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ABSTRACT

This dissertation focuses on the first maritime archaeology research project conducted in Ghana, specifically off the town of Elmina in the Central Region. Survey and diver investigations resulted in the discovery of a mid-seventeenth century shipwreck, which archaeological and archival research suggests may be the Dutch West India Company vessel *Groeningen* that sank after arriving to Elmina on a trading voyage in 1647. The site lies approximately 2.4 kilometers (1.5 miles) southeast of Elmina and is characterized by a mass of trade goods, including brass and pewter basins, brass manillas, lead rolls, trade beads, pins, cowrie shells, as well as large iron cannons.

I utilize a multi-scalar approach in this research, which allows me to take the shipwreck as the basic unit of analysis (an event or *événement* as Braudel would place it in his three scales of history), and situate it within the broader sphere of the Atlantic World. This geographical and chronological construction, encompassing Africa, Europe and the Americas and spanning the fifteenth to the nineteenth centuries, can be considered an example of the *longue durée* as defined by the *Annales* school, a level of analysis involved with long term structures and world views. In utilizing these multi-scalar constructs, the Elmina Wreck serves as an example of the maritime element within the interconnections of the Atlantic World. Artifacts from the wreck site provide insights into the commodities involved in exchange between Africans and Europeans on the coast, and speak to the culture contact and flow of commodities across different cultural contexts.

**THE MARITIME ARCHAEOLOGY OF WEST AFRICA
IN THE ATLANTIC WORLD:
INVESTIGATIONS AT ELMINA, GHANA**

By

Gregory D. Cook
B.A. Indiana University, 1989
M.A. Texas A&M University, 1997

DISSERTATION

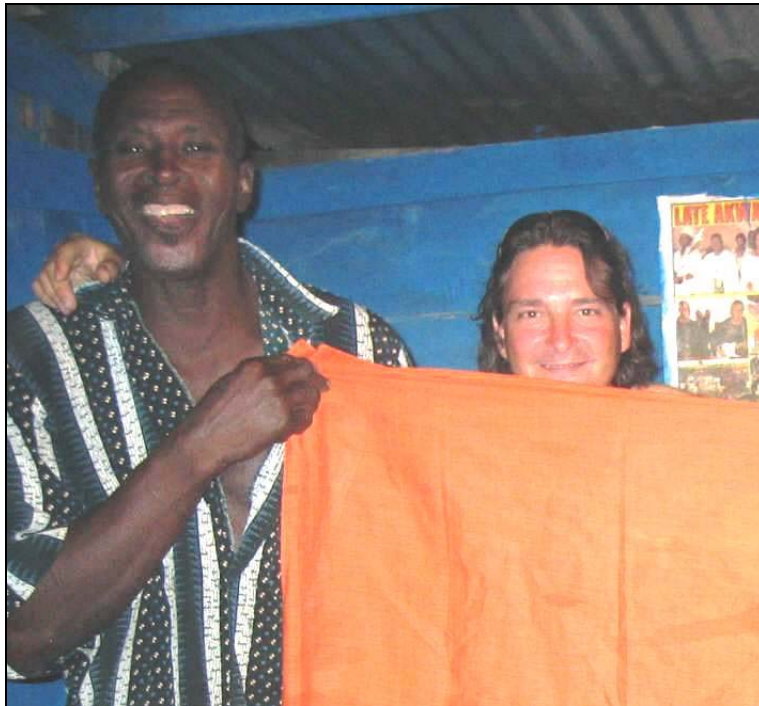
Submitted in partial fulfillment of the requirements for the
degree of Doctor of Philosophy in Anthropology in the
Graduate School of Syracuse University

December, 2012

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DEDICATION

This dissertation is dedicated to Papa Kofi Arhin, master fisherman and dear friend, who passed away on June 20, 2012. Papa Kofi was instrumental in the success of the maritime archaeological research at Elmina, and his generosity and good nature will be missed by all who knew and worked with him.



Photograph by Amy Mitchell-Cook

ACKNOWLEDGEMENTS

As with any research project that spans years and geographical regions in scope, I owe many individuals and institutions a great debt of gratitude in the culmination of this dissertation. First I want to thank my advisor, Christopher R. DeCorse, who initiated archaeological work at Elmina and saw the value of extending investigations to underwater sites off the coast. Chris' guidance was not only critical in the success of this research, but also served as an excellent example of mentorship that I have strived to adapt in my own interactions with students. Whether huddled together in his office or sitting at his dinner table, Chris literally opened his doors to me and other graduate students, and his passion for teaching and research extends to generations of archaeologists that he has mentored. I also want to thank the other members of my committee: Doug Armstrong, Theresa Singleton, Kevin Crisman, Sue Wadley and Cathryn Newton. Whether serving as teachers or advisors, each of you played a key role in the completion of this research, and I am honored to have worked with all of you.

I am indebted to the National Geographic Society, the Maxwell School of Citizenship and Public Affairs at Syracuse University, and the University of West Florida (UWF) Scholarship and Creative Activities Faculty Research Grant Program for funding the fieldwork in Ghana. I also would like to express gratitude to Elizabeth Benchley, Director of the Division of Anthropology and Archaeology at UWF for her assistance and support, as well as UWF maritime archaeologist and conservator John Bratten, who oversaw the conservation of artifacts from the Elmina Wreck. Stephen James of Panamerican Consultants, Inc., provided the remote sensing gear that allowed the first survey for submerged archaeological sites off Ghana to be successful.

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Friends and colleagues in Ghana were instrumental to the success of this project. My friendship with Benjamin Kankpeyeng began while we were graduate students at Syracuse, and his assistance and support in Ghana helped me immeasurably. The work was permitted and supported by the Ghana Museums and Monuments Board, and I particularly want to thank Raymond Agbo and Nicholas Ivor for their assistance while in the field. The University of Ghana's Archaeology Department assisted with logistics, and Bossman Murey supported my research as well as that of many colleagues while in

Ghana. My dear friend Papa Kofi Arhin served as a local facilitator in Elmina, and provided the canoe we used for the research. I will forever remember his warmth and good nature. Isaac Abban, Barnabus Akon and Joseph Annan assisted with fieldwork and logistics, and provided great company while voyaging offshore in canoes. Bob Millikin at Aquatec Diving Services in Tema provided key information on underwater conditions in coastal Ghana, and loaned diving equipment for the initial investigation of sites there in 2003.

I also want to express gratitude to the multitude of colleagues, friends and students who accompanied me on multiple field seasons to Elmina. Michael Tuttle assisted with the initial remote sensing survey and helped to foster maritime research in Ghana. Additional crew members included Nicole Davis, Lisa Hopwood, Andrew Pietruszka, Jason Raupp, Paul Sjordal, and Hiroshi Toshikage. Despite challenging field and diving conditions, all of you played a central role in the success of this project. Nicole Davis and Lisa Hopwood completed M.A. theses on some of the artifacts recovered from the Elmina Wreck, and it was a pleasure working with them at UWF. My Syracuse colleagues Andrew Pietruszka and Rachel Horlings continued work on the site after my initial research, and their findings helped to elucidate the vessel's date and nationality. I take great pride in standing alongside both of them in pioneering maritime archaeology in Ghana.

