CHAPTER 4

Atlantic Material Culture: Boats, Ships, and Navigation

Oceans, like most large bodies of water, are paradoxical (Adams 2001:292). They can be treacherous and deadly to ships and their passengers, and in extreme cases they can destroy coastal settlements. But oceans also provide the sea life that has sustained humans at coastal settlements for centuries. Water bodies can also be a nation's strength or its weakness. They can delimit a nation's physical boundaries and instill a sense of security and defense, but they also can provide ready access for hostile attackers. They can appear as impenetrable frontiers, difficult and dangerous to traverse, while at the same time encouraging exploration.

For island peoples like the seventeenth-century English, the water surrounding them was all of the above. The Atlantic variously served as hazard, source of life, physical boundary, and vulnerable route of attack. Like their ancestors, the seventeenth-century English understood the oceans' dangers and opportunities. Despite the peril of possible capture and enslavement by non-Christian "infidels," English trade expeditions to the eastern Mediterranean had tangibly demonstrated the many benefits of braving large bodies of water (Games 2008:64–65). But as English seafarers and their financial backers gazed west beyond the warm waters of the Mediterranean, they were profoundly aware of the abundant and richly rewarding successes of the Spanish and the Portuguese, their frequent Roman Catholic rivals. Richard Hakluyt (1599:2–3), famed booster of English exploration, urged on his adventurous fellows near the end of the Elizabethan era: "it is high time for us to weigh our ancre, to hoise up our sailes, to get cleare of these boisterous, frosty, and misty seas, and with all speede to direct our course for the middle, lightsome, temperate, and warm Atlantick Ocean, over which the Spaniards and Portugales have made so many pleasant prosperous and golden voyages." Hakluyt, steadfast English patriot, dutifully recognized the "tempests, dangers and shipwracks

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[sic]" that bedeviled even the most gifted sailors but tempered this stark reality with the ideal that "a great number of them have satisfied their fame-thirsty and gold-thirsty mindes with that reputation and wealth, which made all perils and misadventures seeme tolerable." Upon weighing the risks, Hakluyt declared that the glory of England was to be found outside the small island, and that brave mariners would have to cross the ocean as the Iberians had so successfully done before them.

In addition to the geopolitical and economic opportunities awaiting daring English men and women, travel could also have personal benefits. As William Lithgow (1632:9) explains, travel provides participants with "the impression of understanding, experience, [and] patience," it offers the opportunity to become familiar with "the government of States, the authority and disposition of Kings and Princes; the secrets, manners, customes, and Religions of all Nations and People." Lastly, travel "brigheth satisfaction of the home-dwelling man." Travel to unfamiliar places thus supplies tangible benefits including wealth, but it also presents important psychological advantages for personal growth.

The Atlantic Ocean was an integral part of the Atlantic World. This statement seems too obvious to require explicit pronouncement, but archaeologists who have addressed transoceanic connections have often overlooked the ocean as an active participant in history. In a recent archaeological study comparing English Virginia and Ulster, the archaeologist virtually ignored the Atlantic as having any significance as a material reality (Horning 2013). The Atlantic performed merely as a space separating colonial Ireland from colonial Virginia. The author of a recent doctoral dissertation takes the same approach, barely mentioning the Atlantic itself (Pecoraro 2015). To be fair, neither Deetz's (1991) international comparative approach nor the earliest iterations of modern-world archaeology (Orser 1994, 1996) included conceptual space for the oceans themselves. Terrestrially focused archaeologists perhaps can be forgiven for their oversights because it seems that within the archaeological community only maritime archaeologists take bodies of water seriously. Maritime archaeologists cannot easily separate shipwrecks and sunken habitation sites from the water because their research subjects are inexorably enmeshed with it. Archaeologists with research interests in the seas must directly confront the difficulties and hazards associated with waterlogged sites and artifacts, and even ensure their personal safety when conducting basic fieldwork.

Including transoceanic travel in the analysis requires viewing the seas as an active component of history. The oceans are pertinent because people required material culture to cross them. Mariners needed boats, ships,

and instruments capable of long-distance travel in often-harsh conditions, in addition to the knowledge and fortitude necessary to make the often-dangerous journeys. Columbian- and post-Columbian-era European colonialism and trade is impossible to imagine without the oceans. They were unavoidable spaces of experience for millions of men, women, and children long before the invention of transoceanic air travel. Even today, crossing the oceans by air – though faster, safer, and considerably more comfortable than in the days of sail – interjects a new space of experience; one that occurs above the sea rather than directly upon it. In crossing the Atlantic, seventeenth-century English men and women had a wholly different experience from being at home because they were on the ocean for considerable periods of time in huge pieces of material culture. They were intimately aware that the Atlantic World encompassed terrestrial spaces in the Old and the New Worlds, but they also knew that the Atlantic itself constituted a huge "third space." They could not dismiss the importance of this space because the ocean was a physical environment that demanded daily attention. All those who traveled upon the seventeenth-century Atlantic understood the hazards and the hopes embedded within it. Irish and English indentured servants traveling to new destinations far from home, and enslaved Africans stuffed into fetid spaces below deck, were certainly aware of oceanic space. Mariners above decks were equally cognizant of the ocean's realities but for far different reasons. They had the responsibility and frequently the financial burden of seeing ships safely and economically across the ocean. Knowledge of currents, the seasonality of hurricanes, and the positions of reefs and deep inlets were their immediate concerns.

As crossing the seas became a centerpiece in the development of England into Great Britain, contemporary authors began to write texts explaining the tools and skills required for the successful navigation of the world's great seas, including the Atlantic (e.g., Barlow 1597; Manwaring 1644; Smith 1626). Learned seventeenth-century English seafarers could acquire knowledge from these books. Robert Clavel (1673) published *A Catalogue of All the Books Printed in England Since the Dreadful Fire of London in 1666 to the End of Michaelmas Term, 1672*. He listed several books for mariners, including *The English Pilot, The Coasting Pilot, Nine Geometrical Exercises for Young Seamen, Practical Navigation*, and *The Seamans Companion: Or, A Guide for Young Seamen*. Several nautical instruments were available to make the art of navigation more reliable and safer. In his *The Navigator Supply*, William Barlow (1597) extolls the virtues of many nautical instruments, including the "sayling compass,"

the compass of variation, the pantometer, and "the traveylors lewell." In the early seventeenth century, George Hakewill (1627:263) regarded the "Marrriners compasse," along with "Printing & Gunnes," as the three most important inventions of his lifetime. He regarded the compass as "most worthy of admiration" because it guided mariners through "the greatest storms and darkest nights," it facilitated trade by permitting "the commodities of all countries [to be] discovered," and it promoted worldwide understanding, making the entire world "as it were one Commonwealth, and the most distant Nations, fellow citizens of the same body politique" (Hakewill 1635:323). Seventeenth-century readers could imagine crossing the Atlantic by reading these volumes, but the most important material culture by far were boats and ships. During the seventeenth century, the largest wooden warships were generally considered to be "the most significant moveable artefacts procured by the state" (Winfield 2009:vii). The seventeenth-century English Atlantic World was simply impossible to imagine without this material culture.

Material Culture, Space, and Mobility

The idea that the seventeenth-century Atlantic had a material culture is key to appreciating how space is conceived in a globally conceived historical archaeology. A significant goal of the research agenda advanced in this book is to encourage archaeologists to disengage from the commitment to single archaeological sites as the termination of research (Orser 1996:140–141). Rather than viewing colonial Europe and the colonized New World as two distinct albeit comparable cultural landscapes, or as two geographic spaces connected by cultural traditions, the current perspective involves envisioning the two places as two locales within the same region. Here, the region is the English Atlantic World, and the distinct archaeological spaces within it, albeit composed of discrete sites of past human activity, are considered to exist within the same region, even though the geographical distance between any two sites may be substantial.

This view of the archaeological project is comfortable with the "new mobilities" paradigm developed by geographers in the early 2000s. The designers of this perspective envision the world as rooted within the realities of a world on the move; it models "the global order" as a space in which individuals and social groups traverse their world, often on their own terms, but in many cases not. The world in this perspective is inexorably interconnected in complex, multifaceted ways. Accordingly, "Such multiple and intersecting mobilities seem to produce a more 'networked'

patterning of economic and social life, even for those who have not moved. And materials too are on the move, often carried by moving bodies whether openly, clandestinely, or inadvertently" (Hannam et al. 2006:2). This view is perfectly in concert with the network model integral to the present study (also see Orser 1996:29–55).

Central to the concept of movement in a globally aware historical archaeology is the caveat that not all people have equal opportunities to relocate as they see fit and on their own terms. In a great many cases, and certainly in the seventeenth-century Atlantic World, the impetus to commence movement often came from individuals at or near the top of the socioeconomic hierarchy. The trade in African captives provides the most-obvious example (see Chapter 3). In this case, the only individuals with true freedom of movement were wealthy slave traffickers, indigenous chieftains, and their agents (financiers, functionaries, and other facilitators). The individuals being forcibly relocated had little or nothing to say in the matter.

In his argument for understanding the politics of mobility, Tim Cresswell (2010:21) proposes six questions useful for identifying sociospatial relations "that involve the production and distribution of power": (1) Why does a person or thing move? (2) How fast does a person or thing move? (3) In what rhythm does a person or thing move? (4) What route does the movement take? (5) How does it feel? (6) When and how does it stop? The works of Lefebvre and Bourdieu, two thinkers important to the theoretical foundation of globally conscious historical archaeology, appear prominent within the new mobilities paradigm. The concept of mobility as learned practice derives from Bourdieu (1977), and the idea that humans actively produce space, and that mobility involves rhythms, comes from Lefebvre (1991).

Lefebvre argues that rhythms can be cyclic or linear. He perceives cyclic time as "cosmic," or integral to life on earth. Cosmic time appears in natural places and includes the animal world, the seasons, and the phases of the moon. Conversely, linear rhythms are products of human social practice (see Elden 2004:195–196). Lefebvre (2004) seeks to investigate the interplay between types of rhythms using "rhythmanalysis." One of his key points about linear rhythm is that humans manipulate time and space in tandem, and that capitalist practice has been particularly effective as a manipulator. Historical archaeologists have long appreciated the role of material culture in affecting time and space (see e.g., Shackel 1993), but the interconnection between cyclic and human-designed rhythms has seldom been explicitly explored with archaeological information.

Archaeologists may not always be able to address Cresswell's questions, given limitations in the extant archaeological and historical information. But despite the obvious difficulties of analysis, his ideas have merit because they foreground the network attributes involved in mobility, their obvious sociospatial dimensions, and the central place of material culture. Migration necessarily includes socially relevant concepts such as space and place, mobility and location, national and transnational identity, and hybridity (Blunt 2007). Contemporary historical archaeologists have significant interests in each of these topics, perhaps most obviously in the study of African cultures in the New World through the complex processes of enslavement, diaspora, and ethnogenesis (see e.g., Franklin and McKee 2004).

