull's eyes (Figure 40), a sheave (Figure 41d), sheave pins (Figure 42 and Figure 43a,b,c) and cordage (Figure 44) provide rigging evidence.

Twenty-nine mast hoop fragments and one nearly complete specimen were documented for both the port and starboard sides of the vessel from excavation units three to eleven (Figures 38, 39). Specimens submitted for analysis indicate their construction from hickory (Appendix A). Hickory is only found in North America. A current price list for Kingston, Jamaica dated August 5, 1795 lists hickory hoops selling at twelve pounds per thousand.¹⁰⁵ The near complete specimen, with an 18-inch diameter, came from units 3C-D (Figure 38). This indicates a mast 15 inches in diameter. For the lower masts of square-rigged ships, the proportion was usually an inch in diameter for each yard of length.¹⁰⁶ Using this ratio, one of the lower masts of the Otter Creek wreck would measure 45 feet in length in comparison. Gaff-rigged masts that required less strain tended to be much thinner for their length. Three iron fasteners attached the hoop with the center nail hole holding the overlapping ends. (Figure 38 inset).

The presence of the mast hoops suggests that the ship was rigged as a schooner, or a combination of fore-and-aft sail with square sail. No yards were located. Schooners of this period,

however, are known to have carried square topsails in addition to their fore-and-aft sails.¹⁰⁷ Square topsails on both masts, as well as a square foresail were becoming popular prior to 1815 on both sides of the Atlantic.¹⁰⁸

By 1750 two types of schooner-rigged craft were in use in North America. One was the ocean-going schooner used on long coastal voyages or in the deepsea fisheries, and rigged with square as well as fore-and-aft canvas; the other was a generally smaller craft used for estuary and inshore work.¹⁰⁹ By 1790, if not earlier, the schooner had become the national rig of both the United States and Canada.¹¹⁰

The double block fragment, 8 inches in length and 6 1/2 inches wide, was recovered from unit 4D. Timbers common in the construction of blocks are elm, ash, or beech, but this specimen was not submitted for testing. The sheave fragment came from the sternpost excavation, unit 0C, and shows parallel cut marks. It has a thickness of 3/4 inch and is likely shaped from *lignum vitae*. The thickness of a sheave was generally 1/10 greater than the diameter of the rope used with it.¹¹¹ The seven sheave pins were recovered from units 0C, 2D, 4C-D, and unprovenienced. Indention points on the ends of some of the sheave pins show evidence of having been turned on a lathe. The bull's eyes came from units 2C-D and 4C-D. The only piece of cordage preservable is a 2 1/4 inch long piece of 1/2 inch S-twist, two-cord specimen found in Unit 4C-D. A second small section of cordage was noted as having come from Unit 4C-D.

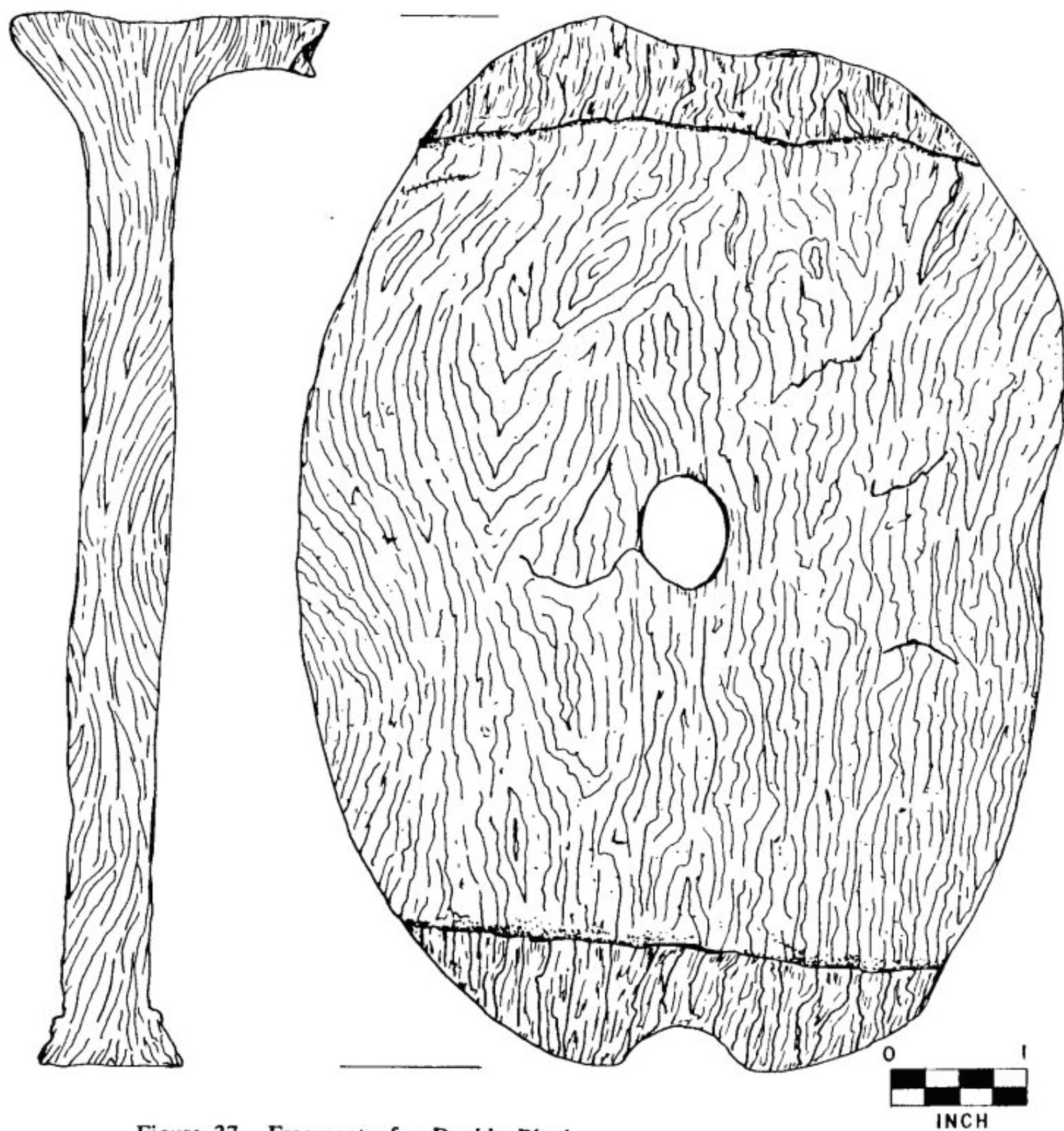


Figure 37. Fragment of a Double Block.

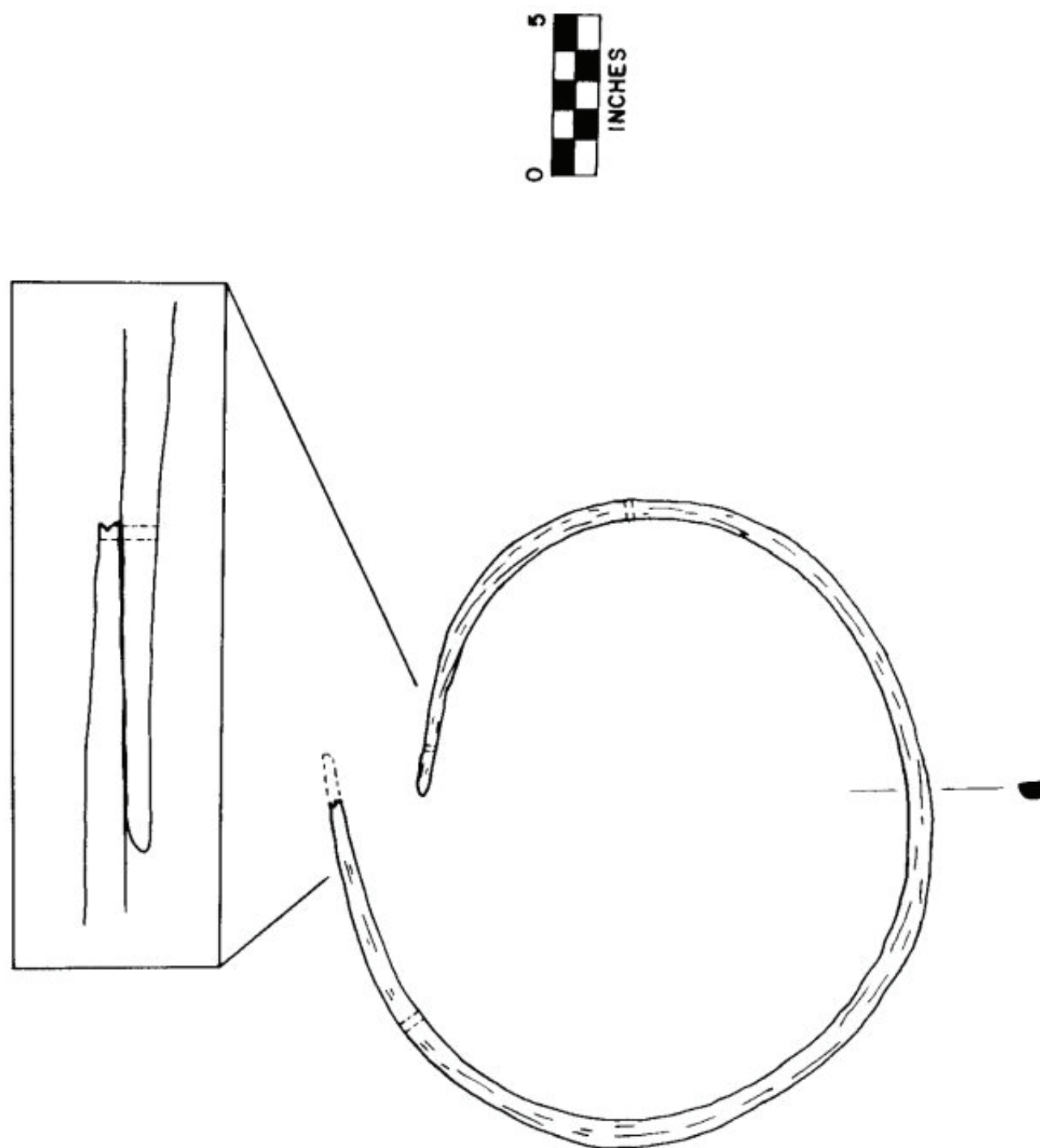


Figure 38. Mast hoop.

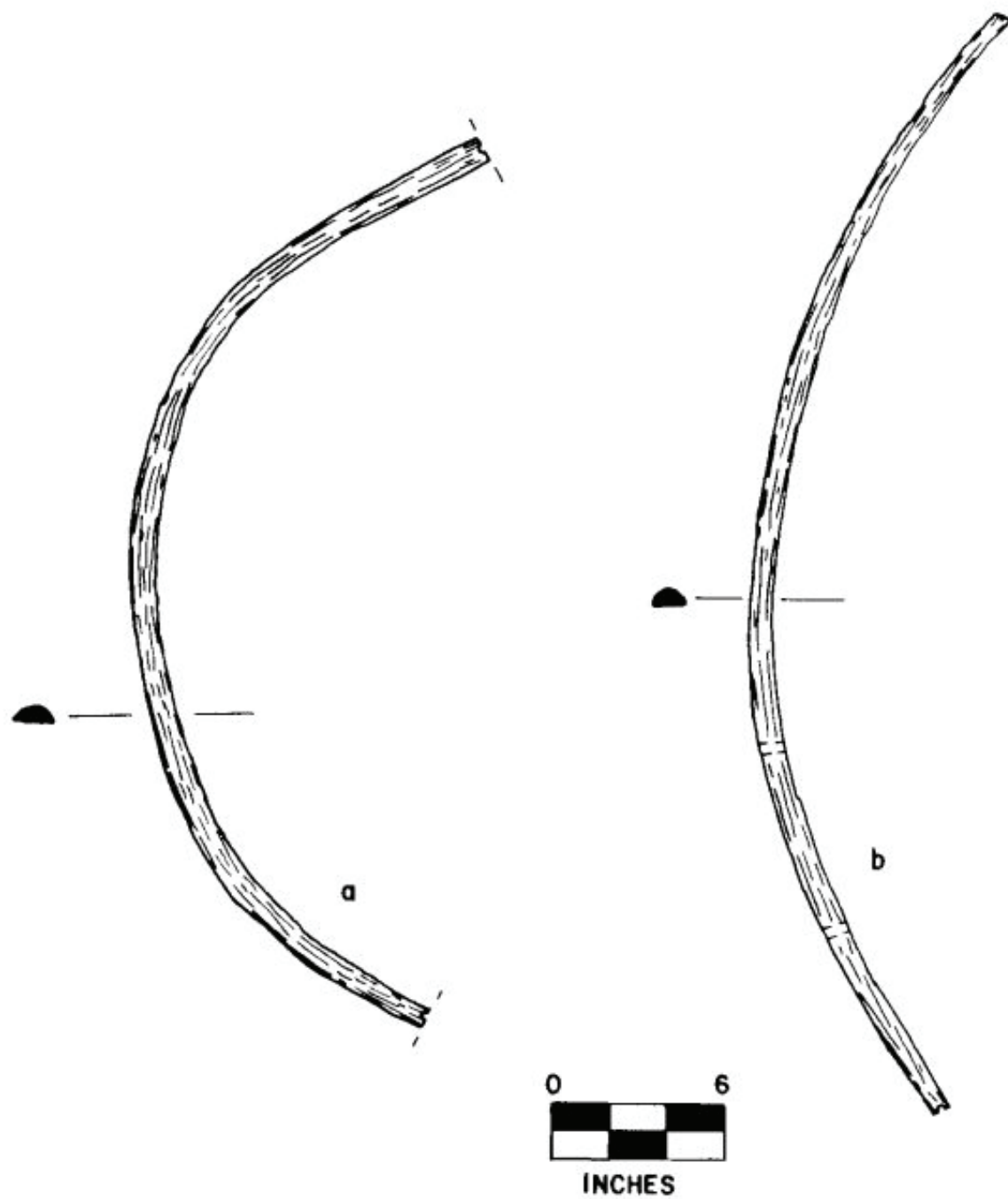
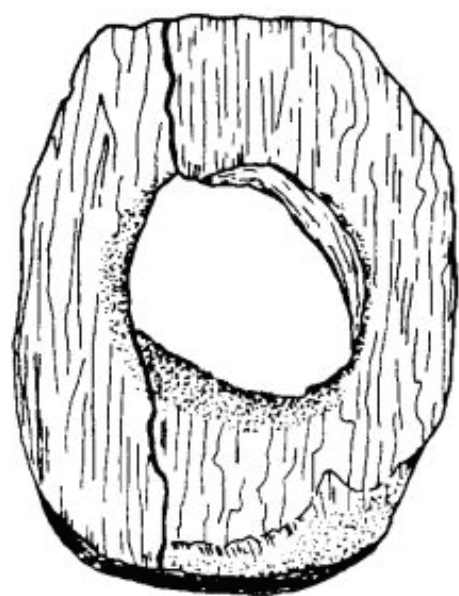
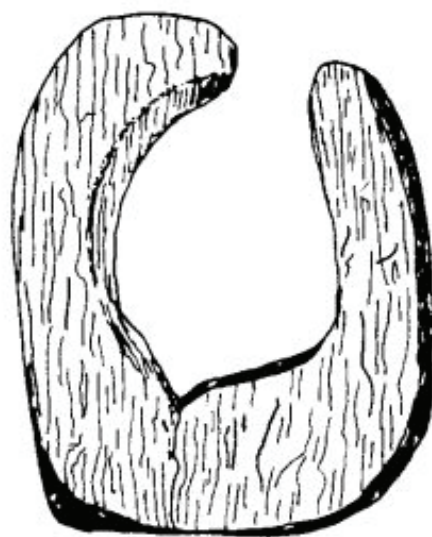


Figure 39. Mast hoop fragments.



a



b



c



Figure 40. Bull's eyes.

Fasteners

Trunnels or "treenails" are wooden pegs, similar to dowels used to secure planking or other major timbers generally in the area below the waterline. "They are often made of oak and teakwood, but the best material is locust, on account of its great durability, toughness and freedom from shrinkage."¹¹² A trunnel submitted for analysis from the Otter Creek wreck was identified as being white oak (Appendix A). Trunnels generally ranged in length from 12 to 48 inches with a diameter of between 1/2 and 2 inches. The fasteners were driven from the outside of the planking into the frames and often wedged on one or both ends. Interior ceiling was often trunneled to the frames.

One maritime dictionary describes three types of treenails in use:

There are three types of treenails. The first is straight and is driven in a hole about 1/16 in. smaller than the treenail. The second has one half sized about 1/8 in. smaller than the other half. The third type is tapered. On account of the large diameter of holes they require, treenail fastenings are not adopted as a rule for vessels of less than about 50 tons."¹¹³

To ensure a straight grain, trunnels were split, rather than cut, from billets of oak and then mooted, (rounded) by hand to the required diameter. Early forms of the trunnel were split and then shaved with a draw knife or spoke shave, producing flat faces.¹¹⁴ Eight-sided trunnels are representative of this manufacturing procedure. During the late eighteenth century the die or dowel plate was introduced. Trunnels were rough shaped, then driven through a

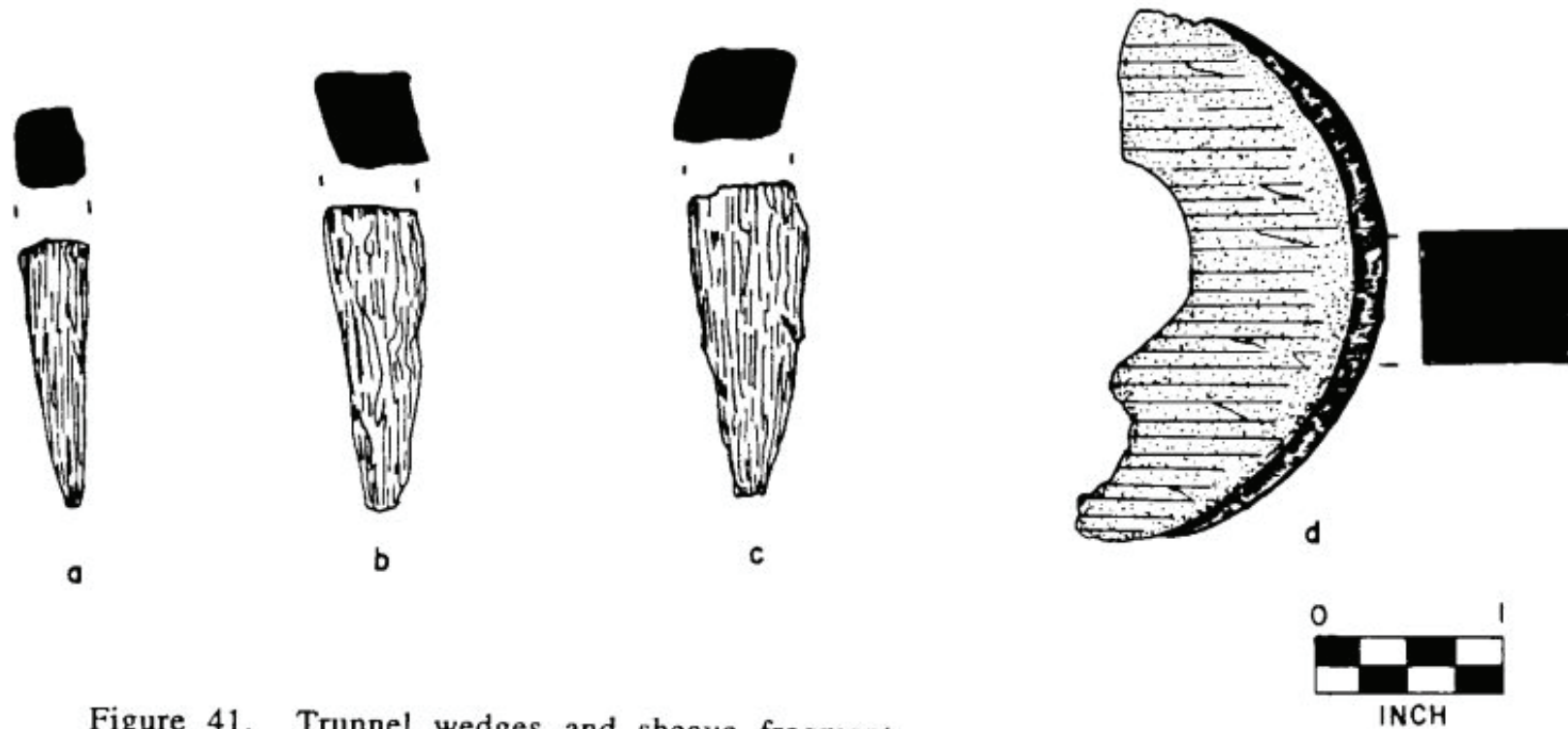


Figure 41. Trunnel wedges and sheave fragment.

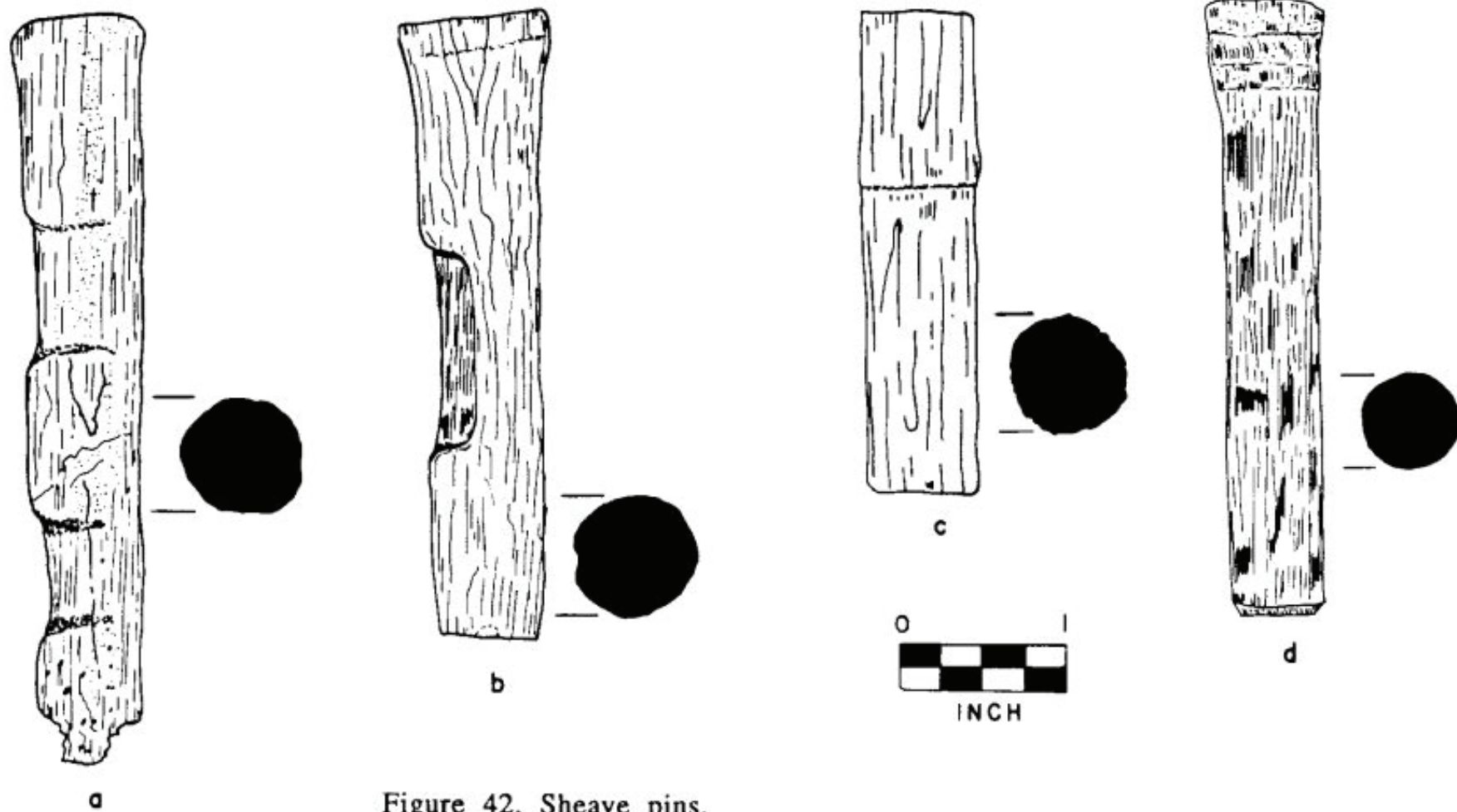


Figure 42. Sheave pins.

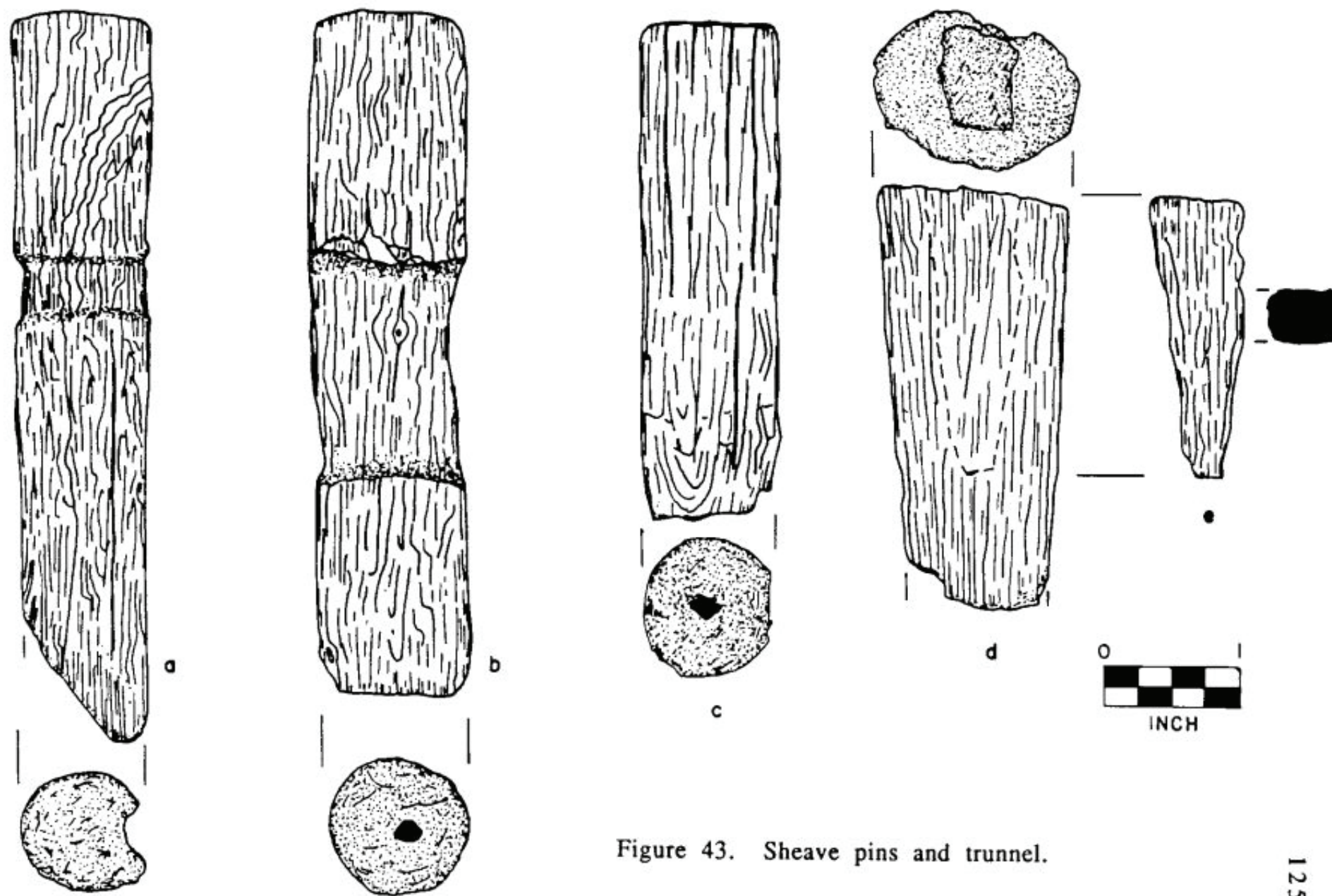


Figure 43. Sheave pins and trunnel.

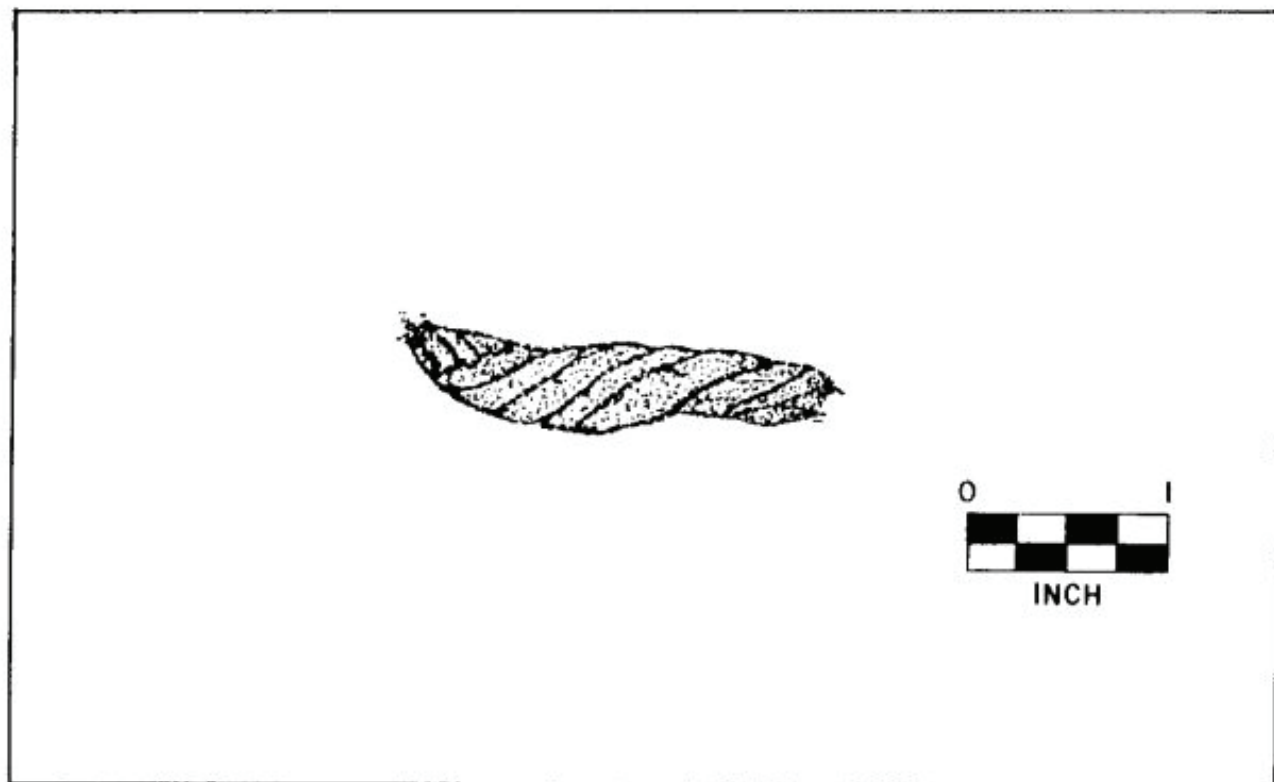


Figure 44. Cordage fragment.

sharp-edged hole in the plate, smoothing the trunnel to a rounded shape of the desired diameter.¹¹⁵ Lathe-turned trunnels were being produced during the nineteenth century. Trunnel wedges were found on the Otter Creek wreck (Figure 41a,b,c). One trunnel still containing its wedge was recovered from unit 6C. (Figure 43d,e).

Chapelle gives a good account of the use and manufacture of trunnels as described below:

Treenails were used to fasten frame futtocks together, for thick planking, and to fasten some of the deadwood. Treenails, after being driven, were wedged with thin oak wedges that stood vertical to the grain of the plank or timber being fastened. A 1" to 1 1/2" dia. treenail, driven in this manner, had tremendous holding power, far exceeding that of a nail or spike of comparative length. Eight-sided treenails were used before 1840. Treenails used at Essex were generally of white oak. Before steam power appeared in Essex (in the 1880s) treenails were made by hand. The wood was sawn into blocks of the desired length, usually 24"-28", and the ends marked off in 1 1/4" - 1 1/2" squares. With axe and mallet these blocks were split into square billets. These were then driven through a tempered steel tube or die, so that a round treenail was formed by the tool; the excess wood falling outside the die. The latter was fixed in a large wooden table or bench set over a hole in the ground below it. When steam power became available, power lathes, or dowel-cutting machines, were used. Shipbuilding areas were slow in employing steam-power tools, except in the large centers of the industry, such as Boston or Portsmouth or New York.¹¹⁶

In the middle of the eighteenth century wood trunnels were often cheaper than iron fastenings.¹¹⁷ Shipwrights sometimes would contract craftsmen to produce trunnels in large quantities, then purchase their goods in unfinished form. The wood shortage, however, played a role in the procurement of trunnels; they were also difficult to obtain at times.¹¹⁸

Most of the treenails found on the 51-foot Brown's Ferry vessel dating to 1740 are "of [the] size, 1 and 1/8-inch diameter, although

3/4-inch treenails were occasionally found. Few treenails were wedged through the hull; those which were had central, square wedges."¹¹⁹

All of the metal fasteners recovered from the wreck are hand wrought with the fibers running parallel to the piece. Preservation of metal was poor when found in association with oak. Tannic acid contained within oak seriously accelerated the decay of iron. On nearly all of the specimens the pointed or spatula-shaped tips have been eroded or broken away. All recorded lengths are for extant pieces except where noted.

Bolts documented on board the Otter Creek wreck secured the keelson to the frames, the breasthooks to the apron, and the knees to the frames and deck beams (Figures 15, 45). Bolts, likely used in the bow and stern, and for the keel, could not be observed. Three fragments of bolts were recovered and conserved (Figure 45). The three bolts measure 3/4 inch in diameter and extant lengths range from 4 1/2 inches to 9 1/2 inches. The longest of the three specimens (Figure 45a) displays a near complete length and a flat head. No clinched over bolts or washers used to secure them were found. Similarly, iron bolts used on the mid-eighteenth-century Terence Bay wreck, measured about 3/4 inch in diameter.¹²⁰

Spikes were the most numerous of the metal fasteners recovered with several forms being present (Figures 46, 47, 48). Ship spikes usually range from 4 to 10 inches and are rose-headed.¹²¹ One large round-headed spike with an extant length of 7

inches shows what appear to be cut marks near the pointed end (Figure 46a). Its purpose is unknown. Falconer does mention that the largest of the round-headed fasteners were used as fender bolts along the wales, stem, or sides to fend off the rubbing of the vessel against other ships or wharfs.¹²² A similar description is given for the ribbing nail. Falconer describes this type nail as generally 9 or 10 inches in length with a large rounded head, used for fastening the ribbands and harpings to ship's timbers.¹²³ This spike was recovered from units 3C-D.

Two large spikes with square heads range in length from 4 inches to 4 1/2 inches (Figure 46b,c). Spikes with rose heads recovered from the wreck range in extant length from 1 1/4 inches to 4 1/2 inches (Figure 47 and Figure 49f). Two of these spikes had been clinched (Figure 47b,c). Four spikes that appear to have been T-headed with a slight taper range from 1 1/8 inches to 5 1/8 inches in preserved length (Figure 48a,b,c,d). Unspecified spikes found on the Terence Bay wreck measured 1/4 by 1/2 inch in section.¹²⁴

Nails found on the Otter Creek wreck were of hand wrought iron. Only a small quantity were preserved, but those recovered varied in design. Falconer lists twenty-two possible types of nails used in ship construction: clap-headed, clincher, copper, single-decked, double-decked, flat, filling, plate, port, ribbing, rudder, scupper, sheathing, spike, and eight sizes of penny nails.¹²⁵ No cut nails were found on the Otter Creek wreck. Generally, the transition from wrought to cut nails occurred during the years 1790 to 1830 in

most areas.¹²⁶ The application of machine made heads to cut nails did not occur until about 1815.¹²⁷ Wrought nails and spikes were used continually for their nature of being easily clinched, whereas cut nails and spikes with the fiber running perpendicular to their length would often snap when attempts were made to clinch them.