I also want to thank my family for all of their support over the years: my parents, Helen and Gilbert, who instilled in me the desire to pursue a career in the sciences, as well as my stepdad Whit and my inlaws Pat and Leck, who are always eager to hear what new discoveries are on the horizon. Finally I owe more than I can ever repay to my wife,

Amy Mitchell-Cook, for her support in completing this endeavor. Amy was a key crewmember, archaeologist and diver during the 2005 field season, and has served as an editor and advisor during the completion of the dissertation. This is just one chapter in the grand adventure that our marriage and partnership has become, and I could not have completed it without her.

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CHAPTER 1: INTRODUCTION

The Genesis of the Project

This study focuses upon the first maritime archaeological¹ remote sensing survey and shipwreck investigation conducted offshore of Elmina, Ghana (Figure 1.1). Side scan sonar and magnetometer survey resulted in the discovery of over fifty anomalies, and initial investigations led to the verification of a shipwreck site with associated trade goods likely dating to the mid-seventeenth century. Though the town of Elmina is known today primarily as a fishing port and tourist attraction centering on the *Castelo de São Jorge da Mina*, historically Elmina figured prominently as a trading entrepôt throughout the Atlantic Period.² For over four centuries trade between Africans and Europeans in the region was primarily carried out via ships anchored offshore, and Elmina served as a major hub of exchange between Europeans and Africans, between the sea and shore, between ships and merchants. Built initially in 1482 to solidify Portugal's control of trade in the region, the *Castelo* became a focal point for European rivalry and competition in West Africa (Figure 1.2). The Dutch captured the fort in 1637, and it

¹ A variety of terms have been used to delineate the underwater investigation of archaeological sites, including maritime archaeology, marine archaeology, nautical archaeology, shipwreck archaeology, submerged archaeology, and underwater archaeology, among others (e.g. Bass 1972: 10; 1988b: 9-10; 2011: 4; Bowens 2009: 2-5; Gibbins and Adams 2001: 279-280; McGhee 2010: 386-387; Muckelroy 1978: 4; Watters 1985: 13-17). Nuanced differences between these terms exist in the literature noted above and elsewhere, with scholars grappling as to whether the remains of a ship found on land, for example, should be considered maritime, nautical, marine or shipwreck archaeology (Green 2004: 2). Other scholars echo George Bass's assertion that "archaeology under water, of course, should be called simply archaeology", and that any further delineation is meaningless" (Bass 1966: 15). In this study I do not differentiate between these, but mainly use the terms maritime archaeology and nautical archaeology interchangeably to refer to the archaeological study of humans and their interactions with the water environment.

² The region encompassing coastal Ghana has had various names through the contact period. Portuguese mariners initially referred to the area as the *Mina de Ouro*, or the mine of gold, due to the amount of gold available for trade there, and referred the coast as the *Costa da Mina*. While the term "Gold Coast" has been used broadly by some scholars to refer to the area, technically the term applies to English usage beginning with early voyages to the coast in the sixteenth century. Gold Coast became the official name of the British colony in the region from 1821 until independence in 1957 when the nation of Ghana was born. In this dissertation I often use the term "coastal Ghana" for the area, regardless of time period.

remained under control of Dutch authorities until its transfer to the British in 1872.

Despite the crucial role maritime trade played in the socio-economic landscape of the

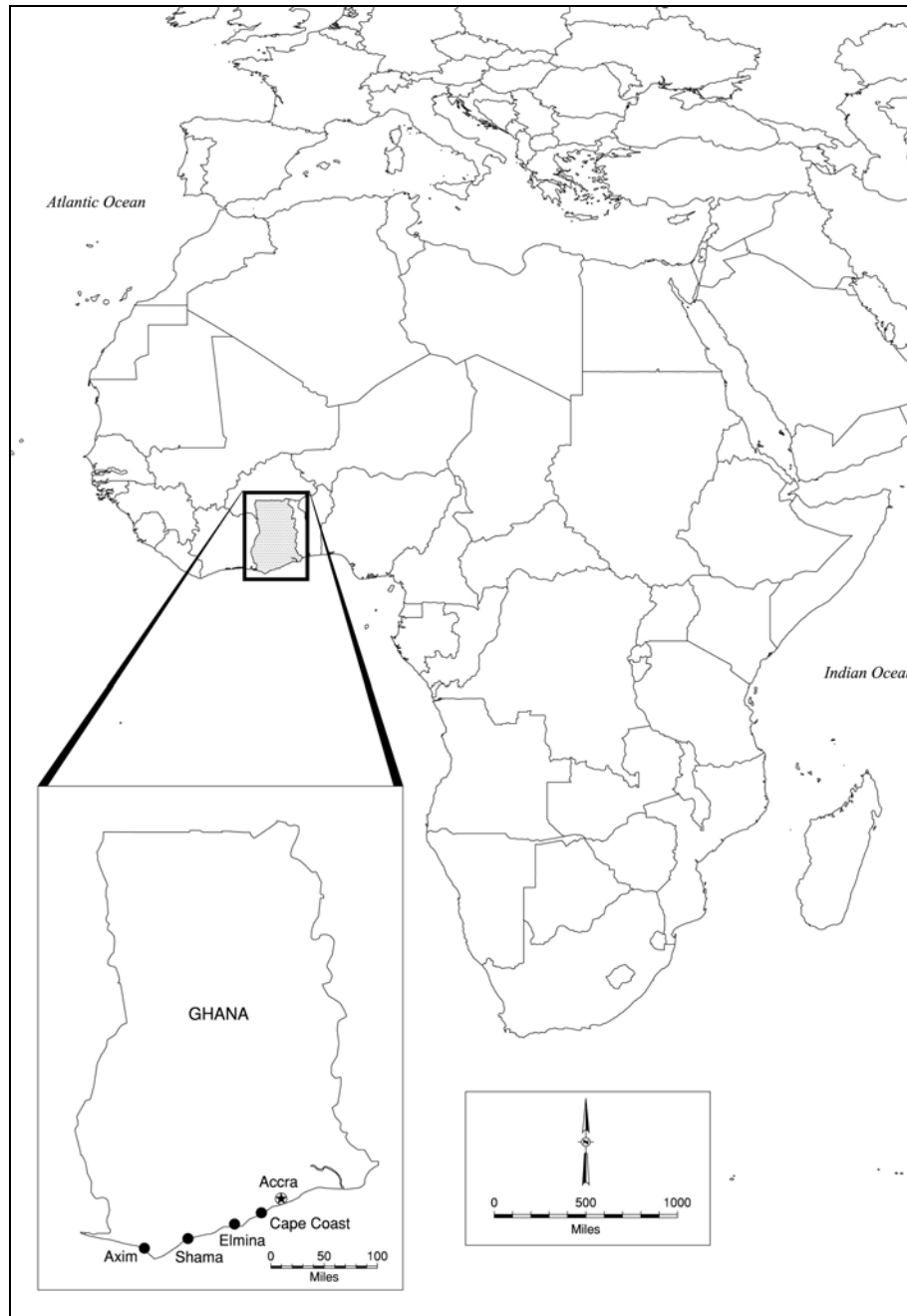


Figure 1.1 Project area location in Ghana (map courtesy of the Archaeology Institute, University of West Florida).