Seventeenth-century English ships crossing the Atlantic were sociospatial worlds all their own. As John Smith (1626:2–7) makes clear in his treatise on ship etiquette, an English ship was a hierarchically produced, moveable place wherein each person in the command structure had his (and sometimes her) own duties and spatial position on board: "The Captaines charge is to commaund all … The Maister Gunner hath the charge of the Ordinances, Shot, Powder … The Boteswaine is to have the charge of all the Cordage, tackling, sailes." Duties were place-bound because sails, guns, cordage, and all the other pieces of material culture required for sailing vessels had specific, functional places onboard. Smith relates that once the ships had "set sayle and put to sea" the captain assigned every seaman a specific position on board. One half of the men were "to goe to the Starreboord, the other to the Larboord." During attack, the captain also assigned each sailor to a strategic locale. The lieutenant was to be on the forecastle, and the captain, the quartermasters, and the midshipmen on the half deck. In peace and war, the assignment of places and the routine of passage were the rhythms of transoceanic travel, both linear and cyclic. The linear rhythms of human social practice (the daily labor of moving the ship through the water in the correct direction) were enmeshed with the natural, cyclic rhythms imposed by the sea and its constantly changing environments (tides, currents, storms, reefs). The "dialectics of outside and inside" (Bachelard 1964:211) differentiated between the small English world onboard ship and the expansive, natural world of the surrounding Atlantic. Those individuals living within the created space of a wind-powered ship relied on the natural world to help them attain their goal of disembarking safely. During the age of sail, a ship progressed at the whim of the winds, combined with the creativity and skill of its crew. The English Atlantic World was thus the product of the dialectics between human ingenuity

and nature. Without the urge for mobility – for whatever reason – and the material culture to realize the goal of migration, English colonization in the Americas would have been impossible.

During the seventeenth century, English men and women – surrounded by water and near navigable rivers and estuaries – were familiar with three kinds of water vessels: small boats for short-distance travel (rowed or with one mast), larger vessels for inland and medium-distance trade (often masted), and large oceangoing ships (large and usually multi-masted). Boat- and ship-builders constructed vessels for functional uses, and as the seventeenth century progressed, ships and shipping grew in importance. The English interest in the Atlantic World played a significant role in the intensification of English shipping and the development of more efficient ship technologies. The late sixteenth and early seventeenth centuries were eras of "the widening of horizons," and from 1629 to 1686 the growth in English merchant shipping increased by 195.7 percent (Davis 1962:15).

Boats and Small Ships

Boats are small constructions designed to move people and goods across and along lakes and rivers. They can also be used to travel short distances on larger bodies of water. All the elements of their construction from keel to gunwales are individual artifacts designed to mesh together into serviceable vessels. The large variation possible in small boat construction and the often-regional nature of their usage means that many boats had purely place-specific names.

English Boats

The number of local names for seventeenth-century English boats was prodigious because the nation had thousands of small crafts transporting "goods and passengers from one little port to another" (Wedgwood 1969:27). In his survey of Cornwall published early in the century, Richard Carew (1602:27) catalogued the boats common to that peninsula. His list includes cockboats ("a small ship's boat, esp. the small boat which is often towed behind a coasting vessel or ship going up or down river. Often used typically as the smallest or lightest of floating craft"; *OED*, ca. 1430), barges ("a flat-bottomed freight-boat, chiefly for canal- and river-navigation either with or without sails"; *OED*, ca. 1480), and lighters ("a boat or vessel, usually a flat-bottomed barge used in lightening or unloading … ships that cannot be discharged [unloaded] at a wharf, etc., and for transporting goods of any

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kind, usually in a habour"; *OED*, ca. 1487). People living in Cornwall and Devon used what Carew terms a "sayn-boat" to catch "Pilcherd," an ocean-dwelling fish smaller than a herring. Ten years later, James I's charter for the Worshipful Company of Shipwrights (1612:3–4), in addition to mentioning all "vessels whatsoever used for Navigation, fishing or transportation within our Realme of England," singled out "Carvels" (caravels), "Hoyes" ("a small vessel, usually rigged as a sloop, and employed in carrying passengers and goods, particularly in short distances on the sea-coast"; *OED*, ca. 1495), "Pinnaces" (also called "barks"; "a small light vessel, generally two-masted and schooner rigged; often in attendance on a larger vessels as a tender, scout, etc."; *OED*, ca. 1546), "Crayers," (a "small trading vessel formerly used"; *OED*, ca. 1400), "Ketches" ("a strongly-built two-masted vessel, usually from 100–250 tons burden"; *OED*, ca. 1481), lighters, boats, barges, and "Wherries" ("a light rowing-boat used chiefly on rivers to carry passengers and goods"; *OED*, ca. 1443).

The use of sailing vessels for trade with coastal English ports and with nearby nations grew in significance as the seventeenth century progressed. The seventeenth century was a time when much of England's fuel source shifted from wood to coal (see Chapter 2). London and other cities with developing industries required coal, a mineral widely viewed as constituting "the Mainspring of Modern Civilization" (Jevons 1865:vii). The industry required an expanding number of "Ships and Barkes" to transport the tons of coal needed to maintain and expand England's industrial production and fulfill its home heating needs. Much of the coal came from "Newcastle upon Tyne, Sunderland, and Blythe, and other places adjacent" (Anonymous 1616). The "energy revolution" experienced by the English saw domestic coal production increase from 177,000 tons (179,840 mT) in the 1560s to 2,200,000 tons (2,235,300 mT) in 1700 to 1709, a change of over 1,100 percent (Wrigley 2010:37).

Waterborne commerce with Ireland, France, and Flanders was extremely important in the development of seventeenth-century English commerce (Davis 1962:202). At the beginning of the century, however, several observers had expressed concern over how the poor condition and bad design of English boats hurt the nation's trade with Europe. Tobias Gentleman (1614:1), for instance, argued that English fishermen were not as successful as the "Hollanders" in the continental market because they lacked "Busses, Pinks, and Line-Boats" and "the right use of making of barreld fish." A buss was "a two-or three-masted vessel of various sizes used esp. in the Dutch herring-fishery," also often called a "fly-boat" (*OED*, ca. 1471), or *fluit* in Dutch. A pink was "a sailing vessel; originally one of small size used for

coasting and fishing, described as flat-bottomed and having bulging sides" (*OED*, ca. 1477), and a line-boat was "a boat used for line-fishing" (*OED*, ca. 1613). Gentleman (1614:34) observed that English fishermen returning from the "North-seas" went either "to London, Ipswich, Yermouth, Lin, Hull, or Scarbrough" where they sold their fish at good prices. Their lack of proper boats and their failure to barrel their catch, however, made it impossible for them to take their catch to France, "as doth the Hollanders." The hesitancy of English fishermen to package their fish in barrels was significant because the French would not purchase unpacked fish. Gentleman's remedy was that English fishermen should adopt both Dutch-style boats and their methods of barreling. The following year, J. R. (1809 [1615]:213, 215) agreed, arguing that England would be "dissolved" without better shipping to Europe. He observed that throughout Europe "the Hollanders do abound, and bring in more commodities by five times to us, than our own shipping." His solution to the problem was to build more boats able to carry English goods to the Continent. In addition to uplifting English commerce, a dedication to more boat building would benefit the needs of working people: "A number of carpenters and shipwrights shall be set to work, coopers busied, numbers of people making lines, ropes, cables, dressers of hemp, spinners of thread, makers of nets, bred [sic]; many salt-houses set up, besides what store of poor people, all along on the sea-coasts, which are now very poor and idle in England and Wales, to be used in splitting of fish, washing of fish, packing, salting, carrying, and re-carrying of fish" (J. R. 1809 [1615]:229). By copying their economic rival, the Dutch, the English fishing class could benefit themselves, the unemployed, and English commerce in general.

After reading the tracts of both Gentleman (1614) and J. R. (1809 [1615]), E. S. (1615) wrote a pamphlet focused on the Dutch buss and considered whether England should establish its own fleet. He (or she) provided a detailed account of the needs and costs of a buss with a 50.0-ft (15.2-m) keel, weighing 70.0 tons (71.1 mT), with a crew of sixteen "Men and Boyes." The author's detailed list offers insight into the conditions of life on the typical buss. Each sailor, for sixteen weeks of herring fishing, would require as provisions: a gallon (3.8 l) of beer, a pound (0.5 kg) of biscuit, one half-pint (0.2 l) of oatmeal or "Peaze," two pounds (0.9 kg) of bacon, as much fresh fish "as they can eate," a quarter-pound (0.1 kg) of butter, a half-pound (0.2 kg) of "Holland Cheese," and three pints (1.4 l) of vinegar (E. S. 1615:15–16). This allotment was extremely generous because "I am informed that the Dutch Busses have not halfe so much allowance of Victualles: But take almost al [sic] theirs out of the Sea." In addition to the ship's material

culture (nets, cables, ropes, anchors), E. S. (1615:8) also provides a list of the utensils needed in the "Stewards store": two short iron "pothangers," two pair pot hooks, "a large Iron peaze pot," a large copper pot, one or two wooden scummers (shallow ladles or sieves for removing scum from the top of liquids), a gridiron, a frying pan, two or three pipkins, an iron chafing dish, a small fire shovel, a pair of tongs, and a pair of bellows. Also required were two trays, two trugs (shallow trays), twelve wooden platters, twenty-four wooden "Pottagers," four dozen trenchers, six baskets for bread, twelve "Beere-cans bigger and lesser," four or five taps and faucets, a pair of wooden "Butter-scales," a series of lead weights, two tinder boxes, candles, candlesticks, and "A Candlebox with locke and key." For weapons, E. S. (1615:9) recommends ten "Halfe pikes," muskets "with Bandaleers, Rests, and Molds," gunpowder, and "leaden bullets." Few boat carpenters must have followed his recommendations because the author reissued the pamphlet with a new title fifteen years later (E. S. 1630).

The concern three seventeenth-century authors expressed about the deficiencies of English fishing when compared to the Dutch industry was warranted. In the sixteenth century, a single Dutch buss was able to carry home as much as 200 tons (203.2 mT) of herring. In addition, Dutch boat builders had made important technological progress by developing the "bun," a saltwater chamber that lengthened the freshness of cod while at sea (Hope 1990:168–169). This invention allowed them to carry fresher fish to European markets and gained them a significant commercial advantage over English boats without the bun.

English settlers in the Atlantic World did not rely strictly on vessels that could cross the Atlantic. They often established their own boatworks to construct small ships. Settlers on the Sagadahoc (Kennebec) River in today's State of Maine built and launched a small decked, single-masted pinnace in 1608 (Ives 1984: 51). The shipwright with the colony, a man named Digby "of London," designed the 30-ton ship. This ship could sail between English America and England (DeCosta 1880:90). The colonists at Sagadahoc also had a shallop able to hold at least twenty-three people. They planned to use this craft to carry goods upriver to trade with indigenous peoples, but the ship was often waylaid by contrary winds (Strachey 1849:174). A shallop was the standard vessel for moving people and things short distances because they were small, easily beached, and could be constructed with one or two masts (Ives 1984:192).

