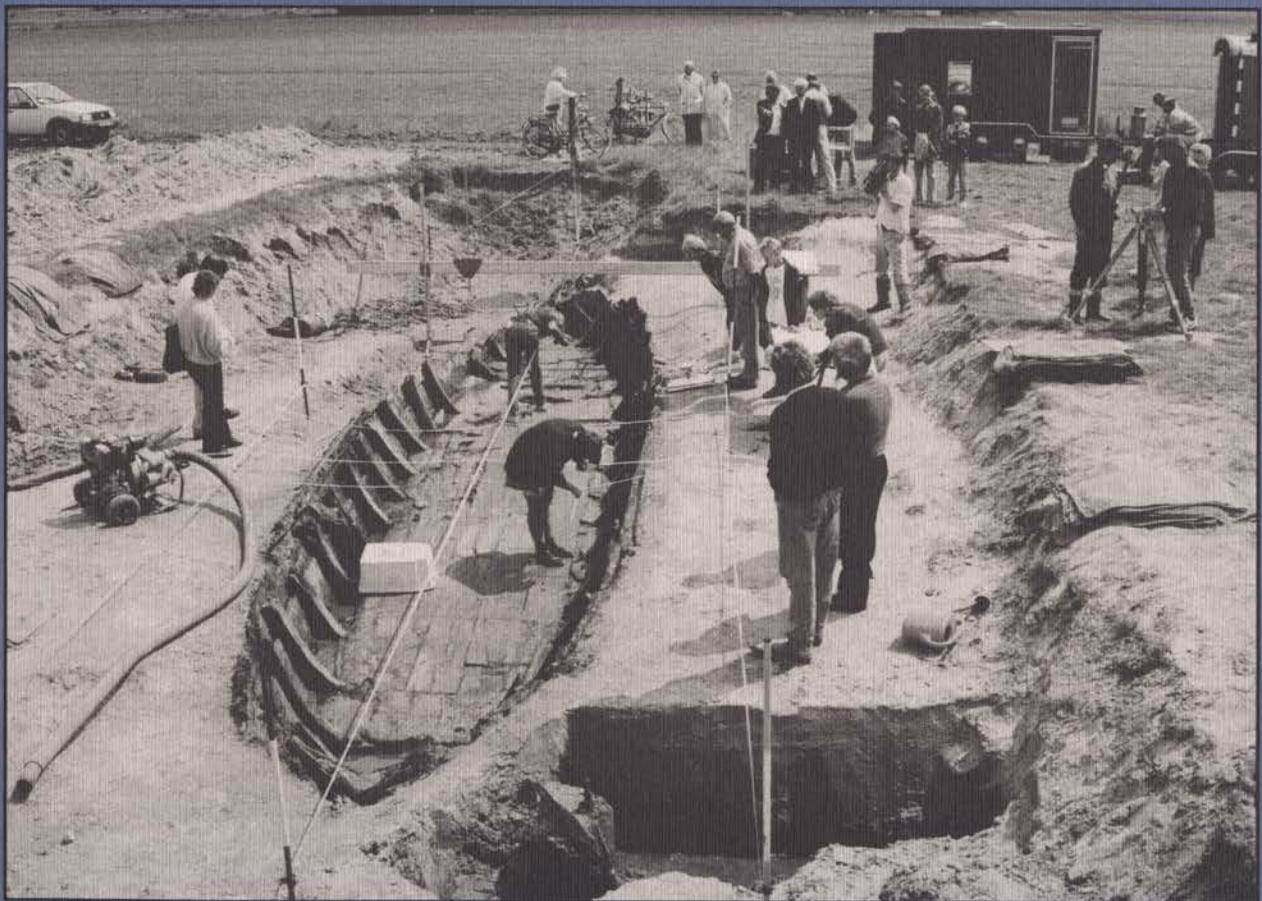


THE INA QUARTERLY



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On the cover: A day designated for visitors at the site of a sixteenth-century shipwreck in the Dutch polders attracts observers as archaeologists measure the hull. A calibrated beam designed for measuring cross sections can be seen in the ship's bow (the view is from the stern). During the summer of 1992, INA research associates Bob Neyland and Kathleen McLaughlin-Neyland directed excavation of the ship under the aegis of the Dutch Center for Ship Archaeology and participated in the excavation and recording of another sixteenth-century ship.

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Editor: Margaret Lynch

Two Sixteenth-Century Ship Excavations in the Netherlands: 1992 Field Report



Photo: B. Neyland

by Kathleen McLaughlin-Neyland
and Robert Neyland

Viewed from the stern, shipwreck M-11 as it appeared after excavation. The port side was separated from the rest of the hull and was divided into two parts. This sixteenth-century merchantman is just one of many wrecks, from all periods of history, found on land (the polders) once submerged beneath the Zuider Zee. Artifacts from the wreck (below) include the staves of a collapsed barrel (foreground), rope, and hearth tiles. A copper pot and slipware bowl found nearby might have been used on board.

Excavating a shipwreck on land may seem like a contradiction, but in the Netherlands terrestrial excavation of ships is a common event. More than 400 such sites, dating from the twelfth through the twentieth centuries, have been discovered on land reclaimed from the Zuider Zee, and over a hundred have been excavated or surveyed so far. Two such shipwrecks, both dating from the sixteenth century, were our undertaking during the summer of 1992.

In the spring of 1992, we were invited by the Dutch Center for Ship Archaeology (located in the town of Ketelhaven) to assist in the excavation, recording, and analysis of a sixteenth-century merchantman found on the polders. When the invitation was expanded to include two other Americans, Gordon Watts of East Carolina University endorsed two of his graduate students, Patrick Cole and Amy Knowles, from the Maritime History Program, thus completing the core of our excavation team. We were to help excavate a shipwreck named M-11, after the agricultural lot on which it was discovered. The site lay near the city of Biddinghuizen in Eastern Flevoland.

The remains of the vessel measured over 20 meters in length and 5 meters in breadth. The hull had come to rest on its bottom. Its port and starboard sides had broken and

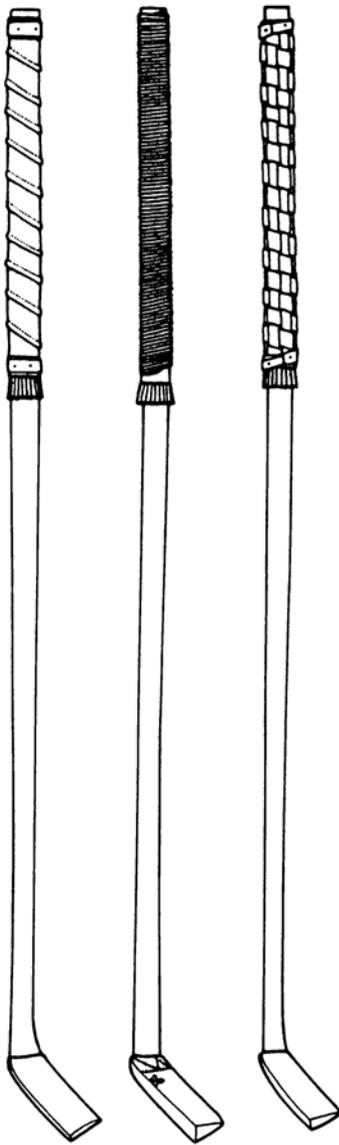
splayed outward at the turn of the bilge. On the port side, the remains were complete up to the gangway. Unlike many other watercraft found on the polders, and once used for inland shipping, this ship had a true keel. It was entirely clinker-built, and its strake overlaps were fastened with iron rivets. With a mast set far forward, the vessel was probably well suited for coastal sailing.

Remains inside the hull showed that the vessel's last main cargo had consisted of numerous barrels of herring and grain. Several large saucer-shaped lead ingots had also formed part of the cargo. A hearth and galley were evidenced by ceramic tiles, bellows made of wood and leather, a copper pot, a slipware bowl, and peat for fuel. Two wooden shovels discovered between timbers were possibly used for loading grain or fish.

Outstanding among the artifacts were the lead heads and ash handles of three *colf sloffen*. These



Photo: B. Neyland



Sixteenth-century golf clubs (drawn here as reconstructed) were found on the M-11 shipwreck. The clubs have handles made from ash and heads made of lead. Golf was played in Holland on both grass and ice during the medieval period, and was spread to Scotland by merchants and fishermen. Drawing not to scale. Drawing: J. Morel

were the prototypes of modern clubs used in golf, a game dating back to at least the fifteenth century in the north of Holland. The *colf* consisted of a wooden stick made from hazel or ash which was fastened to a lead head or slipper. The early version of golf was played on both grass and ice and was spread to Scotland about AD 1450 by merchants and fishermen.