Figure 1.2 Elmina castle from the water. Photograph by G. Cook.

town, no previous attempts to study the submerged archaeological record off of Elmina have occurred.

The impetus to initiate maritime archaeological investigations in West Africa began with a casual conversation with Professor Doug Armstrong of Syracuse University while conducting fieldwork in St. Ann's Bay, Jamaica. I was working on my Masters thesis research at Texas A&M on an abandoned eighteenth-century sloop off of Seville Plantation, and Dr. Armstrong was just finishing an excavation season on the enslaved African quarters of the plantation (Armstrong and Kelly 2000). After dinner in the Great House where both the underwater and terrestrial crews were staying, I mentioned my

experience studying abroad as an undergraduate at the University of Malawi, and how fascinated I was by the potential study of European shipwrecks off of the West African coast. Dr. Armstrong and I began talking about the potential for marine archaeology to elucidate the contact period in West Africa. He urged me to apply to Syracuse for my Ph.D. studies and work with Dr. Christopher DeCorse in Ghana. Upon finishing my Masters degree, I soon found myself in Syracuse studying with Dr. DeCorse along with graduate colleagues who shared a research focus on the archaeology of West Africa in the Atlantic World.

It was an opportune time for a renewed focus on the archaeology of Ghana's contact period. Dr. DeCorse's excavations at Elmina extend back to 1985, providing a substantial foundation for new research endeavors (DeCorse 1987; 1989a; 1989b; 1992; 1998a; 1998b; 2001). Some of his subsequent work expanded into nearby areas such as Eguafu, Brenu Achyinim and Coconut Grove for a more regional perspective that spans the era of pre- and post-European contact (DeCorse 2008: 89; 2005: 3).

With the groundwork laid for regionally-focused archaeological projects in Central Ghana, fellow Syracuse graduate students Gerard Chouin, Sam Spiers and Edward Carr and I were well situated to conduct Ph.D. research that would expand our understanding of the social, economic and political transformations occurring in the Central Region during the period of European contact (e.g. Carr 2001; Chouin 2002, 2008, 2010; Cook and Spiers 2004; DeCorse 2001, 2005; DeCorse et al. 2000; DeCorse et al. 2009; DeCorse and Spiers 2009; Spiers 2007). This dovetailed nicely with my goal of initiating nautical archaeological investigations offshore focusing on maritime trade and African-European interaction.

Archaeological examinations of areas “beyond the castle” became the nexus for the Central Region Project, which sought to conduct research both in the coastal hinterland as well as offshore to gain a better understanding of the broader trade networks in the region and their impact on the socio-political organization of coastal polities (Cook and Spiers 2004: 17). Centering geographically on the town of Komenda, a key Dutch and British trading post, the Central Region Project extends west to the Pra River near Shama, an early Portuguese trading center, and east to the Kakum River, which remained an active European outpost for over four centuries. Moving inland from these trading entrepôts, the project’s broader limits incorporate the town of Eguafo and extend approximately 15 kilometers (9.3 miles) to the hinterland (Figure 1.3).

With the research established for the Central Region Project, the graduate students building upon DeCorse’s work began looking at fieldwork opportunities. Upon my initial trip to Ghana in 2001, I was excited about the potential for maritime research, but also daunted by the logistics involved. The sea seemed to be in a perpetual state of crashing, violent waves hitting the shore. More importantly, there is no sport diving tradition, and no dive shops exist in the country that might support diving operations, dive safety, air fills and equipment repair. There is also no reliable recompression chamber in Ghana; emergency evacuation plans to the Canary Islands or Europe had to be prepared in case a diving accident should occur.

No previous nautical archaeological work had been conducted in the region, thus there were few answers for the myriad of questions regarding the research. What would be the best method for finding sites? Are underwater sites in the area exposed or buried by seafloor sediments? This would be a key factor in whether they might be better

detected through magnetometer, side scan sonar, or sub-bottom sonar methods. To what extent are underwater sites preserved off the coast of West Africa? This might also be affected by the state of sedimentation on the seafloor, and we had very little information in this regard. Was the water clarity sufficient for towed diver surveys, visually searching the seafloor for wreck sites? Did local fishermen know of net snag areas that may indicate the presence of ballast piles or other structure? And finally, how can these resources be used to reveal the region's past?

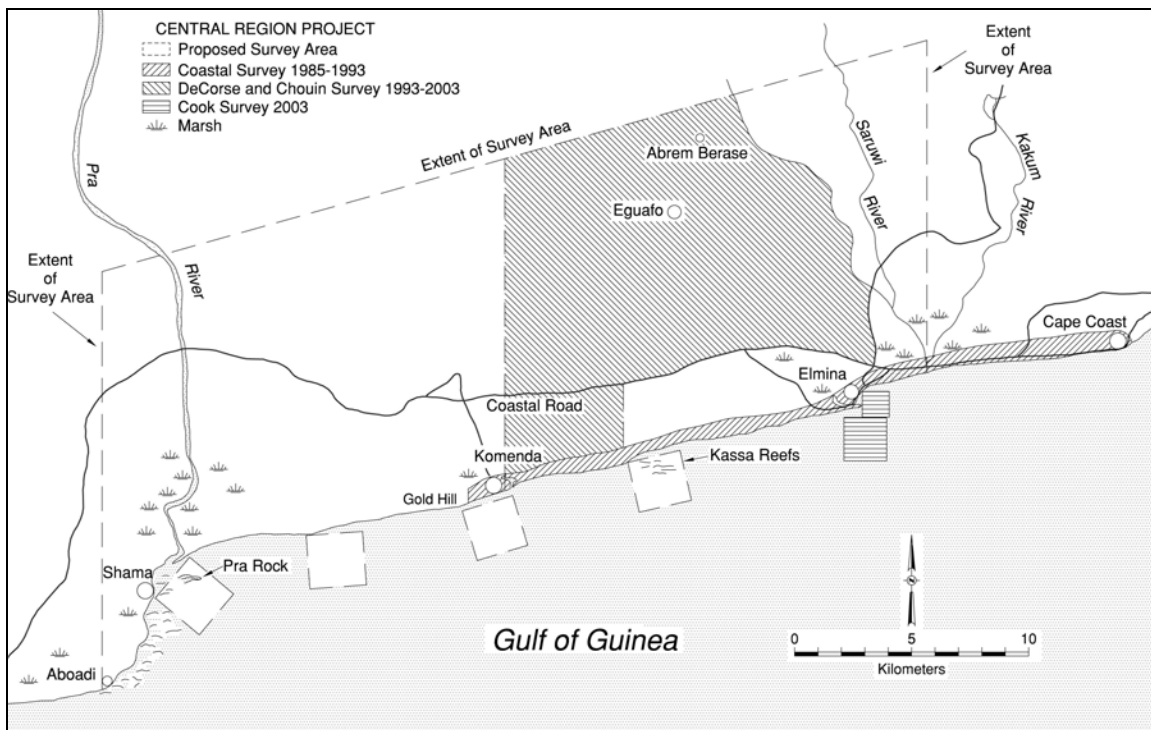


Figure 1.3 Area map of the Central Region Project (map courtesy of the Archaeology Institute, University of West Florida, 2005).