Another small ship built in the English Atlantic was the Caribbean sloop. Sloops constructed in Bermuda and Jamaica were English colonial adaptations to the realities of seventeenth-century island life (Evans

2007:84; Jarvis 2002:594). Builders made them with graceful lines, one or two masts, and rigging designed for the high speeds necessary for outpacing pirates and privateers. The ships also had adequate cargo space and could maintain high speeds even when fully loaded. A Dutch marine carpenter shipwrecked in Bermuda in 1619 may have invented the Bermuda sloop (Jarvis 2010:126). Bermuda shipbuilders, after having critiqued Dutch ships stopping at the island, may have added beneficial modifications to the sloop's design. They also may have reversed-engineered ships that wrecked on the island (Jarvis 1995:40). An example of a vessel shipwrecked at Bermuda was the Portuguese-owned, 300-ton *San Antonio*. It wrecked in 1621, bringing with it a group of Spanish and Portuguese men, women, and children (Macmillan 2010). Their possible influences on the design means that the Caribbean sloop was a multicultural product incorporating aspects of English, colonial, Spanish, Portuguese, Dutch, and French elements, as its form evolved over time (Jarvis 2010:215; Watts 2014:126–127). The sloop provided an excellent mediator between the natural environment and the human desire to travel and trade throughout the Atlantic.

English ship carpenters generally constructed their ocean-going ships with oak, but Caribbean sloop builders used cedar. Caribbean cedar grew quickly and tall (averaging 30.0–50.0 ft [9.1–15.2 m]), was resistant to rot, and could be used while still green (Evans 2007:89). Caribbean sloops were the product of knowledge passed down from master to apprentice, father to son, and owner to enslaved (Jarvis 2010:143). The ship's vernacular origin meant that reliable records from the seventeenth century are sparse. Research suggests, however, that Jamaica sloops had keel lengths of 40.0 to 50.0 ft (12.2–15.2 m) with drafts of 5.0 to 9.0 ft (1.5–2.7 m) (Evans 2007:91)

Caribbean sloops grew in popularity during the late seventeenth century. In 1687, Bermuda's merchant fleet contained eighteen sloops, but in 1716 the fleet had grown to ninety-two, an increase of 411.1 percent (Jarvis 1995:45). In many cases, slaveowners assigned their enslaved laborers to ship duty, so that by the last half of the seventeenth century, enslaved sailors served on many of the sloops transporting goods from port to port (Jarvis 2002). By 1700, Caribbean sloops constituted a significant mode of transportation throughout the Atlantic.

Indigenous Boats

As sailors from England and other European nations traveled into the Atlantic World they learned that they were not the only boat builders in the region. Indigenous peoples living on or near watercourses also often

built vessels they could use for travel and trade. The precise composition and design of indigenous watercraft varied widely depending upon cultural tradition, local environment, and the size and nature of the watercourses to be traversed. In all cases, knowledge about boat construction was vernacular. Accomplished boat builders passed on the methods of construction to younger builders, sometimes having made their own subtle modifications of traditional designs. Indigenous peoples in the Atlantic World generally made two types of boats: dugouts and framed canoes.

Many cultures made dugout canoes. Archaeological evidence indicates that the knowledge of creating a water-worthy boat from a large log extended into deep history. Upon their entry into the Americas, Spanish explorers noted that the Mayas carried on trade and traveled via canoes for at least a millennium before any European had ever set foot on the continent (McKillop 2005:5630). An example of a dugout canoe found in Arkansas has been carbon-dated to 1310/1360 to 1380/1450 CE (Boles 2010:204). The builders had fashioned the canoe from a bald cypress log with 110 growth rings. The vessel measured 6.6 m (21.8 ft) long and 33.0 cm (13.0 in) deep. Archaeologists throughout the Americas have discovered numerous examples of canoes of this type (see, e.g., Hothem 1978). At Newmans Lake, Florida, for example, archaeologists discovered ninety-five whole, nearly whole, or fragmentary dugout canoes (Wheeler et al. 2003). A thorough examination of fifty-three of them revealed that their makers had used fire to hollow out coniferous logs. The canoes' length ranged from 5.6 m (18.4 ft) to 7.7 m (25.3 ft). Radiocarbon dating revealed that forty-one of the canoes dated to 2,300 to 5,000 years before present; the remaining thirteen dated to 500 to 1,300 years before present. On the other side of the Atlantic, seventeenth-century West Africans were also adept at making and using canoes for both sea and riverine excursions. As was true in the Americas, the techniques they used to construct dugouts were hundreds of years old when the first Europeans made contact (Smith 1970:519).

Seventeenth-century observers often noted the indigenous use of dugout canoes. In the 1680s, the Sieur Raveneau de Lussan (1698:177) expressed amazement at the prowess of the Miskitos in their "little Boats" at Gracias a Dios, in today's Nicaragua. Using canoes, seventeenth-century Miskitos had created an extensive trading network that extended well into the twentieth century (McSweeney 2004). English travelers and settlers in the western Caribbean, at settlements like Providence Island, were intimately familiar with the Miskitos and their watercraft (see Kupperman 1993). In the late seventeenth century, English slaver Thomas Phillips (1969 [1732]:405) mentioned purchasing "five hand or seven hand canoes" on the

Gold Coast. The English sailors found that at sea the canoes plunged "very deep" into the water and, while the people of the Gold Coast were comfortable with them, Phillips and his crew thought the vessels needed repairs to be safe. They decided to "strengthen them with knees and weather-boards fore and aft to keep the sea out." An image of "Negro's Canoes" in Barbot's late seventeenth- to early eighteenth-century journal depicts a long canoe at the Gold Coast. Eight people are onboard and room exists for three more. Both the bow and the stern have long pointed extensions (see Rediker 2007:after 210).

Several indigenous cultures living in the deciduous forests of North America made canoes with individual wooden ribs and bark covering rather than from whole logs. Throughout the seventeenth century, French, Dutch, and English visitors observed the manufacture and use of these canoes. A culture's use of a particular kind of bark for their canoes could vary, with birch being common in many regions (Innis 1962:13–14; Kinietz 1965:49–50). In 1605, George Waymouth noted how the "savages" in coastal Virginia made canoes "of the barke of Beech, strengthned [sic] within with ribbes and hoopes of wood, in so good fashion and with such excellent ingenious art, as our men that had beene often in the Indies, said they farre exceeded any that ever they had seene." He further stated that the indigenous people used the canoes to "fetch Furres and Skins" (Purchas 1625:1661).

Indigenous water vessels were essential pieces of material culture to the peoples who relied upon them for transportation, and their designs and methods of construction were well adapted to their environments. Being made of local materials and based on vernacular knowledge, boat builders could construct new vessels as required.

Large Ships

Seventeenth-century peoples living along watercourses, on islands, and on the edges of the Atlantic Ocean made and used a variety of boats in their daily lives. They employed them to transport goods and people, and adopted various methods of construction rooted in combinations of traditional, mostly orally transmitted knowledge, and ideas gained from observing unfamiliar boats and small ships. The construction of the seventeenth-century's largest ships, those capable of traveling long distances for considerable periods, however, required considerable formal training and practical experience.

Large ships could withstand the battering of the open seas, traverse great distances, transport large groups of people, and serve in military actions. The largest and most well-built were the pride of English shipbuilding.

In 1615, J. R. (1809 [1615]:212) succinctly summarized the importance of English ships: "they are our weapons, they are our ornaments, they are our strength, they are our pleasures, they are our defence, they are our profit." A few years earlier, Robert Johnson (1609:4) had referred to England's large ships as "the Jewels of our land." One hundred and sixty-nine years later, Thomas Gordon (1784:23) echoed these sentiments in his *Principles of Naval Architecture*: "As a ship is undoubtedly the noblest, and one of the most useful machines that ever was invented, every attempt to improve it becomes a matter of importance, and merits the consideration of mankind." As a caveat, he added that despite many attempts to refine ship design, English shipbuilding "has not yet arrived at perfection."

Gordon's hesitation to anoint British shipbuilding as the pinnacle of the art form demonstrates that even some people in the late eighteenth century believed that the nation's shipbuilding ability was not equal to its national pride. It perhaps comes as no surprise that seventeenth-century shipwrights had wrestled with creating the best and most economical ships possible. In looking to the Dutch buss for inspiration, they demonstrated their interest in constructing larger, faster, and more spacious ships. But ship construction presented numerous challenges not faced by the builders of small vernacular boats and ships designed for short journeys and limited numbers of passengers. The English people demanded much more from their large ships.

The charter of the Worshipful Company of Shipwrights (1612:3) makes it abundantly clear that constructing a seaworthy ship was a skilled trade, not a vernacular craft. The Company describes their work as "the Art, trade, skill or misterie of building, making, trimming, dressing, graving, launcing [sic], winding, drawing, stocking or repairing." Like any seventeenth-century guild, the learned shipwrights were intent on protecting their livelihoods by restricting their membership only to those whom they deemed to have the knowledge and skills worthy of inclusion. The Company argued that the charter was necessary because without it they had no way to "reforme, prevent, order and correct [the] many contempts, misdemeanors, deceits, and offences in the said art or misterie" committed by the "stubborne, obstinate, and disobedient persons" who built poor-quality ships. They bolstered their case by noting that poor shipbuilding was responsible for the unnecessary loss of life and the destruction of goods, both of which did great harm to the prosperity of the nation. Their concern was well founded. During the sixteenth and early seventeenth centuries, boat builders, often relying on vernacular knowledge, built and repaired small boats on England's beaches. In many cases, and to the consternation of local authorities,

they often excavated unauthorized dry-dock basins to aid their efforts (Scammell 1999:29). Poorly constructed boats posed obvious hazards. For example, Samuel Purchas (1625:1645) reported that on July 25, 1585, when Walter Raleigh "tooke a Spanish Ship of three hundred tunne richly Laden," he boarded her "with a Boate made of the boards of Chests." As soon as Raleigh was onboard, the boat "fell in sunder and sunke at the Ships side." This tale sounds apocryphal, but perhaps real enough to capture Purchas' attention as an object lesson.

In spite of the indeterminate, albeit likely sizeable, number of boat builders practicing the craft in seventeenth-century England, the Shipwrights' charter identified only twenty individuals in the guild: a lone master shipwright, his three wardens or deputies, and sixteen assistants. Guild membership was a serious matter in seventeenth-century England, and a significant amount of social capital was attached to it (Pooley 1947). Membership in the company was also a mark of substantial cultural capital deriving from having acquired the expert knowledge of ship design and construction.