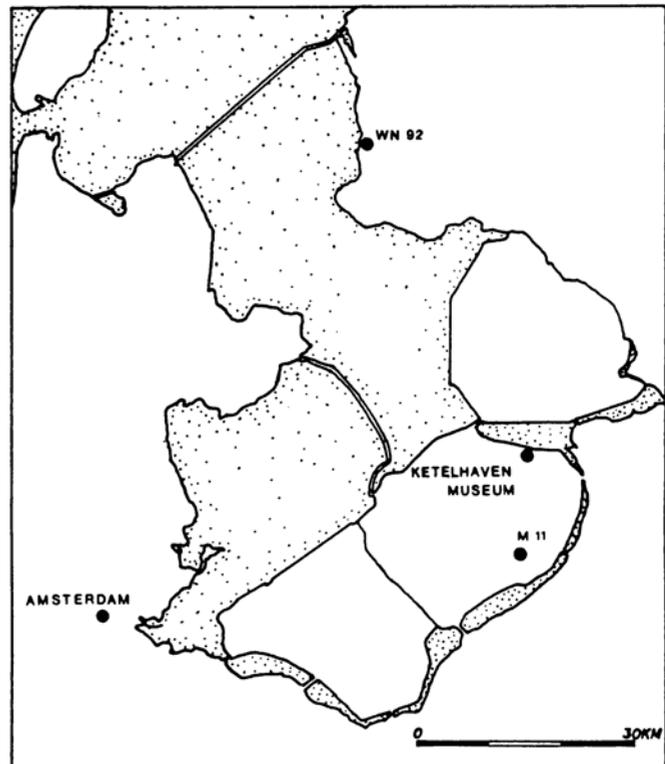
While planning for the M-11 excavation was underway, a second late medieval shipwreck was found. The site was uncovered by workers digging a new drainage ditch in the northern province of Friesland. The wreck lay in the Workumer Nieuwland polder, immediately south of the city of Workum. Construction on the dike that created this polder was completed in AD 1624, therefore, it was apparent from the beginning that the wreck predated 1624. Dendrochronological analysis of samples taken from hull planking revealed that the oaks used to construct the vessel were felled between AD 1547 and 1553. Thus, the wreck represents the oldest example of Frisian boatbuilding yet discovered.

A preliminary survey indicated that the site, designated WN-92, con-

tained a well preserved pram-like craft. Prams were flat-bottomed boats primarily used on inland waterways for carrying all sorts of bulk goods. The vessel itself was of a well known type, but it displayed an unusual method for securing caulking to bottom planks. Both this unique construction and the ship's location on a polder that gave us an approximate date for the hull recommended the wreck as a significant archaeological site, so when agricultural development threatened its survival immediate excavation became necessary, even while the M-11 excavation was in progress.

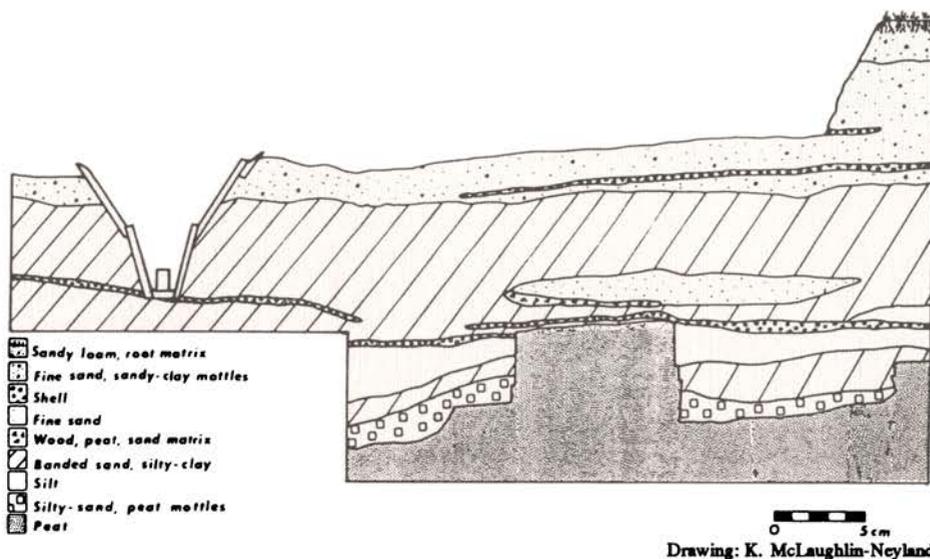
The Frisian wreck was situated in a striking geological profile, with the hull resting on top of a peat bed. The peat had been mined prior to the boat's sinking. Distinct shovel marks were visible in cut faces beneath the hull. Both the peat and the shipwreck were covered by layers of silt and clay, probably as a result of the land subsidence and increased coastal flooding that plagued low-lying areas of the Netherlands. Such inundation was suggested on the WN-92 site by thin layers of marine shells. One shell stratum immediately overlay the hull: shells were piled against the chine (the turn of the bilge) and mast step inside the hull, while others were sandwiched between the wreck and peat bed.

Under our direction, the excavation of WN-92 was begun June 4, 1992. We had very little time in which to



Map: B. Neyland

Sites M-11 and WN-92 are located in the Dutch polders, northeast of Amsterdam.



A geological profile taken at the stern of WN-92 includes the hull at left. A peat bed (bottom right) still displays cuts where blocks of peat had been removed.

complete the project, as the land's owner was eager to finish building his drainage ditch. The advantages of a terrestrial ship excavation over an underwater project quickly became apparent: within one short summer season we were able to excavate the site, disassemble the hull, and completely record the 14-meter-long shipwreck.

Our work was speeded along by some innovative field techniques. An experimental pantograph made it possible to prepare a 1:20 scale site plan in just a few days. We also drew a 1:10 scale site plan using more traditional steel tapes and a plumb. The new pantograph, developed by Jan Eric Dilz, however, was to prove as accurate as standard field techniques, even while it was many times faster.

By June 12 the ceiling planking was completely exposed and a 1:10 scale architectural site plan of the wreck was begun. On June 17, Herr Dilz tested the prototype of his pantograph, which could record in three dimensions (existing pantographs record in two dimensions). He prepared a 1:20 scale site plan of the entire hull remains in about four hours. The plan was refined over the next three to four excavation days until a satisfactory copy was produced. On June 18 we began taking cross-sections of the hull using a measuring beam. This calibrated beam (see cover photo), designed and built by the staff of the Ketelhaven Museum, enabled us to take precise and rapid sectional measurements of the hull.

After the site plans were completed, the ceiling planking was labeled and removed. It was then possible to record floor timbers and frames that had been covered. Mud below the ceiling planking and between the frames was

excavated, placed in labeled buckets, and later sieved on a 1/16 inch mesh screen. Each frame was given a unique identification label and removed after being drawn on the 1:10 scale site plan. The same procedure was used for the bottom and outer hull planking. All of the ship timbers eventually were carried to the State Museum for Ship Archaeology in Ketelhaven. Once there, detailed 1:10 scale drawings of each piece from the hull were made using pantographs, although a few drawings were made using a gridded table. All recording was completed by September 7 and the hull remains were prepared for reburial at a location where their preservation would be insured. The process from beginning to end lasted no longer than three months.

The Frisian wreck appeared to have been placed or sunk intentionally. A line of pine posts extended forward of the stem; another pine post and an oak beam were placed just after the sternpost. The oak beam, with one end sharpened to create a stake, was probably taken from the vessel. Also immediately after the sternpost (on the port side) two pieces of pine planking had been driven into the peat a few centimeters apart. The pieces fit together into one plank and may represent a fragment of decking from the vessel. More tellingly, an unplugged drain hole with the plug lying a short distance away was observed in the stern. Also in the stern, a short piece of wood had been driven into the chine, separating the bottom from the port side strake. The extremely worn and heavily repaired condition of the hull indicated that the vessel had been at the end of its career when it came to rest on the peat bed.

A high concentration of wood chips, bark, twigs, and leaves found amidships may mean that workmen trimmed the posts placed fore and aft of the vessel from inside the boat. Wood shavings were produced with an adze. Both they and most of the posts are pine, and this fact combined with the size of the wood shavings and tool marks, including grooved marks from a nicked adze that enabled us to match shavings to specific cuts on the timbers, reinforces the idea that the wood fragments came from the posts, which in turn further suggests that WN-92 had been placed deliberately at its present site.

Both hull and posts may have been part of a structure to combat flooding occurring prior to the 1624 dike. The boat rests near the mid sixteenth-century ship channel, however,



Photo: B. Neyland

Jan Eric Dilz records the bow of WN-92 with his innovative pantograph.

and could have been used as a dock or landing place for loading and unloading cargo.

Few sixteenth-century manufactured artifacts were uncovered at the site, but traces of medieval cargoes were found throughout the vessel. Amidships and in the bow a well preserved layer of hay was present. Aft of midships the layer thinned out and essentially disappeared. Hay was an important fodder in the pastoral economy of late medieval Holland.

Bricks were also once hauled on our vessel. Sediments between the frames revealed a solid layer of brick dust between 3.5 and 4.25 meters north of the sternpost. Forty-one percent of the site's 223 brick fragments (recovered by screening) came from this area. Brick dust was concentrated mainly in the chine but extended, in places very lightly, to cover an area 3.0 to 6.0 meters north of the sternpost. Three-quarters of all brick fragments recovered from the site came from this area, which roughly delineates the after part of the hold, forward of a probable stern cuddy.

Peat also had been transported on the Frisian vessel. In sediments between the frames, a distinct layer of peat underlay the brick dust, and peat mixed with clay extended as far forward as the mast step. Fragments of peat blocks were found throughout the ship.