When I asked a commercial diver I met during this trip, Bob Millikin of Aquatec Diving Services in Tema, what diving conditions offshore were like, he simply said “It’s dark, cold and violent near shore. Conditions change constantly. What’s exposed one

day may be buried by several feet of sand the next day” (Millikin 2003: personal communication). While these considerations did not sway my determination to search for submerged sites in Ghana’s waters, they did highlight the potential difficulties involved in conducting this research for the first time in a region far away from any substantial diving support.

Since we would be dependent on local watercraft for at least the initial survey and investigations of submerged sites, I heeded Dr. DeCorse’s advice to “get to know the fishermen”, and met several owners of large dugout canoes who let me join their crews on overnight fishing voyages. These trips impressed upon me the functionality of canoes, with a few modifications, as potential research vessels for remote sensing survey and diver investigation of sites. I was also fascinated by the methods employed in navigating the canoes in open water beyond the sight of land, and seine fishing techniques in both motor-powered and sailing canoes (the construction and use of modern-day Fanti fishing canoes is a topic worthy of future research by maritime scholars). By the time my first visit to Ghana ended, I had secured use of a 15.25 meter (50 feet) dugout canoe for our research, and was convinced that a remote-sensing survey and diver investigation of potential sites was possible if funding allowed a return trip.

Although the logistics of maritime field research in Ghana appeared daunting, I had no doubt concerning the potential of maritime archaeological survey in the region. This work would be unprecedented; no shipwreck surveys have been conducted in Ghana, and only a few archaeological projects with a maritime focus have occurred in broader sub-Saharan West Africa.³ The marine resources described in this dissertation

³ Other published projects include a survey and limited diving off of Gorée Island, Senegal (Guerout 1996) and work in the Cape Verde Islands (Smith 2002).

had never been studied and they remain protected from looting and treasure hunting activities due to the general lack of sport diving and very limited commercial diving activity in the country. Such heretofore neglected archaeological resources have the potential to generate an entirely new perspective on maritime contact, providing a greater understanding of cultural interaction as mediated through trade, particularly within the region (DeCorse 1992; 1997; 1998a; 2001; Posnansky and DeCorse 1986). Discovery of a vessel involved in the West African trade would allow access to tangible remains of the materials involved in African-European interaction, as the exchange of mundane commodities such as brassware, manillas and beads constituted a bulk of this trade. Despite the vast amounts of European trade goods entering the African market, little is known specifically about the varieties of goods carried in the holds of these trading vessels, and few examples survived after cargoes were offloaded on the coast and their journey into interior markets continued (Alpern 1995; DeCorse 2001: 147). On a broader scale, these sites will increase our understanding of the development of transatlantic trade and its role in the intersection of Europe, Africa and the Americas and the creation of an Atlantic World (Benjamin 2009: xxiii; Cañizares-Esquerria and Seeman 2006: xvii; Ogundiran and Falola 2010: 3).⁴ The study of a cargo of trade goods intended for the West African market would provide insight into the market demands within Africa, and its influence on the types of goods transported in European ships and manufactured in European factories for trade with African merchants on the coast. Such a study would

⁴ This study focuses specifically on interactions between West Africa and the rest of the Atlantic World. It should be remembered, however, that in the same time period a variety of interactions occurred in different parts of the African continent, as well as with other world areas such as the Indian Ocean and Asia. These are beyond the scope of the context of Atlantic connections with Elmina (see DeCorse 2001: 196 for a discussion of broader African connections on a global scale).

add substantially to the debate regarding African agency in the mediation of this exchange (e.g. Rodney 1970: 171-199; Thornton 1996: 44).

If the potential for underwater archaeological work exists, the first step is to locate relevant sites in an area where no previous research had been conducted. The Ghana Museums and Monuments Board granted permission to conduct the research, and funding support came in the form of a National Geographic Expeditions Council Grant. This led to the successful 2003 survey which became the impetus for continued funding for the subsequent seasons of diver investigations. The initial 2003 fieldwork involved side scan-sonar and limited magnetometer remote sensing in an area offshore of the town of Elmina, located in Ghana's Central Region. In just two weeks more than fifty anomalies were located, and though diver investigation was not a priority, limited site investigation led to the discovery of an intact mound of cannon and trade goods approximately 1.5 miles (2.4 kilometers) offshore of Elmina. In 2005 I returned with students from Syracuse University and the University of West Florida and conducted intensive mapping of exposed cultural material on the Elmina Wreck site, as well as limited surface recovery of diagnostic items. Further fieldwork was undertaken in 2007 and 2009 by graduate colleagues at Syracuse University, Andrew Pietruszka and Rachel Horlings, with the goals of further excavation of the Elmina Wreck site, additional survey work, and the investigation of site formation processes (Horlings 2011; Pietruszka 2011).

This dissertation is an analysis of the data and discoveries made during the 2003 and 2005 field seasons on the Elmina Wreck site, placing the discussion within the context of later findings by Pietruszka and Horlings as they relate to the potential date and identity of the Elmina Wreck site. Interpretation of my discoveries, as well as the

findings by Pietruszka and Horlings, was more challenging than anticipated at the start of the research. Located in a highly dynamic environment, the Elmina Wreck site initially presented a mix of historic material spanning the seventeenth century to the present. While some initial indications suggested a possible nineteenth-century age, further research on the wreck site (including obtaining a series of radiometric dates) indicates the ship dates to the mid-seventeenth-century. Archival research suggests the wreck is the Dutch West India Company ship *Groeningen*, which exploded while anchored off Elmina in 1647. The contradictory evidence recovered and initial challenges in evaluating the site serve as a warning regarding the identification and dating of sites on the basis of limited surface collection. Further mysteries of the Elmina Wreck site, including its trade objectives, will likely be revealed by future investigations.

Organization of the Dissertation

With the genesis of the Elmina Wreck project established in this chapter, I continue the dissertation by establishing a context for underwater investigations in West Africa in Chapter 2. This includes an examination of theory in nautical archaeology in general, followed by a more specific theoretical context of the research in coastal Ghana. Chapter 3 presents a historical background of Elmina, focusing on initial Portuguese explorations, the establishment of the trading entrepôt *Castelo de São Jorge da Mina* and later competition for the region's trade by other European powers. I also provide an overview of the complexities of the West African trade and the types of commodities involved in this exchange. In Chapter 4 I examine the logistics of the trade, and specifically how trade goods arrived at the coast. For this discussion, I provide a brief

overview of vessel types involved in the African trade. Chapter 5 describes the methodologies utilized, both in the 2003 survey as well as the more intensive site investigations and artifact recovery that occurred in 2005. It also includes a discussion of the results of these phases of fieldwork. An analysis of the finds resulting from the 2005 dives follows in Chapter 6, with a discussion relating to our initial thoughts on the site's nationality, date and site formation processes. Chapter 7 provides a summary of field research on the Elmina Wreck site conducted by Andrew Pietruszka and Rachel Horlings in 2007 and 2009. These projects yielded additional material and insights that suggested the Elmina Wreck site was the Dutch West India Company ship *Groeningen*, which sank off the coast of Elmina after catching fire during a salute to the castle in 1647. The dissertation concludes with Chapter 8, presenting our current state of knowledge regarding the wreck site and potential for future research in the region.

