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Cover Page Footnote

Many individuals have contributed to this research project. Without their support, interest, and dedication, it could not have been a success. The author wishes to thank the archaeological staff of the Institute of Maritime History (Mason Palmer McDaniel, Christopher Ellis, and Samuel Turner), Jeffrey Gray of East Carolina University, and those individuals who volunteered their time on site. I would like to thank the following organizations and individuals for their invaluable assistance: Old York Historical Society of York, Maine, which provided office and storage facilities; Molly Carlson of Bath, Maine, for the conservation of wooden artifacts; Dr. Alaric Faulkner of University of Maine at Orono for iron conservation; Guy Denoux of the Geochemical and Environmental Research Group, Center for Wood Anatomy Research in Madison, Wisconsin; Dr. Kevin Crisman of Texas A&M University; Dr. Robert Bradley of the Maine Historic Preservation Commission; contributors Mr. Neil Rolde, Dr. Anna Marguerite McCann, and the members of the Institute of Maritime History. A very special thanks is extended to Margareta Claesson for her tireless energy and support.

A Preliminary Report on the Excavation of a 19th-Century Derelict Vessel in Cape Neddick, Maine: The Southern New Jersey Coasting Schooner *Annabella*

Stefan H. Claesson

In 1995, the Institute of Maritime History conducted the archaeological investigation of a 19th-century coasting schooner, Annabella, in Cape Neddick, Maine. This type of craft, though ubiquitous on the eastern seaboard in the 19th century, has not been documented in an archaeological setting to date in New England. Maine played a pivotal role in America's economy, supplying the southern states and Caribbean Islands with a seemingly inexhaustible supply of raw materials such as timber, stone, ice, lime, and agricultural goods. This vessel was primarily involved in the transportation of cordwood along the east coast of the United States. Its heavily-built, shallow-draft hull was ideal for transporting heavy cargoes through the shallow tidal inlets of New England. Built in New Jersey in 1834 and finally abandoned in Cape Neddick in 1885, Annabella endured over 50 years of service, surviving the antebellum coasting trade, the Civil War, and beyond; thus, its excavation affords us a detailed look at the coasting trade that heretofore has been absent.

En 1995, l'Institute of Maritime History a fait l'investigation archéologique d'une goélette de cabotage du XIX^e siècle, l'Annabella, à Cape Neddick (Maine). Ce genre d'embarcation, quoique omniprésent sur le littoral oriental au XIX^e siècle, n'a pas été étudié dans un cadre archéologique jusqu'ici en Nouvelle-Angleterre. Le Maine a joué un rôle essentiel dans l'économie américaine: il a fourni aux états du Sud et aux îles Caraïbes un approvisionnement presque inépuisable en matières telles que le bois d'oeuvre, la pierre, la glace, la chaux et des produits agricoles. Ce bateau servait surtout au transport du bois de corde le long de la côte orientale des États-Unis. Sa cale à faible tirant d'eau et solidement construite était idéale pour le transport de lourdes cargaisons par les criques à marée peu profonde de la Nouvelle-Angleterre. Construite au New Jersey en 1834 et finalement abandonnée à Cape Neddick en 1885, l'Annabella a été de service durant plus de cinquante ans; elle a survécu au cabotage d'avant-guerre et à la Guerre civile; son excavation nous assure donc sur le cabotage un regard détaillé jusqu'ici absent.

Background

The coasting schooner *Annabella* was built at Port Elizabeth, New Jersey, in 1834. Originally constructed as a sloop, the vessel was built specifically for transporting raw materials such as cordwood, brick, coal, and perishables to markets and industries along the northeast United States coast. During its lengthy 50-year career, ownership of *Annabella* was transferred among numerous merchants located in Philadelphia, Plymouth, Boston, and, finally, Cape Neddick, Maine. Though *Annabella* underwent many repairs and structural changes and passed through several hands, the schooner's main purpose remained immutable throughout the 19th century, namely to supply the lumber for domestic markets and to power the industrial plants along the Atlantic seaboard.

The vessel was finally abandoned on October 17, 1885, in the Cape Neddick River, as it was beyond repair and no longer fit for service (FIG. 1). *Annabella* was originally surveyed in 1994 by graduate students from Boston University and Texas A&M University, and an excavation of the derelict vessel by the Institute of Maritime History (IMH) followed in 1995. The excavation and study of *Annabella* included complete documentation of the hull and the recovery of artifacts associated with the ship. The primary objective of this investigation was to document a type of craft that was ubiquitous along the eastern seaboard in the 19th century but that to date had not been archaeologically documented in New England.

At the close of the excavation in September of 1995, nearly 350 artifacts dating from the 19th and early 20th centuries had been recov-

Figure 1. The excavation site of *Annabella* is located at the southern tip of Maine in Cape Neddick. (Drawing by Stefan Claesson.)

ered from the site. The hull, approximately 20 percent of which remained, was recorded and reburied *in situ* on the western bank of the Cape Neddick River. Extensive research in local libraries and interviews with local residents eventually led to the identification of the derelict vessel as the schooner *Annabella*.

The excavation has provided an excellent look at the structural characteristics of a coasting vessel of the mid-19th century that was originally designed to carry cumbersome cargoes through the shallow inlets of southern New Jersey and Delaware Bay. What follows reports on the excavation of *Annabella*, presents a description and analysis of the primary hull components, and summarizes historical documents relating to *Annabella*. In addition, a

glossary of terms and a diagram of structural features are included at the end of the article to aid the reader unfamiliar with ship-related terminology and vessel construction.