The hull's style and shape are certainly suitable for a bulk carrier of hay, brick, and peat. Its timbers measure 13.2 meters long and 2.8 meters wide. The wreck consists of five bottom planks, three strakes each on port and starboard sides, and an inner wale. Side strakes overlap and are fastened with twice-bent nails. A central plank of oak, the ends of which are shaped to fit the heels of the stem and sternpost, runs from bow to stern.

The lower edges of the bottom planks are beveled to hold moss caulking. The moss is supported by willow lathes held in place by numerous small wooden tenons (1.5 cm long x 1 cm wide x 0.05 to .2 cm thick) called *prikken*. On both Roman-era and medieval vessels from northern Europe, caulking and lathe usually were held in place by iron staples, called *sintels*. On WN-92, however, all of the bottom caulking is held in place by only lathe and *prikken*.

Side strakes are fastened to the bottom strakes with wooden pegs and iron nails. The pegs (1.1 cm in diameter) are much smaller than treenails, and each has been sharpened to a point. In several places the hull's bottom had been so worn as to expose the pegs.

Frames consist of L-shaped futtocks that alternate with straight floor timbers and top timbers. In the bow and stern single V-shaped timbers fit atop the stem and sternpost. Port and starboard futtocks overlap across the bottom but are not fastened together. Aft of midships several futtocks display holes angled through their inboard face. These locations served ropes, which probably secured cargo and livestock.

The builder and operator of the vessel went to great lengths to construct and maintain a tight, continuous ceiling across all of the bottom, except over the last meter in the stern. Removable ceiling planks line the space between the futtocks along the chine. These removable pieces overlap adjacent ceiling planks and are held in place by chocks on the futtocks. The freedom to remove planks along the chine would aid in cleaning out the bilges, especially since bilge water circulated at the chine, around and underneath the frames.

In the bow, the ceiling is thinner, consisting of overlapped thin pine boards. The overlapping created a more watertight structure. Where these boards fit against the chine, tiny wedges are jammed to insure a very tight fit. This area was probably the floor of the forward cuddy. It would have provided a dry place for a few goods or personal belongings, or it might have been a place where a person could curl up and sleep. Curiously, a pair of children's shoes was found here.

Most of the other personal artifacts were also found in the forward cuddy area. These include a ceramic skillet, heather brushes, and several leather fragments. The latter, having been cut for reuse, were tentatively identified as once belonging to a leather garment, knife sheath, leather pouch, and adult's shoe.

The excavation and analysis of WN-92 should lead to new insights into the late medieval watercraft of northern Europe. Pram construction was a well defined tradition for centuries, and it exemplifies technological continuity from

AD 1500 to 1900. Evidence from WN-92, along with previous research by the authors on eighteenth-century prams and with new evidence from a 1993 excavation of another pram in the Netherlands, provides the rare opportunity to study the history and development of one class of watercraft across the centuries.

Future Projects

The excavation of another pram found in the polders is planned for the summer of 1993. All excavation expenses will be provided by the State Museum and Center for Ship Archaeology at Ketelhaven, the Netherlands, and by the Dutch State Service for Archaeological Investigations. Robert Neyland will direct the 1993 excavation. Team members will include Texas A&M University graduate students from the Nautical Archaeology Program and Department of Anthropology: James Coggeshall, Georgia Fox, and Mason McDaniel. Birgit Schroeder, a participant in past Uluburun excavations run by INA, will join the team. As with the excavation of WN-92, the 1993 project will include complete excavation, disassembly, and recording during a single summer season.

The Center for Ship Archaeology has planned a monumental excavation of the largest merchantman ever found in the polders. This vessel measures about 40 to 45 meters long, 7 meters broad, and over 6 meters deep in the ground. The excavation will be carried out in conjunction with the Batavia Foundation (which is currently responsible for reproducing and researching a seventeenth-century East India merchantman in Lelystad, the Netherlands). The project should require 5 to 10 years. Dutch archaeologists plan to build a museum hall over the entire site in order to

Rob Oosting, Head of Research at the Center for Ship Archaeology, fastens identification labels to the frames of WN-92 before the wreck is disassembled and moved.



Photo: B. Neyland

allow the public to observe the excavation in progress.

Acknowledgements

We would like to thank the Center and the State Museum for Ship Archaeology for the opportunity to participate in the excavation of M-11 and to conduct the excavation of WN-92. All costs of the excavation, recording, and conservation, as well as our living expenses, were paid by the museum. Royal Dutch Airlines (KLM) generously donated one free ticket from Texas to Amsterdam and discounted another. As always, their service was both efficient and helpful. The Institute of Nautical Archaeology cooperated by granting us research associate status and provided some film and processing expenses.

This work could not have been accomplished without the help of certain individuals. Dr. Jaap Morel and Rob Oosting from the Center for Ship Archaeology were particularly supportive of the 1992 field work, and both helped make arrangements for the 1993 excavation. Karel Vlierman contributed his wide knowledge of medieval cultural materials and archaeology. Lucas van Dijk and Jentz van der Land patiently conserved artifacts. Many other museum staff, including Rudy Loos, Harrum Post, Gert Schreurs, and Hans Schaal, were involved in the excavation and recording of WN-92. Special appreciation goes to Herre Wynia, a ship archaeologist from the Netherlands, who put in many long hours assisting with the recording of the hull remains. Gordon Watts located at short notice two students willing to assist with the project. Special thanks to Tony Pye, accounts executive at KLM, for his help both in 1992 and 1993 in finding affordable tickets.

Suggested Reading

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Neyland, Robert S.

1991 The Preliminary Hull Analysis of Two 18th-century Dutch Prams. In *Underwater Archaeology Proceedings from the Society for Historical Archaeology Conference*, edited by John D. Broadwater, pp. 111-114.

Reinders, Reinder

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The Search Continues for Columbus's Caravels: 1992 Field Report

by James Parrent and Maureen Brown Parrent

"Another eighteenth-century British ship," seemed to be a common exclamation among the 1992 field crew as the Columbus Caravels Archaeological Project (CCAP) continued the methodical search for Columbus's last two ships in St. Ann's Bay on the north coast of Jamaica. So far, six eighteenth-century British ships have been found in the bay, all within a small area just west of Reader's Point, which pushes out from the center of the bay's shoreline. Finding only British vessels has been frustrating though not surprising since the British were present in the area much longer than the Spanish.

Columbus first visited Santa Gloria, as he named present-day St. Ann's Bay, on his second voyage of exploration in 1494. He was forced to return during his fourth voyage when his ships became too unseaworthy to continue sailing and was marooned for over a year before being rescued in 1504. Later, in 1510, the Spanish established their first settlement in Jamaica near where Columbus had beached his two remaining ships on his last, fateful voyage. By 1523 the Spaniards were disillusioned with the area and moved to St. Jago de la Vega, now called Spanish Town, on the south coast of Jamaica.

The British, soon after capturing Jamaica from the Spanish in 1656, established several sugar plantations near St. Ann's Bay. The bay was commercially important to the British for the rest of the seventeenth century and throughout the eighteenth and nineteenth centuries. Sugar cane was the area's most important crop during this time. In Jamaica, the cane was processed into raw sugar, molasses, and rum and then exported to England. This period of British activity, spanning about 240 years, far outlasted the 14 years of Spanish occupation at St. Ann's Bay. Consequently we expect to continue finding British artifacts and hulls; but we have not lost hope for our original goal. There is no doubt that Columbus's ships are lying somewhere beneath the sediments of the placid bay.

During the 1992 field season, a total of 21 sites (including Sites 14, 16 and 23, previously tested in 1991) were investigated over a three-month period that began on May 20 and ended on August 20, 1992. The sites investigated were numbered 2 through 10, 12 through 18, 23, and

27 through 30.

With the exception of Sites 27 through 30, all sites had been targeted by a chirp subbottom profiler in 1990 and 1991 (for a description of these surveys, see *INA Newsletters* 17.4 and 18.4). Sites 27 through 29 were detected during a magnetometer survey in 1992. Site 30, which appeared to be two stone ballast piles, was discovered before Hurricane Gilbert in 1988.

Sites 2, 4, 6, 14, 17, and 18 were tested by probing and coring. Sites 3, 5, and 30 were examined with small test trenches, while Sites 7, 8, 9, 10, 12, 13, 15, 16, and 23 were subjected to larger-scale excavations. Sites 27, 28, and 29 were tested by limited coring.

