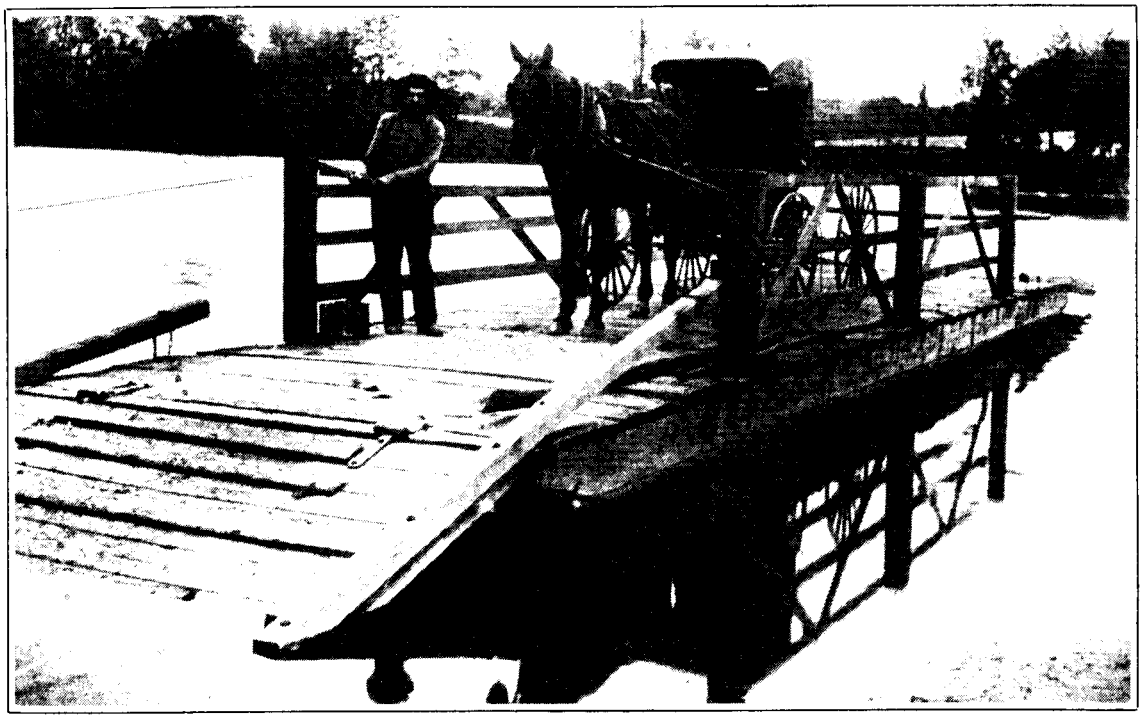

An Investigation of

Blossom's Ferry

on the

Northeast Cape Fear River

by

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ABSTRACT

Since the discovery of vessel remains on the bottom of the Cape Fear River at Blossom's Ferry in 1980, East Carolina University has carried out a series of investigations to identify and document several wrecks, and survey the bottom environment at the site. On the basis of archaeological data collected during brief reconnaissance surveys in 1981 and 1982, and historical research undertaken in 1982, a grant was secured from the National Trust for Historic Preservation to thoroughly document the remains of two early ferries dating from the mid-18th and late 18th/early 19th centuries. During a five-week investigation in September and October 1983, a team of staff and students from the Program in Maritime History and Underwater Research at East Carolina University excavated and recorded the two ferries. A preliminary bottom surface reconnaissance was carried out to locate and identify additional material associated with bridge and ferry operations at Blossom's Ferry. From this data plans and research models of both vessels have been developed. Efforts are underway to identify sources of funding to continue the investigation of a third vessel and the structural remains of a bridge that existed at Blossom's Ferry during the late 18th or early 19th century. Research at the site has confirmed both the historical and archaeological importance of Blossom's Ferry, the potential for additional investigation, and the necessity to protect the site from disturbance.

ACKNOWLEDGEMENTS

Investigation of the Blossom's Ferry vessels would not have been possible without the generous assistance of the National Trust for Historic Preservation. Funding from the National Trust provided operating funds that supported staff and students; equipment was provided by the East Carolina University Program in Maritime History and Underwater Research. For their unflagging support and assistance, special thanks must go to Ms Lynn Hickerson of the Maritime Preservation Office of the National Trust and Dr. Fred Ragan, Chairman of the East Carolina University Department of History. Additional thanks must go to Mr. Robert Edwards and Mr. Curtis May in the Office of Grants Administration, for their invaluable assistance in project administration.

Without the assistance of graduate students in the Program in Maritime History and Underwater Research we would not have been able to accomplish many aspects of the Blossom's Ferry investigation. This was particularly true for on-site field research. During every phase of field operations students proved an enthusiastic and competent project staff. The first reconnaissance in the fall of 1981 was carried out with assistance from Wesley K. Hall and Rob Reedy. The preliminary survey of the vessels in 1982 was assisted by James L. Cox, Jr., David Moore, Sam Newell, and Brian Watson. In 1983 Wesley K. Hall, Stuart Morgan, Kim Elmore, and Rick Herron assisted in field research activity. Vessel -specific data collected during the survey was developed in research model form by Robert Schneller during his tenure as graduate assistant. Additional recognition must go to Julie Melton, Kaea Morris, and Brina Agranat for their assistance in editing and developing report graphics that included maps, plans, and artifact illustrations. Brina Agranat also edited and coordinated the printing of this report. Conservation of material recovered from Blossom's Ferry is still in progress. The assistance of Brad Rogers, Bruce Terrell, Chris Cunanan, an Susan Peele has been instrumental in what has been accomplished to date. David Cooper designed the travelling educational exhibit on the Blossom's Ferry Project.

Dina B. Hill's valuable assistance with historical research, grant proposal development, and project administration must be acknowledged. Finally, the authors would like to thank Mr. Thomas P. Pearsall of Rocky Point, North Carolina for providing valuable local knowledge and assistance in berthing MURPHY BASE during on-site operations.

INTRODUCTION

For over two hundred years ferry service provided instrumental links in the transportation network that developed in America. Until well into the 19th century ferries made travel along poorly developed roadways practical. Although critical to travel and transportation, ferries received little vessel-specific attention in the surviving historical records. Virtually all of the surviving documentary evidence associated with the operation of ferries pertains to the issuance of licenses, regulations governing the operations of ferries, and a few references to the location, facilities, and operators of such enterprises. Only the rarest references concern the vessels used in the trade. Until the discovery of two well-preserved vessels at the site of Blossom's Ferry on the Northeast Cape Fear River north of Wilmington, North Carolina, artists' illustrations and later photographs served as the most reliable source of specific architectural and construction data.

Since discovery of the vessels in 1980, the Blossom's Ferry site has been the object of a series of investigations carried out by the Underwater Archaeology Branch of the North Carolina Division of Archives and History and the staff and students of the East Carolina University Program in Maritime History and Underwater Research. Based on a preliminary reconnaissance of the site in 1981, and a more detailed examination of the vessels in 1982, plans were formulated for a major investigation designed to document the vessels. Historical research and the construction of scale models based on data from previous on-site research identified a series of research priorities for the project. Those priorities were integrated into a research design for a project carried out during the fall of 1983.

With assistance from the National Trust for Historic Preservation, the staff and second-year graduate students in the Program in Maritime History and Underwater Research conducted a detailed investigation during the 1983 fall research semester. Operating from MURPHY BASE, an LCM-6 converted to serve as a research platform for the Program, the project team spent five weeks at Blossom's Ferry. After mapping the site, the interior of each vessel was cleared of sediment. The remains of the ferries were thoroughly documented along with artifacts exposed by excavation within the hull. A reconnaissance of the site was made during the final week of the investigation and the remains of a third vessel were identified.

Historical and archaeological research associated with the Blossom's Ferry investigation has yielded a considerable body of data associated with the design, construction, and operation of early North Carolina ferries. On-site investigation has confirmed the importance of Blossom's Ferry as a unique source of insight into transportation history and illuminated the need for further research.

LOCATION OF THE SITE

Blossom's Ferry is located on the Northeast Cape Fear River on the border between New Hanover and Pender Counties, one mile east-northeast of the community of Castle Hayne, and approximately nine miles north of Wilmington, N.C. Both vessels documented during the survey lie adjacent to the south bank of the Northeast Cape Fear River 7/10ths of one mile east of the Highway 117 bridge connecting New Hanover and Pender Counties. Geographical coordinates for the site are 77 53' 05" west longitude and 34 21' 29" north latitude (Figures 1-3). Universal Transverse Mercator coordinates for the site are N3806125 / E2345000.

DESCRIPTION OF THE SITE

In the vicinity of Blossom's Ferry the Northeast Cape Fear is a freshwater river, but it is subject to tidal fluctuations. Observed currents varied between approximately .2 knots at flood and approximately .4 knots at maximum ebb during the project. At maximum ebb water depth varied from 10 feet 9 inches to 18 feet over the remains of the ferry vessels. Maximum depth of the Northeast at the Blossom's Ferry Site is 25 feet 4 inches near the center of the river channel. Due to the transport of sediment, water depth at the site is subject to periodic variations.

With the exception of the channel shoulders which are formed from clay and, at least in part, covered by decaying vegetation, the bottom is composed of Castle Hayne marl scoured clean by the river. Sand, mud, decaying vegetation, and other natural material form random deposits at the base of the channel shoulders and in areas where currents are not sufficient to maintain constant scouring. At Blossom's Ferry bottom deposits also include rock, brick, cut logs, timbers, and a variety of cultural material spanning at least 250 years of occupation.

Because the Northeast Cape Fear originates in bottomland hardwood swamps, water at Blossom's Ferry contains a high tannin content. Produced by decaying vegetation, this acid discolors the river, creating a "black" water environment that restricts light below a depth of five to six feet. Visibility on the bottom at Blossom's Ferry is entirely dependent upon artificial light sources and generally varied from two feet to approximately four feet.

HISTORICAL BACKGROUND

European exploration of what is today southeastern North Carolina began early in the sixteenth century. In 1524 the French explorer Giovanni da Verrazano visited the coast and made sufficient

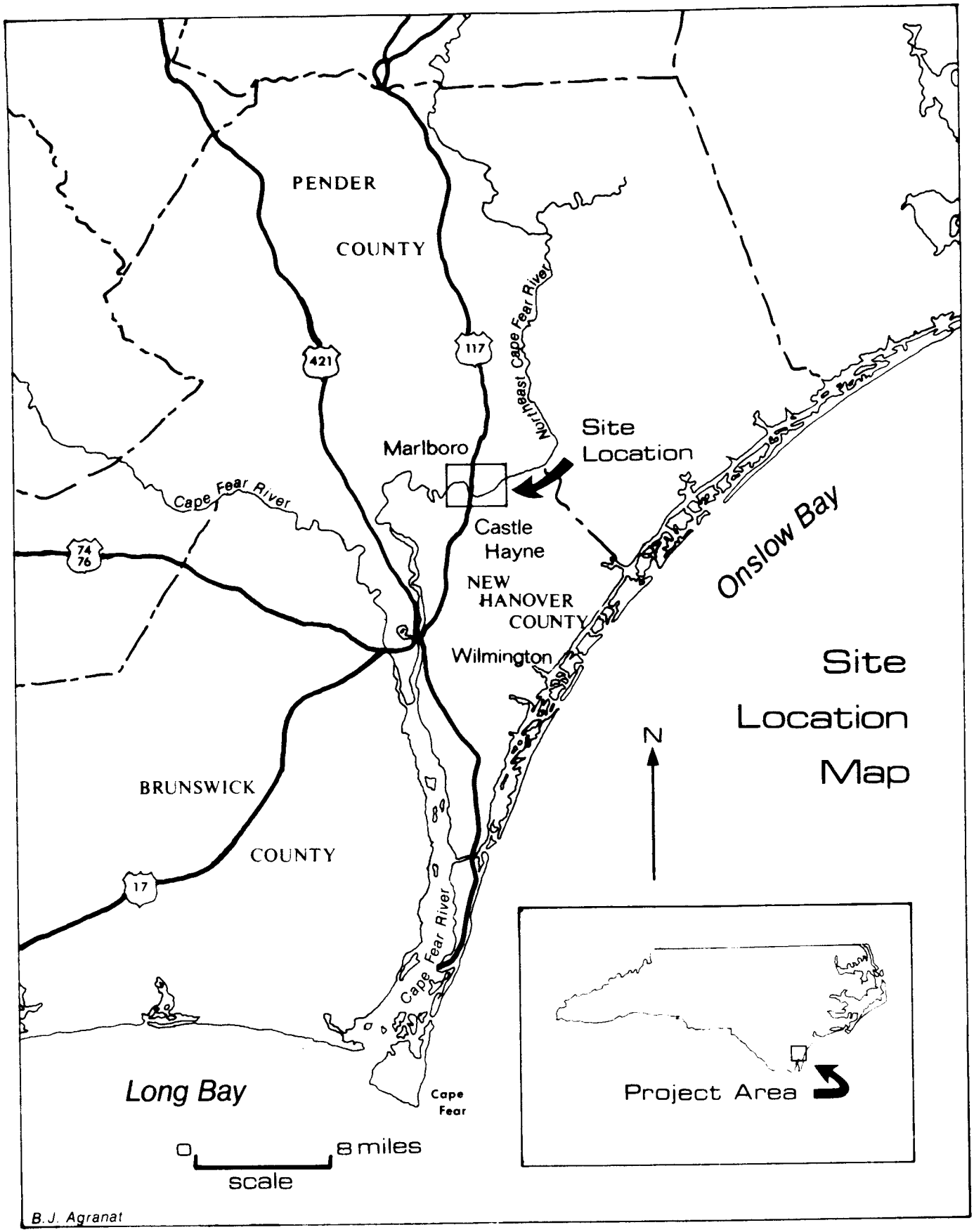
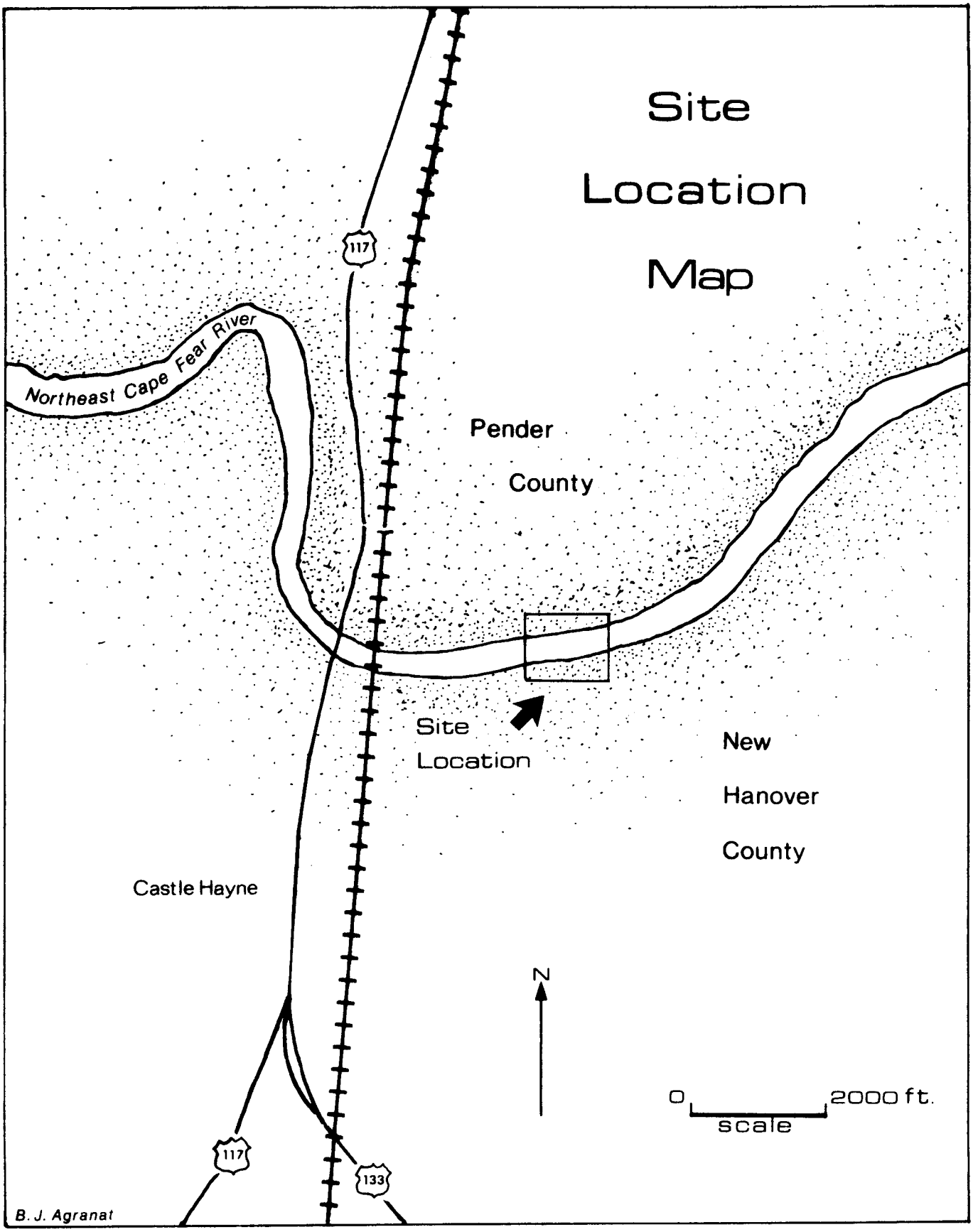

PENDER
COUNTY
421
117
Northeast Cape Fear River
Site
Location
Marlboro
Cape Fear River
74
76
Castle
Hayne
NEW
HANOVER
COUNTY
Wilmington
Onslow Bay
Site
Location
Map
N
BRUNSWICK
COUNTY
17
Cape Fear River
Long Bay
Cape
Fear
0
8 miles
scale
Project Area
B.J. Agranat

Figure 1.


Site
Location
Map
117
Northeast Cape Fear River
Pender
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Castle Hayne
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B. J. Agranat

Figure 2.

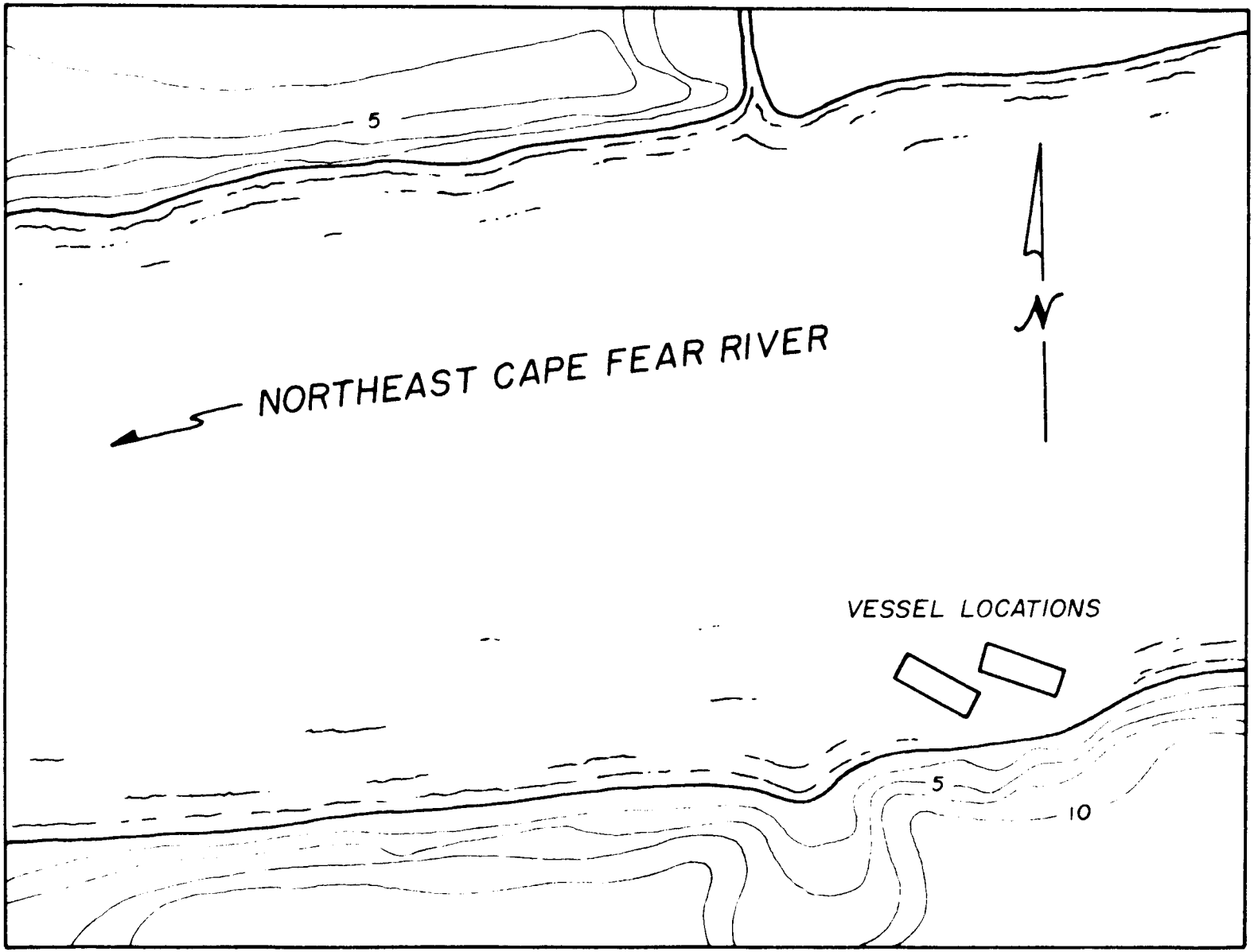


Figure 3. Location of Ferries.

observations to support enticing accounts of the areas natural resources that could be circulated in France to generate interest in colonization of North America (Reaves, 1978: 1). Two years after da Verrazano sailed along the coast Lucas Vasquez de Ayllon, a Spaniard from the island of Hispanola, brought an expedition into the area. Blown north of his original destination by a tropical storm, de Ayllon lost one of his ships during an attempt to navigate the bar of a river in the vicinity of 34 degrees north latitude (Saunders, 1886-1890: XXV, 506-507 and Lowery, 1911: 160-163). Although de Ayllon subsequently abandoned his effort to establish a settlement in the area, he remained long enough to conduct local explorations and construct a replacement for his lost vessel. Although 16th century Spanish colonial activity along the eastern seaboard is well documented, little, if any attention or support was devoted to developing permanent bases along the North Carolina coast (Lee, 1965: 11).

English interest in developing claims to the North American continent received considerably more attention and support than those of the Spanish. Although unsuccessful, Sir Walter Raleigh's Roanoke Island settlements established the English presence in North America during the last quarter of the 16th century (Quinn, 1984: 4-5). Once that claim had been reinforced by a permanent settlement at Jamestown, Virginia grants to encourage the development of other areas were forthcomming. In 1629 King Charles I granted the Cape Fear region to Sir Robert Heath. When Heath proposed to establish a colony of French Huguenots along the river and exploit the Cape Fear's extensive natural resources, King Charles reconsidered. Desiring only loyal subjects with strong ties to the Church of England in his New World settlements, the King required that the grant be turned over to Lord George Berkley (Andrews, 1939: 202). Berkley failed to pursue the matter, however, and the issue languished for more than three decades (Lee, 1965: 24).

Interest in the Cape Fear area revived in 1662 when Captain William Hilton explored the river for a group of New England settlers. Finding the land habitable and rich in natural resources, Hilton successfully negotiated with the Indian inhabitants for title to a large section of land along the Lower Cape Fear and returned to New England to recruit settlers. The first colonists arrived in 1662 and quickly built a small settlement called Charles Towne in honor of their English monarch. Within four months the colony was abandoned and the settlers returned to New England (Lowery, 1911: 146-159).

In 1663 Captain Hilton returned to the Cape Fear to furthur explore the area on behalf of a group from the island of Barbados. Impressed with Hilton's assessment of the region, John Vassal financed an expedition which arrived off the coast in May 1664. The Barbadians established a loosely organized settlement called Clarendon approximately 20 miles upstream from the mouth of the river. Trouble with the Indian inhabitants and lack of the support necessary to maintain the colony forced Vassal's settlers to abandon the colony in

1667 (Reaves, 1978: 1-2). Problems with the Indians were additionally complicated by the activities of pirates operating in the area and the Lords Proprietors elected to close the Cape Fear to settlers. Clarendon was the last attempt to establish a permanent settlement until the end of the first quarter of the 18th century (Lee, 1965: 33).

