

Chapter 2

Improvise, Adapt, Overcome: Vernacular Boats as Environmental Adaptations

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Introduction

The year 2012 marked the centennial of the sinking of the RMS *Titanic*. Few vessels have achieved the same level of notoriety as that awarded to the ship once declared “unsinkable.” Over the last hundred years *Titanic* has been the subject of both academic (e.g., Biel 1996; Annas and Elias 1999; Eustice et al. 2010) and popular publications (e.g., Archbold et al. 1997; Lord 2004). Famous vessels are sometimes well known because of their associations with tragic loss of life, or because they represented technological innovations or previously unknown levels of opulence and grandeur. For every infamous vessel like *Titanic* though, there are thousands of long-forgotten ships that were utilized in the development of human societies. Vessels have been built along every coastline using unique, locally available materials to meet different environmental conditions and serve specific functions. These common boats and ships, known collectively as vernacular watercraft, encompass a diversity of vessel types and were designed and constructed for use within local spheres of interaction and exploitation. Examples of vernacular vessels include riverboats, pirogues, catboats, and lumber schooners, as demonstrated by other chapters in this volume. The use and development of these vessels is not restricted to a single geographic place; they appear in a diverse range of communities over time. A vernacular watercraft is a unique combination of tangible and intangible aspects of place, and as such provides insight into the environment, available technologies, and economies in which it was built. Information about the construction, use, reuse, and discard of vernacular watercraft can contribute to an enhanced understanding of the communities in which they appear. In the colonial

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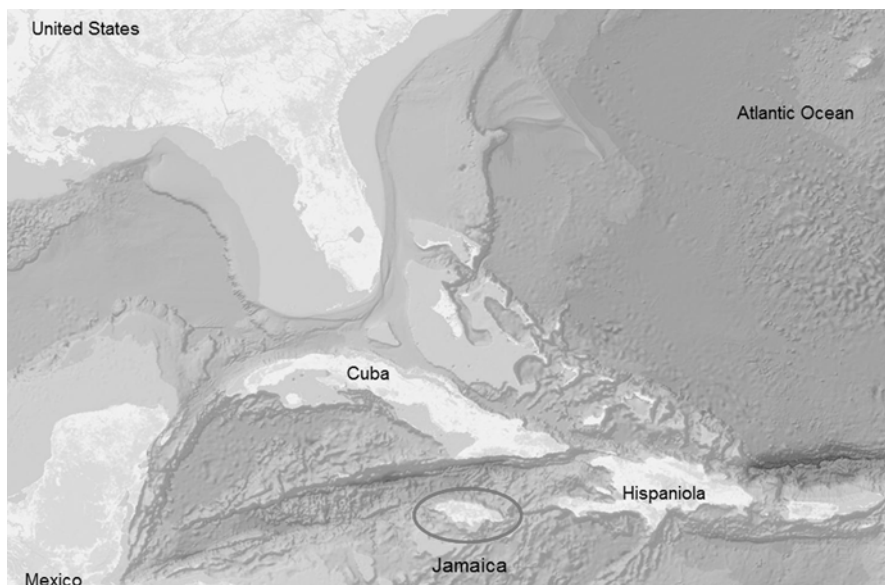


Fig. 2.1 Location map showing Jamaica and the Greater Antilles in the Caribbean; map is oriented north up

Caribbean, the Jamaica sloop is a vernacular watercraft that is defined by the cultural, economic, and technological systems in which it was developed (Fig. 2.1).