Seventeenth-century shipwrights built ships for two general purposes: merchant ships for the transportation of goods, and warships for the navy and the army. Other ships could be fitted out for piracy or the transportation of enslaved individuals. The distinction between merchant and military service was not rigid because any ship could be repurposed. For instance, a list of ships in the "Navy Royall" published in 1645 enumerated thirty-two ships belonging to the king and twenty-five "Merchants Ships" requisitioned for duty (Anonymous 1645). A list published the following year included forty-four "Shipps and Friggotts" in the "Navy Royall" and twenty "Merchants Ships." An additional thirty-three ships were listed as "Merchant Ships ordered to be graved [cleaned and covered with tar] and fitted for Sea, for the better defence of the Kingdome upon any emergent occasion" (Anonymous 1646a). Throughout its history, the English navy either hired or requisitioned mercantile ships for military service. In such instances, the sailors and captain stayed on the ship but the navy placed an officer in command over them. The number of merchant ships swelled as the territory influenced by England grew, particularly because of expeditions to West Africa and into the Atlantic (Winfield 2009:260–279).

Merchant Ships

The construction of early seventeenth-century English ships could vary because shipwrights at the time struggled to identify and codify the best

designs. Two ships famous in Atlantic history, the *Susan Constant* and the *Sea Venture*, provide useful examples of ship design early in the century.

The Virginia Company leased the ship *Susan Constant* from the London firm of Colthurst, Dapper, and Wheatley. The Colthurst family was involved in shipping and the Wheatleys dealt in the sale of masts and timber (Lavery 1988:7; Spectre and Larkin 1992:8). The ship was about one year old when the shipwrights launched it in the Thames in December 1606 bound for Virginia with the Jamestown settlers. The ship, with seventy-one people on board, was accompanied by *Godspeed*, with fifty-two passengers, and *Discovery*, with twenty-one passengers (Purchas 1625:1705n). Captain Christopher Newport, the admiral of the expedition, had command of the ship because it was the largest in the expedition at 120 tons (Cook 1937:229; Grizzard and Smith 2007:216). Both before and after the voyage to Virginia, *Susan Constant* saw service as a merchant vessel traveling between England and the European Continent (Lavery 1988:7).

Little concrete information exists about the dimensions of *Susan Constant*, but the common formulae for seventeenth-century merchant ships indicates that it probably had a keel of about 55.2 ft (16.8 m), was approximately 22.8 ft (6.9 m) wide, and contained a hold about 9.5 ft (2.9 m) deep. Like most ships of the era, *Susan Constant* would have had three decks: two upper decks front and aft, and a lower deck amidships. The distance between the upper and lower decks was probably around 5.3 to 6.0 ft (1.6–1.8 m). It would have had a bowsprit and three masts: a mizzenmast in the rear, a mainmast in the center, and a foremast near the bow. The shipwrights would have attached the mizzenmast to the base of the rear upper deck, while anchoring the mainmast on the upper side of the keel at the middle of the ship, and the foremast on the upward-sloping, inside front edge of the bow. Given that it had seventy-one passengers and perhaps twelve to fourteen crew members, *Susan Constant* would have needed eighty-three to eighty-five beds. The beds for the common passengers may have been simple straw mattresses, but the wealthier passengers may have been offered better sleeping arrangements, possibly even in cabins. Temporary cabins onboard could have been made of boards or even canvas suspended from iron hooks. The ship's captain and the officers would have had designated places within permanent cabins. Conditions onboard would have been cramped but bearable by seventeenth-century standards. A cook room with a brick furnace was likely positioned behind the foremast on the upper deck beam. This room would have been furnished with a large kettle hanging by an ess hook. Information about the ship's guns is not extant, but documented examples of similar-sized ships from the early

seventeenth century usually carried four to six minions and two to four falcons, or faucons. Minions were small cannon weighing 800 to 1000 lbs (362.9 kg), measuring 8.0 ft (2.4 m), and firing 3.0-in (7.6-cm) shot. Falcons weighed 750 lbs (340.2 kg), were 7.0 ft (2.1 m) long, and fired 2.5-in (6.4-cm) shot (Anonymous 1672b:4). These light cannon would have provided some defense against enemies approaching by sea. The accounts of the Jamestown settlers indicate that they had demi-culverins on shore, so these probably also came from *Susan Constant* (see, e.g., Haile 1998:167, 240, 430). Such guns weighed 4,000 lbs (1,814 kg), were 10.0 to 12.0 ft (3.0–3.7 m) long, and fired 4.5-in (11.4-cm) shot (Anonymous 1672b:4). Being larger and considerably heavier than either minions or falcons, the demi-culverins were probably carried as ballast in the ship's hold rather than set upon carriages for use at sea. The ship's gunports could have been positioned anywhere because shipwrights did not use standard locations at the time. (The innovation of cutting gunports through the ships' hulls had begun in the sixteenth century. Before this time, cannon were typically sighted over the gunwales; see Cipolla 1965:81–82.) In any case, *Susan Constant*'s carpenters would have had to adjust the size of the ports to fit between the ship's timbers. Calculations suggest that the gunports on *Susan Constant* would have been about 14.0 ft (4.3 m) apart (Lavery 1988).

A second merchant ship also associated with the early years of the Jamestown settlement was *Sea Venture* (often called *Sea Adventure*; Robinson and Goodison 1936:515). *Sea Venture* was one of nine ships sent out of England in 1609 to Jamestown as the third supply to the struggling colony (Doherty 2007; Glover and Smith 2008; Woodward 2009). Christopher Newport, the former captain of *Susan Constant*, was in command of the ship, and onboard was Sir George Somers, the admiral of the fleet. The ships carried 500 to 600 people, and during the crossing many of the passengers became deathly ill with yellow fever (Brown 1898:92). Passengers and seamen also frequently faced the plague because of the presence of black rats onboard most ships (Fury 2012b:211). After six weeks at sea and on the approach to Bermuda, a terrific storm hit the fleet and *Sea Venture* sprang "a leake and so maine a one as that she had nine foot [2.7 m] depth of water in her hold" (Lefroy 1882:11). According to passenger Silvester Jourdain, the crew tried valiantly to pump out the water for three straight days and nights, but they grew exhausted and gave up (Wright 1964:105). Somers, who had stayed with the ship, ran it aground between two reefs (Wingood 1982:333). Literary scholars have long considered the storm to have been Shakespeare's model for *The Tempest* (e.g., Henry 1894:58; Wright 1964:ix–xi).

In 1958, an amateur diver discovered what he believed to be the wreck of *Sea Venture* lying between two reefs in about 9.1 m (29.8 ft) of water (Watts 2014:100). The wreck was situated at the far northern tip of Bermuda, just off St. George's Island (Wingood 1982:333–334). *Sea Venture* was a "shipp of three hundred tunnes" (Lefroy 1882:11), and when found, part of the hull remained on the sea floor as a series of heavy timbers overlain by flint ballast stones, sand, and mud. About 15.5 m (52.0 ft) of the keel remained along with eighteen floor timbers. In design, *Sea Venture* probably represented a combination of shipbuilding techniques sometimes referred to as an "Elizabethan Galleon" (Adams 1985:297). Ships of this nature were general-purpose vessels that blurred the line between ships intended for trade and those designed for war. They were fast and maneuverable enough for warfare but somewhat uneconomical for trade in bulk items. Their limited cargo space was the main reason English writers promoted the construction of ships more like the Dutch buss (fly-boat or *fluit*). Contemporaries concerned with expanding English commerce believed that vessels with greater carrying capacities were needed if England was to become the leader of the world's international economy.

The extant physical evidence from the wreck site indicates the nature of *Sea Venture*'s armaments. Divers discovered an iron cannon 7.6 ft (2.3 m) long with a 3.3-in (8.4-cm) bore and a shot diameter of 3.0 in (7.6 cm). Divers originally identified the gun as a saker, but more recent analysis correctly identifies it as a minion (Wingood 1982:334). Compared to a minion, a saker was longer, heavier, and fired larger shot (Anonymous 1672b:4). Among the debris found at the wreck site were shot for demi-culverins, sakers, minions, and falconets. A falconet was a small cannon 7.0 ft (2.1 m) long, weighing 400 lb (181.4 kg), and firing 2.0-in (5.1-cm) shot (Anonymous 1672b:4). As was true of *Susan Constant*, the large cannon found with *Sea Venture* was probably carried as ballast along with the shot. The settlers' intention was probably to employ the larger cannon on land.

Other seventeenth-century English ships discovered in the waters around Bermuda include *Virginia Merchant*, *Eagle*, and *Warwick*. Both *Virginia Merchant* and *Eagle* were ships sent to resupply Jamestown. Divers discovered the first ship on the south coast of the island and the second northeast of the island on the edge of the North Reef. *Warwick* was also a supply ship ultimately headed to Jamestown, though an important passenger was Governor Nathaniel Butler. The ship was wrecked while at anchor on the south side of Castle Harbour in 1619. Analysis of wood samples extracted from the ship's timbers indicates that the wood was harvested between

winter 1616 and summer 1617. This means that *Warwick*, though built sturdier than *Sea Venture*, was a new ship when lost (Watts 2014:96–108).

The discovery of shipwrecks in the waters around Bermuda provides information about the kinds of artifacts carried on early seventeenth-century English vessels transporting colonists into the Atlantic World. The discovered ceramic collection from the wrecks includes pieces of North Devon ware, delftware, German stoneware, and Chinese export porcelain. These were common wares familiar to seventeenth-century English men and women, and their presence on these transports is unsurprising (see Chapter 7). They demonstrate the settlers' desire to surround themselves with familiar items, even in the unfamiliar natural environments of their destinations. Personal items carried onboard *Sea Venture* included pewter spoons, pieces of white clay tobacco pipes, the basket hilt of a broad sword, a pewter candlestick, a pewter syringe, and a ball-shaped padlock. Four merchants' weights suggest the settlers' plan to transport English commercial practices to the New World. A 1.0-lb (0.4-kg) circular lead weight was marked with a crowned I (for James I) and a small sword of Saint Paul (the symbol of the City of London). Another weight found with the same markings weighed 0.25 lb (0.1 kg). A bronze apothecaries weight from a nested set weighed 1.0 oz (28.6 g). A square, brass coin weight, dating to the 1580s, measured 0.6 in (15.0 mm) in size. On the obverse it exhibits a hand within a wreath (symbolizing the City of Antwerp) and on the reverse a medieval ship. Other indicators of financial concern are two brass jettons or casting counters. Seventeenth-century individuals used these essentially worthless counters, which have the appearance of coins, to keep track of accounts. The specimens from *Sea Venture* are stamped "Hans Krauwinckel Nurnberg" and probably date 1580–1610 (Wingood 1986:156–158). Unique artifacts found on *Warwick* include a toy cannon, a wooden plain scale designed to allow a pilot to plot a ship's course on a navigational chart, a carved railing fragment, a stoppered gourd containing seeds, and pieces of Roman pottery, probably dredged from the Thames in the ballast matrix. *Warwick* also had lead merchants' weights identical to those found on *Sea Venture*.