With the support of George Burrington, Royal Governor of the North Carolina Colony, Colonel Maurice Moore obtained a Land Grant containing title to 1500 acres on the west bank of the Cape Fear River in 1725 where he established the port of Brunswick Towne that same year(Lee, 1965: 118). In 1729 the English Crown purchased the Carolinas from the Lords Proprietors and established two separate colonies. On November 27,1729, New Hannover precinct was created by the General Assembly of North Carolina, and the port of Brunswick Towne was designated as the county seat (Lee, 1965: 109).

Brunswick Towne developed rapidly into the most active port in the colony. Natural resources provided the basis for a naval stores industry that developed to make Port Brunswick the colony's major trading center. Sawn lumber, shingles, and staves produced by mills and plantations along the Cape Fear funneled additional trade downriver to Colonel Moore's development. As plantations developed, exports included corn, rice, and indigo. With good deep-water access to both the ocean and interior, Brunswick Towne developed into one of the most productive seaports on the southeast coast (Lee, 1965: 161-169).

Unfortunately, the deep-water access that contributed so much to the success of the Port of Brunswick also contributed to its decline by providing ready access to Spanish privateers who destroyed shipping and attacked the town in 1748, and British warships that disrupted trade during a conflict that developed into the American Revolution. Perhaps the most significant factor that contributed to the decline of the port of Brunswick Towne was the establishment and growth of the settlement of New Carthage (Lee, 1965: 166; Watson, 1974:122). Located at the confluence of the Cape Fear and Northeast Cape Fear rivers, the town grew rapidly in both size and commercial activity, despite British support of Brunswick as the official port through which all Cape Fear River shipping cleared. By 1769 New Carthage was incorporated into the Town of Wilmington and had replaced Brunswick Towne as the seat of county government (State Records, XXIII: 133-135).

Growth of the town of Wilmington was supported, at least in part, by continued development of the lands along the Cape Fear and Northeast Cape Fear rivers. Prior to 1731 almost 115,000 acres had been deeded to private ownership through grants. The majority of this property was held by a group of 35 individuals and was developed into large plantations supported by slave labor. By 1733 John Watson had acquired by Crown warrant a 640-acre tract on the east bank of the Cape Fear River near the confluence with the Northeast Cape Fear. James Wimble aquired almost half of the property and by April 1733 had laid out the

plan of New Carthage. Wimble joined Watson, merchant Joshua Grainger, and tavern keeper Michael Higgins in the development of a larger settlement to be called New Liverpool (Lee 1965, 123-127).

To distinguish the settlement from Brunswick Towne, however, the name was changed to New Town and subsequently Newton. By 1740 the North Carolina Assembly introduced and Governor Gabriel Johnston approved, "An Act for Erecting the Village called Newton in New Hanover County into a Town & Township, by the name of Wilmington, & for Regulating & ascertaining the Bounds thereof" (Colonial Records, IV: 492, 510-511, 515). Despite continued opposition from proponents and supporters of Brunswick Towne, Wilmington continued to grow. On February 25, 1760 a borough charter was signed by Governor Arthur Dobbs. The charter provided the town with authority to hold markets, sponsor fairs, conduct court, and establish a government consisting of mayor, recorder, aldermen, and common council.

Wilmington's continued development was also fostered by the settlement of towns along the Cape Fear and Northeast Cape Fear. In 1773, William McRee proposed, and the North Carolina Assembly approved, a bill establishing Elizabeth Town on the west bank of the Cape Fear approximately 50 miles above Wilmington (Lee, 1965: 141). On the Northeast Cape Fear River, Alexander Lillington, Samuel Ashe, Thomas Merrick, John Gardner and Henry Skibbow organized the town of New Exeter about two miles below the mouth of Holly Shelter Creek. Although incorporated in 1754 and supported by some of the most prominent plantation owners on the river, New Exeter never developed beyond a small community (Lee, 1965: 143). Although Duplin County, immediately north of New Hanover, failed to support development of a town called South Washington as late as the American Revolution, the area supported extensive naval stores and agricultural activity.

As early as 1731 that activity had been sufficient to justify the operation of a ferry on the Northeast Cape Fear River. The ferry was constructed and operated by John Marshall and served the road that connected Duplin County to what would become the port of Wilmington. Marshall's ferry was located on a substantial tract of land on the Northeast Cape Fear River north of Wilmington. Marshall's property had been part of an extensive tract of land originally granted to Anthony Green in 1729 as an inducement to participate in the development of a system of large plantations along the river (Bath County Land Grants, 1705-1734: Vol. 1729-3-391). While historical records provide no specific insight into the earliest operation of the ferry, it is apparent that John Marshall had initiated the service prior to the production of Edward Mosley's map of North Carolina. Mosley's map, printed in 1733, specifically identifies Marshall's Ferry (Figure 4).

After operating the ferry for almost a decade, John Marshall sold both his property and the ferry license to Joseph Blake in 1742. John Howe, who subsequently purchased the operation from Blake almost a decade later, conveyed the ferry to Captain Benjamin Heron in 1755 as a gift to celebrate Heron's marriage to Howe's daughter (Kellum Collection,

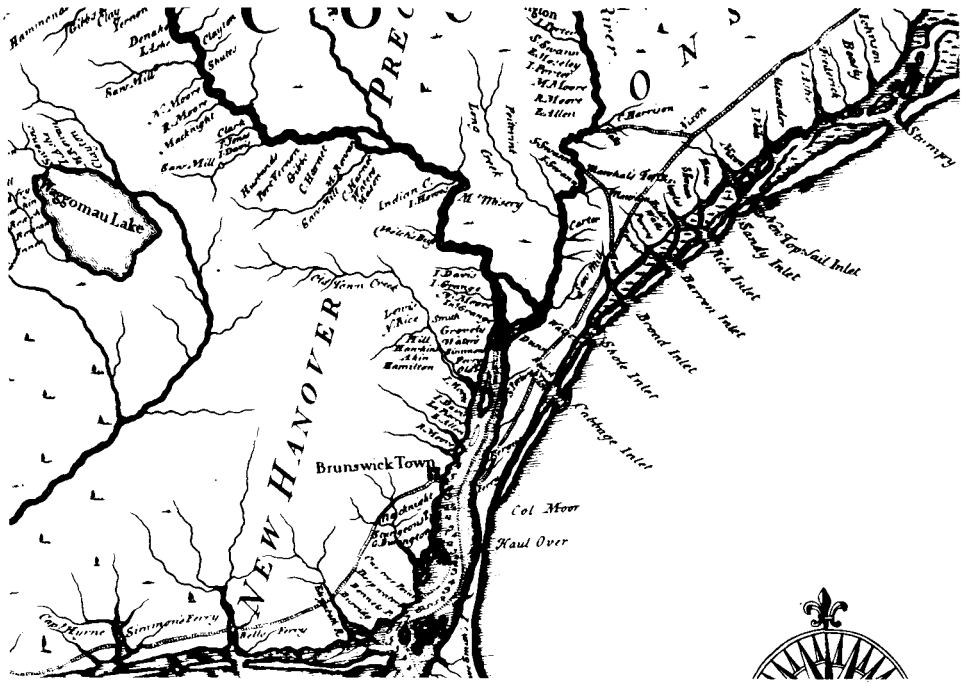


Figure 4. Section of 1733 map by Edward Mosely showing the location of Marshall's Ferry on the Northeast Cape Fear River.

Figure 5. The site of "Big Bridge" on an 1808 map by Jonathan Price and John Strother.

1978). Unlike the previous owners, Heron did not operate the ferry himself. Instead, Edward Davis was hired or permitted to lease the concession. By 1759 Davis operation was sufficient to merit petitioning the New Hanover County Court for a permit to construct and operate an ordinary to accomodate travelers using the ferry (Walker, 1958: 113). Davis continued to manage the operation until 1766 and perhaps as late as 1769, when Elizabeth Heron McKenzie obtained the property through her father's will (New Hanover County Will Book C: 137).

Before his death, Captain Heron had also constructed a drawbridge at the ferry site. According to his 1766 authorization from the colonial assembly, Heron was to construct the bridge with

> one wide arch of thirty feet for rafts and pettiauguas to pass through, and six feet high above the high water mark, and be made to draw up occasionally for the navigation of vessels of large burthen (Saunders, XXV: 506-507).

In spite of the engineering problems associated with the construction of a 30-foot mechanical span, the enterprising Heron completed the project prior to 1770 when the structure was identified on a map by John Collet. In her Journal of a Lady of Quality , Miss Janet Schaw, a British traveler who visited southeastern North Carolina, provided a graphic description of life along the Cape Fear River in the months immediately preceeding the American Revolution. While describing the "great road" that linked Wilmington and the plantations of the Northeast Cape Fear, Miss Schaw noted that Captain Heron's bridge

> tho' built of timber is a truly noble one, broader than that over the Tay at Perth. It opens at the middle to both sides and rises by pullies, so as to suffer Ships to pass under it (Andrews, 1939: 202).

The bridge was operated apparently in conjunction with a ferry until 1781 when it was destroyed by a detatchment of British soldiers under the command of Major James Craig shortly after Lord Cornwallis occupied Wilmington. In addition to the drawbridge, Major Craig's sortie into northern New Hanover County resulted in the destruction of several "public store ships and their contents," which had been removed from Wilmington prior to Cornwallis' occupation (Dickerson mss, 1784-1790, P.C. 1088). One of the vessels was inadvertently run aground and burned; two more proved too broad in the beam to pass through the 30-foot span of Heron's bridge.

After the American Revolution, a second bridge was constructed at the site. Although there is no historical confirmation, it is possible that the bridge was erected by Benjamin Heron's daughter Elizabeth and her husband John McKenzie. An 1829 reference to "Big Bridge," as the structure was called, indicated that both the bridge and its associated property had been transferred to William Campbell in

January 1794 (New Hanover County Deed Book O, NCDAH: 156). How long the bridge survived is unknown. A map prepared by Jonathan Price and John Strother and published in 1808 identified that location as the site of "Big Bridge" (Figure 5). When James F. McRee purchased the property at public auction in January 1853, however, no mention of either the bridge or ferry was recorded (New Hanover County Deed Book KK, NCDAH: 204). Six years later, when George Aviritt purchased the property, his deed included "the bridge or ferry" indicating some confusion about exactly what did exist at the site. Aviritt appears to have operated the ferry or possibly a bridge, throughout the Civil War. By 1866, when he sold the property to Jackson Wood, the bridge had ceased to exist, possibly destroyed as Confederate General Braxton Bragg retreated across the Northeast Cape Fear River in Februry 1865. Wood's title included only "the ferry known as Big Bridge Ferry" (New Hanover County Deed Book UM, NCDAH: 294).

Jackson Wood, and subsequently his nephew John E. Wood, maintained the ferry operation until 1882 when, in January of that year, the property and concession to operate the ferry were purchased by Margaret Sophia Blossom (New Hanover County Deed Book RRR, 462). She and her husband Samuel continued the service until his death in 1926 (Figures 6,7; Cross, 1979). By that time the construction of a state-maintained bridge less than a mile west of the "Blossom's Ferry" site eliminated the need for a ferry and brought to a halt almost 200 years of transportation activity.

PREVIOUS WORK

Blossom's Ferry was identified as an archaeological site during a survey of New Hanover County carried out by the Underwater Archaeology Branch of the North Carolina Division of Archives and History. The New Hanover County Archaeological Survey was funded through Title II of the Comprehensive Employment and Training Act of 1973. CETA funding permitted a project staff of 10 to operate in New Hanover County from July 1977 until July 1978. Although no indication of the site's underwater potential was recognized at that time, Blossom's Ferry was one of almost 600 archaeological sites documented during the project (Wilde-Ramsing, 1977).

The first indication of the nature and scope of the archaeological record preserved underwater at the Blossom's Ferry site came to light when Wesley K. Hall made a reconnaissance dive in the area in 1979. That initial examination of the site identified the remains of a vessel and confirmed the presence of a considerable amount of 18th century cultural material. In reporting his findings to the Underwater Archaeology Branch of the North Carolina Division of Archives and History, Hall strongly recommended a survey of the site to identify and assess the wreck.

Based on Hall's recommendations, the river in the vicinity of Blossom's Ferry was surveyed using a proton precession magnetometer in

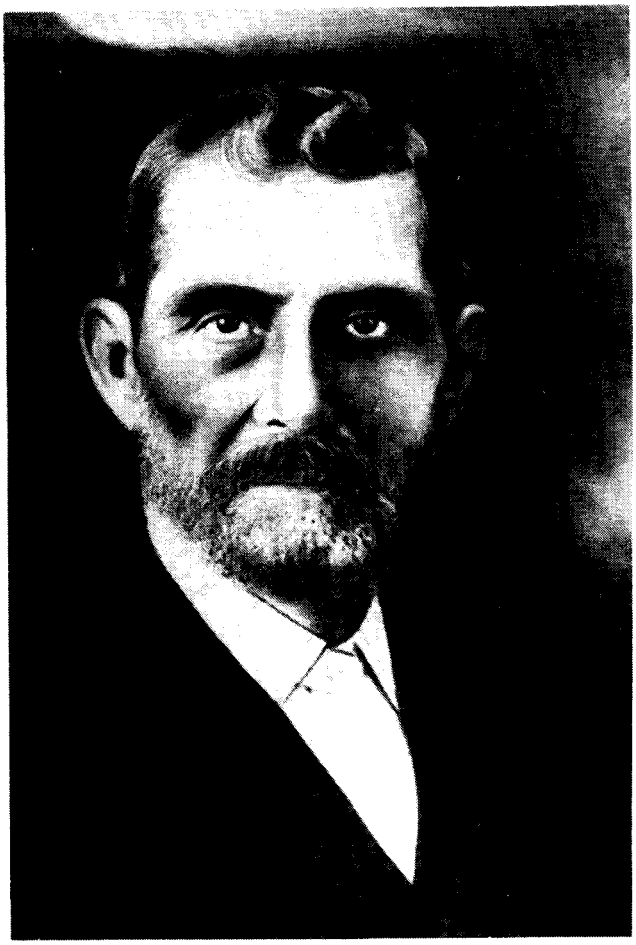
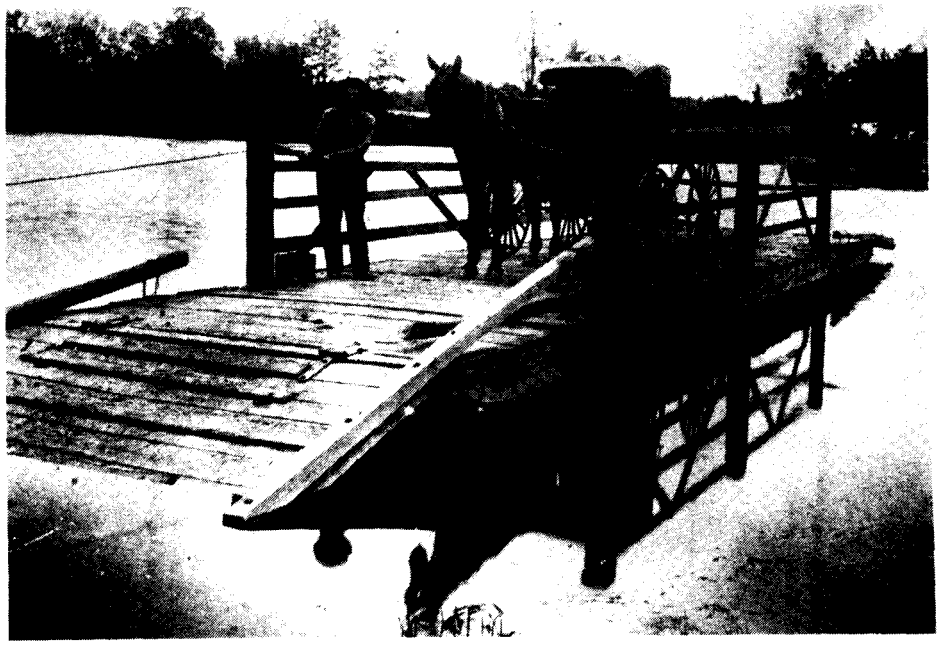


Figure 6. Samuel Blossom, who with his wife Margaret Sophia Blossom, operated the ferry from 1882 until his death in 1925. (Photo courtesy of the Edelweiss Mishoe Collection, New Hanover County Museum).

Figure 7. Late nineteenth century vessel in operation at Blossom's Ferry. (Photo courtesy of the Edelweiss Mishoe Collection, New Hanover County Museum).



August 1980. A one-day follow-up examination of the river bed by the Underwater Archaeology Branch in July 1981 confirmed the presence of a flat-bottom, barge-like vessel and identified a variety of 18th and 19th century material in the vicinity of the ferry crossing. In order to better assess the age of the vessel, a second survey was conducted out in October 1981 by staff and graduate students from the newly-formed Program in Maritime History and Underwater Research at East Carolina University (Watts and Reedy, 1982). The two-day investigation identified a second barge-like vessel in the immediate vicinity of the first, and provided the first insight into architectural and construction details to confirm identification of both vessels as ferries. To determine the precise location of the vessels, buoys were attached to the four corners of each hull. With these references in place, the general specifications of each vessel were recorded, specific structural details were identified and specifications were recorded for the east ferry. From this data a set of preliminary plans was drawn for each of the vessels.

A collection of artifacts were recovered to facilitate dating. A lead-glazed course earthenware crock, a three-leg cast iron pipkin, and fragments of creamware plate recovered from the east vessel indicate that the ferry could data to the middle of the 18th century. That date is reinforced by the the nominal use of iron fastenings in the structure. Dark-green bottle glass and transfer printed ceramics recovered from the west vessel suggest a late 18th or early 19th century date. The extensive use of iron in the construction of the west vessel and comparitively smaller amount of water-wear apparent in the structure supports this date. This evidence sufficiently confirms the potential significance of the Blossom's ferry vessels and supports the preparation of proposals for continued on-site research.

On July 20, 1982, Daniel Koski-Karell conducted a proton precession magnetometer survey of an area immediately downstream from the site of Blossom's Ferry under contract with the North Carolina Department of Transportation to assess the impact of proposed bridge costruction on submerged cultural resources at the site. (Koski-Karell, 1982). The magnetometer failed to identify any material of significance; five targets located during the survey proved to be modern debris.

In November 1982, East Carolina University carried out a third investigation of the Blossom's Ferry vessels. Graduate students working under the supervision of the staff of the Program in Maritime History and Underwater Research spent three days documenting additional structural details on the west ferry. A baseline established on the river bottom was used as a reference to accurately locate the position of each vessel on a preliminary site plan. This, and earlier, data supported the construction of research models of the two ferries, and the refinement of proposals for a major investigation of the known vessels and an initial reconnaissance of the remaining river bottom at Blosson's Ferry (Newell, 1982).

DESCRIPTION OF THE WORK

On September 13, 1983, MURPHY BASE, a 56-foot LCM-6 converted to serve as a base for field operations of the Program in Maritime History and Underwater Research, arrived at Blossom's Ferry. Following a brief search to relocate the Blossom's Ferry vessels, MUURPHY BASE was moored along the bank immediately east of the site (Figure 8). Buoys were attached to angle iron stakes driven into the bottom sediment adjacent to the corners of each vessel to provide surface references to their locations. Project personnel then devoted approximately one hour to familiarization and the removal of snags and debris from the site.

With the position of the ferries identified by surface buoys a baseline was established on the south bank from a point adjacent to the site and immediately west of the Colonial roadbed to a second point 90 feet east. Vegetation at the west end of the baseline prevented establishing a series of transects for taking topographic and bathymetric profiles of the site so a third position was established on the baseline 10 feet west of the initial west end point. This produced a 100 foot-long east/west baseline on the bank adjacent to the sunken ferries.

Stainless steel pipes permanently identified the ends of the baseline. Wood stakes were used to establish stations every 10 feet from the west end of the baseline to a point 60 feet east of the west end station. Using the west end of the baseline as a reference, relative elevations for each station were measured using the transit and stadia rod. Later, this relative datum was tied into an absolute elevation transfered from a piling cap on the I-40 bridge under construction west of Blossom's Ferry. From each of these stations a survey lane was established to transect the site. Using the transit to maintain the proper orientation, an eight-foot bubble level was employed to transfer a series of elevations along each lane. From the bubble level vertical measurements documenting changes in elevation were made using a plum-bob and tape measure. The series of measurements developed using this technique established a profile of the bank from the baseline to the river's edge (Figure 9).

From the river's edge a similar technique was employed to develop the corresponding bathymetric profile. Using the transit to maintain proper orientation for each lane, a weight was deployed on the river bottom well beyond the location of the ferries. A buoy attached to the weight identified the end of each lane and provided an anchor for a small inflatable. The inflatable served as a surface support platform for an individual holding one end of an underwater tape measure. A second anchor placed up current from the survey area provided assistance in maintaining the proper position of the inflatable.

The tape held by the individual in the inflatable was stretched from a stake at the intersection of the survey transect and the river's edge

Figure 9. From a riverbank baseline established to control the collection of on-site data, a series of survey lanes were extended into the river well beyond the remains of the Blossom's Ferry vessels. Using submersible tapes and special buoys, the students collected water depth data that permitted development of a three-dimensional surface and sub-surface site plan.

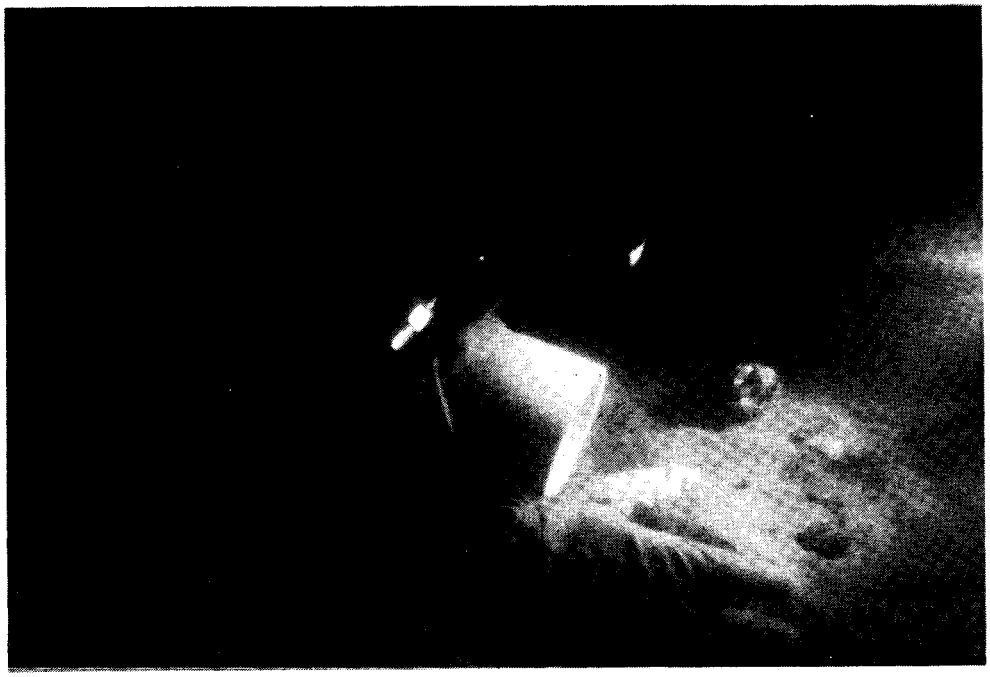


Figure 10. Sediment hand-fanned into suspension was carried away using an induction dredge powered by a high-pressure centrifugal pump aboard Murphy Base. A 1,000-watt, 110-volt underwater light powered by Murphy's generator provided light in the otherwise black environment.