Square-headed small-shanked nails ranged in extant lengths from 1 inch to 2 3/8 inches (Figure 49a,e). Rose-headed nails also preserved on this wreck ranged in remaining lengths from 7/8 inch to 1 1/4 inches (Figure 49b,c,d). Wrought-iron rose-headed nails with hammered facets on the head date to about the period 1790-1820. Wrought nails, however, continued to be used for several decades following the introduction of the cheaper cut nails.¹²⁸ Following the Revolutionary War, Britain continued to dominate in the manufacture of nails. Most nails used in this country from the late eighteenth century until the early nineteenth century were imported from England.¹²⁹ It is also likely that the quantity of nails used in the construction of the Otter Creek wreck could have been produced locally. William and John Gray Blount had established a large nailery in 1788 in Washington, North Carolina.¹³⁰ An analysis of the percentage of metals in nails can be used to date the manufacture of the fastener within fifty years.¹³¹ None of the Otter Creek fasteners were submitted for an analysis of their metallic content.

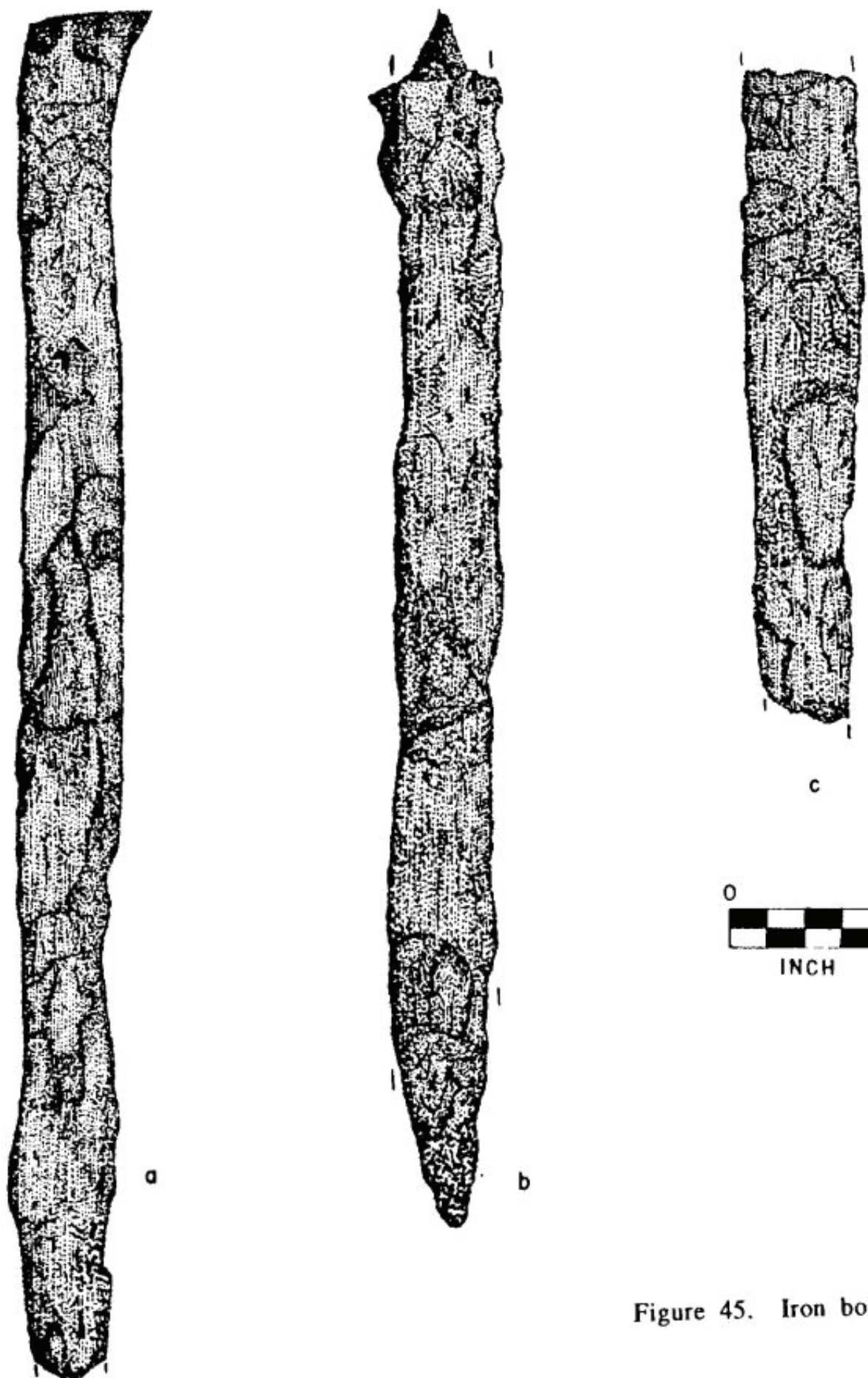


Figure 45. Iron bolts.

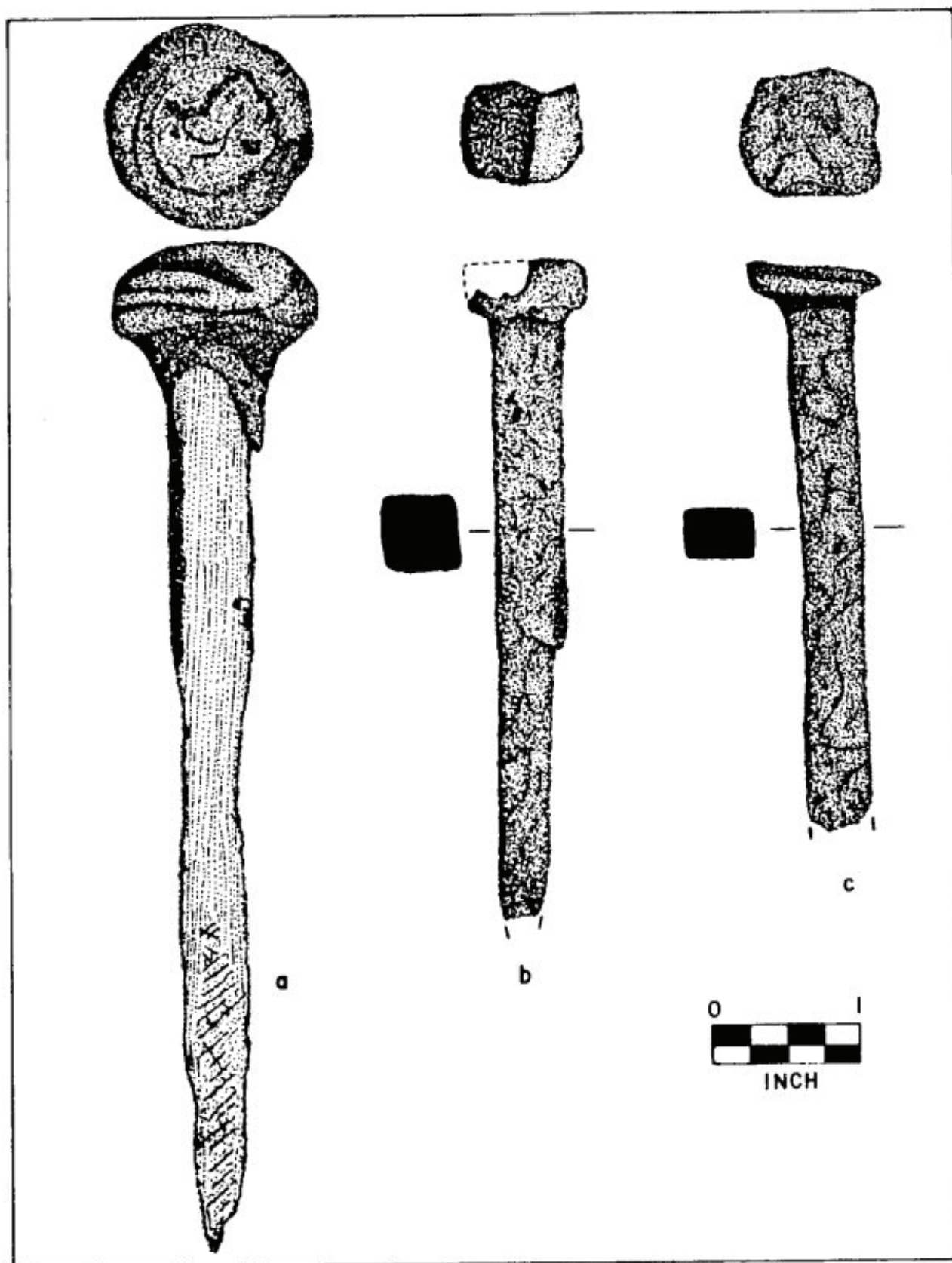


Figure 46. Spikes.

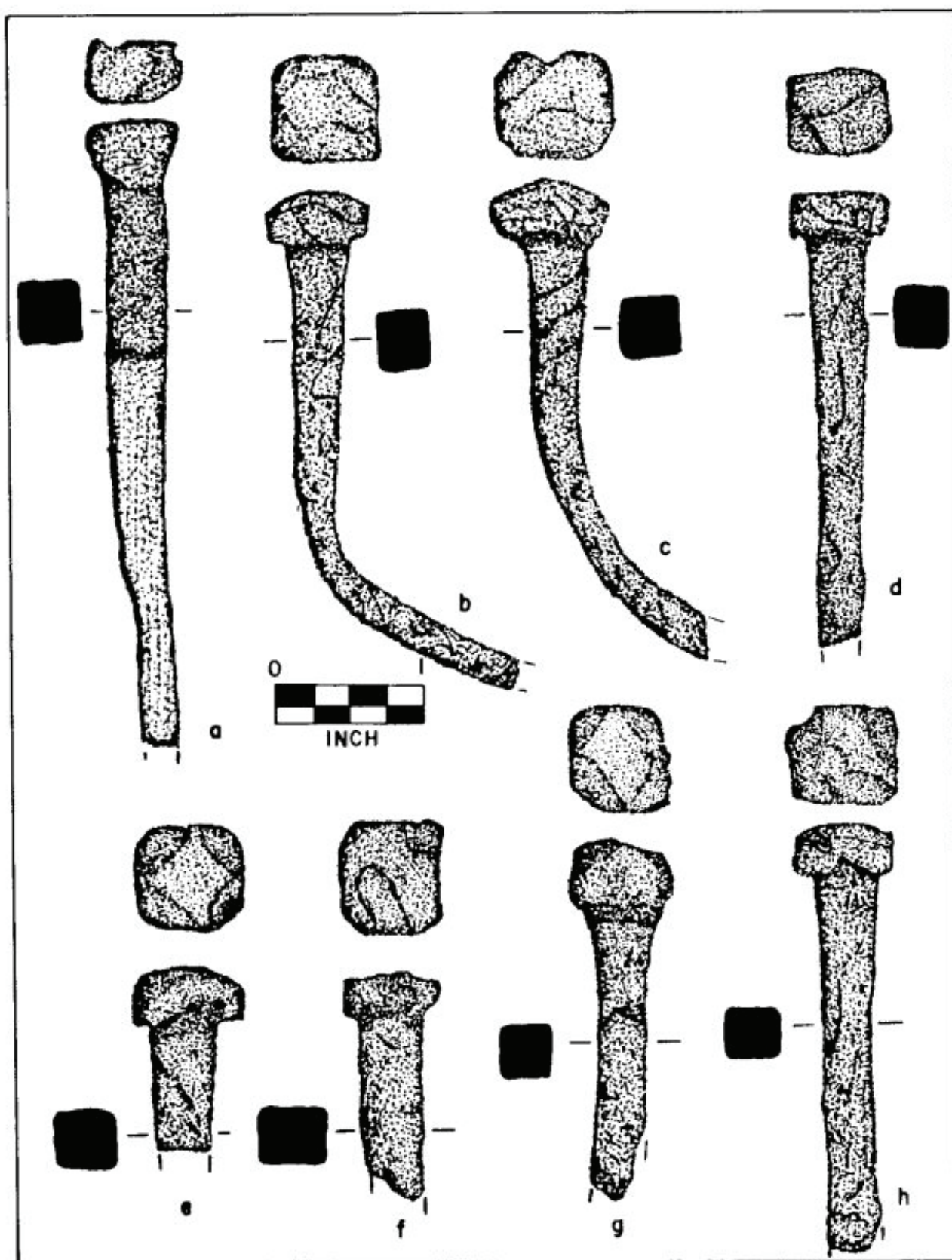


Figure 47. Spikes.

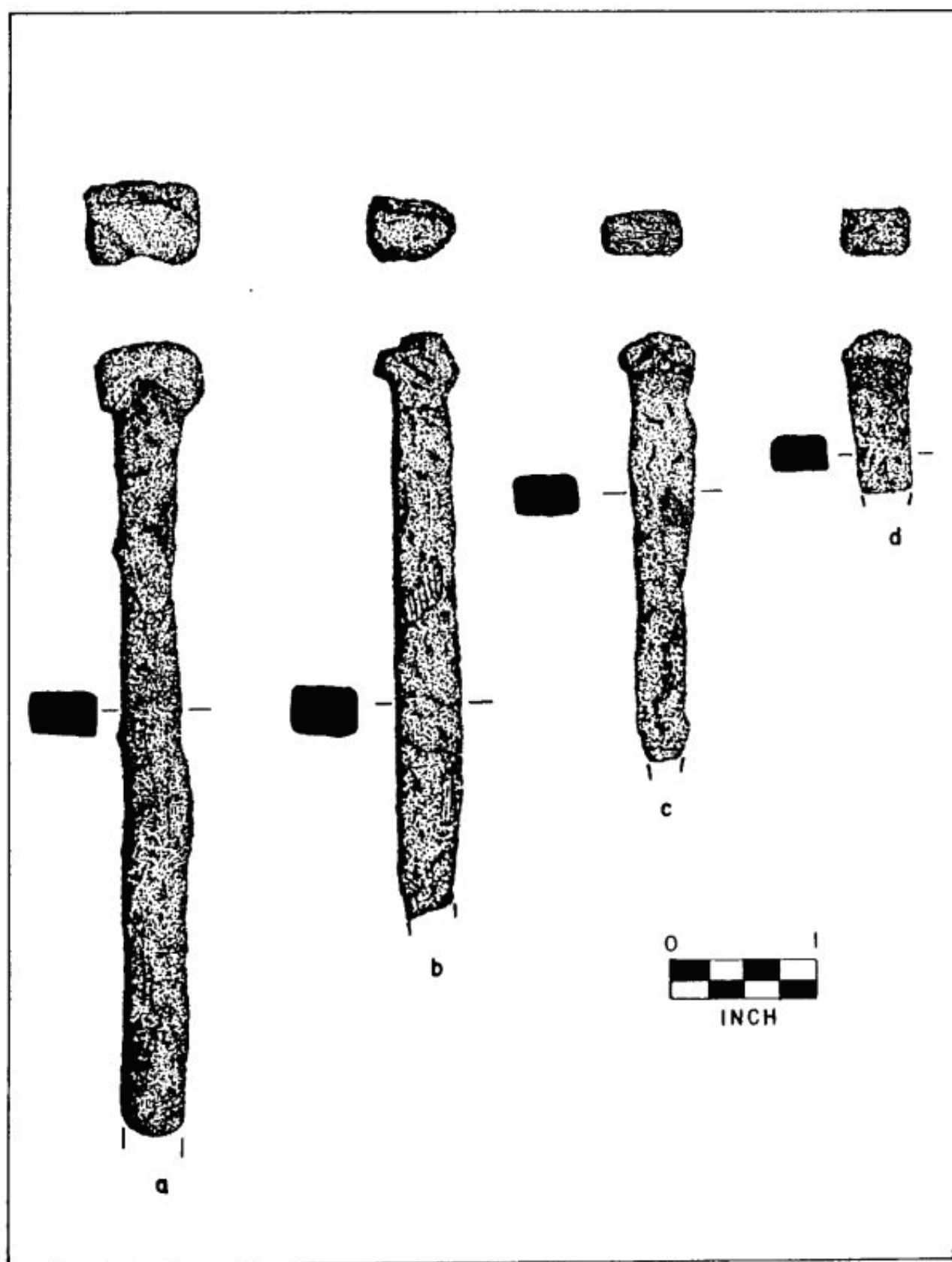


Figure 48. Spikes.

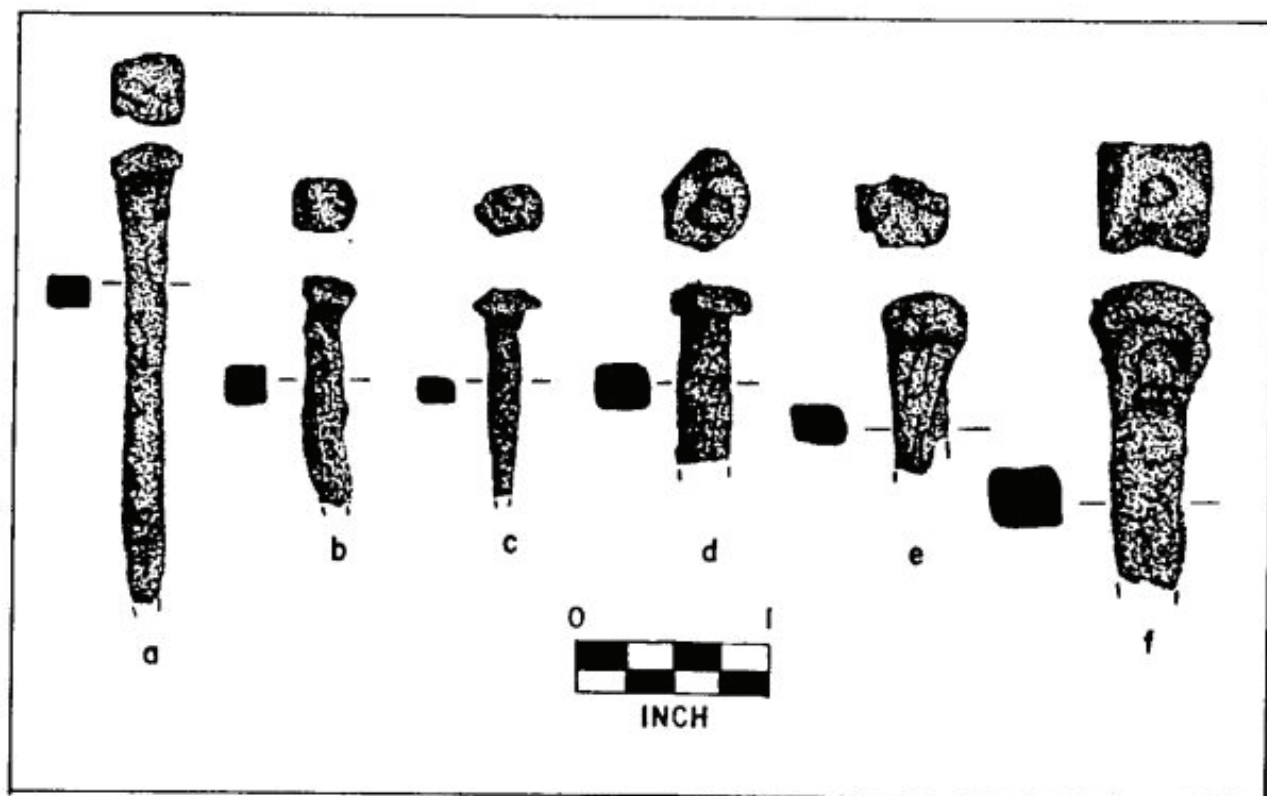


Figure 49. Nails and spike.

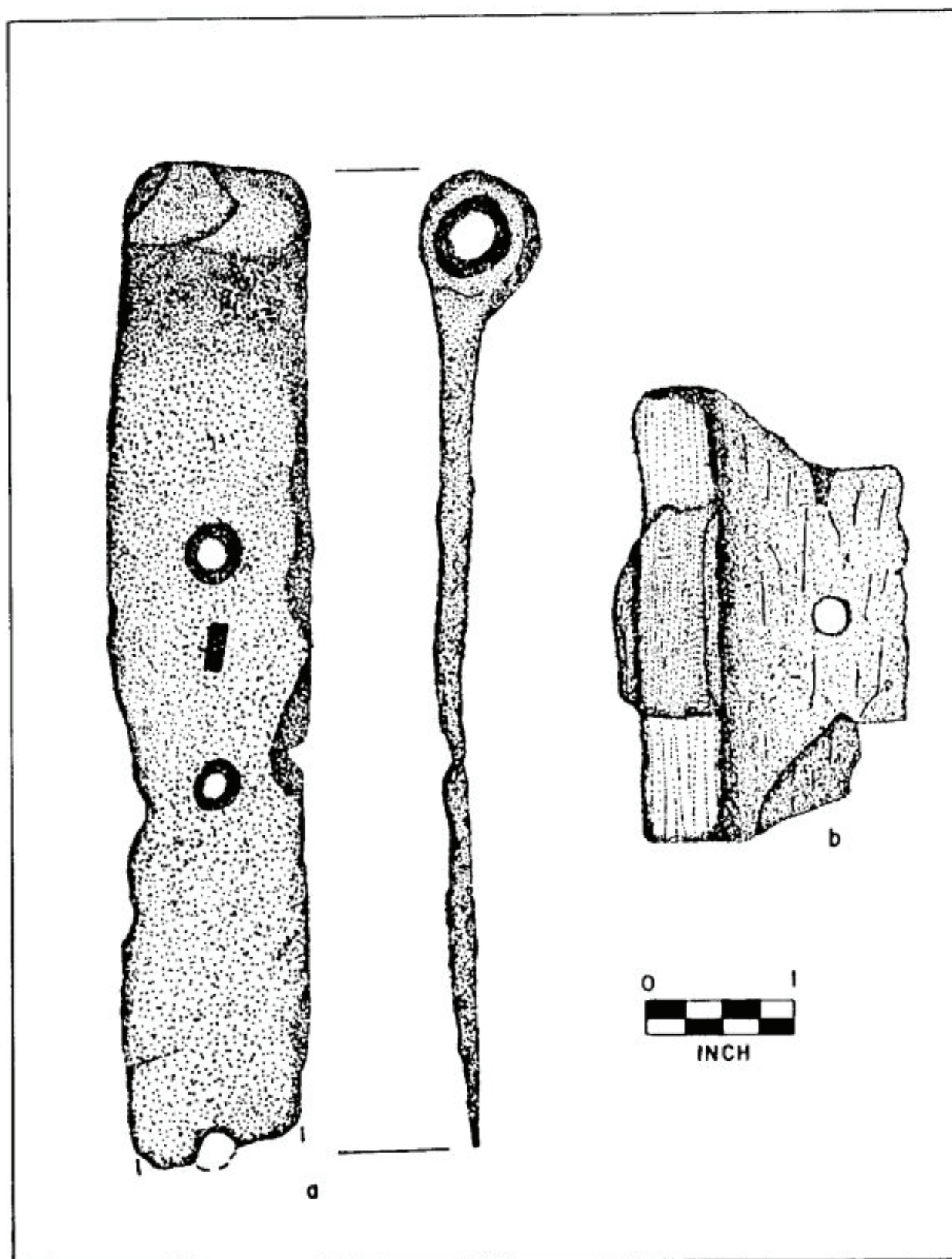


Figure 50. Hinges.

Two hinges were recovered from the Otter Creek wreck. The first (Figure 50a) came from unit 3D. The second, a common type (Figure 50b), came from unit 4C. Their function is unknown. Falconer's dictionary lists butt, dovetail, scuttle, locker-joint, and port side as some of the types of hinges found on ships.¹³²

Ballast

The Otter Creek wreck had on board large rounded stones as ballast. Five of these stones were removed from the stern area of the wreck for analysis (Appendix B). The assortment of rounded cobbles of basalt, granite and feldspar indicates that the ship was ballasted from a beach or riverine source. Large cobbles of this nature are not present in eastern North Carolina. The closest source for ballast of this size is located in the Piedmont in the western part of the state. Ballast of this size and type have a wide distribution north of the Chesapeake Bay area. North of this location the source of large stones from the Appalachian Mountains extend nearer the ocean in the absence of a coastal plain. The readily available ballast along the coast would provide an easily accessible source for ships. Northern construction and ballasting is a possibility, as is the transportation of ballast from the Piedmonts to a southern coastal construction site, or the transfer of ballast from one ship to another.

Conclusions

The documented structural elements of the Otter Creek wreck show an almost exclusive use of white oak. Shipwrights constructing vessels along the Southern Atlantic coast during the eighteenth century, could have used oak, or possibly highly accessible pine. This may not have been as likely as one would expect, as the following example illustrates the range of timber types used in the region.

Thomas Sparrow and James Howard, shipwrights of the town of New Bern, contracted to build a vessel in 1832-33 of similar dimensions to the Otter Creek wreck. Their description of the construction materials can be used as a comparison to what timber types may of been available locally for ship construction during the first half of the nineteenth century.

A vessel would be built of the following dimensions. 60 feet keel straight rabbit, - 22 feet Beam, 8 1/2 feet hole and out of the following materials, Timbers and Stanchions of prime live Oak and red cedar, the bends of prime white Oak, Bottom, Deck and Side planks of prime pitch pine, the binding Streak of prime white oak, Beams and Carlins of prime pitch pine, the comens of the fore and main hatches to be of prime white or Live oak, the pawl bits and knees of prime white or live oak, knees of prime live oak or red cedar, the keelson bottom planks and beads to be spiked and bolted with copper, all the bolts in the bends and Bottom to be bolted with copper bolts, except as much of the stem and stern posts as may be above the upper part of the bends, that much of the stem and stern posts and upper breast hooks to be bolted with iron bolts, the deck plank, side plank, waterways and knees to be well fastened with iron spikes and bolts, the two lower breast hooks and transom log to be bolted with copper bolts, the comens of the hatches, windlas, knees and bits to be bolted with iron bolts, all the heads of the spikes in the sides and deck and waterways, to be plugged with wood, all the trunnels to be of the locust wood, crutch in the run to be bolted with copper bolts....¹³³

The use of hickory for the mast hoops on the Otter Creek wreck provides evidence that the vessel is North American and not European built. White oak, the major component of this ship, is distributed along the entire eastern coast of the United States, as well as in Europe. The use of white oak for planking and irregular spaced and sided floors were characteristic of vessel construction in the Chesapeake area until 1830.¹³⁴ This presents one possibility for an area of construction, although a more definitive area of construction for this vessel based upon timber materials alone cannot be established.

Excavated remains of the Otter Creek wreck show the preserved vessel to have been at least 58 feet in length with a beam of 16 feet. These measurements would support a vessel of approximately 100 tons and a draft of 9 feet. The presence of two mast steps along with mast hoops suggests that this vessel was schooner-rigged.

The Otter Creek wreck was built with a double frame pattern. This method may suggest that the vessel was intended for open water voyages requiring sturdy construction. It could not be determined whether the frames displayed the likely trait of being pegged together as seen on two South Carolina vessels whose date of construction occur before and after that of the Otter Creek wreck - the Brown's Ferry vessel and the Mepkin Abbey wreck respectively.

Constructional details of the Otter Creek wreck tend to indicate that it was built during the last half of the eighteenth century. The

keelson is suspected to continue aft until it butts with the sternpost, but this important aspect of construction could not be verified at the time. On vessels built prior to 1750 this feature would not likely be present.¹³⁵ The use of wooden knees rather than iron ones may indicate that this vessel was constructed prior to the early nineteenth century when iron knees came into common use at major ship construction areas in the North. However, this development did not occur as rapidly in the South, as may indicate a later date of construction. On the Otter Creek wreck every other floor is bolted to the keelson. This method ended around 1800 when the common practice began of bolting every floor.¹³⁶

Preservation of metal was limited on this wreck, but surviving fasteners also provide evidence of the vessel's approximate date of construction. The presence of wrought nails, and the absence of cut nails on this wreck may indicate that it was built before 1790, when cut nails began to replace wrought nails. However, it must be kept in mind that wrought nails continued in use for several more years.

The structural characteristics of this wreck indicate North American construction sometime after 1750 and before the turn of the nineteenth century. The Otter Creek wreck likely represents a well-constructed coastal schooner used during the last half of the eighteenth century in eastern North Carolina.

Chapter III Endnotes

¹Geoff Scofield, "Otter Creek Wreck Vessel Construction," 1991, Manuscript on file, North Carolina Maritime Museum, p. 2.

²Scofield, "Otter Creek Wreck Vessel Construction," p. 8.

³Geoff Scofield, personal communication, June 12, 1991.

⁴Sir Westcott Abell, *The Shipwright's Trade* (Cambridge, England, 1948), p. 96.; Basil Greenhill, *The Evolution of the Wooden Ship* (New York: Facts on File, 1988), p. 112; Robert G. Albion, *Forests and Sea Power: The Timber Problem of the Royal Navy 1652-1862* (Cambridge, Mass.: Harvard University Press, 1926), p. 9.; David R. MacGregor, *Fast Sailing Ships, Their Design and Construction, 1775-1875* (Annapolis: Naval Institute Press, 1973 and 1988), p. 20.

⁵Albion, *Forests and Sea Power*, p. 9.; Greenhill, *Evolution of the Wooden Ship*, p. 110.

⁶Albion, *Forests and Sea Power*, p. 9.

⁷James Dodds and James Moore, *Building the Wooden Fighting Ship* (New York: Facts on File Publications, 1984), p. 13.

⁸George Moorsom, *A Brief Review and Analyses of the Laws for the Admeasurement of Tonnage* (London: 1852), p. 82.

⁹Albion, *Forests and Sea Power*, pp. 37-38.

¹⁰Dodds and Moore, *Building the Wooden Fighting Ship*, pp. 13-14.

¹¹Albion, *Forests and Sea Power*, p. 7.

¹²Albion, *Forests and Sea Power*, p. 325.

¹³Dodds and Moore, *Building the Wooden Fighting Ship*, p. 18.

¹⁴Dodds and Moore, *Building the Wooden Fighting Ship*, p. 18.

¹⁵Albion, *Forests and Sea Power*, p. 32.

¹⁶Albion, *Forests and Sea Power*, p. 14.

¹⁷Elbert L. Little, *The Audubon Society Field Guide to North American Trees, Eastern Region* (New York: Alfred A. Knopf, 1980), pp. 382-383.

¹⁸Albion, *Forest and Sea Power: The Timber Problem of the Royal Navy 1652-1862*, p. 24.

¹⁹Dodds and Moore, *Building the Wooden Fighting Ship*, p. 20.

²⁰Greenhill, *Evolution of the Wooden Ship*, p. 112.

²¹Greenhill, *Evolution of the Wooden Ship*, p. 112.

²²Albion, *Forests and Sea Power*, pp. 12-13.

²³Dodds and Moore, *Building the Wooden Fighting Ship*, p. 14.

²⁴U.S. Navy Bureau of Ships, *Wood: A Manual For Its Use as a Shipbuilding Material*, 2 vols. (Washington: U.S. Navy Bureau of Ships, 1957) as quoted in Robert M. Steward, *Boatbuilding Manual* (Camden, Maine: International Marine Publishing Co., 1987), Vol. 1, p. 34.

²⁵Dodds and Moore, *Building the Wooden Fighting Ship*, p. 17.

²⁶Scofield, "Otter Creek Wreck Vessel Construction," p. 2.

²⁷William Falconer, *A New Universal Dictionary of the Marine*, (London: Joyce Gold, 1815), p. 209.

²⁸Scofield, "Otter Creek Wreck Vessel Construction," 1991, p. 2.

²⁹Richard J. Steffy, "The Charon Report," Gordon P. Watts, Jr. ed., *Underwater Archaeology: The Challenge Before Us. The Proceedings of the Twelfth Conference on Underwater Archaeology* (San Marino, Calif.: Fathom Eight, 1981), p. 126.

³⁰Scofield, "Otter Creek Wreck Vessel Construction," pp. 2-3.

³¹René De Kerchove, *International Maritime Dictionary* (New York: Van Nostrand Reinhold Co., 1961), p. 379.

³²Scofield, "Otter Creek Wreck Vessel Construction," p. 3.

³³Falconer, *Dictionary of the Marine*, p.19.

³⁴Scofield, "Otter Creek Wreck Vessel Construction," p. 3.

³⁵Falconer, *Dictionary of the Marine*, p. 57.

³⁶Scofield, "Otter Creek Wreck Vessel Construction," p. 3.

³⁷Scofield, "Otter Creek Wreck Vessel Construction," p. 3.

³⁸John D. Broadwater, John W. Morris III, and Marcie Renner, "Yorktown Shipwreck Archaeological Project: An Interim Report on the 1987 Season," James P. Delgado, ed., *Underwater Archaeological Proceedings From The Society For Historical Archaeology Conference* (Ann Arbor, Mich.: Braun-Brumfield, Inc., 1988), p. 14.

³⁹Falconer, *Dictionary of the Marine*, p. 234.

⁴⁰MacGregor, *Fast Sailing Ships*, p. 20.

⁴¹Greenhill, *Evolution of the Wooden Ship*, p. 109.

⁴²David Steel, *Elements and Practice of Naval Architecture*, reprint (London: Sim Comfort Association, 1977), p. 378.

⁴³Scofield, "Otter Creek Wreck Vessel Construction," p. 4.

⁴⁴Ralph Wilbanks, "A Preliminary Report on the Mepkin Abbey Wreck, Cooper River, South Carolina: An Early 19th-Century River Trading Vessel," Gordon P. Watts, Jr. ed., *Underwater Archaeology: The Challenge Before Us. The Proceedings of the Twelfth Conference on Underwater Archaeology* (San Marino, Calif.: Fathom Eight, 1981), p. 153.

⁴⁵Broadwater, Morris, and Renner, "Yorktown Shipwreck Archaeological Project," p. 14.

⁴⁶David C. Switzer, "Interpretation of the Stern Area of the Privateer Defence," Gordon P. Watts, Jr., ed., *Underwater Archaeology: The Challenge Before Us. The Proceedings of the Twelfth Conference on Underwater Archaeology* (San Marino: Calif.: Fathom Eight, 1981), p. 149.

⁴⁷Greenhill, *Evolution of the Wooden Ship*, p. 117.

⁴⁸Geoff Scofield, "Otter Creek Wreck Vessel Construction," p. 5.

⁴⁹Greenhill, *Evolution of the Wooden Ship*, pp. 149, 153.

⁵⁰Broadwater, Morris, and Renner, "Yorktown Shipwreck Archaeological Project," p. 14.

⁵¹Greenhill, *Evolution of the Wooden Ship*, p. 126.

⁵²Falconer, *Dictionary of the Marine*, p. 210.

⁵³Geoff Scofield, personal communication.

⁵⁴Scofield, "Otter Creek Wreck Vessel Construction," p. 4-5.

⁵⁵Steffy, "Charon Report," p. 126.

⁵⁶Wilbanks, "Mepkin Abbey Wreck," p. 154.

⁵⁷Falconer, *Dictionary of the Marine*, p. 210.

⁵⁸Mungo Murray, *A Practical Treatise on Ship-Building and Navigation* (London: A. Millar, 1764), p. 12.

⁵⁹Falconer, *Dictionary of the Marine*, p. 210.

⁶⁰Abraham Rees, *Rees' Naval Architecture, 1819-1820*, reprint (London: David and Charles, 1970), p. 19.

⁶¹Wilbanks, "Mepkin Abbey Wreck," p. 154.

⁶²Richard W. Lawrence, "Current Underwater Archaeological Research in North Carolina, J. Barto Arnold III, ed., *Underwater Archaeology Proceedings From the Society for Historical Archaeology Conference* (Pleasant Hill, Calif.: Society for Historical Archaeology, 1989), p. 56.