Site Description

The remains of *Annabella* came to the attention of IMH in 1993. At that time, the hull of *Annabella* lay partially exposed during low tide, listing on its port side; as a result, the starboard frames and planking had eroded noticeably, primarily as a result of the constant tidal changes in the river (FIG. 2). The port side of the vessel, however, lay buried beneath the sediment, protecting the wood from decay. The visible features of the hull and its location

Figure 2. A photograph of the derelict vessel prior to the excavation. To the right, the surface of cant frames and apron of the bow are visible. (Photograph by Patrick Grace.)

in the shallow tidal flat suggested that it was a derelict vessel, laid up against the bank after it was no longer profitable to repair. The arrangement and sturdy character of the exposed timbers and its overall size suggested that the vessel was a 19th-century coasting schooner designed to carry heavy cargo such as timber or stone. Because no other vessel of this type and period had been excavated along the Maine coast, an in-depth analysis of the hull would shed new light on a type of vessel that was in widespread use along the Atlantic seaboard, with structural characteristics that might typify schooners of the antebellum coasting trade.

The sediment that covered the port side of the hull was deposited as a result of the construction of the current Cape Neddick Bridge at the mouth of the Cape Neddick River. In 1891, a wooden-piled bridge, the York Cliffs Bridge (Passaconaway Bridge), was constructed where a cement and earthen bridge now stands (York Town Report 1893: 29). The current Army Corps of Engineers bridge was constructed in the 1920s and narrowed the river channel significantly, restricting the flow

of water and sediment out of the estuary and causing the river and harbor to fill rapidly with silt.

In 1897, the construction of a railroad bridge across the river eliminated access for all masted vessels to the mills and landing areas upriver (Bardwell 1986: 66). This proved disastrous for the fishing and coasting trade in Cape Neddick, which succumbed to the more efficient transportation of the railroad, and the local economy gradually shifted to the more profitable tourism industry. These factors, though damaging to the area's traditional economy, resulted in the preservation of a number of maritime archaeological sites in the Cape Neddick River basin, including the remains of *Annabella*.

Recording Methods

During the 1994 survey by students from Texas A&M and Boston University, the visible features of *Annabella* were mapped using a scaled drawing in conjunction with a theodolite to record the position of the ship's timbers, and a preliminary site plan was generated.

Figure 3. The excavated remains of *Annabella* seen at low tide (facing the stern). Sediment excavated from the hull was put in semi-permeable sandbags and placed along the starboard side of the vessel. (Photograph by Christopher Ellis.)

The coordinates from the theodolite were then entered into an AutoCad file and plotted to the same scale as the site plan. Discrepancies in the locations of timbers in the measured drawing were adjusted to the coordinates obtained with the theodolite.

This preliminary survey allowed an evaluation of the logistics for a complete excavation of the hull remains. The site was situated in a tidal flat and could be recorded through standard terrestrial site recording techniques. It was also determined that the excavation should be a low-impact investigation. This decision was based on the vessel's location in protected wetlands, a concern on the part of the Department of Environmental Protection that displacing sediment might alter the existing water channels, and the local community's request to maintain the visual aesthetics of the shipwreck. The excavation would also be limited by tidal changes that allowed only a four-to-five-hour excavation period daily. Moreover, the site was not easily accessible

because of the knee-deep sediment covering the hull.

Using the probable location of the keel as a baseline, a measuring system that consisted of a grid of 2-meter squares was established over the entire site. A local surveying company using a SOKKIA surveying instrument accurately located the coordinates of individual grid squares. The sediment from the site was cleared from each unit and placed into semi-permeable sandbags, insuring that the sediment would not be deposited elsewhere in the river (FIG. 3). The excavated sediment was used in the reburial of the wreck.

Offsets were taken from the grid using measuring tapes and plumb bobs in order to locate each timber, fastener, and artifact related to the hull (FIG. 4). Transverse hull sections were recorded at approximately 3-meter intervals along the length of the hull to determine the shape of the preserved hull remains (FIG. 5). Longitudinal sections were also taken at the bow and stern to illustrate the construc-

Figure 4. Site plan of the hull remains of *Annabella*. The overall remains measure 63 feet (m) in length, with a maximum breadth of 20 feet (m). The locations of hull sections are also shown in plan. (Drawing by Stefan Claesson.)

Figure 5. Locations of the hull sections. Sections were recorded at approximately 3 m intervals along the length of the hull. (Drawing by Stefan Claesson.)

tion and dimensions of the keel, apron, stem, stern knee, and garboards. In addition, a series of black and white photographs was taken of the entire hull. The individual photographs were then assembled using PhotoShop computer software to create a photo-mosaic of the remains.

Artifacts

The excavation resulted in the recovery of over 300 individual artifacts dating from the 1840s to the early 20th century. Factors such as tidal changes and reported vandalism, how-

ever, indicate that not all of the artifacts recovered can be associated with the vessel. Most of the artifacts were located on the port side of the vessel, a result of the ship listing to that side.

Excavation between the frames revealed two distinctive deposits. The first was a dark brown layer approximately 6 inches (15.2 cm) deep, consisting primarily of wood chips. Interspersed among these wood chips, just above the surface of the keel and garboards, were brick chips and dust. These deposits support the argument that *Annabella* carried cargoes of both brick and wood. That the vessel transported such cargoes was finally verified

Table 1 Wood identification

Keel	Hard maple group
K5	degraded, most likely hard maple
Apron	White oak
APR3	White oak
Stern knee	White oak
Chock	White oak or chestnut (<i>castanea dentata</i>)
Rudder	
RUD1	White oak
RUD3	White oak
Stern knee	White oak
Hull planking	
SHP10	Red oak group
SHP11	Red oak
Ceiling	
CP2	White oak
CP3	White oak
CP5	White oak
CP16	White oak
Floors	
FLR5	White oak
FLR23	White oak
Futtocks	
FUT1	White oak
PCF6	White oak
Starboard Garboard	White oak
Treenails	White oak

through its identification as *Annabella* and by the discovery of ledgers that list its cargoes in the late 19th century.

A number of ceramics were recovered forward and to port of the stern knee. These included lead-glazed redware, Albany-slipped stoneware, Rockingham, and whiteware sherds. Near the bow and to starboard there was a large deposit of ceramics, though these artifacts were likely deposited at a later date than *Annabella's* abandonment. These ceramics, which include molded and gilded porcelain, appear to have been manufactured in the early 20th century. A variety of glass bottles and vials were found within and outside of the hull. As with the ceramics, the glass artifacts are difficult to associate with the ship because of post-depositional factors such as tidal fluctuations. Only two pipe stems were found, one of which has the maker's mark "HENDERSON." William Henderson was one of the earliest known Montreal pipe manufacturers, and this particular pipe stem was made between 1847–1876 (Walker 1983: 22). Though the significance of the shipboard material culture is not considered here, the artifacts are

important in verifying the approximate date of the vessel to the second half of the 19th century.