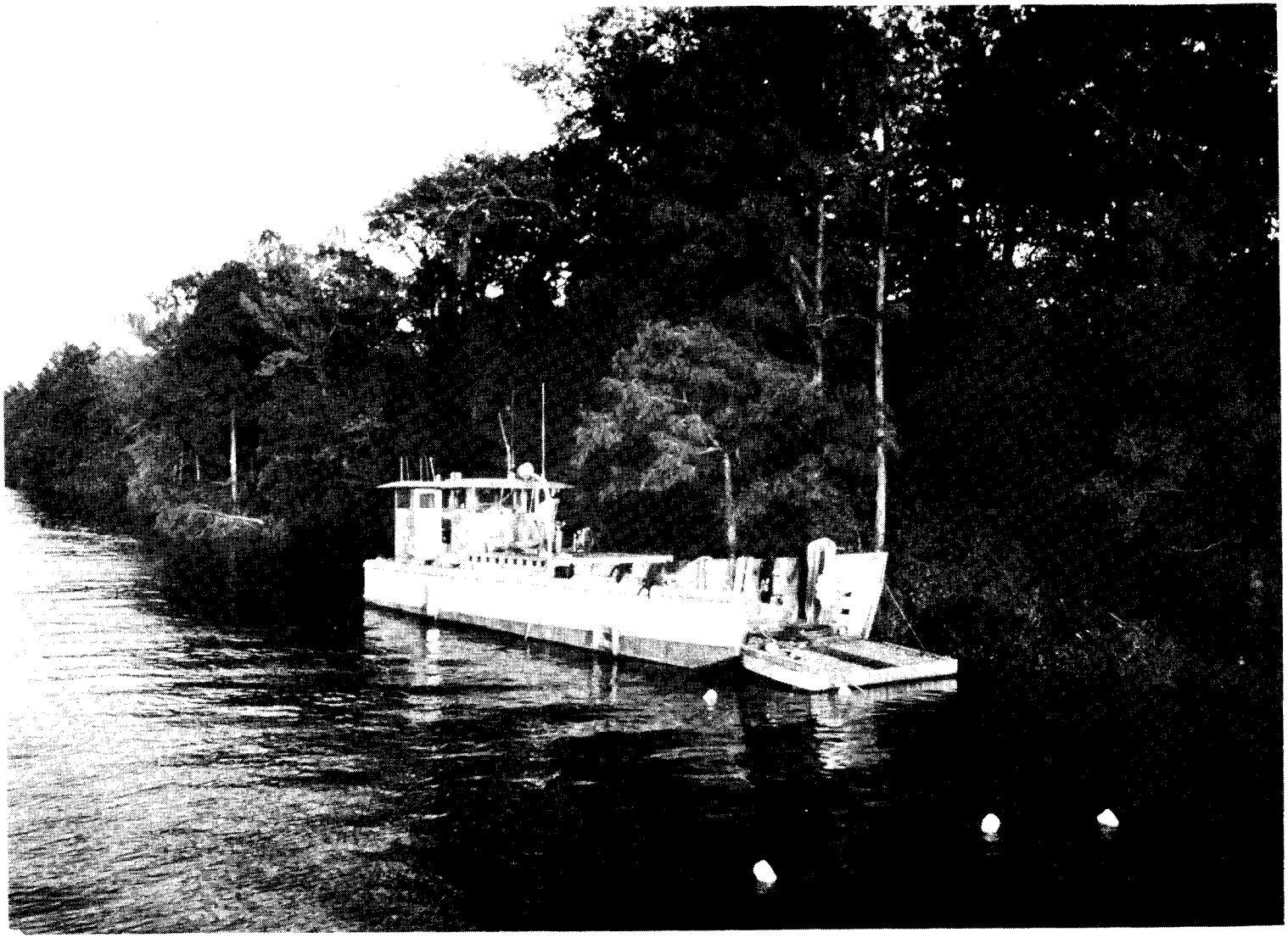


Figure 8. Murphy Base, a 56-foot LCM-6 converted to serve as a research vessel for the Program in Maritime History and Underwater Research, provides a reference identifying the site of Blossom's Ferry. Reference buoys off the bow mark the location of the sunken ferries.

thereby extending the lane into the river. At two-foot intervals along the tape, vertical measurements were taken using a plum-bob attached to a second underwater measuring tape. Vertical control was maintained using the surface of the river as a reference. Data from each transect was recorded on a slate by the individual in the inflatable. A total of eight transects were surveyed using this technique. Data from this survey was developed into topographic and bathymetric maps of the site.

To establish the precise position of the ferries on the site map, a survey buoy designed to float directly above an underwater location was positioned at each corner of the vessels by a diver. The location of the buoy at each corner was recorded as an angle from each end of the baseline using the transit. The depth at each corner was recorded to establish the orientation of each of the vessels.

Once the location of the ferries had been established, investigation of the hulls began. A cross-sectional reference line used in previous examinations was re-established to provide a reference for collecting structural data and artifact provenience. On the East vessel the reference line was established 14 feet 2 inches west of the east end of the vessel. On the West vessel the reference line was established 19 feet 10 inches west of the east end of the vessel. The athwartships orientation of the reference line was maintainted on both vessels by aligning it with the joint between two bottom planks. From the base of each side the reference line ran on a 90 degree axis to the top of the side planks. This reference provided a transverse section that served as a datum for recording all major structural elements on the vessels.

A one-foot wide trench excavated along the athwartships reference provided a profile of sediment accumulation within the hull of each ferry. At this location a comprehensive cross section of the hull was developed from detailed measurements tied to the athwartships reference. Once the sediment profile and cross-section of each vessel had been documented, excavation commenced along the entire length of the south side of each hull. A one-foot wide longitudinal section excavated to the bottom of the hull, permitted mapping of the floor planks. By plotting the position of each plank joint in relation to the cross sectional reference, longitudinal control could be extended along the entire length of each vessel. Plank width measurements provided assurance that the location of each joint was accurate (Figure 10).

Two longitudial stringers divide each hull into three roughly equal longitudinal sections; systematic excavation of hull sections removed the remaining sediment from within the confines of each vessel. Working out from the cross-sectional reference line, the sediment was fanned into suspension and redeposited north of each vessel by an induction dredge. Working in teams of two permitted one student to excavate while the second positioned a work light. As soon as excavation of the south section of the hull was completed a second team began to map structural details and plot the position of artifacts exposed by excavation in situ. Measurements and drawings

were recorded on mylar sheets. Due to the high energy environment, both material associated with the ferries and modern refuse were found on the bottom of the vessels. The remaining sections were excavated and mapped in the same sequence.

After recording hull bottom details and artifact locations, the details of each side were measured and recorded using the cross-sectional reference as a point of departure. The precise position of fastenings, joints, stanchions, and the configuration of each end were also documented. With the corners of each vessel identified and tied to the cross-sectional reference, the ends of each ferry were recorded and the location, features, and details of each ramp identified and documented (Figures 11,12).

Artifacts exposed by excavation of sediments within each segment of the hull were mapped and recovered during the documentation process. Once on board MURPHY BASE each artifact was inventoried and tagged for identification before being wet-stored for transportation to temporary conservation facilities at East Carolina University. With the exception of a 450-pound torpedo which required a displacement, lift all of the material was placed in containers and brought to the surface by project personnel.

Once the vessels were completely exposed, major design features and construction details were photographed. A closed circuit television record of the east ferry was also made on black and white video tape. Major features of the structure and construction details were systematically documented while observers on the surface examined record quality on a remote television monitor.

Investigation of the two known ferries required virtually all of the time allocated for on-site operations. However, a preliminaary reconnaissance of the river bottom in the vicinity of the vessels and the ferry crossing site was conducted along a single random lane between the New Hanover and Pender County ferry landing sites. Two divers examined a bottom area roughly 10 feet wide and 300 feet long.

The remains of bridge structure and the small vessel identified during examination of the transect were marked with buoys. Both were examined, and rough, partially-measured sketch plans of each were drawn before operations at the site were terminated. Time constraints precluded documentation of the remains of a wagon found while relocating the bridge structure.

Before departing the site all but the major vessel-specific references were removed. Buoys identifying the ferry locations were recovered but the angle iron corner references were left in place. With the exception of magnesium rods designating the eastern and western extremities of the baseline, on-shore station references were also removed. Except for vegetation removed to facilitate work on the site, the surface environment was not disturbed.

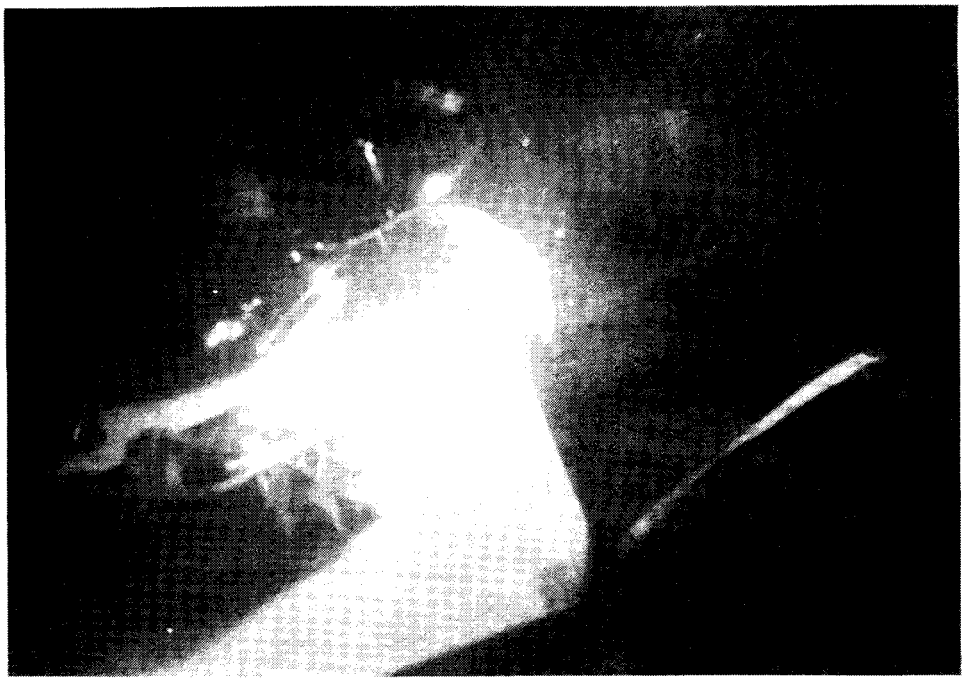


Figure 11. Underwater mapping of ferry structure was accomplished by teams utilizing high-intensity lights and mylar slates.

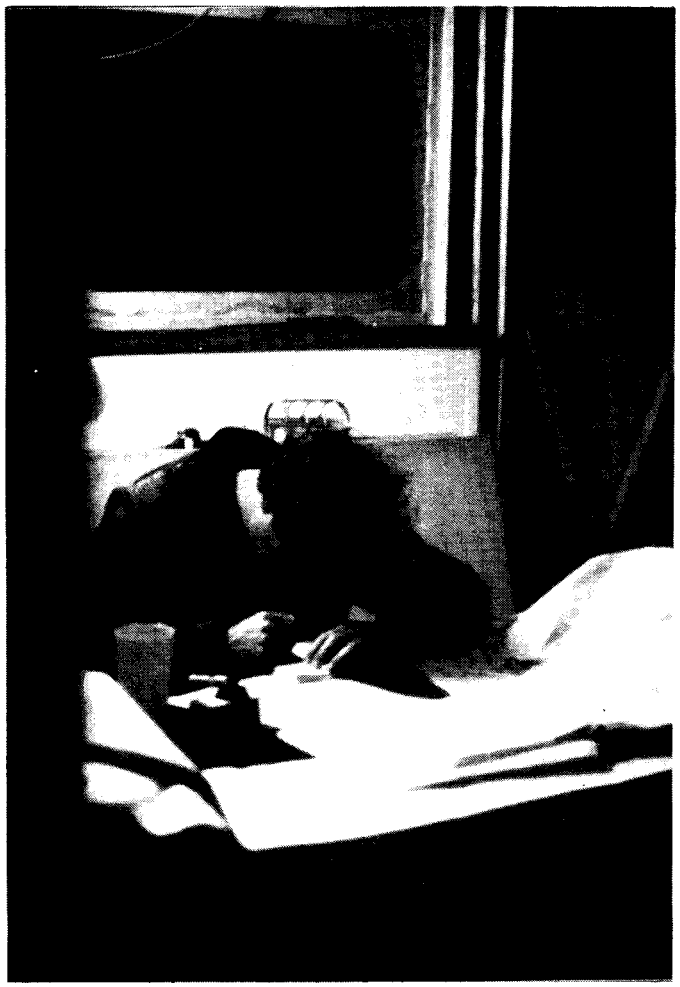


Figure 12. Aboard Murphy Base, Wes Hall transfers measurements to the permanent site map.

DESCRIPTION OF THE FINDINGS

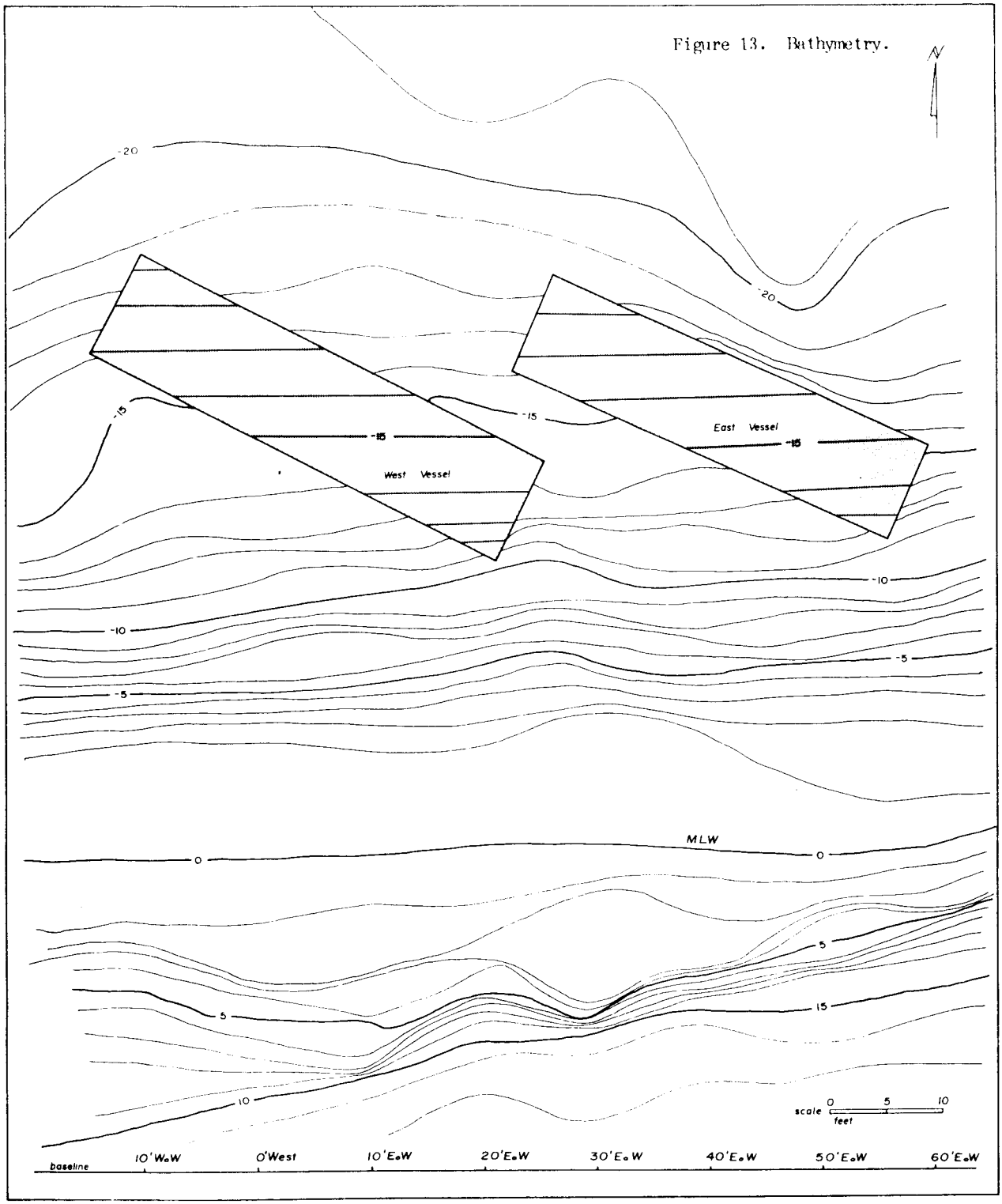
The terrestrial and bathymetric surveys established both the location and orientation of the two ferries under investigation. The vessels lie 80 feet northeast of the Colonial ferry landing on the New Hanover County side of the Northeast Cape Fear River. Both hulls lie along an east-southeast to west-northwest axis. This orientation places the southeast corner of each vessel in the immediate vicinity of the 10-foot bottom contour along the south channel shoulder. The northwest corner of each hull lies in the immediate vicinity of the 19-foot bottom contour (Figures 13,14).

The remains of the east vessel exhibit a greater level of deterioration than the west vessel. None of the vessel's four stanchions remain, and only the presence of two sheaves and fastenings on the hull preserve evidence of their existence. Although the ends of the vessel are partially destroyed, enough of the northwest and southeast corners remain intact to permit reconstruction. Both sides of the hull are excessively water worn, and in some areas the 3-inch thick side planks are less than 1/4 inch in thickness. Those bottom planks exposed to the water column exhibit similar wear. Portions of the hull protected by sediment accumulations have survived without noticeable deterioration, and numerous tool marks are in evidence. In the northwest corner of the hull, frames that supported interior planking have survived intact. Near the west end, a portion the interior planking was identified. Although badly deteriorated, both aprons were located on the river bottom near the ends of the vessel (Figure 15).

The west vessel survived in a much better state of preservation than the east vessel. Of the vessel's six stanchions, five are intact and attached in their original positions along the side of the hull. The sixth stanchion was found lying on the bottom adjacent to its original position near the southwest corner of the hull. The southeast and southwest corner stanchions contain sheaves retained by iron pins. Although some separation is evident, the west end of the vessel is intact. Although the east end of the vessel is badly damaged, most of the disarticulated fragments lie in the immediate vicinity of the hull. Both sides of the west ferry have survived intact with only nominal evidence of water-wear and wood surface deterioration. Bottom planking on the west vessel is in good condition with nominal evidence of deterioration and water-wear.Plan surfaces exhibit excellet tool marks where protected by sediment accumulations. In the ferry's west end, heavily water-worn interior planks survive intact. Although only a portion of the east apron was found, the west apron is still attached to the hull. Both aprons are well water-worn.

Sediment within the hulls consisted of coarse yellow sand, fine white sand, mud composed of lighter sediments, and organic detritus. The stratigraphic profile exposed by excavation of a transverse section across each hull confirms that the record is the result of

Figure 13. Bathymetry.



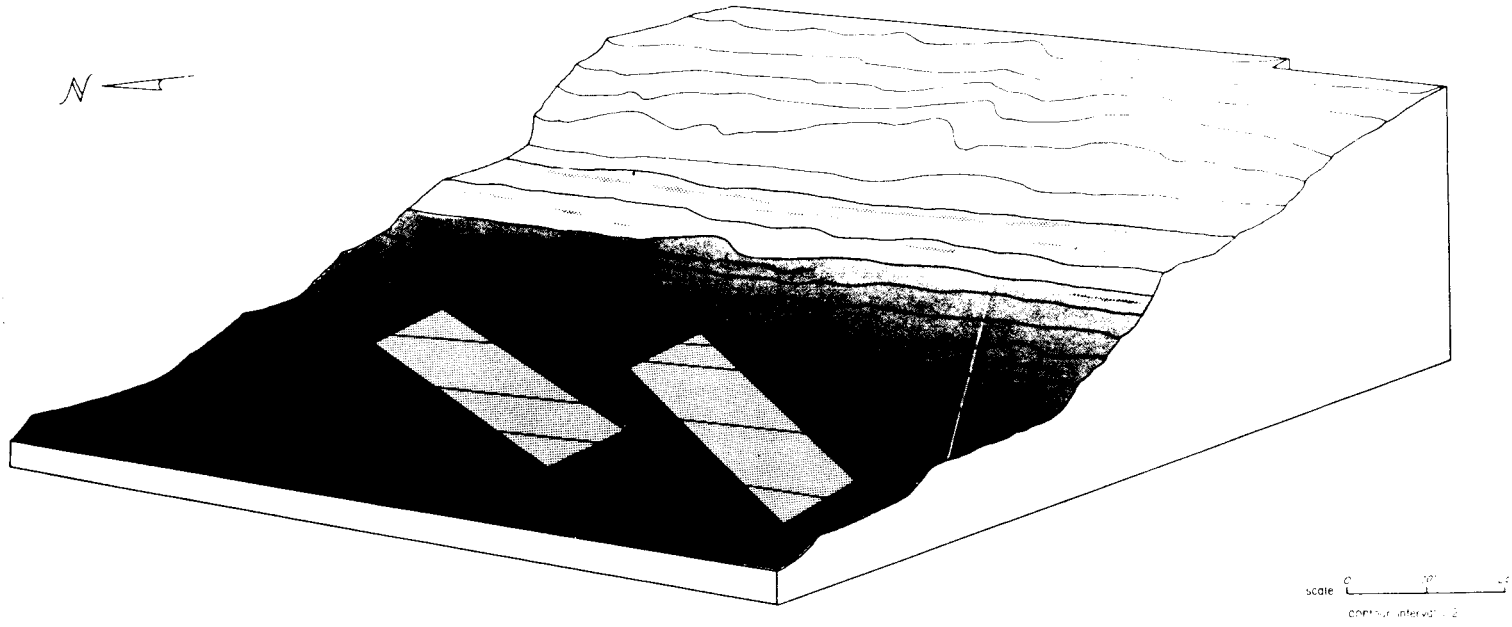


Figure 14. Topography.

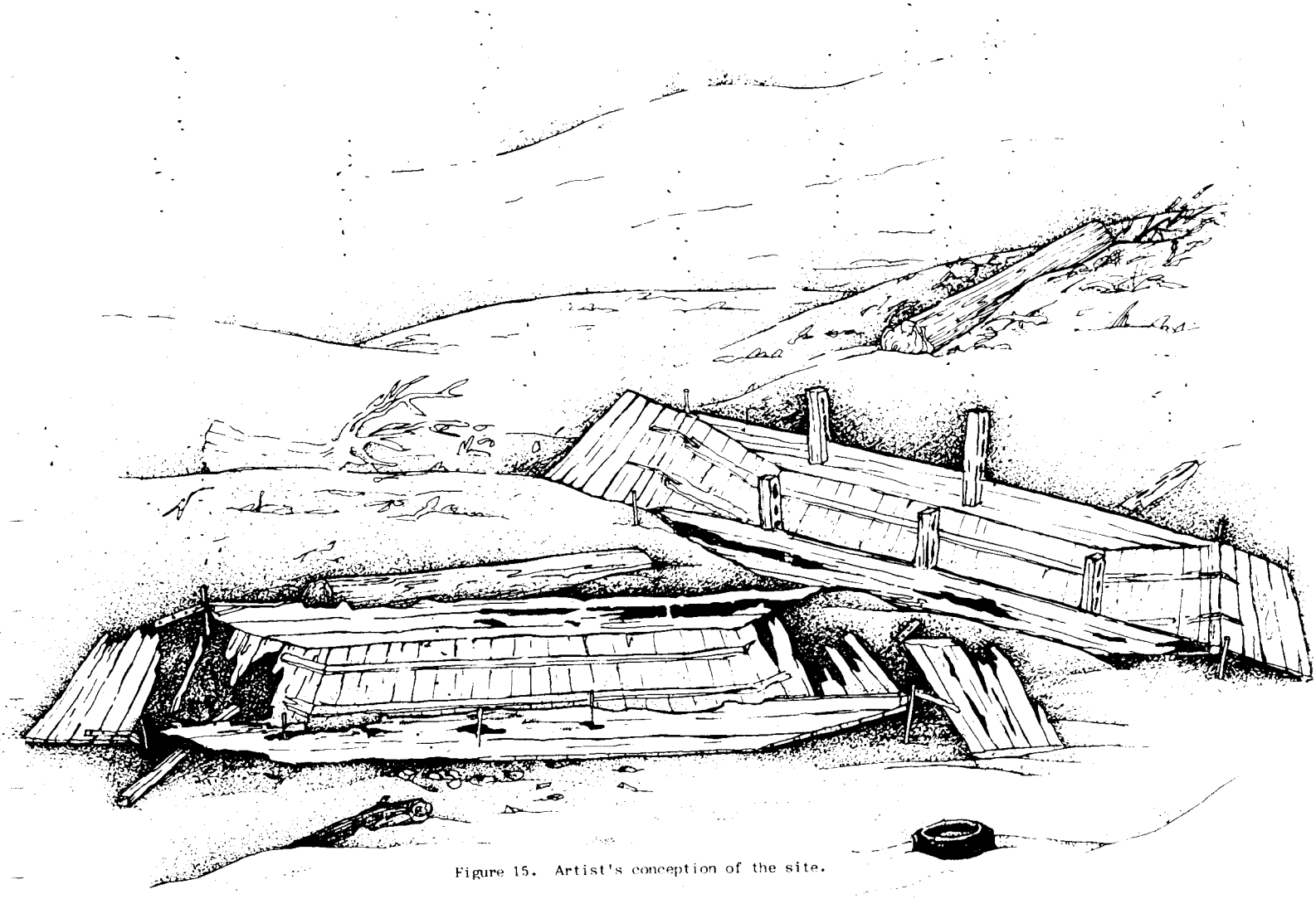


Figure 15. Artist's conception of the site.

environmental sorting. The presence of both modern debris and artifacts contemporary with the ferries at the lowest level of the sediment profile confirms the periodic resorting of the archaeological record. Only the earliest material found within the hull has been considered in establishing a date for the construction and use of the vessel. Later materials are assumed to be modern intrusions.