Another important function of merchant ships, and increasingly so as the seventeenth century progressed, was to transport kidnapped Africans from their home continent to various locales throughout the Atlantic World. The *Plan and Sections of a Slave Ship*, published by James Phillips (Anonymous 1789), informs today's perceptions of the ships that took enslaved individuals across the Atlantic. This image portrays captured individuals onboard lying directly adjacent to one another. Bodies cover every available space on the

decks. Former captive Olaudah Equiano (1789:91) describes the inhuman practice of allotting each person the smallest possible space by noting that the ship was so crowded "that each [person] scarcely [had] room to turn himself" and that he and his fellow captives "almost suffocated" in the stifling environment. Calculations made using historical information for eighteenth-century British slave ships indicate that most captives probably had an average of about 0.5 m^2 (5.4 ft^2) available to them throughout the voyage (Garland and Klein 1985:244–246).

The development of enslavement as a major force within the capitalist project commenced with the development of the fully rigged, three-masted ship outfitted with a strong complement of cannon. The ships used to transport enslaved African captives were "essential to the rise of capitalism" (Rediker 2007:43), and without this technology England would have found its global position significantly weakened and perhaps even nonexistent. Despite their global significance, however, little concrete information exists about the seventeenth-century ships the English used to carry African captives across the Atlantic. The union between ship technology and the nation's increasing commitment to the capitalist project came together around 1650, timing that also coincides with English efforts to become deeply involved with the capture, transportation, and sale of African individuals (see Table 3.2). By the end of the seventeenth century, numerous English private entrepreneurs – individuals who had gained social and cultural capital through wealth – urged Parliament to end all monopolies on the slave trade to make room for their participation (Webster 2015:74).

Archaeologists have rarely found the remains of sunken slave ships. To date, only one confirmed seventeenth-century example has been discovered in the Atlantic. Many more undoubtedly remain to be located, but the tasks of identifying them and conducting expensive and often dangerous excavations, often at significant depths, limit their availability for study. *Henrietta Marie* is one seventeenth-century ship archaeologists have investigated.

Divers from a salvaging company first discovered *Henrietta Marie* in 1972 while searching for a Spanish treasure galleon off the Florida Keys. The recovery of the ship's bronze bell – emblazoned with the ship's name and "1699" – clearly identified the wreck. The ship appeared as a loose scatter of artifacts and ship's timbers spread over an area of 30.0 x 40.0 m (98.4 x 131.2 ft). The ship's date suggests that it represented the first generation of independent English slaving ships in the Atlantic after the Royal African Company lost its monopoly in 1698. The ship's activities ceased

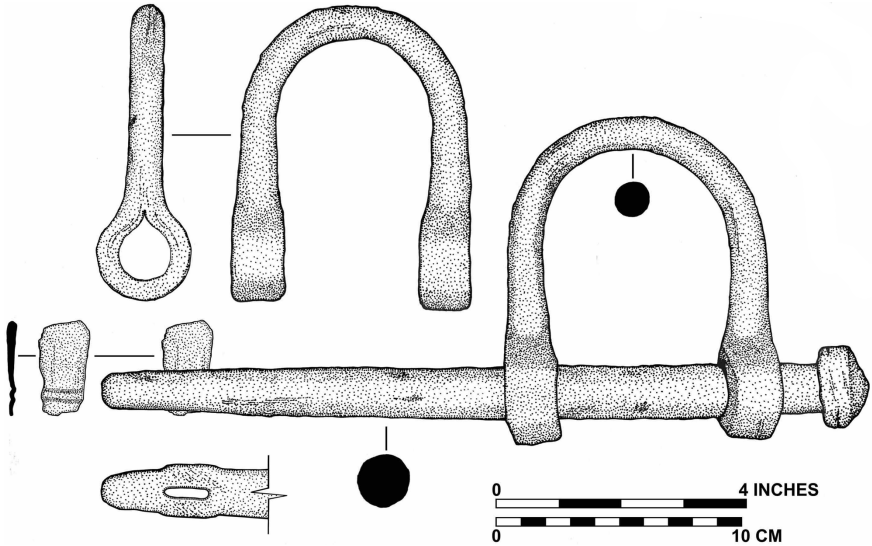

FIGURE 4.1 Iron bar-and-loop shackle from *Henrietta Marie* (drawing by David D. Moore, used with permission).

in 1700, when it sank in a storm apparently with no survivors (Moore and Malcom 2008:20–28).

The artifacts archaeologists recovered from *Henrietta Marie* represent the material culture carried on late seventeenth-century English slaving ships. The excavated collection includes iron shackles of the bar-and-two-loop variety (Figure 4.1), specimens of ivory elephant tusks, which the English called "Teeth" (Anonymous 1665), over 11,000 glass trade beads, a pewter flagon with a screw top, two pewter tankards, pewter bottles, and over 130 pewter spoons and spoon fragments (some decorated with designs and initials). Also included in the ship's cargo were twenty-eight iron bars, termed "voyage iron," and two lidded copper kettles. The smaller of the two, with two interior chambers, two openings in the top, and loop handles, held about 62.5 l (16.5 gal) of liquid (Figure 4.2). The larger specimen, with one chamber and one opening, held approximately 321.7 l (84.9 gal) of liquid (Figure 4.3). The crew used both vessels for feeding themselves and their captives (Moore and Malcom 2008:28–36.)

The horrors of capture, enslavement, and shipment would understandably lead one to conclude that the African men, women, and children caught within the slave system would have been able to take little if any material culture with them across the Atlantic. This image is essentially

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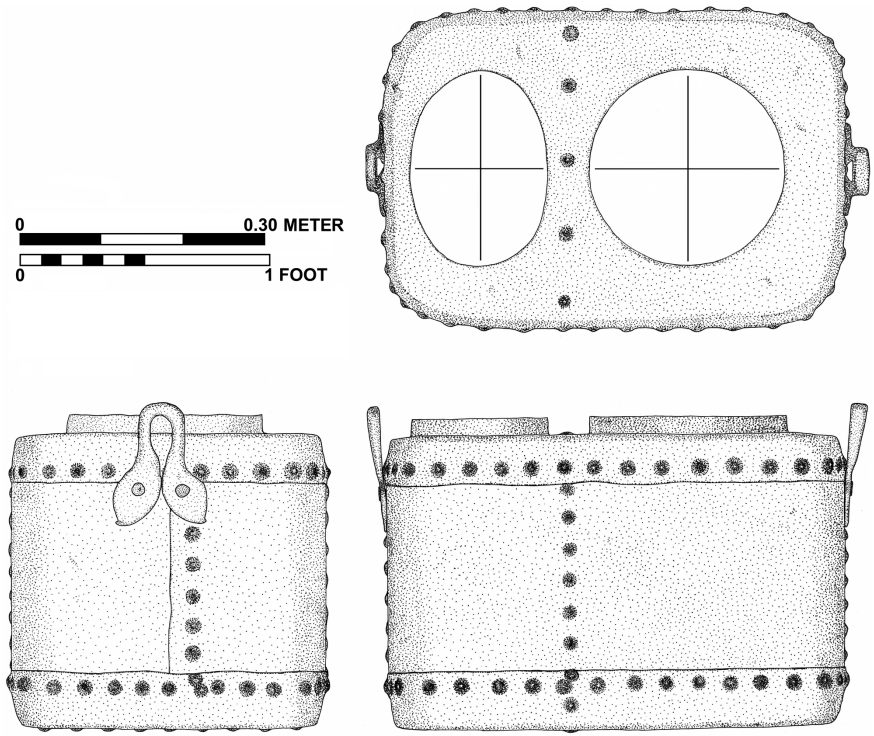

FIGURE 4.2 Double-opening, lidded copper kettle from *Henrietta Marie* (drawing by David D. Moore, used with permission).

true, but combined historical and archaeological research suggests that enslaved individuals could transport a small number of objects across the ocean. The scant extant evidence indicates that among the many millions of trafficked Africans were some who had been able to carry a few glass beads, possibly a small piece of metal or bone jewelry, and maybe an occasional smoking pipe. In general, however, "as a group, enslaved Africans brought virtually no material goods with them, and for all intents and purposes arrived empty-handed in the New World" (Handler 2009:12). The ingenuity of captives to adapt and create a new material culture is thus most evident in their New World habitations rather than onboard the fetid holds of slave ships.

Merchant ships were not the only large vessels found at seventeenth-century English ports. England relied on a fleet of heavy military ships for national protection and as guarantors of security at home and abroad. Ships designed for combat at sea required modifications not necessarily

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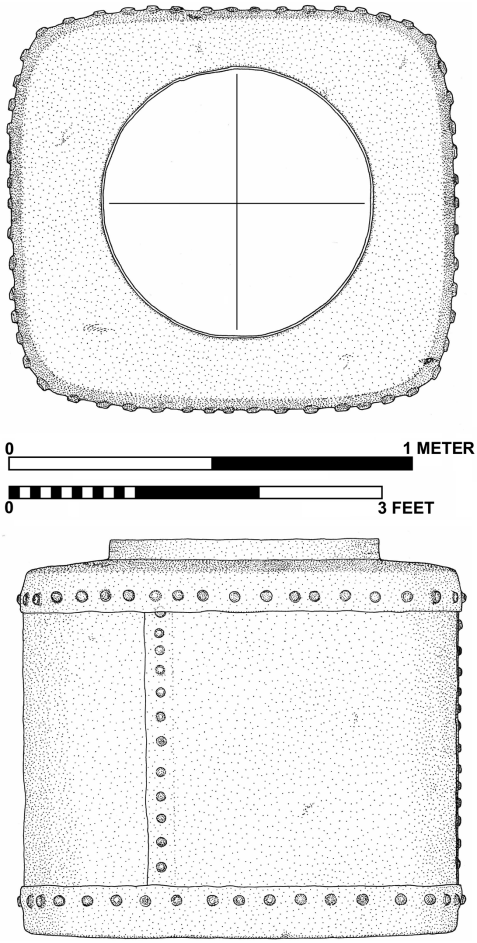

FIGURE 4.3 Single-opening, lidded copper kettle from *Henrietta Marie* (drawing by David D. Moore, used with permission).

required on merchant ships. Merchant ships needed space for inanimate cargo and captive human beings, whereas military ships required strength, armaments, and maneuverability.