Ships as Cultural Artifacts

Humans have used ships for practical matters such as transportation, trade, and communication for over 5000 years (Ward 2004:19). Indirect evidence, however, suggests that humans have been making and using boats for over 60,000 years (Adams 2001:292). Despite this long history of use, only rare examples of shipwreck sites, such as the Swedish warship *Vasa* (Cederlund and Hocker 2006), have been found relatively intact. More often, partial remnants of vessels are preserved. Archaeologists work with these remains to derive as much information as possible about the whole from the few preserved remains. Shipwreck sites can contain a diverse range of artifacts, but typically exhibit better states of preservation than contemporary terrestrial sites (Adams 2001:293). Despite the excellent preservation conditions, it can be difficult to justify the logistically complicated and expensive process of excavating shipwreck sites and conserving the artifacts. The value of shipwreck archaeology though, is in part, the ability to use idiographic data related to microprocesses apparent at the site and relate those to broader questions of social processes. As Gibbins and Adams (2001:280) described it, a ship's crew and the material culture reflected by the artifact assemblage represented "unique manifestations of society."

The metaphor of shipwrecks as time capsules containing well-preserved data has been used to describe the significance of shipwreck sites (Konstam 1999:10). The time capsule argument can be limiting though, since it reduces the role of the vessel to that of the setting for a static event. Ships were not merely platforms upon which activities happened. The use, design, construction, reuse, and discard of vessels all have implications related to human decision-making (e.g., Richards 2008). Shipbuilding is a deliberate, agent-based process, and decisions concerning the vessel's form and construction materials indicate the circumstances within which it was built. Wreck sites may contain a vast array of artifact types, but the ship itself should not be overlooked. As Gould (1983:6) states, "generalizations about various ways the human species has adapted to the conditions of voyaging and its use of the maritime habitat may be possible on the basis of evidence provided by shipwrecks." Ships are most often associated with transportation and trade, but their archaeological remains yield greater significance when viewed within the context of "the greater system at large" (Schmidt and Mrozowski 1983:143). The particular details of vernacular ship construction can provide evidence of agent-based adaptations to social and environmental conditions. Form and construction are essential features to consider when tracing the development of a vessel type, and hull data are likely to be preserved in inundated archaeological settings.

Archaeological investigations of shipwreck sites may result in data sets pertaining to the construction materials, form, and shape of at least a portion of the hull and its component pieces. Conceptual paradigms have been constructed to apply idiographic hull data to more general issues of economic systems, trade patterns, and local environments. According to Adams (2001:301) the seven "interrelated constraints on the form, structural characteristics, appearance and use of ships" include economics, environment, ideology, materials, purpose, technology, and tradition.

Vernacular watercraft were built for a variety of uses, and may or may not include specialized design features; however, constraints such as available technology, resources, and environmental conditions impact the final form of a ship. The interactive nature of the relationship between the constraints on ship design and appearance results in a dynamic system where changes in one factor necessitate changes in the others. This relationship is especially apparent in situations where people from one environment colonize a different geographic or climatic zone. Adapting to local conditions and resources is one aspect of colonizing new environments. Technological systems that offered maximum efficiency in one environment are not guaranteed to work as well in new areas. Changes from a traditional pattern of ship design, construction, use, and discard within these colonial situations may be interpreted as physical manifestations of human adaptation and variability. In the colonial Caribbean, it is hypothesized that English colonists developed a vernacular sloop type in response to new, available resources for ship construction and external environmental pressures.

Colonial Technology

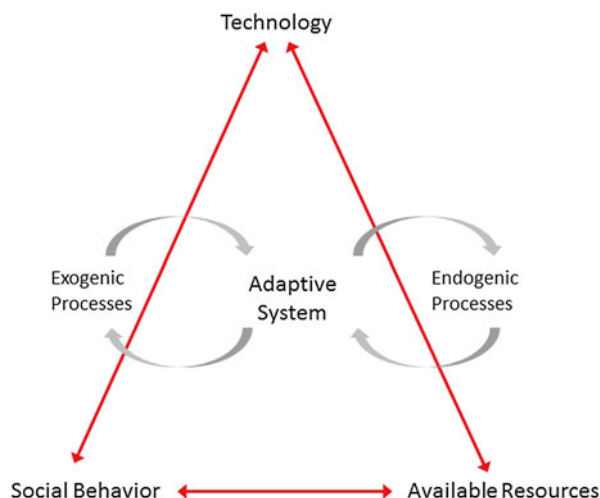
Seventeenth-century European colonialism is characterized by the imposition of existing social and technological systems onto new landscapes (Blanton 2003:191). European colonists arriving in the Caribbean brought with them technologies and ideas