Cultural materials recovered from the east ferry, including an earthenware crock fashioned of red clay and lead-glazed on the interior, a small, three-legged cast iron pipkin, and fragments of a creamware plate, suggest a mid-18th century date for the vessel. Two Civil War Period rifled musket shot were also found inside the hull; these are considered to be contamination from later activity at the site. One of the shot had been altered to serve as a fishing weight. Materials recovered from the west ferry, including dark green bottle glass fragments, transfer-printed ceramics, and an axe, indicate a late 18th or early 19th century date.

The dates indicated by the artifacts are supported by both the hull fastenings and surviving tool marks. The east vessel was constructed with a combination of both wood and iron fastenings. Bottom planks are attached to the stringers and sides by wood trunnels, hand-wrought iron spikes and drift bolts. The apron hinges were also hand wrought of iron and are fastened with spikes of similar construction. Tool marks on the bottom planks of the east vessel were produced by both pit and sash saws. Fasteners used in the construction of the west vessel are almost entirely iron. Spikes used in attaching the bottom planking and apron hinges are examples of early industrially-produced varieties. The hinges are smaller and more uniform, indicating a more sophisticated method of construction than that employed for the east vessel hinges. Instead of the peened drift bolts that secure the sides of the east ferry, the sides of the west vessel are secured by threaded bolts containing compression washers and nuts. Tool marks on the bottom planking were produced by sash and large-diameter circular saws. The tool marks and the iron work associated with the west vessel represent a later technology than that associated with the east vessel (Figure 16).

The remains of a third, smaller vessel were identified during a brief reconnaissance of the river bottom in the vicinity of the ferry crossing. The remains of the sides are separated from the bottom planking; one side is collapsed across the top of the other. Both sides lie amid the remains of the bottom of the vessel. Iron fasteners on the bottom of the sides preserve evidence of the athwartships planking pattern. Evidence of water-wear on the exposed remains of the vessel is generally greater than on the west vessel, but less than that of the east vessel.

In addition to the third vessel, the reconnaissance identified remains of bridge structure. The largest was constructed using two 14 by 14-inch oak timbers 30 feet in length, capped by a third of similar dimensions but 12 feet in length. This was attached by

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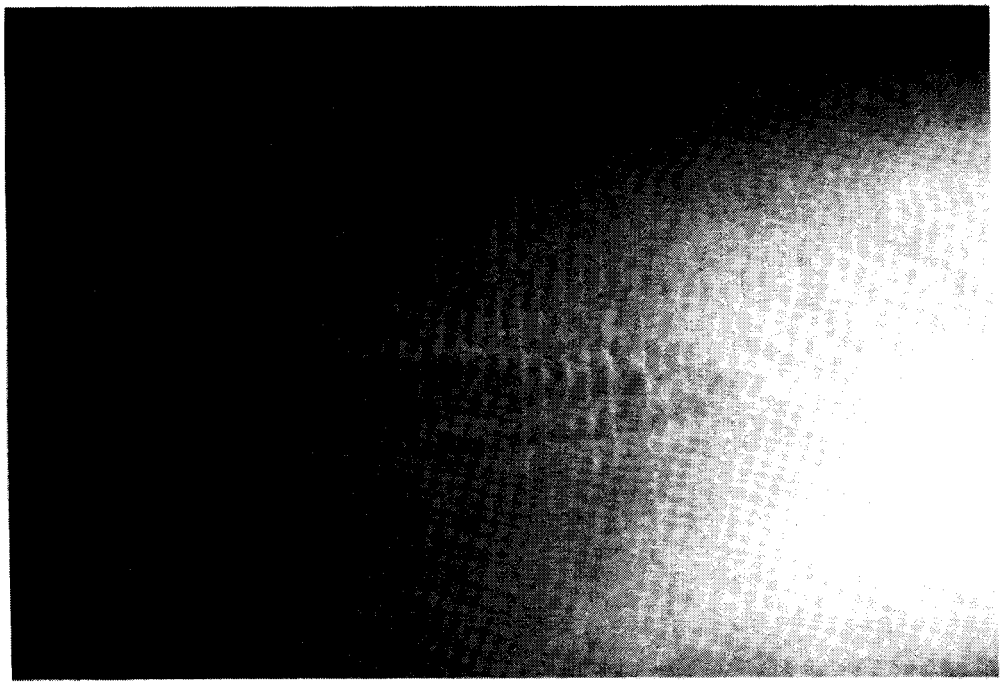


Figure 16. Sash saw marks on the planking of the west ferry confirm that mechanical saw mills were operating in southeastern North Carolina at the beginning of the nineteenth century. Excellent tool marks on the bottom planking of both ferries illustrate the high degree of preservation found in material protected by the bottom sediments.

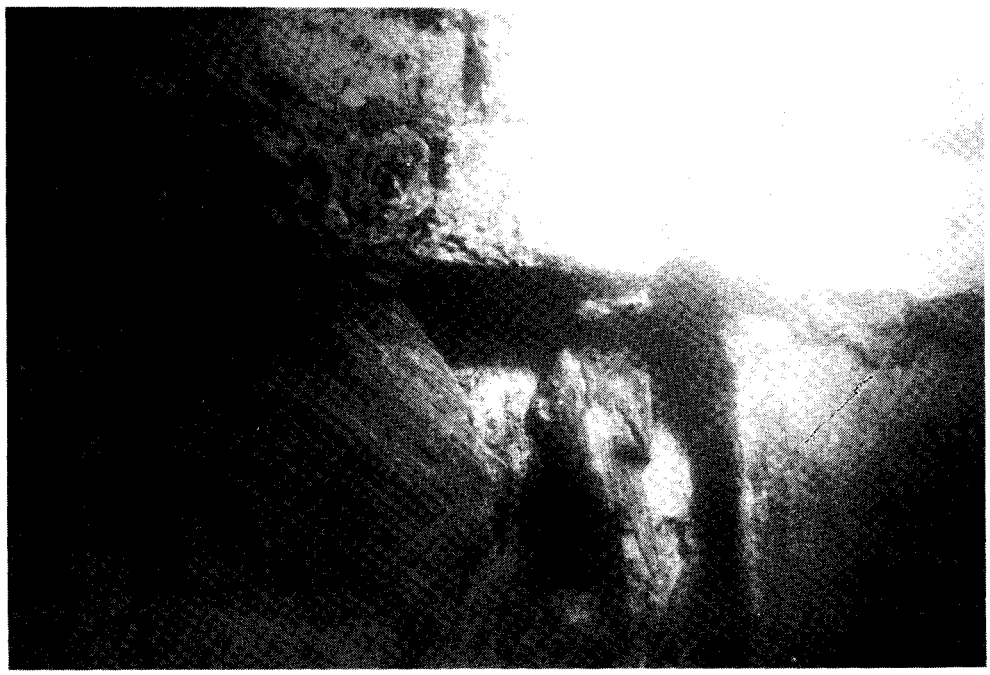


Figure 17. Apron hinge found intact on the east vessel at Blossom's Ferry.

trunneled mortise-and-tendon joints and reinforced by mortise-and-tendoned diagonal bracing that connected the 30-foot timbers to the the cap piece. Fragments of a second, identical structure were also identified. Both frames are associated with concentrations of stone ballast and planks that may have formed sunken cribs designed to retain bridge pilings that could not be driven into the marl deposits exposed by the channel.

DESCRIPTION OF THE VESSELS

Analysis of the data generated by investigation of the Blossom's Ferry vessels provides insight into the design, construction, and use of early North Carolina ferries. Although dating to different periods, both ferries are simple flats quite similar in design. The vertical sides of both vessels were formed prior to the addition of the bottom planks by pinning, and in the case of the west vessel, bolting planks together. While three random-width pine planks form the 36-inch sides of the earlier east vessel, only two 12-inch wide pine planks were used to fashion the 24-inch sides of the west vessel. The planks were cut about 8 feet from the end to make a 12-degree rake ending under a lap joint used to attach the timber forming each end of the hull. The 3-inch thick, 10-foot long pine and cypress planks forming the bottom of the vessels were cut in random widths varying from 9 to 22 inches.

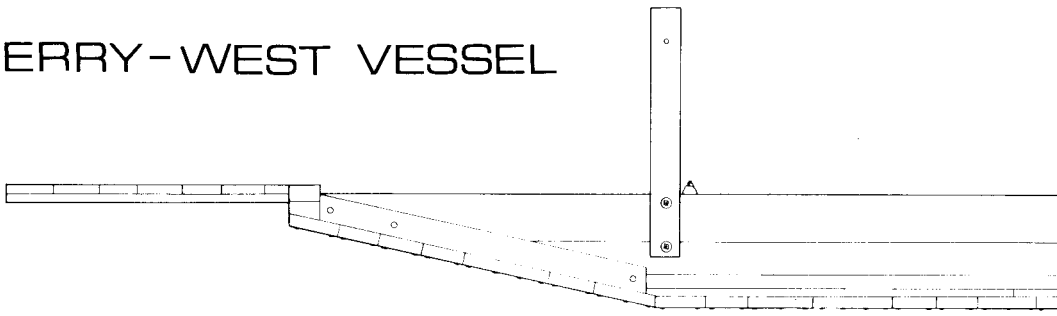
Wrought-iron hinges 4 feet long on the east vessel, and 2 feet long on the west vessel, attached adjustable 4-foot long aprons to each vessel's ends. The aprons facilitated loading and unloading, and channeled traffic into the interior hull planking that covered stringers and assured an even distribution of weight over the hull. Stanchions, each 5-feet long, were located along the sides of the vessels and served at least two purposes. Mortises in the stanchions confirm that rails designed to restrain livestock and passengers had been installed on both sides of the hull. The top of the stanchions nearest the end of the hull were also fitted with sheaves that may have been used in raising and lowering the aprons or in conjunction with cables that guided the ferry across the river (Figure 17).

East Vessel Specifications (Figure 18)

The east vessel is 46 feet 2-1/2 inches long overall including the aprons, with a hull structure length of 38 feet 2-1/2 inches. Each of the vessel's sides is 36 inches deep and the beam measures 9 feet 9-3/4 inches along the entire length of the hull.

Each side of the east vessel is composed of three 3-inch thick planks. The upper and lower planks on the north side of the vessel were finished to a width of 12 inches and the center plank was finished to a width of 9 inches. On the south side of the vessel the upper plank was finished to a width of 13 inches and the bottom plank measures 14 inches, finished width. The center plank measures 6 inches in width. Including the 3-inch thick planks of the bottom, each side measures 36 inches in height. No scarph joints were observed, as each plank is of

BLOSSOM'S FERRY-WEST VESSEL



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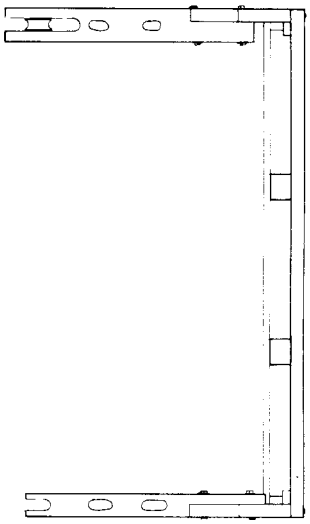
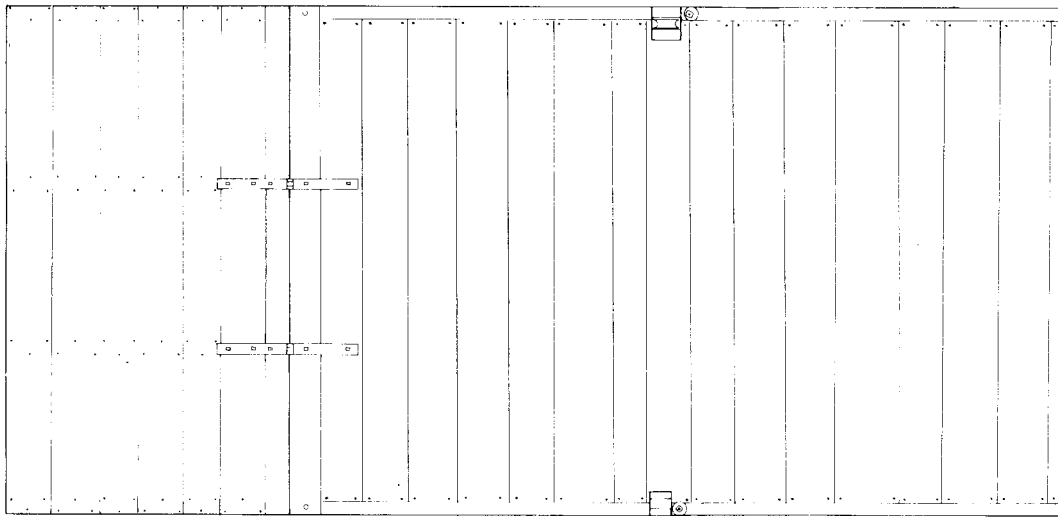
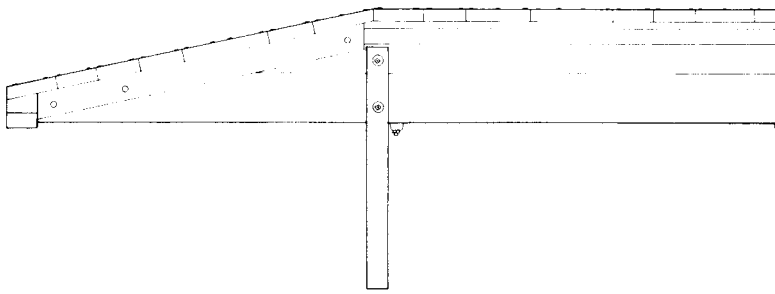


Center Section





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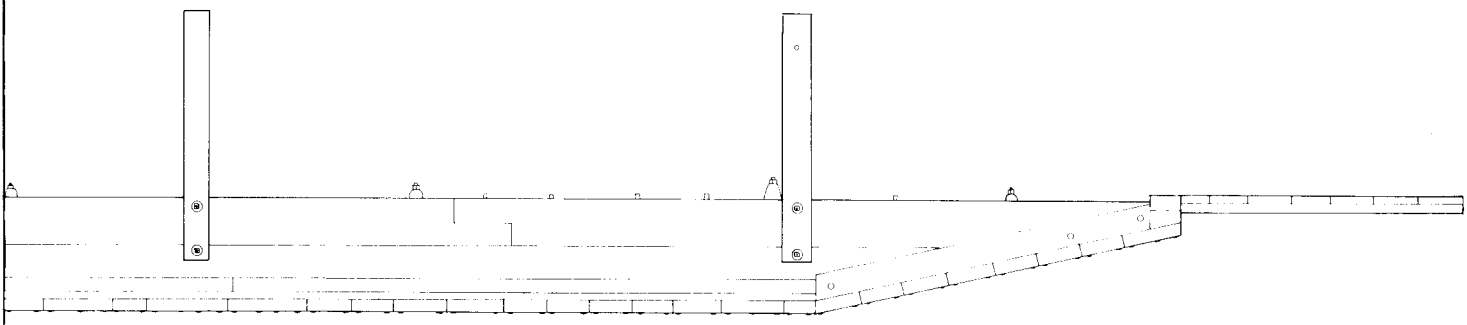

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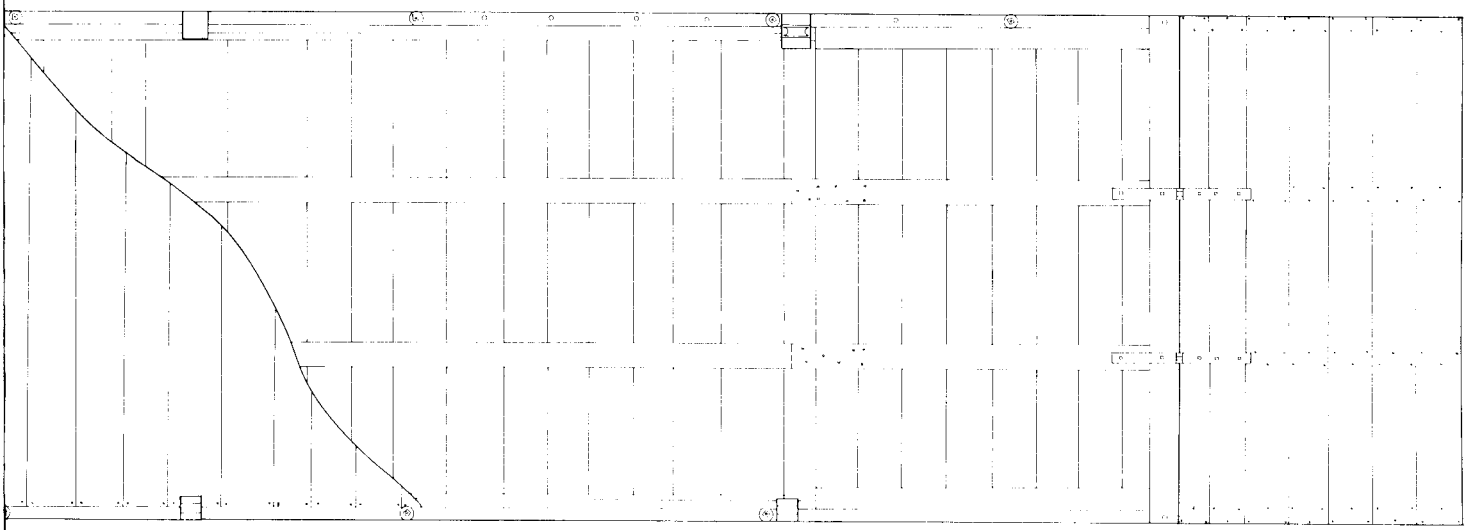
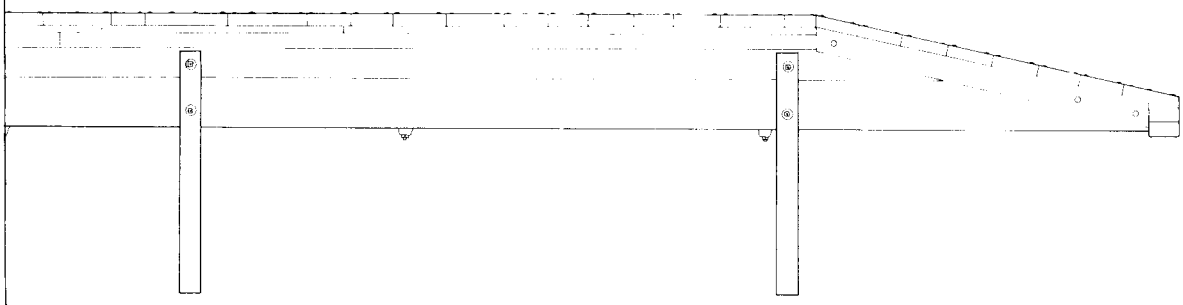


Plan View



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sufficient length to run the entire length of the hull. Approximately 8-1/2 feet from each end the sides were cut diagonally to produce a bevel. The bevel terminates 8 inches below the top of the uppermost plank. The top of the upper plank is also notched producing a 4-inch deep, 6-inch wide lap joint.

Iron drift pins driven through augered holes secure the three side planks as an integral unit. Five 3/4-inch wrought-iron pins were driven through all three planks in the area between the beveled ends of the hull. The pins are approximately spaced on 4-foot centers and peened down to clench the planks for a watertight seal. Additional and progressively shorter drift pins driven into the planks along the bevel secure the ends. Each pin was cut to length to insure that it would penetrate the upper plank to a depth of approximately 9 inches. The apex of the angle formed by the bevel was also cut off forming a second facet and providing an almost undetectable rounding to the bottom planking.

Bottom planks on the east vessel vary in width from 9 to 17 inches. The various widths are randomly spaced throughout the bottom and each plank is attached to the sides by two iron spikes and a trunnel. The trunnel is approximately centered in the plank and the spikes are equidistant between the trunnel and each edge. The sides of those planks at the joint between the flat of the bottom and the bevel were beveled to insure a tight fit. Each of the end planks is also beveled, producing a vertical face at the end of the hull. Trunnels fasten the bottom planks to the stringers. Two trunnels were driven into the stringer at the intersection with each plank. The trunnels were staggered to avoid weakening or splitting the stringer.

Each end of the hull is formed by a 6 by 9 inch athwartship timber. The bottom of the timber is beveled to conform to the configuration of the lower hull planking and notched to form a lap joint with each side. This joint is secured with two 1-inch trunnels driven vertically and horizontally through the joint. A triangular lodging knee composed of 3-inch thick plank is located in each corner of the hull to reinforce the joint. Each lodging knee is fastened with drift pins and a trunnel.

Two 4 by 6 inch stringers reinforce the interior of the hull. Each stringer is centered approximately 3 feet from the side of the vessel, and is attached to the bottom planking with trunnels in the pattern previously mentioned. Both ends of each stringer are compound-beveled to fit flush with the rise of the floor at each end of the ferry. Additional upward-sloping, 7-foot 7-inch extensions to each stringer placed at each end of the vessel reinforce planking between the bottom and the end of the hull where the apron was attached. Each 4 by 6 inch extension was diagonally cut to fit flush with the top of the main stringer and flush with the beam at the extremity of the hull. Both joints are fastened with trunnels and the joint with the main stringer is additionally reinforced by 2-inch thick planks placed on either side of the joint and trunneled to both stringer sections. From the flat of the hull to the timber forming the end of the hull,

the joints between the bottom planking and sides of the ferry are reinforced by 7-foot 7-inch long, 6 by 6 inch timbers. These were cut to fit flush with the timber forming the end of the hull and rounded vertically with an axe near the joint between the bevel and the flat of the bottom. Like the stringers, these timbers attach to the sides of the hull and bottom planking with horizontal and vertically driven trunnels.

The interior planking, or bilge ceiling, in the east vessel is supported by a timber frame. A series of 2 by 3 inch spacers cut to span the entire interior width of the hull were placed across the stringers and fastened at random, approximately on 3-foot centers, throughout the flat of the hull. Each end of the spacers is supported by a 1-3/4 by 3 inch timber attached vertically to the side of the hull so that the top edge lies flush with the top of the stringers. While these supports are fastened to the sides of the hull by iron spikes, the spacers rest on them unattached. Each spacer is fastened to both stringers by iron pins driven through the stringer, spacer, and a 3 by 4 inch false stringer placed on top of the spacers. The false stringers are centered over each stringer and extend the entire length of the flat of the hull. At each end the false stringerswere cut diagonally to fit flush with the top of the stringer extensions. Along the sides of the hull 1-1/2 inch by 4 inch planks placed atop the spacers provide uniform height supports for the interior planking. Each end of these planks was cut diagonally to fit flush with the top of the timber reinforcing the joint between the floor and the side of the hull, beyond the flat of the hull.

Although no interior planking survives in the east ferry, the remains of fasteners employed to retain the planking provide some indication of the plank widths. These appeared to have varied from approximately 9, to 12 or 14 inches. On the false stringers and side supports each plank was attached by two iron spikes. An unattached, 1-inch thick, 6-inch wide plank, cut to fit between two stanchions attached to each side of the vessel, may have served as a spacer between the ends of the interior planking and the sides of the hull. No evidence of fastenings was observed on the spacer. At the base of each stanchion appropriate interior planks appear to have been notched to permit each stanchion to extend into the hull below the bilge ceiling. In the ends of the east vessel beyond the flat of the hull, the interior planking appears to have been attached directly to the stringer extensions and timbers reinforcing the joint between the side of the hull and the bottom planking.

To facilitate loading and unloading, the ends of the east vessel were equipped with articulated aprons. Each of the 4-foot 3-inch long, 10-foot wide aprons operated on 6-foot long wrought-iron hinges. Each hinge was constructed in two sections. The section attached to the apron measures 4 feet in length while the section attached to the top of the hull of the vessel is half that. Sections of each hinge were attached and pivoted on a one-inch diameter peened pin. Iron spikes attached the hinges to both the apron and the hull of the

ferry. The east apron was constructed from four, 2-1/2 inch thick planks that vary from 11 to 13 inches in width. The athwartships planks of the apron are retained and supported by four longitudinal planks. Along the sides of the apron 2-inch by 6-inch longitudinal planks retain and support the ends. Two additional 2 by 5 inch longitudinal planks are spaced and attached equidistant from the sides of the apron. These supports are located on the bottom side of the apron and operated as extensions of the stringers and sides of the hull. Along the edge of the apron, fasteners were driven through holes in the apron hinge and clinched under the longitudinal support. Where the apron planks attach to the longitudinal apron supports, two spikes were driven through each plank in a staggered pattern.