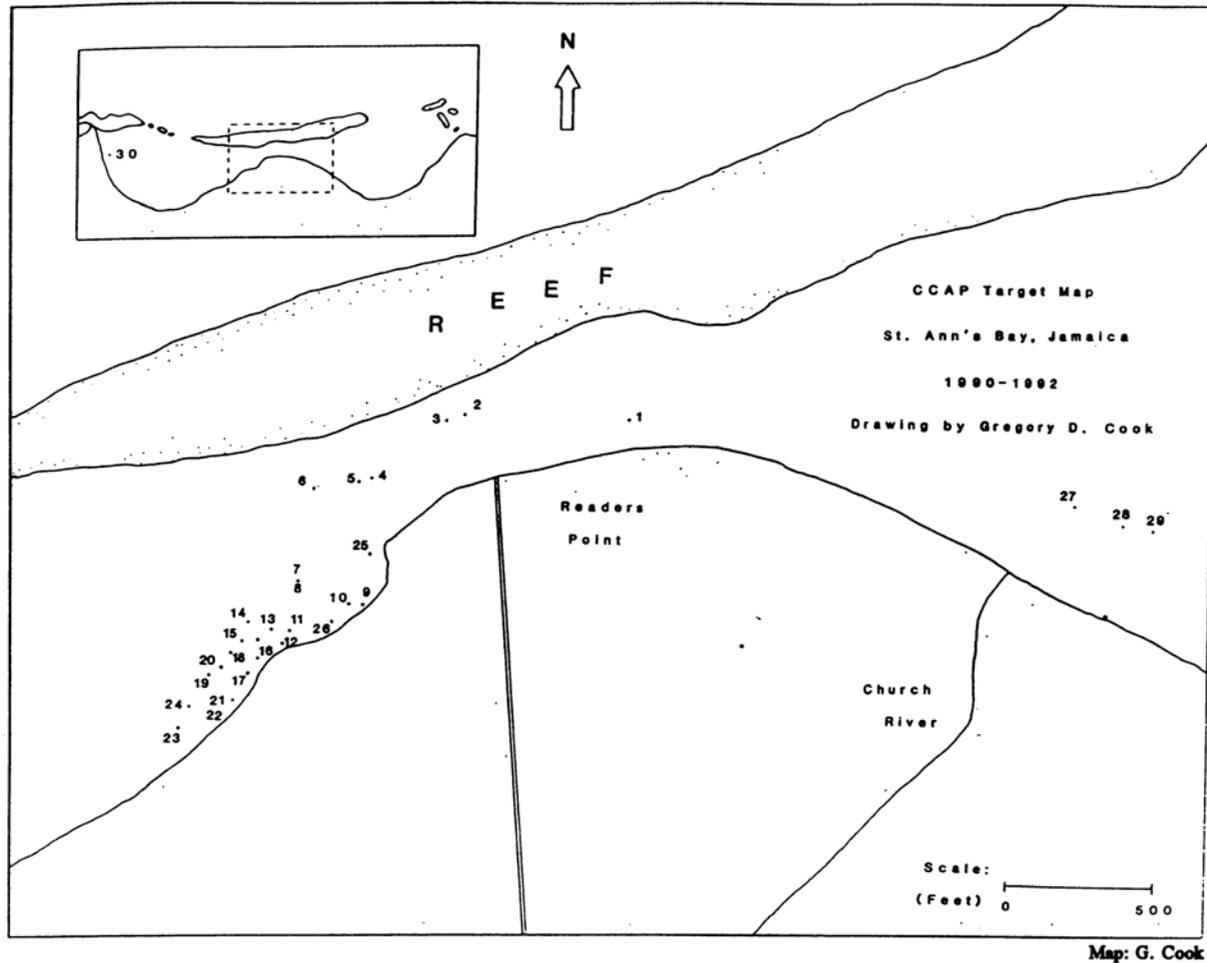
Of the sites tested in 1992, three turned out to be the remains of British ships, eight contained cultural debris, and seven were natural phenomena. Three others have not been examined fully.

The sites were dated by analyzing associated artifacts. The artifact assemblage for each site was classified by material type and date. Only a small portion of each site was test excavated, so the quantity of artifacts recovered was small. The diagnostic artifacts, i.e., ceramics, glass, and pipes, allowed us to establish the probable country of origin, as well as the date, for each ship site tested.

Our study of Sites 7 and 8 typifies the procedures and methodology used to test sites that probing and coring indicated might be ships. The two sites are located near each other in 10 to 22 feet of water on the southwestern edge of a bathymetric depression just west of the old British wharf complex that was constructed around 1670 and reportedly used until the late 1960s.

Sites 7 and 8 were originally detected by the subbottom profiler in 1991. Site 8 is located under the steeply sloping edge of the depression, which drops from 5 to 20 feet below the surface. Site 7 rests at the bottom of the slope in approximately 22 feet of water.

In 1992 probing of the sites indicated a hard layer that suggested the presence of wood at 8 to 10 feet below the sea floor. Coring was difficult due to a hard layer that could not be penetrated or, when penetrated, held the core tubes so that they could not be removed. The sites were



St. Ann's Bay is divided into two sections by Reader's Point. Most of the sites investigated during the 1992 field season lie in the western part of the bay.

further tested by excavating a north-to-south, 5 by 15 foot trench to determine the nature of the hard layer.

Excavation revealed that the first 3 to 5 feet of sediment was soft silt with concentrations of flakes from *Halimeda*, a marine alga. A layer of black stream-worn cobbles was found near the 5 foot level. A modern plank and several coconut palm tree segments were located in the upper soft sediment. Numerous eighteenth-century materials were found among the cobbles. Silty clay, sand, and small cobbles continued down to a depth of 8 feet. Charred barrel staves and badly decomposed boards were encountered in the southern half of the trench at approximately 7 feet below the sea floor. The amount of cultural material found decreased significantly at 8 feet, where a dense concentration of cobbles, large shells, and shell fragments was encountered. This material was resting on an extremely hard deposit of clay, shell, and coral fragments. Below this level, at 10 feet, the strata became increasingly dense until the clay gave way to a hard calcium carbonate layer.

This material stopped further probing attempts and most likely accounted for the trapped cores and "wood" layer sensed by earlier probing.

The two sites most likely represent an accumulation of debris from river runoff and storm activity. They are located at the end of a slump in the sea floor that forms a natural trap for drifting debris. The diagnostic remains from the area include two pocket knives with etched and encrusted bone handles. The knives resemble a knife and fork illustrated on page 182 of *A Guide to Artifacts of Colonial America* (1969) by Noël Hume; these are dated ca. 1750. A late eighteenth-century case bottle neck fragment and a pipe with a "TB" maker's mark on the bowl were also found in the area. The diagnostic artifacts recovered from Sites 7 and 8 suggest a mid to late eighteenth-century date for the material deposits.

Other sites were tested during the 1992 season through probing, coring, and, in some instances, limited excavation. Site 2, which lacked any associated cultural material,

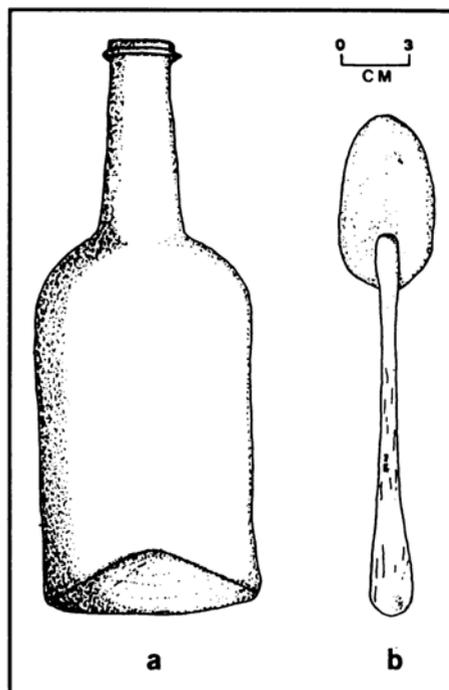
turned out to be merely a natural hard layer of calcium carbonate and coral. Site 3 represents a possible ballast dump. The only artifacts found there were a small concreted fastener and a bone fragment. Both were reburied on the site. Sites 4 and 5 are the remnants of a partially buried coral ridge lying in a roughly east-west orientation north of the old British wharf. They may have been part of a coral ridge system that once ran along the northern edge of the bay's deep channel and was subsequently killed and buried by heavy siltation in historic times. Site 6 is an accumulation of coral debris covering a hard-packed sand layer. No cultural material was associated with Site 6. Site 9 is a concentration of cultural debris and stones washed down from the old British wharf complex. The cultural material dates to the eighteenth and nineteenth centuries and is British in origin. Sites 12 and 13 are areas where littoral drift has left an accumulation of debris, both from Site 11, a British ship site, and from material deposited farther up current.

The anomaly detected at Site 14 was produced by a gravel layer in the sediment profile. The few cultural materials found at the site are probably debris. At Site 17 and 18, coring revealed a dense layer of rocks, pea gravel, and coarse sand. This mixture of materials probably induced the targets detected by the subbottom profiler.

Site 10

At Site 10 a ship was excavated during the 1992 field season. The remains are located in a bathymetric depression west of the old British wharf complex, approximately 50 feet north of a mangrove shoreline, in about 3 feet of water and under about 6 feet of sediment.