developed over time in a European environment. New arrivals in the Caribbean faced several hurdles in order to succeed in the new settlements. Colonists first had to adjust to landfall after weeks or months at sea. According to Blanton (2003:193), overseas colonists cannot make gradual adjustments or process information in the same manner as overland travelers. English colonists to Jamaica were deposited into a radically different environment, but they had brought with them technology that was suited to European areas that featured established networks of improved overland roads and waterways connecting rural and urban areas (Blanton 2003:193). Caribbean islands at this point in time lacked improved waterways, and in some areas were not suited for overland travel. Caribbean colonies were established as peripheral, imperial outposts in the European competition for raw materials and wealth. The Caribbean colonies were part of an integrated economy, and ships were vital to both establishing the colonies and keeping them connected to global patterns of trade and conquest.

In new environments, successful colonists “learn the local resources and adapt extant procurement strategies and technologies” (Meltzer 2003:238). Newly arrived colonists may also benefit from local knowledge that has been accumulated by pre-existing populations (Meltzer 2003:225), but colonists must be willing to assimilate that local knowledge into their preexisting systems. In the Caribbean, for example, this meant successfully incorporating local flora and fauna as adaptations to the tropical climate. This phenomenon can be identified in the colonial Caribbean by the incorporation of local timber in shipbuilding or repairs. The identification of wood types used in hull construction allows archaeologists to make some initial observations about where the vessel was constructed, and where it might have been used, or even possibly repaired. Traditional European hardwoods used in ship construction during the seventeenth century were highly susceptible to shipworms present in warm Caribbean waters, and required frequent repair and timber replacement (Kaplan 1988:261; Smith et al. 1999:134–137). Timber stands of local Caribbean cedar were exploited as a readily available construction material and proved to be better suited for use on hulls operating in the region. In addition to being less expensive than imported English oak, local cedar had a higher tensile strength, meaning it was lighter and stronger than comparable oak timbers. Local cedar also had a high resin content that shipworms found bitter to the taste, resulting in less frequent careening (Jarvis 1990:35).

Colonists make decisions based on their experiences within an existing set of structures. Karl Butzer (1982:286) developed a model of these structures, defining them as interactive variables within an adaptive system (Fig. 2.2). In Butzer’s model, an adaptive system has three main categories: technology, social behavior, and resource opportunities. If vernacular ships are viewed as an adaptive system, then based on Butzer’s model, technology encompasses the design of a vessel, the assembly and form of the individual pieces, and the hydrodynamics of the hull-water interface. Again using Butzer’s categories, resource opportunities are defined as those available at a particular place and time and subject to ecological processes such as biotic competition and disease. Caribbean colonists were restricted to materials that were either available locally, or items that could be imported or obtained through trade. In some cases, locally available timber stands were sacrificed to make room for plantation crops, a choice that stressed the

Fig. 2.2 Adaptive systems are feedback loops, created by the interaction of technology, available resources, and social behavior, and influenced by external pressures (after Butzer 1982:286)



economic viability of one crop over another. The shift from timber stands to plantation crops has also been used to infer a shift in colonial subsistence strategies (Adams 2001:303). Finally, Butzer's model includes aspects of social behavior, including existing political and economic systems, cultural attitudes and perceptions, and existing social organization. The variables defined by Butzer are stimulated by both exogenic and endogenic forces. Exogenic forces acting in the Caribbean included geological hazards such as offshore reef formations, and shallow water hazards. Other exogenic forces included climatic events such as hurricanes, ecosystemic imbalances (such as the shift from indigenous to exotic species), intergroup warfare or migration, the diffusion of new information through trade, and the subsequent colonization of new environments. Endogenic stimuli included processes such as innovation and acculturation.