The presence of trunnel fasteners and notches in the spacers along the sides of the hull of the east ferry confirms that at least two stanchions were attached to each side of the vessel near the ends of the flat portion of the hull. The stanchions appear to have been 6 inches in width and approximately the same in thickness. Each stanchion was notched to fit flush with the exterior of the hull and was attached by three trunnels placed in a triangular configuration. The remains of two 4-inch thick, 8-inch diameter wood sheaves found attached to fragments of stanchions by an iron bolt confirm that the north side stanchions served in some capacity to support pulleys on which the vesssel operated. Although there is no archaeological evidence to confirm this supposition, it is likely that the stanchions also served to support rails that retained both passengers and livestock.

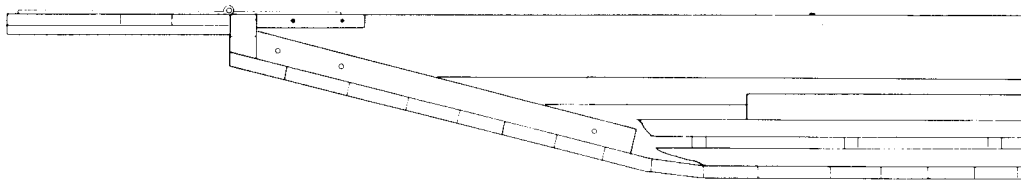
West Vessel Specifications (Figure 19)

The west vessel is 49 feet 10-1/4 inches long overall including the aprons, with a hull structure length of 38 feet 8-1/4 inches. Each of the vessel's sides is 27 inches deep and the beam measures 10 feet along the entire length of the hull.

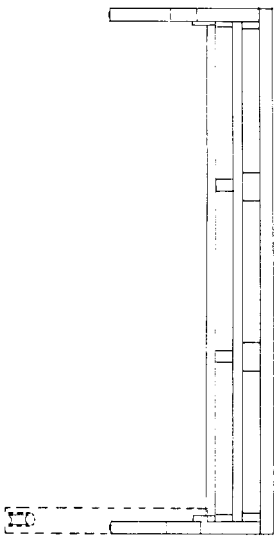
Each side of the east vessel is composed of two 3-inch thick planks. Each plank was finished to a width of 12 inches. Including the 3-inch thick planks of the bottom, each side measures 27 inches in height. With the exception of the upper plank on the south side of the hull no scarph joints were observed as each plank is of sufficient length to run the entire length of the hull. The upper plank on the south side is composed of two planks joined by a common lap joint 14 feet 4 inches from the east end of the hull. Approximately 7 feet 3 inches from each end the sides are cut diagonally, producing a bevel. The bevel terminates 6 inches below the top of the uppermost plank. The top of the upper plank is also notched to produce a 3-inch deep 7-inch wide lap joint.

Iron drift bolts driven through augered holes secure the three side planks as an integral unit. Five 3/4-inch wrought iron bolts secure

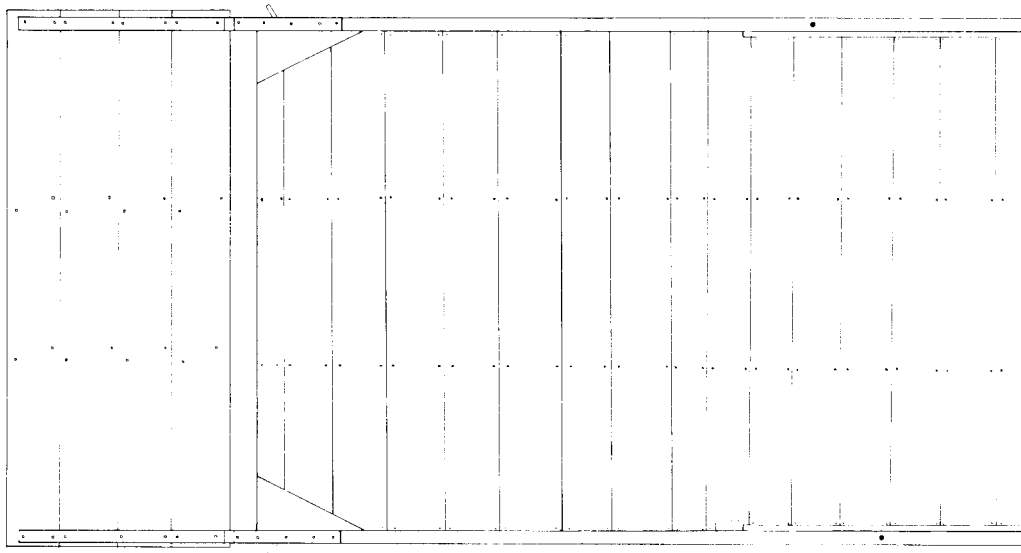
BLOSSOM'S FERRY- EAST VESSEL

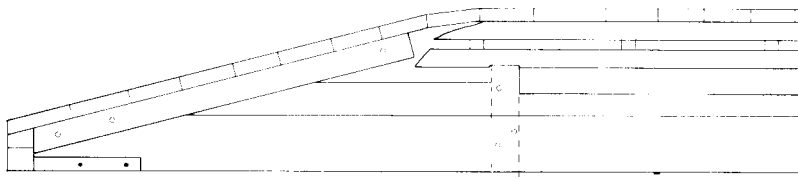


So



Center Section

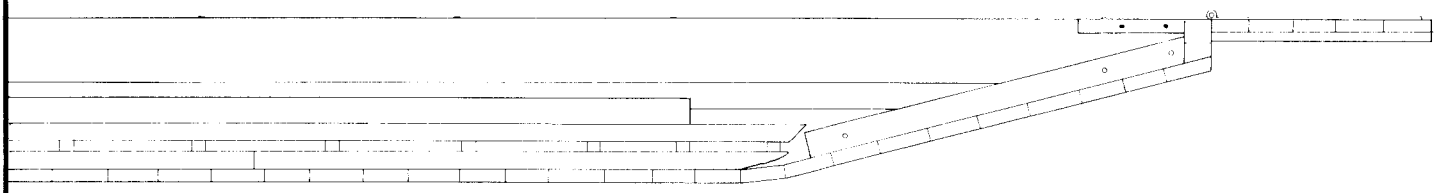




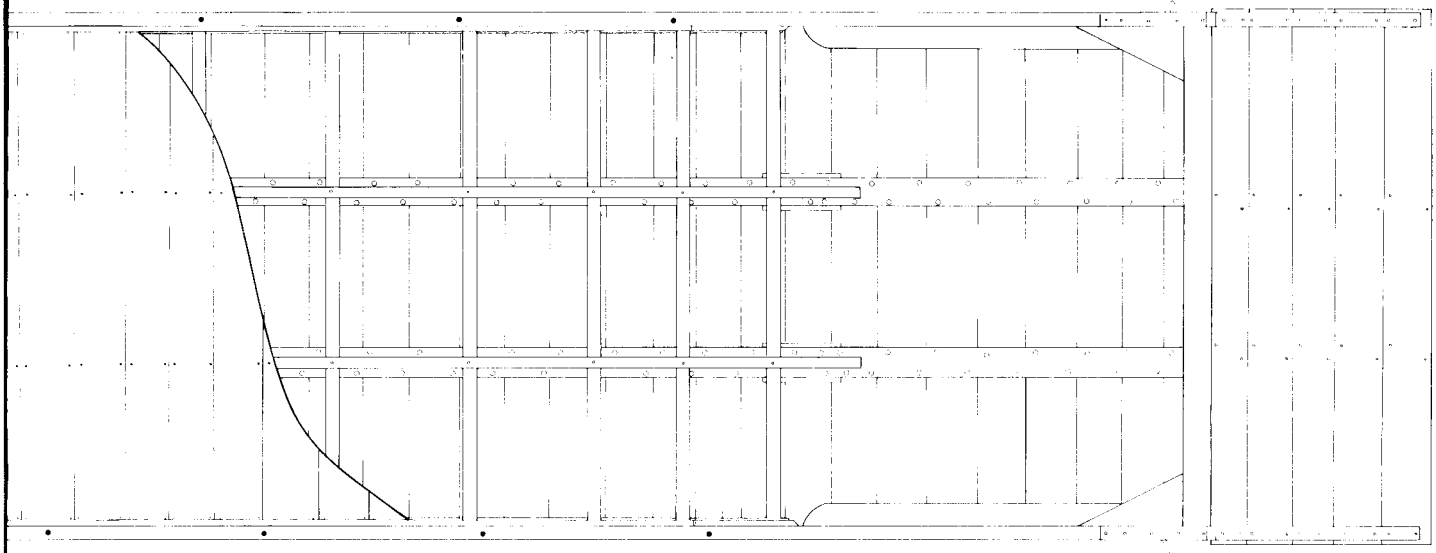
SCALE IN FEET

0 1 2 3 4

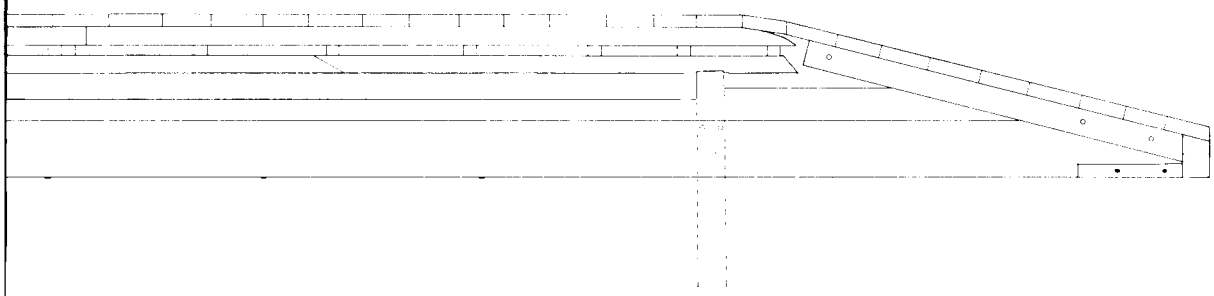
No



h Interior Profile



Plan View



h Interior Profile

the south side of the hull, while four bolts secure the north side. With the exception of the fifth bolt in the east end of the south side, all of the drift bolts are located between the beveled ends of the hull. Although the specific locations vary, the bolts are approximately placed on 8-foot centers. The bolts are all fitted with heavy bell-shaped, 3-inch diameter, 3-inch high, iron compression washers retained by square nuts. Additional, and progressively shorter, drift pins driven into the planks along the bevel secure the ends. Each pin was cut to length to insure that it would penetrate the upper plank to a depth of approximately 6 inches.

Bottom planks on the east vessel are uniformly 10 feet long and vary in width from 7 to 21 inches. The various widths are randomly spaced throughout the bottom, and each plank is attached to the sides by two iron spikes. The sides of those planks at the joint between the flat of the bottom and the bevel of the ends are beveled to insure a tight fit. Each of the end planks is also beveled to produce a vertical face at the end of the hull. Iron spikes also fasten the bottom planks to the stringers. Two, three, and on the widest planks, four spikes were driven into the sides and stringers at the intersection with each plank. The fasteners attaching each plank to the stringers were staggered to avoid weakening or splitting the stringer.

Both ends of the west vessel hull are formed by a 7 by 8 inch athwartship timber. The bottom of the timber is beveled to conform to the configuration of the lower hull planking and notched to form a lap joint with each side. This joint is secured with two 1-inch trunnels driven vertically through the joint. The lap cuts do not produce a flush joint; the top of the athwartships timber extends a full 2 inches above the sides of the ferry.

Two 5 by 6 inch stringers reinforce the interior of the hull. Each stringer is centered approximately 3 feet from the side of the vessel and is attached to the bottom planking with spikes in the staggered pattern previously mentioned. Both ends of each stringer are beveled to fit flush with the rise of the floor at each end of the ferry. Additional upward-sloping, 6-foot 8-inch extensions of each stringer at each end of the vessel reinforce planking between the flat bottom and the ends of the hull. Each 5 by 6 inch extension is diagonally cut to fit flush with the top of the main stringer and fashioned with a tenon to fit into a mortise in the beam at the end of the hull. Both mortise-and-tenon joints are fastened with trunnels and the lap joints with the main stringer are fastened with iron spikes. From the flat of the hull to the timber forming the end of the hull, the joint between the bottom planking and the sides of the ferry is reinforced by 6-foot 9-inch long, 6 by 6 inch timbers. These were cut to form a mortise-and-tenon joint with the timber forming the end of the hull, and sawn vertically at the joint between the bevel and the flat of the bottom. Like the stringers, the mortise-and-tenon joints are secured with trunnels, and the timbers are attached to the sides of the hull and bottom planking by horizontal and vertically-spiked trunnels.

The interior planking, or bilge ceiling, in the west vessel was attached directly to the stringers. The fastening pattern consists of two iron spikes per plank driven in a staggered pattern along the stringer. Although no archaeological evidence was found to confirm this hypothesis, additional longitudinal planks must have been employed along the sides of the hull to support the interior planking, or bilge ceiling. The fastening pattern indicates that the interior planks ranged from 9, to approximately 12 inches in width. In the ends of the west vessel beyond the flat of the hull, the interior planking was attached directly to the stringer extensions and timbers reinforcing the joint between the side of the hull and the bottom planking.

To facilitate loading and unloading, the ends of the west vessel were equipped with articulated aprons. Each of the 5-foot 7-inch long, 10-foot wide aprons operated on 4-foot long, wrought iron hinges. Each hinge was constructed in two sections that measure 2 feet in length, 2-1/2 inches in width, and 1/2 inch in thickness. Sections of each hinge attached and pivoted on a 1-inch diameter peened pin. Iron lag bolts attach the hinges to the stringer extensions, and iron bolts fasten the hinges to the apron. Unlike the east ferry, the hinges of the west ferry are located in conjunction with the stringer extensions.

The west ferry aprons were constructed from seven, 2-1/2 inch thick planks that vary from 8 to 11 inches in width. Four,2 by 5 inch longitudinal planks retain and support the athwartships apron planks. Along the sides of the aprons, longitudinal planks are attached to retain and support the ends. Two additional longitudinal planks are spaced and attached equidistant from the sides of the apron. These supports, located on the bottom side of the apron, operated as extensions of the stringers and sides of the hull. Along the edge of the apron, iron spike fasteners were driven through the apron and clinched under the longitudinal support. Where the apron planks attach to the longitudinal apron supports, two spikes were driven through each plank in a staggered pattern.

Also unlike the east ferry, the stanchions of the west ferry have survived. Five of the six are attached in their original positions, and the sixth lies outside the hull structure near its original position. Two of the stanchions on each side were located at the end of the flat of the hull and the third was centered in the side of the hull structure. The stanchions on the north side of the ferry measure 5 by 5-1/2 inches in width. Each of the south stanchions is 4 feet 9 inches in height. The base of each stanchion has a notch 3 inches deep and 18 inches long to facilitate mounting on the side of the hull. Two, 3/4 by 8-inch iron bolts with 3-inch flat washers and square nuts attach each stanchion to the hull.

Stanchions on the south side of the vessel are of noticeably heavier construction than those on the north side. The center stanchion is 6 by 6-1/2 inches wide and 4 feet 11 inches high. The two stanchions

located at the extremity of the flat of the hull are 7 by 8 inches wide and are similar in height to the center stanchion. The base of each of the three stanchions on the south side is notched 3 inches deep and 18 inches long to facilitate mounting on the side of the hull. Again, two, 3/4 by 8 inch bolts attach each stanchion to the hull. Both of the stanchions located at the ends of the hull contain sheaves. A 3-inch slot is cut 15 inches into the longitudinal axis of the stanchion; a 7-1/4 inch sheave is mounted in the slot on a 1-inch bolt. The sheave measures 1-3/4 inches in width and contains a 1/2 inch deep groove around the circumference.

All of the stanchions are mortised for rails. The remains of tenons were also found in several of the mortises on the south side of the hull. Although there is no archaeological evidence to confirm the supposition, it is likely that the stanchions also served to support rails that retained both passengers and livestock.

ARTIFACT CONSERVATION (Figure 22)

Artifacts from the Blossom's Ferry site were classified according to composition (metal, ceramic and glass, organic). Most of the artifacts survived in a good state of preservation due to the freshwater environment and the presence of tannic acid.

The iron artifacts were first subjected to electrolytic reduction to stabilize any active corrosion and reduce or eliminate any chlorides present. In the case of the iron pipkin, this treatment took nearly two months. The objects were then baked for 48 hours at 350 degrees Farenheit to remove most of the water. Finally, the artifacts were boiled in microcrystalline wax at approximately 220 degrees Farenheit. This process further reduces the water content and prevents additional moisture from entering.

Organic artifacts (leather and wood) were mechanically cleaned and rinsed in fresh water. They were then dehydrated in methyl alcohol for several weeks until the proper water content was achieved. At that point the objects were placed in a 50% solution of polyethylene glycol (molecular weight 600) and methyl alcohol. As the alcohol evaporated, the objects retained the PEG.

Glass and ceramic artifacts were mechanically cleaned after rinsing in fresh water.

Artifacts recovered from the Northeast Cape Fear River will be retained by the North Carolina Division of Archives and History.

RESEARCH MODEL CONSRUCTION

The concept of using research models in the archaeological investigation of shipwreck remains was developed by Mr. Richard Steffy of the Institute of Nautical Archaeology at Texas A & M University. Research models of the Blossom's Ferry vessels satisfied several objectives. The first generation models were constructed following

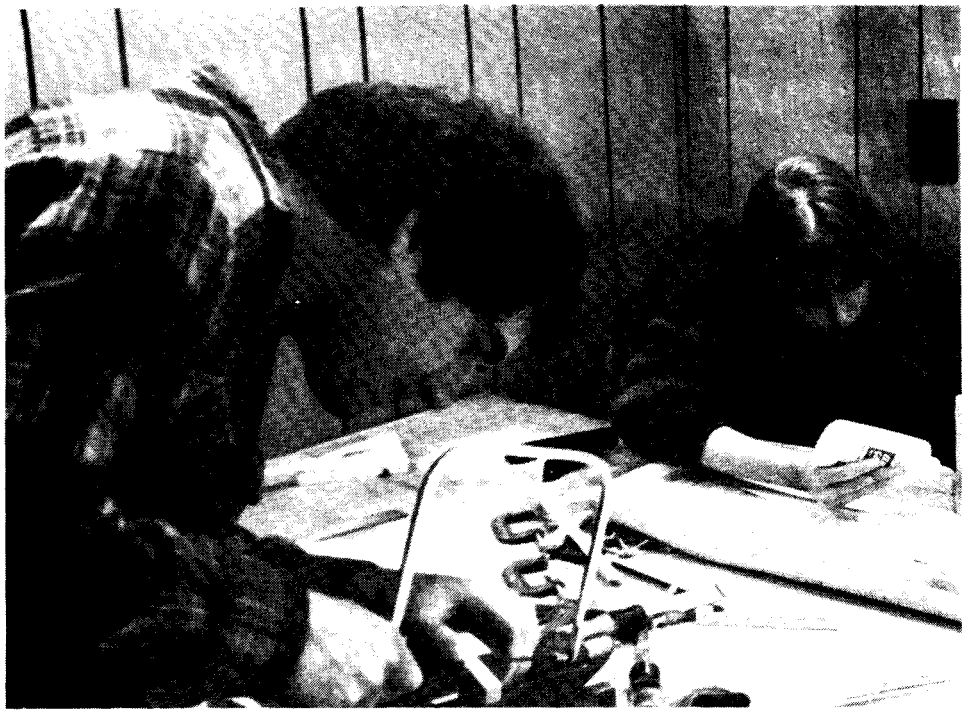


Figure 20. Wes Hall and Kim Elmore examine preliminary ferry models to identify areas requiring additional documentation.

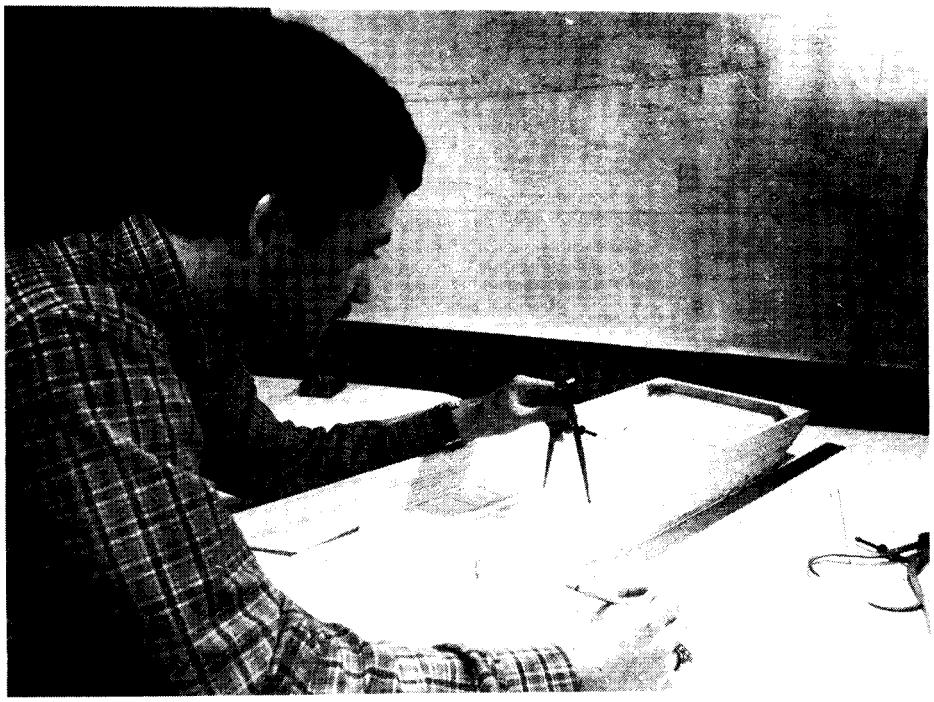


Figure 21. Stuart Morgan uses first generation ferry models to prepare research objectives for the 1983 investigation.

Figure 22. Kaea Morris records artifact details at the East Carolina University Conservation Lab.

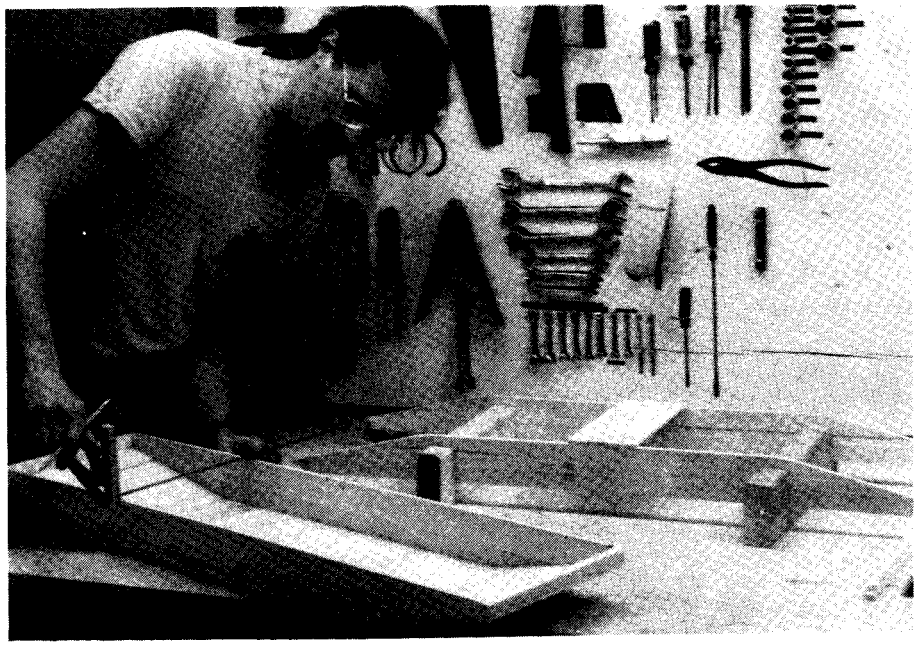


Figure 23. Bob Schneller begins construction of the final ferry models.

Figure 24. Bob Schneller completes the final research model of the mid-eighteenth century vessel at Blossom's Ferry.

the 1981 field project based on information from the initial reconnaissance. By building 1/4-inch scale reconstructions of each ferry hull, gaps in field data could be identified along with specific design and construction features that required further investigaton. Priorities for additional research could then be formulated on a highly specific basis. The preliminary models were taken into the field in 1983 so that errors and specific features could be more effectively addressed (Figures 20-21; 23-24).