⁶³Peter Goodwin, *The Construction and Fitting of the Sailing man of War, 1650-1850* (London: Conway Maritime Press, 1987), p. 28.

⁶⁴Scofield, "Otter Creek Wreck Vessel Construction," pp. 4-5.

⁶⁵Scofield, "Otter Creek Wreck Vessel Construction," p. 5.

⁶⁶David MacGregor, *Merchant Sailing Ships, 1815-1835* (London: Conway Maritime Press, 1984), p. 45.

⁶⁷Geoff Scofield, "Otter Creek Wreck Vessel Construction," p. 5.

⁶⁸David Switzer, "Recovery and Initial Interpretation of the Shot Locker and Bilge Pump Well From the Privateer *Defence*," Wilburn A. Cockrell, ed., *In the Realms of Gold: The Proceedings of the Tenth Conference on Underwater Archaeology*, (San Marino, Calif.: Fathom Eight, 1981), p. 79.

⁶⁹Mark Wilde-Ramsing, "Preliminary Report on the Rose Hill Expedition" 1988 (report on file, North Carolina Underwater Archaeology Unit, Kure Beach, N.C.), pp. 3-4.

⁷⁰Greenhill, *Evolution of the Wooden Ship*, p. 157.

⁷¹William Hutchinson, *A Treatise on Naval Architecture* (Liverpool: T. Billinge, 1794), p. 254.

⁷²Howard I. Chapelle, *The American Fishing Schooners 1825-1935* (New York: W.W. Norton & Co. Inc., 1973), p. 572.

⁷³Hutchinson, *Treatise on Naval Architecture*, p. 254.

⁷⁴Greenhill, *Evolution of the Wooden Ship*, p. 134.

⁷⁵Greenhill, *Evolution of the Wooden Ship*, p. 132.

⁷⁶MacGregor, *Fast Sailing Ships*, p. 21.

⁷⁷MacGregor, *Fast Sailing Ships*, p. 22.

⁷⁸Greenhill, *Evolution of the Wooden Ship*, p. 112.

⁷⁹Arthur Bugler, *HMS Victory: Building, Restoration, and Repair* (London: Her Majesty's Stationary Office, 1966), p. 128.

⁸⁰Robert M. Adams, "Yorktown Archaeological Shipwreck Project: 1985 Field Season," John W. Foster and Sheli O. Smith, eds., *Archaeology in Solution. Proceedings of The Seventeenth Annual Conference on Underwater Archaeology* (Salinas, Calif.: Coyote Press, 1988), p. 216.

⁸¹Greenhill, *Evolution of the Wooden Ship*, p. 157.

⁸²Falconer, *Dictionary of the Marine*, p. 497.

⁸³UAU Daily Log, p. 27.

⁸⁴Albion, *Forests and Sea Power*, p. 9.

⁸⁵Lee J. Cox, "Preliminary Investigations of a Revolutionary War Era Vessel in Crosswicks Creek, Bordontown, New Jersey," Alan B. Albright, ed., *Underwater Archaeology Proceedings From the Society For Historical Archaeology Conference* (Ann Arbor, Mich.: Braun-Brumfield, Inc., 1987), p. 69.

⁸⁶Broadwater, Morris, and Renner, "Yorktown Shipwreck Archaeological Project," p. 14.

⁸⁷Greenhill, *Evolution of the Wooden Ship*, p. 134.

⁸⁸Greenhill, *Evolution of the Wooden Ship*, p. 146.

⁸⁹Greenhill, *Evolution of the Wooden Ship*, p. 153.

⁹⁰Dodds and Moore, *Building the Wooden Fighting Ship*, p. 23.

⁹¹Greenhill, *Evolution of the Wooden Ship*, p. 146.

⁹²Greenhill, *Evolution of the Wooden Ship*, pp. 129, 146.

⁹³Greenhill, *Evolution of the Wooden Ship*, p. 146.

⁹⁴Dodds and Moore, *Building the Wooden Fighting Ship*, p. 18; Goldenberg, p.90; Falconer, *Dictionary of the Marine*, p. 451.

⁹⁵Falconer, *Dictionary of the Marine*, p. 291.

⁹⁶E.H.H. Archibald, *The Wooden Fighting Ship in the Royal Navy, A.D. 897-1860* (New York: Arco Publishing Co., 1976), p. 59.

⁹⁷Archibald, *Wooden Fighting Ship*, p. 59.

⁹⁸Falconer, *Dictionary of the Marine*, pp. 451-452.

⁹⁹Falconer, *Dictionary of the Marine*, p. 452.

¹⁰⁰Broadwater, Morris, and Renner, "Yorktown Shipwreck Archaeological Project," p. 14.

- 101Cox, "Revolutionary War Era Vessel," p. 69.
- 102Dodds and Moore, *Building the Wooden Fighting Ship*, p. 23.
- 103De Kerchove, *Dictionary*, p. 715.
- 104Warren C. Riess, "History of the Ronson Ship," *Archaeology in Solution*. John W. Foster and Sheli O. Smith, eds., *Proceedings of the Seventeenth Annual Conference on Underwater Archaeology* (Salinas, Calif.: Coyote Press, 1988), p. 149.
- 105Alice B. Keith, ed., *The John Gray Blount Papers*, 2 vols. (Raleigh: State Department of Archives and History, 1959), Vol. 2, p. 577.
- 106Albion, *Forests and Sea Power*, p. 28.
- 107MacGregor, *Fast Sailing Ships*, p. 21.
- 108MacGregor, *Fast Sailing Ships*, p. 21.
- 109David R. MacGregor, *Schooners in Four Centuries* (Annapolis: Naval Institute Press, 1982), p.22.
- 110Howard I. Chapelle, *The History of American Sailing Ships* (New York: W.W. Norton & Co.), p.22.
- 111Falconer, *Dictionary of the Marine*, p. 42.
- 112De Kerchove, *Dictionary*, p. 860.
- 113De Kerchove, *Dictionary*, p. 860.
- 114Mendel Peterson, *History Under the Sea* (Alexandria, Va.: published by the author, 1973), p. 122.
- 115Peterson, *History Under the Sea*, pp. 122-123.
- 116Howard I. Chapelle, *American Fishing Schooners*, p. 661.

¹¹⁷Dodds and Moore, *Building the Wooden Fighting Ship*, p. 24.

¹¹⁸Albion, *Forests and Sea Power*, p. 10.

¹¹⁹J. Richard Steffy, "Construction Details of the Brown's Ferry Ship," J. Barto Arnold III, ed., *Beneath the Waters of Time: The Proceedings of the Ninth Conference on Underwater Archaeology* (Austin: Texas Antiquities Committee, 1978), p. 57.

¹²⁰John Carter and Trevor Kenchington, "The Terrence Bay Wreck: Survey and Excavation of a Mid-18th Century Fishing Schooner," Paul F. Johnson, ed., *Proceedings of the Sixteenth Conference on Underwater Archaeology* (Ann Arbor, Mich.: Braun-Brumfield, Inc., 1985), p. 20.

¹²¹De Kerchove, *Dictionary*, pp. 527, 763.

¹²²Falconer, *Dictionary of the Marine*, p. 50.

¹²³Falconer, *Dictionary of the Marine*, p. 291.

¹²⁴Carter and Kenchington, "Terrence Bay Wreck," p. 20.

¹²⁵Falconer, *Dictionary of the Marine*, p. 291.

¹²⁶Lee H. Nelson, "Nail Chronology as an aid to Dating old Buildings," Technical Leaflet 48, *History News*, Vol. 24, No. 11, (1968), n. p.

¹²⁷Ivor Noël Hume, *A Guide To Artifacts of Colonial America* (New York: Alfred A. Knopf, 1982), p. 253.

¹²⁸Nelson, "Nail Chronology," n. p.

¹²⁹John T. Keene, Jr., "The Nail Making Industry in Early Virginia," *The Chronicle of the Early American Industries Association, Inc.*, Vol. XXV, No. 1 (March, 1972), p. 6.

¹³⁰Keith, *Blount Papers*, Vol.1, p.398; Vol. 2, p. 577.

¹³¹Peterson, *History Under the Sea*, p. 120.

¹³²Falconer, *Dictionary of the Marine*, p. 195.

¹³³Joseph I. Roberson Papers, Raleigh: North Carolina State Archives.

¹³⁴Howard Chapelle, *The Search For Speed Under Sail 1700 - 1855* (New York: W. W. Norton & Company, 1967).

¹³⁵Goodwin, *Construction and Fitting*, p. 28.

¹³⁶Rees, *Naval Architecture*, p. 19.

Chapter IV

Description of the Artifacts

Noticeably few artifacts were recovered from the Otter Creek wreck. Those artifacts that have been recovered, preserved and analyzed have been grouped into the following seven classes for discussion: ceramics, glass, metal, wood, miscellaneous, faunal and botanical. When possible, type, date of manufacture, distribution and function for each artifact will be noted.

Ceramics

Stoneware

SPECIMEN 18NUR130 is the largest of the stoneware artifacts recovered (Figure 51). Only a fragment of the neck and complete handle are now present from a jug-shaped container. The specimen displays a pitted chocolate brown glaze on its exterior. The interior has a light brown glaze darker at the neck orifice and decreases in color lower on the vessel. The paste is grey in color. The specimen measures 3 5/8 inches by 4 5/8 inches. The collar of the neck measures 1 5/8 inches in diameter and .238 inches thick and has an interior opening of 7/8 inch diameter. The strap handle is solid and attached at both ends with a maximum thickness of one inch. This specimen was excavated from unit 4D.

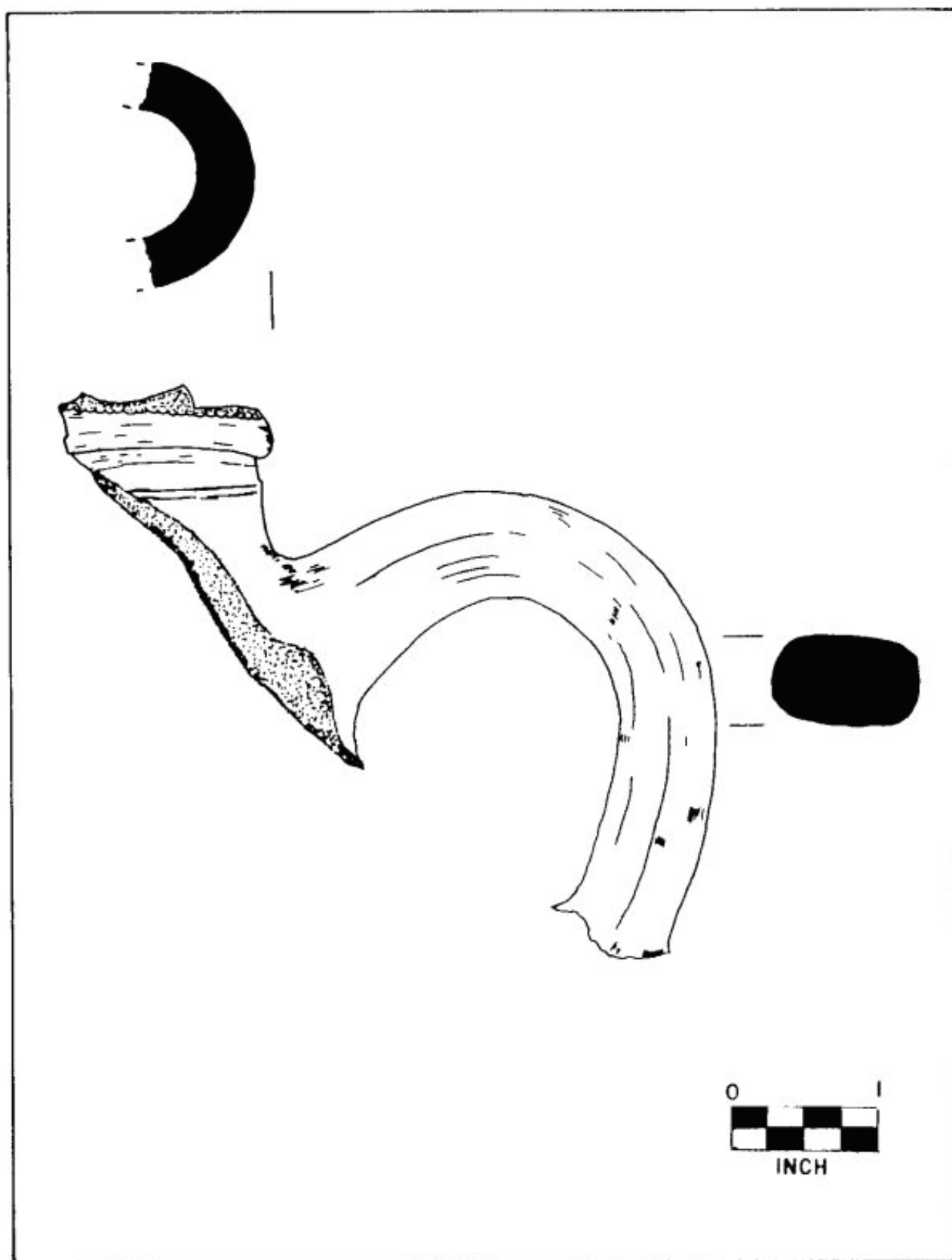


Figure 51. Stoneware jug fragment. 18NUR130

SPECIMEN 18NUR161 is a shoulder and body fragment pieced together (Figure 52i). The artifact exhibits a burnt appearance with a wrinkled gray exterior surface. The interior shows multiple horizontal parallel grooves and has a dark brown glaze color. The paste is brown in color and shows burning part way through. The piece measures $2 \frac{1}{4}$ inches by $2 \frac{5}{8}$ inches with a maximum thickness of .153 inches. This specimen was found in units 2C-D.

SPECIMEN 18NUR320 is a fragment of a vessel handle (Figure 52h). It is a nearly complete specimen that exhibits rounded top and bottom edges. It measures $1 \frac{5}{8}$ inches from top to bottom, with an incomplete $1 \frac{3}{8}$ inches width. The piece is uniformly brown salt-glazed with marks from a small smoothing tool present. The handle is .565 inches thick at its greatest measurement. This specimen was recovered from units 5-6C.

SPECIMEN 18NUR279 is part of the base and side of a stoneware ceramic bottle (Figure 52d). This piece and specimens 18NUR166, 18NUR280, 18NUR150c, 18NUR211, and possibly 18NUR283 are all likely from the same vessel. This piece is a brown and gray mottled salt-glazed fragment with the letters "NUFA," possibly part of the word MANUFACTURED, stamped near the base. Above these $\frac{1}{4}$ -inch letters, two other partial letters, slightly larger in size, are visible. The specimen measures $\frac{3}{4}$ inch by $1 \frac{1}{2}$ inches. Maximum wall thickness is .216 inches. A small groove occurs just below the letters around the base. The letters and groove retain a

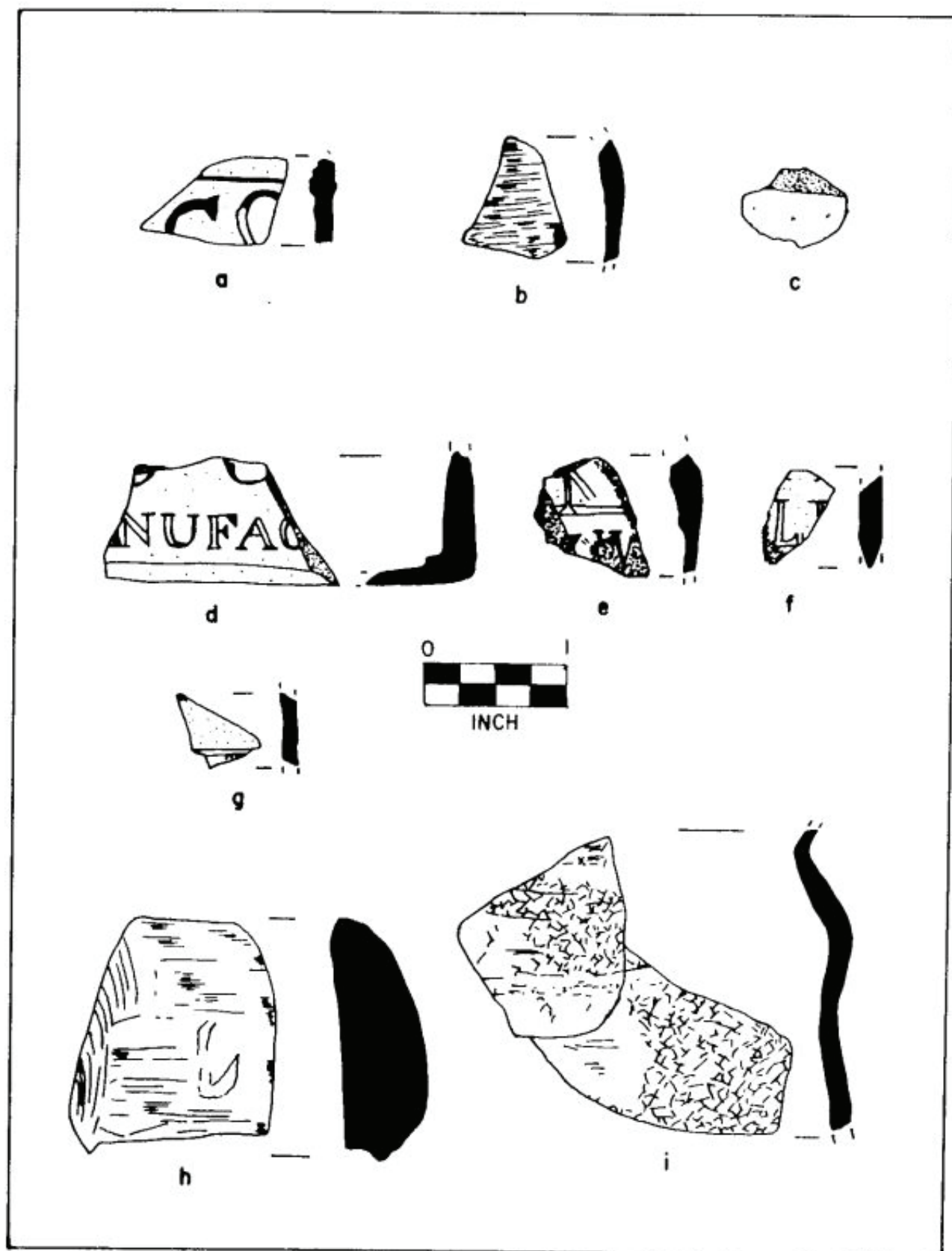


Figure 52. Stoneware ceramic fragments. a)18NUR211 b)18NUR237 c)18NUR283 d)18NUR279 e)18NUR166 f)18NUR280 g)18NUR150c h)18NUR320 i)18NUR161.

grayish-blue tint, likely a cobalt blue glaze. The interior is not glazed and the paste is buff in color. This specimen was excavated from unit 4C-D.

SPECIMEN 18NUR166 is a small fragment from a ceramic bottle (Figure 52e). It measures 1 inch by $\frac{3}{4}$ inch with a maximum thickness of .213 inches. The piece is salt-glazed with a mottled brown glaze. The partial letters "N" and either a "W" or "M" are stamped and filled with a cobalt blue glaze. A small groove separates the two lines of letters. The interior is slightly channeled and may have a brown glaze. This specimen was recovered from the sternpost excavation pit.

SPECIMEN 18NUR280 is another small fragment of a ceramic bottle with a mottled brown exterior glaze (Figure 52f). This piece measures $\frac{11}{16}$ inch by $\frac{3}{8}$ inch with a thickness of .131 inches. Portions of two stamped letters $\frac{1}{4}$ inch high are visible, one letter possibly being an "L". No blue glaze remains in the letters of this specimen. This piece came from units 4 C-D.

SPECIMEN 18NUR150c, a small specimen only $\frac{1}{2}$ inch by $\frac{1}{2}$ inch, is likely from the same ceramic bottle as the other specimens based on its similarity to the other pieces (Figure 52g). It is grey salt-glazed and mottled brown with a faintly blue glazed groove. The piece has no interior glazing and the paste is buff in color. It measures .124 inches thick. It was excavated from units 2 C-D.

SPECIMEN 18NUR211 is possibly from the same ceramic bottle as the other described pieces and may represent a fragment nearer

the top of the container (Figure 52a). The upper edge is slightly rounded as if part of the shoulder. The salt-glazed piece is grey in color with only a slight amount of the mottled brown glaze. Just below the rounded top edge is a grayish-blue filled groove. Below the groove are two partial letters, each possibly being an "C," "G" or "S." This specimen measures $5/8$ inch by 1 inch. The thickness is .124 inches and the interior is unglazed. The paste is buff colored. This specimen came from unit 4C.

SPECIMEN 18NUR283 is considered part of the same ceramic bottle based only upon the similarity of the unglazed buff interior (Figure 52c). The exterior has fractured off and the piece only measures $9/16$ inch by $3/4$ inch. This specimen was excavated from units 4C-D.

SPECIMEN 18NUR237 measures $13/16$ inch by $11/16$ inch and has a salt-glazed brown interior (Figure 52b). The exterior is unglazed and brownish-gray in color. The paste is also a brownish-gray. The thickness of the piece measures .135 inches at its thickest point. This specimen was recovered near the sternpost on the port side.

Earthenware

SPECIMEN 18NUR212a has been identified as a fragment of creamware, on the basis of the slight yellow tinted glaze that is typical of this type of ware (Figure 53b). It measures $1\frac{1}{4}$ inches by 1 inch with a thickness of .133 inches. This specimen has a

yellow-white glaze that is extremely crazed. The crazing is filled with a dark substance, likely mud. The paste is white and somewhat sticky when moist. This piece was recovered from unit 4C.

SPECIMEN 18NUR281 has a yellowish tint to the glaze, suggesting that it is also creamware (Figure 53g). The piece measures $7/8$ inch by $3/4$ inch, and its greatest thickness is .093 inches. The glaze is slightly crazed on the exterior, while not on the interior. No staining is present in the crazing. The paste is white, porous and slightly sticky when wet. This specimen was excavated from units 4C-D.

SPECIMEN 18NUR150c exhibits a noticeable yellowish tint on the exterior glaze common in creamware (Figure 53f). The interior white glaze does not show this tint. Both the interior and exterior surfaces are moderately crazed, but no staining is present. The piece measures $1 \frac{1}{16}$ inches by $1/2$ inch, with a thickness of .116 inches. This piece was recovered near the keelson in units 2C-D.

SPECIMEN 18NUR19 is the only specimen identified as a fragment of annular pearlware from the ceramic assemblage (Figure 53h). The specimen is a rim that displays a hand painted blue line parallel to and $1/8$ inch from the edge. The exterior and interior glaze is grayish-white with a blue tint typical of pearlware. The specimen measures $13/16$ inch by $5/8$ inch with a .135 inch thickness. The paste is slightly porous and white in color. This piece came from the exterior sternpost trench.

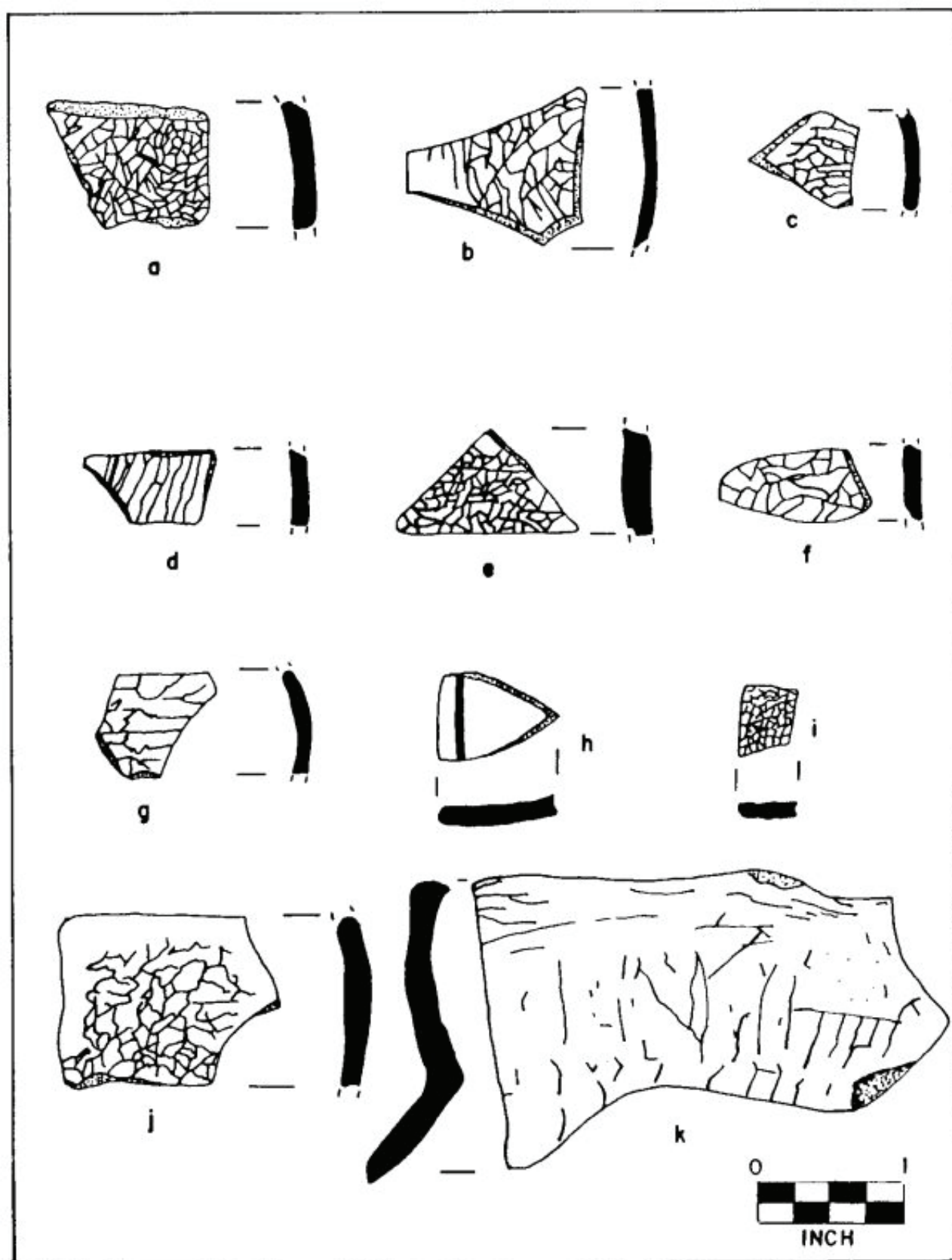


Figure 53. Earthenware ceramic fragments. a)18NUR186
 b)18NUR212a c)18NUR212b d)18NUR284 e)18NUR150d
 f)18NUR150c g)18NUR281 h)18NUR19 i)18NUR282
 j)18NUR150b k)18NUR150a.

SPECIMEN 18NUR150a is one of the largest of the ceramic specimens collected and is a scalloped rim fragment from either a dish or deep plate (Figure 53k). The specimen measures $3 \frac{1}{4}$ inches by $1 \frac{15}{16}$ inches with a thickness of .189 inches. The paste and glaze are white with extensive grey crazing present. This piece, while similar to the crazed creamware pieces, appears to have only a slight yellow tint in the crevice. This specimen was excavated from units 2C-D.

SPECIMEN 18NUR150b measures $1 \frac{9}{16}$ inches by $2 \frac{1}{4}$ inches (Figure 53j). It is made of a porous white paste with a white interior and exterior glaze. The piece is similar to the other creamware sherds but shows no tinting. A moderate amount of grey-filled craze marks are visible. The specimen measures .148 inches thick and was recovered from excavation units 2C-D.

SPECIMEN 18NUR150d is a triangular fragment with dark stained crazing (Figure 53e). A white glaze appears on both the interior and exterior surfaces. The specimen measures $1 \frac{1}{2}$ inches by $\frac{3}{4}$ inch with a thickness of .185 inches. It was recovered from units 2C-D.

SPECIMEN 18NUR186 is another fragment similar in appearance to several of the other creamware specimens (Figure 53a). It has an interior/exterior white glaze that is severely crazed and stained. No tinting is visible on this piece, which measures $1 \frac{1}{4}$ inches by $\frac{7}{8}$ inch. A maximum thickness taken on this slightly

rounded piece measured .139 inches. Excavation on the exterior of the wreck around the sternpost uncovered this specimen.

SPECIMEN 18NUR212b measures $\frac{3}{4}$ inch by $\frac{9}{16}$ inch and exhibits a white glazed interior and exterior surface (Figure 53c). Crazing is present on both faces and is slightly stained gray. This piece has a thickness of .101 inches and was recovered from unit 4C.

SPECIMEN 18NUR284 is a specimen that displays crazing on white glazed surfaces (Figure 53d). An orangish-brown stain in the crazing and on the edges indicates that this piece has been in contact with iron. The specimen is .112 inches thick and measures $\frac{7}{8}$ inch by $\frac{1}{2}$ inch. This piece came from units 4C-D.

SPECIMEN 18NUR282 is the smallest piece of ceramics recovered and is a rim specimen (Figure 53i). It is glazed white on both the interior and exterior surface, and is moderately crazed. The crazing has been stained orangish-brown due to the presence of iron. The rim measures $\frac{1}{2}$ inch by $\frac{3}{8}$ inch with a thickness of .091 inches. This specimen also came from units 4C-D.

Pipe Fragments

Four pipe stems and one bowl fragment were recovered from the Otter Creek wreck (Figure 54). The stem fragments range in length from $\frac{11}{16}$ inch to $1 \frac{1}{4}$ inches. Three of the specimens 18NUR215 (Figure 54e), 18NUR216 (Figure 54a), and 18NUR335 (Figure 54b) are made of grayish-white kaolin clay. The remaining pipestem 18NUR265 (Figure 54d) is brown in color. The pipestems

appear to be fragments of four pipes. The bore diameters of three of these specimens measure $5/64$ inch, and that of pipestem 18NUR215 measures $4/64$ inch. The average diameter of the bore has been shown to decrease over time, thus providing a means of dating stems.¹ According to the accepted date range these measurements place manufacture of three pipestems between 1710 - 1750, and specimen 18NUR215 from 1750 - 1800.²

Two of the pipestems were excavated from units 4C, one pipestem was recovered from unit 2D, and one specimen is unprovenienced. The pipebowl was recovered from units 4C-D.

SPECIMEN 18NUR285 is the only tobacco pipebowl fragment found on the wreck (Figure 54c), and came from units 4C-D. The fragment is $1 \frac{1}{16}$ inches tall with a portion of the rim intact. It is made of fired clay, natural brown in color, and does not display any design or markings. The piece represents approximately forty percent of the entire bowl, which would measure, if complete, one inch in diameter. The bowl interior measures at its greatest preserved width $1/2$ inch, and tapers to $11/32$ inch at both the top and bottom. The bowl interior also shows a parallel band of deep striations made $1/3$ distance below the rim, during manufacture or possibly during cleaning of the bowl.

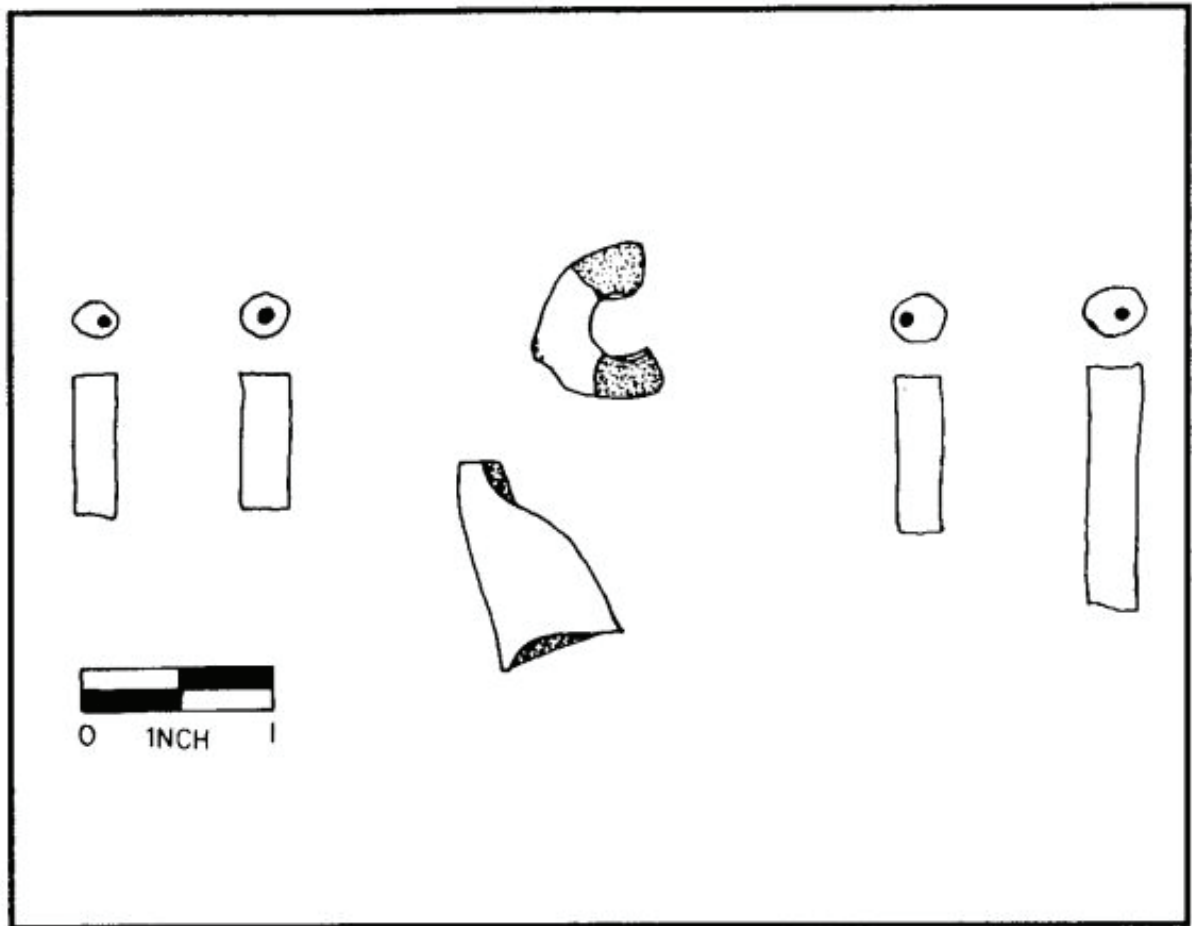


Figure 54. Pipe stem and bowl fragments. a)18NUR216
b)18NUR335 c)18NUR285 d)18NUR265 e)18NUR215.

Ceramic and Pipe Discussion

The entire assemblage of twenty-one pieces of ceramics and five pipe fragments does not provide a data base large enough from which to draw reliable conclusions about the age of this vessel. It does, however, offer supportive evidence when used in conjunction with other dating criteria.