Butzer wrote that the different stimuli and variables form feedback loops; changes in one part of the system necessitated adjustments in each of the others, creating a dynamic equilibrium. An effective examination of past human behavior requires a reflexive analysis of "structural events and patterns of practice" (Dornan 2002:325). When viewed within this framework, vernacular Jamaica sloops are an observable consequence of historically unique microprocesses of Caribbean geography and English colonization and broader macroprocesses of international economics and policy (Dornan 2002:235).

Agency and Cultural Ecology

Biophysical factors influencing Caribbean colonists included unpredictable hazards inherent to colonization of a new environment; sociocultural stimuli included intergroup competition from either warfare or migration, and diffusion of new

information, generated outside of the ecosystem, through trade (Butzer 1982:289–283). Growing plantations within the Caribbean required trade goods and supplies, as islands at the periphery of European imperialism became more economically important within the global system of trade between 1600 and 1750 (Richardson 1992:4). Patterns of Caribbean trade demonstrated interdependence between nations, qualifying it as a world-system (Chase-Dunn and Grimes 1995:390). It is widely accepted that the triangular trade represented an international commodity flow linking the economies of Europe, Africa, and the Americas, but early interpretations of world-systems theory failed to recognize ships as an adaptive reaction within the system, ignoring them as static tools used to move trade goods between points. In 2004, Wallerstein (2004:17) wrote that the capitalist world-economy predicated “a need for constant technological change,” and a constant expansion of geographical, intellectual, and scientific frontiers. Traditionally, nautical scholars such as Baker (1966:1) have argued that modifications in ship designs occurred gradually, based in large part on “changes in trade patterns that altered cargo carrying requirements, refinements of form, improvements in rig, availability of timber, and mere whim and fashion.” This explanation of design modifications ignores economic or political stimuli, and more recent studies argue against such a simplistic explanation. In fact, it has been argued that technological change increases at a dramatic pace under capitalist systems, because the success of an adaptation is determined solely by its production efficiency, without regard to any potential disruption of existing social structures (Chase-Dunn and Grimes 1995:400). Capitalist systems allow the unchecked accumulation of wealth; therefore, social effects of technological change are generally ignored because the developers are primarily interested in raising their profit margins against aggressive competition (Chase-Dunn and Grimes 1995:400). Based on these principles, a ship design that can move trade items more quickly and more securely, while requiring less capital investment, or upkeep, will quickly be adopted regardless of social factors.

Maritime Technology and the Caribbean

Steele and Rockman (2003:132) state that it is a “truism that humans modify their habitats by technological means to make them more favorable to habitation” but humans also modify their technology to suit new habitats. Obviously the type and availability of construction materials will impact the finished product, but the actual form of a vessel has as much to do with its purpose as the area where it will be used. Travel by sea and across water was a calculated risk, and each venture was predicated on an evaluation of environmental, technological, and human factors (Adams 2001:293). Jamaica sloops were built by local colonists and used to transport goods across a volatile region. Pirates, privateers, vessels of enemy nations, and natural hazards were all factors that had to be considered when a ship went to sea. The decision to sail was the end result of an assessment of the risk of failure and the potential for success. Fast vessels that could outrun, and outmaneuver hostile vessels were

more successful for their owners, and local shipbuilders experimented with designs that attempted to reach equilibrium between speed, maneuverability, and cargo capacity. Vernacular Jamaica sloops were relatively small vessels, characterized by design elements that included a raked mast slightly forward of the midships, a rounded bilge, raked sternpost, and sharply rising floor (Baker 1966:111; Chapelle 1967:65; Evans 2005:74). The design, combined with local cedar that had a higher tensile strength than heavier European oak, resulted in a vessel that earned an enviable reputation for speed and seaworthiness (Cordingly 1995:163). Jamaica sloops were adopted and adapted by other Caribbean colonists because the design was effective in providing safe and reliable transportation.