Following the 1983 field investigation, additional archaeological data supported the construction of second generation models. The construction of these models confirmed the accuracy of plans, and permitted a more effective consideration of vessel function. The models have provided new insight into the function of both the end ramps and the stanchions with sheaves for cables. In addition to serving as 3-dimensional objects for study, the final models will be used in a series of educational exhibits to illustrate the nature of underwater archaeological research and activity at Blossom's Ferry.

CONCLUSIONS

Although ferries played an instrumental role in the development of Colonial America the historical record contains little vessel-specific information. Today the most important source for data on ferry architecture and construction is the archaeological record associated with ferry crossing sites. Blossom's Ferry is a valuable source of information about early riverine ferry operations. Research to date confirms the rich and varied nature of that data source. In addition to the remains of at least three submerged ferries, the site preserves structural material from one or more bridges. Without question, the most significant bridge structure is associated with the drawbridge built during the third quarter of the 18th century by Captain Heron. Historical research has established that Heron's drawbridge was one of the earliest in the American colonies. As such it represents a highly valuable source of engineering data. As the bottom of the Cape Fear River contains an extensive collection of cultural material associated with on-site transportation activity the archaeological and historical value of the site extends well beyond the vessel-specific data produced by research to date. Clearly, additional investigation of both terrestrial and submerged components of Blossom's Ferry can provide a wealth of data unavailable in the historical record.

Some specific conclusions can be suggested from Blossom's Ferry. First, the design of riverine ferries appears to have been relatively stable from the Colonial Period through the first quarter of the 20th century. The Blossom's Ferry vessels are very similar in design and vary only slightly in construction. Construction differences appear to reflect the changes in wood product technology, and the industrial production and increased availability of iron products. Examination of additional flat and ferry vessels in the vicinity Brown's Ferry on the Black River in South Carolina tends to support these initial

findings. An early flat or ferry identified downstream from the Brown's Ferry crossing appears to have been constructed without any iron fastenings. The one-piece design of the sides of the hull and floor plank rabbet match the description of a design found in a document of the third quarter of the 17th century describing the construction of a ferry. The early Brown's Ferry flat has the same slab side, flat bottom, raked end, double stringer configuration as the two Blossom's Ferry vessels.

This same configuration is apparent in the remains of two late 19th/early 20th century ferries found at the Brown's Ferry crossing. The major differences in these later vessels is in the shallower side height, increase in standardized construction material, extensive use of iron and steel, and increased number of stringers used to reinforce the floor of the vessel. While the early vessels were all constructed with double, roughly square stringers, the later ferries contained six or more stringers all fashioned from 3 or 4 inch planks of 10 to 12 inches in width. While graphic and photographic evidence seems to confirm this design consistency, additional research is necessary to confirm the subtle changes in construction technique and identify regional variations.

RECOMMENDATIONS

Research at Blossom's Ferry illuminates the need for additional investgation. Although ferries and bridges played an important role in early transportation, little historical or archaeological research has been directed toward sites like Blossom's Ferry. Before we can accurately assess the role of Blossom's Ferry or other similar sites, additional historical and archaeological research must be undertaken. This will require data from a broad spectrum of ferry sites and is not likely to be accomplished in the immediate future. Immediate consideration should be given to additional research at Blossom's Ferry.

A comprehensive survey of the Northeast Cape Fear River in the immediate vicinity of Blossom's Ferry should be carried out to assess the nature and scope of the archaeological record. A high resolution side-scan sonar survey of the river bottom would provide an excellent indication of the location and nature of surviving cultural material. Using the sonar data, an examination of each target should be made and a comprehensive map of the river bottom produced. The third vessel, vehicle, and bridge structure identified during this investigation, should be documented; surface material should be mapped and collected to minimize data loss associated with looting of the site. The survey should be extended to include terrestrial material associated with both ferry and bridge operations. After completion of the survey, Blossom's Ferry should be nominated to the National Register of Historic Places and plans developed to provide for protection of the site. Until research demonstrates otherwise, Blossom's Ferry can be considered the most important underwater archaeological site associated with early ferry and bridge operations in North Carolina.

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CATALOG OF ARTIFACTS

CATALOG NUMBER: NECF-1-83
DESCRIPTION: Small cast iron pipkin with three legs and a handle.
PROVENIENCE: Recovered 5'8" northeast of the northwest corner of the east ferry exposed on the river bottom.
PHOTO NUMBER: B&W;#149,150,151
PLATE NUMBER: 1

CATALOG NUMBER: NECF-2-83
DESCRIPTION: Iron carpenter's axe head.
PROVENIENCE: River bottom. 48'5" north-northwest of the northwest corner of the east ferry.
PHOTO NUMBER: B&W; #152
PLATE NUMBER: 2

CATALOG NUMBER: NECF-3-83
DESCRIPTION: Iron spike 6 5/16" long, 1" head diameter.
PROVENIENCE: West vessel. Adjacent to north side 18' 2" west of the east end of the vessel.
PHOTO NUMBER: B&W;#152
PLATE NUMBER: 3

CATALOG NUMBER: NECF-4-83
DESCRIPTION: "T" head iron pin with keyway.
PROVENIENCE: West vessel. Adjacent to north stringer 13' 9" west of the east end of the hull.
PHOTO NUMBER: B&W; #154,155
PLATE NUMBER: 3

CATALOG NUMBER: NECF-5-83
DESCRIPTION: Iron tack, 1 3/16".
PROVENIENCE: West ferry. Adjacent to north stringer 5'6" west of east end.
PHOTO NUMBER: B&W; #156
PLATE NUMBER:

CATALOG NUMBER: NECF-6-83
DESCRIPTION: Two broken, decomposed iron nails.
PROVENIENCE: Unknown.
PHOTO NUMBER: B&W; #157
PLATE NUMBER:

CATALOG NUMBER: NECF-8-83
DESCRIPTION: Iron encrustation.
PROVENIENCE: Unknown.
PHOTO NUMBER: B&W; #160,161
PLATE NUMBER:

CATALOG NUMBER: NECF-9-83
DESCRIPTION: The iron hook is 5" long, 2" wide at its flattend end, 1" in circumference at its rounded end and the hook is 3" deep.
PROVENIENCE: West vessel. Adjacent to south side of north stringer 6'3" west of the east end of the vessel.
PHOTO NUMBER: B&W; #162,163
PLATE NUMBER: 4

CATALOG NUMBER: NECF-10-83
DESCRIPTION: Unidentified iron artifact.
PROVENIENCE: West vessel. Adjacent to south side of the north stringer 4'3" east of the baseline.
PHOTO NUMBER: B&W; #164
PLATE NUMBER: 4

CATALOG NUMBER: NECF-11-83
DESCRIPTION: Unidentified artifact made of two slabs of 1/4" thick iron, one flat and the other convex, measuring 3" by 4" and held together by an iron nail. Cast into the convex surface is a geometric design and the word DIME. Two patent dates, March 13, 1888 and June 2, 188? and some lettering appear on the extenal surface of the flat piece.
PROVENIENCE: West vessel. Adjacent to south side of north stringer 8'1" from east end of vessel. Considered intrusive material.
PHOTO NUMBER: B&W; #165,166
PLATE NUMBER: 5

CATALOG NUMBER: NECF-12-83
DESCRIPTION: Iron concretion found to be an iron chain in state of poor preservation.
PROVENIENCE: River bottom adjacent to south side of east vessel 3'5" south of south end of baseline.
PHOTO NUMBER: B&W; #167
PLATE NUMBER:

CATALOG NUMBER: NECF-13-83
DESCRIPTION: Iron file section measuring 5 1/2" long by 1 3/8" wide.
PROVENIENCE: West vessel. Adjacent to the north side 5'5" west of the east end of the vessel.
PHOTO NUMBER: B&W; #168,169
PLATE NUMBER: 4

CATALOG NUMBER: NECF-14-83
DESCRIPTION: Portion of a brick.
PROVENIENCE: West vessel. Between stringers. Intrusive.
PHOTO NUMBER: B&W; #170
PLATE NUMBER:

CATALOG NUMBER: NECF-15-83
DESCRIPTION: One sherd of blue transferware.
PROVENIENCE: West vessel. South side of north stringer 7'3" east of the west end of the vessel.
PHOTO NUMBER: B&W; #171
PLATE NUMBER: 11

CATALOG NUMBER: NECF-16-83
DESCRIPTION: One unglazed redware sherd.
PROVENIENCE: East vessel. Adjacent to south stringer 3" east of athwartship baseline.
PHOTO NUMBER: B&W; #172,173
PLATE NUMBER: 11

CATALOG NUMBER: NECF-17-83
DESCRIPTION: Ceramic chamber pot rim in two pieces with a 9" diameter from outer edge to outer edge.
PROVENIENCE: River bottom surface 16' northwest of the west end of the west ferry.
PHOTO NUMBER: B&W; #174,175
PLATE NUMBER: 11

CATALOG NUMBER: NECF-18-83
DESCRIPTION: One iron ring 9 1/2" outer diameter. In crossection it is flat on one side and convex on the other.
PROVENIENCE: West vessel. South of the south stringer 4'6" east of the baseline.
PHOTO NUMBER: B&W; #176
PLATE NUMBER: 6

CATALOG NUMBER: NECF-19-83
DESCRIPTION: Iron bolt, 11 3/4" long.
PROVENIENCE: West vessel. Adjacent to south side of north stringer immediately east of baseline.
PHOTO NUMBER: B&W; #177
PLATE NUMBER: 3

CATALOG NUMBER: NECF-20-83
DESCRIPTION: Iron bracket. Total length 5", width 2" and has a small hole in one end.
PROVENIENCE: West vessel. Between stringers 6'9" east of baseline.
PHOTO NUMBER: B&W; 178,179,180
PLATE NUMBER: 4

CATALOG NUMBER: NECF-21-83
DESCRIPTION: Iron pulley block with wood attached, 4" pulley; on an 8" bolt.
PROVENIENCE: East vessel. Adjacent to north side 14'2" east of the northwest corner of the hull.
PHOTO NUMBER: B&W; #181
PLATE NUMBER: 3

CATALOG NUMBER: NECF-22-83
DESCRIPTION: Iron axe head with portion of a wood handle. Blade end 4 3/4" wide hammer end 3 1/2" wide and total length measures 7 3/4".
PROVENIENCE: West vessel. Adjacent to south side 6'10" west of the southeast corner of the hull.
PHOTO NUMBER: B&W; #181
PLATE NUMBER: 2

CATALOG NUMBER: NECF-23-83
DESCRIPTION: Iron spike/nail remains.
PROVENIENCE: West vessel. Unknown.
PHOTO NUMBER: B&W; #182
PLATE NUMBER:

CATALOG NUMBER: NECF-24-83
DESCRIPTION: Ferry pulley block with associated wood same as NECF-21-83.
PROVENIENCE: East vessel. Adjacent to north side of hull 12' 3" west of the east end of the hull.
PHOTO NUMBER: B&W; #183
PLATE NUMBER:

CATALOG NUMBER: NECF-25-83
DESCRIPTION: Iron chain section, 5" long in poor preservation.
PROVENIENCE: West vessel. River bottom adjacent to northeast corner of the hull of the vessel 10'4" west of the corner.
PHOTO NUMBER: B&W; #184
PLATE NUMBER:

CATALOG NUMBER: NECF-26-83
DESCRIPTION: Two pieces of brick.
PROVENIENCE: West vessel. Unknown.
PHOTO NUMBER: B&W; #185
PLATE NUMBER:

CATALOG NUMBER: NECF-27-83
DESCRIPTION: Three 5 1/4" iron nail remains.
PROVENIENCE: West vessel. Adjacent to north stringer 11'7" east of the west end of the hull.
PHOTO NUMBER: B&W; #186
PLATE NUMBER:

CATALOG NUMBER: NECF-28-83
DESCRIPTION: Leather shoe and detached heel. Measuring 10 1/2" long and 2 1/2" wide.
PROVENIENCE: River bottom 28' northwest of the northwest corner of the west vessel.
PHOTO NUMBER: B&W; #187,188
PLATE NUMBER: 13,14

CATALOG NUMBER: NECF-29-83
DESCRIPTION: Miscellaneus pieces of shoe leather; two pieces of heel and one boot side with holes for laces.
PROVENIENCE: River bottom 27' 6" northwest of the northwest corner of the west vessel.
PHOTO NUMBER: B&W; #189
PLATE NUMBER: 13,14

CATALOG NUMBER: NECF-30-83
DESCRIPTION: Unidentified wooden piece with iron plate, overall dimensions 20 1/8" long by 3 1/8" wide.
PROVENIENCE: West vessel. Between stringers 14' 5" west of the east end of the hull.
PHOTO NUMBER: B&W; #180,191,192
PLATE NUMBER:

CATALOG NUMBER: NECF-31-83
DESCRIPTION: Wood with an iron pin and ring.
PROVENIENCE: West vessel. Between stringers 18' 1" west of east end of hull.
PHOTO NUMBER: B&W; 193
PLATE NUMBER:

CATALOG NUMBER: NECF-32-83
DESCRIPTION: Wooden axe handle, measuring 31" in length.
PROVENIENCE: West vessel. Adjacent to north side of hull 16'2" west of the east end of the vessel.
PHOTO NUMBER: B&W; #194
PLATE NUMBER:

CATALOG NUMBER: NECF-33-83
DESCRIPTION: Wooden board with oyster shells attached as well as teredo damage Measuring 27 1/2" by 9" overall.
PROVENIENCE: Unknown.
PHOTO NUMBER: B&W; #195,196
PLATE NUMBER:

CATALOG NUMBER: NECF-34-83
DESCRIPTION: Iron weight for torpedo. Overall measurements; 20" diameter and 8" high with a ring protruding from the center.
PROVENIENCE: River bottom 46' northwest of the west vessel.
PHOTO NUMBER: B&W; #197,198
PLATE NUMBER: 7

CATALOG NUMBER: NECF-35-83
DESCRIPTION: Lead projectile, rifled musket shot, measuring 1" long and then modified at a later date for use as a fishing weight.
PROVENIENCE: West vessel. Adjacent to south side of north stringer 11'2" east of the west end of the hull structure.
PHOTO NUMBER: none
PLATE NUMBER: 8

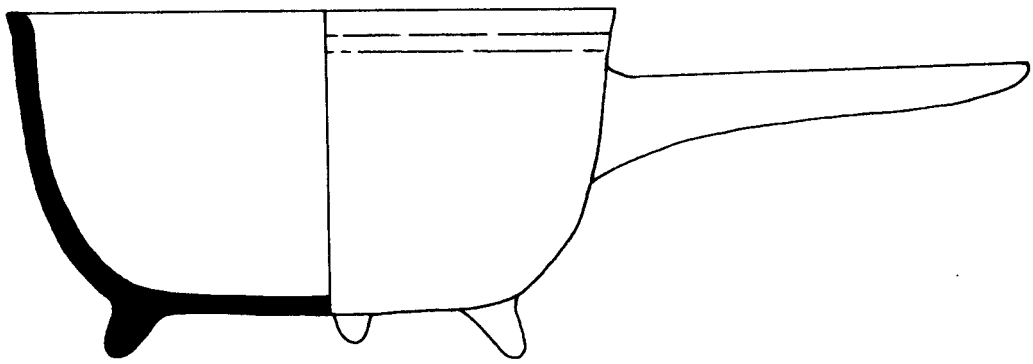
CATALOG NUMBER: NECF-36-83
DESCRIPTION: Lead glazed red earthenware pot with a rim diameter of 7" and a bottom diameter of 8 3/4" standing 10" high.
PROVENIENCE: East vessel. Between stringers 17'4" west of the east end of the hull structure.
PHOTO NUMBER:
PLATE NUMBER: 12

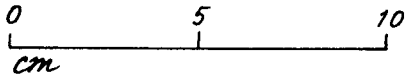
CATALOG NUMBER: NECF-37-83
DESCRIPTION: Pine stanchion measuring 4'9" long with an 8" iron pulley.
PROVENIENCE: West vessel. River bottom adjacent to the southwest corner of the hull 7'8" east of the southwest corner of the hull.
PHOTO NUMBER:
PLATE NUMBER: 15

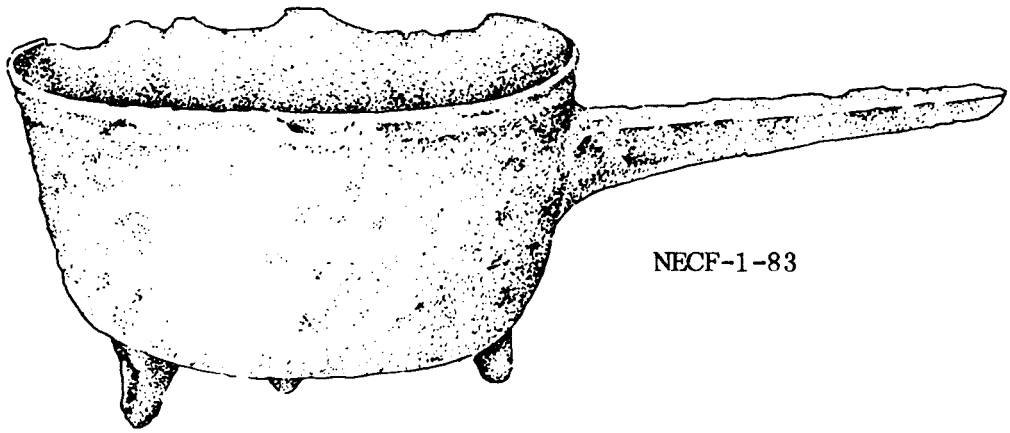
CATALOG NUMBER: NECF-38-83
DESCRIPTION: Iron frame torpedo measuring 2'5" in height including the lifting ring and with a diameter of 1'.
PROVENIENCE: River bottom 67' west-northwest of the northwest corner of the west vessel.
PHOTO NUMBER:
PLATE NUMBER: 9

CATALOG NUMBER: NECF-39-83
DESCRIPTION: Iron counterweight for frame torpedos. Measures 2'2" in length and 5 1/2" by 4 1/2" in width and height. Two diagonal holes are present on each end and are 1" in diameter.
PROVENIENCE: River bottom 58' northwest of the northwest corner of the west vessel.
PHOTO NUMBER:
PLATE NUMBER: 10

CATALOG NUMBER: NECF-40-83
DESCRIPTION: Wooden ramp lever measuring 26'7" long with three bolts and three spikes.
PROVENIENCE: River bottom 66' west of the west vessel hull.
PHOTO NUMBER:
PLATE NUMBER: 16