CHAPTER 2: ESTABLISHING THE CONTEXT OF UNDERWATER ARCHAEOLOGICAL INVESTIGATIONS IN GHANA

Project Background

This dissertation is one of the few nautical archaeological studies conducted to date in the broader sub-Saharan West African region. Other published projects include a survey and limited diving off Gorée Island, Senegal (Guerout 1996) work in the Cape Verde Islands (Smith 2002), and excavations on a wrecksite off Gabon identified as the Dutch East India Company ship *Mauritius* (L'Hour et al 1989; 1990). As such, many of the initial questions confronted in this research were exploratory in nature, such as: are there submerged archaeological sites in the region? What is the best method for finding sites? Are underwater sites in the area exposed or buried by seafloor sediments? To what extent are underwater sites preserved off the coast of West Africa? How can these resources be used to reveal the region's past? This study is a first step at answering these questions.

Nautical archaeology in West Africa is only just beginning, and the success of remote-sensing surveys conducted in 2003 and subsequent investigations of the Elmina Wreck and adjacent sites indicate that the area offers great potential for underwater archaeological investigations (e.g. Cook and Spiers 2004; DeCorse et al. 2009; Horlings 2011; Pietruszka 2011). The coastal waters of Ghana, known by the Portuguese as the *Costa da Mina*, and in later English sources as the "Gold Coast" (Hair 1994b: 43; DeCorse 2001: 7) provide an excellent venue for pursuing these investigations due to the intensity of maritime activities in the region, and the prolonged period of seaborne trade that was conducted off Ghana's shores. Beginning in the late fifteenth century,

interactions between West Africans and Europeans centered on coastal settlements where trade was conducted within a maritime context (e.g. Barbot 1992; Bennett and Brooks 1965; Blake 1967; Bosman 1967; Brooks 1962: 71-77; DeCorse 2001: 21; de Marees 1987: 8-10; Hair 1994b). This exchange represented a complicated and dynamic network, involving trade goods from Europe, Asia, and Northern Africa, and eventually the Americas. After arriving at the coast in the holds of ships, these commodities were exchanged for goods and enslaved Africans coming from the interior through indigenous African trade networks. As such, this traffic provides a fascinating example of the emergence of a global economy and of the role non-Europeans played in this socio-economic interaction.

Shipwrecks hold the potential to present an entirely new perspective on the contact period in Ghana by yielding original examples of the trade goods and other material culture that were exchanged in this region. Shipwrecks (as opposed to vessels purposefully abandoned when no longer functional) were catastrophic events, and the resulting submerged archaeological sites often preserve large amounts of materials in better states of preservation compared to land sites (Hamilton 1996; Robinson 1981; Rodgers 2004; Singley 1988). In West Africa, goods that made it safely into the hands of African brokers were quickly dispersed into the hinterland, leaving only a fraction of material to enter the terrestrial archaeological record at coastal sites. While cultural deposits on land sites allow archaeologists to view changes and continuities over the *longue durée*, the impact of any particular nation or trading interest is often obscured (Braudel 1984; Chouin and DeCorse 2010: 145). This can make investigations into more specific periods ambiguous (DeCorse 2001:146-147). Therein lies the potential

contribution of nautical archaeology: the ability to recover a large amount of material culture involved in African-European trade with the possibility of tight temporal contexts and potential national origins for the wrecks investigated.

An investigation of underwater archaeological sites on the Ghanaian coast can be particularly helpful in the study of commodity exchange and the West African trade. Exchange on the coast is poorly documented in historic accounts; early chroniclers focus on initial explorations of Africa and the quest to find a maritime route to India, largely ignoring the details of African-European commerce and interactions (Elbl 1986: xxxi; Hair 1994a: 105). Later sources, including trading accounts and shipping registries, offer only limited insights into the specific types of goods traded. For example, contemporary trading lists often summarize enormous varieties of brass and pewter wares as “Guinea basons,” “brass pans” or “wrought pewter” with little specifics as to what these terms actually mean (Donnan 1965: 362-363, 536). This places archaeological research of wreck sites in a unique position to contribute to our understanding of the material culture involved in this exchange.

In addition, this research promises insights into the unique potential of nautical archaeology to contribute to a broader anthropological perspective on culture contact. By focusing on the vessels lost while sailing from one social context into another, nautical archaeology seems particularly suited for the study of cross-cultural interaction, and the material culture that mediated this exchange. The ships themselves served as the instruments of this movement of things, people and ideas across cultural milieus; the goods carried in their cargo holds reflect both European and African economic and social forces (e.g. Thomas 1991). This can be seen as a give-and-take between what Europeans

sought to provide to the African market, and how African market desirability drove this exchange through the demands of seasoned coastal African merchants in a particularly challenging area of the world to trade in. Ships were intrinsically instrumental to the creation of the Atlantic World, and not only traversed geographical boundaries, but can be considered geographies unto themselves (Ogundiran and Falola 2010: 35). If, as Paul Gilroy argues (1993: 16-17), ships should be thought of as “cultural and political units rather than abstract embodiments of the triangular trade”, then an examination of theoretical approaches to the study of nautical archaeology will be useful.

Theory in Nautical Archaeology

The perfection of a self-contained underwater breathing apparatus (S.C.U.B.A.) in the 1940s granted access to the underwater world on an unprecedented scale. Archaeologists soon began to take advantage of this technology to investigate underwater sites. In 1949 French archaeologists donned dive gear to record an inundated Roman site at *Fos-sur-Mer* (Beucaire 1964), and in 1960 George Bass and Peter Throckmorton conducted the first underwater excavation of a shipwreck site in Turkey (Bass 1967). Although these early efforts focused on Mediterranean waters, as the discipline evolved nautical archaeologists expanded into other regions where shipwrecks provided insights into the human past (Babits and Van Tilburg 1998: 115-140; Bass 1966; 1972; 1975; 1988a; Green 1977; 1989; Muckelroy 1978; Throckmorton 1964; 1970; 1987). Despite initial skepticism on the part of classical scholars and more traditional archaeologists (see Bass 1975: 127-130), the investigation of underwater sites is now generally accepted as an important specialization within the broader field of archaeology.

While the potential of nautical archaeology to address a wide variety of research questions is clear, the field's disciplinary home, theoretical grounding, and research agenda are still unfolding. Early attempts to grapple with the broader potential for nautical archaeology include Lucien Basch's seminal article published in the very first issue of *The International Journal of Nautical Archaeology and Underwater Exploration*, which would eventually become the leading academic journals focusing on nautical archaeology. In this article, Basch sees the value of nautical archaeology (which he calls "naval archaeology") as contributing to seven distinct areas: the history of art; the history of technology; the history of harbors; the exploration of former land sites now submerged; the study of ancient anchors; and the history of international trade (Basch 1972: 1-2). While Basch's concept of the value of nautical archaeology illustrates the early influence of Mediterranean studies and classical archaeology, it nevertheless provides an interesting perspective of how early practitioners viewed the field.