Excavation exposed an area of the hull that includes a composite mast step, ceiling planking, frames, and outer hull planking. The first three ceiling planks south of the mast step appear to be made of oak. Only a few strakes of

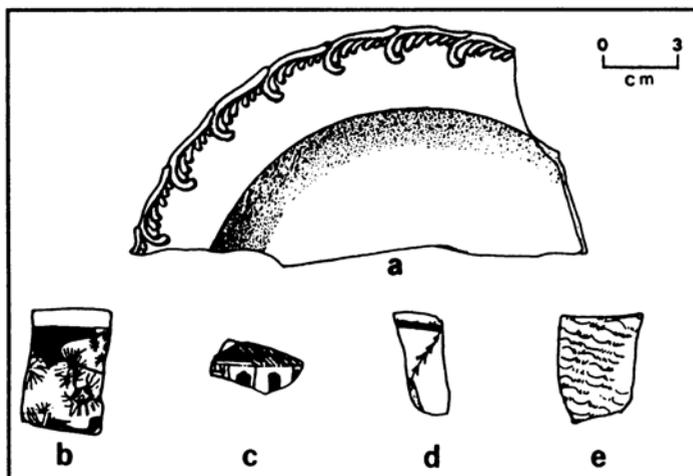


Drawing: M. Brown Parrent

the outer hull were examined. They are made from a yellowish wood, possibly pine. The mast step measures 4 feet long, 1 foot 2 inches sided, and 11 inches molded and appears to be made of oak. It is joined to the keelson with two iron through-bolts running vertically through the step and keelson. The step is

simply a large rectangular timber cut to fit over the keelson, with its longest dimension running athwartships. The keelson measures 6 inches molded and 6 inches sided. According to CCAP staff member Greg Cook, who has studied the remains, the keelson maintains the same dimensions under the step.

In general the hull from Site 10 is not heavily constructed. The keelson and mast step mortise are quite small and do not appear to have been made for a large boat with extensive sail area. Due to the limited area excavated and efforts to leave the integrity of the hull intact, it was not possible to examine the fastenings of the outer hull strakes. The ceiling planking and frames, however, were noteworthy in their scarcity of fasteners, which may further



Drawing: M. Brown Parrent

Sherds, at left, found at Site 10 are British in origin and date from the mid to late eighteenth century: (a) "Old Feather Edge" creamware plate sherd, (b) "mochaware" cobalt on brown pearlware rim sherd, (c)(d) blue transfer pearlware body and rim sherds, (e) tanish stoneware body sherd. Above, an eighteenth-century bottle and pewter spoon also came from Site 10. A maker's mark, "SW & Co," was visible on the back of the spoon after conservation. The mark may have belonged to manufacturers "Whitfield & Scofield," who were listed in 1793 as pewter spoon makers in Digbeth. Howard Cottrell includes the mark in *Old Pewter Its Makers and Marks in England, Scotland and Ireland* (1978) on page 335.

indicate that Site 10's vessel was small.

Black plastic covering six of the frames in the center of the east-west trench indicates that the vessel was previously excavated. Because of the earlier disturbance, only artifacts found within the ship's remains can be considered diagnostic of the vessel's age. Ballast was not found in conjunction with this ship even in the areas not previously excavated.

The diagnostic artifacts discovered among the Site 10 hull remains were all manufactured in England, and they date from the mid to the late eighteenth century. The area's ceramic sherds include an "Old Feather Edge" pattern creamware plate, mocha and transfer-printed pearlware, stoneware, Jackfieldware, and delftware fragments. An intact British wine bottle, discovered between the frames and ceiling and outer hull planking, is similar to examples (on page 68) dated 1788 to 1798 in Noël Hume's *Guide to Artifacts of Colonial America*. A plain pewter spoon recovered from just above the hull layer is of a type and pattern in common use from about 1760 until 1800.

The diagnostic artifacts from Site 10 yield a date of approximately 1790. The ship itself was probably abandoned near the British wharf after suffering some kind of accident that buckled the east end of the vessel.

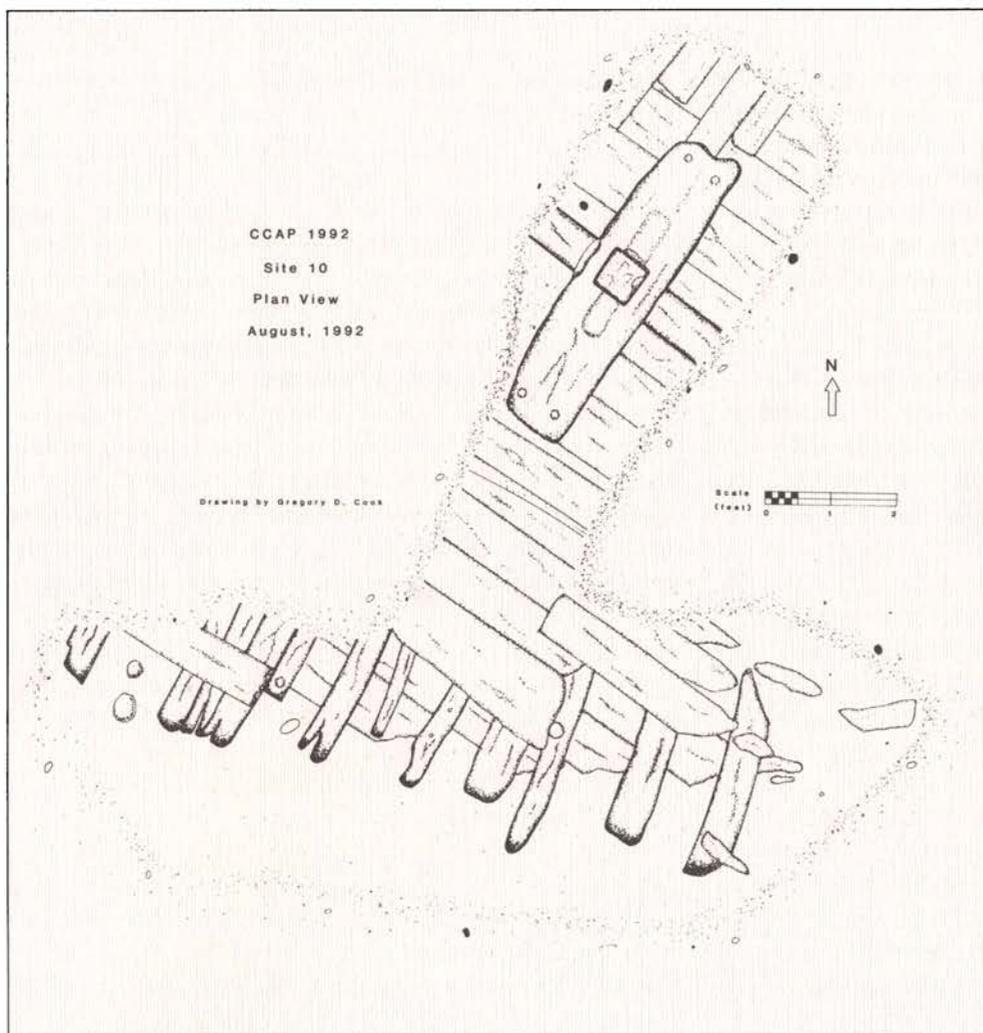
Site 15

Site 15 was detected by the subbottom profiler in 1991, and five of ten cores taken there in 1991 contained wood. Four revealed metal concretions, brick fragments, charcoal, and burned wood.

The presence of cultural materials at Site 15 prompted the 1992 CCAP team to excavate two trenches, one running north to south for 20 feet and the other, to the north, running 10 feet from east to west. The two trenches form a T over the site. In the east-west trench, the remains of a ship's hull were found underneath some ballast.

The hull remains have been identified as a section of the main wale, probably the lower-most timbers, including the futtocks, some external planking, and part of the bilge ceiling. The remains are oriented on an east-west axis, parallel to the coastline. A total of five frames, all made of cedar, were uncovered. Only one bilge ceiling plank was exposed in the test trench; it appears to be oak. The outer hull planking also appears to be oak. Seams between the outer hull planking are caulked with oakum, according to Greg Cook.

The artifact assemblage for Site 15 was concentrated in two separate areas at approximately the same depth. A few diagnostic artifacts were directly associated



Drawing: G. Cook

A plan view of the hull remains contained in Site 10 includes the mast step, ceiling planking, and frames. The relatively light construction of the timbers suggests that the remains are from a small vessel. Only a small portion of the ship was uncovered during the test excavation of Site 10. Associated artifacts were used to date the vessel and to determine its place of origin.

with the ship's hull timbers located within the east-west trench, but, unfortunately, the majority of the artifacts were not associated with the hull and were concentrated towards the south end of the north-south trench.