High quantities of iron artifacts were found throughout the site, primarily in the form of fasteners such as bolts and spikes. The concreted artifacts are currently undergoing conservation at the University of Maine at Orono; and are discussed in detail in this report (see *Fasteners* below). The largest of these concretions was found at the bow, and has been identified as a hawse pipe. Other finds include buttons, barrel staves, leather shoe fragments, tool handles, and structurally related artifacts.

The Hull

The hull remains were preserved to the turn of the bilge on its port side. As the vessel came to rest, a considerable amount of pressure was placed upon the hull as water receded during low tides, leaving the hull high and dry in the flats. On the starboard side of the hull, planking had fallen from the framed distorting the shape of the lower portion of the hull. Floors supporting the starboard side had

Table 2. Maximum dimensions of hull timbers.

Timber	Moulded (cm)	(in)	Sided (cm)	(in)	Length (m)	(ft)
Keel	33.0	13.0	30.0	11.8	16.85	55.28
Apron	22.0	8.6	38.0	14.9	2.45	8.03
Stern knee	20.0	7.9	37.0	14.6	2.68	8.79
Deadwood	24.0	9.4	27.0	10.6	1.35	4.43
Mast step	23.5	9.2	26.9	10.6	2.25	7.38
Rudder						
Main piece	27.0	10.6	15.0	11.65	3.55	5.9
Middle piece	29.0	13.0	2.02	11.4	5.1	6.63
After piece	31.0	12.2	16.0	6.3	1.78	5.83
Inner piece	20.0	7.9	15.0	5.9	1.12	3.67

Table 3. Average dimensions of hull timbers.

Timber	Moulded (cm)	(in)	Sided (cm)	(in)	Width (cm)	(in)	Thickness (cm)	(in)
Floors	20.0	7.8	18.2	7.2	0	0	0	0
Futtocks	18.0	7.1	13.7	5.4	0	0	0	0
Hull planking	0	0	0	0	23.0	9.1	4.0	1.6
Ceiling	0	0	0	0	26.5	10.4	6.0	2.4

also cracked near amidships, and that entire side of the vessel had collapsed. In the bow, the forward timbers are preserved, including cant frames, apron, and the heel of the stem. At the stern, the remains of the vessel's stern knee and rudder are preserved. Table 1 summarises the wood types of various parts of *Annabella*. These timbers will be discussed in depth below.

During the excavation, ship timbers were recorded in metric units for ease of documentation and for purposes of standardization. The craft was built employing the English system of measurement, however, and timber dimensions are also presented in Tables 2 and 3 in feet and tenths of inches. The wooden remains have an overall length of 19.60 m (64.3 ft), a maximum breadth of 6.10 m (20.0 ft), and a maximum depth of approximately 1.5 m (5.0 ft). Most major timbers below the turn of the bilge are represented except for a keelson or mast step(s).

The following timber catalogue is a description of the primary components of the ship's hull. Basic descriptions and measurements of these timbers are very technical in nature and may be difficult to understand for the reader unfamiliar with ship terminology. The detailed documentation of a ship's structural elements, however, is essential in deter-

mining if the type of construction seen in *Annabella* is tied to a specific region. Moreover, the description and interpretation of structural features and materials used in construction as well as shipboard items aid in determining a craft's specific purpose, and may illuminate the economic and social environment of the individuals who built, owned, and sailed *Annabella*.

Considering the proliferation of coasting schooners in the 19th century, it is surprising that there are few archaeological examples of coasting schooners with which to conduct a comparable structural analysis to the heavily-built *Annabella*. Rarely is a derelict vessel identified in the field associated with such a wealth of historical documents as is the case with *Annabella*. The maritime archaeologist is usually faced with only hull remains with which to draw conclusions about a specific type of craft, the type of trade of which a vessel was engaged, and the economic and social factors that led to a ship's construction and eventual demise. The structural elements of *Annabella*, in light of the serendipitous identification of the vessel and subsequent discovery of historical documents pertaining specifically to *Annabella's* career, offer the opportunity to study a type of design that allowed vessels to carry heavy cargoes across shallow waters and

Figure 6. Forward longitudinal section of hull, showing keel, chock, and apron. (Drawing by Stefan Claesson.)

hence are representative of a type of craft prevalent along the eastern Atlantic seaboard in the 19th century.

Keel

The entire length of keel is extant; it is constructed of hard maple (*Aceraceae* sp.). It is 16.9 m in length and averages 30 cm sided and 33 cm molded, though in the stern it tapers to 15 cm sided and 22 cm molded. A mortise for a sternpost is cut 30 cm from the stern end of the keel and measures 4 cm deep and 18 cm in width. The shape of the rabbet varies along the length of the keel; forward of the sternpost it maintains a v-shape and terminates in the bow with chamfered edges for placement of the garboards. The chamfered rabbets also extend along the edges of the chock timber below the apron. In the stern, the rabbets are cut almost horizontally for the placement of nearly vertical garboards and are 2.5 cm in depth. The forward end of the keel terminates with a flat scarf where the stem or an intermediate stem piece would have been attached.

Stem

The stem of the vessel was not found during the excavation, but the apron and a curious chock do exist (FIG. 6). These timbers are of white oak and are fastened to the keel by iron through-bolts. The apron has a maximum length of 2.45 m and is 22 cm molded and 38 cm sided. Three notches are cut into the top of the timber for the placement of forward-most floor timbers. The notch at the extreme after portion of the timber is 10 cm deep, the middle notch 6 cm, and the forward notch 2 cm. The lower edges or undersides of the timber are beveled to receive the hood ends of the garboards and first strakes.