Warships

The largest and most expensive ships to construct were warships. A catalog of the King's ships published in June 1627 provides an early-century overview of warship size by tonnage (Anonymous 1627). *Triumph*, at 921

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TABLE 4.1 *King's Ships in 1627*[a]

Size (tons)	Ships		Seamen		Landmen[b]	
	N	%	Range	Total	Range	Total
650–950	8	8.3	250–300	2,050	100	700
400–500	6	6.3	26–120	314	60–160	500
300–399	40	41.7	18–100	1,850	30–160	3,880
200–299	4	4.2	10–60	110	160–200	360
100–199	6	6.3	20–24	132	50	100
>100	32	33.3	8–45	514	50–200	1,450
	96	100.1		4,970		6,990

[a] The original published list undoubtedly contains some typographical errors.

[b] Soldiers. Their number is not always listed.

Source: Anonymous 1627

tons and 300 sailors, was the largest military vessel in the fleet, while *Fly*, at sixteen tons and twelve sailors, was the smallest. (*Fly* was thus smaller than a Caribbean sloop.) In the five squadrons listed in the broadside, ships of 300–399 tons with 18–100 seamen and those of less than 100 tons with 8–45 sailors predominated (Table 4.1). All the ships maintained a complement of "landmen," or solders, in addition to the ships' crews. The soldiers, though merely "landmen," were not idle while on board. By royal decree of October 3, 1625, the captain of a ship was required to ensure that soldiers knew "the names and places of the ropes that they may assist the sailors in their labours upon the decks, though they cannot go up to the tops and yards" (Corbett 1905:56). The Crown also commanded that the captain not interfere with the punishment of soldiers, but leave that to their commanding officer.

Discipline was a serious issue on seventeenth-century warships because most explosions onboard occurred because of the sloppy handling of powder. A renowned example was the destruction of *London* in 1656 when thirteen tons of gunpowder blew the ship out of the Thames. At least 300 seamen were drowned (Fox 2012:57). Samuel Pepys memorialized the tragedy in his diary: "She lies sunk, with her round-house above water. Sir J. Lawson hath a great loss in this, of so many good chosen men, and many relations among them" (Latham and Matthews 1972:52). He did note, however, that twenty-five people had been saved.

Extending back in time at least to the Elizabethan era, England's maritime community was composed of two general social categories

representing a double duality. The first duality, the topmost prestige group, was composed of skilled craftsmen. This maritime elite – pilots, masters, and officers – usually had obtained their naval knowledge through formal training and experience. The second social group included regular seamen. These were individuals who had generally learned the craft of seafaring without the benefit of indenture or apprenticeship (Fury 2012a:118). A second duality included recruits who had found naval service appealing and unwilling sailors who had been pressed into service. Many sailors were "masterless men," vagabonds, traveling actors, peddlers, and tramps (Hill 1991:49). The social groups crosscut one another in that common sailors could be either recruited or pressed. Both dualities, however, were hierarchical. Officers had more authority and better conditions onboard than sailors, and enlisted sailors often received better rations and clothing than pressed sailors (Hope 1990:184).

Common seamen could be a rough lot, and ensuring that the navy found the best seamen was a constant challenge as many men did not wish to face the travails of life at sea. Identifying the problem, James I (1624), near the end of his reign, issued a proclamation stating "That no Mariner, or Seafaring man, should absent, hide, or withdraw himselfe from Our service." The law would treat anyone caught trying to evade naval service "as malefactors in a very high degree." James did not simply place the onus on common sailors, however. He added that any "Owner or Master of any Ship, or vessell, nor any other, setting forth any vessels of Trade, Fishing, or otherwise" would face punishment and imprisonment if they hired sailors whom they knew had willfully avoided service to the state.

The problem of finding enough sailors for England's navy continued into the Interregnum. In 1652, the Parliament of the Commonwealth (1652) issued *An Act for Impresing* [sic] *of Seamen*, in which they gave the Commissioners of the Navy and their officers the right to "raise, levy and imprest" as many "Mariners, Sailers [sic], Watermen, Chyrurgions, Gunners, Ship-Carpenters, Cawkers, Coopers, Whoymen or Carmen" as they felt necessary to maintain the strength of the fleet. The government saw the effort to stock the nation's ships with sailors and auxiliaries as essential for a number of reasons, one of which being their knowledge that most European monarchs were distressed at the trial and execution of Charles I, one of their own. The new English rulers could not ascertain whether these unhappy monarchs would decide to attack their island for their own benefit or in the name of Charles II, who lived in exile (Capp 1989:3).

In the early years of James I's reign, the English navy introduced a rating system to classify its ships (Table 4.2). First-rate ships, the "Ships Royal,"

TABLE 4.2 *English Navy Warship Ranking System at the End of the Seventeenth Century*

Rate	Gun Decks				
	Length (feet)	Width (feet)	Tons	Men	Guns
First	159–174	44–50	1,313–1,882	706–800	96–110
Second	153–165	41–46	1,086–1,482	524–640	84–90
Third	142–188	37–42	871–1,262	389–476	64–80
Fourth	118–146	29–38	448–915	226–346	48–60
Fifth	100–120	24–31	259–542	45–190	26–44
Sixth	87–95	22–25	152–256	50–110	16–24

Source: Guillet de Saint-Georges 1705:341–342

were those with 400 men and above. These and the second-rate ships – those with 250- to 350-man crews, or the "Great Ships" – were the largest and most powerful ships in the navy. They were also the most conspicuous for projecting England's might to the world. A ship named *Sovereign of the Seas* is an exemplary model of the power, real and ideological, bestowed upon first-rated ships (Figure 4.4).

In 1634, Charles I visited the Woolwich dockyard and asked master shipwright Phineas Pett to build him a first-rate ship. Pett was the sole Master Shipwright mentioned in the Charter of the Worshipful Company of Shipwrights (1612). Pett gave the responsibility for the ship to his son Peter, who set about designing and overseeing the ship's construction.

Sovereign of the Seas was the first English warship to have three masts and three gun decks extending the full length of the vessel. It was also the first to have cannon positioned only on the broadsides rather than pointing only fore and aft. The ship held 600 men, 102 brass cannon on the broadsides, and smaller guns on the bow and stern. At the time, the cost of brass was about eight times higher than iron (Fox 2012:59). The ship's figurehead was a statue of King Edgar, King of England (959–975 CE) on horseback (Winfield 2009:5). *Sovereign of the Seas* saw service during the Interregnum, but with the restoration, Charles II renamed it *Royal Sovereign*.

Charles I commissioned playwright and actor Thomas Heywood to design the decorations for *Sovereign of the Seas*. In his published description of the ship, Heywood (1637:1) begins by observing, "Navigation is as ancient as the first great Deluge, and the Arke, which God Almight commaunded [sic] to be made, the first Vessell that was ever lifted upon

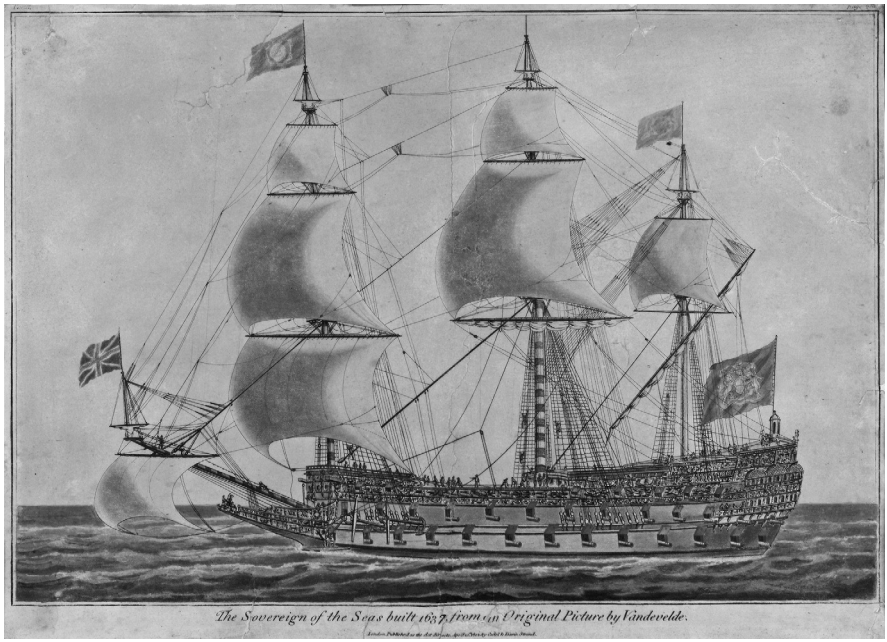

FIGURE 4.4 *Sovereign of the Seas*, after the original by Willem Van de Velde, the Elder (by permission of the National Maritime Museum, Greenwich, London).

the Waters." Thus, beginning with the Ark, Heywood provides his opinions about some of the world's greatest historical ships – many coming from his reading of the classics – finally ending with *Sovereign of the Seas*, which he considers the pinnacle of ship design. Obviously proud of the ship, Heywood describes its many decorations. Starting at the "beak-head," he asked readers "to take notice, that upon the stemme-head there is Cupid, or a Child resembling him, bestriding, and bridling a Lyon, which importeth that sufferance may curbe Insolence, and Innocence restraine violence; which alludeth to the great mercy of the King, whose Type is a proper Embleme of that great Majesty, whose Mercy is above all his Workes." He notes that on the stern is the inscription "He who Seas; Windes, and Navies doth protect, Great Charles, thy great Ship in her course direct" (Heywood 1637:44). Attempting to demonstrate his adulation of the ship's greatness, Heywood metaphorically intertwines the mystery of the ancient past with the Caroline present. In this manner, he can conflate ancient glories with seventeenth-century English grandeur. But the majesty of *Sovereign of the Seas* was also rooted in the massive physicality of the ship itself. Heywood (1637:44) notes, for instance, "that one peece of Timber which made the

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Kelson, was so great and weighty that 28 Oxen and 4 Horses with much difficulty drew it from the place where it grew." Heywood's joy over the ship is not simply self-directed, though he does view his association with the ship of great importance. At the end of the book he thanks the Master Builder, Peter Pett who, at twenty-five years of age "made the Model, and since hath perfected the worke." He also acknowledges Francis Shelton, the office master who looked after the workmen, and perhaps most importantly Gerard Christmas and his sons John and Mathias, the master carvers who brought his decorative visions to life in wood (Heywood 1637:47). The launch of the ship was a great occasion for the royal court, who all went to witness it. They were disappointed when the dockyard crew was unable to launch the ship because the tide did not rise the required amount. A considerably less-distinguished audience was the only witnesses when the tide finally rose enough for the crew to put the great ship in the water (Wedgwood 1969:180).

The navy ranked smaller ships beneath the ideologically rich first- and second-rated vessels. Third-rated ships, the "Middling Ships," carried 160 to 200 men, and fourth-rated ships, the "Small Ships," usually carried fewer than 160 men (Winfield 2009). After 1625, ships too lightly armed to withstand heavy combat but having two decks were rated fifth. Sixth-rated ships were like the fifth rank but with only one deck. The author of an early eighteenth-century *Gentleman's Dictionary* explained the navy's ranking system for warships (Guillet de Saint-Georges 1705:341–342) (Table 4.3). From sixth rank to first, the ships became longer, wider, heavier, and carried larger crews and more ordnance.