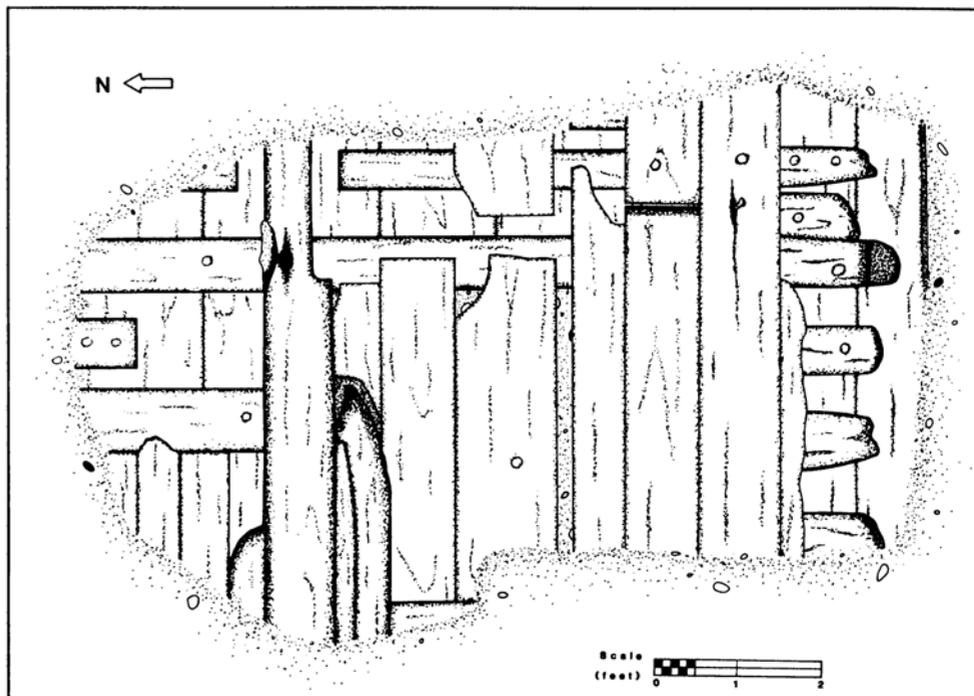
The diagnostic artifacts that were associated with the hull include one agateware and three delftware sherds manufactured in England. CCAP staff have dated the delftware sherds to ca. 1640 to 1800 and the agateware to about 1745 to 1775. The diagnostic ceramics yield a date of 1758 for Site 15.

Site 16

Site 16 was located by the subbottom profiler in 1991 and tested by limited excavation the same year. Results of the excavation indicated a late eighteenth-century British vessel. The site was reopened during the 1992 field season to test under the remains of the ship to assure that they were not concealing another site. Excavation exposed an area of the hull extending approximately 3 feet to the port of the keelson and to the end of the preserved starboard side, approximately 7 feet from the keelson.

The hull, especially the framing, is heavily built. The keelson is small in comparison to the large frames, but this may be partially explained by the erosion of the keelson timber compared to the good preservation of the frames. A scarf found at the forward or eastern end of the keelson appears to have been the apron-keelson scarf. This join was strengthened with a through-bolt that originally would have run through the keelson, apron, and floor. Deadwood is visible under the keelson-apron scarf, and the edges of garboards can be seen angling down on either side of the deadwood. The molded dimension of the keelson at the scarf is considerably less on the starboard side compared to the port side, indicating that the scarf was not a simple horizontal example but a beveled hook scarf.

Aft of the scarf, what may be the beginnings of a composite mast step emerge from the western wall of the excavation unit. This is indicated by the increased molded and sided dimensions of the keelson, the presence of sister keelsons along either side of the main timber, and a buttress timber extending laterally from the starboard sister keelson. The sister timbers are joined to the keelson with



Drawing: G. Cook

A plan view of hull timbers found at Site 16 includes the keelson at left.

horizontal through-bolts. Both sisters are heavily eroded and the starboard one extends approximately 3 feet farther forward than the port timber. The starboard sister keelson appears to be composed of two distinct pieces of wood while the port side is definitely made from a single piece. A study of the vessel was conducted by Greg Cook.

Analyses of the 1992 diagnostic artifacts complement the previous year's results. The artifacts, including ceramic sherds produced in the latter half of the eighteenth century, suggest that Site 16 is the remains of a British vessel from the mid or late eighteenth century. One kaolin pipe recovered from Site 16 has a vertical stamped maker's mark on the bowl reading "IA EATO.. LIVERPOO...." A. Oswald, in *Clay Pipes for the Archaeologist* (1975) lists a pipemaker by the name of James Eaton residing in Liverpool, England, in the mid eighteenth century.

The results from the 1991 and 1992 artifact analyses, when combined, suggest a date ranging from 1765 to 1780 for the Site 16 hull.

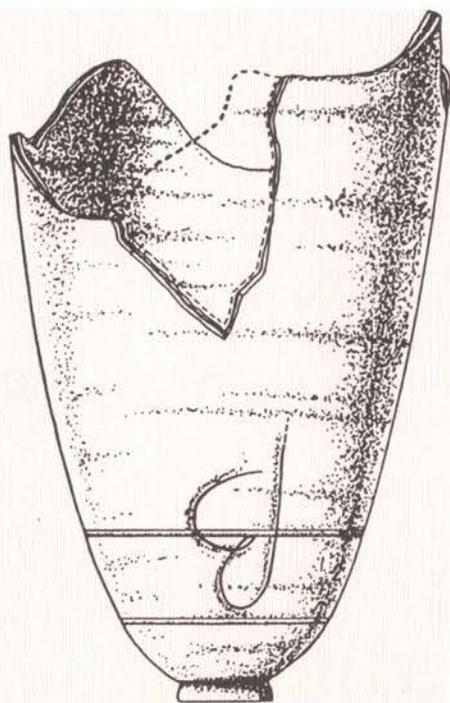
Site 23

Site 23 was located in October 1990 when our subbottom profiler detected rock at 6 to 8 feet below the sea floor. Further probing and coring in 1990 and a small test excavation verified this finding, and it was determined that

the target was two stone ballast piles resting on a white sand layer.

During the 1992 field season, investigative probing revealed a concentration of rock along the eastern edge of the target area and slightly west of the 1990 test excavation area. Following additional probing, a 15-foot test trench was excavated along a north-south axis. At 3.1 feet below the sea floor a British sugar mold, possibly dating from the late seventeenth to the early nineteenth century, was recovered from the northern end of the excavation. Subsequently, the trench was enlarged to expose the top layers of two ballast piles; however, no ship remains were found. The proximity and similarity of rock types, the lack of wood, and a scarcity of other artifacts tell us that Site 23 is probably a ballast dump site formed when a ship discharged ballast stones from both sides of the vessel.

This sugar mold was found at Site 23. Jamaica's most important crop during the early years of British colonization was sugar cane, which was processed on the island. Molds like this one were used to drain molasses from raw brown sugar. The molasses was then sent to a rum distillery, while the cones of sugar knocked from the pots were exported.



Drawing: R. Holmgren

Site 23 did, however, give us the sugar mold, an artifact that symbolizes an important part of Jamaica's early colonial history. The mold, shaped like an inverted cone with a drip hole at its base (much like a flower pot), was discovered almost whole. The pot is unglazed, and an outer paste colored reddish-orange covers an inner gray core. A *B* inscribed near the drip hole of the mold may represent a label for the size of the vessel, a maker's mark, or a plantation owner's mark. According to Dr. D. L. Hamilton, director of INA's excavations at the sunken eighteenth-century city of Port Royal, Jamaica, Site 23's sugar mold is similar to fragmented molds found at Port Royal.

Several sources describe sugar molds and how they were used. Florence and Robert Lister, in *Andalusian Ceramics in Spain and New Spain* (1987), suggest that the form of molds like the one found at Site 23 was developed by the Spanish when they began to grow and export sugar from the New World. Juices squeezed from sugar cane would be put into the molds and allowed to harden into crude sugar. Apparently the English adopted the Spanish sugar mold form.

In *Sugar and Slaves* (1973), Richard Dunn describes the process early English planters used to cure sugar after the cane had been boiled. Muscovado (raw brown sugar) was packed into earthenware pots and placed in a curing house on earthenware pans called drips. Even a small planter would have needed several hundred such pots. The bottom hole of each pot was plugged for 48 hours to allow molasses to drain from the sugar. When the pots were unplugged, the molasses that poured out was collected and taken to a distillery to make rum. Planters kept their potted sugar drying and draining in the curing house for about a month. The sugar finally knocked out of the pots would have hardened into cone-shaped loaves. The central two-thirds of the loaf, well drained muscovado, was spread in the sun, packed into hogsheads, and stored in a warehouse for shipment to England.

Dunn also suggests that potters who made sugar molds and drips would have been found on any well run seventeenth-century plantation. Thus, it is possible that the mold discovered at Site 23 was produced locally. A late seventeenth-century probate inventory of a Port Royal merchant, researched by Diana Thornton, a graduate of Texas A&M's Nautical Archaeology Program, lists two places in Jamaica that may have produced sugar molds.

Sites 27, 28 and 29

The three anomalies representing Sites 27, 28, and 29 were generated during a 1992 magnetometer survey east of Reader's Point. The survey was an attempt to relocate a dipolar magnetic anomaly originally located by Gordon

Watts during an earlier project and referred to as the "sand bar anomalies." The sites lie slightly more than 300 feet offshore in a medium energy zone inside a reef in 4 to 6 feet of water. The remnants of a rock wharf are located south of the search area. The southeasternmost anomaly found in 1992, Site 29, probably represents the dipolar anomaly found previously.

Following the magnetometer survey, cores were taken at the center of each anomaly. An additional four cores, spaced 10 feet from the center, one each to the north, south, east, and west, were taken around each anomaly. In each core, a few feet from the top, fragments of red brick, wood, coal slag, iron concretions and possibly heat-modified chert were found, suggesting to us that we might have found another wreck, but none of the cores was extracted with its full sample (sample loss ranged between 2 to 8 feet of the down-core sediments), so we conducted a circular probe survey and a visual reconnaissance of the bottom. Cans, wire, pieces of cable, and numerous fish trap and fish trap anchor fragments were found. Any of these modern items could have caused the magnetic anomalies, as could any ferrous objects from the rich cultural layer encountered a few feet into our cores. Contamination from the old wharf and its nearby anchorage, as well as from the Church River, will create problems with any further search for magnetic anomalies. A subbottom-profiler survey is planned for the future.