Chamfered rabbets are also cut along the upper edges of the chock for the fitting the garboards. The chock has a maximum length of 1.35 m, is 27 cm sided, and has a maximum molded dimension of 24 cm. A semi-circular concavity located at the forward upper edge of the timber is likely a stopwater impression. In addition, nail holes and a shallow mortise located at the lower edge of the chock may be the remnants of a fish plate, although there are

no corresponding mortises or fasteners on the keel.

Stern

No sternpost was located during the excavation, but a stern knee and complete rudder were exposed at the stern of the ship. The stern knee is a naturally curving timber of white oak (FIG. 7), and its dimensions vary considerably. It has a maximum sided dimension of 37 cm and tapers to 23 cm at the throat. The upper portion of the stern knee is broken off, but it has a maximum preserved height of 63 cm, and the rake of the timber is approximately 20 degrees from vertical. The molded dimension of the timber is approximately 20 cm. At the forward end of the timber are two notches that are cut into both sides of the stern for the placement of half frames. The notches are 16 cm wide (parallel to the keel); however, the notch in the starboard side of the timber is 10 cm deep, and the port side notch is 5 cm deep. The garboards are fastened to the stern knee by iron nails and treenails. The stern knee is also fastened to the keel by a number of iron bolts.

Frames

The heavily-built hull has undergone extensive repair work. Consequently, a consistent framing pattern or spacing was difficult to determine, but there is a maximum of only 5 cm between any two given frame members. The floor timbers average 18.2 cm sided and 20 cm in molded dimensions. The floors sit flush or flat on the keel, and are fastened to the keel by iron bolts. Most of the floors consist of a short arm and a long arm, though some of these timbers have arms of equal length. Generally, the heads of the floors are butted to the second futtocks; however, there is an unusual example of a futtock (PTF 58) on the port side of the vessel that is butt-joined at its heel a flat scarfed at its head (FIG. 8). No fastenings are visible in the scarf, which is vertically oriented. Though the head of the timber is slightly eroded, the cuts of the scarf are intentional.

There is great variation in the dimensions and distribution of first futtocks along the length of the hull, but near amidships their pattern maintains some regularity, with most of the futtocks placed forward of the floors. In

Figure 7. The stern assembly showing the stern knee, garboard, and keel. Note the mortise in the keel for the placement of the sternpost. (Photograph by Samuel Turner.)

Figure 8. Timber PTF 58 is a futtock with a flat scarf. Note the blind treenail holes in the outboard face of the timber. (Drawing by Stefan Claesson.)

Figure 9. Measured drawing of stern frame PTF 52 with a shim treenailed to its outboard face. (Drawing by Stefan Claesson.)

the other areas of the hull, the futtocks seem to display a rather haphazard placement. This is likely indicative of the extensive repair work on the hull, in combination with original construction technique. Instead of spacing timbers at regular intervals, futtocks and filling pieces were laid between the floors to fill in any gaps. In addition, chocks were used to fill in areas between the futtocks and the hull planking (FIG. 9). This type of heavy construction would have been necessary to carry the bulky cargoes that *Annabella* transported. None of the futtocks are fastened horizontally to adjacent

frames, but are generally attached to the hull planking by treenails. Though most of the treenail holes extend through the hull planking and frames, there are a number of wedged treenails in blind holes (PTF 58 [see FIG. 8]).

The cant frames in the bow of the ship are beveled and have average dimensions of 23 cm molded and 14 cm sided. The cant frames would have abutted the apron. Though iron bolts are located at the base of each cant frame, their point of attachment is unclear, as there are no adjoining fastening holes in the deadwood or apron timbers. A high density of coal

Figure 10. Probable mast step of *Annabella*. (Drawing by Stefan Claesson.)

tar (see *Caulking* below) was also found at the base of the cant frames and around the base of the apron and deadwood.

Planking

The hull planking is of red oak and measures 4 cm in thickness and averages 23 cm in width. The quarter-sawn hull planks are fastened to the frames almost exclusively with treenails, though graving pieces located throughout the hull, have been fastened with iron nails. In addition to being treenailed, the hooded ends of the first strakes at the bow of the vessel are fastened with a single iron nail and are joggled to fit the garboard strakes. The garboard strakes are 25 cm in width and 6 cm thick near amidships, but taper in the bow to only 5 cm in width and 3 cm in thickness. In the stern, the garboards are treenailed and nailed to the stern knee in an almost vertical position.

Ceiling

The ceiling planking was fashioned from white oak, with thickness varying from 3.5–9 cm. Close to the keel the ceiling is relatively thin (3.5 cm), but the outermost ceiling is a heavier stringer, 9 cm thick at the turn of the bilge. Many of the ceiling strakes are recycled timbers, as fastener holes are seen in ceiling

strakes where no fasteners exist. The ceiling is fastened to the hull primarily by treenails that are also driven through the hull planking, frames, and ceiling, but the ceiling is also attached to the frames by iron nails and iron bolts.

Mast Step

Neither keelson nor mast steps were found within the hull, though a timber was discovered approximately 100 m southeast of the excavation site that seems to be a mast step for a ship (FIG. 10). The timber is extremely eroded, no surface detail is discernable, and the timber cannot be positively associated with *Annabella* because of its distance from the excavation site. Moreover, there is a wide scatter of ship timbers throughout the Cape Neddick tidal flats; the timber may derive from one of many other shipwrecks in the area. It is, however, of the same type of wood as the frames of *Annabella* (*Quercus* sp.). Its identification as a ship timber is further supported by the fact that treenails are seen around the rectangular cut in the center of the timber. At the base of the rectangular cut is a circular depression that may represent wear from repeatedly stepping a mast. The timber is 2.25 m in length, and it has a maximum sided dimension of 26.9 cm and a molded dimension of 23.5 cm.

Figure 11. *Annabella*, as seen shortly after its abandonment in 1885. The poor resolution of the photograph results from its enlargement from a panoramic photograph taken of the Cape Neddick River circa 1890 (Courtesy Old York Historical Society, York, ME.)