A major attempt in the 1970s to refocus theoretical approaches within the field was voiced with the publication of British archaeologist Keith Muckelroy's volume *Maritime Archaeology*. Muckelroy espoused the benefits of historical, ethnological and archaeological approaches in the study of seafaring, and he defined maritime archaeology as "the scientific study of the material remains of man and his activities on the sea" (Muckelroy 1978: 4). Muckelroy emphasized that the primary object of study should be people, not necessarily the ships, cargoes, fittings or instruments with which the archaeologist is immediately confronted with. He also stressed that the phrase "maritime archaeology" encompasses more than boats or ships, but rather relates to everything that is connected with seafaring in its broadest sense. This is distinct from "nautical

archaeology”, which Muckelroy considered the specialized study of maritime technology including the boats, ships, and ancillary equipment necessary to operate them (Muckelroy 1978: 4-5).

A key aspect of Muckelroy’s approach was the conception of a theoretical framework with three distinct levels: the shipwreck, the ship itself, and the maritime culture in which the ship was embedded. He conceptualized the shipwreck as the event by which “a highly organized and dynamic assemblage of artifacts are transformed into a static and disorganized state,” or essentially the site formation processes that result in the site studied by the archaeologist. Central to the understanding of these processes are what Muckelroy called extracting filters that lead to the loss of material on the wreck site, and scrambling devices that can rearrange materials on the seafloor and affect interpretation of the site (Muckelroy 1978: 157-169). His focus on the ship involved attempting to reverse the wrecking process and “move back through the system to the original ship itself”, to learn as much about the original vessel as possible relying on the archaeological data. In this discussion, he conceptualizes the ship in terms of a machine, as part of a military or economic system, and as a closed community of seafarers onboard at the time of sinking (Muckelroy 1978: 215-225). Finally, Muckelroy argued the ultimate goal in studying shipwrecks was to go beyond the individual and specific events related to a site, and examine the maritime culture which they represented. *Maritime Archaeology* represents one of the early attempts to seriously grapple with issues related to theory within the discipline. Keith Muckelroy’s untimely death in a diving accident soon after its publication robbed the field of a skilled and innovative contributor.

Despite Muckelroy's efforts, a rift continued to divide the more theoretically oriented terrestrial archaeologists from their nautical counterparts, not only methodologically but intellectually as well. The next attempt to explicitly grapple with issues related to theoretical approaches in maritime archaeology occurred at the School of American Research (SAR) seminar entitled "Shipwrecks as Anthropological Phenomena," and subsequently published as an SAR volume titled *Shipwreck Anthropology* (Gould 1983). In the volume, an anti-anthropological stance was championed by George Bass, a leading founder of nautical archaeology, who questioned whether or not an anthropological approach can add anything to our understanding of human behavior connected with shipwrecks (Bass 1983: 95-100).⁵ Other scholars participating in the seminar posed more basic questions. One participant stressed that "there is nothing inevitable about the relationship between shipwreck archaeology, or any other kind of archaeology, and anthropology. This relationship, which has seen its greatest development among American-trained scholars, is not a necessary one, and its value must be demonstrated by those who advocate it" (Gould 1983: 6). Participants also criticized the "inchoate nature" of anthropology as it is practiced today, and whether nautical archaeologists should jump onto some sort of "...anthropological bandwagon when the anthropologists themselves are uncertain about what kind of social science, if any, they are involved with" (Gould 1983: 7). While the overall tone of the volume emphasizes the great potential for maritime archaeological studies (even if this potential had not, in their opinion, been achieved), the critical stance held by some of the

⁵ It should be made clear that this was Dr. Bass's opinion at the time, and his stance has altered somewhat since. I also want to stress that the Nautical Archaeology Program at Texas A&M is based in the Anthropology Department, and their graduates are versed in the broader field of Anthropology.

participants toward anthropologically-oriented studies of shipwrecks and other maritime-related sites was clear.

This antagonism or disregard for an anthropological approach in shipwreck investigations articulated by the SAR participants should be considered a distinct issue from an explicit anti-*theoretical* stance by these authors.⁶ Many of the participants, including the organizer and editor of the resulting volume itself, Richard Gould, have directed substantive studies of shipwreck sites that incorporate disparate theoretical perspectives and datasets for a fuller understanding of the dynamic nature of such sites (Gould 1983; 2000; 2007). George Bass, one of the participants who most avidly expressed criticism toward an anthropological approach to archaeology, has a proven record of interpreting ships from antiquity within a dynamic Mediterranean world of intercultural exchanges while steadfastly avoiding couching his research within an anthropological framework (Bass 1988a; 1986; 1973; 1967; Bass and Van Doorninck 1982).⁷

Still, if most terrestrial archaeology conducted in North America maintains this close connection to the broader field of anthropology, it is worth examining why this connection is not a foregone conclusion within the nautical archaeological discipline. A key factor stems from the historic development of nautical archaeology as a scholarly specialization in the United States. Texas A&M University's Nautical Archaeology

⁶ This is a particularly relevant point considering Muckelroy's (1978) influence on theoretical perspectives within maritime archaeology. He saw the key approaches to the study of the field being historical, ethnological and archaeological, conspicuously leaving an explicit *anthropological* approach absent from his analysis (e.g. Muckelroy 1978: 4). This is mainly due to the tradition in England of considering archaeology as linked more to history and classics rather than anthropology.

⁷ Bass sums up his perspective in writing; "Just as I have no desire, or perhaps ability, to become an astronomer, criminologist, or athlete after enjoying books on astronomy, criminology and sports, even the most stimulating of the anthropological readings did not make me regret that I am not an anthropologist. The farmer digs into the ground for different reasons than a miner, and a classical archaeologist digs for different purposes than does an anthropologist" (Bass 1983: 94).

Program (begun by Bass and Van Doorninck in 1976), is technically considered a part of the Anthropology Department, yet its curriculum and focus exist largely independently from the Department. This is a reflection of the founding faculty members' training in classical archaeology and their general criticism of anthropological approaches to the study of the past (Bass 1983 :95-100; Lenihan 1983: 43). The second program to offer a specific focus on archaeological shipwreck sites in the United States began at East Carolina University in 1981. From its inception, however, East Carolina's program took root in maritime history rather than archaeology or anthropology. Thus, nautical archaeology in the United States developed with perspectives and aims independent of anthropological archaeology as practiced in the majority of American university programs.

While American terrestrial archaeology arguably follows more explicitly along anthropological tenets, nautical archaeology, for a variety of reasons, does not necessarily adhere to the same framework. In addition to the historical development of the discipline outlined above, advances in nautical archaeology have relied heavily on contributions by foreign scholars, who (like Muckelroy) generally see archaeology either as an independent field of study or as a specialization within history rather than a sub-field of anthropology (e.g. Sutton and Yohe 2006: 5-8; Willey and Phillips 2001: 6-7; Willey and Sabloff 1993: 5-6). European archaeologists have called for a greater interaction between maritime archaeology and terrestrial archaeology, even if they do not necessarily advocate an explicit anthropological perspective. In his critical overview of maritime archaeology, as practiced particularly in Sweden, Carl Olaf Cederlund argued that “The greatest potential seems to lie in an independent development of marine archaeology

integrated with mainstream archaeology: the theoretical basis for archaeology is generally the same, regardless of individual specialist fields” (Cederlund 1995: 12).