Creamware, pearlware, stoneware and possibly whiteware types are represented. Three of the specimens have been identified as creamware sherds (18NUR150C, 18NUR212A, 18NUR281) with seven others possibly falling into this category (18NUR186, 18NUR284, 18NUR150D, 18NUR212B, 18NUR282, 18NUR150B, and 18NUR150A). Creamware has been documented as being in common use from 1762 to 1820.³

The only specimen of annular pearlware (18NUR19) was recovered from the sternpost trench outside of the extant vessel remains. Undecorated pearlware had a period of use from 1780 to 1830, with annular pearlware in common use from 1790 to 1820.⁴

Some of the small ceramic specimens, similar in appearance to creamware, lack the yellow characteristic tint and may be fragments of whiteware. This type of pottery was first produced around 1820 and has continued in use to present day.⁵

Six of the ten stoneware specimens recovered may represent fragments from a single brown stoneware bottle. American-made brown stoneware bottles for ink, beer, etc. date from 1820 to post

1900, but, imported British brown stoneware bottles and mugs date earlier from 1690 to 1775.⁶ No words can be recognized from the stamped letters on some of the specimens, with the exception of the likely word "MANUFACTURED" partially shown around the base of specimen 18NUR279. Bottle forms were generally made to hold effervescent liquids such as beer and ale of a quart or less in capacity. Cylindrical in shape and without handles, this style of bottle changed little during the nineteenth century. Beer and ale bottles often had the merchants' names impressed upon them.⁷

In addition to stoneware beverage bottles, ink bottles were produced in a range of sizes. Stoneware ink bottles were either short, cone- or cylindrical-shaped that held approximately two to four ounces and generally had small mouth openings. Larger ink bottles range in size up to one quart, with some as large as a gallon.⁸ Other small bottle forms, slightly different than those used as ink containers, were made to hold dyes, shoe blackings, and medicines. These utilitarian stoneware bottles normally had larger mouth openings.⁹

The stoneware neck and handle fragment (Figure 51) recovered from the Otter Creek wreck is likely from a jug, the most common form of stoneware container. Jugs were used for the storage of liquids and had relatively small mouths. Sizes ranged from one to five gallons, with larger sizes being rare. Smaller sizes were often

handleless, while the larger sizes had one or more handles. All true jugs had handles. Jugs above four gallons generally had two handles.¹⁰

Stoneware jugs show gradual changes over time. The early jugs usually had longer necks and more pear shaped forms typical of European styles of the seventeenth and eighteenth centuries. Full bellied or ovoid forms became common during the first half of the nineteenth century. Jug styles began to narrow and form more pronounced shoulders after the mid-nineteenth century.¹¹ Not enough of this jug specimen has been preserved to identify its shape and chronological relationship.

In addition to the jug fragment, and the specimens from the bottle, at least two additional stoneware containers are represented. Specimen 18NUR320 is a handle that has been horizontally attached. Jugs usually had the handles attached vertically. Specimen 18NUR161 exhibits characteristics that could be associated with burning, or underglazing, since both produce a wrinkled appearance.¹²

The four pipestems and one pipebowl fragment recovered from the Otter Creek wreck permit only a limited assessment of the vessel's age based upon the datable characteristics of pipestems. From the established chronology determined from the diameter of the pipestem bore, a span of ninety years exists. Three of the pipestems have a bore diameter of 5/64 inch that places them in the

period of manufacture from 1710 to 1750. A single pipestem bore measures 4/64 inch and has a use range dating from 1750 to 1800.

The fragile nature of pipestems made from clay dictated that they were not likely to remain in circulation long. As a result a large quantity was needed to meet demands, and fragments are commonly found in the archaeological record.

Glass

Bottle Glass

Seventy-six fragments of bottle glass were recovered from the Otter Creek wreck. Among these specimens only one, 18NUR181 (Figure 55) has been illustrated. All but six of the specimens are dark green, with most exhibiting some iridescent patina. Morphological fragments are mostly body sherds with six shoulder, two neck, and one base sherd in addition to the illustrated specimen. The thickness of all bottle glass fragments ranges from .032 to .182 inches. The identifiable base fragment is the corner section of a square bottle. Bottle glass was mostly concentrated in units 2C-D and in the sternpost trench in units OC-D.

The six remaining bottle fragments are clear, or show a slight orangish-brown patina. Two rims are present among this group. One of the rims is straight sided, while the other has a flat and outward flared lip. No inscribed marks or embossing are present on any of the glass specimens.

The illustrated specimen (Figure 55) is a complete lip, neck and shoulder section of a fragment measuring 4 1/8 inches tall. The specimen is dark green in color with only a slight iridescent patina. Twist marks are visible and air bubbles occur within the glass. The neck is approximately 2 1/4 inches tall and has a 5/8-inch applied rim. The rim measures 1 3/8 inches outer diameter with a 3/4-inch opening. A cork stopper was still in place when the bottle fragment was recovered from the sternpost trench in unit 0C. Its appearance is similar to the 1788 or 1800 style illustrated by Hume.¹³

Pane Glass

Fifty-four fragments of flat, light green pane glass have been recovered. The largest piece measures 2 7/8 inches at its greatest width. Thickness for the specimens range from .050 to .072 inches. A few of the glass pieces exhibit a brown staining, likely from their contact with iron specimens. Pane glass was mostly concentrated in units 2C-D and in the sternpost trench in units OC-D.

Pane glass manufacture varied with its intended use, with off-hand crown and cylinder processes being the most common forms.¹⁴ Crown glass was initiated by using a blowtube to expand a heated mass of glass. The glass was then attached to a pontil and spun in a furnace, where heat and the centrifugal force flattened the glass into a disc shape. Crown glass, because it had been repeatedly fired, exhibited an extremely brilliant surface, but also varied in thickness from the center to the edge for the same reason.¹⁵ This method

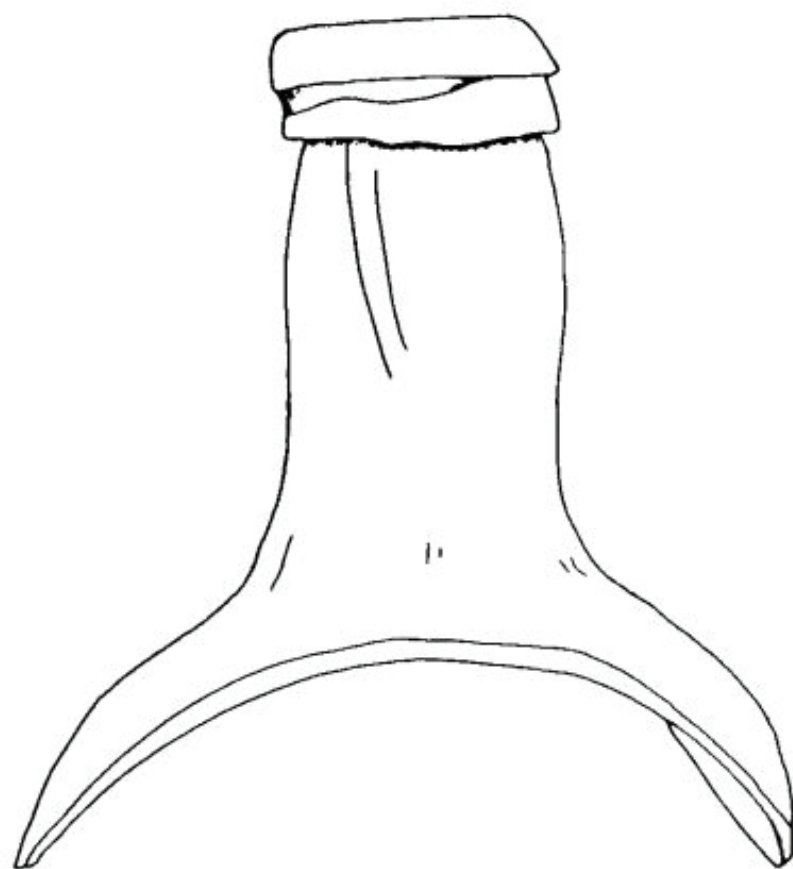


Figure 55. Bottle fragment. 18NUR181

limited the size of the panes that could be produced; they were generally smaller than those produced by the cylinder process. Sheet glass produced by the crown process was highly reflective, and thus had a less transparent quality. It was often imported from Britain for ornamental use, mainly in casement, coach, and carriage windows.¹⁶ American-made glass produced by the crown process was limited and was relatively insignificant before the 1820s.¹⁷

The cylinder process was considered more efficient, and could produce larger panes of glass.¹⁸ As its name implies, the glass sheets were formed by blowing a long hollow cylinder. When cooled the ends of the cylinder were cut off and the cylinder then split. After annealing, the glass could be cut into panes of various sizes with little waste. Because the cylinder glass was not exposed to repeated firings and exposure to high heat, it did not obtain a fire-polished, reflective appearance. This process produced a pane of higher transparency, but due to the annealing process and splitting from the cylinder, imperfections resulted in the glass. This inferiority of the glass was often offset by the availability of larger panes and reduced cost. Cylinder glass dominated American plate glass manufacturing during the eighteenth and nineteenth centuries.¹⁹

The production of sheet glass for use on board ships would also likely have been by the cylinder process, as the following reference by Dodds and Moore indicates:

A slightly unusual item of ship's stores was glass, used for lanterns and for the windows in the after cabins. At this time sheet glass was made by the laborious and highly skilled method of blowing long 'bottles'

which were then laid on a cast-iron slab and cut so they could be flattened. The size of the sheets, therefore, was limited by the size of cylinder a glass blower could blow.²⁰

One source states that a captain's cabin located on deck near the stern would use 3/8 inch plate clear glass, protected by removable wooden shutters or a grid of brass rods as windows.²¹ The small size of the fragments of pane glass from the Otter Creek wreck makes it almost impossible to identify which of the processes may have been used. Imperfections do occur in the fragments, suggesting that they were produced by the cylinder process of manufacture, but not solely limited to it either.

Metal

Two non-structural metal artifacts were recovered from the wreck. Both have been identified as buttons.

SPECIMEN 18NUR217 is a thin plain brass button with a single arch attachment (Figure 56). The button measures 3/4 inch in diameter and .018 inches thick. The face of the button is plain and dimpled. Its thinness suggests that it is only the backing from a complete button. A small section of the edge has been nicked. The arch-shaped attachment on the back measures 1/4 inch in width and has a height of 3/16 inch. The attachment has been drilled through from both sides. The button was recovered from the dredge box during dredging in unit 4C.

SPECIMEN 18NUR218 represents the most unusual of the artifacts recovered, and the only item with a date (Figure 57). This specimen has tentatively been identified as a button impressed from a coin. The item was recovered in the dredge box during excavation of unit 4C. The button is made of either lead or pewter and measures $13/16$ inch in diameter with a thickness of .038 inches. Two slight nicks occur along the edge. Two holes have been drilled through the center, $5/32$ inch apart, one from each side, indicating its likely attachment as a button. The coin-like object is not completely flat, but rather has the appearance of hammered metal with an uneven pitted surface. On the obverse side of the button the reverse impression of a coin bearing the marking CAAROLUS·III or IIII is present. Across from the name appear the possible letters GRA. The faint date of 17__ or 177_ is present directly before the name. None of the bust is preserved, although the ends of hair ribbons are barely visible. Partial cording is also shown along the edge. No markings are visible on the reverse. Any marking, if even present, have been removed from the reverse side by use.

Carolus, the Latin spelling for Charles, appeared on Spanish coins minted during the reigns of Charles III (1759-1788) and Charles IV (1788-1808). Coins, however, were only minted under Charles III from 1760 until 1788, and under Charles IV from 1789 till 1808.²² During the reign of Charles III two types of coins called silver reales were minted: the "Pillar", "Columnar" or "Two World" variety coined until April of 1772, and the "Bust" type, minting of

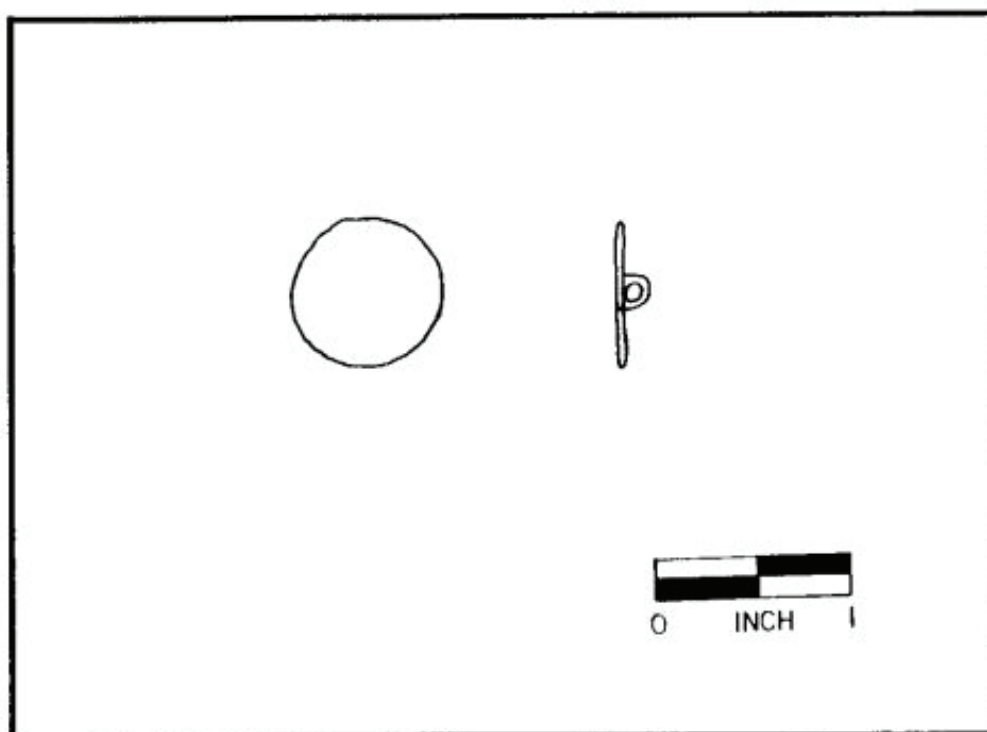


Figure 56. Button. 18NUR217

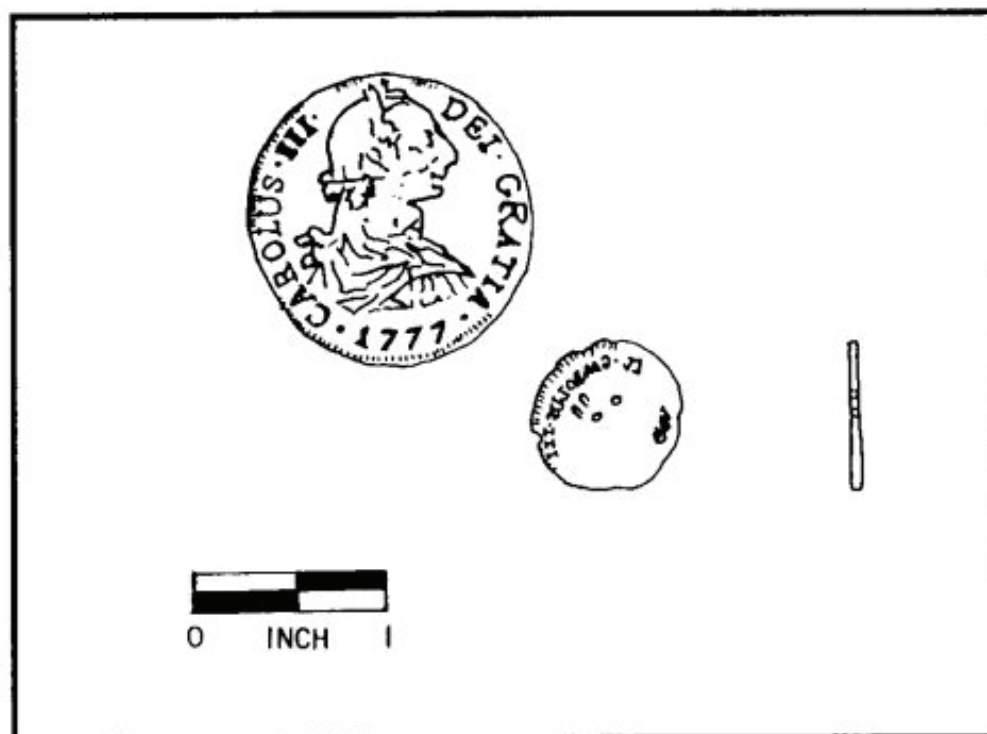


Figure 57. Coin impressed button. 18NUR218

which began on April 8, 1772. The "Bust" type spelled out GRATIA and the pillar type did not. Gold escudo pieces only had the abbreviation DG, not DEI GRATIA. Therefore, the coin impression on the button showing the first three letters of GRATIA would have been made from a "Bust" type silver coin minted after 1772. Additionally, coinage in Spain did not spell out the word GRATIA, so it is likely that the coin used for the impression was made in one of the Spanish colonies. Of these mints Potosi was the best known, but it is also possible that the coin was minted in one of the other major mints in the Americas, such as Lima or Mexico City, or at a minor mint such as Guatemala or Santiago.²³

Silver coinage of Charles IV was first minted in 1789. Upon the death of Charles III, Spain, aware that there would be difficulties in cutting a new coin die bearing the likeness of Charles IV and considerable delay in getting it to the American colonies, issued a royal order on December 24, 1788 empowering the mint officials of New Spain to continue using the dies bearing the bust of Charles III. They were instructed at the same time to add a digit to the Roman numeral on the old dies, thus having the new coins read CAROLUS IIII. Coins of this type were only struck in Mexico during 1789 and 1790 before new dies were cast to replace them.²⁴

A photograph of the specimen was sent to the American Numismatic Society for identification. Based upon the sparse markings and the size of the specimen the American Numismatic Society believe the coin used in the impression of the button to be a

silver one reale piece minted either during the reign of Charles III or early in the reign of Charles IV, and minted in either Mexico City, Potosi, or Lima.²⁵

The most unusual characteristic of the impression is the double "A" in the name CAAROLUS. No reference to this being produced intentionally could be found, and the American Numismatic Society felt the misspelling to be of little consequence. The Society states that "quite possibly the coin shifted when it was impressing the button."²⁶ This explanation, however, is hard to accept since only a single letter of the name has been doubled, and not any of the other letters! The sharp impression of the double "A" within the name leads one to suspect that the die was intentionally struck this way, perhaps as a counterfeit.

Wood

All of the wooden artifacts that are not associated with the ship structure are included in this category. This assemblage includes cask staves, head pieces, hoops, plugs, bungs, a shingle, and a mallet.

Mallet

SPECIMENS 18NUR74 and 18NUR75 have been identified as a mallet head and handle fragment respectively (Figure 58). The two pieces came from unit 6C. The rectangular wooden mallet head measures 7 inches by 3 inches by 3 inches. Wear from use shows on

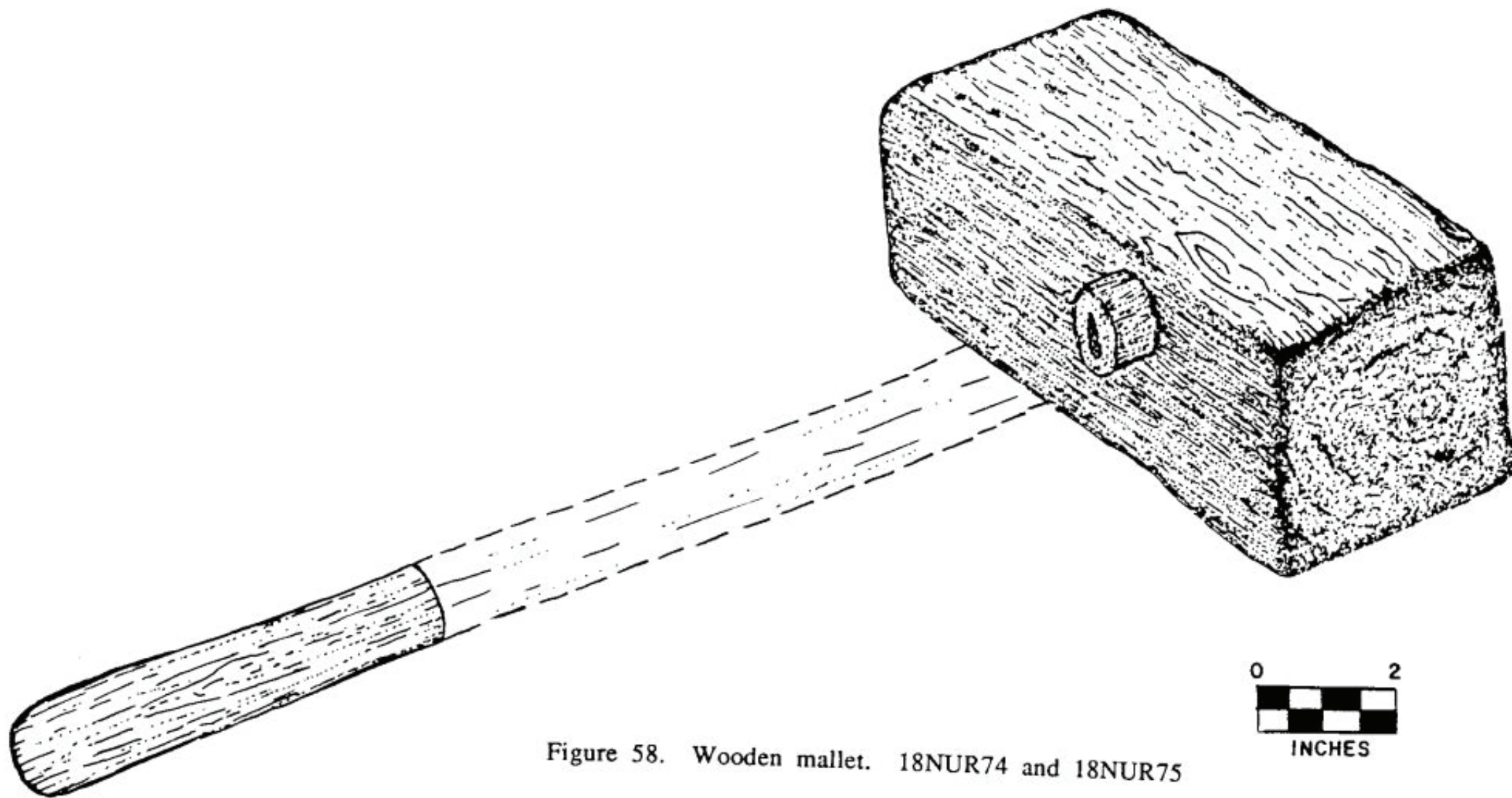


Figure 58. Wooden mallet. 18NUR74 and 18NUR75

both ends. Only the end section of the handle was recovered, so the length of the complete handle could not be determined. The end section of the handle measures 6 1/4 inches in length with a diameter of 1 inch. A wood species analysis was not made for this specimen.

Shingle

SPECIMEN 18NUR116 is likely a section of shingle (Figure 59). It measures 6 5/8 inches in length by 6 1/4 inches wide, by 5/8 inch thick at the butt end. One corner of the shingle has been notched and adze marks occur randomly over both surfaces. It appears to have been shaped from soft pine. Recovery of the specimen came from unit 4D.

The abundance of forests within North Carolina amply supplied the timber for the production of shingles. Shingles were a commonly exported commodity. For the period from October 1, 1763 to October 1, 1764, 222,150 shingles were exported from Port Beaufort.²⁷ A Wilmington boat for sale in April, 1797, sixty-five feet long on the keel, (slightly larger than the Otter Creek wreck), was said to be capable of carrying 100,000 shingles.²⁸ Shingles were selling that same month for between \$1.00 and \$1.25 per thousand.²⁹

Heart cypress and yellow pine were most often used in the production of shingles in coastal North Carolina, but juniper and cedar were occasional sources. Advertised in a 1766 Wilmington newspaper were white cedar shingles for sale. They were stated to

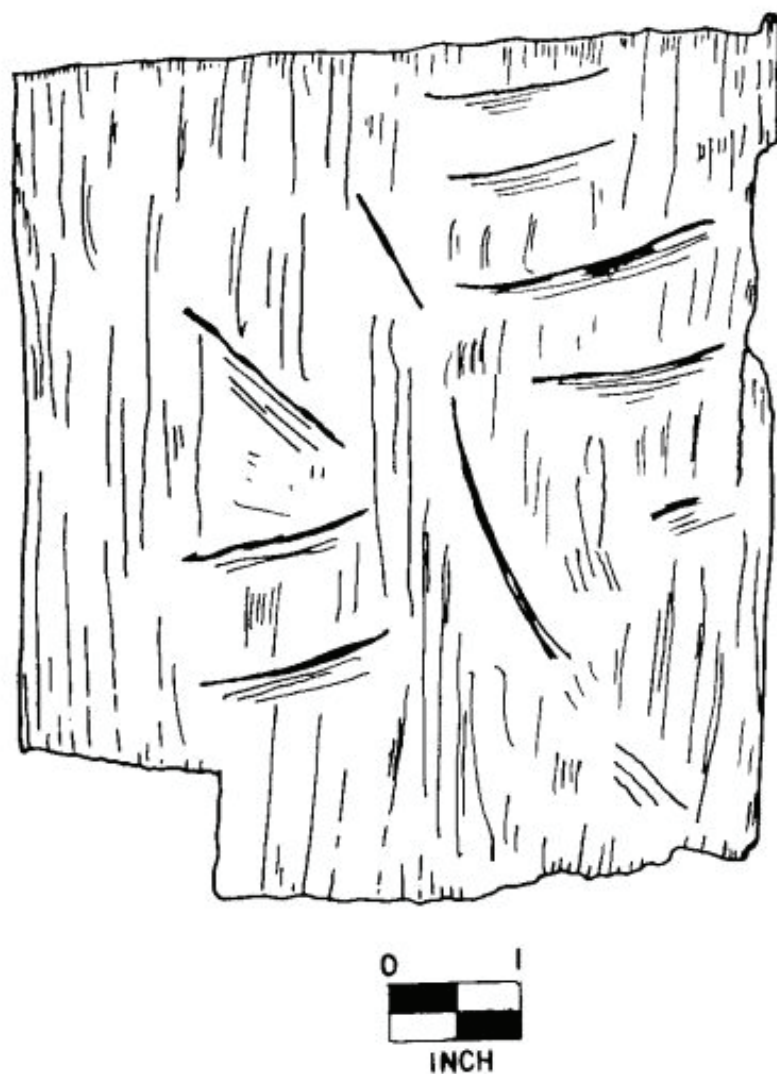


Figure 59. Shingle.

be the "most lasting and durable" kind.³⁰ Shingle sizes measured 18 to 24 inches long and from 3 1/2 to 6 inches wide.³¹ Early shingles tapered, measuring from 3/8 to 7/8 inch thick at the butt end, and from 1/8 to 1/4 inch thick along the thin edge.³² Paint or tar was often applied as a weather-proofing method.³³

An act to prevent the exportation of unmerchantable commodities was first passed by North Carolina legislation in 1758, and continued in 1764, 1770, and 1784, stated that shingles, in order to pass the required inspection, "shall be Eighteen Inches and an half Inche long, Five Inches Broad, and Five Eights of an Inch thick" and made from "good, sound, Merchantable Timber."³⁴

Plugs

SPECIMENS 18NUR8, 18NUR29, 18NUR301 and 18NUR59 have tentatively been identified as wooden plugs (Figure 60). Their length and diameter distinguish them from shorter bungs associated with casks. Specimen 18NUR8 is similar in appearance to a rounded trunnel, but has a four-sided tapered end (Figure 60a). It measures 3 1/2 inches in length and 1 1/4 inches in diameter. The taper measures 7/8 inch. Made from a soft wood, probably pine, its function is unknown.

SPECIMEN 18NUR29 has been faceted on six sides and tapers to a blunt square end (Figure 60b). It has been shaped from hard wood, likely oak, and measures 2 3/8 inches in length, with a

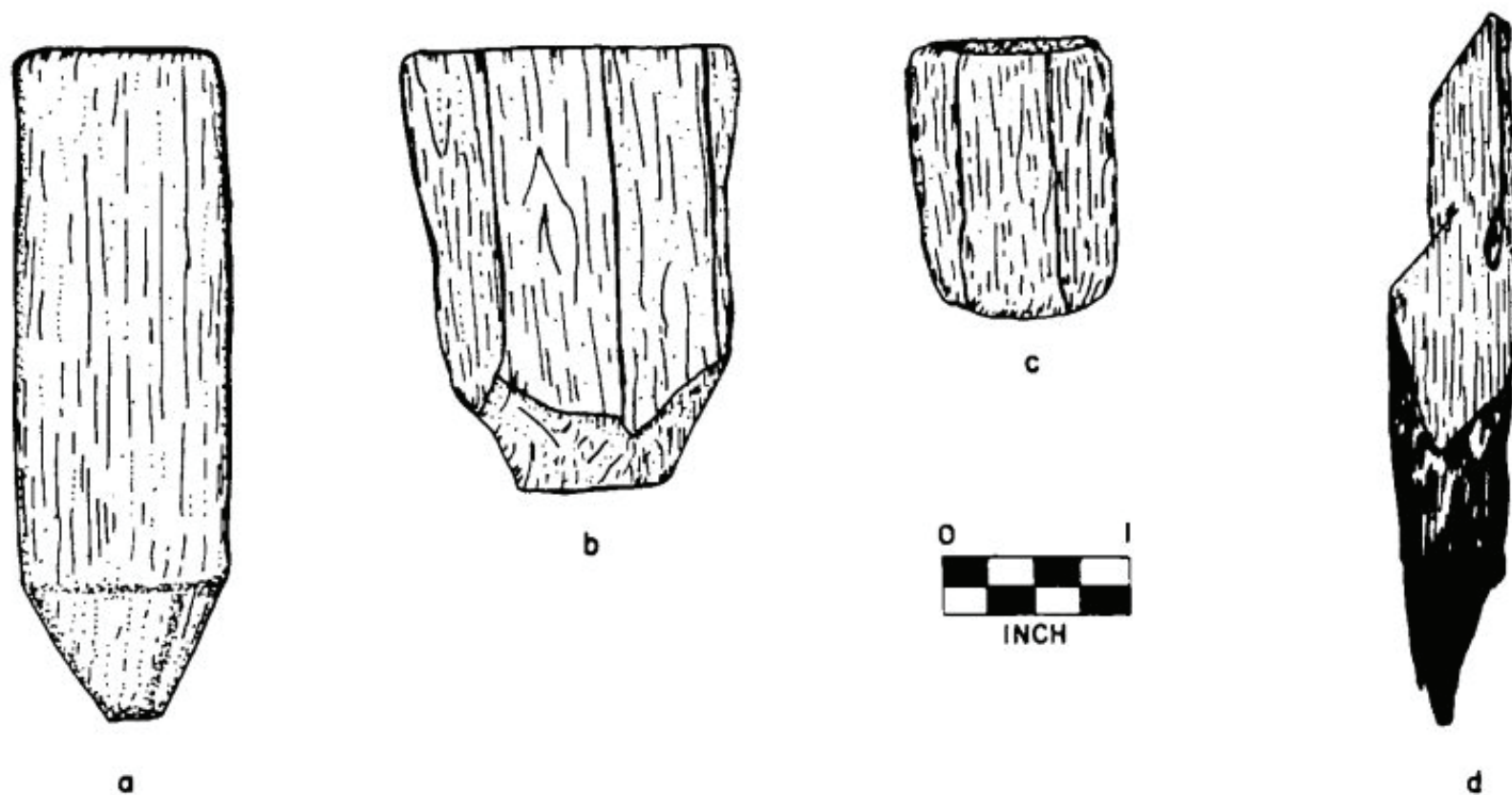


Figure 60. Plugs. a)18NUR8 b)18NUR29 c)18NUR301 d)18NUR59

maximum diameter of 1 1/2 inches across the top and 7/8 inch on the squared end. The specific use of this item is unknown.

The smallest of the three plugs, specimen 18NUR301, measures 1 5/8 inches in length (Figure 60c). It has been crudely faceted on seven sides with a maximum diameter of 1 1/8 inches. The wood species can not be identified. The end has not been tapered and may be rounded or slightly deteriorated.

SPECIMEN 18NUR59 appears to be a charred plug (Figure 60d). The piece tapers along its four inches of length and has parallel cuts in one end giving it a stepped appearance. The longer side of this specimen retains in a rough bark-like appearance, and charring occurs only from the lower cut to the tapered end. The notch does not show any charring, indicating that the piece was cut after it had been burnt. This specimen was recovered from unit 6D.

Bungs

SPECIMENS 18NUR30 and 18NUR185 have been identified as cask bungs (Figure 61c,d). Specimen 18NUR30 measures 3/4 inch in length with a diameter of 1 3/8 inches. It has been faceted on several sides with the base cut parallel to the top. Specimen 18NUR185 measures 3/4 inch in length with a diameter of 1 inch. The piece has been faceted on several sides and the end has either been slightly rounded or has deteriorated.

Bungs are used as stoppers or corks on some wet casks. Their length would only need to be slightly greater than the thickness of

the stave. The bung hole generally is located on the bulge of the cask on the bung-stave. In addition to having the bung hole, a bung stave can generally be identified from the rivets or attachment of the hoops occurring on this stave of the cask.³⁵ These specimens were excavated from units 0C and 8C and as shown in relationship to other cask components in Figure 66.

Cask heads

SPECIMENS 18NUR58, 18NUR67, 18NUR108, 18NUR119, 18NUR110 and 18NUR137 have been identified as cask heads (Figures 61a,b, 62, 63). Their distribution and association to other cask components are shown in Figure 66. Six different casks are represented by these specimens.

SPECIMEN 18NUR58 was excavated from unit 6D and measures 5 3/8 inch by 1 5/8 inch by 5/16 inch (Figure 61a). It is a cant head piece with a charred interior. One face of the curved edge has been tapered to fit a croze. No markings or brands were noted.

SPECIMEN 18NUR67 is a cant head piece that measures 13 inches by 2 inches by 3/4 inch and was recovered from unit 6C (Figure 62b). One end has broken off but been included in the overall length measurement. The curved edge has been tapered to fit into a croze and no dowel holes are present. No marking were visible on this piece.

SPECIMEN 18NUR108 was excavated from units 4C-D. It is a cant head piece that measures 12 inches by 1 7/8 inches by 1 inch

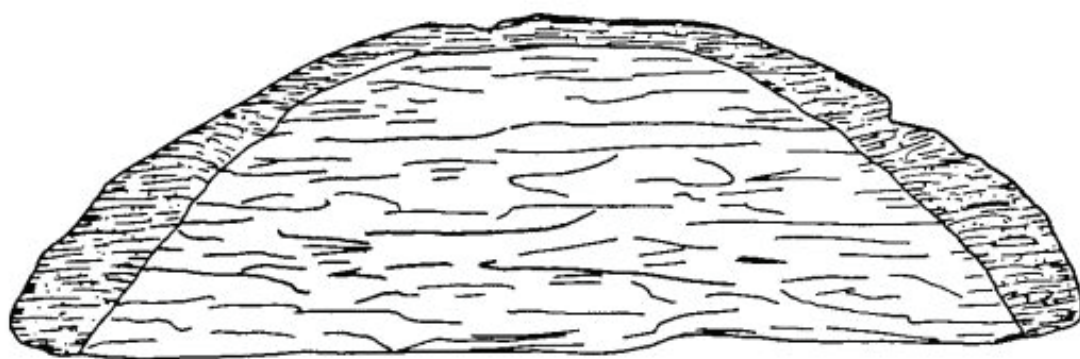
(Figure 62a). The head piece is roughly shaped and does not display any markings or dowel holes. The curved surface is flat and does not taper to fit into a croze. It was likely held in place by nails or interior liner hoops.

SPECIMEN 18NUR110 is a broken cant head piece with an extant length of 10 1/2 inches by 3 3/4 inches by 1/2 inch (Figure 63b). It is crudely made and was recovered from unit 4D. One face along the curved edge has been tapered to fit a croze. No markings are present.

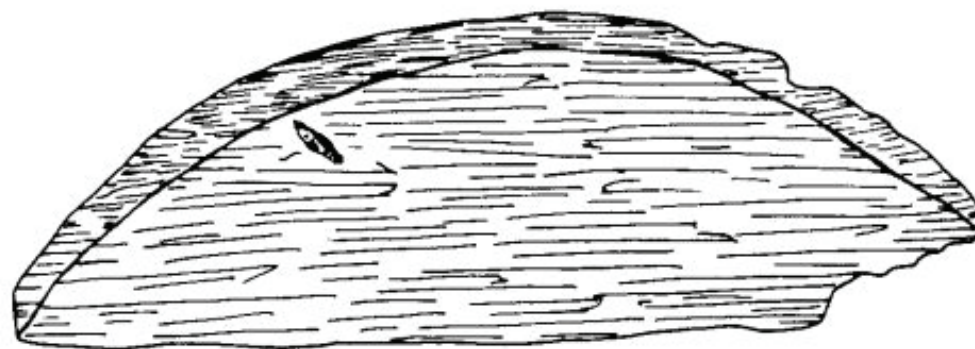
SPECIMEN 18NUR119 is a complete quarter head piece that measures 28 inches by 5 5/8 inches by 3/4 inch (Figure 63a). The specimen shows dowel holes for attachment on both straight edges. This specimen was excavated in unit 4D.