Figure 12. Maritime painting of *Thomas G. Smith*, a 19th-century schooner built in Camden, New Jersey. (Courtesy of the Cumberland County Historical Society, Greenwich, NJ.)

The photograph in Figure 11 is an enlarged image of *Annabella* taken from a panoramic photograph of the Cape Neddick River ca. 1890. The condition of the ship is clearly discernable in the picture, which was taken shortly after the abandonment of the vessel. Its top timbers are visible along the starboard side of the vessel, as are the decking, deck beams, and the main holds of the ship. A mast step may have been located near the aft end of the apron, as a foremast is visible in the bow. Computer enhancement of the photograph was attempted, but was unsuccessful because the resolution of the original photograph was

too poor. A maritime painting of the schooner *Thomas G. Smith* is also useful in interpreting parts of the superstructure of *Annabella* that are no longer extant (i.e., deckhouses and rigging components), though the *Thomas G. Smith* is considerably larger in dimensions than *Annabella* (FIG 12).

Rudder

The rudder lay under a thin layer of sediment immediately abaft the stern knee (FIG. 4). The rudder is traditional in its design, consisting of an after piece, middle piece, main

piece, and rudder stock, but there is also a smaller inner piece at the base of the rudder. The pieces average 15 cm in thickness and were fastened together by iron bolts. The maximum length of the main piece is 3.55 m. The rudder post, which also forms the main piece, is 21 cm in diameter and is notched at the top to seat a tiller.

Chamfered notches have been cut into the forward edge of the main piece for the fitting of pintles. The upper pintle of the rudder is cylindrical, 12 cm in length and 5 cm in diameter. The iron of the strap has deteriorated considerably, though the heavy iron staining and impressions indicate the extent of the fitting. The lower pintle is concreted, obscuring its details and dimensions. Like the upper pintle, the lower pintle has an iron strap extending from it across the face of the rudder pieces. Both of the iron straps were fastened to the rudder by iron nails.

Caulking

Adhering to the surface of the keel and lower hull planks was a hard, black, granular tar. The substance was analyzed by the Geochemical and Environmental Research Group (Texas A&M University) and identified as coal tar. High concentrations of tar were located around the apron and adjacent timbers and around the stern knee, particularly at the aft end of the timber. The garboards and lower strakes exhibit some dark staining on their exterior and edges, which may be residue from tarring the planks, though it is more likely that the staining is a result of oxidized iron.

It is uncertain if the coal tar was used in the original construction of the ship, though it is probable that the ship was recaulked in light of the extensive repair work on other portions of the hull. The use of coal tar rather than pine tar for caulking ships during the 19th century is unusual. Southern New Jersey had coal resources, however, so in the first half of the 19th century the use of coal tar may have been more common in the construction of southern New Jersey ships than it was elsewhere (Elmer 1869: 79). Coal tar was not the only type of caulking that was used; the A. Goodwin & Co. ledgers note the purchase of oakum for

Annabella in 1874, though none of this material was identified during the excavation.

Fasteners

Three primary types of fasteners were found: treenails, iron nails, and iron bolts. The treenails are used mostly in the fastening of the hull planking to the frames, though the ceiling is also fastened to the frames by wedged treenails. The treenails are white oak and generally 3 cm in diameter. In addition, the ceiling is fastened with small pegs (1.0 cm diameter) and square-headed iron nails. These pegs were probably used to fill old fastener holes in the ceiling rather than fastening the ceiling to the frame. A description of iron fasteners will appear in a subsequent report, after conservation is completed.

Historical Documents

There is a wealth of primary documents relating to the 19th-century maritime history of Cape Neddick, Maine and southern New Jersey, but the historical documents discussed here relate specifically to the schooner's original dimensions, structural changes or repairs in the hull, its ports of destination and cargoes, and changes in ownership and masters. The historical research conducted by IMH involved an extensive search through manuscript collections in local libraries, as well as interviews with local residents regarding the history of Cape Neddick. The ship was not identified until the middle of the excavation season. In an interview with a 93-year-old Cape Neddick resident, Harry Hutchins, related how his grandfather had "[gone] down to work on the *Annabella*." Enrollment records would eventually confirm that Hutchins' grandfather was master of the schooner *Annabella* in the last years of the vessel's life. To further reinforce the identification of the vessel as *Annabella*, the last enrollment record relates that the vessel was finally "Surrendered at York, October 17, 1885, vessel broken up or abandoned as unfit for service" (National Archives, File Folder 1789, E 1). The vessel was described as being abandoned in York and not Cape Neddick, but this was not uncommon, as Cape Neddick was and is con-

Table 4. A list of the enrollment records of *Annabella*. (National Archives, File Folder 1789).

Record	Date	Port of Registration	Primary Ownership	Master
E 102	11-06-1834	Bridgetown, NJ	Isaac Townsend	Philip Burch
E 83	05-22-1841	Philadelphia, PA	Samuel Townsend	William Sayres
E 188	12-02-1843	Boston, MA	unknown	unknown
E 24	03-08-1845	Barnstable, MA	William Stutson	Roland Gibbs
E 139	08-05-1851	Boston, MA	Dening Jarvis	John Piree
E 22	11-25-1851	Plymouth, MA	unknown	unknown
E 19	10-15-1853	Kennebunk, ME	Samuel Lindsey	Abner Boothby
E 13	10-21-1854	Kennebunk, ME	Samuel Lindsey	unknown
E 10	03-31-1864	Kennebunk, ME	Samuel Lindsey	George Goodwin
E 11	07-31-1867	Kennebunk, ME	Samuel Lindsey	Asa H. Bourne
E 4	06-22-1868	Kennebunk, ME	George Hobbs	George Goodwin
E 6	06-21-1869	Kennebunk, ME	Samuel Lindsey	Asa H. Bourne
E 4	03-26-1874	Kennebunk, ME	Samuel Lindsey	George H. Hutchins
E 1	04-10-1875	Kennebunk, ME	Samuel Lindsey	George H. Hutchins
E 2	04-01-1876	York, ME	Samuel Lindsey	Joseph A. Donnell
E 3	05-18-1878	York, ME	Joseph A. Donnell	Joseph A. Donnell
E 1	06-21-1882	York, ME	Joseph A. Donnell	Joseph A. Donnell

sidered part of, and is governed by, the Town of York.