Site 30

Site 30 is located on the west side of St. Ann's Bay just offshore of an area known locally as Columbus Beach. This site, thought to be two ballast piles, was first detected before Hurricane Gilbert hit the coast in 1988. During the 1990 field season, the area was investigated with the subbottom profiler. Nothing was found. During the 1992 field season, the site was probed, and a test excavation was conducted, but no concentration of ballast stones was uncovered. The original sighting might have been a thin layer of stones that was later dispersed by Hurricane Gilbert.

Conclusion

The surveying methods used by CCAP have allowed quick coverage of a large section of the bay, and far more sites have been located than could be excavated during single field seasons. Thirty sites were identified during surveys in 1990 and 1991. Six hold the remains of British ships. Three (27, 28, and 29), located by a magnetometer survey in 1992, have not been tested fully.

During November and December of 1992, portions of the east end of St. Ann's Bay and an area to the east of

Reader's Point were surveyed with the chirp subbottom profiler. Five substantial targets were located near the far eastern shore of St. Ann's Bay, and two targets, each represented by side-by-side anomalies (precisely what we would expect from Columbus's two beached caravels), were located close to shore east of Reader's Point. These seven targets, plus Sites 27, 28, and 29, will be tested during the next field season.

We have not yet found the caravels, but we have demonstrated conclusively, by the number of other ships found in St. Ann's Bay, that we are using the right techniques and methodology in our quest.

Acknowledgements

Funding for the 1992 season was supplied by the John Brown Cook Foundation, the JFM Foundation, Cambridge Seven Associates, *American Way Magazine*, the National Geographic Society, the Meadows Foundation, George Bass, and INA Board Members Don Geddes III, Bruce Heafitz, and Robert Lorton, and INA's Chairman, Ray H. Siegfried II. Equipment and supplies were donated by Jonathan Blair; Dr. Karen Arents of Dental Plus in Bryan, Texas; Scott and White Clinic in Bryan, Texas; Brazos County Humana Hospital; and Dive World in San Antonio, Texas.

Suggested Reading

Cook, Gregory D.

1993 Ship Remains Uncovered During the 1992 Columbus Caravels Archaeological Project, St. Ann's Bay, Jamaica. Paper presented at the 26th Conference of the Society for Historical Archaeology, Kansas City.

Dunn, Richard S.

1972 *Sugar and Slaves: The Rise of the Planter Class in the English West Indies, 1624-1713*. W.W. Norton, New York.

Lister, Florence C. and Robert H.

1987 *Andalusian Ceramics in Spain and New Spain: A Cultural Register from the Third Century B.C. to 1700*. University of Arizona Press, Tucson.

Parrent, Maureen Brown

1993 The Artifact Assemblages from the Remains of Ships Investigated During 1992 in St. Ann's Bay, Jamaica. Paper presented at the 26th Conference of the Society for Historical Archaeology, Kansas City.

REVIEW

by Richard D. Herron

Easter Island, Earth Island.

Paul Bahn and John Flenley

London: Thames and Hudson Ltd, 1992.

ISBN 0-500-05065-1, 240 pages, illustrations, maps, tables, bibliography, and index. \$24.95.

As the authors of *Easter Island, Earth Island* would agree, outlandish fantasy and wild speculation have no place in scientific analysis. Nevertheless, since the first recorded visits by Europeans, Easter Island has received more than its share of wild and outlandish interpretations concerning its history and archaeology. In this century some highly popularized accounts have come from Erich Von Däniken and Thor Heyerdahl. In spite of this we now know far more about the rise and fall of the island's unique culture; thus, it is surprising that nearly thirty years have passed since any serious general account of the island's history and archaeology has appeared in English. To rectify this, Paul Bahn and John Flenley, academicians in archaeology and geography respectively, have recently provided us with a scholarly yet highly readable narrative concerning the people of Easter Island--an analysis made all the more important by its foreboding conclusion. Although the book mainly discusses the island and its inhabitants, it also provides a good description of the possible nautical origins of the Easter Islanders, which should be of interest to scholars of maritime archaeology and history.

The authors begin by explaining that although Europeans may have first encountered Easter Island as early as the sixteenth century, the first official discovery is accredited to the Dutch commander Jacob Roggeveen on April 5, 1722. Impressed by the massive statues found on the island, Roggeveen postulated that, because of their size, they were made of clay. In 1774, under the aegis of Captain James Cook, investigations revealed that the statues were made of stone, not clay. How and by whom they were created and moved into position, however, remained a mystery. By the 1880s archaeological investigations were begun and continued into the twentieth century, culminating in William Mulloy's influential work beginning in 1955--when he sailed to the island with Heyerdahl's *Kon-Tiki* expedition--until his death in 1978.

The mystery behind the statues has led to wide speculation concerning the cultural-geographical roots of the original Easter Island population. Thor Heyerdahl vehem-

ently believes that the population of Easter Island, as well as that of the rest of Polynesia, originated in the New World and migrated westward. Bahn and Flenley strongly oppose this theory and provide evidence--ranging from the linguistic to the botanical--which clearly and convincingly refutes it. Instead, Bahn and Flenley contend that the ancestors of the Easter Islanders were eastward-migrating Polynesian colonists intent on finding and settling new land. A general description is provided of how these voyagers were able to make such an oceanic passage, and what these migrants encountered once they arrived on Easter Island.

Today the island's vegetation is sparse, causing many observers to wonder how the original inhabitants could develop and support a population large enough to create the kind of statuary found there. Evidence indicates that originally Easter Island was densely covered with vegetation. The early inhabitants built large ocean-going canoes, and their land had fertile soil for growing crops. Population grew and the statue-building culture developed. The various ways these statues might have been formed and transported are lucidly and logically presented by Bahn and Flenley. But, perhaps most salient to the theme of the book, the authors further explain that it was the large amounts of materials required for the construction and transportation of these statues that greatly accelerated the drastic depletion of the island's vegetation and, subsequently, effected the profound, and possibly grizzly, destruction of the people's own culture.

As Bahn and Flenley point out, Easter Island provides an exhortation for the modern world. Like the early inhabitants of Easter Island, we today are rapidly depleting our world's vital resources and, thus, heading for destruction. Will we heed the warning provided us, or will we meet a similar, but world-wide, fate as that experienced by the island's inhabitants? Either way, *Easter Island, Earth Island* remains an informative, readable, and possibly profound description of the island and its people.

IN THE FIELD

Uluburun

A final campaign at the site of the Late Bronze Age Shipwreck at Uluburun on the southern coast of Turkey will be conducted by INA during the summer of 1993. Excavation at Uluburun began in 1984 and has continued each summer. Plans for the 1993 season include raising all ingots left at the site (most of the wreck's approximately 350 ingots were removed in previous years). Remains of the ship's

During one of the earlier seasons at Uluburun, a diver removes an amphora. The 1993 campaign, the tenth at Uluburun, will be the last excavation season at the site. Now, archaeologists turn to completing conservation, research, and publication of the Late Bronze Age Shipwreck.



Photo: Courtesy INA

hull will be exposed, studied, documented and raised, and the area under the hull will be fully excavated. Further investigations at the deepest end of the wreck (at approximately 200 feet) are planned; a few large objects that had rolled down the site's steep slope were recovered from the area in 1992.

The excavation season will begin on May 29 and continue into August. Principal Investigator George F. Bass and Cemal Pulak, acting as co-director, will be joined by veterans from previous Uluburun campaigns. Don Frey, Robin Piercy, Murat Tilev, Tufan Turanlı, Sheila Matthews, and Gökhan Özağaçlı will travel from INA's Bodrum headquarters for the 1993 season. Faith Hentschel, INA adjunct professor, will participate, along with hyperbaric specialists David Perlman, M.D., and Tom Sutton. Volunteer archaeologists Michael Halpern, Jerry Lyon, Patricia Sibella, and Heleen van der Molen, and Texas A&M University graduate students William Charlton, Michael Fitzgerald, Roxani Margariti, Samuel Mark, Brendon McDermott, Claire Peachey, Edward Rogers, and Mark Smith, and Cai Thorman of Pamona College will also return for the last season at Uluburun.

The National Endowment for the Humanities, National Geographic Society, INA, Institute for Aegean Prehistory, and Texas A&M University will fund the 1993 campaign.

Work on the Late Bronze Age Shipwreck will continue long after excavation is completed. Already, a productive fall season was spent at the Bodrum Museum of Underwater

Archaeology in 1992 when artifact cataloguing--the first step toward final publication--was initiated. During the fall of 1993, archaeologists will conduct a study of Uluburun artifacts and will take samples from several objects for laboratory analyses.