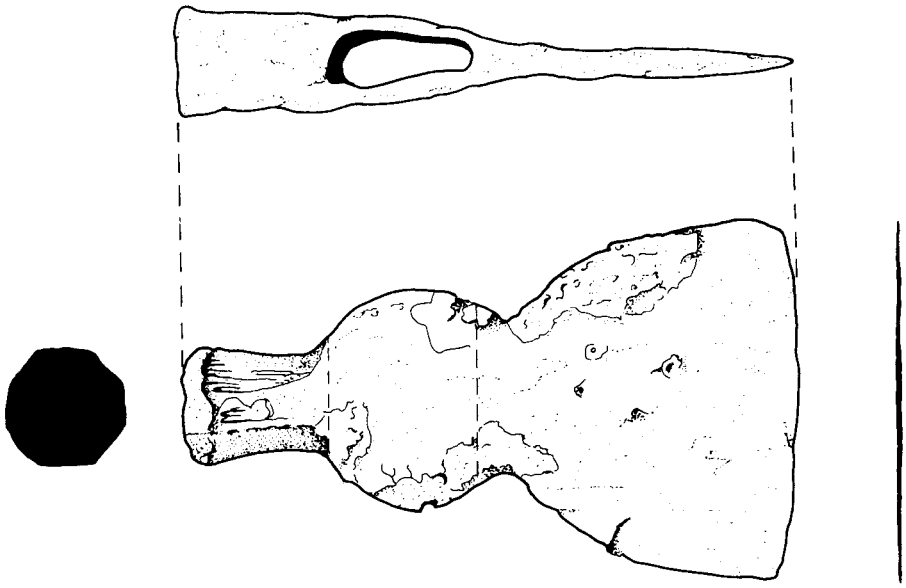




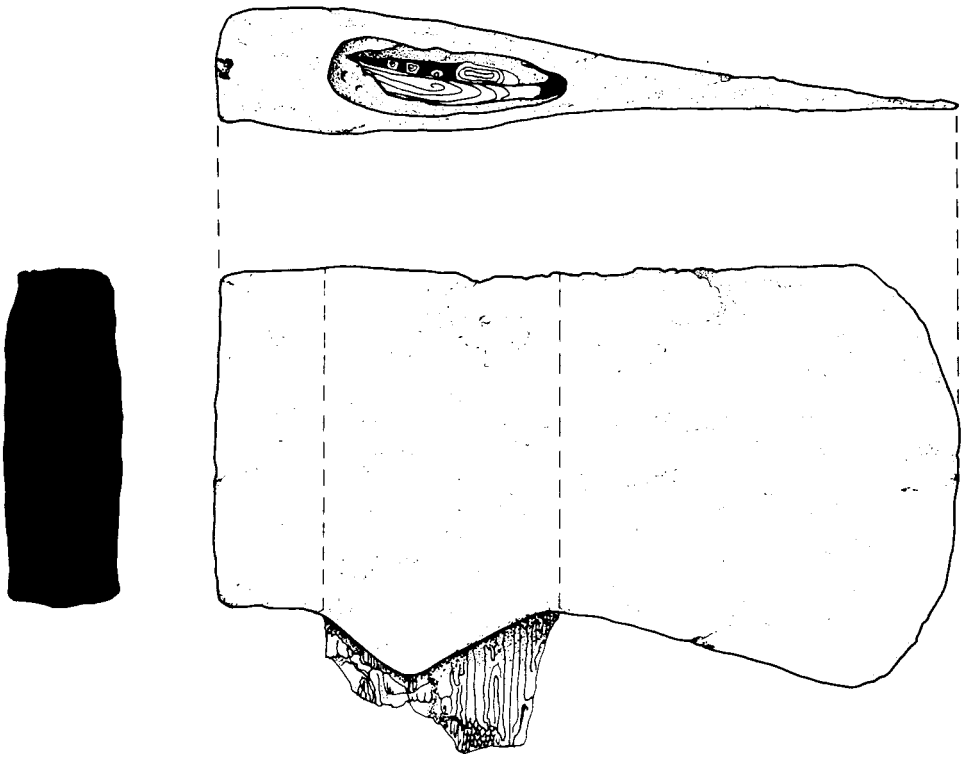


NECF-1-83

Plate I



NECF-2-83



NECF-22-83

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Plate II

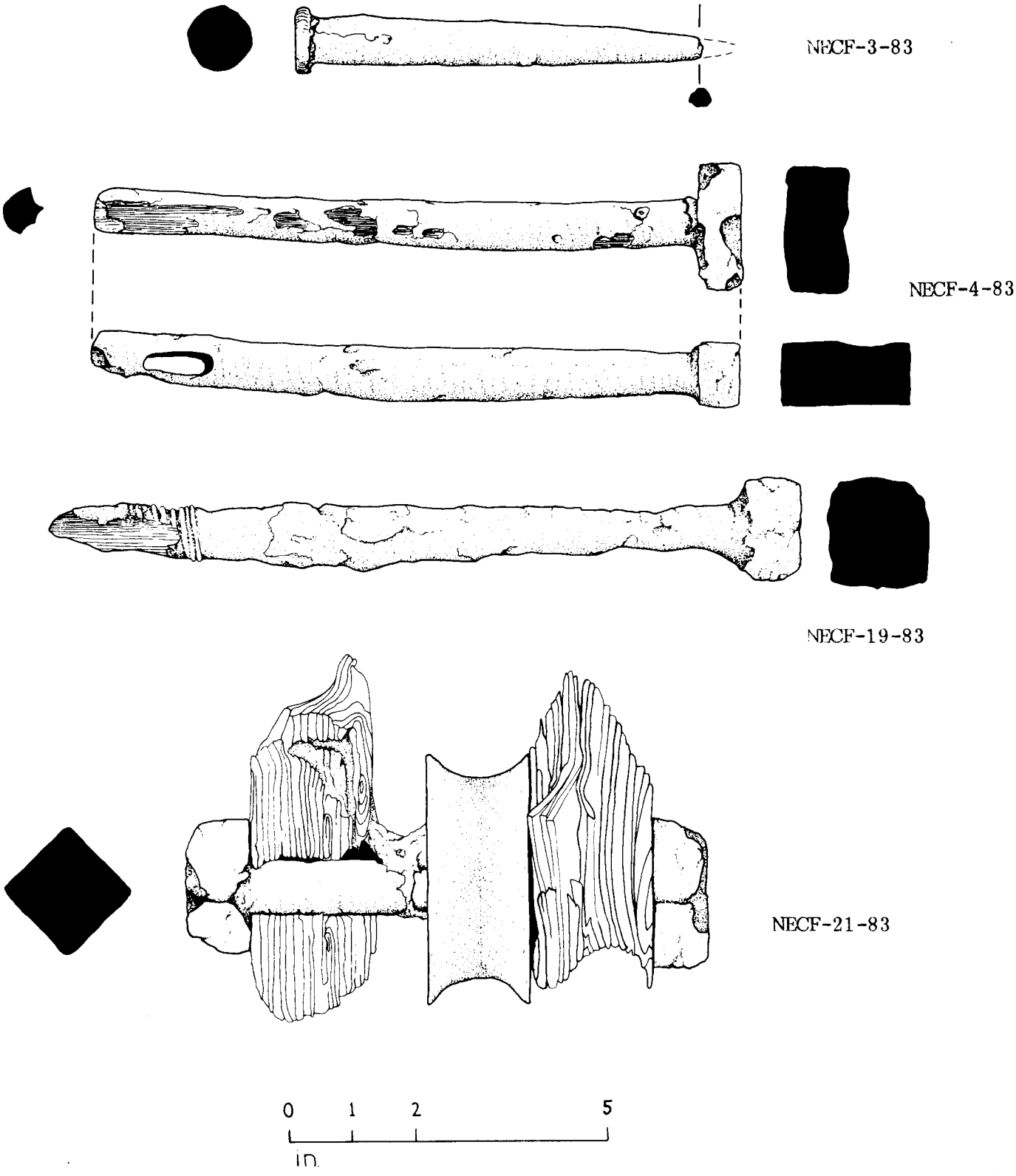
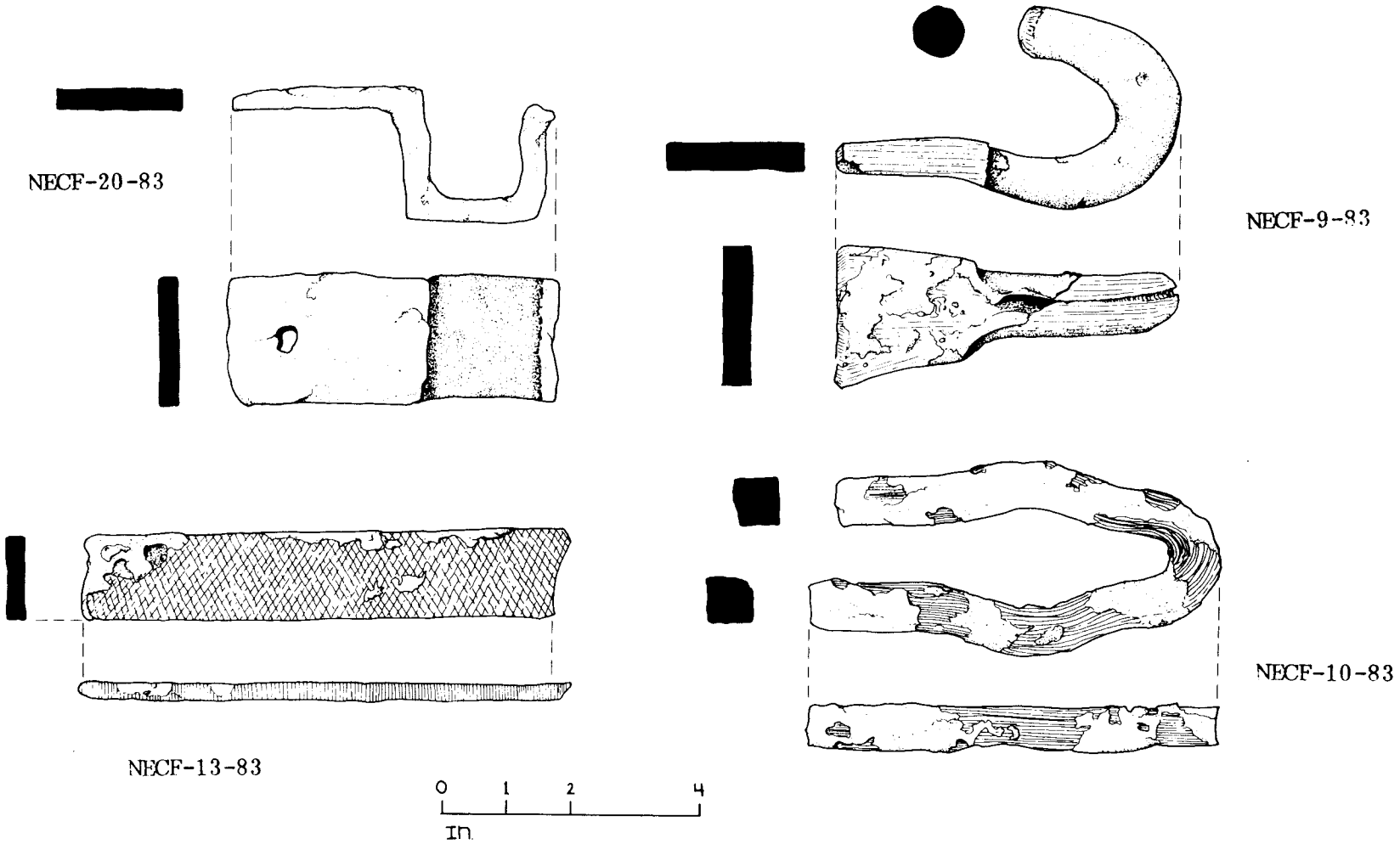
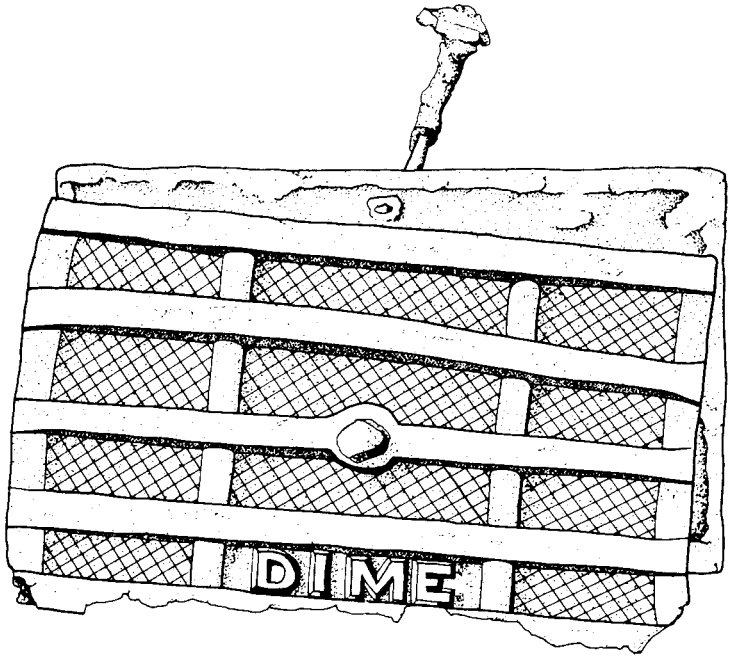
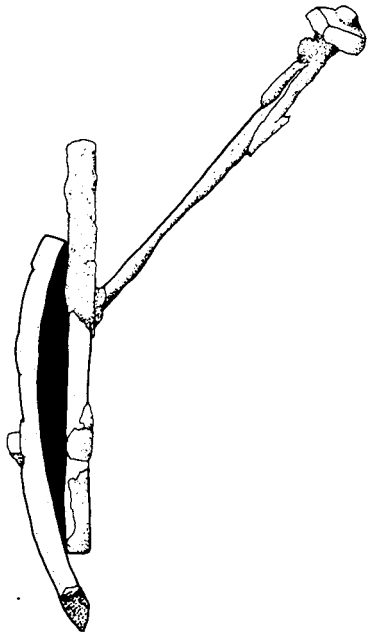


Plate III

Plate IV







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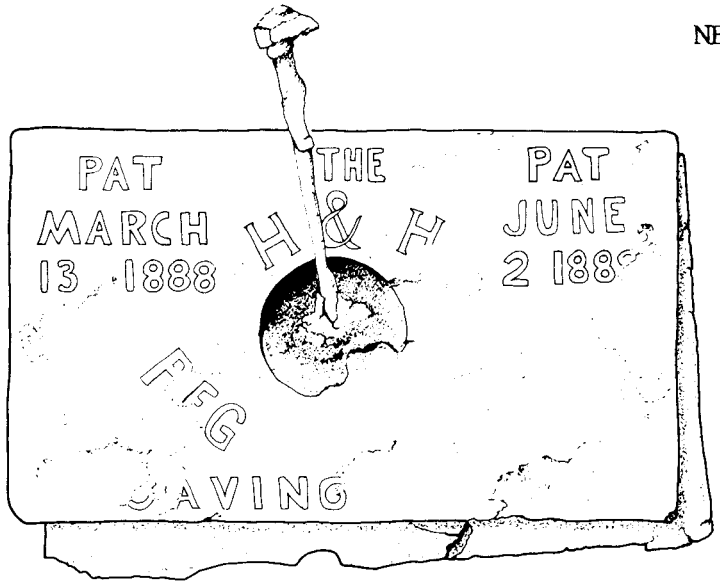

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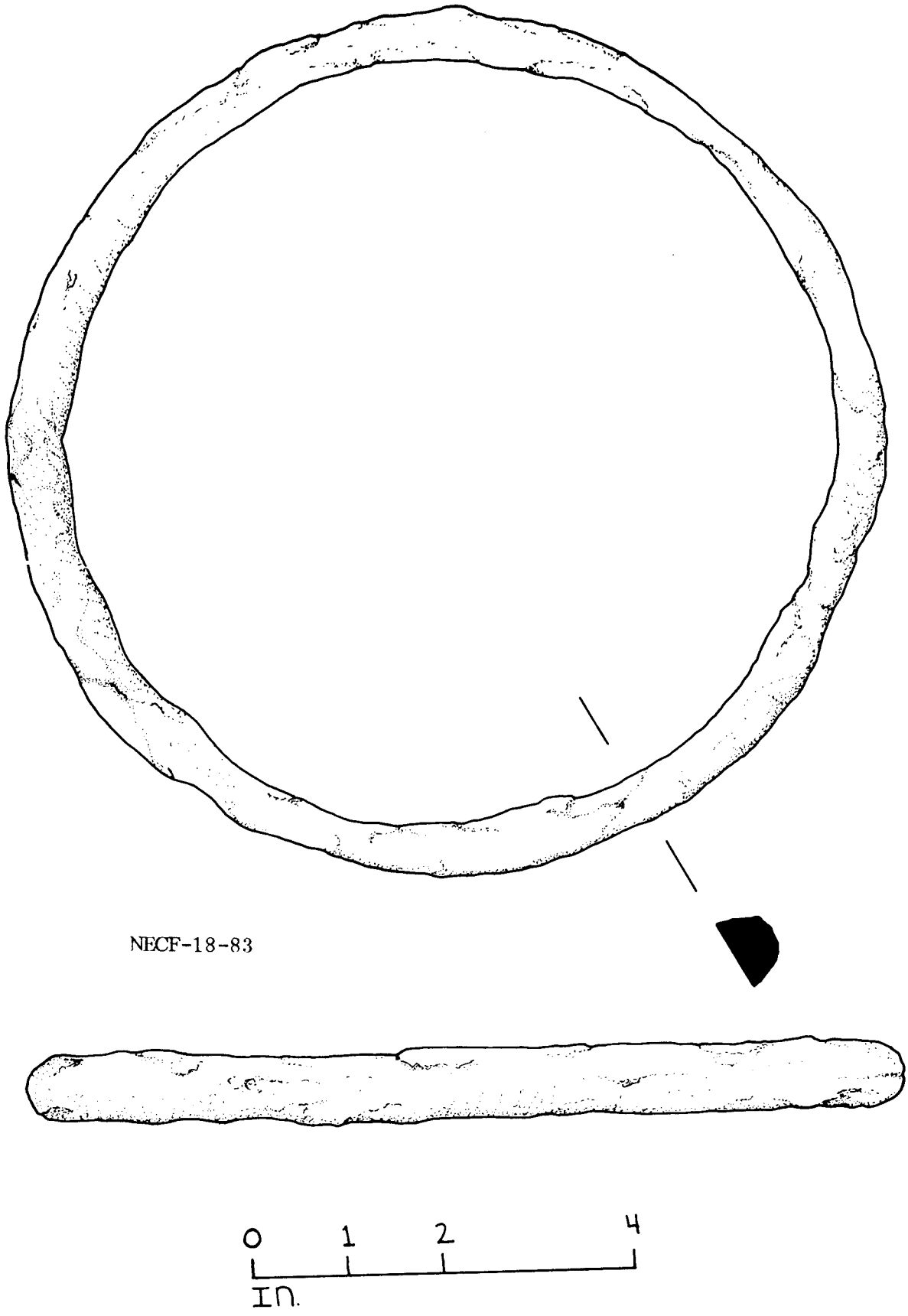

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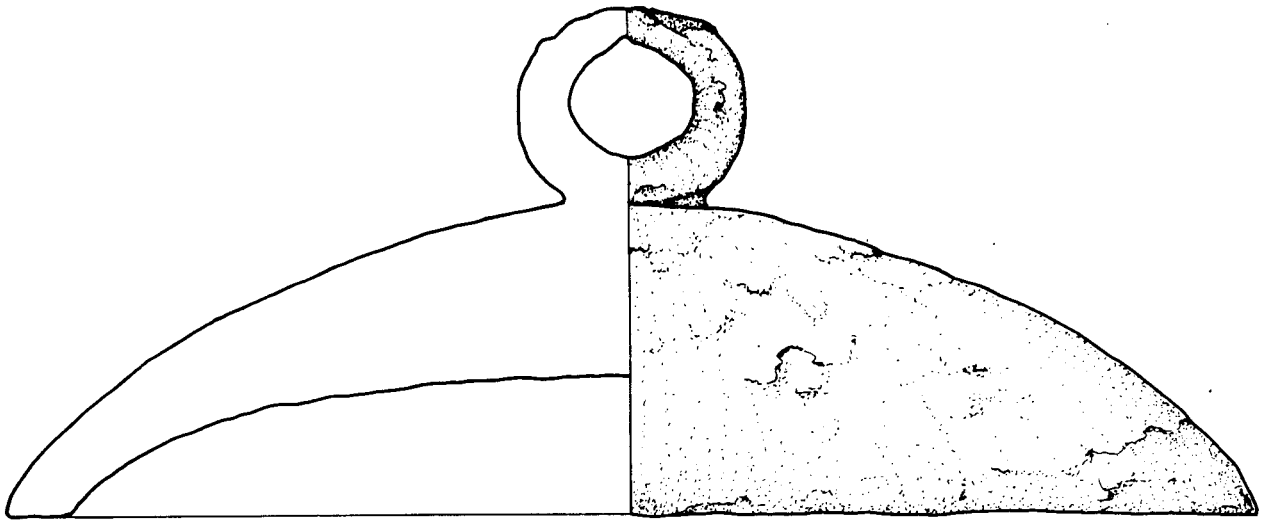

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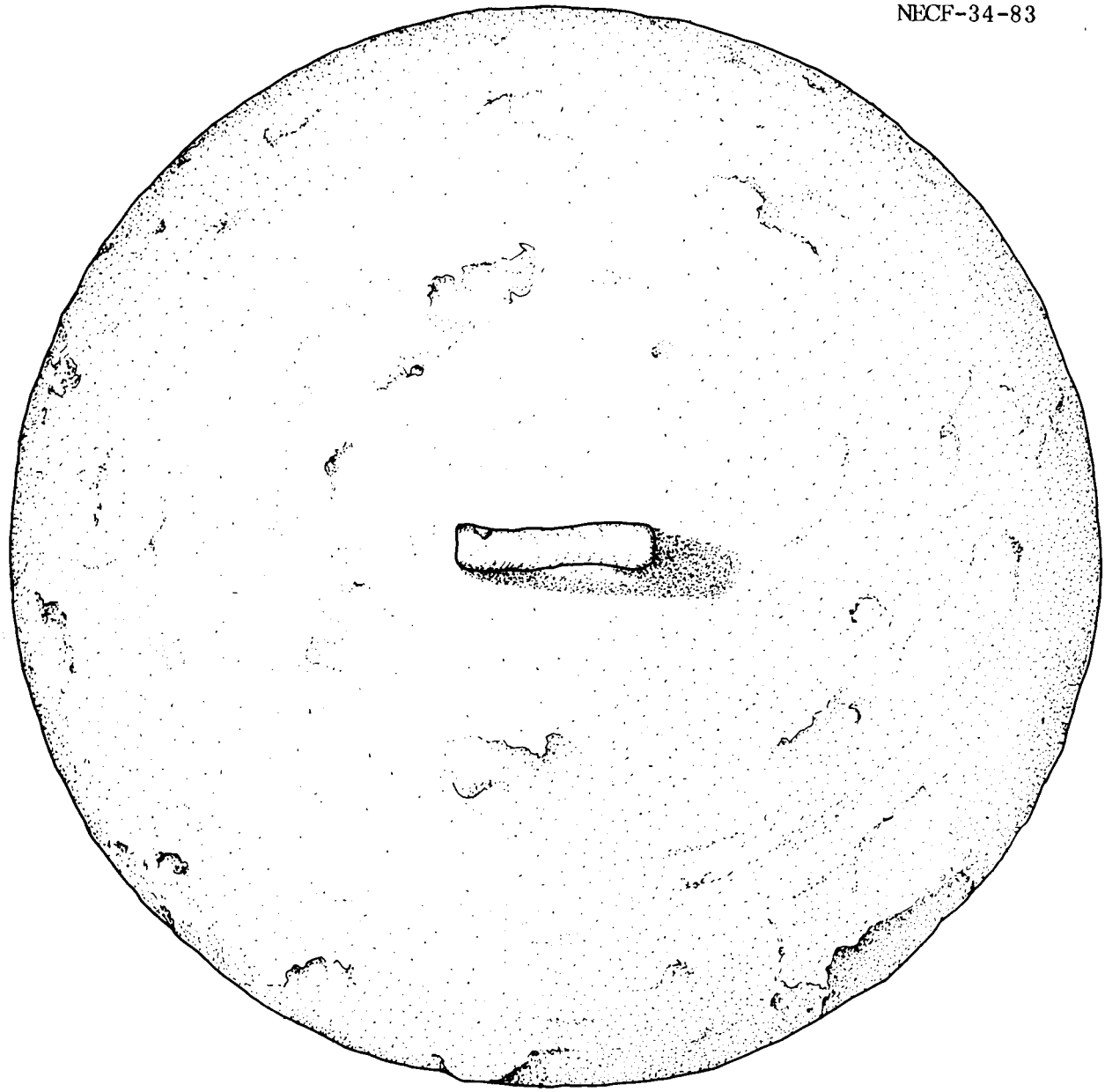

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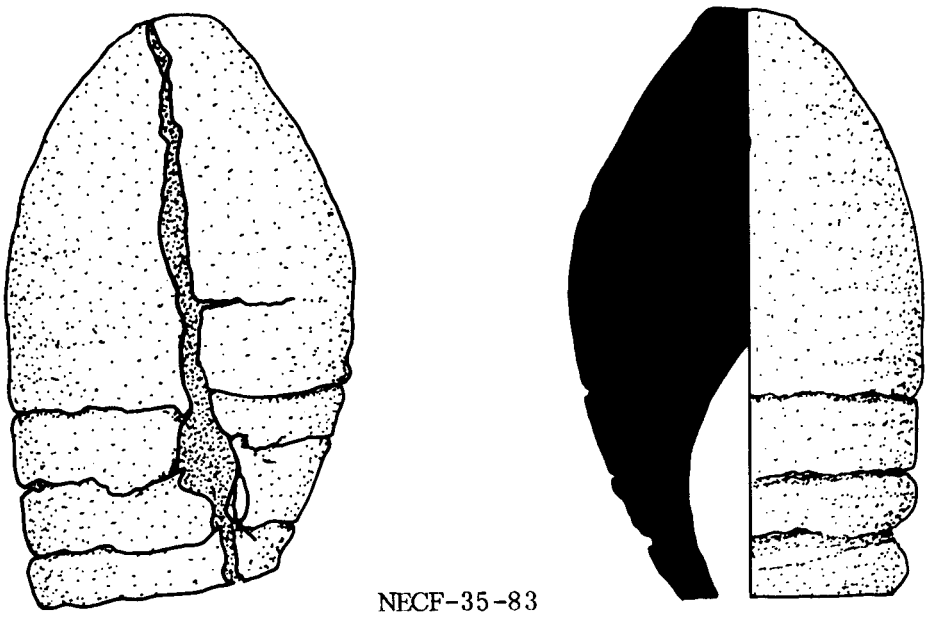
Plate VII



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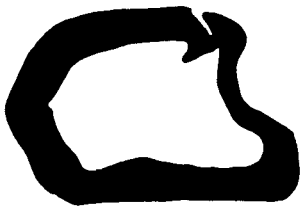


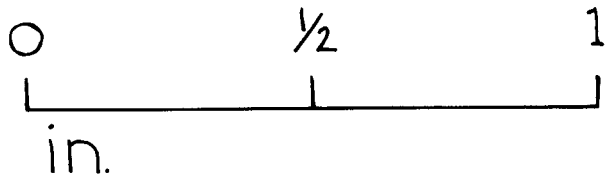
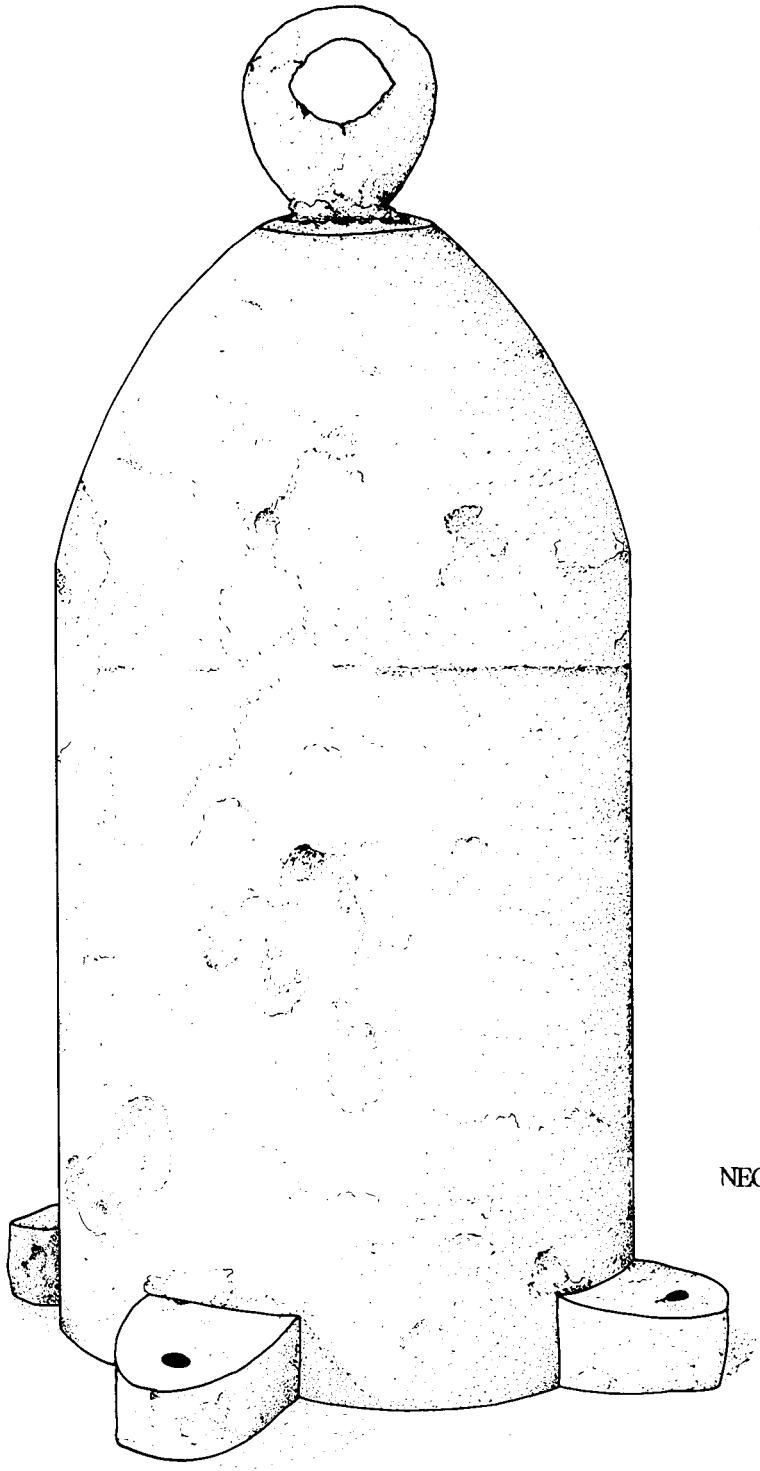