One avenue of maritime archaeological conceptualization that has taken hold on an international front is Christer Westerdahl’s maritime cultural landscape. This concept came to fruition through maritime surveys conducted by Westerdahl and others in Sweden’s Norrland as a means of incorporating archaeological finds on land and underwater (Westerdahl 1992: 5). Defined by Westerdahl as comprising the network of sailing routes, ports and harbors along the coast, related constructions and the remains of human activity in both underwater and terrestrial contexts, he argues that it “mirrors then entire range of maritime economies, that is, *mariculture*” (Westerdahl 1992: 6). Again, while not explicitly anthropological, the maritime cultural landscape has proven a useful theoretical concept and has seen expression in maritime archaeological work throughout the world (Cederlund 1995; Firth 1997; Hunter 1994; Jasinski 1993; 1999; Myhre 1985; McErlean *et al.*, 2002; Stewart 2007; Westerdahl 1991; 1992; 1994).

This more open approach to theoretical perspectives involving maritime sites can be seen in more recent work by scholars in the field. Joe Flatman maintains that theory is in fact used in maritime archaeology, even if it’s implicit, and that “any refutation of this fact is implicitly theoretical in itself” (Flatman 2003: 143). He cites advances in European maritime archaeology, including multivariate expressions of the “ship as symbol” that, even if not explicitly anthropological (as noted above regarding Cederlund’s work), are theoretical constructs worthy of consideration (Adams 2001; Cederlund 1994; 1995; Crumlin-Peterson and Munch-Thye 1995; Flatman 2003: 143; Gibbins and Adams 2001; Maarleveld 1995; Wedde 1996, 2000).

Contributions by Australian archaeologists, in particular Mark Staniforth (currently at Monash University, and recently of Flinders University), have led to new approaches in applying theoretical constructs to maritime archaeology. Among Staniforth's contributions is a plea to revisit the potential for *Annales* historical approaches in the study of shipwrecks and other maritime sites (Staniforth 2001; 2003). He draws upon Fernand Braudel's three scales of history, namely: the short term or event (*événements*); the medium term concerned with processes or social time (*conjonctures*); and the long term dealing with structures and world views (*longue durée*). Staniforth states that investigations of specific wreck sites, which he categorizes as "events", can lead to larger scale interpretations regarding capitalism, consumption and colonization (Staniforth 2001: 44). He further argues that by incorporating the event into *conjonctures* or even the *longue durée*, maritime archaeology "has some of its most powerful explanatory value" (Staniforth 2003a: 30). As discussed below, Staniforth's perspective resonates with the theoretical vantage employed in the research in coastal Ghana.

Yet, if an openly espoused anthropological approach is not necessarily a *de facto* requirement for nautical archaeological pursuits, developments in the field suggest that maritime archaeology is finding a home within anthropology. More explicitly anthropological approaches to the discipline are recently forthcoming, as established anthropology departments embrace nautical archaeology as a specialization worthy of study (at Brown University and the University of West Florida, for example). There is also a trend wherein graduates of nautical archaeology programs are pursuing their doctoral degrees in more traditional historical and anthropological departments, such as the underwater component at Syracuse University. As discussed below, over the past

decade nautical archaeological research in coastal Ghana has produced three dissertations, including this one, and an M.A. degree. While many nautical archaeologists today would still question the maxim "archaeology is anthropology or it is nothing" (Willey and Phillips 2001: 2), at least a growing number of specialists who investigate shipwrecks see an anthropological framework as a viable means of conceptualizing the past. It should, however, be kept in mind that the disciplinary ties and substantive grounding of nautical archaeological studies with the critical use of historical sources remains a very important component of nautical archaeological research, particularly with regards to the study of the Atlantic World.

Discussion

In reviewing the varieties of theoretical approaches that have been applied to nautical archaeology in the course of the discipline's development, it is useful to examine any congruities within these arguments to plot a way forward for nautical archaeological studies. Whether one argues for using specific wreck sites to understand the broader maritime culture (Muckelroy 1978: 226), or the particularistic study of astragals from a Canaanite wreck to gain an understanding of Bronze Age maritime superstitions (Bass 1983: 101), or the study of a wreck or *événement* to understand the broader world view or *longue durée* (Staniforth 2001: 44), the central goal implied from each of these approaches is a movement from the study of a specific site to broader understandings of social phenomena. As these varied practitioners argue, a number of theoretical pathways exist that can lead us to this objective, including historical, archaeological, sociological, and (I maintain), anthropological perspectives.

I believe that broader approaches, incorporating anthropological and historical disciplines in particular, can lead to a fruitful analysis of such sites, and that this perspective is particularly appropriate within the context of the West African trade. While the study of a specific wreck site may represent what Braudel and Staniforth would call the “event”, placed in its broader context such studies offer insights into culture contact, the role of trade in this interaction, and the potential for material culture to illuminate aspects of both African and European agency in this relationship.

This sort of approach can be seen in the work of Pietruszka and Horlings, my colleagues at Syracuse University who have conceptualized their research into varying scales of investigation in order to place individual sites into their broader social and economic contexts. In his research on the Elmina Shipwreck site and the Benya Lagoon site, Pietruszka utilized a multiscale approach incorporating multiple vantages to understand these sites and the broader social, political and economic contexts they existed in. This analysis places the “particularistic elements of archaeological minutia within a context provided by a macroscopic model, leading to a fuller site-specific interpretation that conversely contributes insight into large-scale social change” (Pietruszka 2011: 14). Horlings relied on a multiscale framework following French’s four scales of resolution (French 2003: 6-7). While French applied this toward understanding landscape evolution in a geoarchaeology setting, Horlings uses a similar approach in understanding the maritime landscape of coastal Elmina. The scales of resolution include: the macro-environment, defined as the effects of climate, topography and geology; the meso-environment, or the immediate area of either land or sea extending out to 5 kilometers (3.1 miles); the immediate environment of the wreck site; and the

micro-environment, including sediment-forming and transforming factors that can destroy or skew evidence and affect interpretations (Horlings 2011: 103; French 2003: 6-7).

The examination of archaeological sites within a multi-scalar context has been advocated before (e.g. Deagen 1988; Delino-Musgrave 2006; Gilchrest 2005: 331-333; Little 1994; Little and Shackel 1989). In historical circles, the notion of that intense reflection on an event, place or life can yield insights across scales of time and space has been called “microhistory” (Walton, Brooks and DeCorse 2008: 3). Microhistory places value in the local perspective as the unit of study for understanding global patterns and wider narratives, and was developed as an alternative to *Annales* approaches that resulted in broad, overarching historical patterns over long periods of time (e.g. Ginzburg 1993; Muir and Ruggiero 1991). These approaches focus on the local event or microscale as a means of illustrating and understanding the global impacts or macroscale. As such, they provide an effective means of harnessing one of the strengths of archaeology, namely its capacity to study small scale processes and relate them to broader contexts and meaning. This can be particularly effective in examining the remains of shipwreck sites that may be situated far from their national or built contexts, and happen to sink enroute to their destinations, or as apparently happened with the Elmina Wreck, offshore of their intended trading port.