The primary sources for this ship consist of enrollment records obtained from the National Archives in Washington, D. C., and 19th-century ledgers from a private collection in Cape Neddick, Maine. There are 17 enrollment records for *Annabella*, of which two are missing. Table 4 lists the enrollment records, dates and places of vessel registration, shipmasters, and the primary owners of *Annabella*.

The vessel was originally built as a sloop in Port Elizabeth, New Jersey; in 1841, however, the sloop was converted to a schooner (National Archives, File Folder 1789, E 83, 1841). The enrollment records offer detailed information concerning modifications in the schooner's construction as well as descriptions of its principal characteristics. Most of the records make note that the vessel had one deck, two masts, a square stern, a billet head, and no galleries. The records also include the overall dimensions of the vessel; it is apparent that any changes in the ship's measurements may be attributed to repairs or alterations in the ship's construction, in addition to changes in tonnage laws established during the 19th century.

The first and most significant change in the vessel's construction can be seen in record E 83, which states "per enrolment no. 102 issued at Bridgetown November 1834 Surrd. Prop.

Changed and vessel altered from a sloop to a schooner." The exact structural and dimensional changes resulting from this alteration in the hull are problematic, as no measurements are given in the record except for the ship's tonnage, listed as 69 and 82/95 tons. The first listing of the hull's dimensions following the alteration is found in the fourth enrollment record (National Archives, File Folder 1789, E 24), and these are as follows: 66 feet in length; 23 ft, 9.5 in. in breadth; and a depth of hold of 5 ft, 4.6 in.

Measurements for the schooner varied little until 1864, after the Act to Regulate the Measurement of Tonnage of Ships and Vessels of the United States was approved on May 6, 1864 (Butts 1873). Not long after the new tonnage laws were passed, *Annabella* was surrendered for new measurements, at which time she was recorded as having a length of 67 and 9/10 ft, a breadth of 23 and 9/10 ft, and a depth of 6 and 5/10 ft. Her tonnage measurement was 65 and 28 hundredths tons. The most significant changes were in the depth of hold and length of the ship, which were both increased by approximately one foot. These changes in measurements may indicate repairs, though more likely they are a result of changes in the method of documenting vessels established by the above-mentioned Act.

An entry listing for *Annabella* was also found in *American Lloyd's Registry of American*

and Foreign Shipping (1862: 371). The register records additional details regarding *Annabella* not noted in the enrollment records. The vessel was first surveyed by Lloyd's in Boston in 1860 and is recorded as 69 tons, single decked, with a draft of seven feet. In addition, the register notes that repairs were made to the vessel in 1853. Unfortunately, these repairs are not specified in enrollment record E 19 in 1853, at which time the schooner was registered to Abner Boothby in Kennebunk, Maine.

The dimensions in the enrollment records agree with the dimensions taken in the field. The length of the keel is preserved in its entirety, with a total length of 58.56 ft. When considering the rake of the sternpost and stem, the deck length would closely match the dimensions listed in the enrollment records of 67 and 9/10 ft. The breadth and depth of hold listed in the records also correspond closely to the dimensions established in the field. *American Lloyd's Registry of American and Foreign Shipping* also noted that the schooner is constructed of oak with iron fasteners, which corresponds to the white and red oak timbers and iron fasteners that were found throughout the hull.

The discovery of ledgers in a private collection of manuscripts in Cape Neddick afforded the archaeological investigation an in-depth look at coasting trade along the New England coast in the late 19th century (FIG. 13). A. Goodwin & Co., a mercantile firm that controlled the cordwood industry in Cape Neddick in the second half of the 19th century, carefully documented the maritime activity of the region. Bearing part ownership in *Annabella*, the company recorded the ports of destination for the ship, what it was shipping out of Cape Neddick and bringing back in return, and the amount and value of goods shipped. Moreover, the ledgers record related bills such as wharfage, repairs, and outfitting costs, and the owners and companies to whom goods were shipped.

The ledgers specifically address the activities of the vessel from 1874–1881, at which time Asahel Goodwin became part owner of the schooner. Asahel Goodwin was the most active merchant in Cape Neddick in the 19th century. The earliest obtainable records of Asahel Goodwin's involvement in the mar-

itime industries indicate his part ownership in approximately fifteen schooners, one brig, a sloop, and numerous fishing vessels (Goodwin 1832–1882). The majority of these vessels were involved in coasting trade on the Atlantic seaboard and occasionally in the West Indies trade. Asahel Goodwin also owned vast tracts of woodlands in Cape Neddick and was largely responsible for exporting cordwood, cut lumber, clapboards, and laths from Cape Neddick to southern markets in the second half of the 19th century.

The trade routes of *Annabella* were limited to the New England coast in the late 1800s. Typically, she transported varieties of cordwood, as well as brick, hay, coal, and perishables (flour, vegetables, etc.). These bulky cargoes were important to America's economy. Raw materials from Maine were essential for providing goods for markets in primary ports such as Boston, New York, and Philadelphia, where most of the local timber resources had been depleted by the early 19th century.

From 1874 to 1881, *Annabella* made 56 voyages, averaging seven trips every year with a maximum of nine trips in 1875. It is estimated that coasting vessels of York, in the first half of the 19th century, would have made approximately 20 trips from York to Boston each year (Wood 1971: 214). Other Cape Neddick coasting vessels in the 1860s rarely made more than ten trips in any given year (Weare 1859). *Annabella* usually departed from Cape Neddick or Wells; in 1879, however, the schooner was contracted to mercantile lumber firms in Bangor. Bangor was also a port of destination for *Annabella*, but Boston and Cambridge, Massachusetts, were the most common destinations. Other coasting routes were very short and were easily traveled within a day. These ports of call included Portland, Maine, and Portsmouth and Dover, New Hampshire.