Plate VIII



NECF-38-83

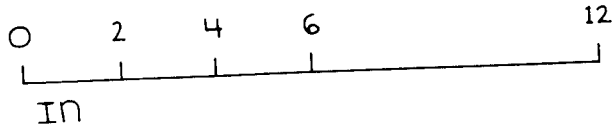


Plate IX

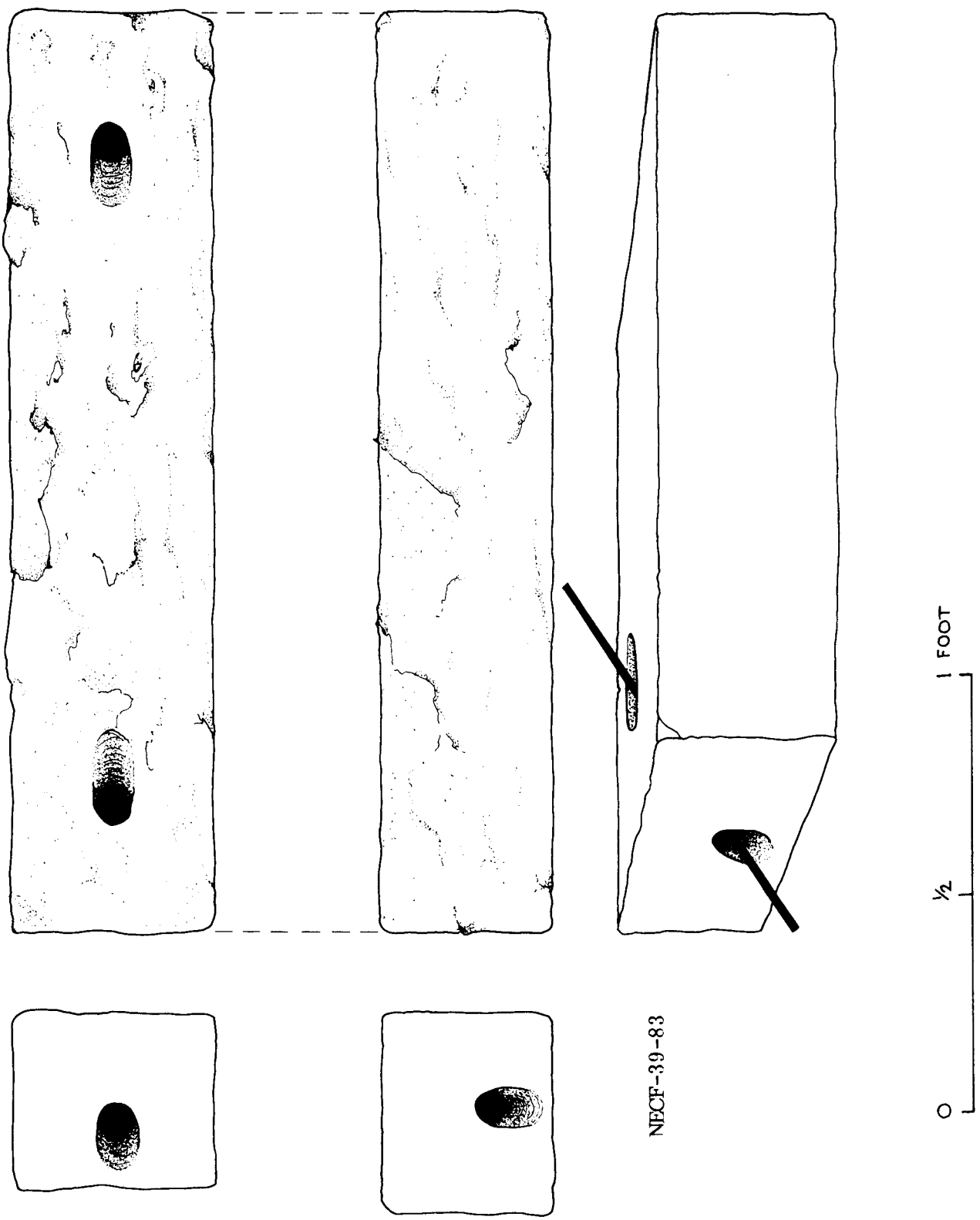
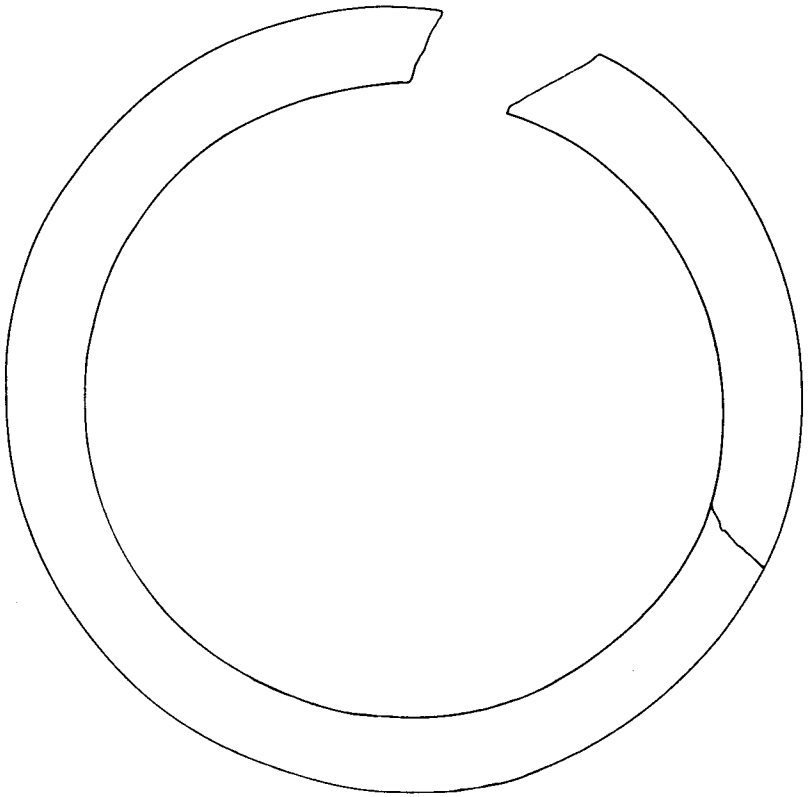
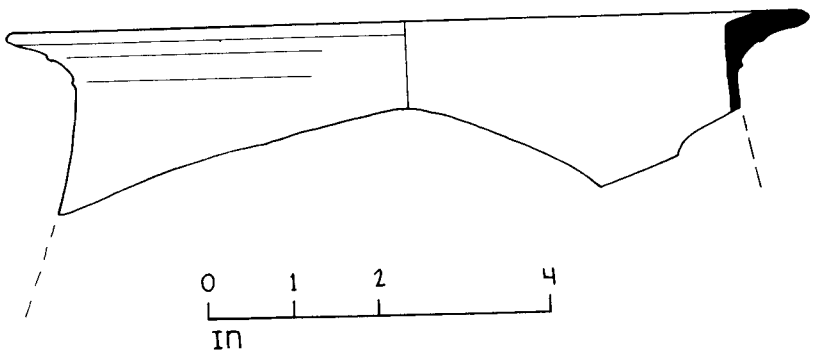


Plate X

Plate XI



NECF-17-83



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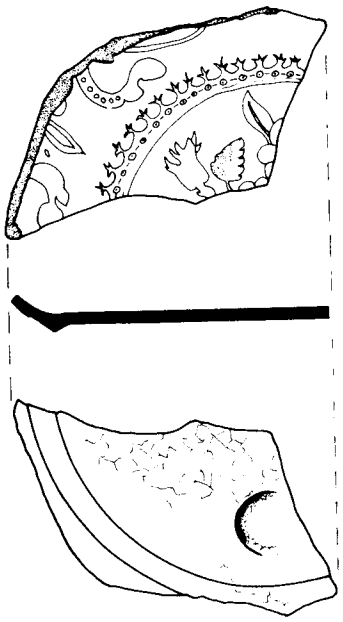


NECF-15-83

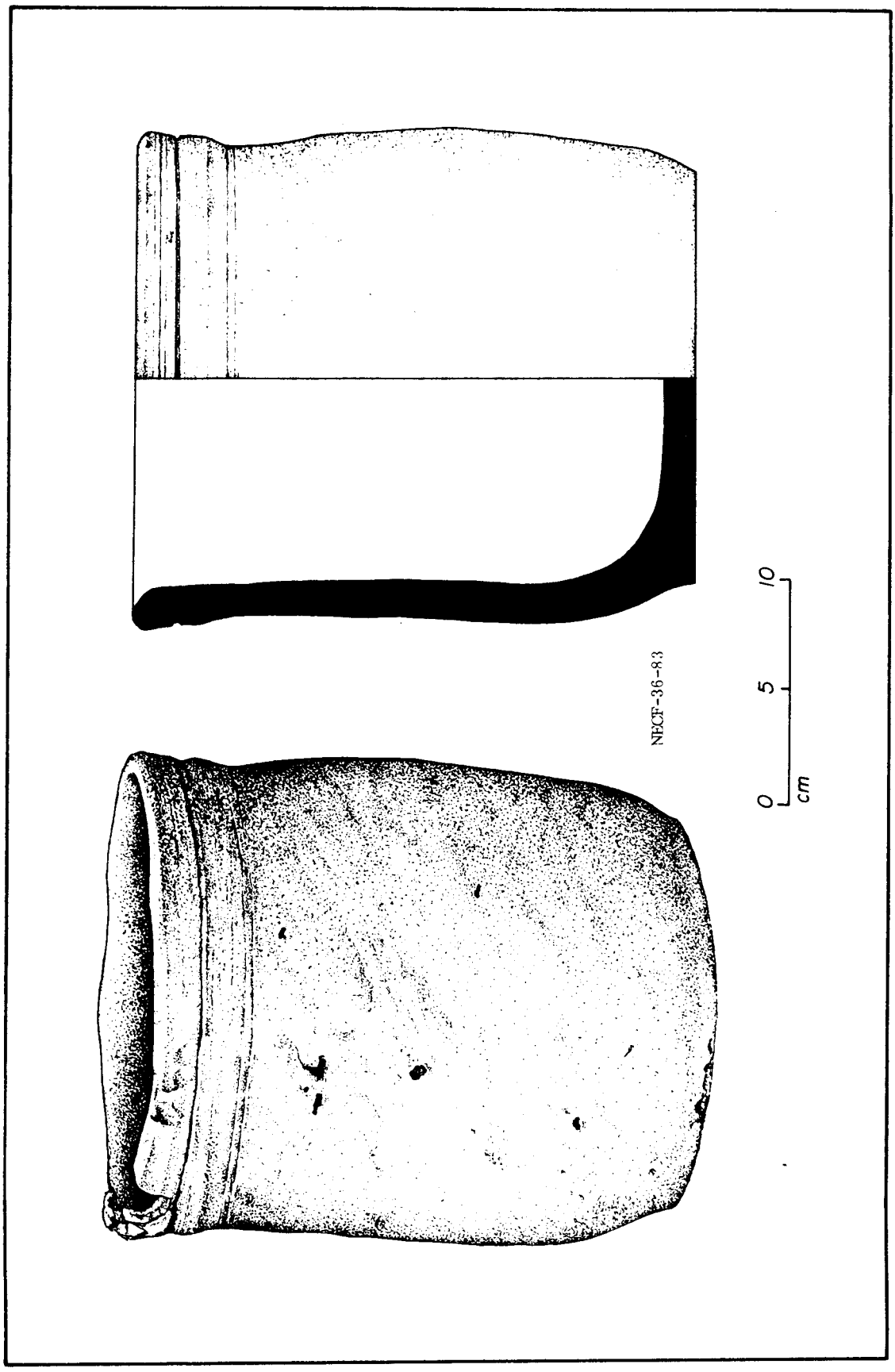
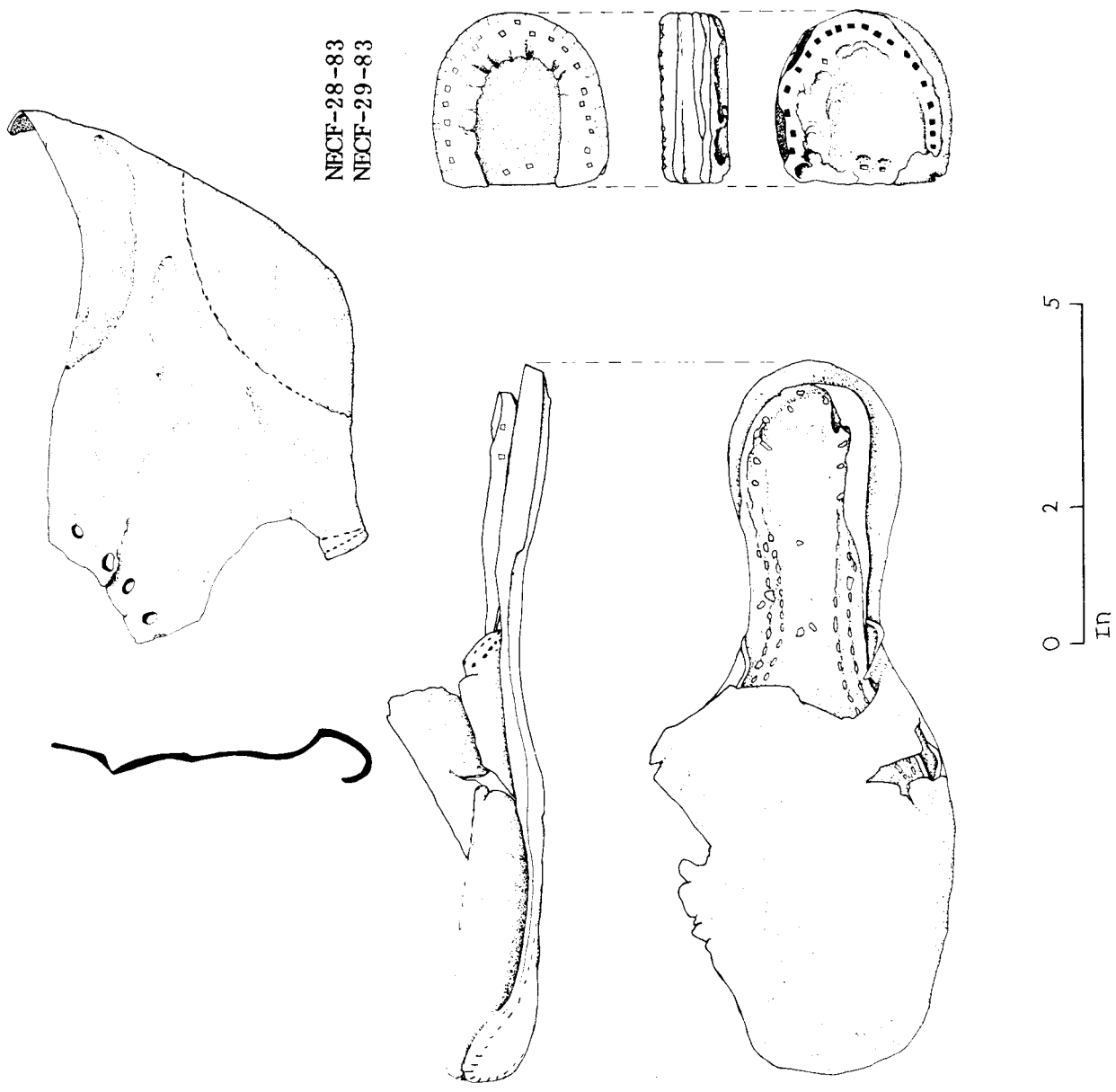


Plate XII



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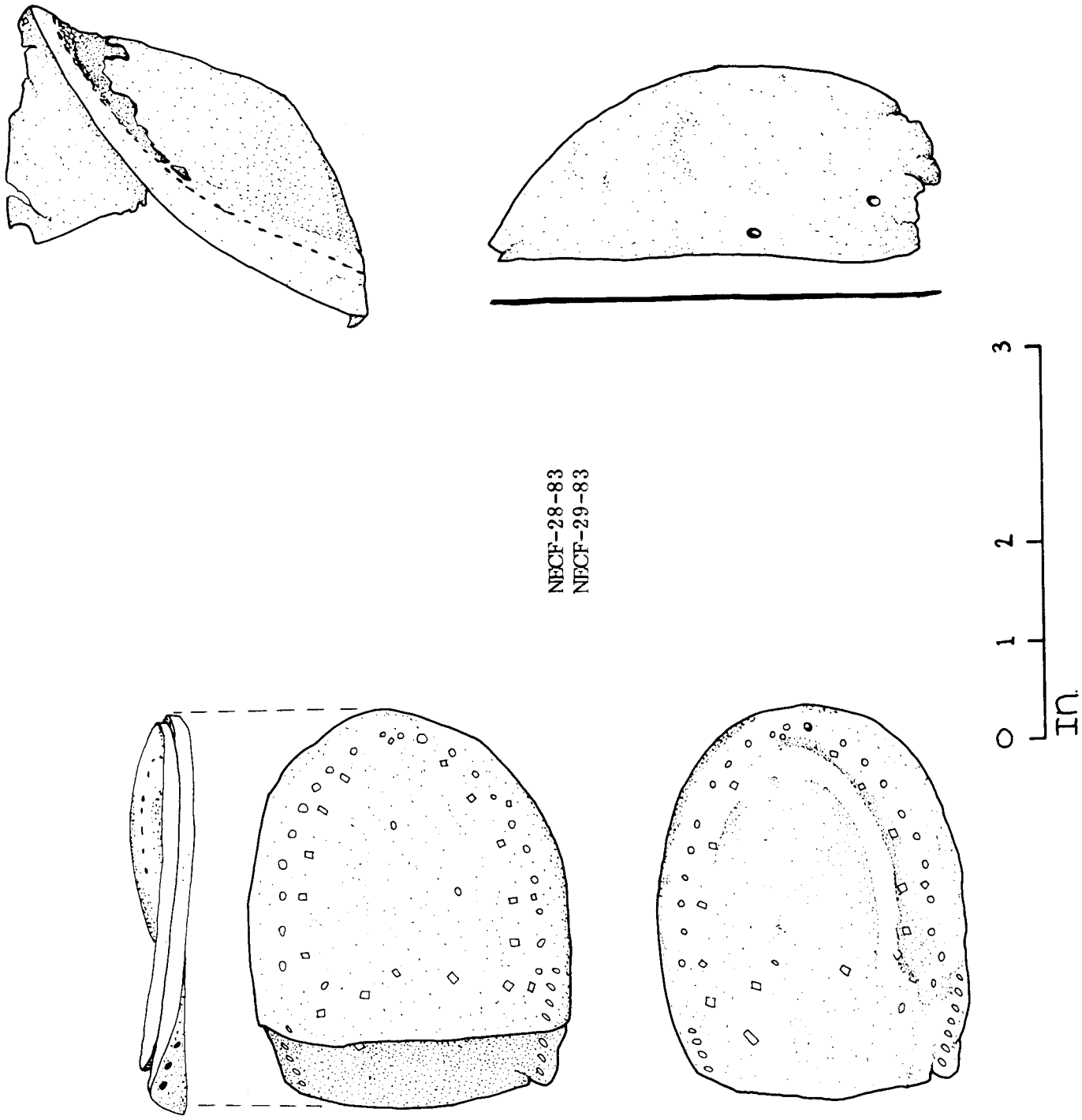


Plate XIV

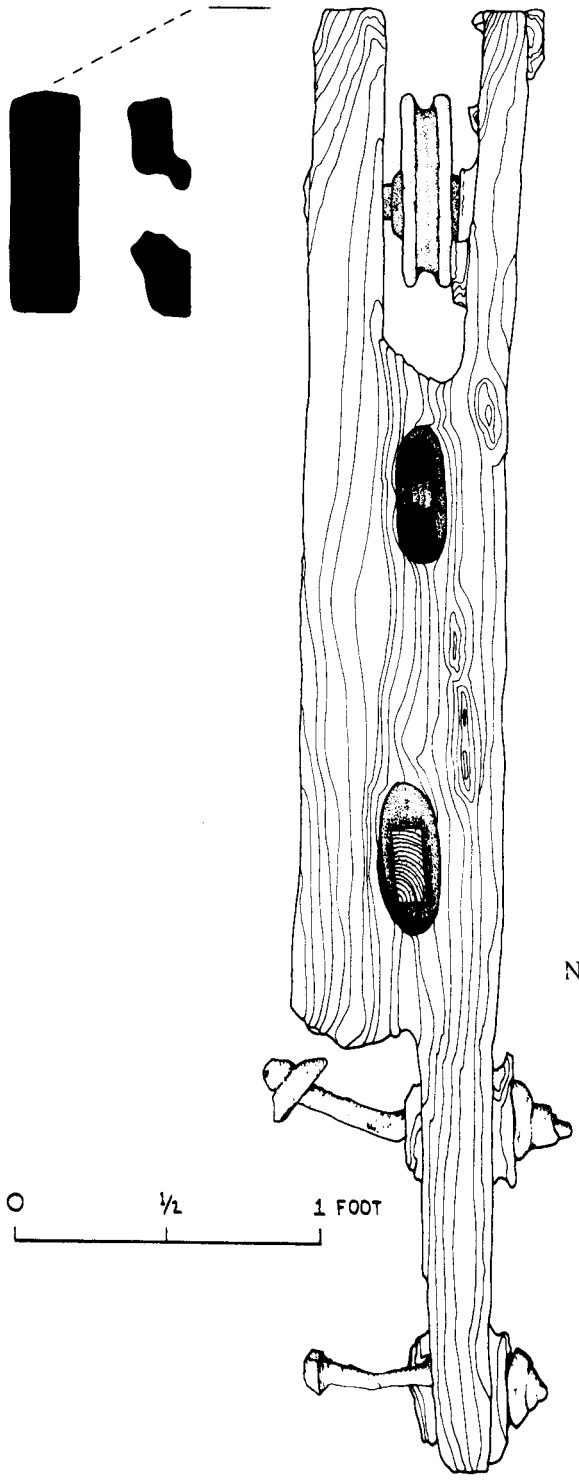
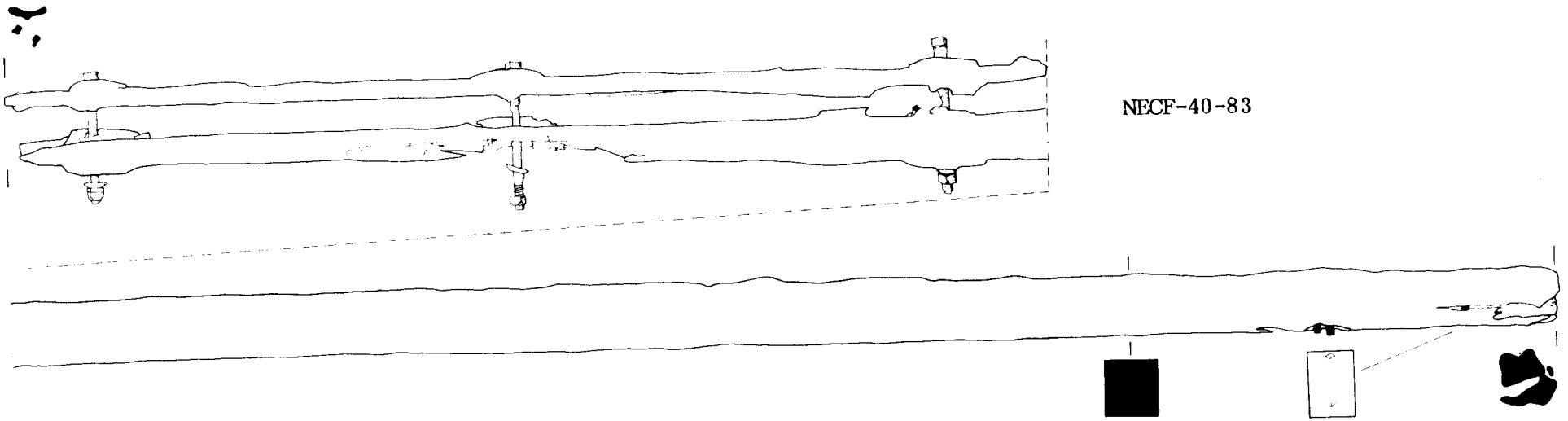


Plate XV



NECF-40-83

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Plate XVI