SPECIMEN 18NUR137 is a broken cant head piece that measures 5 inches in length by 1 3/4 inches wide and 5/16 inch in thickness (Figure 61b). It was recovered from unit 3D. One edge has been tapered along the curved edge to fit a croze. No markings were observed.

Cask heads are composed of middle, cant, and quarter pieces, or on some casks just the middle piece and cants.³⁶ Two or more sections of cask head pieces are usually pegged together. During construction the pegs, or dowels, allow the head pieces to be cut circular as a unit. Wood flagging is sometimes used between head pieces.³⁷ On smaller casks, when the head pieces are too thin to allow for the use of dowels, the tightness of the fit into the croze and



a



b



c



d



Figure 61. Cask heads and bungs. a)18NUR58 b)18NUR137
c)18NUR30 d) 18NUR185

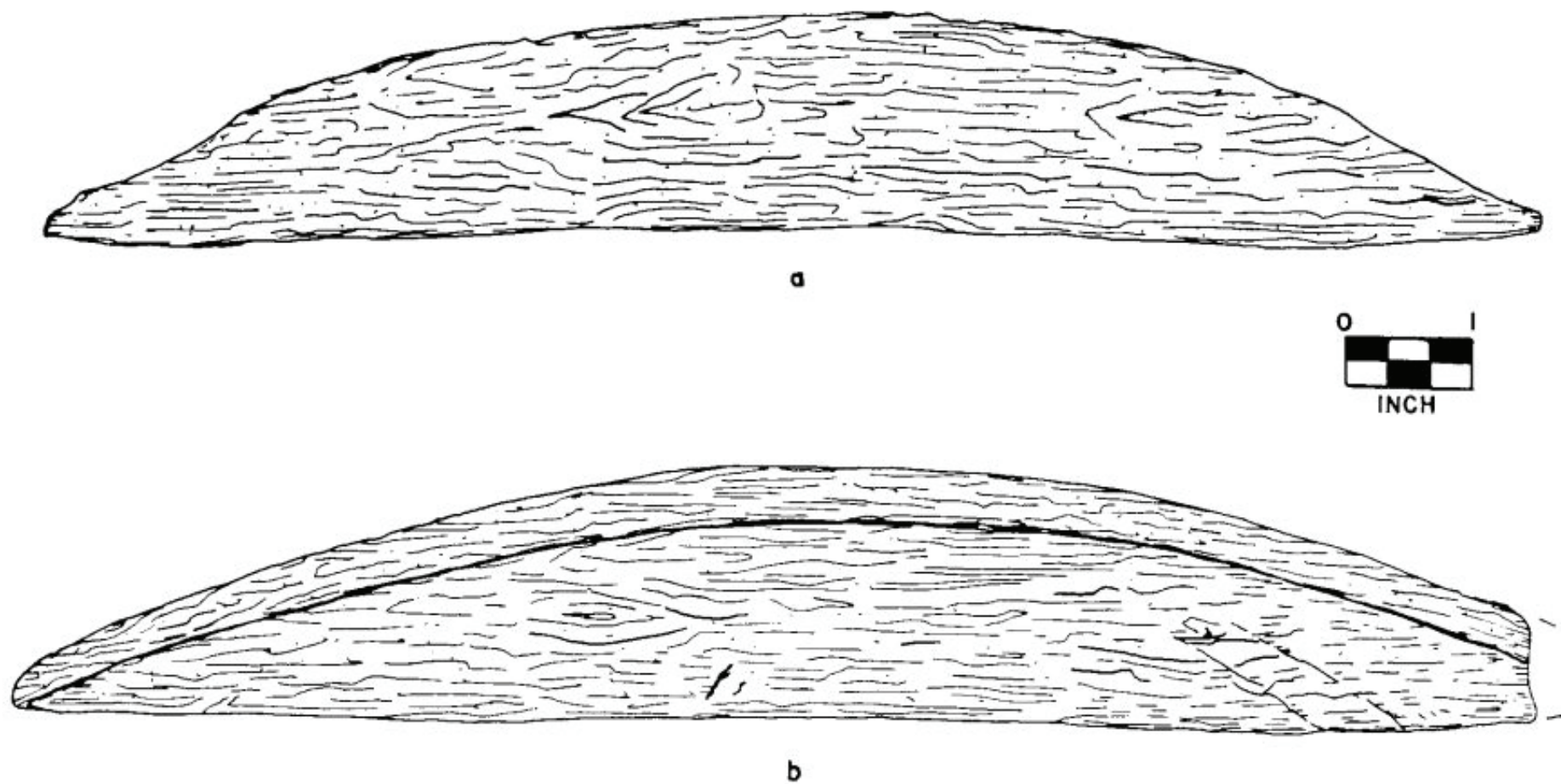
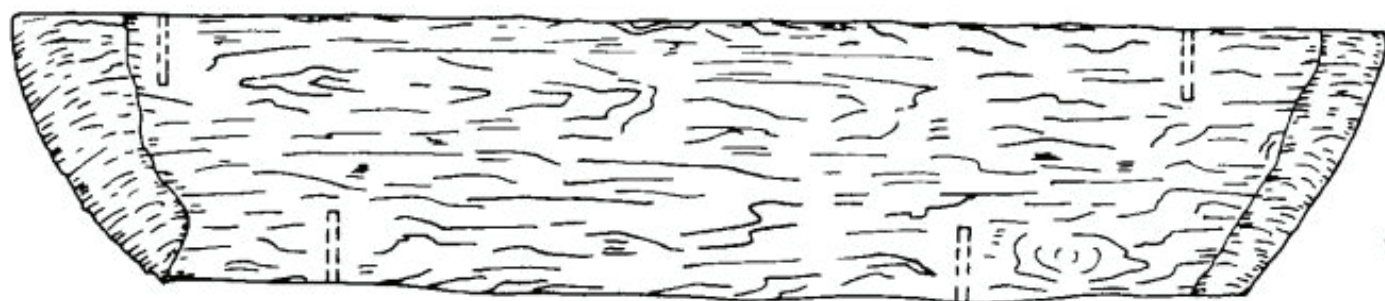
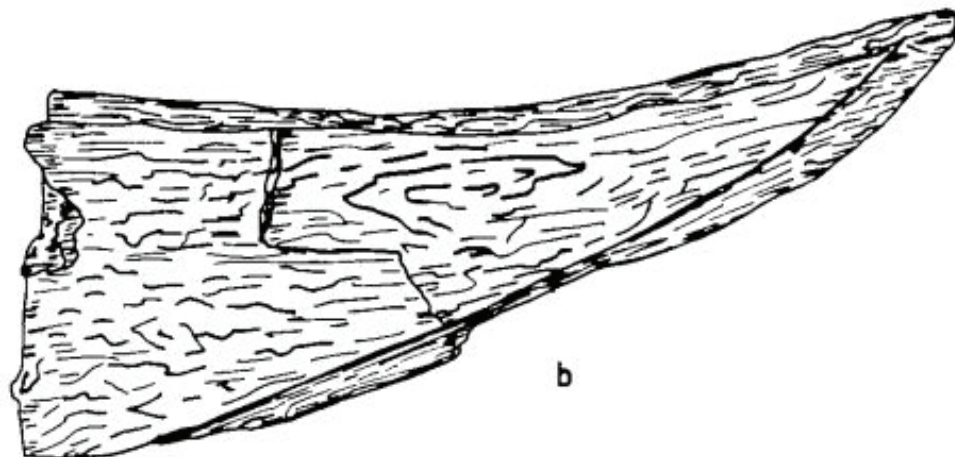


Figure 62. Cask heads. a)18NUR108 b)18NUR67



a



b



Figure 63. Cask heads. a)18NUR119 b)18NUR110

to each other generally surfices to hold them in place. A tongue and groove method may also be used.

Head pieces are held into place in the staves by a cut croze. Heads could also be held in place by nails and interior liner hoops.³⁸ Crozes will be further discussed in the construction section under staves.

The first legislation to require the marking or branding of casks, generally found on head pieces, was passed in 1715 when "An Act for Ascertaining the Gauge of Barrels & to prevent Fraudes in pork, beefe, Pitch & Tar" was enacted by the Proprietors of the Province of Carolina.³⁹ Barrel capacity was established at "Thirty One Gallons & a halfe," and barrels were made from timber seasoned at least six months. Staves were to be "not less than Half an inch thick when wrought" and heading was to be "not less than 3/4 of an Inch thick & well Dowelled." "Twelve, good substantial Hoops" were to be used on each cask.⁴⁰ Any cooper found guilty of selling a cask not meeting these prescribed dimensions would forfeit six shillings & eight pence for each offence. For failing to brand a cask or barrel, the fine was twenty shillings.⁴¹ The act was confirmed in 1749, 1758, 1764, 1770, and amended in 1784.⁴²

Cask hoops

SPECIMENS 18NUR104 and 18NUR105 have tentatively been identified as cask hoops, or "withy" (Figure 64). Specimen 18NUR104 (Figure 64a), the longer of the two, measures three feet in length and

one inch in thickness. Specimen 18NUR105, (Figure 64b) measures 17 inches in length with a one inch thickness. Both of these pieces are split from rough cut poles and have been planed or hewn. No bark remains. The barrel hoops were excavated in unit 6C and their association to other cask components is shown in Figure 66. A wood species analysis was not conducted on these specimens, although hickory is the likely type.

Wooden cask hoops were used extensively prior to iron hoops. Their documentation is scarce, with most information being recorded about staves and heading pieces, but a late nineteenth-century source describes how withy were produced from hoop-poles.

Hoop-poles are a staple crop in some districts, where the land is rough and where white oak and hickory thrives. There are many acres...in the East, that might profitably be planted with these trees, if for no other object than hoop-poles. Sandy ridges and stony bluffs might be made to produce a crop of poles every four or five years, or indeed every year, by selecting each time those of proper size, and furnish shelter at the same time. When they are ready to be cut, which is when they are from 8 feet high and 1 1/2 inches thick up to 14 or 16 feet high and 3 to 4 inches thick; they are simply cut off with a slanting blow of an axe or brush-hook about 6 inches from the ground.... When cut at this height, the stumps will sprout again and produce another crop. The winter is the season for cutting. The shorter poles will make firkin-hoops, and the bound with a small withe or the slender top of a pole. Sometimes these poles are shipped to market in this condition, when they are worth from 50 to 75 cents a hundred for the smaller ones, up to \$3 a hundred for the largest. More frequently the poles are made into hoops upon the ground, and not only a great amount of waste is removed, but a more valuable article produced. The hoops are split carefully, commencing at the butts.... The split larger ones will serve for hoops to barrels and hogsheads. The poles are trimmed of the branches and tied up in bunches of 100 each, or of 25 or 50 each of the larger ones. A box...is used in binding the bundles for sale. They are then worth much more than in the unfinished state. There is a regular demand for hoops at all the seaports, for shipment to foreign countries. Every vessel, which brings a cargo of sugar from Cuba or Brazil, takes out on her return a quantity of hoops, together with staves and heading, of which to make sugar hogsheads. Hickory and white oak make the

best hoop-poles, and it is not probable that one who should plant a few acres of rough land with these, would lose his labor, even should he produce nothing but hoops, for this product has the merit of becoming salable earlier than almost any other planted tree crop.⁴³

During the eighteenth century two types of wooden hoops were used in the construction of casks: an overlap notched hoop, and hoops fastened at the ends by a lashed split reed. Specimen 18NUR146 illustrated in Figure 65 may be an example of an overlapping lashed-type hoop. The notched example appears to be the less used of the two methods during the eighteenth century⁴⁴. Of the willow and chestnut hoops recovered from the Yorktown wreck scuttled in 1781, however, this was the type found most often. The majority of the hoops were wooden on the Yorktown wreck, although at least two cask assemblies were found to be bound with iron hoops.⁴⁵ Wooden hoops found on the Yorktown wreck also present the first evidence of nailed hoops, with one cask assembly having 51 nails along the top. Flagging, battens, and hoop liners were also documented on this wreck.⁴⁶

Cask hoops have also been documented on other excavated eighteenth-century vessels. Withy, a barrel stave, and a 5-cm carved barrel bung were recovered from the Terence Bay wreck, a mid-eighteenth-century fishing schooner sunk near Halifax, Nova Scotia.⁴⁷ Barrels measuring less than 25 inches in length were found to be bound with locking notch withy on board the *Defence*, a Revolutionary War privateer scuttled in 1779 in the Penobscot River, Maine. Their contents likely were vinegar or gun powder.⁴⁸ Barrel

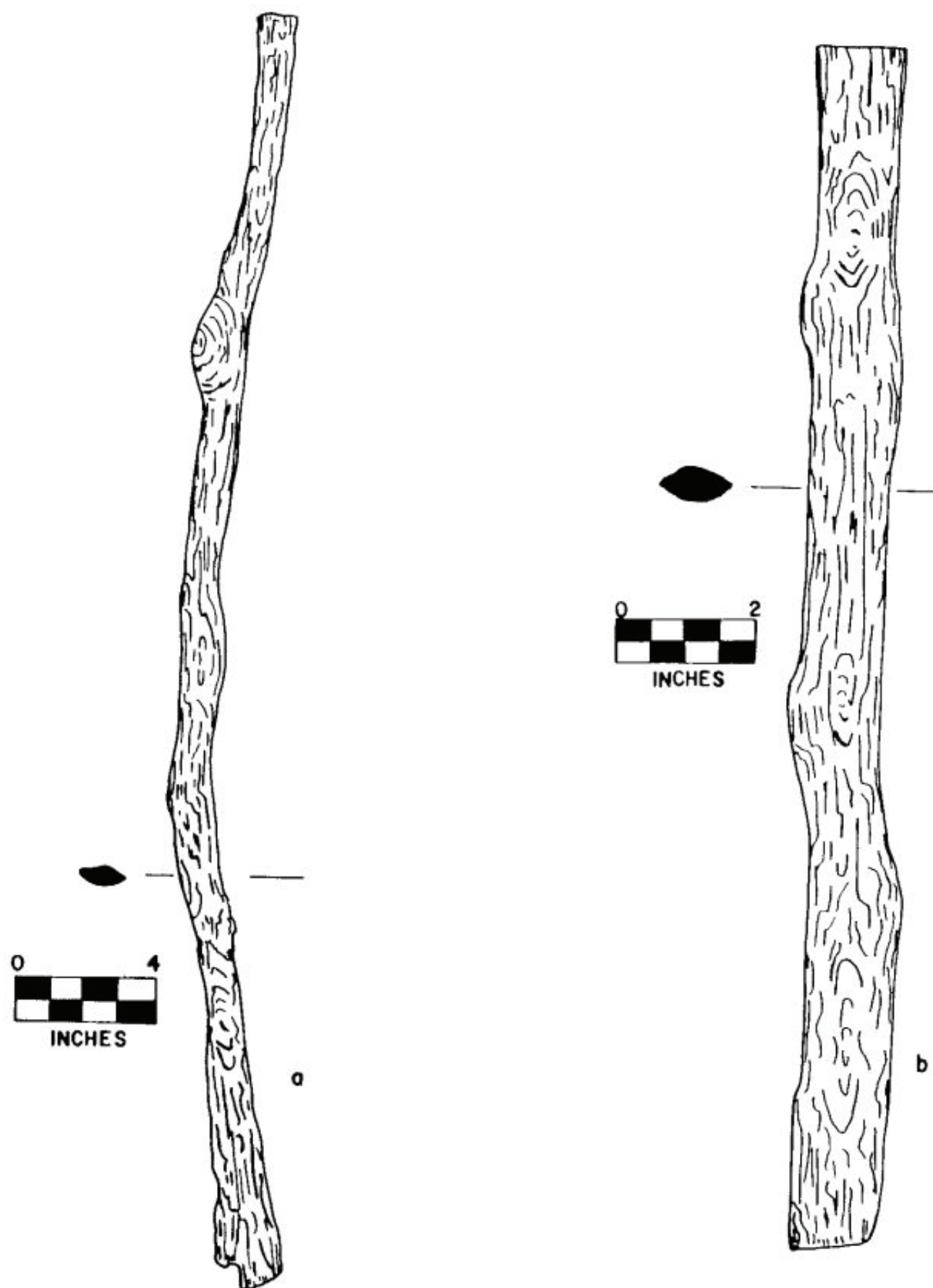


Figure 64. Cask hoops. a) 18NUR104 b) 18NUR105



Figure 65. Possible overlapping lashed hoop end. 18NUR146

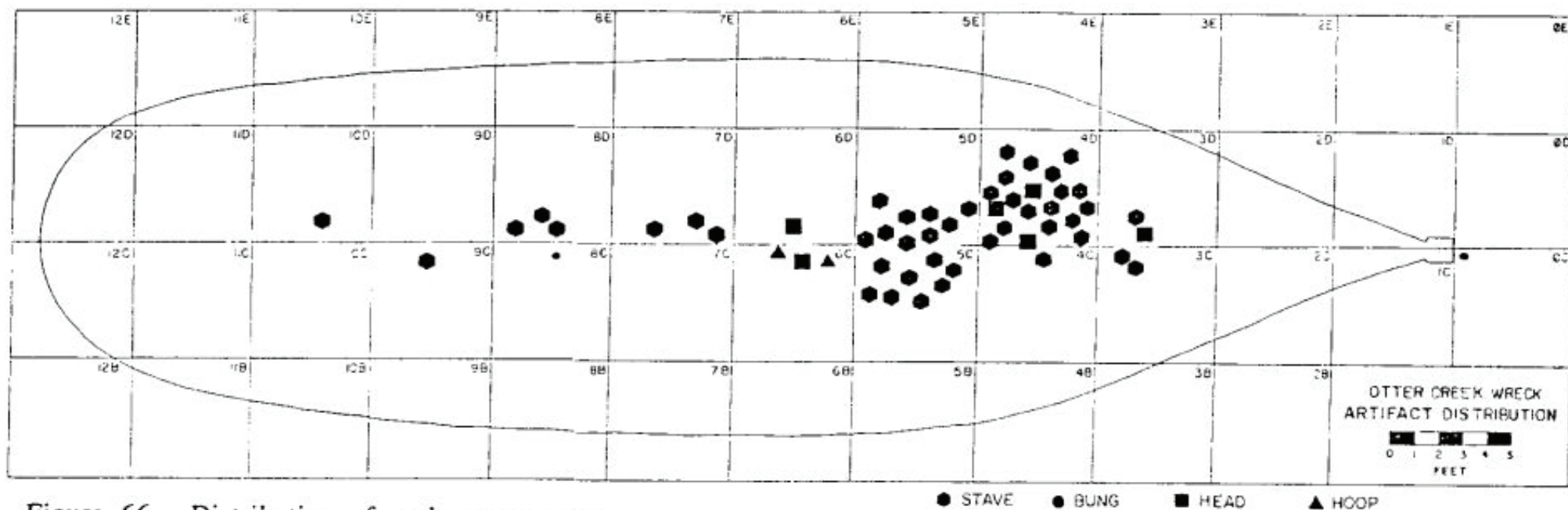


Figure 66. Distribution of cask components.

staves, end pieces, bungs, withy and remnants of iron hoops have also been documented on the *Charon*, a British fifth rate sunk in the York River, Virginia, in 1781.⁴⁹

The use of strong hoops played a critical role in the transporting of tobacco in large casks by rolling them. In this method hogshead casks were laid on their side and stiff poles were attached to either end. A draft animal was then harnessed to the poles and the cask rolled along the ground behind the animal. One source describing this method refers to the use of numerous hickory hoops to support the cask. "The hogsheads, which are designed to be rolled in common hoops, are made closer in the joints than if they were intended for the waggon; and are plentifully hooped with strong hickory hoops (which is the toughest kind of wood) with the bark upon them, which remains for some distance a protection against the stones."⁵⁰

In legislation passed in 1715, barrels were required to have "Twelve good, substantial Hoops on each Cask...."⁵¹ This act was confirmed in 1749, and amended in 1758, 1764, 1770 and 1784.⁵² To prevent barrels of tar from bursting open they were similarly required to be bound with at least twelve hoops, but those of less size were to have no more than one third part of the staves left bare.⁵³

Cask staves

Cask staves made up a significant part of the artifact inventory. Forty staves or stave fragments were recovered from the Otter Creek wreck (Table 3). Their provenience of recovery are listed in Appendix E, and a distribution map (Figure 66) shows their relationship to other cask components recovered from the wreck.

"Cask" is a general term referring to the assortment of wooden container sizes. The importance of casks during this period is commonly compared to today's use of the cardboard box. Both served a vital role in the distribution of commodities. Staves comprise the majority of the components used in the construction of a cask.

Cask construction has changed little over the centuries, and thus casks are extremely hard to date by their components (Figure 67). Casks, when preserved and able to be documented from datable assemblages such as shipwrecks, provide important evidence into the manufacture, use and development of cooperage.

Wooden casks can be of two kinds: slack casks used for dry goods, and tight cask for liquids. Slack casks are usually made of pine, but can be constructed from other softwoods. Tight casks, requiring careful construction and placement of the staves, are generally made from high-grade woods, usually white oak, or sometimes red oak, gum, ash, or Douglas fir.⁵⁴ Casks excavated on the Yorktown wreck, scuttled in 1781, were found to be constructed from a variety of wood types, including white oak, red oak, yellow

Table 3. Stave Measurements* (N=40).

Permanent number	Length	Width	Thickness	Distance of Cruzes from ends		Cruze widths		Cruze depths	
18Nur45	(37 4/16)	2 12/16	9/16	-	-	-	-	3/16	3/16
18Nur46	41	3 8/16	12/16	2	1 12/16	3/16	3/16	2/16	1/16
18Nur47	(38 14/16)	2 10/16	10/16	1 12/16	-	3/16	-	2/16	2/16
18Nur48	41 7/16	3	10/16	2 1/16	1 10/16	2/16	3/16	2/16	2/16
18Nur49	(38 12/16)	2 4/16	10/16	1 12/16	-	4/16	-	3/16	3/16
18Nur50	(38 12/16)	3 4/16	9/16	1 12/16	-	3/16	-	2/16	2/16
18Nur51	41 5/16	3 6/16	10/16	2 2/16	1 12/16	3/16	3/16	2/16	2/16
18Nur52/72	(37 2/16)	2 14/16	10/16	none	-	-	-	-	2/16
18Nur53/71	(39 6/16)	2 13/16	10/16	1 12/16	-	3/16	-	3/16	2/16
18Nur54	-	-	-	1 9/16	-	3/16	-	2/16	-
18Nur55	-	-	-	-	-	-	-	-	-
18Nur56	-	-	-	-	-	-	-	3/16	-
18Nur57	-	-	-	-	-	-	-	4/16	-
18Nur80	(32 2/16)	2 14/16	12/16	1 12/16	-	3/16	-	3/16	-
18Nur96	41 4/16	3 6/16	12/16	2	2	3/16	3/16	2/16	2/16
18Nur97	(38 12/16)	2 12/16	12/16	1 14/16	-	4/16	-	2/16	2/16
18Nur98	(37 2/16)	2 14/16	12/16	-	-	-	-	2/16	3/16
18Nur99	(38 8/16)	2 12/16	8/16	1 12/16	-	3/16	-	3/16	-
18Nur100	41 4/16	3 4/16	8/16	2 1/16	2 2/16	3/16	3/16	2/16	2/16
18Nur103/224	(38)	2 7/16	12/16	1 10/16	-	3/16	-	2/16	-
18Nur120	(11 4/16)	2 8/16	10/16	-	-	-	-	2/16	-
18Nur127	41 2/16	3 3/16	11/16	1 15/16	2	2/16	3/16	1/16	2/16
18Nur136	35 8/16	2 10/16	14/16	2 10/16	2 15/16	2/16	2/16	2/16	2/16
18Nur139	(38 8/16)	2 12/16	12/16	1 10/16	-	3/16	-	3/16	2/16
18Nur140	(38 8/16)	2 12/16	10/16	1 14/16	-	4/16	-	2/16	-
18Nur157	(12 12/16)	3	8/16	1 12/16	-	3/16	-	3/16	-
18Nur174	41 3/16	3 1/16	10/16	2 2/16	2	2/16	2/16	1/16	1/16
18Nur175	(38 10/16)	2 14/16	10/16	1 12/16	-	3/16	-	3/16	2/16
18Nur176	(38 8/16)	2 12/16	7/16	1 10/16	-	3/16	-	2/16	2/16
18Nur194	41	3 8/16	10/16	2	2	2/16	3/16	2/16	2/16
18Nur195	41 4/16	4 1/16	12/16	2 2/16	1 12/16	2/16	3/16	1/16	2/16
18Nur219	(38 8/16)	2 14/16	10/16	1 10/16	-	5/16	-	2/16	2/16
18Nur220	(37)	2 8/16	10/16	-	-	-	-	2/16	-
18Nur221	41 4/16	3 4/16	12/16	2	2 1/16	2/16	3/16	2/16	2/16
18Nur222	41	3 2/16	12/16	1 13/16	2	2/16	3/16	2/16	2/16

cont.

Table 3. cont.

Permanent number	Length	Width	Thickness	Distance of Cruzes from ends		Cruze widths		Cruze depths	
18Nur225	40	2 12/16	12/16	1 10/16	1 13/16	3/16	4/16	2/16	3/16
18Nur226	41 3/16	3 4/16	12/16	1 15/16	2 1/16	3/16	3/16	2/16	2/16
18Nur227	41	3 5/16	12/16	1 14/16	1 15/16	3/16	3/16	2/16	3/16
18Nur303	-	2 6/16	-	-	-	-	-	-	-
18Nur360	-	-	-	-	-	-	-	2/16	-

*
All measurements are expressed to the nearest sixteenth of an inch. Length measurements in parenthesis represent those of incomplete staves. (N=40).

pine, willow, and chestnut.⁵⁵ The stave submitted for wood analysis from the Otter Creek wreck has been identified as red oak (Appendix A).

Cask Construction

There were three main branches of coopering: wet, dry and white (Table 4). The wet cooper manufactured casks with a bulge capable of holding a variety of liquids. Dry cooperage dealt with the manufacture of bulge casks for the containment of dry goods. Finally, the branch of cooperage known as white produced straight sided, splayed containers for a variety of uses.⁵⁶

The first step in construction of a cask was the preparation of the staves (Table 5). Stave blanks were generally split rather than sawn radially from logs.⁵⁷ It was not until the early nineteenth century that the preparation of stave blanks became automated in the United States. This included cutting the staves to given lengths and forming the concave inside surface and outside convex surface by machinery.⁵⁸ Tight, or wet, casks often had thicker staves.

Once the staves were rough shaped they were arranged upright in a circle and fitted with temporary hoops.⁵⁹ The staves were often then longitudinally curved by heating over a fire. They were then cut on each end with a groove or croze in order to hold the cask heads in place. Three types of grooves were used during the eighteenth century: the hawksbill, a deep wide groove used with cask for liquids; a shallow V-shaped groove used for either dry or

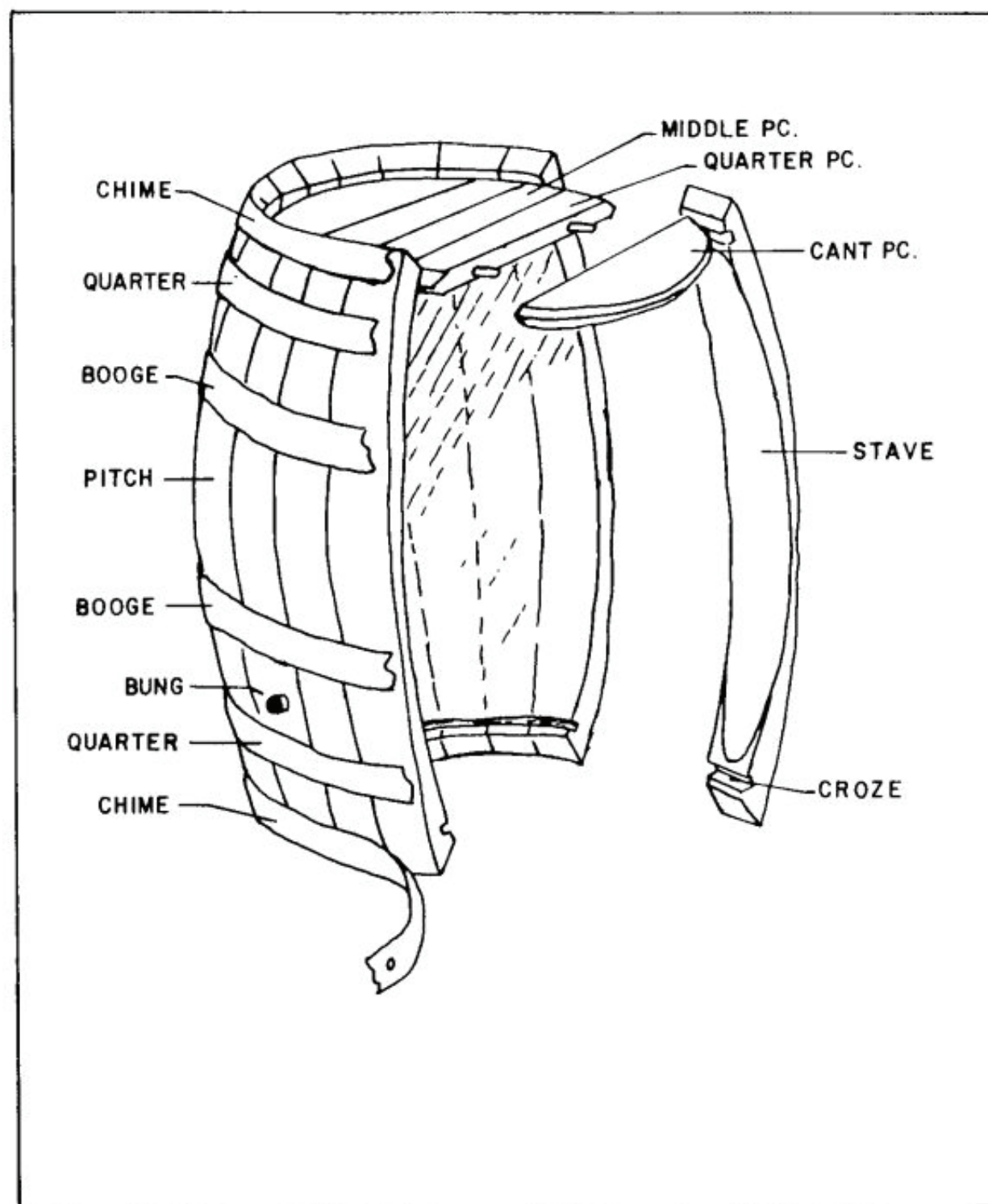


Figure 67. Cask components (after Shackleford, 1988).

wet containers; and the scratch groove, used only on casks for dry storage. Multiple grooves were also sometimes found on the same cask indicated multiple or reuse. Occasionally, in the absence of grooves, cask heads were nailed in place.⁶⁰

The next step in the construction involved tapering the stave with an axe and curving the inner and outer surfaces with a draw knife. A straight or flat knife was used to shape the outer surface, and a curved knife to produce the concave inner surface of each stave.⁶¹ If the cask had been constructed for liquids, a bung hole was then tapped in the bung stave. In addition to the bung hole the bung stave was identified as the stave on which the rivets or other attachment of the hoops to the cask were located.⁶²

Cask head pieces were made next from two or more sections generally pegged together. The pegs, or dowels, allowed the head pieces to be cut circular as a unit. The head was then beveled along the edge to allow it to fit into the groove. The temporary hoops were then removed and the head put in place. Permanent hoops were then replaced and securely attached.⁶³ The cask was then tested for leaks.⁶⁴

Table 4
Types of Cooperage:
their applications, sizes and wood types
 (after Roberts, *EAI* 1968)

<u>Types</u>	<u>Application</u>	<u>Sizes</u>	<u>Wood types</u>
Dry	Flour, grain, sugar, powder, tobacco, fish	Barrels, kegs, hogsheads	White pine
Wet	Oil, liquor, water, tar, turpentine, etc.	Barrels and kegs	Oak
White	Butter, cheese, fruits preserves	Kegs, tubs, buckets	Oak, ash, sycamore

Table 5
Sequence of Barrel Construction
 (after Roberts, *EAI* 1968)

<u>Steps</u>	<u>Operation</u>	<u>Purpose</u>
1.	Preparing the staves	Making material for sides
2.	Raising the cask	Arranging the staves in a circle
3.	Trussing-up	Bending the staves by steam
4.	Firing	Shrinking and drying the staves
5.	Topping	Trimming and grooving top
6.	Cleaning down	Finishing the inside and outside stave surfaces
7.	Bunging	Forming truncated tap hole
8.	Heading	Preparing the covers
9.	Hooping	Banding the sides

The manufacture and trading of staves played a large part in the commerce of coastal North Carolina. Large numbers of staves and stave blanks were shipped yearly to numerous American ports, as well as British and West Indian ports, for first-time use or as containers for cargo. This transferring of staves back and forth among American and foreign ports makes the identification of the source of staves on the basis of their wood species very difficult.⁶⁵ From October 1, 1763 to October 1, 1764, 253,161 staves were exported from Port Beaufort.⁶⁶ Staves were sold by the thousand, and in October, 1764 white oak hogshead staves were selling at four pounds, white oak pipe staves at six pounds, and white oak barrel staves at thirty-five shillings.⁶⁷

The number of staves shipped continued to increase into the later eighteenth century. One example illustrates the number that just one vessel could transport. In November, 1793, the schooner *Sally* of Newport wrecked on the Carolina coast and was advertised for sale along with her sails, rigging, cables and cargo of 26,000 barrel staves.⁶⁸ In early 1797, William Ross in New Bern, offered some thirty or forty thousand red and white oak hogshead staves at Bay River for sale.⁶⁹

Hogshead staves were selling in New Bern in February, 1804 for eighteen to twenty dollars and hogshead heading was also going at twenty dollars.⁷⁰ Nearly a decade later the price of staves had slightly decreased, likely as a result of restricted trade encountered

during the latest war. White oak hogshead staves were now selling at the beginning of the year for sixteen dollars, red oak hogshead staves from seven to eight dollars, and white oak hogshead heading between eighteen and twenty dollars.⁷¹ A few months later, in May, 1814 John Shaw of New Bern offered for sale sixty thousand red oak hogshead staves and twelve thousand white oak staves available at a convenient landing on Bay River.⁷²

Casks, as required by the 1715 legislation, were to be made of staves not less than 1/2 inch thick when wrought. Their heading was to be not less than 3/4 of an inch thick and well dowelled.⁷³ The act was further defined in 1758 by cask size and whether intended for a European or northern market (Table 6). It states that cask staves and heading should be of the following dimensions:

Butt Staves, shall be Five Feet Nine Inches long, Four Inches broad, and an Inch thick on the Heart or thin Edge. Pipe Staves, Four Feet Eight Inches long, Four Inches broad, and Three quarters of an Inch Thick on the Heart or thin Edge. Hogshead Staves, shall be Three Feet Six Inches long, Four Inches broad, and Three-quarters of an Inch thick on the Heart or thin Edge. Barrel Staves, shall be Two Feet Eight Inches Long, Four Inches broad, and Three-quarters of an Inch thick on the Heart or thin Edge, for the European Market; and those to be Exported to the Northern Colonies only, Thirty Inches long, same Breadth and Thickness. White-Oak Hogshead Heading, shall be Thirty-two Inches Long, Six Inches Broad, and One Inch thick on the Heart or thin Edge. Barrel Heading, shall be Nineteen Inches long, Six Inches broad, and Three-quarters of an Inch thick on the Heart or thin Edge.⁷⁴

In 1764, the required length of barrel staves was amended by increasing the stave length by one inch to be "Two Feet Nine Inches Long."⁷⁵ The remaining requirements for cask stave measurements

stayed the same until amended in 1784. In that year the following changes were made to the restrictions on barrel measurements:

...no inspector shall hereafter refuse to pass and brand any barrel containing any inspectable commodity on account of width or thickness of the staves: Provided, no stave exceed five inches in width and is at least three-quarters of an inch thick at the chime or crose, and of proportionable thickness in the bilge.⁷⁶

Table 6
Types and Dimensions of Cask Staves
(after *State Records of North Carolina*)

Type	Length (inches)	Width (inches)	Thickness (inches)
Butt	69	4	1
Pipe	56	4	3/4
Hogshead	42	4	3/4
Barrel (European)	33	4	3/4
Barrel (American)	30	4	3/4
Hogshead heading	32	6	1
Barrel heading	19	6	3/4

Cask Discussion

Complete stave measurements were taken on fifteen of the specimens recovered from the Otter Creek wreck. A single specimen measured 35 1/2 inches in overall length, placing it between the

required lengths of 33 inches for barrels exported to Europe, and 42 inches for hogsheads. The additional fourteen specimens ranged in complete length from 40 to 41 $\frac{7}{16}$ inches. These staves fall slightly short in length of the required size, 42 inches, for hogshead casks. Although the recovered staves do not coincide with lengths established by the North Carolina legislature, their width and thickness measurements are within the five inch and one inch maximum requirements respectively. Several other staves, most broken at the croze, would have complete lengths greater than 37 $\frac{1}{2}$ inches. Staves less than the established lengths may represent shortening and reused. It is, however, likely that the majority of the staves represent hogshead casks, with at least one barrel size cask, used for the transportation of liquids. Based on the meager evidence that this vessel made voyages to the Carribean, rum may have been the likely contents. Another possibility is that the casks contained turpentine or tar as indicated by a spilled tar-like sample recovered from the bilge.