In the 1870s and 1880s, large cargoes of brick and coal were occasionally shipped to markets, though lumber was the most common cargo on *Annabella*. These bulky cargoes were usually accompanied by a variety of perishable and country goods. On one trip to Boston, the cargo consisted solely of 414 bushels of potatoes. Perishable items transported to and from markets included oil, flour, potatoes, apples, beans, hay, salt, sugar, pork,

[illegible]

Figure 13. A page from the A. Goodwin & Co. ledger, listing cargoes and destinations of the schooner. The ledger documents the vessel's activities from 1874-1881. (Photograph by Stefan Claesson.)

cheese, and molasses. Brick was not as common a cargo as cordwood on *Annabella*, though it is not an unusual export from York, since the York River was one of the largest brick-manufacturing centers in southern Maine (Norton 1902–1905).

Lumber was undoubtedly the most valuable resource of Cape Neddick, and on a larger scale, for the state of Maine. The demand for cordwood in Boston, New York, and other metropolitan New England areas was extremely high. For Boston, Cape Neddick was the first accessible source of timber on the Maine coast. Though Kittery and York are south of Cape Neddick, their rivers would have had to have been plied well inland to reach timber resources in the 19th century. Consequently, Cape Neddick was able to supply a small but constant stream of cordwood and some building material to Boston and other ports.

The most common types of cordwood shipped by *Annabella* were pine and hemlock, though a variety of softwoods and hardwoods, slabs, and poplar were also exported. Cordwood was the primary cargo listed in the ledgers, with approximately 50 cords of wood transported at a time. The maximum load listed in the ledgers is 70 cords, comprising an approximate volume of 9000 cubic feet. The mills of Cape Neddick produced a number of pre-cut timbers in the 19th century such as laths, clapboards, shingles, planks, and boards (Talpey 1871). *Annabella* was never responsible for shipping such products to markets, however. After 1850, most manufactured timber goods appear to have been absorbed by local consumption. Surplus products were exported more often in the 18th and early 19th centuries (Ferguson and Jewett 1825). There is only one instance when *Annabella* shipped manufactured lumber to markets; in this case, the lumber was exported from Bangor, Maine, and consisted of 11,038 ft of long lumber and 198,400 laths (Goodwin 1874–1882: 173).

As noted above, cordwood shipped by *Annabella* was almost exclusively pine and hemlock. An average load was 58.5 cords of wood. Pine was the most common type of cordwood and sold for \$5.50/cord. Hemlock sold at \$4.75/cord, and hardwood and poplar was valued at \$4.00/cord. The costs of cordwood did not witness any drastic price fluctu-

ations during the 1870s and 1880s in Cape Neddick. Freight rates, however, consistently dropped toward the end of the 19th century. In 1847, freight rates from Bangor to Boston were \$2.00–\$2.50, and the following year rates dropped to \$1.50–\$2.00/cord (Wood 1971: 223). Rates continued to fall and, by 1880, shipping wood on *Annabella* cost \$1.00 per thousand board ft, or per cord (Goodwin 1874–1882). The drop in freight rates and wharf charges may have been the result of fluctuating prices during the Civil War and the depression of the 1870s.

Annabella received numerous hull, sail, and rigging repairs in the 1870s (Goodwin 1832–1882). In addition, occasional maintenance and outfitting expenses were recorded in ledgers kept by Asahel Goodwin, such as hauling anchor, purchasing manilla rope and oakum for caulking, vessel launching, and hull repair. Sawmill records are also suggestive of hull repairs, as 42 ft of pine planks and hardwood planks were cut for the vessel in 1879. Again, in June of 1880, 52 ft of spruce plank and 96 ft of pine plank were cut for the schooner by the Talpey sawmill (Talpey 1871). Moreover, repairs to *Annabella* in 1853 are noted in *Lloyds' Registry of American and Foreign Shipping*, but do not specify the type or condition of repair (Blunt 1862: 371).

The historical significance of the *Annabella* must be perceived in relation to its economic milieu to understand exactly how this ship is representative of maritime activity and technology of the 19th century. The information contained in the historical manuscripts relating to *Annabella* provides detailed accounts of the history of the vessel in its later years as a working vessel. Together, these historical and archaeological maritime resources are essential to our understanding of economic and social behaviors of the past, particularly in New England where the survival of coastal communities was dependent upon the sea for its resources and on ships such as *Annabella* for transporting goods to markets.

Conclusion

Ships of the 19th century are well documented in historical sources. Plans, ship lines, and general construction techniques (e.g.,

lofting, etc.) can be researched through historical documents; ship construction, however, cannot be studied in detail through such sources. Only the archaeological study of hull remains can provide information that is illustrative of the nuances of a particular shipwright's skills, or of how a craft was adapted to a specific economic and physical environment. To understand how basic shipbuilding philosophies developed and varied in the 19th century, a detailed look at hull construction in an archaeological setting is essential. This is particularly the case with coasting and fishing schooners, which would likely exhibit a high degree of variation in design and construction. Even Howard Chapelle's *The American Fishing Schooners* (1973), a treatise dedicated to the evolution of the fishing schooner in New England, is unable to present a comparable representation of the construction and timber arrangement seen in *Annabella*. Clearly, schooners, whether employed in fishing, coasting, or West Indies trade, show a remarkable diversity in function and construction.

The study of *Annabella* has far-reaching implications, as *Annabella* represents not only a type of craft that was ubiquitous to the eastern seaboard in the 19th century, but also a type of craft that was specifically built for carrying heavy cargoes across shallow waters. The historical and archaeological analysis of *Annabella*'s remains and career at sea for over 50 years, including the Antebellum, Civil War, and Post-Civil War eras, are beginning to provide a detailed picture of the coasting trade and maritime commerce in southern Maine in the 19th century.

Glossary

Amidships—The middle of a vessel, either longitudinally or transversely.

Apron—A curved piece of timber fixed to the after surface of the stem or to the top of the end of the keel and the after surface of the stem; an inner stempost.

Bevel—The fore-and-aft angle or curvature of an inner or outer frame surface.