In addition to rated ships, several ancillary ships, such as fire ships and bomb ships, often accompanied fleets during times of war. Contemporary statistics, though perhaps flawed, provide a general overview of England's navy during the seventeenth century. Removing the support ships from the table indicates that of the remaining 605 ships, most were of the fourth rank (36.2 percent). Third-rated ships constituted the next-largest percentage (21.7 percent). Taken together, third- and fourth-rated ships composed fully 57.9 percent of the century's warships. Thus, while England's naval power might be symbolically represented most clearly by the impressively large, well-manned, and heavily gunned first- and second-rate ships, smaller ships with fewer men composed the bulk of the navy's might.

In his *Excellent Observations and Notes*, Walter Raleigh (1650:8) offers his view on the wisdom of using smaller rather than larger ships in combat. Regarding ship repair and redesign, he observes, "if any decayed Ship be intended to be new made, it is more fit and profitable to make her a size

TABLE 4.3 *Number of Ships in the English Navy by Rate, 1625–1688*

Rates	Years						
	1625	1653	1660	1672	1677	1688	Total
1	4	4	4	7	9	9	37
2	14	11	11	7	15	11	69
3	6	11	15	18	42	39	131
4	5	63	46	23	40	42	219
5[a]		35	37	13	12	2	99
6		9	22	5	8	6	50
other	4[b]	18[c]	11[d]	42[e]	15[f]	65[g]	155
Total	33	151	146	115	141	174	760

[a] The Royal Navy adopted the six-part rating system after 1625.

[b] pinnaces.

[c] fireships (4), storeships, "victuallers" (8), hulks (6)

[d] ketches (5), pinks (6).

[e] fireships (16), hospital ships (2), ketches or tenders (24).

[f] fireships (5), ketches (2), sloops (8).

[g] fireships (26), bomb vessels (3), ketches (3), smacks (5), yachts (14), hoys, unarmed (6), hulks, unarmed (8).

Sources: Anonymous 1672a; Winfield 2009:287–294

lesse then [sic] she was, then bigger." His reasoning is simple: large timbers can be cut down to fit a new ship but small timbers cannot be made larger. He continues, "we find by experience that the greatest ships are least serviceable." Ralegh bases his argument on experience, stating that a large Spanish ship of 1,200 tons can carry more ordnance than a ship of 600 tons, but "the lesser will turne her broad sides twice before the greater can wend once." Thus, more guns on larger ships is only a perceived advantage. Smaller ships actually can deliver more firepower against a larger, less mobile ship. Raleigh (1650:9–10) concludes by listing the six attributes necessary "in the building of all ships":

1. First, that she be strong built.
2. Secondly, that shee bee swift.
3. Thirdly, that she be stout sided.
4. Fourthly, that she carry out her Guns all weather.
5. Fifthly, that she hull and try well, which we call a good Sea-ship.
6. Sixthly, that shee stay well, when bourding [sic] and turning on a wind is required.

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Raleigh's observations about refitting ships were well considered because the English navy frequently redesigned old ships. For example, shipbuilders originally launched *Triumph* in 1562. Shipwrights repaired it between 1585 and 1586 at Woolwich, it was commissioned in 1588 and was under the command of Martin Frobisher when defending against the Spanish Armada. Carpenters rebuilt it again between 1595 and 1596 again at Woolwich, and the ship saw service until 1618, when it was retired (Winfield 2009:1–2).

The English navy began a period of upheaval with the commencement of the civil wars in August 1642. In October of that year, Robert Rich, Earl of Warwick – the one-time privateer, backer of colonial enterprises, and ardent Puritan (Capp 1989:15–16; Reeve 1989:81; Wedgwood 1969:29; also see Chapter 3), was named Vice Admiral of the Fleet. In December 1643, during the first civil war, the navy placed Warwick in command as Lord High Admiral. Charles I disapproved of his appointment because Warwick was a long-time opponent of the monarchy. The king asked Warwick to step aside for his appointee, Sir John Pennington (Elsynge 1642), but Warwick stayed in the post until April 1645, when he resigned. In March 1648, just before the commencement of the second civil war, Parliament again appointed Warwick as Lord High Admiral of the Fleet and gave him the authority to declare martial law "upon such Captains, Commanders, Officers, Mariners, Seamen, and Soldiers," including those not under his direct command (Elsynge 1648). Parliament canceled Warwick's appointment in February 1649 with the death of Charles I (Winfield 2009:xxii). Given the conflicts and controversies between the Royalists and the Parliamentarians, it comes as no surprise that Warwick was frequently called to defend himself against scandalous attacks, usually from staunch Royalist quarters (Anonymous 1646b; Rich 1648).

Despite Warwick's personal problems as head of the navy, a major crisis during the civil war era was the sailors' revolt in 1648 (Capp 1989:15–48; Ollard 2001:22–30). The complaints of the sailors covered a range of issues involving pay, taxes, arbitrary power, and monarchy. Despite such upheavals, the king's Navy Royal was reconstituted with the restoration of the monarchy in 1660. After this date, the navy always had a first-rate ship named in honor of the monarch (Winfield 2009:xiii). With the political situation in English ostensibly settled, English writers could once again express their pride in the Royal Navy. Thomas Fuller (1662:60–61) observed that the nation's ships were superior to those of Portugal, France, Spain, and the Netherlands. He also stated that English oak was the best in the world for shipbuilding, that English ships had the most "Advantagious [sic]

TABLE 4.4 *Rated Ships in the English Navy, 1672*

Rate	Men			Guns	
	Number	Range	Total	Range	Total
1	7	600–850	5,350	90–100	666
2	7	420–530	3,350	56–80	474
3	18	340–400	6,620	58–66	1,102
4	23	160–280	4,950	36–60	1,048
5	13	120–170	1,890	24–34	370
6	5	30–70	190	6–10	34
Total	73		22,350		3,694

Source: Anonymous 1672a

Weapons," and that the kingdom's sailors were the most skilled, most courageous, and best-fed of any in the world. By the second decade of the Restoration, the seventy-three rated ships in the English navy had combined crews of over 22,000 sailors and over 3,000 cannon (Table 4.4).

The numerical difference between the sailors in the navy in 1627 (see Table 4.1) and in 1672 amounts to a 349.7 percent increase. In 1692, the navy boasted 27,725 seamen and 4,500 cannon, an increase from 1672 of 24.0 percent for seamen and 21.8 percent for cannon (Anonymous 1692). These numbers slightly dropped the following year to 22,680 seamen and 3,498 cannon, decreases of -18.2 percent and -22.3 percent, respectively (Anonymous 1693). The compiler made both lists during the Third Anglo-French War, when the English navy joined forces with a much smaller contingent of Dutch warships.

One of the technological improvements made by English shipwrights in the 1670s was sheathing the king's ships with cast sheet lead. Within twenty years, however, much of this lead had severely corroded and the iron bolts holding the sheets in place were almost completely eaten away. To correct the problem, T. H. (1691) advised the navy to adopt milled lead sheathing because it was more durable than cast lead. Issues such as these were of deep concern to naval officials because of England's growing role in the world, including within the Atlantic. Ships that required less refitting would be more economical.

English warships increased in size as the seventeenth century wore on (see Tables 4.1 and 4.2). The English navy not only built more ships at the end of the century than at the beginning (see Table 4.3), but they built them larger. By the end of the century, the English navy would have viewed

Triumph, at 921 tons, as only a third-rate ship. Most of the ships used during the early seventeenth century would have ranked as fifth-rate or below in 1705. The growth in the size of warships related to the English desire to remain competitive in both trade and colonial enterprises. Refinements in the craft of shipbuilding expressed England's symbolic designs on the world as it morphed into Great Britain. As Thomas Digges (1680:6) noted years before the attack of the Spanish Armada, "I would have given you a List of the last thirty Ships, but that they are not all yet finished, but when they are, will make the most glorious Fleet in the World." Size, power, and glory were entwined in all English warships, but especially in the largest among them.

Diggs' mention of thirty ships was not an arbitrary number. In September 1652, during the Commonwealth era, the English Parliament raised over £584,978 "for the speedy building [of] Thirty Ships of War" (Anonymous 1682:64). Parliament required the treasurer of the navy to keep this money separate from the rest of the state's funds and to "pay it forth to no other use or intent but only for the building and Rigging of the said Thirty Ships." The treasurer, however, decided to lend £90,000 at 8 percent to the army, so only twenty ships were ordered, of which only ten were built. These ships were fourth-rate craft designed to carry forty guns on two decks (Winfield 2009:103).

Navigation

The development of more proficient shipbuilding techniques, the adoption of more seaworthy materials, and the knowledge of handling large sailing craft at sea were undeniably integral to the ability of seventeenth-century English men and women to move into, through, and about the Atlantic World. But ships alone were not enough. In addition to the skills for managing a large sailing vessel, mariners needed a significant amount of practical knowledge about the ocean itself. The Atlantic Ocean has its own flora, fauna, and microenvironments. English men and women for generations had exploited the ocean's sea life, perhaps most notably cod, herring, and oysters. These species sustained about half of England's seventeenth-century population (Wedgwood 1969:25–26). Residents on the coasts and islands were extremely familiar with the ocean's many seasonal changes, and many people knew how to read the signs of change using various traditional and sometimes pseudo-scientific means (see, e.g., Wright 1975). Most people relied on folk knowledge because the science of meteorology was in its infancy at the time (see Jankovič 2000). The ocean was a

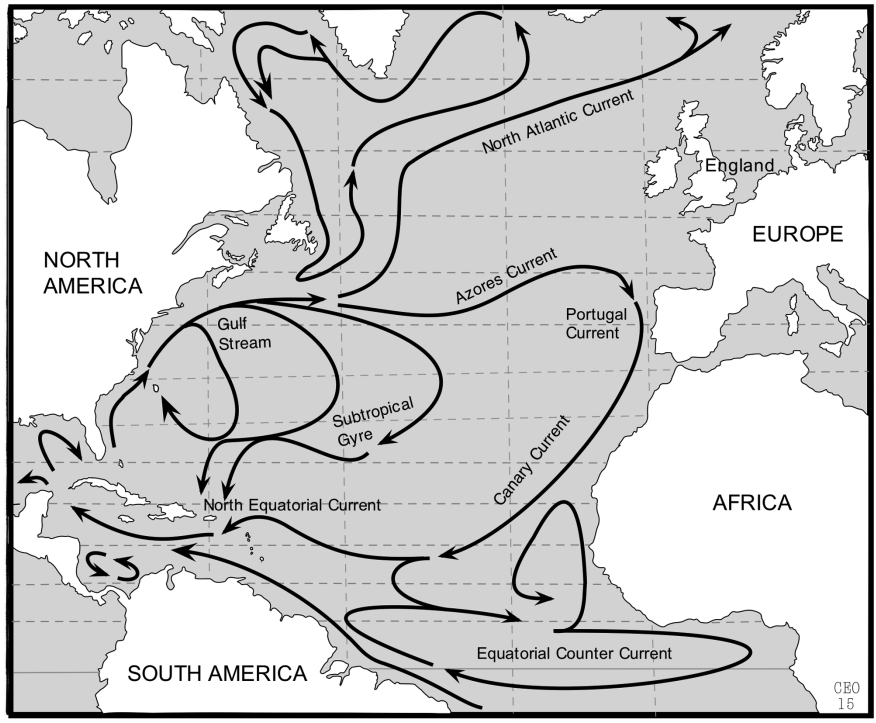

FIGURE 4.5 The main surface ocean currents in the northern Atlantic.

physical thing to be challenged and conquered, and mariners, to survive, had to understand, appreciate, and respect its power. The most significant forces English mariners would confront were the ocean's surface currents, its prevailing winds, and its often-severe storms.