The six cask head pieces recovered represent six different casks. No markings on any of the specimens provide any indication as to their contents or supplier. The cask heads from the two small casks, as well as those cask heads possibly from barrels, may be associated with the storage of food supplies on board the vessel as part of her stores. Some casks are known to have been reinforced with hoops.

Staves were found to cluster in the stern area near the main mast step on the Otter Creek wreck (Figure 66). This may just be a factor of the extent of excavation in the stern, as a few cask staves were also recovered along the keelson in the forward part of the vessel where limited excavation was completed. On board other excavated contemporary wrecks, casks have been documented stowed in the forward part of the vessel. Several intact or partially-intact casks, as well as hundreds of loose staves were recovered from the bow area of the 1781 Yorktown wreck.⁷⁷ Similarly, stowage of barrels on board the *Defence* were "three feet from the stem aft to port/starboard frames #13, arranged on their long axis and stacked in tiers."⁷⁸ Barrels stowed on board the 1781 wreck of the British warship *Charon* were also in a side to side athwartships (end to end longitudinal) manner.⁷⁹ When compared to the known stowage patterns of these eighteen-century wrecks, casks on board the Otter Creek wreck may similarly have been longitudinally stowed in the forward part of the ship. The presence of loose staves in the aft part of the vessel may indicate additional stowage or use in this area as well. The daily use from these casks of water and provisions may also be a possibility.

Miscellaneous

SPECIMENS 18NUR214, 18NUR231 and 18NUR288 are three thin fragments of mica documented from the wreck. No measurements were taken. The fragments were found within close

proximity of each other in Units 4C, 2C and 4CD. Mica was sometimes used in lanterns in place of more expensive glass. Additional uses for mica on board ship may have been in transom windows, or deck vent covers in lieu of the more expensive glass.⁸⁰

SPECIMEN 18NUR191 is a small notched clay piece, possibly fired. It was recovered from unit OC during the excavation of the stern trench. Its function is unknown.

SPECIMEN 18NUR23 and an unnumbered specimen are two small hardened fragments of rosin recovered from the Otter Creek wreck. One of the specimens measures 1 1/2 inch by 1/2 inch and was excavated from unit 8C. A second unmeasured piece came from unit 6D. The rosin may have been remains from a cargo of naval stores.

SPECIMEN 18NUR83 is a sample of pine tar removed from the bilge in unit 6C that remained quite viscous and sticky to the touch. As of this date the analysis of the residue has not been completed for identification or inspection of included bilge micro specimens. It is likely this sample is spillage from a cargo of naval stores.

SPECIMEN 18NUR20, a small thumb-nail-size fragment of flint, was recovered from unit 7B during excavation of the cross trench. It does not appear to be a gunflint, although it may have been used for striking a light.

A thumb-nail-size specimen of quartz, not given a specimen number, was excavated in unit 6D. It may be shatter from the ballast material.

Faunal

Twenty-six faunal specimens were recovered from the wreck located in Otter Creek (Appendix C) and submitted for identification to Dr. David T. Clark, a qualified zooarchaeologist. Figure 68 illustrates the distribution of faunal and botanical specimens. Beef (*Bos taurus*), pork (*Sus scrofa*), lamb (*Ovis aries*), chicken (*Gallus gallus domesticus*), bird (*Aves* sp), turtle (*Chrysemys concinna*), (*Kinosternon subrubrum*) and fish (*Ocipenser* sp) and (*Pisces* sp) are represented. Deer (*Odocoileus virginianus*) and other wild fauna, other than fish and turtles, are noticeably absent from the assemblage. The majority of the specimens recovered came from units located in the stern of the vessel, while none were found in the forward area of the ship which is the typical location for a cook stove and food preparation. Only limited excavation, however, was conducted along the keelson in the forward part of the ship, while all of the stern area was excavated. This may have skewed the distribution sample as shown in Figure 68.

The faunal specimens submitted for analysis were found to be in very good physical condition, with only a few specimens showing fine pitting, probably as the result of water chemical decomposition. The bones displayed a dark brown color, typical for waterlogged remains, while some specimens also exhibited rust discoloration as a result of direct contact with iron materials. Several of the faunal specimens had been butchered, as exhibited by the presence of cut

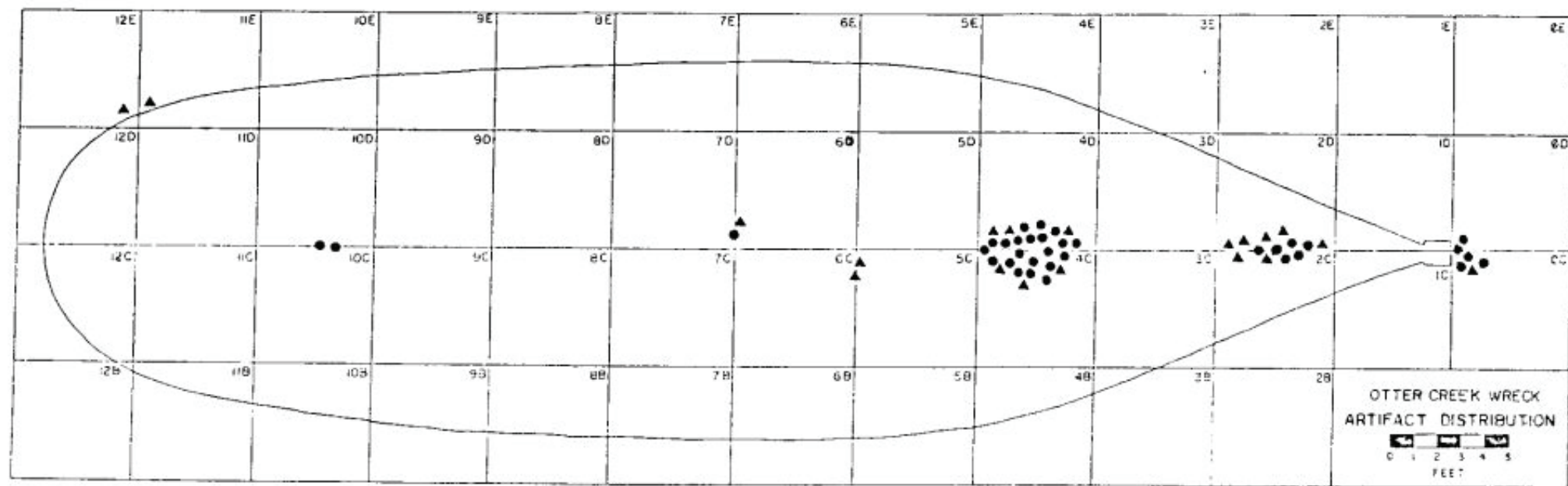


Figure 68. Distribution of Faunal and Botanical specimens.

and axe marks, with some others displaying post-depositional gnawing by scavengers.⁸¹

The five cow bones identified, 19.2 percent of the sample, were found to consist of fragments of two limb extremities, two ribs, and one vertebrae. Lengthwise axe marks were found on one of the vertebrae. The vertebrae and the two rib fragments (joint ends) probably represent rib roast meat portions. An "ox tail" portion of meat was represented by one caudal (tail) vertebrae, while a patella (kneecap) may indicate the processing of bulk leg meat, such as a full hind shank. At least two cows are represented in the sample, one being less than 1.4 years and the other more than two years old at death as established by bone growth/fusion.⁸²

An equal number of pig bone fragments were identified from the wreck. They also represent 19.2 percent of the sample and consist of two limb extremities, one vertebrae, one rib, and one forelimb bone. Lengthwise axe marks were found on the vertebrae fragment produced when butchering the animal in half along the spine. This specimen represents either a pork chop or pork loin, the result of further cutting the halves into smaller meat sections. The rib joint end (proximal) came from a rib chop and/or loin roast meat cut. A preference for hock and "pig's feet" was evidenced by the presence of three limb fragments. All of the pig bone fragments were from individuals less than one year in age, typical of pigs used as a food source.⁸³

Two faunal bone fragments from lamb, 7.7 percent of the sample, were identified from an individual less than 1.4 years of age. Both consisted of neck (cervical) vertebrae and had been cut lengthwise. These specimens represent lesser quality lamb neck meats (slices).⁸⁴

Two chicken bone fragments and one unidentified bird bone, including pelvis and lower leg elements, were found. These fragments made up 11.5 percent of the sample and represented back and leg meats.⁸⁵

Three turtle bones, from two immature individuals, have been tentatively identified as river cooter. The three specimens are from the plastron or lower part of the shell. The river cooter is common in the southern states, and generally inhabits streams and rivers of the coastal plain. It is found in waters with a moderate current, or in brackish water environs of tidal marshes and the like.⁸⁶

An additional turtle bone specimen, a carapace, or upper shell fragment, from a mud turtle has been identified. This species is also common in southern regions, and prefers fresh or brackish water, and shallow, slower moving streams with abundant vegetation. All four turtle bone specimens comprise 15.4 percent of the sample.⁸⁷

Five specimens of fish were examined, two being identifiable. Fish account for 19.2 percent of the identifiable faunal sample. One fragment, a vertebrae from a sturgeon, was recorded. Sturgeon can be found in ocean to freshwater environments. Certain species are anadromous, ascending rivers to spawn in fresh or brackish waters.

Once considered important game fish, sturgeon numbers were considerably reduced due to overfishing and pollution. Sturgeon meat was usually smoke dried, and the black roe, or caviar, considered a delicacy. A tooth fragment from a ray was also found and identified. This species of fish inhabit shallow ocean water, and are frequently found in estuaries and fresh water environs. The remaining three fish elements could not be identified, but all exhibit cut marks, representative of processing and not natural deposition.⁸⁸

Table 7 lists the faunal specimens by type and gives their provenience of recovery. Table 8 defines the faunal specimens by count and minimum numbers.

TABLE 7
Faunal Specimens by Type

BEEF N=5 (19.2%)

SPECIMEN NO.	TYPE	PROVENIENCE
18NUR159	Cow caudal vertebrae (tail) fragment	2-CD
18NUR201	Cow rib fragment	4-C
18NUR266	Cow patella (kneecap)	2-D
18NUR307	Cow thoracic (middle) vertebrae split	4-CD
18NUR339	Cow rib (proximal) fragment	unprov.

PORK N=5 (19.2%)

18NUR202	Pig lumbar vertebrae (lower) split	4-C
18NUR203	Pig ankle bone fragment	4-C
18NUR238	Pig phalange (toe)	0-C
18NUR327	Pig rib (proximal) fragment	6-7-D
18NUR350	Pig radius (lower foreleg) fragment	unprov.

LAMB N=2 (7.7%)

18NUR289	Sheep cervical (upper) vertebrae, split	4-CD
18NUR340	Sheep cervical (upper) vertebrae, split	unprov.

CHICKEN (FOWL) N=3 (11.5%)

18NUR260	Chicken leg bone fragment	2-CD
18NUR342	Chicken pelvis fragment	unprov.
18NUR343	Bird pelvis fragment	unprov.

TABLE 7 cont.

TURTLE N=4 (15.4%)

18NUR154	Mud turtle carapace (upper shell) fragment	2-CD
18NUR267	River Cooter plastron (lower shell) fragment	2-D
18NUR268	River Cooter plastron (lower shell) fragment	2-D
18NUR269	River Cooter plastron (lower shell) fragment	2-D

FISH N=5 (19.2%)

18NUR242	Sturgeon vertebrae	stem pit
18NUR243	Skate/Ray tooth fragment	stem pit
18NUR290	Fish vertebrae, cut	4-CD
18NUR322	Fish vertebrae, cut	5-6-C
18NUR344	Fish vertebrae	unprov.

UNIDENTIFIED N=2 (7.7%)

18NUR321	Large mammal rib fragment	5-6-C
18NUR341	Large mammal bone fragment	unprov.

TABLE 8
Faunal Specimens by Count and Minimum Number

(Clark, p. 2)

Scientific Name	Common Name	Number of Specimens	Minimal Number of Individuals
<i>Bos taurus</i>	Cow	5	5
<i>Sus scrofa</i>	Pig	5	2
<i>Ovis aries</i>	Sheep	2	1
Large Mammal	Indeterminable	2	-
<i>Gallus gallus domesticus</i>	Chicken	2	1
<i>Aves</i> sp	Bird	1	-
<i>Chrysemys</i> (cf) <i>concinna</i>	River Cooter	3	2
<i>Kinosternon subrubrum</i>	Mud Turtle	1	1
<i>Ocipenser</i> sp	Sturgeon	1	1
<i>Pisces</i> sp	Fish	4	-
		26	13

All faunal specimens represented food refuse.⁸⁹ The presence of beef, pork, lamb, fowl and aquatic sources of meat indicates that the ship made voyages of sufficient length to necessitate the preparation of meals. While it is possible that these cuts of meat were eaten fresh, it is more likely that they were preserved and stored on board in containers. Although the amount of meat carried on board merchant vessels varied with the size of their crews and the lengths of their voyages, some sources give indication of the quantity of meat packed. The British navy required that "Beef was shipped in casks with capacities of 30 seven-pound pieces, for a total of 210 pounds of beef. Pork was packed in containers holding 52 four-pound pieces, for a total of 208 pounds." The portions made it easy to serve a mess of five men, seven pounds of beef and four pounds of pork weekly.⁹⁰ North Carolina legislation passed in 1758, as expanded from the original law in 1715, for the regulation of unmerchantable commodities required marketable beef and pork barrels to be made of sufficient white oak, seasoned six months, and not contain more than 31 1/2 gallons. They further had to be of the standard dimensions and tight enough to hold pickle and "shall contain at least Two Hundred and Twenty Pounds of Good, clean, sound, merchantable Meat, properly sorted, and well salted between each Layer...."⁹¹ To ensure that buyers would not be paying for only lesser quality cuts of meat, "no more than Two Heads in one Barrel of Pork, and not any Boar's Flesh in any Barrel of Pork; or any Bull's Flesh or Heads, nor more than two Shanks in any Barrel of Beef"

could be included.⁹² Beef, pork and other perishables in barrels had to be laden or put on board any ship or vessel within three months after they had been inspected, or they had to be reinspected.⁹³ The length of time was amended in 1764 to sixty days.⁹⁴

For a schooner of approximately sixty feet length, subsistence for a crew of between three and five individuals would be needed. The length of time that these meat cuts were preserved is unknown, but replenishment was likely done fairly regularly aboard smaller vessels, like the one at Otter Creek, eliminating the need for lengthy storage.

The small faunal assemblage from the Otter Creek wreck indicates that both domestic and some wild species were utilized. Large domestic mammal remains, including cow, pig and sheep, comprised over half the sample. Domestic chicken was also included in the sample. Wild species were represented by river turtles and fish. Many of the faunal remains show axe or cut marks, evidence of butchering and use as a food source. Several of the bone fragments are from immature animals, although specimens identified as cow vary in age. This may indicate that they were selected from multiple purpose animals such as draft, dairy or food stock. The majority of cut portions represent lesser quality meats such as hocks, shanks and tailmeats.⁹⁵

Botanical

Forty-one botanical specimens were recovered from the Otter Creek wreck (Appendix D) and submitted to Lee Newsom, a qualified ethnobotanist, for analysis. The specimens likely represent food source remains. The overwhelming majority (85.4%) of specimens are hard nutshell fragments.⁹⁶ It follows that nutshells, given their durability, are more likely to survive than are softer textured seeds. The following Table 9 groups the specimens for comparison and lists their provenience. Table 10 groups the botanical specimens by count.

Nearly all of the botanical specimens were recovered from units in the stern of the vessel, or from outside the vessel in the sternpost excavation trench (Figure 68). Only two specimens were recovered in the forward part of the vessel, units 10C-D, in the likely location of where a cook stove, or food preparation area, may have been located. It should be again pointed out that only limited excavation along the keelson was carried out in the forward part of the ship, and the stern area completely excavated. A comparable distribution of remains may be revealed by further excavation in the forward part of the vessel.

Although the botanical food specimens may have been dried and preserved prior to the sinking of the Otter Creek wreck, their season of ripening may indicate a time period when the ship sank, if the specimens were recently harvested. The most commonly recovered botanical type were the black walnut (*Juglans nigra*) and

European English walnut (*Juglans* sp., probably *J. regia*) that ripen in October. The hickory nut (*Carya* sp.) similarly ripens during the same month. The single persimmon (*Diospyros virginiana*) ripens from September through October. The watermelon seed (*Citrullus vulgaris*) recovered from within the wreck ripens from August until the first frost. These specimens all have a season of ripening during the fall, with the assemblage possibly having the month of October in common.⁹⁷

The two peach seeds (*Prunus persica*) found on the wreck ripen during mid-summer, June and July, and could not have been present in a fresh state when the nuts were harvested in the fall. One specimen was recovered of peanut, (*Arachis hypogaea*) harvested during the months of September and October. Since the four specimens of coconut shell (*Cocos nucifera*) recovered are not natively grown, they would have had to be brought into North Carolina on board ship from a tropical environment.⁹⁸

TABLE 9
Botanical Specimens by Type

WALNUT N=29 (70.7%)

SPECIMEN NO.	TYPE	PROVENIENCE
18NUR84	Black Walnut	10-CD
18NUR131	Black Walnut	4-D
18NUR132	Black Walnut	4-D
18NUR160	Black Walnut	2-CD
18NUR170	Black Walnut	stern pit
18NUR171	Black Walnut	stern pit
18NUR204	Black Walnut	4-C
18NUR205	Black Walnut	4-C
18NUR206	European Walnut	4-C
18NUR246	European Walnut	2-CD
18NUR247	European Walnut	2-CD
18NUR248	European Walnut	2-CD
18NUR249	European Walnut	2-CD
18NUR292	Black Walnut	4-CD
18NUR293	Black Walnut	4-CD
18NUR294	Black Walnut	4-CD
18NUR295	Black Walnut	4-CD
18NUR309	Black Walnut	4-CD
18NUR310	Black Walnut	4-CD
18NUR311	Black Walnut	4-CD
18NUR312	Black Walnut	4-CD
18NUR313	European Walnut	4-CD
18NUR314	European Walnut	4-CD
18NUR328	Black Walnut	6-7-D
18NUR345	Black Walnut	unprov.
18NUR346	Black Walnut	unprov.
18NUR347	Black Walnut	unprov.
18NUR355	Black Walnut	unprov.
18NUR356	European Walnut?	unprov.

TABLE 9 cont.

HICKORY N=2 (4.9%)

18NUR85	Hickory	10-CD
18NUR192	Hickory, immature	0-C

COCONUT N=4 (9.8%)

18NUR121	Coconut	4-D
18NUR291	Coconut	4-CD
18NUR308	Coconut	4-CD
18NUR354	Coconut	unprov.

OTHER N=6 (14.6%)

18NUR155	Persimmon	2-CD
18NUR172	Peanut	stern pit
18NUR207	unidentified	4-C
18NUR208	Peach pit	4-C
18NUR241	Peach pit	stern pit
18NUR296	Watermelon seed	4-CD

TABLE 10
Botanical Specimens by Count

Scientific Name	Common Name	Number of Specimens
<i>Juglans nigra</i>	Black Walnut	21
<i>Juglans</i> sp. probably <i>J. regia</i>	European English Walnut	8
<i>Carya</i> sp.	Hickory	2
<i>Cocos nucifera</i>	Coconut	4
<i>Diospyros virginiana</i>	Persimmon	1
<i>Citrullus vulgaris</i>	Watermelon	1
<i>Arachis hypogaea</i>	Peanut	1
<i>Prunus persica</i>	Peach	2
Unidentified	-	1
		41

Chapter IV Endnotes

¹J. C. Harrington, "Dating Stem Fragments of Seventeenth and Eighteenth Century Clay Tobacco Pipes," *Quarterly Bulletin of the Archaeological Society of Virginia*, (1954), No. 9, pp. 1-5.

² Harrington, "Dating Stem Fragments," pp. 1-5.

³Stanley South, ed., *The Conference on Historic Site Archaeology Papers*, (Columbia, S. C., June 1972), Vol. 6, foldout.

⁴South, *Historic Site Archaeology Papers*, foldout.

⁵South, *Historic Site Archaeology Papers*, foldout.

⁶South, *Historic Site Archaeology Papers*, foldout.

⁷Georgeanna H. Greer, *American Stonewares, The Art and Craft of Utilitarian Potters* (Exton, Penn.: Schiffer Publishing Ltd., 1981), p. 79.

⁸Greer, *American Stonewares*, pp. 79-80.

⁹Greer, *American Stonewares*, p. 80.

¹⁰Greer, *American Stonewares*, pp. 76-77.

¹¹Greer, *American Stonewares*, p. 77.

¹²Greer, *American Stonewares*, p. 201; John Clauser, personal communication.

¹³Ivor Noël Hume, *A Guide to Artifacts of Colonial America* (New York: Alfred A. Knopf, 1982), p. 68.

¹⁴Ronald W. Deiss, "The Development and Application of a Chronology of American Glass," Bloomington, Midwestern Archeological Research Center, Illinois State University, 1982, p. 26.

¹⁵Karl G. Roenke, "Flat Glass: Its Use as a Dating Tool for Nineteenth Century Archeological Sites in the Pacific Northwest and Elsewhere," *Northwest Anthropological Research Notes*, Memoir No. 4. (Moscow, Idaho: University of Idaho, 1978), p.6.

¹⁶Deiss, "Chronology of American Glass," p. 28.

¹⁷Pierce Davis, *The Development of the American Glass Industry* (Cambridge, Mass.: Harvard University Press, 1949), pp. 36, 46.

¹⁸Deiss, "Chronology of American Glass," p. 28

¹⁹Deiss, "Chronology of American Glass," p. 30.

²⁰Dodds and Moore, *Building the Wooden Fighting Ship*, p. 24.

²¹Basil Greenhill, *The Evolution of the Wooden Ship*, p. 149.

²²Alberto F. Pradeau, *Numismatic History of Mexico from the Pre-Columbian Epoch to 1823* (Sanford J. Durst Publishing, 1978), pp. 60-66.

²³The American Numismatic Society, personal communication, April 3, 1990.

²⁴Pradeau, *Numismatic History of Mexico*, pp. 60-66.

²⁵The American Numismatic Society, personal communication, April 3, 1990.

²⁶The American Numismatic Society, personal communication, April 3, 1990.

²⁷*The North Carolina Magazine* (New Bern, N.C.), October 5, 1764.

²⁸*Hall's Wilmington Gazette* (Wilmington, N.C.), April 6, 1797.

²⁹*Hall's Wilmington Gazette* (Wilmington, N.C.), April 20, 1797.

³⁰*North Carolina Gazette* (Wilmington, N.C.), February 26, 1766.

³¹William E. Bean, Jr. "A Brief History of Wood Shingle Roofs in North Carolina, With Helpful Hints For Their Restoration," *North Carolina Historic Preservation Office Newsletter*, Summer, 1989, p. 19.

³²Bean, "Wood Shingle Roofs," pp. 19-20.

³³Bean, "Wood Shingle Roofs," pp. 20-21.

³⁴Walter Clark, ed., *The State Records of North Carolina*, Vol. XXIII, *Laws 1715-1776* (Goldsboro, N.C.: Nash Brothers, Book and Job Printers, 1904), p. 648.

³⁵Albert F. Butler, "The Bung Starter," *The Chronicle of Early American Industries* (Vol. XXVI, No. 4, Dec. 1973), p. 64.

³⁶Jean Boudriot, *The Seventy-Four Gun Ship* 4 vols. (Annapolis: Naval Institute Press, 1986), Vol. II, p. 108.

³⁷Kerry Shackelford, "The Casks From Cork," *Historic Trades*, 1 vol. to date (Williamsburg, Va.: The Colonial Williamsburg Foundation, 1988), Vol. 1, pp. 40, 50.

³⁸Shackelford, "Casks From Cork," p. 49.

³⁹Clark, ed., *State Records*, Vol. 23, p. 56

⁴⁰Clark, ed., *State Records*, Vol. 23, p. 56.

⁴¹Clark, ed., *State Records*, Vol. 23, p. 56.

⁴²Clark, ed., *State Records*, Vol. 23, pp. 333, 639-649, 790-801; Vol. 24, pp. 580-586; Vol. 25: pp. 378-387.

⁴³Anonymous, *American Agriculturist*, January, 1875, Reprinted in "An Early Account of the Growing, Harvesting and Preparation of Hoop Poles," *The Chronicle of Early American Industries*, Vol. 40, No. 1, (March 1987), pp. 72-73.

⁴⁴Kerry Shackelford, Sheli Smith and Linda Brown, "Preliminary Report on Casks Excavated from 44YO88," John W. Foster and Sheli O. Smith, eds., *Archaeology in Solution: Proceedings of the Seventeenth Annual Conference on Underwater Archaeology*, 1988, p. 220.

⁴⁵Shackelford, "Casks Excavated from 44YO88," p. 220.

⁴⁶John D. Broadwater, "The Yorktown Shipwreck Archaeological Project, Results from the 1986 Season," Alan B. Albright, ed., *Underwater Archaeology Proceedings From the Society For Historical Archaeology Conference*, 1987, p. 79.

⁴⁷John Carter and Trevor Kenchington "The Terence Bay Wreck: Survey and Excavations of a Mid-18th Century Fishing Schooner," Paul Johnston, ed., *Proceedings of the Sixteenth Conference on Underwater Archaeology*, 1985, p. 20.

⁴⁸David C. Switzer, "Provision Stowage and Galley Facilities Onboard the Revolutionary War Privateer, *Defence*," J. Barto Arnold, ed., *Beneath The Waters of Time: The Proceedings of the Ninth Conference on Underwater Archaeology*, 1979, p. 41.

⁴⁹Richard Steffy et. al. "The Charon Report," Gordon P. Watts, Jr. ed., *Underwater Archaeology: The Challenge Before Us. Proceedings of the Twelfth Conference on Underwater Archaeology*, 1981, pp. 118, 120.

⁵⁰William Tatham, *A Historical and Practical Essay on the Culture and Commerce of Tobacco*, 1800. Reprinted in *The Chronicle of Early American Industries*, Vol. 41, No. 1, March 1988, p. 15.

⁵¹Clark, ed., *State Records*, p. 56.

⁵²Clark, ed., *State Records*, Vol. 23, pp. 333, 639-649, 790-801; Vol. 24, pp. 580-586; Vol. 25: pp. 378-387.

⁵³Clark, ed., *State Records*, Vol. 25, p. 381.

⁵⁴*Academic American Encyclopedia* (Danbury, Conn.: Grolier Incorporated, 1985), p. 93.

⁵⁵Shackleford, "Casks from Cork," p. 45; Shackelford, Smith and Brown, "Preliminary Report on Casks Excavated from 44YO88," p. 220.

⁵⁶Kenneth Kilby, *The Cooper and His Trade*, (London: John Baker Publishers Ltd., 1971), p. 42.

⁵⁷Shackleford, "Casks from Cork," pp. 46, 48.

⁵⁸Kenneth D. Roberts, "Some Cooper's Tools," *The Chronicle of Early American Industries*, Vol. XXI, No. 4, (Dec. 1968), p. 56.

⁵⁹*Academic American Encyclopedia*, p. 93

⁶⁰Shackleford, "Casks from Cork," p. 49.

⁶¹Shackleford, "Casks from Cork," pp. 46, 48.

⁶²Butler, *Early American Industries*, p. 64.

⁶³Shackleford, "Casks from Cork," p. 50.

⁶⁴*Academic American Encyclopedia*, p. 93.

⁶⁵Shackleford, "Casks from Cork," p. 46.

⁶⁶*The North Carolina Magazine* (New Bern, N.C.), October 5, 1764.

⁶⁷*The North Carolina Magazine* (New Bern, N.C.), October 5, 1764.

- ⁶⁸*The North Carolina Gazette* (New Bern, N.C.), October 26, 1793.
- ⁶⁹*The North Carolina Gazette* (New Bern, N.C.), January 28, 1797.
- ⁷⁰*North Carolina Circular* (New Bern, N.C.), February 24, 1804.
- ⁷¹*Carolina Federal Republican* (New Bern, N.C.), January 1, 1814.
- ⁷²*Carolina Federal Republican* (New Bern, N.C.), May 14, 1814.
- ⁷³Clark, ed., *State Records*, Vol. 23, p. 56.
- ⁷⁴Clark, ed., *State Records*, Vol. 25, pp. 385-386.
- ⁷⁵Clark, ed., *State Records*, Vol. 23 p. 648.
- ⁷⁶Clark, ed., *State Records*, Vol. 24, p. 660.
- ⁷⁷John D. Broadwater, "Mechant Ships at War: The Sunken British Fleet at Yorktown, Virginia," J. Barto Arnold III, ed., *Underwater Archaeology Proceedings From the Society For Historical Archaeology Conference*, 1989, p. 122.
- ⁷⁸Switzer, "Provision Stowage," p. 41.
- ⁷⁹Steffy et. al., "*Charon* Report," pp. 118, 120.
- ⁸⁰Geoff Scofield, personal communication, June 28, 1991.
- ⁸¹David T. Clark, "An Analysis of the Faunal Remains From the Otter Creek Shipwreck Site (0018NUR)," Zooarchaeology Research Facility, Department of Anthropology, The Catholic University of America, Washington, D.C., pp. 1-2.
- ⁸²Clark, "Faunal Remains," pp. 2-3.
- ⁸³Clark, "Faunal Remains," pp. 3, 5.

- ⁸⁴Clark, "Faunal Remains," p. 3.
- ⁸⁵Clark, "Faunal Remains," p. 3.
- ⁸⁶Clark, "Faunal Remains," p. 4.
- ⁸⁷Clark, "Faunal Remains," p. 4.
- ⁸⁸Clark, "Faunal Remains," pp. 4-5.
- ⁸⁹Clark, "Faunal Remains," p. 2.
- ⁹⁰Shackleford, "Casks from Cork," p. 43.
- ⁹¹Clark, ed., *State Records*, Vol. 25, p. 381.
- ⁹²Clark, ed., *State Records*, Vol. 25, p. 381.
- ⁹³Clark, ed., *State Records*, Vol. 25, p. 382.
- ⁹⁴Clark, ed., *State Records*, Vol. 23, p. 644.
- ⁹⁵Clark, "Faunal Remains," pp. 5-6.
- ⁹⁶Lee Newsom, personal communication, Sept. 21, 1988.
- ⁹⁷Lee Newsom, personal communication, Sept. 21, 1988.
- ⁹⁸Lee Newsom, personal communication, Sept. 21, 1988.

Chapter V

Conclusions

For more than two hundred years the Neuse River has served as a vital artery of eastern North Carolina's commerce and transportation. The label "cradle of Neuse colonization" has been applied to the vicinity of Smith and Greens Creeks. Early settlers in this area near the mouth of the Neuse, such as Farnifold Green, Richard Smith, and William Powell, played an important role in the beginning and growth of the region. Extensive amounts of land purchased by Farnifold Green during the early eighteenth century in the present-day Oriental area were subsequently passed down to his heirs.

Historical documentation (Figure 5) suggests that the house and property once belonging to Farnifold Green II were located on the peninsula of land where the Otter Creek wreck was discovered. This structure cannot be the original "Green's Neck plantation," as that dwelling is known to have been destroyed in 1714 at the time of the senior Farnifold Green's death. Although the renaming of creeks through time has lent some confusion, it appears that Farnifold Green II's house was located South of Smith's Creek. Today this tributary is referred to as Greens Creek. Confirmation that the present Greens Creek was once known as Smith's Creek is again indicated on the 1805 map (Figure 9) showing Smith Creek in relation to Dawson Creek and the Neuse River. Since Farnifold Green and his heirs were

prominent shippers, the wreck may have been associated with them but presently there is no historical or archaeological documentation to support it.

At the time of the projected loss of the Otter Creek wreck in the late eighteenth, or early nineteenth century, the present Smith and Greens Creek area were all but forgotten due to the domination of New Bern. Only a handful of small farms and plantations in the area helped provide growing New Bern with locally raised products for export. Despite the development of early roads, the Neuse River and larger creeks continued to be the most convenient way to travel and transport goods for the local population. A variety of small vessel types that included the bateaux, flat, sloop, and schooner, like the one at Otter Creek, carried naval stores and agricultural products from the surrounding small farms and plantations to the wharves of New Bern, where most were distributed to other markets. In return manufactured goods and imports such as rum, molasses, brown sugar and wine arrived by ship at New Bern from northeastern colonies, Europe, Bermuda, and the West Indies.

The Revolutionary War and War of 1812 created temporary disruptions of the normal trading pattern for New Bern merchants. These periods of hostility, however created privateering opportunities that brought considerable benefit to enterprising individuals or a town bold enough to take the risk of fitting out a ship to plunder enemy shipping. During the years of conflict the need for vessels to carry arms and provisions, and for the purpose of

privateering or defense increased. Shipyards prospered around New Bern. During the period between the wars, the booming commercial center of New Bern supported a ship construction industry that produced some of the finest vessels in the country. The prosperity of the wooden shipbuilding industry lasted only a few decades until the practicality of steamboats became accepted. The Neuse River, therefore, became even more important to the area's agricultural economy and naval stores industries.

As a consequence of New Bern's maritime heritage, the lower Neuse River undoubtedly contains the remains of a variety of potentially significant historic vessels. Many of these wrecked or abandoned vessels are likely associated with New Bern's zenith during the late eighteenth century as a maritime center. Shipwrecks occurred in virtually all navigable areas of the river and major creeks. Colonial and state records, newspaper articles, and contemporary accounts confirm that vessels were often driven onto shore during severe weather, or abandoned when they became unseaworthy. Historical research has documented the loss of several ships in the lower Neuse River vicinity in addition to the Otter Creek wreck (Appendix F), although very few have been investigated. These wrecks date between 1769 and 1959. The wrecks include examples of the wide variety of vessel types that supported colonization, trade, warfare, travel, fishing, and all the other activities associated with the development of our state and nation.

Virtually all trade and travel on the lower Neuse River arrived at or departed from New Bern and ventured past the mouth of Greens Creek. Historical research in the site files of the Underwater Archaeology Unit confirmed the loss of more than forty vessels in the vicinity of New Bern, and eleven known wrecks from all periods have been identified. It comes as no surprise then that a wreck dating to the federal period, the glory years of New Bern's maritime history, was found in the vicinity of Greens Creek near the mouth of the Neuse. Very little is known about the construction of vessels from this period.