Bow—The forward part of a hull, specifically, from the point where the sides curve inward to the stem.

Breadth—The width of a hull; sometimes called beam, which is technically the length of the main beam.

Butt joint—The union of two planks or timbers whose ends are cut perpendicularly to their lengths.

Cant frame—A framing member mounted obliquely to the keel centerline in the ends of a vessel; canting provided better frame distribution and permitted more nearly rectangular cross sections of the timbers along the vessel's incurving ends.

Caulk—To drive oakum, moss, animal hair, or other fibrous material into the seams of planking and cover it with pitch to make the seams watertight.

Ship profile with timbers labeled (*Wooden Ship Building and the Interpretation of Shipwrecks*, J. Richard Steffy, Texas A&M). Not to be copied without the permission of the publisher.

Chamfer—The flat, sloping surface created by slicing the edge off a timber.

Chock—An angular block or wedge used to fill out areas between timbers or to separate them; chocks are used to fill out deadwoods and head knees, separate frames and futtock, etc.

Coaster [Coasting vessel]—Any vessel carrying cargo from one coastal port to another. A few coasters carried cargoes to and from the West Indies but none were considered deep water vessels. In the United States, the coasting trade was carried on almost entirely by sailing vessels.

Deadwood—Blocks of timber assembled on top of the keel, usually in the ends of the hull, to fill out the narrow parts of the body of a vessel.

Depth of hold—The distance between the bottom either of the main deck or the bottom of its beams and the limber boards or innermost ceiling, measured at the midship frame.

Draft—The depth to which a hull is immersed.

Filling piece [Filler]—A single timber or block used to fill out an area, such as the spaces between frames, to maintain rigidity.

Fish plate—A metal plate used to join two timbers externally.

Flat scarf—The union of two timbers whose diagonal ends are cut off perpendicular to their lengths.

Floor timber—The bottom of a vessel between the upward turns of its bilges.

Futtock—A frame timber other than a floor timber, half-frame, or top timber; one of the middle pieces of a frame.

Garboard strake—The strake of planking next to the keel; the lowest plank.

Graving piece—A wooden patch, or insert, let into a damaged rotted plank.

Hawse pipe—Flanged iron pipes through the bow, through which passes the chain from windlass to anchor.

Intermediate timber—Those individual timbers installed between the sequential frames for additional localized strength. The timber could span part of the bottom, turn of the bilge, or side.

Keel—The main longitudinal timber of most hulls, upon which the frames, deadwoods, and ends of the hull are mounted; the backbone of the hull.

Keelson—An internal longitudinal timber or line of timbers, mounted atop the frames along the centerline of the keel that provides additional longitudinal strength to the bottom of the hull; an internal keel.

Mast step—A mortise cut into the top of a keelson or large floor timber or a mortised wooden block or assembly of blocks mounted on the floor timbers or keelson, into which the tenoned heel of a mast is seated.

Molded [Molded dimension]—The various dimensions of timbers as seen from the sheer and body views of construction plans. The vertical surfaces of timbers such as the keel or frames. Normally, timbers are described in sided and molded dimensions, while planks and wales are listed in thickness' and widths. Molded and sided dimensions are used because of the changing orientation of timbers, such as frames, where "thick" and "wide" or "height" and "depth" become confusing.

Mortise—A cavity cut into a timber to receive a tenon.

Oakum—Caulking material made from rope scraps that were picked apart, and the fibers then rolled and soaked in pitch before being driven into planking seams.

Pintle—A vertical pin at the forward edge of a stern-hung rudder that fits into a gudgeon on the sternpost to form a hinge. On most vessels, they were welded or cast to a bracket whose arms were fastened to the sides of the rudder.

Port—The left side of a vessel when facing forward.

Rabbet—Generally, the term refers to the grooves cut into the sides of the keel, stem, and sternpost, into which the garboards and ends of the outer planking are seated.

Rake—The inclination of the stem and sternpost beyond the ends of the keel.

Rudder—A timber, or assembly of timbers, that can be rotated about an axis to control the direction of a vessel underway.

Rudder post—A term infrequently used to describe either the outer sternpost or the rudder stock.

Rudder stock—A strong vertical piece to which the tiller is fitted. Also known as the main piece.

Scantlings—The principal timbers of a vessel.

Scarf—An overlapping joint used to connect two timbers or planks without increasing their dimensions.

Schooner—A sailing vessel rigged with fore-and-aft sails on two or more masts. Usually refers to a vessel with two masts with the mainmast taller than the foremast; however, schooners have been built with as many as seven masts. An effective vessel type for coasting trade because they required a smaller crew than a square-rigged vessel of comparable size.

Sided [Sided dimension]—The dimension of an unmolded surface; the distance across an outer frame surface, the forward or after surface of a stem or sternpost, or the upper surface of a keel or keelson.

Sloop—A sailing vessel with a single mast, typically fore-and-aft rigged, with a single headsail.

Starboard—The right side of a vessel when facing forward.

Stem—A vertical or upward curving timber or assembly of timbers, scarfed to the keel or central plank at its lower end, into which the two sides of the bow are joined.

Stern—The after end of a vessel.

Stern knee—An angular timber that reinforces the joint between the keel or lower deadwoods and the sternpost or inner sternpost.

Stopwater—A wooden dowel inserted athwartships in the scarf seams of external timbers to prevent shifting of the joint or to discourage water seepage along the seams.

Tonnage—A measurement based on an arbitrary formula, intended originally to be a rough measure of cargo capacity.

Treenail [Trunnel]—A round or multi-sided piece of hardwood, driven through planks and timbers to connect them. Treenails were employed most frequently in attaching planking to frames. They were used in a variety of forms: with expanding wedges or nails in their ends, with tapered or square heads on their exterior ends, or completely unwedged and unheaded. When immersed, treenails swelled to make a tight fit.

Turn of the bilge—The outboard part of the lower hull where the bottom curved toward the side.

The glossary is compiled from the following sources: Kemp 1976; Leavitt 1970; Steffy 1994.

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