Social constructs do not exist in the archaeological record, but artifacts such as hull remains can inform hypotheses of these abstract behavioral patterns. The process of causation, or agency, as suggested by Ortner (1984:127) and reiterated by Dornan (2002:324), is a mechanism for identifying “the intersection of individual intention with resistance to or incorporation of particular social structures” at a given point in time. Dobres (2000:135) argues that agents and structures are relational. In a Caribbean example, the agents were English colonists in Jamaica. The structures can be defined as the material, social, and symbolic conditions within they existed and through which they reproduced and transformed themselves. As relational entities, any attempt to understand the agent must consider the structures in which it operates to avoid misinterpretations of the agent’s, or more generally, human behavior.

It is no sure bet that agents will act just because they can or should. In other words, not acting is still a form of agency [Kegan Gardiner 1995]—and context is the only means by which to understand these nuanced qualities of agency. What this generally means for technology studies in particular, but archaeology more generally, is a new and different interest in the question of material patterns of variability juxtaposed against norms (Dobres 2000:135).

Dobres’ argument can be divided into two main points. The first is the idea that not making a decision, choosing not to decide, is still an active choice. The second part is that, from Dobres’ perspective, the underlying question is not who made the object, or how they made it. Instead, an agent-based archaeological inquiry examines the degree of variability between the object and its normative equivalent. Agent-based studies are concerned with the process of causation. If seventeenth- and eighteenth-century English sloop data is used to create a normative equivalent for sloop construction, then this baseline may be compared with the stimuli necessitating the adaptation of existing ship designs by Jamaican colonists to identify areas of potential variability. As one interpretation of Bass (1983:97) implies, particularist data extracted from shipwreck sites are essential because the resulting datasets can be analyzed and used to reconstruct the behavior of the people associated with the ship. In several instances, limited excavation of portions of vernacular shipwrecks has produced particular data that resulted in a detailed analysis of the local community, economic systems, and trade patterns associated with the vessel (e.g., Horrell 2005; Stanbury 2003).

Shipwrecks, by definition, represent technological failure since the vessel did not survive to deliver its contents, but it should not be assumed that only unsuccessful designs result in shipwrecks (Adams 2001:293). English colonists in the colonial Caribbean were threatened

by attack and their vulnerability stimulated the intentional development of an adaptive ship technology. Jamaica sloops were a unique product of spatial and temporal conditions, and they can be identified by their unique design and construction.

Conclusion

Vernacular watercraft is an academic term applied here to locally built ships. Colonists in new areas often found that technologies that were previously successful were not well suited for their new environment. In some cases, colonists benefited from knowledge obtained by preexisting populations, but in other cases, they learned through trial and error. In colonial Jamaica, shipbuilders drew from a common knowledge base to construct their vessels, but they made independent adaptations that are revealed by a particularistic analysis of the hull structure and materials used in the construction of Jamaica sloops.

Cultural ecological models, specifically Butzer's interactive variables of an adaptive system (Butzer 1982:286) are particularly useful for analyzing shipwreck sites. The particular details of construction materials or hull scantlings provide a picture of the vessel which can then be compared to normative equivalents, from which areas of adaptation can be identified. Although it can be easy to overlook the vessel involved in trade, it is not a static object moving trade goods. It is as much a part of the economic and cultural system that it was used in, and represents deliberate adaptations on the part of local colonists to their situation.

Early studies of ship design and innovation assumed that alterations were attributable to changes in trade patterns or stylistic whim (Baker 1966:1); however, more recent research demonstrates that ship design was influenced by a far greater number of variables. Despite historical references to Jamaica sloops as a specific type, no archaeological remains have been identified; however, it is possible to define the ship's form by modeling it as an adaptive system. Ship design was part of a larger tradition of human adaptations based on technological factors, available resources, and social behavior. These three variables, stimulated by exogenic and endogenic processes create an unstable environment, and adaptations to ship designs are therefore viewed as a coping mechanism. In addition to the colonial Caribbean, the concept of vernacular ships as adaptations to new environments can be seen in geographically and temporally distinct cultures who developed vernacular shipbuilding traditions to ensure their survival.

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