Excavation of the Otter Creek wreck was undertaken in order to better understand and provide comparative documentation on one of the types of vessels utilized in the commerce of the lower Neuse River vicinity during the late eighteenth and early nineteenth centuries. The study of shipwrecks in the Neuse provides invaluable opportunities to examine and reconstruct important aspects of our maritime heritage that do not survive in the historical record. Shipwrights, well into the twentieth century, continued to build vessels without benefit of plans or documentation. Shipwrecks, like the one examined at Otter Creek, therefore, are among our most important sources of data concerning the evolution of nautical architecture and construction.

The Otter Creek wreck appears to be similar to the type vessel most common during the period. Schooners had become the favored type vessel and proved to be the most practical to operate along the

coast and in the shallow lower portions of rivers and creeks within the state. Schooners therefore represent one of the most important classes of vessels associated with North Carolina's maritime heritage. To date only an insignificant percentage of historically documented schooner losses have been located and examined, making any constructional data obtained important for future assessment. Shipwreck sites of the eighteenth century may represent the earliest vessels built on the lower Neuse River.

The documented structural elements of the Otter Creek wreck show an almost exclusive use of white oak. The use of hickory, with its limited area of growth, for mast hoops on the vessel provides evidence that the ship was likely North American and not European built. White oak is distributed along the entire eastern coast of the United States, as well as in Europe, while hickory is not found in Europe. The use of white oak for planking and irregular spaced and sided floors were characteristic of vessels built in the Chesapeake area until 1830, suggesting one possible area of construction.

Excavated remains of the Otter Creek wreck show the preserved vessel to have been at least 58 feet in length with a beam of 16 feet. These measurements indicate a vessel of approximately 100 tons and a draft of 9 feet. Constructional details of the Otter Creek wreck tend to imply that it was built during the last half of the eighteenth century. The keelson, suspected to continue aft until it butts against the sternpost, is one indication that construction was after 1750, prior to which time the keelson stopped short of the

sternpost. The use of wooden knees rather than iron ones may suggest that this vessel was constructed prior to the early nineteenth century, when iron knees came into common use at major ship construction areas in the North. This development did not, however, occur as rapidly in the South. The fact that every other floor is bolted to the keelson on the Otter Creek wreck indicates that the vessel was built prior to the turn of the century. After 1800 it became common practice to bolt every floor.

A double frame pattern also used on the vessel may suggest that the vessel was intended for open water voyages requiring sturdy construction, although heavy framing seems to have been more common than first believed. Surviving fasteners also provide evidence of the vessel's approximate date of construction. The presence of wrought nails and spikes and the absence of cut nails on this wreck may suggest that it was built before 1790, when cut nails began to replace wrought nails. It must be kept in mind, however, that wrought nails continued in use for many more years depending on locality.

Atypical construction was also found in the Otter Creek wreck. The placement of the mast steps directly on the keelson scarfs has not been recorded on any other North American wreck. One contemporary source does suggest that this practice was used in a much larger British ship that dates to 1818. Another unusual construction technique found on the Otter Creek wreck was the different scarf patterns used on the keelson. The forward

keelson/apron scarf had been cut vertically, and the two sections of keelson were horizontally scarfed. No other examples of this pattern have been documented. On a vessel the size of the Otter Creek wreck, the use of pillars down the keelson is puzzling. Generally this method would only be found in ships requiring sturdy construction to support heavy weight on deck. Therefore, the pillars may have been added later in the life of the ship to support a weakening deck, or been a necessity with the use of "half-beams," as may have been found on this wreck.

Non-perishable cargoes carried on board ships can often provide a look at items of everyday use and reflect the economic system that supported European development of the region. In addition, items associated with the vessel provide insight into shipboard life and maritime technology at the time. Together these items permit reconstruction of historic lifeways and provide an important record of our evolving material culture.

Although the artifacts recovered from the Otter Creek wreck are few in number, some indications of the cargo, shipboard life, period of use, and history of the vessel can be inferred from the remains. Ceramic artifacts found on the wreck imply an utilitarian function and were not part of a cargo. The absence of elaborate or foreign types indicates that the vessel was probably American-owned.

Twenty-one pieces of ceramics were recovered from the wreck. creamware, pearlware, stoneware and possibly whiteware types are

represented. The periods of use for these types provide a rough idea of when the vessel was in operation. Creamware has been documented as being in common use from 1762 to 1820. The annular piece of pearlware represents a type in common use from 1790 to 1820. Some of the small ceramic specimens, similar in appearance to creamware, lack the characteristic yellow tint and may be fragments of whiteware. This type of pottery was first produced around 1820 and would, if present, date the wreck to later than thought.

Six of the ten stoneware specimens recovered may represent fragments from a single brown stoneware bottle. American-made brown stoneware bottles for ink, beer, etc. date from 1820 to post 1900, but common imported British brown stoneware bottles and mugs date from 1690 to 1775. Bottle forms were generally made to hold effervescent liquids such as beer and ale of a quart or less in capacity.

The four ceramic pipestems and one pipebowl fragment recovered from the Otter Creek wreck permit only a limited assessment of the vessel's age based upon the datable characteristics of pipestems. According to an established chronology determined from the diameter of the pipestem bore, these specimens span ninety years. Three of the pipestems have a bore diameter of $5/64$ inch that places them in the period of manufacture from 1710 to 1750. A single pipestem bore measures $4/64$ inch and has a use range dating

from 1750 to 1800. The fragile nature of pipestems made from clay dictated that they were not likely to remain in circulation long.

Seventy-six glass fragments were recovered from the wreck, representing both container and pane glass. One fragment from the upper portion of a bottle is similar to the 1788 or 1800 styles identified by Hume. Most of the bottle glass was concentrated in units 2C-D and in the sternpost trench in units 0C-D. These units located toward the stern of the vessel are in the general proximity of the space occupied by the captain's cabin on board a vessel of this period. Therefore, it is likely they were property belonging to the captain and not cargo. The distribution of the pane glass specimens from units 2C-D and 0C-D may indicate their use as lantern or window glass in the area of the captain's cabin.

The two metal artifacts recovered from the wreck not associated with the vessel construction were identified as buttons. Specimen 18NUR218, (Figure 48), a button impressed from a coin, provides a *terminus ante quem* date of 1772 for the wreck. The button bears the faint reverse impression from a coin bearing the marking CAAROLUS·III or IIII, a portion of DEI GRATIA and the date of 17__ or 177_. Carolus, the Latin spelling for Charles, appeared on Spanish coins minted during the reigns of Charles III (1759-1788) and Charles IV (1788-1808). Coins, however, were only minted under Charles III from 1760 until 1788, and under Charles IV from 1789 until 1808. During the reign of Charles III two types of coins called silver reales were minted: the "Pillar" variety coined until

April of 1772, and the "Bust" type, minting of which began on April 8, 1772. The "Bust" type spelled out GRATIA and the pillar type did not. Therefore, the coin impression on the button showing the first three letters of GRATIA must have been made from a "Bust" type silver coin minted after 1772. Additionally, coinage in Spain did not spell out the word GRATIA, so it is likely that the coin used for the impression was made in one of the Spanish colonies.

If the button was impressed from a silver coin minted during the reign of Charles IV, it could only have been during 1789 or 1790 when the transition coins bore CAROLUS IIII. The most unusual characteristic of the impression, the double "A" in the name CAAROLUS, could not be explained. The impression of the button was likely made from a silver one-reale piece minted either during the reign of Charles III or early in the reign of Charles IV, and minted in either Mexico City, Potosi, or Lima.

The majority of the wooden artifacts recovered from the Otter Creek wreck are associated with casks for either the transportation of cargo or daily use. Fourteen complete cask staves ranged in length from 40 to 41 7/16 inches. These complete staves, however, are slightly shorter in length than the hogshead casks of 42 inches required by North Carolina legislation. This 1715 legislation was confirmed in 1749, and amended in 1758, 1764, 1770 and 1784. Their width and thickness measurements however are within the five inch and one inch maximum requirements respectively. Staves shorter than the required lengths may represent shortening and

reuse, non-American production, or failure by the cooper to adhere to the legislation. It is, however, likely that the majority of the staves represent hogshead casks, with at least one barrel-size cask, used for the transportation of liquids. One possibility is that the casks contained turpentine or tar, a major export of the region. None of the six cask head pieces recovered from different casks shows markings indicating the casks contents or supplier. Two small cask heads, as well as those cask heads possibly from barrels, may be associated with the storage of food supplies on board the vessel as part of her stores. Some casks are known to have been reinforced with hoops for added support to bulky or heavy contents.

Staves were clustered in the stern area near the mainmast step on the Otter Creek wreck. This may just be a factor of the extent of excavation in the stern, as a few cask staves were also recovered along the keelson in the forward part of the ship where testing was limited. On board other excavated contemporary wrecks casks have been stowed longitudinally in the forward areas. This may also be the case on the Otter Creek wreck, however, the presence of loose staves in the aft part of the vessel may also indicate additional stowage or use in this area as well.

Faunal specimens recovered from the wreck represented food refuse including remains of beef, pork, lamb, fowl and aquatic sources. This diversity in food suggests that voyages of several days length necessitated the preparation of meals on board ship. While it is possible that these cuts of meat were obtained and eaten fresh

while in port, it is more likely that they were preserved and stored on board ship in containers. The amount of meat carried on board merchant vessels varied with the size of their crews and the lengths of their voyages. For a schooner of approximately sixty feet length, such as the one found at Otter Creek, subsistence for a crew of between three and five individuals was needed.

The small faunal assemblage from the Otter Creek wreck represents the use of both domestic and wild species. Large domestic mammal remains, including cow, pig and sheep, comprised over half of the specimens in the sample. Domestic chicken was also included. Wild species were represented by river turtles and fish. Many of the faunal remains show axe or cut marks, evidence of butchering and use as a food source. Several of the bone fragments are from immature animals, although specimens identified as cow vary in age. This may indicate that they were selected from multiple purpose animals, such as draft, dairy or food stock. The majority of cut portions represent lesser quality meats such as hocks, shanks and tailmeats.

The forty-one botanical specimens recovered from the Otter Creek wreck likely represent food source remains. The overwhelming majority of the specimens are hard nut shell fragments. The recovery technique utilized at the site, however, excluded the collection of specimens smaller than 1/4 inch in size. The presence of coconut shell fragments on the wreck indicates that this vessel may have been engaged in trade with the Caribbean.

Nearly all of the botanical specimens were recovered from units in the stern of the vessel, or from outside the ship in the sternpost excavation trench. Only two specimens were recovered in the forward areas, units 10C-D, in the likely location of where a cook stove, or food preparation area, may have been located. Only limited excavation was carried out in the forward part of the ship, however, while the stern area was completely excavated.

Historical research was unable to identify the name of the sunken vessel, or how this schooner came to be located in the shallow waters of what is now called Otter Creek. One possible explanation is that the ship was seeking refuge from a storm when she entered the mouth of the creek and ran aground. If this were the case any attempts to free the ship and return her to service should have been successful.

The most likely explanation is that the Otter Creek schooner had become unseaworthy and was abandoned. During this period the Greens/Smith creek area was relatively sparsely settled, and abandonment at this location may not have interfered with local navigation. Additionally, the 9-foot draft of this vessel roughly corresponds to what is projected by geologists as the contemporary creek depth at the point of grounding. The absence of cargo, personal belongings, and most rigging elements, along with the overall paucity of all artifacts supports the contention that the vessel was intentionally sailed into shallow water, salvaged of all usable goods, and then scuttled.

Based upon historical and archaeological research we can make a final analysis about the Otter Creek wreck. There is a probable association of the vessel with the Farnifold Green family, based upon property ownership where the wreck was discovered. The structural characteristics of this wreck indicate that the vessel was of North American construction sometime after 1750 and likely before the turn of the nineteenth century. Artifactual analysis provided a *terminus ante quem* date of 1772 for the ship's sinking, and its probable use in trade with the West Indies, possibly with the Spanish colonies. Lastly, the Otter Creek wreck represents a well-constructed coastal schooner, typical of the vessels used during the last half of the eighteenth century in eastern North Carolina.

Bibliography

Primary Sources

- "Abstract of the Tonnage of the Shipping of the last day of December, 1794." Commerce and Navigation Records, Vol. 1, H. Doc. 30, 4th Congress, 1st Session, 1796. Treasury Department to the United States House of Representatives.
- "Abstract of the Tonnage of the Shipping of the last day of December, 1800." Commerce and Navigation Records, Vol. 1, H. Doc. 61, 7th Congress, 1st Session, 1802. Treasury Department to the United States House of Representatives.
- "Abstract of the Tonnage of the Shipping of the Several Districts of the United States, and Recorded Vessels, on the last day of December, 1803." Commerce and Navigation Records, Vol. 1, House Doc. 96, 8th Congress, 2nd Session, 1805. Treasury Department to the United States House of Representatives.
- "Abstract of the Tonnage of the Shipping of the Several Districts of the United States, and Recorded Vessels, on the last day of December, 1811." Commerce and Navigation Records, Vol. 1, House Doc. 179, 12th Congress, 2nd Session, 1813. Treasury Department to the United States House of Representatives.
- "Account of Vessels and Cargoes Cleared from Newbern in Port Beaufort since December 1788," Box 5, (January 7, 1789 to June 29, 1789) J[ames] Coor, Naval Officer, New Bern, N. C. Treasurer's and Comptroller's Papers, Manuscript Room, North Carolina Division of Archives and History, Raleigh.
- Craven County Court Minutes. 1733, 1750, 1753, 1758, 1761, 1826. Division of Archives and History, Raleigh, N.C.
- Craven County Deed Books. No. 78 and No. 81. Division of Archives and History, Raleigh, N.C.

Haun, Weynette Parks. Craven County North Carolina, County Court Minutes (Court of Pleas & Quarter Sessions), 3 vols. Durham, N.C., Published by the author, 1978-1983.

John Green and Farnifold Green folders. Craven County Estates Papers, Division of Archives and History, Raleigh, N. C.

Joseph I. Roberson Papers. North Carolina State Archives, Raleigh.

"Returns of Entries Made in the Collector's Office of [New Bern in] Port Beaufort" (April 2, 1787 to October 1, 1787), John Dawes, Collector, New Bern, N. C. Treasurer's and Comptroller's Papers, Port Beaufort, 1784 to 1789, Manuscript Room, North Carolina Division of Archives and History, Raleigh, N. C.

Underwater Archaeology Unit. Site files, North Carolina Underwater Archaeology Branch, Kure Beach, N.C.

Underwater Archaeology Unit. "Daily Log of the Otter Creek Shipwreck Excavation, Oriental, North Carolina," On file, North Carolina Underwater Archaeology Branch, Kure Beach, N.C.

Will of Farnifold Green. Secretary of State's Wills, North Carolina State Archives, Raleigh, North Carolina.

Printed Primary Sources

Anonymous. *American Agriculturist*, January 1875. Reprinted in "An Early Account of the Growing, Harvesting and Preparation of Hoop Poles," *The Chronicle of Early American Industries*, Vol. 40, No. 1, March 1987.

Clark, Walter, ed. *The State Records of North Carolina*. 26 volumes. Winston and Goldsboro: State of North Carolina, 1895-1907.

Emerson and Company. *Charles Emerson and Company's Newbern Directory*. Raleigh: Edwards, Broughton and Company, 1880-81.

- Falconer, William. *A New Universal Dictionary of the Marine*. London: Joyce Gold, 1815.
- Fouts, Raymond Parker, compiler. *Abstracts from the North Carolina Gazette of New Bern, North Carolina, 1751-1759 and 1768-1790*. Volume I. Cocoa, Florida: Gen Rec Books, 1983.
- Hofmann, Margaret M., ed. *Colony of North Carolina, 1735-1775: Abstracts of Land Patents*. 2 volumes to date. Weldon: Roanoke News Co., 1982 and 1984.
- Hutchinson, William. *A Treatise on Naval Architecture*, 4th ed., Liverpool: printed by T. Billinge, 1794.
- Journal of a French Traveler in the Colonies, 1765* *American Historical Review*, Vol. XXVI, No. 4, 1921.
- Keith, Alice B. ed. *The John Gray Blount Papers*, Vol. 2, Raleigh: State Department of Archives and History, 1959.
- Lawson, John. *A New Voyage to Carolina*. Reprinted Facsimile edition, 1967. Edited by Hugh Lefler, Chapel Hill, The University of North Carolina Press, Originally published in 1709, London.
- Lemmon, Sarah McCulloh, ed. *The Pettigrew Papers*. 2 vols. Raleigh: North Carolina Department of Archives and History, 1971.
- Moore, Elizabeth. *Records of Craven County*. Vol. I. Bladensburg, Maryland: Genealogical Recorders, 1960.
- Moorsom, George. *A Brief Review and Analyses of the Laws for the Admeasurement of Tonnage*. London: n.p., 1852.
- Murray, Mungo. *A Practical Treatise on Ship-Building and Navigation*. London: A. Millar, 1764.
- Rees, Abraham. *Rees' Naval Architecture, 1819-1820*, Reprint; London: David and Charles, 1970.

Saunders, William L., ed. *Colonial Records of North Carolina*. 10 vols. Raleigh: State of North Carolina, 1886-1890.

Steel, David. *Elements and Practice of Naval Architecture, 1805*. Reprint; London: Sim Comfort Association, London, 1977.

Stephenson, Richard and William N. Still, compilers. "A Statistical Analysis of Interstate and International Vessel Construction in North Carolina," Greenville: East Carolina University, 1977-1981.

Todd, Vincent H., ed. *Christoph Von Graffenried's Account of the Founding of New Bern*. Raleigh: Edwards and Broughton, 1920.

Tatham, William. *A Historical and Practical Essay on the Culture and Commerce of Tobacco*, 1800. Reprinted in *The Chronicle of Early American Industries*, Vol. 41, No. 1, March, 1988.

Newspapers

Carolina Federal Republican, New Bern, N.C.

Hall's Wilmington Gazette, Wilmington, N.C.

New Bern Spectator, New Bern, N.C.

North Carolina Circular, New Bern, N.C.

North Carolina Gazette, Wilmington, N.C.

The North Carolina Gazette, New Bern, N.C.

The North Carolina Magazine, New Bern, N.C.

The Pamlico News (Oriental, N.C.), "International Group Coming to Oriental to Examine 300-Year Old Sunken Vessel," 16 March 1988.

Secondary Sources

Published Works

Abell, Sir Westcott. *The Shipwright's Trade*. Cambridge: 1948.

Academic American Encyclopedia. Danbury, Conn.: Grolier Incorporated, 1985.

Albion, Robert G. *Forests and Sea Power: The Timber Problem of the Royal Navy 1652-1862*. Cambridge, Mass.: Harvard University Press, 1926.

Archibald, E.H.H. *The Wooden Fighting Ship in the Royal Navy, A.D. 897-1860*. New York: Arco Publishing Co., 1976.

Boudriot, Jean. *The Seventy-Four Gun Ship*. Vol. II. Annapolis: Naval Institute Press, 1986.

Bugler, Arthur. *HMS Victory, Building, Restoration, and Repair*. London: Her Majesty's Stationery Office, 1966.

Chapelle, Howard I. *The American Fishing Schooners 1825-1935*. New York: W.W. Norton & Co. Inc., 1973.

_____. *The Search For Speed Under Sail 1700 - 1855*. New York: W. W. Norton & Company, 1967.

_____. *History of American Sailing Ships*, New York: W.W. Norton & Co., 1985. Originally published, New York: Norton, 1935.

Conner, R.D.W. *History of North Carolina*. Vol. I. Chicago and New York: The Lewis Publishing Company, 1919.

Corbitt, David L., ed. *The Formation of the North Carolina Counties 1663-1943*. Raleigh: North Carolina Department of Cultural Resources, 1950.

- Davis, Pierce. *The Development of the American Glass Industry*. Cambridge, Mass.: Harvard University Press, 1949.
- De Kerchove, René. *International Maritime Dictionary*. New York: Van Nostrand Reinhold Co., 1961.
- Deharpporte, Dean. *South and Southeast Wind Atlas*, New York: Van Nostrand Reinhold Co., 1984.
- Dodds, James and James Moore. *Building the Wooden Fighting Ship*. New York: Facts on File Publications, 1984.
- Goodwin, Peter. *The Construction and Fitting of the Sailing Man of War, 1650-1850*. London: Conway Maritime Press, 1987.
- Greenhill, Basil. *The Evolution of the Wooden Ship*. New York: Facts on File, 1988.
- Greer, Georgeanna H. *American Stonewares, The Art and Craft of Utilitarian Potters*. Exton, Penn.: Schiffer Publishing Ltd., 1981.
- Hardy, Albert V. and Jessie D. Hardy. "Weather and Climate in North Carolina." *Agricultural Experiment Station Bulletin 396*. Raleigh: North Carolina State University, 1971.
- Hardy, Marion W. *I Remember "Oriental."* New Bern: A-1 Special Secretarial Service, 1975.
- _____. *A Glimpse of Pamlico County*. Charlotte: Herb Eaton, Inc. and Marceline, Missouri: Wadsworth Publishing Co., 1977.
- Hutchins, John G. B. *The American Maritime Industries and Public Policy, 1789-1914, An Economic History*. Cambridge: Harvard University Press, 1941.
- Kilby, Kenneth. *The Cooper and His Trade*. London: John Baker Publishers Ltd., 1971.
- Knittle, Walter Allen. *Early Eighteenth Century Palatine Emigration*. Baltimore: Genealogical Publishing Co., 1970.

- Lefler, Hugh T. and A. R. Newsome. *The History of a Southern State: North Carolina*. Chapel Hill: University of North Carolina Press, 1954.
- Little, Elbert L. *The Audubon Society Field Guide to North American Trees, Eastern Region*. New York: Alfred A. Knopf, 1980.
- MacGregor, David R. *Fast Sailing Ships, Their Design and Construction, 1775-1875*. Annapolis: Naval Institute Press, 1973 and 1988.
- _____. *Merchant Sailing Ships. 1815-1835*, London: Conway Maritime Press, 1984.
- _____. *Schooners in Four Centuries*. Annapolis: Naval Institute Press, 1982.
- Merrens, Harry Roy. *Colonial North Carolina in the Eighteenth Century: A Study in Historical Geography*. Chapel Hill: University of North Carolina Press, 1964.
- Morgan, William Stuart, III. "The Commerce of A Southern Port: New Bern, North Carolina, 1783 to 1812." M.A. thesis, East Carolina University, Greenville, 1985.
- National Oceanographic and Atmospheric Administration. *Climates of the States*. Third edition, Volume 2. Detroit: Gale Research Co., 1985.
- Nöel Hume, Ivor. *A Guide To Artifacts of Colonial America*. New York: Alfred A. Knopf, 1982.
- Peterson, Mendel. *History Under the Sea*. Alexandria, Va.: published by the author, 1973.
- Powell, William S. *North Carolina Through Four Centuries*. Chapel Hill: The University of North Carolina Press, 1989.

- Powell, William S., ed. *Dictionary of North Carolina Biography*. Volumes I and II. Chapel Hill: University of North Carolina Press, 1979 and 1986.
- Pradeau, Alberto F. *Numismatic History of Mexico from the Pre-Columbian Epoch to 1823*. Sanford J. Durst Publishing, 1978.
- South, Stanley ed. *The Conference on Historic Site Archaeology Papers, 1971*, Columbia, S. C., Vol. 6, June 1972.
- Stick, David. *The Outer Banks of North Carolina*. Chapel Hill: The University of North Carolina Press, 1958.
- Thorne, Barbara M. Howard, ed. *The Heritage of Craven County, North Carolina*. Vol. 1. Winston-Salem: Hunter Publishing Co., 1980.
- Todd, Vincent and Julius Goebel. *Christoph Von Graffenried's Account of the Founding of New Bern*. Raleigh: Edwards and Broughton Printing, 1920.
- U.S. Navy Bureau of Ships. *Wood: A Manual For Its Use as a Shipbuilding Material*. Vol. 1. Washington: U.S. Navy Bureau of Ships, 1957, as quoted in Robert M. Steward, *Boatbuilding Manual*, 3rd ed., Camden, Maine: International Marine Publishing Co., 1987.
- Watson, Alan D. *A History of New Bern and Craven County*. New Bern: Tryon Palace Commission, 1987.

Articles

- Adams, Robert M. "Yorktown Archaeological Shipwreck Project: 1985 Field Season." John W. Foster and Sheli O. Smith, eds. *Archaeology in Solution: Proceedings of The Seventeenth Annual Conference on Underwater Archaeology*, Salinas, Calif.: Coyote Press, 1988.

- Bean, William E. Jr. "A Brief History of Wood Shingle Roofs in North Carolina, With Helpful Hints For Their Restoration." North Carolina Historic Preservation Office *Newsletter*, Summer 1989.
- Broadwater, John D. "The Yorktown Shipwreck Archaeological Project, Results from the 1986 Season." Alan B. Albright, ed., *Underwater Archaeology Proceedings From the Society For Historical Archaeology Conference*, 1987.
- _____. "Merchant Ships at War: The Sunken British Fleet at Yorktown, Virginia." J. Barto Arnold III, ed., *Underwater Archaeology Proceedings From the Society For Historical Archaeology Conference*, 1989.
- Broadwater, John D., John W. Morris III, and Marcie Renner, "Yorktown Shipwreck Archaeological Project: An Interim Report on the 1987 Season." James P. Delgado, ed. *Underwater Archaeological Proceedings From The Society For Historical Archaeology Conference*, Ann Arbor, Mich.: Braun-Brumfield, Inc., 1988.
- Butler, Albert F. "The Bung Starter." *The Chronicle of Early American Industries*, Vol. XXVI, No. 4, Dec. 1973.
- Carter, John and Trevor Kenchington. "The Terrence Bay Wreck: Survey and Excavation of a Mid-18th Century Fishing Schooner." Paul F. Johnson, ed. *Proceedings of the Sixteenth Conference on Underwater Archaeology*, Ann Arbor, Mich.: Braun-Brumfield, Inc., 1985.
- Cox, Lee J. "Preliminary Investigations of a Revolutionary War Era Vessel in Crosswicks Creek, Bordontown, New Jersey." Alan B. Albright, *Underwater Archaeology Proceedings From the Society For Historical Archaeology Conference*, Ann Arbor, Mich.: Braun-Brumfield, Inc., 1987.
- Crittenden, Charles C. "Inland Navigation in North Carolina, 1763 to 1789." *The North Carolina Historical Review*, Vol. 7, April, 1931.

Deiss, Ronald W. "The Development and Application of a Chronology of American Glass." *Midwestern Archeological Research Center*, Illinois State University, Bloomington, 1982.

Dill, Alonzo Thomas, Jr. "Eighteenth Century New Bern: A History of the Town and Craven County, 1700-1800." 8 parts, *North Carolina Historical Review*, Vol. XXII (1945) and Vol. XXIII (1946).

_____. "Political and Commercial Rise of New Bern." *The North Carolina Historical Review*, Vol. 23, January 1946.

Harrington, J. C. "Dating Stem Fragments of Seventeenth and Eighteenth Century Clay Tobacco Pipes." *Quarterly Bulletin of the Archaeological Society of Virginia*, No. 9, (1954).

Hutchins, John G. B. "History and Development of the Shipbuilding Industry in the United States." F. G. Fassett, Jr., ed., *The Shipbuilding Business in the United States of America*. Vol. 1 New York: Society of Naval Architects and Marine Engineers, 1948.

Jameson, Franklin J., (ed.). "Journal of a French Traveller." *The American Historical Review*, Part 1, Vol. 26, 1921.

Keene, John T. Jr. "The Nail Making Industry in Early Virginia." *The Chronicle of the Early American Industries Association, Inc.*, Vol. XXV, No. 1, March, 1972.

Lawrence, Richard W. "Current Underwater Archaeological Research in North Carolina." J. Barto Arnold III, ed. *Underwater Archaeology Proceedings From the Society for Historical Archaeology Conference*. Pleasant Hill, Calif.: Society for Historical Archaeology, 1989.

Morgan, William Stuart, III. "The Commerce of a Southern Port: New Bern, North Carolina, 1783 to 1789." *The American Neptune*, Vol. XLIX, No. 2, 1989.

- Nelson, Lee H. "Nail Chronology as an aid to Dating old Buildings," Technical Leaflet 48, *History News*, Vol. 24, No. 11, 1968.
- Riess, Warren C. "History of the Ronson Ship," John W. Foster and Sheli O. Smith, eds. *Archaeology in Solution. Proceedings of the Seventeenth Annual Conference on Underwater Archaeology*, Salinas, Calif.: Coyote Press, 1988.
- Robinson, Wendy S. Appendix titled "A classification and distribution of marine wood-boring organisms which may attack archaeological wrecks" following "Observations on the preservation of archaeological wrecks and metals in marine environments," *The International Journal of Nautical Archaeology and Underwater Exploration*. Volume 10, Number 1, 1981.
- Roberts, Kenneth D. "Some Cooper's Tools." *The Chronicle of Early American Industries*, Vol. XXI, No. 4, Dec. 1968.
- Roenke, Karl G. "Flat Glass: Its Use as a Dating Tool for Nineteenth Century Archeological Sites in the Pacific Northwest and Elsewhere." *Northwest Anthropological Research Notes*, Memoir No. 4. Moscow, Idaho: University of Idaho, 1978.
- Shackleford, Kerry. "The Casks From Cork." *Historic Trades*, Vol. 1, Williamsburg, Va.: The Colonial Williamsburg Foundation, 1988.
- Shackelford, Kerry, Sheli Smith and Linda Brown. "Preliminary Report on Casks Excavated from 44YO88." John W. Foster and Sheli O. Smith, eds. *Archaeology in Solution, Proceedings of the Seventeenth Annual Conference on Underwater Archaeology*, 1988.
- Steffy, J. Richard. "Construction Details of the Brown's Ferry Ship." J. Barto Arnold III ed. *Beneath the Waters of Time: The Proceedings of the Ninth Conference on Underwater Archaeology*, publication #6, Austin: Texas Antiquities Committee, 1978.

- _____. "The Charon Report," Gordon P. Watts, Jr. ed.
Underwater Archaeology: The Challenge Before Us. The Proceedings of the Twelfth Conference on Underwater Archaeology, San Marino, Calif.: Fathom Eight, 1981.
- Steffy, Richard et. al. "The Charon Report." Gordon P. Watts, Jr. ed.,
Underwater Archaeology: The Challenge Before Us: Proceedings of the Twelfth Conference on Underwater Archaeology, 1981.
- Switzer, David C. "Provision Stowage and Galley Facilities Onboard the Revolutionary War Privateer, Defence." J. Barto Arnold, ed.
Beneath The Waters of Time: The Proceedings of the Ninth Conference on Underwater Archaeology. Publication No. 6, Austin: Texas Antiquities Committee, 1979.
- _____. "Recovery and Initial Interpretation of the Shot Locker and Bilge Pump Well From the Privateer Defence." Wilburn A. Cockrell, ed. *In the Realms of Gold: The Proceedings of the Tenth Conference on Underwater Archaeology*, San Marino, Calif.: Fathom Eight, 1981.
- _____. "Interpretation of the Stern Area of the Privateer Defence." Gordon P. Watts, Jr., ed. *Underwater Archaeology: The Challenge Before Us. The Proceedings of the Twelfth Conference on Underwater Archaeology*. San Marino: Calif.: Fathom Eight, 1981.
- Watson, Alan D. "The Ferry in Colonial North Carolina: A Vital Link in Transportation." *North Carolina Historical Review*, Vol. LI, No. 3, 1974.
- Wilbanks, Ralph. "A Preliminary Report on the Mepkin Abbey Wreck, Cooper River, South Carolina: An Early 19th-Century River Trading Vessel." Gordon P. Watts, Jr., ed. *Underwater Archaeology: The Challenge Before Us. The Proceedings of the Twelfth Conference on Underwater Archaeology*. San Marino, Calif.: Fathom Eight, 1981.

Technical reports

Angle, Wilson. "A Brief Maritime History of the Oriental Area of Pamlico County." Research Branch, Division of Archives and History, North Carolina Department of Cultural Resources. Manuscript on file, Underwater Archaeology Unit, Kure Beach, North Carolina.

Clark, David T. "An Analysis of the Faunal Remains From the Otter Creek Shipwreck Site (0018NUR)." Zooarchaeology Research Facility, Department of Anthropology, The Catholic University of America, Washington, D.C.

Littleton, Tucker, compiler. Archaeological and Historical Survey of U. S. M. C. Base Camp LeJeune. Manuscript on file, University of North Carolina, Wilmington, 1981.

Wilde-Ramsing, Mark. "Otter Creek Magnetometer Survey and Site Assessment, North Carolina." Report on file, North Carolina Underwater Archaeology Unit, Kure Beach, N.C., 1986.

_____. "Examination of the Otter Creek Wreck." Report on file, North Carolina Underwater Archaeology Unit, Kure Beach, N.C., 1987.

_____. "Preliminary Report on the Rose Hill Expedition." Report on file, North Carolina Underwater Archaeology Unit, Kure Beach, N.C., 1988.

Scofield, Geoff. "Otter Creek Wreck Vessel Construction." Manuscript, 1991, on file, North Carolina Maritime Museum. Beaufort, N.C.

Maps

Collet Map, 1770. W. P. Cumming, *North Carolina in Maps*. Plate VII, Raleigh: State Department of Archives and History, 1966.

Craven County Land Grants and Surveys. Property Map of Farnifold Green. No. 1671, Book 13, page 292. Issued October 23, 1761. North Carolina Division of Archives and History, Raleigh.

Craven County Land Grants and Surveys. Smith Creek, 1805. North Carolina Division of Archives and History, Raleigh.

Edward Moseley Map, 1733. W. P. Cumming, *North Carolina in Maps*. Plate VI, Raleigh: State Department of Archives and History, 1966.

Graffenried's chart of New Bern 1710. Reprinted in *Christoph Von Graffenried's Account of the Founding of New Bern*. Vincent H. Todd, ed. Raleigh: Edwards and Broughton, 1920.

Mouzon Map, 1775. W. P. Cumming, *North Carolina in Maps*. Plate VIII, Raleigh: State Department of Archives and History, 1966.

Newton, J. G., O.H. Pilkey, and J.O. Blanton. *An Oceanographic Atlas of the Carolina Continental Margin*, Morehead City, N.C.: Duke University Marine Laboratory, 1971.

Oriental, North Carolina Quadrangle. 7.5 Minute Series (Topographical). U. S. Department of Commerce, Coast and Geodetic Survey. United States Geologic Survey, 1948, photorevised 1983.

Price - Strother Map, 1808. W. P. Cumming, *North Carolina in Maps*. Plate IX, Raleigh: State Department of Archives and History, 1966.

United States - East Coast North Carolina. *Neuse River and Upper Part of Bay River*, #11552. U. S. Department of Commerce, 15th ed. National Oceanic and Atmospheric Administration, Aug. 1986.

Personal Communications

Clauser, John. Personal communication, n. d.

Newsom, Lee. Personal communication, Sept. 21, 1988.

Scofield, Geoff. Personal communications, June 12 and 28, 1991.

The American Numismatic Society. Personal communication, April 3, 1990.