The ocean's surface currents played a major role in the triangular trade developed between Europe, Africa, and the Americas. The Atlantic, like all the world's oceans, has powerful, major currents that provide the routes for sea travel. All seventeenth-century sailors regardless of nationality would have been aware of these currents because their lives and livelihoods depended upon it. English mariners sailing southwestward from the island into the Atlantic would have first encountered the Canary Current near the Iberian Peninsula's Portugal Current (Figure 4.5). From there they would have been swept east by the Equatorial Counter Current and thus straight into the West African coast. Here, they would have encountered seas that one mid-nineteenth-century scientist termed "a perfect jumble of heaped-up waters from the meeting of currents" (Toynbee 1866:342).

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Once sailors had unloaded the ship's trade goods and reloaded their cargoes – both inanimate and animate – the ship's captains would sail into the southern arm of the Equatorial Counter Current and head toward the Americas. From the waters of the Caribbean, captains could catch the Gulf Stream toward North America and head back to Europe via the Azores Current.

Scientific information about the world's sea currents was not widely available to seventeenth-century mariners. Even early nineteenth-century sailors often recorded information about the ocean's major currents by the discovery of floating bottles. As an example, James Rennell, a fellow in the Royal Society and former Surveyor-General of Bengal, reported: "*Gulf-stream to the Azores.* – A bottle from H. M. ship *Newcastle*, latitude 39°12' N., long. 63° 52', by Mr. James Napier, master, 20th June, 1819; – found on the shore of St. George one of the Azores, 20th May, 1820, in about 38°40' N. and 28° W." (Rennell 1832:347). These reports were not unusual and though crude by today's standards they helped sailors and scientists document the global movement of the ocean's greatest surface currents.

The route into the Atlantic World seems straightforward when recounting the major currents, but seventeenth-century mariners understood that this knowledge alone was not enough. They also had to be mindful of the winds that blew across the ocean's surface, and these could vary wildly from day to day, season to season. In January, the Horse Latitudes north of the equator may counter the ocean's northeast-running surface currents by blowing southeast. Any sailing ship heading south on the Canary Current would have to push against these winds to make headway. The Northeast Trade Winds would help a ship across the Atlantic along the Canary Current, but upon sailing north from Cuba, equatorial winds might push the ship south. Ships from the Mid-Atlantic region of North America would have been helped back to Europe with the strong Prevailing Westerlies that normally reached from the North American coast directly to Ireland and western England (see, e.g., Purdy 1812; Rennell 1832).

Mariners seldom found the ocean as straightforward as the above summary suggests. They had to confront an ever-shifting environment as they found it, and so they had to rely on their skills, their knowledge, the seaworthiness of their ships, and often luck. Early in the 1670s "a very skilfull [sic] navigator" told Ralph Bohun of the "variations he observ'd of the Trade Winds in his voyages to the West Indies":

> The Trade Winds have their Variations as well as others, though not so much: For betwixt the Tropiques, where wee are at the greatest certainty, they differ two or three points.

> Their most certain points are the NE. by N. and NE. by E. I have observ'd both outward, and homeward bound, that as wee came Northerly, so wee had the more Easterly Winds in the same Latitude: As for example, outward bound, in the Latitudes of 20, 21, 22, and 23, neere the Tropique of Cancer, and in the Longitudes of 52, 53, and 54 beginning the said Longitude at the Meridian of London; I say, there wee found the Winds at E.N.E. and E. by N. and E. and sometimes E. and by S. and E.S.E. so likewise homeward bound, sayling along the North side of Cuba, in the same Latitude above mention'd, neere the Tropique, wee found the Winds upon the same points as a foresaid, though there were 35 degrees of Longitude difference: but after wee have passed these Latitudes, and sayling neere the line, wee shall then find the Trade Winds to incline more towards the N.E. as is above declared (Bohun 1671:76–77).

Gilbert Burnet (1724:787) later recounted the difficulty Prince William of Orange's navy had in dealing with the fickle winds off the Dutch coast in 1688: "It was not possible to keep the Army, especially the horses, long at sea: And it was no easy matter to take them all out, and to ship them again: After the wind had stood so long in the West, there was reason to hope it would turn to the East: And when that should come, no time was to be lost." When the wind turned favorable, England's Glorious Revolution of 1688 could begin, and for generations, people remembered how the "Protestant wind" had brought it about (Anderson 1983:17–20).

The usual wind patterns of the Atlantic generally hold throughout the year, with the exception of the doldrums. In January, the doldrums inhabited the ocean between West Africa and the tip of northeast Brazil, but in July they shifted northward. They then appeared between West Africa (near today's Senegal) and Suriname. Sailors may also have found doldrums further north in an area stretching west from near the Azores to near Bermuda. These stretches of the ocean could spawn violent storms or conversely they could present extremely calm conditions. When becalmed, watercraft dependent on wind power were helpless (see, e.g., Davis 1884:41). Samuel Taylor Coleridge memorialized the danger of calm conditions to sailing vessels in *The Rime of the Ancient Mariner*, written in the late eighteenth century: "Day after day, day after day, / We stuck, nor breath, nor motion; / As idle as a painted ship / Upon a painted ocean" (Morley 1884:279).

The doldrums, though normally calm, could spawn violent weather. Sailors familiar with the world's great oceans understood the likelihood of having to confront ferocious storms at some point. When sailing into and across the Atlantic, the worst weather condition mariners could face were hurricanes, the "tempests" of the seventeenth century.

In his study into the nature of wind, Bohun (1671:256) was deeply concerned with "contrary" winds that "occasion strange Conflicts and Seditions in the Air." These were the storms with the power to disrupt travel, hinder trade, and destroy people and property. Early in the century, William Strachey had observed that the islands of Bermuda were "often afflicted and rent with tempests, great strokes of thunder, lightning, and rain in the extremity of violence" (Wright 1964:20). He added that great storms could blow for two days straight and submerge whole sections of once-dry islands. Bohun agreed with this assessment, observing that hurricanes have been known to carry "ships a considerable distance from the Sea, up the Dry-Land: Some have been miserably wrackt & buryed in the waves, other split in a thousand pieces against the Rocks." Bohun also noted that "At the Island of St. Christophers, severall ships in the Harbour, being laden with Tobacco, were all cast away by an Hurricane; & afterwards the Tobacco poyson'd most of their Fish on their Coasts" (Bohun 1671:265, 284).

Hurricane season in the Caribbean begins in July, peaks in September, and ends in December. During the seventeenth century, around 200 hurricanes occurred in the Caribbean alone. Of this number, sailors in the open sea had reported 51.5 percent, or 103, of them (García-Herrera et al. 2005:2–3).

A hurricane hit *Sea Venture* in 1609, and, as mentioned above, destroyed it. Strachey, writing in 1610, provides an evocative image of the storm:

> For four-and-twenty hours the storm in a restless tumult had blown so exceedingly as we could not apprehend in our imaginations any possibility of greater violence; yet did we still find it not only more terrible but more constant, fury added to fury, and one storm urging a second more outrageous than the former, whether it so wrought upon our fears or indeed met with new forces (Wright 1964:6).

One memorable seventeenth-century hurricane in the English Atlantic World occurred in August 1635 (Ludlum 1963:10–13; Perley 1891:3–10). The storm formed in the North Atlantic and hit the English colonies in New England. On August 16, 1635, John Winthrop described it as: "The wind having blown hard at S. and S.W. a week before, about midnight it came up at N.E. and blew with such violence, with abundance of rain, that it blew down many hundreds of trees, near the towns, overthrew some houses, [and] drave [sic] the ships from their anchors" (Hosmer 1908:155). The force of the wind and seas battered a number of ships. *Great Hope*, a ship of 400 tons, was driven aground; *James*, from Bristol and carrying 100 passengers from Yorkshire, lost its three anchors; and a bark belonging to

colonist Isaac Allerton was cast away, drowning twenty-one people. *Angel Gabriel*, also from Bristol, arrived just in time to encounter the storm (Perley 1891:6). The storm surge caused the tide to fluctuate wildly, and at "Naragansett" it rose "fourteen feet [4.3 m] higher than ordinary, and drowned eight Indians flying from their wigwams" (Hosmer 1908:157). William Bradford noted that no one "either English or Indian" had ever seen a storm of this magnitude in New England (Morison 1970:279). Years later, Increase Mather (1684:311–312) agreed, observing, "I have not heard of any Storm more dismal than the great Hurricane which was in August 1635."

Summary

The material culture traveling on the Atlantic Ocean was as essential as any other aspect of the seventeenth-century English Atlantic World. The boats and ships built by indigenous peoples, skilled English shipwrights, novice boat builders, and colonial settlers made it possible for people, while in transit and on land, to construct sustainable networks having multicultural connections. Millions of individuals sailed on the ships of the seventeenth century to encounter new environments far distant from their homelands. A significant proportion traversed the ocean unwillingly as forced laborers destined for difficult lives of bondage or indenture. The huge array of artifacts crossing the ocean on English ships extended from the smallest nails to the largest ships. The residents of the seventeenth-century Atlantic World relied on these material things because without them life itself would have been impossible.

Material culture, though hugely important in the history of the seventeenth-century English Atlantic and a primary source of archaeological research, did not exist in an ideological void. Rather, material culture was shaped, impacted, and contextualized within the confines of extant ideas, attitudes, and perceptions that swirled within the seventeenth-century English world. Ships were simultaneously practical and grand, functional and ideological. They projected power and wealth, even though nature could make even the largest and most important ship seem small and insignificant. The mental constructs built around ships help to define the era and offer special insights into the interplay between them and the tangible, material world. The broadest ideological constructs in which English ships and their builders, crews, and passengers operated were four metaprocesses that in the interlinkage help to define the modern Western world.