1993 Survey

From mid August and continuing into the fall of 1993, INA plans to conduct a survey of shipwreck sites along the Mediterranean coast of Turkey and along the coast of Syria. George F. Bass will act as principal investigator. Don Frey and Cemal Pulak will co-direct the Turkish survey. They will be joined by long-time INA staff members Robin Piercy, Tufan Turanlı, and Murat Tilev and by a number of graduate students. Douglas Haldane, INA research associate, will join the crew for the Syrian portion of the survey.

The INA crew will use small boats and the institute's expedition vessel *Virazon* to search for sunken ships. They will also meet and interview coastal fishermen, divers, and museum officials. In the past, discussions with local people familiar with coastal waters have been invaluable in identifying the locations of known wrecks.

INA Board Director Marty Wilcox plans to bring a sonar graphics system and assist in sonar surveys of the seabed.

Ottoman Wreck

Cemal Pulak and Gökhan Özağaçlı continue to study, record, and con-



Photo: Courtesy INA

INA's expedition vessel Virazon serves as a diving boat on the Uluburun site. This year, as in years past, it will head down the Turkish coast, once excavation is completed at Uluburun, for the 1993 survey. INA also plans to conduct a survey on the Syrian coast in 1993.

serve the hull timbers and associated artifacts of a sixteenth-century Ottoman wreck raised in 1983. Most of the drawings of wood timbers have been completed, but a number of artifacts covered with concretions still need to be cast and studied. Recent X-rays of two large complex concretions have failed to reveal the nature of objects inside them. The concretions will now have to be disassembled and cast before anything can be said about the various components sealed inside.

Additionally, epoxy casting of the ship's 5-foot-long pintle and gudgeon arrangement, executed by Gökhan Özağaçlı, continues in the Bodrum Museum of Underwater Archaeology. The somewhat twisted state of the rudder straps and the fragmented condition of the large concretion surrounding the pintle and gudgeon have lengthened the casting process. When completed the rudder will represent the only known archaeologically excavated and complete example of rudder hardware for a round-sterned ship.

Lake Champlain

INA staff return to Lake Champlain during the summer of 1993 to work on three projects in the lake and to run a summer field school in underwater archaeology. Kevin Crisman, INA

faculty member and assistant professor at Texas A&M University, will co-direct the season with Arthur Cohn of the Lake Champlain Maritime Museum. The field school will begin on June 7 with a week of training, and the season will end in mid July.

Projects planned for the 1993 field school include a preliminary survey of a mid nineteenth-century sidewheel steamer wrecked in 1875. Approximately two-thirds of the steamer, the *Champlain*, are preserved beneath the waters of the lake.

The schooner *Water Witch* will be the subject of an underwater study. The 90-foot-long vessel was built as a steamer in 1832 and converted to a schooner in 1836; it sank in 85 feet of water in 1866. The schooner, still displaying its once beautiful hull, remains nearly intact under water. Project staff and students will record the lines and external appearance of the schooner and extensively photograph and videotape the site.

If funding is approved by the Vermont State Legislature, a third project will also be conducted. Archaeologists hope to continue a 1992 survey of the waterfront at Mount Independence, a fortification built on the lake by American forces in 1776 to counter a British invasion from Canada. The fort was abandoned by the Americans in 1777 after they were overwhelmed

by the British forces.

A 1992 survey indicated that considerable equipment was tossed into the lake to keep it out of British hands as the Americans retreated. In 1993, the project staff hope to recover and conserve all finds and complete the waterfront survey.

Texas A&M Nautical Archaeology Program students Joseph Cozzi, Elizabeth Robinson, John Bratten, David Robinson, Alan Flanigan, Stephen Paris, Scott McLaughlin, Charles Coleman, and Peter Hitchcock will participate along with volunteer Tray Siegfried and University of Vermont students.

Monte Cristi Shipwreck Project

Jerome Lynn Hall, a Ph.D. student in the Nautical Archaeology Program at Texas A&M University, will return to the Dominican Republic for the summer of 1993 to direct the excavation of seventeenth-century ship remains found just off Isla Cabra (Goat Island). This year's campaign will be the third at the Monte Cristi site. The project has incorporated more than 50 volunteers, the majority of whom were supplied by Earthwatch, a non-profit corporation that matches volunteers with peer-reviewed field projects around the world.



Photo: Courtesy J. Hall

In Monte Cristi Bay, on the coast of the Dominican Republic, Jemison Beshears and Harry Pecorelli III measure a cast-iron cannon from a seventeenth-century merchant ship. Archaeologists and volunteers will excavate the section of the site where the cannon was found during the 1993 season.

In the last two seasons, Monte Cristi Shipwreck Project staff and volunteers have recovered more than 13,000 clay pipe fragments, all of which appear to be Dutch. Heel stamps (all maker's marks) on the pipes have been used to date the ship to the mid seventeenth century. Dendrochronological studies of the hull timbers suggest that the trees used to build the ship grew in England and were felled sometime between 1642 and 1643. Spanish silver coins found on the site, most likely pocket change belonging to the crew, were from the Potosi and Santa Fe de Bogota mints in South America. The coins have been used to establish a *terminus post quem* of 1651 for the vessel's demise. A set of nested bronze apothecary weights discovered on the wreck were found to be from Nuremberg and were manufactured *ca.* 1650.

During the 1993 season, archaeologists and volunteers will excavate an area immediately southwest of the ship where a cast-iron cannon was found at the close of the 1992 season. The 1993 excavation is scheduled for June

1 to July 26; time for registration and conservation is scheduled for August 1 to August 30.

Principal staff will include Jemison Beshears, from East Carolina University, as assistant director; Richard Wells, from Texas A&M University, as director of field operations; and Ron Halbert, M.D. Rahila Abbas and Colin O'Bannon, both students at Texas A&M's Nautical Archaeology Program will work as graduate student assistants. Jillian Nelson will travel from Hunter College to act as photographer; Lillian Ray, a graduate of the Nautical Archaeology Program will also work as a photographer for the project. Alexandra Roberts will serve as registrar and staff artist, and Sam Giordano will cook for the project's crew.

The 1993 project is funded by Earthwatch, the Pan-American Institute of Maritime Archaeology, Continental Airlines, Igloo Products, Coleman Outdoor Products, and INA.

The excavation is scheduled to continue for two more summer seasons in 1994 and 1995.



INA SHIRTS

INA polo shirts are available in white with our logo embroidered on in dark blue. 100% cotton. Available in unisex sizes (S, M, L, XL). Each shirt \$25.00 plus shipping (call Pat Turner at 409-845-6694 for details). Send checks made out to the Institute of Nautical Archaeology with your order to: INA, P.O. Drawer HG, College Station, TX 77841-5137.

News & Notes

Vincent Lectures in Urbana

Robert K. Vincent Jr., president of INA, traveled to Urbana, Illinois, to deliver a talk at the University of Illinois at Urbana-Champaign. A lecture entitled "Diving into the Past: Modern Techniques and Methodology in Underwater Archaeology" was given on April 5, 1993, at the Beckman Institute for Advanced Science

and Technology on the university's campus. The lecture followed a call-in show on local radio. Vincent also gave a more informal talk on underwater methods and recovery of artifacts to an anthropology class.

Nautical Archaeology Graduates

Five students received graduate degrees from Texas A&M Univer-

sity's Nautical Archaeology Program in May 1993. The graduate program is associated with INA. One student, Cheryl Haldane, completed a doctoral dissertation, and four others completed master's theses. The May 1993 theses and dissertations are listed below.

- Sheila Clifford:
An Analysis of the Port Royal Shipwreck and its Role in the Maritime History of Seventeenth-Century Port Royal, Jamaica.
- Elizabeth Garver:
Byzantine Amphoras of the Ninth through Thirteenth Centuries in the Bodrum Museum of Underwater Archaeology.
- Cheryl Haldane:
Ancient Egyptian Hull Construction.
- Harold J. (Jim) Jobling:
The History and Development of the English 'Admiralty' Anchor, ca. 1500-1860.
- Jerry D. Lyon:
The Pottery from a Fifth Century B.C. Shipwreck at Ma'agan Michael, Israel.

For a complete list of theses and dissertations produced by graduates of the Nautical Archaeology Program, write to:

The Librarian
Nautical Archaeology Program
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College Station, Texas 77843-4352

Or call 409/845-6398.

Dissertations may be borrowed through the interlibrary loan system.

CALL FOR PAPERS

International Conference on Fresh Water and River Archaeology

June 1994 at University College of North Wales, Bangor

Most people associate underwater archaeology with ship wrecks on the sea bed, but in recent years exciting and important archaeological work has taken place within the waters of rivers, lakes, wells, and sinkholes, and at inundated settlements. University College of North Wales and Oxford University's Maritime Archaeological Research program will hold a gathering to hear speakers discuss fresh water projects conducted all over the world. The conference will be held for three days in Bangor, one of the foremost centers for maritime studies in Europe. Appropriately, Bangor is situated in an area renowned for the beauty of its lakes, mountains, rivers, and estuaries. Sessions will cover such subjects as lake dwellings and crannogs, lake transport, riverside habitation sites, river transport, estuarine excavations, sink holes, inundated sites, drains, wells, and cisterns, and boat finds from landfills and drainage areas.

Those wishing to submit papers should write to:

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