Appendix A

Wood Sample Analysis

<u>Sample</u>	<u>Location</u>	<u>Description</u>
18NUR-A	Apron	oak, (<i>Quercus</i> sp.), white group
18NUR-B	Keel	oak, white group
18NUR-C	Futtock	oak, white group, narrow rings
18NUR-D	Floor	oak, white group, slow grown
18NUR-E	Outer Planking	oak, white group, narrow rings
18NUR-F	Ceiling	oak, white group, narrow rings
18NUR-G	Limber board	oak, white group, narrow rings
18NUR-H	Stern post	oak, white group
18NUR-I	Trunnel	oak, white group
18NUR-J	Mast hoop	hickory (<i>Carya</i> sp.)
18NUR-K	Sheathing	pine (<i>Pinus</i> sp.) <i>sylvestris</i> group, including several old world species and American red pine (<i>P. resinosa</i>).
18NUR-L	Barrel stave	oak, red group

Appendix B

Ballast Stone Analysis

<u>Specimen</u>	<u>Type</u>	<u>Description</u>
18NUR92	Basalt,	wt. 12lbs. 3oz.
18NUR93	Granite,	wt. 7lbs. 3oz., A thinly weathered cobble of plutonic igneous origin. Contains orthoclase, plagioclase, quartz and a minor amount of biotite. A concentration of quartz in bands indicates metamorphic period after crystallization.
18NUR94	Hornblende and plagioclase (Feldspar),	wt. 8lbs. 11oz., A fine grained matrix of igneous volcanic origin with no crystal structure. A volcanic rock with phenocrysts of hornblende and plagioclase feldspar.
18NUR95	Hornblende and plagioclase (Feldspar),	wt. 3lbs. 9oz.
18NUR109	Basalt?,	wt. 1lb. 14oz., Small cobble with heavy pink staining of unknown origin.

Appendix C

Faunal Analysis

<u>Specimen</u>	<u>Description</u>	<u>Provenience</u>
18NUR154	Mud turtle carapace (upper shell) fragment	2-CD
18NUR159	Cow caudal vertebrae (tail) fragment	2-CD
18NUR201	Cow rib fragment	4-C
18NUR202	Pig lumbar vertebrae (lower) split	4-C
18NUR203	Pig ankle bone fragment	4-C
18NUR238	Pig phalange (toe)	0-C
18NUR242	Sturgeon vertebrae	stem pit
18NUR243	Skate/Ray tooth fragment	stem pit
18NUR260	Chicken leg bone fragment	2-CD
18NUR266	Cow patella (kneecap)	2-D
18NUR267	River Cooter plastron (lower shell) fragment	2-D
18NUR268	River Cooter plastron (lower shell) fragment	2-D
18NUR269	River Cooter plastron (lower shell) fragment	2-D
18NUR289	Sheep cervical (upper) vertebrae, split	4-CD
18NUR290	Fish vertebrae, cut	4-CD
18NUR307	Cow thoracic (middle) vertebrae split	4-CD
18NUR321	Large mammal rib fragment	5-6-C
18NUR322	Fish vertebrae, cut	5-6-C
18NUR327	Pig rib (proximal) fragment	6-7-D
18NUR339	Cow rib (proximal) fragment	unprov.
18NUR340	Sheep cervical (upper) vertebrae, split	unprov.
18NUR341	Large mammal bone fragment	unprov.
18NUR342	Chicken pelvis fragment	unprov.
18NUR343	Bird pelvis fragment	unprov.
18NUR344	Fish vertebrae	unprov.
18NUR350	Pig radius (lower foreleg) fragment	unprov.

Species Count

Scientific Name	Common Name	Number of Specimens	Minimal Number of Individuals
<i>Bos taurus</i>	Cow	5	5
<i>Sus scrofa</i>	Pig	5	2
<i>Ovis aries</i>	Sheep	2	1
Large Mammal	Indeterminable	2	-
<i>Gallus gallus domesticus</i>	Chicken	2	1
<i>Aves</i> sp	Bird	1	-
<i>Chrysemys</i> (cf) <i>concinna</i>	River Cooter	3	2
<i>Kinosternon subrubrum</i>	Mud Turtle	1	1
<i>Ocipenser</i> sp	Sturgeon	1	1
<i>Pisces</i> sp	Fish	4	-
		26	13

Appendix D
Botanical Analysis

<u>Specimen</u>	<u>Description</u>	<u>Provenience</u>
18NUR84	Black Walnut	10-CD
18NUR85	Hickory	10-CD
18NUR121	Coconut	4-D
18NUR131	Black Walnut	4-D
18NUR132	Black Walnut	4-D
18NUR155	Persimmon	2-CD
18NUR160	Black Walnut	2-CD
18NUR170	Black Walnut	stern pit
18NUR171	Black Walnut	stern pit
18NUR172	Peanut	stern pit
18NUR192	Hickory, immature	0-C
18NUR204	Black Walnut	4-C
18NUR205	Black Walnut	4-C
18NUR206	European Walnut	4-C
18NUR207	unidentified	4-C
18NUR208	Peach pit	4-C
18NUR241	Peach pit	stern pit
18NUR246	European Walnut	2-CD
18NUR247	European Walnut	2-CD
18NUR248	European Walnut	2-CD
18NUR249	European Walnut	2-CD
18NUR291	Coconut	4-CD
18NUR292	Black Walnut	4-CD
18NUR293	Black Walnut	4-CD
18NUR294	Black Walnut	4-CD
18NUR295	Black Walnut	4-CD
18NUR296	Watermelon seed	4-CD
18NUR308	Coconut	4-CD
18NUR309	Black Walnut	4-CD
18NUR310	Black Walnut	4-CD
18NUR311	Black Walnut	4-CD
18NUR312	Black Walnut	4-CD

Botanical Analysis cont.

<u>Specimen</u>	<u>Description</u>	<u>Provenience</u>
18NUR313	European Walnut	4-CD
18NUR314	European Walnut	4-CD
18NUR328	Black Walnut	6-7-D
18NUR345	Black Walnut	unprov.
18NUR346	Black Walnut	unprov.
18NUR347	Black Walnut	unprov.
18NUR354	Coconut	unprov.
18NUR355	Black Walnut	unprov.
18NUR356	European Walnut?	unprov.

Species Count

<u>Scientific Name</u>	<u>Common Name</u>	<u>Number of Specimens</u>
<i>Juglans nigra</i>	Black Walnut	21
<i>Juglans</i> sp. probably <i>J. regia</i>	European English Walnut	8
<i>Carya</i> sp.	Hickory	2
<i>Cocos nucifera</i>	Coconut	4
<i>Diospyros virginiana</i>	Persimmon	1
<i>Citrullus vulgaris</i>	Watermelon	1
	Peanut	1
<i>Prunus persica</i>	Peach	2
Unidentified	-	1
		<hr/> 41

Appendix E
Artifact Inventory

Permanent #	Field #	Description	Provenience
May 15, 1987			
18NUR01	1999	gudgeon strap	stern, port
18NUR02	1998	ballast stone	4-D
18NUR03	1997	ballast stone	4-D
18NUR04	1996	ballast stone	4-D
18NUR05	1995	ballast stone	4-D
18NUR06	1994	wedge-shaped wood	general coll.
18NUR07	1993	trunnel?	general coll.
18NUR08	1992	wooden plug	stern area
18NUR09	1991	futtock	4-D
18NUR10	1990	futtock	5-CD
July 13, 1988			
18NUR11	none	iron pin	bow area
18NUR12	none	iron pin	bow area
18NUR13	none	iron pin	bow area
18NUR14	none	iron pin	bow area
July 14, 1988			
18NUR15	none	lead	stern area
18NUR16	none	2 bottle glass	stern area
18NUR17	none	1 bottle glass	stern area
18NUR18	none	1 pane glass	stern area
18NUR19	none	pearlware	stern area
August 8, 1988			
	1001	nail	7-B
	1001	3 pcs. charcoal	7-B
	1001	thorn	7-B
	1001	3 mast hoop frag	7-B
	1001	1 mast hoop frag.	7-B
18NUR20	1001	flint	7-B
18NUR21	1002	wood	7-B
18NUR22	1003	trunnel wedge	7-C
August 9, 1988			
	1005	wood	7-D
	1005	nail	7-D
	1006	2 brick frags	7-C

Artifact Inventory cont.

Permanent #	Field #	Description	Provenience
18NUR23	1006	rosin	8-C
18NUR24	1006	caulking	8-C
18NUR25	1006	5 pcs. coal	8-C
18NUR26	1006	1 pc. coal	8-C
18NUR27	1006	tack	8-C
18NUR28	1006	nail	8-C
18NUR29	1006	wooden plug	8-C
18NUR30	1006	cask bung	8-C
	1006	mast hoop wood sample	8-C
18NUR31	1007	lead sheathing	8-C
18NUR32	1008	nail	7-D
18NUR33	1008	nail	7-D
18NUR34	1009	wood w/moulded edge	7-C
	1010	futtock	7-D
18NUR35	1011	nail	7-C
	1011	nail	7-C
	1011	2 metal concretions	7-C
18NUR36	1012	wood with impression	7-C
18NUR37	1012	nail	7-C
	1012	nail	7-C
18NUR38	1013	spike	7-C
18NUR39	1014	mast hoop frag	5-C
18NUR40	1014	beveled trim	5-C
	1015	nail	5-D
18NUR41	1015	nail	5-D
18NUR42	1015	spike	5-D
August 10, 1988			
18NUR43	1016	wood with impression	9-C
	1017	futtock-trunnel sample	9-CD
18NUR44	1018	nail	6-CD
18NUR45	1019	cask stave	5-CD
18NUR46	1019	cask stave	5-CD
18NUR47	1019	cask stave	5-C
18NUR48	1019	cask stave	5-C
18NUR49	1019	cask stave	5-C
18NUR50	1019	cask stave	5-CD
18NUR51	1019	cask stave	5-CD
18NUR52	1019	cask stave	5-CD
18NUR53	1019	cask stave	5-CD
18NUR54	1019	cask stave end	5-CD
18NUR55	1019	cask stave end	5-CD
18NUR56	1019	cask stave end	5-CD

Artifact Inventory cont.

Permanent #	Field #	Description	Provenience
18NUR57	1019	cask stave end	5-CD
	1019	stave wood sample	5-CD
18NUR58	1020	cask head	6-D
18NUR59	1020	square charred plug	6-D
18NUR60	1020	square plug	6-D
18NUR61	1020	trunnel wedge	6-D
	1020	wood	6-D
	1020	wood	6-D
18NUR62	1020	nail	6-D
	1020	nail	6-D
	1020	4 nail frags	6-D
18NUR63	1020	7 pebbles, ballast?	6-D
18NUR64	1020	2 brick frags	6-D
18NUR65	1020	5 pcs. coal	6-D
	1020	quartz	6-D
	1020	caulking	6-D
	1020	rosin	6-D
18NUR66	1020	pane glass	6-D
18NUR67	1021	cask head	6-C
18NUR68	1022	nail	6-C
18NUR69	1022	nail	6-C
18NUR70	1022	nail	6-C
18NUR71	(1019)	cask stave	5-CD
18NUR72	(1019)	cask stave	5-CD
18NUR73	1024	trunnel with wedge	6-C
18NUR74	1024	mallet head	6-C
18NUR75	1024	mallet handle	6-C
18NUR76	1025	trunnel	9-C
18NUR77	1025	trunnel wedge	9-C
18NUR78	1025	mast hoop	9-C
18NUR79	1025	tack	9-C
	1025	5 nail frags	9-C
	1025	4 pcs. chaulking	9-C
18NUR80	1026	cask stave	9-C
18NUR81	1027	chock	5-C
	1028	spike	10-CD
18NUR82	1029	nail	10-D
18NUR83	1030	pine tar	6-C
18NUR84	1031	nut shell	10-CD
18NUR85	1031	nut shell	10-CD
18NUR86	1032	trunnel	10-CD
18NUR87	1032	mast hoop	10-CD
18NUR88	1032	spike	10-CD
18NUR89	1032	nail	10-CD

Artifact Inventory cont.

Permanent #	Field #	Description	Provenience
18NUR90	1032	2 nail frags	10-CD
	1032	metal strap	10-CD
	1032	3 pcs. coal	10-CD
August 11, 1988			
18NUR91	1033	spike	10-CD
18NUR92	none	ballast stone	general coll.
18NUR93	none	ballast stone	general coll.
18NUR94	none	ballast stone	general coll.
18NUR95	none	ballast stone	general coll.
18NUR96	1034	cask stave	4-D
18NUR97	1034	cask stave	4-D
18NUR98	1034	cask stave	4-D
18NUR99	1034	cask stave	4-D
18NUR100	1034	cask stave	4-D
18NUR101	1034	cask stave blank?	4-D
18NUR102	1034	cask stave blank?	4-D
18NUR103	1034	cask stave	4-D
18NUR104	(1023)	wooden cask hoop	6-C
18NUR105	(1023)	wooden cask hoop	6-C
18NUR106	1035	mast hoop	11-C
18NUR107	1036	nail concretion	11-C
18NUR108	1037	cask head	4-CD
18NUR109	1038	ballast stone	7-C
	1039	nail concretion	9-10-CD
	1039	nail concretion	9-10-CD
	1039	11 pcs. coal	9-10-CD
18NUR110	1040	cask head	4-D
18NUR111	1041	wood	4-D
18NUR112	1042	bevelled plank	11-D
18NUR113	1043	rope	11-D
18NUR114	1044	leather pump boot	4-D
	1045-1054	not assigned	-
18NUR115	1055	towel rack end	4-D
18NUR116	1056	shingle	4-D
18NUR117	1057	mast hoop frag	11-C
18NUR118	1058	door handle assemble	4-D
18NUR119	1059	cask head	4-D
18NUR120	1060	cask stave	4-D
18NUR121	1061	coconut shell	4-D
18NUR122	1062	bilge pump casing?	4-C
18NUR123	1062	bilge pump casing?	4-C
18NUR124	1063	73 pcs. coal	11-C

Artifact Inventory cont.

Permanent #	Field #	Description	Provenience
	1063	nail concretion	11-C
	1064	nail concretions	11-C
18NUR125	1064	nail concretion	11-C
18NUR126	1064	nail concretion	11-C
August 12, 1988			
18NUR127	1065	cask stave w/ hole	4-D
18NUR128	1066	metal strap?	11-C
18NUR129	1066	2 pcs. metal strap?	11-C
18NUR130	1067	ceramic jug handle	4-D
18NUR131	1067	nut shell	4-D
18NUR132	1067	nut shell	4-D
	1067	nail concretion	4-D
18NUR133	1068	beveled wood panel	3-CD
18NUR134	1068	nail	3-CD
18NUR135	1068	nail	3-CD
18NUR136	1069	cask stave	3-D
18NUR137	1069	cask head	3-D
18NUR138	1070	hinge	3-D
18NUR139	1071	cask stave	4-D
18NUR140	(1034)	cask stave	4-D
18NUR141	1072	wooden wedge	4-D
18NUR142	1073	wood	3-D
18NUR143	1074	moulded wood	3-C
	1075	not assigned	-
August 15, 1988			
18NUR144	1076	leather	stern area
18NUR145	1077	wooden sheave pin	stern, port
18NUR146	1078	notched wooden peg	stern, port
18NUR147	1079	shive	stern, port
18NUR148	1080	leather	4-C
18NUR149	1081	bull's eye	4-CD
18NUR150	1082	5 pcs. ceramics	2-CD
18NUR151	1082	14 pcs. bottle glass	2-CD
18NUR152	1082	11 pcs. pane glass	2-CD
18NUR153	1082	1 pc. glass	2-CD
18NUR154	1082	bone	2-CD
18NUR155	1082	seed	2-CD
18NUR156	1083	mahogany wood pc.	3-D
18NUR157	1084	cask stave	4-D

Artifact Inventory cont.

Permanent #	Field #	Description	Provenience
August 16, 1988			
18NUR158	1085	sheathing	1-C
18NUR159	1086	bone	2-CD
18NUR160	1086	nut shell	2-CD
18NUR161	1086	ceramic	2-CD
18NUR162	1086	6 pcs. pane glass	2-CD
18NUR163	1086	4 pcs. bottle glass	2-CD
	1086	moulded trim	2-CD
	1086	nail concretion	2-CD
18NUR164	1087	gudgeon strap frag?	0-C
18NUR165	1088	nail	stern area
18NUR166	1088	ceramic	stern area
18NUR167	1088	4 pcs. bottle glass	stern area
18NUR168	1088	7 pcs. pane glass	stern area
18NUR169	1088	1 pc. glass	stern area
18NUR170	1088	nut shell	stern area
18NUR171	1088	nut shell	stern area
18NUR172	1088	nut shell	stern area
	1088	moulded wood trim	stern area
	1088	3 pcs. coal	stern area
August 17, 1988			
18NUR173	1089	mahogany wood pc.	3-D
18NUR174	1090	cask stave	4-D
18NUR175	1090	cask stave	4-D
18NUR176	1090	cask stave	4-D
18NUR177	1090	cask stave blank?	4-D
18NUR178	1091	4 pcs. mast hoop	3-D
18NUR179	1092	metal strap concretion	0-C
18NUR180	1093	sheathing/wood sample	1-D
18NUR181	1094	bottle frag. w/cork	0-C
18NUR182	1094	bottle glass	0-C
18NUR183	1095	metal spike	0-C
18NUR184	1096	metal concretion	0-C
18NUR185	1097	wooden bung	0-C
18NUR186	1097	ceramic	0-C
18NUR187	1097	5 pcs. pane glass	0-C
18NUR188	1097	bottle glass	0-C
18NUR189	1097	bottle glass	0-C
18NUR190	1097	5 pcs. bottle glass	0-C
18NUR191	1097	notched clay piece	0-C
18NUR192	1097	nut shell	0-C

Artifact Inventory cont.

<u>Permanent #</u>	<u>Field #</u>	<u>Description</u>	<u>Provenience</u>
August 18, 1988			
	1098	ceiling plank	4-D
18NUR193	1099	double-block fragment	4-D
18NUR194	1100	cask stave	3-C
18NUR195	1100	cask stave	3-C
	1101	deck beam	5-C
18NUR196	1102	2 pcs. pane glass	4-C
18NUR197	1102	nail	4-C
18NUR198	1102	nail	4-C
18NUR199	1102	nail	4-C
	1102	nail concretion	4-C
18NUR200	1102	3 pcs. brick	4-C
18NUR201	1102	bone	4-C
18NUR202	1102	bone	4-C
18NUR203	1102	bone	4-C
18NUR204	1102	nut shell	4-C
18NUR205	1102	nut shell	4-C
18NUR206	1102	nut shell	4-C
18NUR207	1102	nut shell	4-C
18NUR208	1102	peach seed	4-C
18NUR209	1102	mast hoop	4-C
18NUR210	1102	caulking	4-C
	1102	5 pcs. coal	4-C
18NUR211	1103	ceramic	4-C
18NUR212	1103	2 pcs. ceramic	4-C
18NUR213	1103	2 pcs. pane glass	4-C
18NUR214	1103	mica	4-C
18NUR215	1103	pipestem frag	4-C
18NUR216	1103	pipestem frag	4-C
18NUR217	1103	metal button	4-C
18NUR218	1103	CAAROLUS Coin/Button	4-C
18NUR219	1104	cask stave	7-D
18NUR220	1105	cask stave	7-D
18NUR221	1105	cask stave	7-D
August 19, 1988			
18NUR222	1106	cask stave	10-D
18NUR223	1107	metal bolt	keel trench
18NUR224	1108	cask stave	5-D

Artifact Inventory cont.

Permanent #	Field #	Description	Provenience
August 20, 1988			
18NUR225	1109	cask stave	8-D
18NUR226	1109	cask stave	8-D
18NUR227	1109	cask stave	8-D
18NUR228	1110	beveled wood	8-D
18NUR-A	1111	wood sample	keel
18NUR-B	1112	wood sample	stern post
18NUR-C	1113	wood sample	futtock
18NUR-D	1114	wood sample	limber board
18NUR-E	1115	wood sample	floor
18NUR-F	1116	wood sample	outer planking
18NUR-G	1117	wood sample	ceiling
18NUR-H	1118	wood sample	stem post
Assigned in Lab			
18NUR229	1119	bottle glass	2-C
18NUR230	1119	bottle glass	2-C
18NUR231	1119	mica	2-C
	1120	nail concretion	2-C
	1120	nail concretion	2-C
18NUR232	1120	nail concretion	2-C
18NUR233	1121	6 pcs. bottle glass	0-C
18NUR234	1121	8 pcs. pane glass	0-C
18NUR235	1121	bottle glass	0-C
18NUR236	1121	bottle glass	0-C
18NUR237	1121	ceramic	0-C
18NUR238	1121	bone	0-C
18NUR239	1121	caulking	0-C
	1121	nail concretion	0-C
18NUR240	1122	nail	keel trench
	1122	nails	keel trench
	1122	moulded wood trim	keel trench
	1122	trunnel	keel trench
	1122	6 pcs. coal	keel trench
18NUR241	1122	peach seed	keel trench
18NUR242	1122	bone	keel trench
18NUR243	1122	bone	keel trench
18NUR244	1123	6 pcs. pane glass	2-CD
18NUR245	1123	bottle glass	2-CD
18NUR246	1123	nut shell	2-CD
18NUR247	1123	nut shell	2-CD
18NUR248	1123	nut shell	2-CD

Artifact Inventory cont.

Permanent #	Field #	Description	Provenience
18NUR249	1123	nut shell	2-CD
18NUR250	1123	bull's eye	2-CD
18NUR251	1123	beveled wooden piece	2-CD
	1123	33 pcs. coal	2-CD
18NUR252	1123	spike	2-CD
18NUR253	1123	spike	2-CD
18NUR254	1123	nail	2-CD
18NUR255	1123	nail concretion	2-CD
18NUR256	1123	spike concretion	2-CD
18NUR257	1123	nail	2-CD
18NUR258	1123	nail	2-CD
	1123	nail concretion	2-CD
18NUR259	1123	metal strap fragment	2-CD
18NUR260	1123	bone	2-CD
18NUR261	1124	wooden sheave pin	2-D
18NUR262	1124	wooden sheave pin	2-D
18NUR263	1124	wooden piece	2-D
	1124	wooden/metal conc.	2-D
	1124	nail concretion	2-D
18NUR264	1124	nail	2-D
18NUR265	1124	pipestem fragment	2-D
18NUR266	1124	bone	2-D
18NUR267	1124	bone	2-D
18NUR268	1124	bone	2-D
18NUR269	1124	bone	2-D
18NUR270	1124	19 pcs. bottle glass	2-D
18NUR271	1124	3 pcs. pane glass	2-D
18NUR272	1124	2 pcs. bottle glass	2-D
	1125	2 pcs. moulded trim	3-CD
	1125	6 pcs. coal	3-CD
18NUR273	1126	brick fragment	4-C
18NUR274	1126	metal hinge	4-C
18NUR275	1126	spike	4-C
18NUR276	1126	nail	4-C
18NUR277	1126	nail	4-C
18NUR278	1126	spike	4-C
	1126	spike	4-C
18NUR279	1127	ceramic	4-CD
18NUR280	1127	ceramic	4-CD
18NUR281	1127	ceramic	4-CD
18NUR282	1127	ceramic	4-CD
18NUR283	1127	ceramic	4-CD
18NUR284	1127	ceramic	4-CD
18NUR285	1127	ceramic pipebowl frag.	4-CD

Artifact Inventory cont.

Permanent #	Field #	Description	Provenience
18NUR286	1127	4 pcs. pane glass	4-CD
18NUR287	1127	bottle glass	4-CD
18NUR288	1127	mica	4-CD
18NUR289	1127	bone	4-CD
18NUR290	1127	bone	4-CD
18NUR291	1127	coconut shell	4-CD
18NUR292	1127	nut shell	4-CD
18NUR293	1127	nut shell	4-CD
18NUR294	1127	nut shell	4-CD
18NUR295	1127	nut shell	4-CD
18NUR296	1127	seed	4-CD
18NUR297	1127	nail	4-CD
18NUR298	1127	nail	4-CD
18NUR299	1127	nail	4-CD
	1127	2 spike heads	4-CD
	1127	2 spike fragments	4-CD
	1127	11 pcs. coal	4-CD
18NUR300	1128	wooden sheave pin	4-CD
18NUR301	1128	wooden plug	4-CD
18NUR302	1128	bull's eye	4-CD
	1128	beveled wood piece	4-CD
	1128	beveled wood piece	4-CD
	1128	wooden piece	4-CD
18NUR303	1128	cask stave end	4-CD
18NUR304	1128	2 pcs. metal strap	4-CD
18NUR305	1128	nail	4-CD
18NUR306	1128	nail	4-CD
	1128	7 pcs.nail fragments	4-CD
18NUR307	1128	bone	4-CD
18NUR308	1128	coconut shell	4-CD
18NUR309	1128	nut shell	4-CD
18NUR310	1128	nut shell	4-CD
18NUR311	1128	nut shell	4-CD
18NUR312	1128	nut shell	4-CD
18NUR313	1128	nut shell	4-CD
18NUR314	1128	nut shell	4-CD
18NUR315	1128	brick fragment	4-CD
18NUR316	1128	clay?	4-CD
18NUR317	1128	cordage	4-CD
	1128	11 pcs. coal	4-CD
18NUR318	1129	moulded wooden piece	5-6-C
18NUR319	1129	6 pcs. mast hoops	5-6-C
18NUR320	1129	ceramic	5-6-C
18NUR321	1129	bone	5-6-C

Artifact Inventory cont.

Permanent #	Field #	Description	Provenience
18NUR322	1129	bone	5-6-C
18NUR323	1129	2 pcs. lead	5-6-C
	1129	2 pcs. nail frags	5-6-C
18NUR324	1130	2 pcs. mast hoops	6-7-D
18NUR325	1130	3 pcs. bottle glass	6-7-D
18NUR326	1130	2 pcs. pane glass	6-7-D
18NUR327	1130	bone	6-7-D
18NUR328	1130	nut shell	6-7-D
18NUR329	1130	lead	6-7-D
18NUR330	1130	brick	6-7-D
	1130	5 pcs. nail frags	6-7-D
18NUR331	1131	mast hoop fragment	11-CD
	1131	nail	11-CD
	1131	7 pcs. coal	11-CD
	1132	5 pcs. coal	12-CD
18NUR332	1133	metal strap	unprov.
	1133	2 spike fragments	unprov.
18NUR333	1134	wooden sheave pin	unprov.
18NUR334	1134	nail	unprov.
18NUR335	1134	pipestem fragment	unprov.
18NUR336	1134	6 pcs. bottle glass	unprov.
18NUR337	1134	bottle glass	unprov.
18NUR338	1134	6 pcs. pane glass	unprov.
18NUR339	1134	bone	unprov.
18NUR340	1134	bone	unprov.
18NUR341	1134	bone	unprov.
18NUR342	1134	bone	unprov.
18NUR343	1134	bone	unprov.
18NUR344	1134	bone	unprov.
18NUR345	1134	nut shell	unprov.
18NUR346	1134	nut shell	unprov.
18NUR347	1134	nut shell	unprov.
18NUR348	1135	wooden sheave pin	unprov.
18NUR349	1135	wooden wedge?	unprov.
18NUR350	1135	bone	unprov.
18NUR351	1135	nail	unprov.
18NUR352	1135	2 pcs. leather	unprov.
18NUR353	1136	bottle glass	unprov.
18NUR354	1136	coconut shell	unprov.
18NUR355	1136	nut shell	unprov.
18NUR356	1136	nut shell	unprov.
18NUR357	1136	nail	unprov.
	1136	2 pcs. nail frags	unprov.
	1136	trunnel	unprov.

Artifact Inventory cont.

Permanent #	Field #	Description	Provenience
	1136	7 pcs. coal	unprov.
	1137	beveled wooden pc.	unprov.
	1137	metal strap frag	unprov.
18NUR358	1138	6 pcs. mast hoops	unprov.
18NUR359	1138	beveled wood trim	unprov.
18NUR360	1138	3 pcs. stave ends	unprov.
	1138	6 pcs. spike frags	unprov.
18NUR361	1138	coal	unprov.
	1138	4 pcs. coal	unprov.
18NUR362	1139	metal concretion	unprov.
18NUR363	1140	metal spike	unprov.
18NUR-I	-	wood sample	trunnel
18NUR-J	-	wood sample	mast hoop
18NUR-K	-	wood sample	sheathing
18NUR-L	-	wood sample	cask stave

Appendix F

Known Shipwrecks Located in the lower Neuse River Near New Bern

Vessels documented as a result of historical research.

Name of Vessel	Type	Tons	Built	Cause	Date Lost	Place	Reference
<i>Albemarle</i>	steam s.w.	183	1855	ran on piles	Apr 05 1862	New Bern	3
<i>Caswell</i>	steamer	-	-	hit obstruction	Sep 30 1872	Neuse River	4
<i>Charming Sally</i>	sloop	-	-	drove ashore	Sep 6,7 1769	New Bern	17
<i>Connecticut</i>	barge	473	1915	burnt	Jun 10 1931	New Bern	2
<i>Cumberland</i>	sloop	-	-	drove ashore	Sep 6,7 1769	New Bern	17
<i>Deb</i>	schooner	-	-	hit obstruction	1876	Neuse River	8
<i>Deborah</i>	sloop	-	-	drove ashore	Sep 6,7 1769	New Bern	17
<i>Deer</i>	steam s.w.	130	1852	burnt	Feb 26 1879	Newbern	2
<i>Defiance</i>	steamer	-	-	sunk	Oct 15 1884	New Bern	12
<i>Diamond</i>	sloop	-	-	drove ashore	Sep 6,7 1769	New Bern	17
<i>Diamond State</i>	barge	380	1898	burnt	Jun 10 1931	New Bern	2
<i>Edward D. McNair</i>	steam s.w.	71	1836	stranded	Sep 29 1841	Newbern	2,7
<i>Farmer's Daughter</i>	sloop	-	-	unknown	1809	Neuse River	8
<i>Fitzherbert</i>	sloop	-	-	drove ashore	Sep 6,7 1769	New Bern	17
<i>Friendship</i>	schooner	-	-	unknown	1806	Wilkerson's Point	8
<i>John E. Wales</i>	oil screw	88	1918	stranded	Apr 18 1930	Neuse River	2
<i>Lucitania</i>	schooner	-	-	drove ashore	Sep 6,7 1769	New Bern	17
<i>Minquas(s)</i>	steam s.w.	160	1864	burnt	Apr 07 1865	Neuse River	2
<i>Pearlie May</i>	steam screw	-	1893	unknown	1911	Neuse River	8
<i>Polly</i>	sloop	-	-	drove ashore	Sep 6,7 1769	New Bern	17
<i>Rough and Ready</i>	steamer	-	-	unknown	1849	Neuse River	7
<i>Sally</i>	sloop	-	-	drove ashore	Sep 6,7 1769	New Bern	17
<i>Sally and Betsey</i>	brig	-	-	drove ashore	Sep 6,7 1769	New Bern	17
<i>Sea Bird</i>	schooner	-	-	destroyed	May 22 1863	New Berne	3
<i>Sweet Pea</i>	oil screw	77	1942	burnt	Nov 12 1959	Cypress Point, Neuse R.	2
<i>Sydney</i>	sloop	-	-	drove ashore	Sep 6,7 1769	New Bern	17
<i>Tryal</i>	sloop	-	-	drove ashore	Sep 6,7 1769	New Bern	17
<i>USS Underwriter</i>	steam. s.w.	341	-	burnt	Feb 02 1864	Foster's Wharf, Neuse R.	2
<i>Wayne</i>	steamer	-	-	burned	March 1848	New Bern harbor	7
Unidentified	sloop	-	-	stoved at wharf	Sep 6,7 1769	Smith's Wharf, Neuse R.	9
Unidentified	sloop	-	-	drove on edifice	Sep 6,7 1769	Smith's Wharf, Neuse R.	9

Name of Vessel	Type	Tons	Built	Cause	Date Lost	Place	Reference
Unidentified	sloop	-	-	breached	Aug 26 1775	Edis's Wharf, New Bern	6
Unidentified	brig	-	-	drove ashore	Sep 6,7 1769	Near Lawson's Creek	9
Unidentified (2)	sloops	-	-	drove ashore	Sep 6,7 1769	Near Lawson's Creek	9
Unidentified (2)	unknown	-	-	sunk by storm	1795	New Bern harbor	13
Unidentified Vessels	"a number of small vessels, of 16 or 20 tons "			drove ashore	Sep 6,7 1769	New Bern	17
Unidentified Vessels	"several ships belonging to John Stanley"			burnt	1776-81	New Bern	13
Unidentified Vessels	"a number of schooners and small boats"				May 26 1863	Near Wilkinson's Point	3

Vessels documented as a result of cultural surveys.

Name of Vessel	Type	Tons	Built	Cause	Date Lost	Place	Reference
Duck Creek 0017NUR	motor yacht	-	-	unknown	-	Duck Creek	10
Duck Creek #1	unknown	-	-	unknown	-	Duck Creek	15
Duck Creek #2	barge	-	-	unknown	-	Duck Creek	15
Duck Creek #3	skiff	-	-	unknown	-	Duck Creek	15
Efird Wreck 0003NUR	steamer	-	-	unknown	-	New Bern Lot #7 wharf	11
Wreck 0004NUR	unknown	-	-	unknown	-	James City, Neuse R.	8
Wreck 0005NUR	unknown	-	-	unknown	-	James City, Neuse R.	8
Bridgeton 0010NUR	schooner	-	-	unknown	-	Neuse River	16
Marker 39 Wreck	steamer	-	-	unknown	-	Neuse River	16
Black Beacon Pt. Wreck	schooner	-	-	unknown	-	Neuse River	16

Vessels sunk as obstructions in blockades.

Name of Vessel	Type	Tons	Built	Cause	Date Lost	Place	Reference
<i>Angelina</i>	schooner	-	-	sunk as obstruction*	-	Fort Point Blockade	14
<i>Isaac W. Hughes</i>	schooner	127	1849	sunk as obstruction*	-	Fort Point Blockade	14
<i>Lorena</i>	schooner	-	-	sunk as obstruction*	-	Fort Point Blockade	14
<i>Nautilus</i>	schooner	-	-	sunk as obstruction*	-	Fort Point Blockade	14
<i>Sea Witch</i>	schooner	-	-	sunk as obstruction*	-	Fort Point Blockade	14
<i>W.S. Robbins</i>	schooner	-	-	sunk as obstruction*	-	Fort Point Blockade	14
Unidentified	brig	-	-	sunk as obstruction*	-	Fort Point Blockade	14
Unidentified (8)	unknown	-	-	sunk as obstructions	-	Batchelor's Crk Blockade	14

*These vessels were subsequently blown up in place on October 4, 1878 to clear the Neuse River channel.

Reference Sources to Shipwreck List

1. *Merchant Steam Vessels of the United States, 1790-1868*. William M. Lytle and Forrest R. Holdcamper (Staten Island, New York: The Steamship Historical Society of America, Inc., 1975)
2. *Encyclopedia of American Shipwrecks*, Bruce D. Berman, (Boston, Mass.: The Mariners Press, 1972).
3. *Shipwrecks of the Civil War*, Donald G. Shomette, (Washington, D.C.: Donic Ltd., 1973).
4. *The Weekly Star*, Wilmington, N.C., October 11, 1884.
5. *The Weekly Star*, Wilmington, N.C., October 15, 1884.
6. *The Maryland Gazette*, October 5, 1775.
7. *Steam Navigation in North Carolina prior to 1860.*, Sarah Woodall Turlington 1933 M.A. Thesis, University of North Carolina, Chapel Hill; *Inland Steam Navigation in North Carolina, 1818-1900*, Thomas H. Sloan, M. A. Thesis, Department of History, East Carolina University, Greenville, N.C.
8. North Carolina Division of Archives and History Site Files, Underwater Archaeology Unit, Wilmington, NC.
9. *The Colonial and State Records of North Carolina*, William L. Saunders, compiler (Raleigh: The State of North Carolina).
10. A Survey of Duck Creek, North Carolina. Tidewater Atlantic Research, 1986.
11. A Cultural Resource Survey of the Efird Company Property New Bern, North Carolina, Gordon P. Watts, Thomas Hargrove and Michael Hamm District, U.S. Army Corps of Engineers).
12. *The Weekly Star*, Wilmington, N.C., October 17, 1884.
13. *A History of New Bern and Craven County*. Alan D. Watson, (New Bern: Tryon Palace Commision, 1987).
14. *Morning Star*, Oct. 5, 1878
15. ECU Program in Maritime History and Underwater Research field school report (On file East Carolina University, Greenville, NC).
16. North Carolina Division of Archives and History and East Carolina University Field School files.
17. *Pennsylvania Gazette*, October 1769