Framing the Maritime Archaeology of Atlantic Africa

African-European interactions in coastal Ghana, and the archaeological record of these activities can be understood within global socio-political and economic

transformations of the post-fifteenth century period. During this century various socio-economic factors on the Iberian peninsula, combined with advances in ship construction and navigation techniques, initiated an era of unprecedented contact between peoples previously separated by immense distances (Benjamin 2009: 81-90; Cañizares-Esquerria and Seeman 2006: Boxer 1969: 2-14; Diffie and Winius 1977: 37-42; Russell-Wood 1992: 129). In vessels such as the *caravela* and *nao*, sailors embarked upon open-ocean voyages of longer duration than ever before, turning oceans into highways instead of obstacles. A shift in scale occurred, where places reachable only by arduous journeys overland (or not at all) became effectively closer, and regions once unknown grew familiar.

By the beginning of the sixteenth century, Portuguese sailors circumnavigated Africa and established maritime trade routes with India, eastern Asia and the Americas (Boxer 1969: 11; Egerton 2007; Falola and Roberts 2008: 27-35; Parry 1981: 117-134). This maritime revolution ushered in a dramatic period of cultural interaction, which (for better and for worse) impacted world history on a massive scale. The Atlantic Ocean had become the “inland sea of Western Civilization, a new Mediterranean on a global scale, with old seats of culture on the east, a great frontier for expansion on the west and a long, integral African shore” (Franklin and McKee 2004: 1; Meinig 1988: 64-65). This unprecedented contact resulted in societies fundamentally different from what they would have been without participation in the new transatlantic network (Eltis 1999: 141; Orser 1996; Ogundiran and Falola 2010: 10-13).

This context of the Atlantic World and wide-scale culture contact lends itself to a holistic approach in the archaeological investigation of wreck sites that occurred as a

result of these processes. As the driving force for these developments was the pursuit of profits through commodity exchange, archaeological investigations of the material culture preserved in shipwreck sites seem particularly suited to elaborate on these phenomena. Thus my research relies on a theoretical foundation incorporating culture contact, the trade of commodities in the mediation of this interaction, and the flow of goods through entrepôts on the West African coast.

Prior to the late nineteenth century most African-European interactions in West Africa primarily occurred within a context of maritime expansion and commerce. As the initial Europeans to make maritime contact with West Africa, Portuguese mariners established trading relationships in the region as they explored the African coastline, and these explorations eventually culminated into the opening of a maritime route to India (Blake 1967: 3-18; Boxer 1969: 2-14). In Immanuel Wallerstein's examination of the modern world-system, these activities served to expand the "geographical size of the known world", a key facet in the development of a global economic network (Wallerstein 1974: 38). The modern world-system, according to Wallerstein, came into existence beginning in the late fifteenth century as a result of three primary factors; Europe's maritime expansion into other world areas, the development of variegated methods of labor control for different products and zones of the world-economy, and the creation of relatively strong state machineries in the core-states of this capitalist world-economy.

An inherent aspect of Wallerstein's model is the disparate hierarchy existing between the highly developed, specialized core areas and the less developed, exploited periphery. The concept of an international division of labor resonates with some researchers, who see this as a key factor in the hegemony resulting from the interlocking

of different parts in the world system (Sella 1977: 30). This is just one factor in world-systems theory's appeal to social scientists, who appreciate a model incorporating such a range of historical, political, social and economical factors within its paradigm. As archaeologists, and historical archaeologists in particular, approach their subjects of study within a global rather than site-specific or regional framework, the world-systems model serves as a means of conceptualizing wide ranging processes that affected people even at the smallest scale (DeCorse 2001: 11).

With their stated attempt to explain the hegemony prevalent in modern political and economic relations, however, world-systems theorists frequently seem deterministic in their dealings with particular historical situations. There is little consideration of peripheral responses or contributions to the world system (Wolf 1982: 21-23).

Interaction between Europeans and indigenous peoples inevitably appear unbalanced, with Europeans' advantages based on economical and technological superiority. Though this plays well in a macroscopic view of history, such an approach threatens to denigrate the roles played by non-Europeans in this cultural interaction (DeCorse 2001: 12; Mintz 1977; Thornton 1996: 4). The resistance and agency of indigenous societies faced with the daunting resources of imperialistic states remains a powerful yet understated conception (Thomas 1991: 84).

I seek to examine contact and interaction between Africans and Europeans within a framework that recognizes the choices and decisions made by all actors involved in this interaction. It is my contention that the African states trading with European ships along the Ghanaian coast were not simply passive recipients of western trinkets for which they traded their gold and slaves, but that they were active agents who maintained a large

degree of influence and power in these interactions. The sophisticated traders and merchants who met European sailors on West African beaches were part of vast trade networks ranging across the Sahara into Northern Africa and beyond, networks that existed long before European contact (Alpern 1995: 5-6; Curtin 1984: 21-24; DeCorse 2001: 145-146). In the centuries following this contact, coastal African states manipulated their social, economic and political relationships with Europeans to consolidate their power in the region (DeCorse 2001: 13). Any study of African-European interactions must be firmly rooted within this dynamic context of power relations, trade and agency.

As a means of accomplishing this, I interpret the material culture of shipwrecks in the West African context as unique archaeological assemblages reflecting the social and economic aspects of not only their ports of origin, but also their intended destinations and potential markets for their cargoes. Items shipped in the holds of European vessels plying the West African trade can be seen as "entangled objects," with multiple meanings and values created by their intercultural context (Thomas 1991: 4-6). This type of material and cultural exchange can be seen as an inherent human capacity, prompting some scholars to describe the global exchanges as a "cultural supermarket" (Mathews 2000: 19-20). Interpreting material culture from archaeological shipwrecks within the historical context of African-European relations will lead to a richer understanding of this contact, and will provide a voice for indigenous societies who played an active role in these cultural interactions. This viewpoint requires a unique approach in looking at the commodities shipped in the holds of ships bound for the African market. It also necessitates a realization that objects are not necessarily what they were made to be, but

what they have become, and examining their trajectory across geographical and social space is as important as their final context in the archaeological record (Appadurai 1986: 5; Thomas 1991: 4).

Shipwrecks and the Flow of Goods

Theoretical approaches to the study of shipwrecks involved in the West African trade rely heavily on an understanding of their particular historic, economic and social contexts. Soon after initial contact, the Portuguese crown established permanent trading fortifications in West Africa, increasing the security and efficiency of its maritime trade network. *São Jorge da Mina* was the first, and most important, trading fort built in the region, but other key trading areas included Shama and Axim (Blake 1967: 19-22, 53, 94; DeCorse 2001: 47-50; 2010: 214-219; Hair 1994b: 11, 77, 128-129; Kimble 1967: 118-122; Vogt 1979: 8). Isolated trading stations established on the coast provided the setting for much of the African-European interaction and trade in West Africa (Eltis et al. 1999: 12). These outposts were often staffed by small numbers of European soldiers, merchants and bureaucrats, who conducted their affairs largely within African sociocultural contexts. The associated African towns such as Elmina, Axim and Shama played a pivotal role in the contact between Africans and Europeans.

From initial European contact with the Mina Coast in the 1470s to the decline of maritime trade in the twentieth century, the ships bringing goods in and taking commodities from the African coast remained an obvious and crucial aspect of maritime trade in the region (Elbl 1994: 91; Oliveira 1580; Prestage 1933; Silva Marques 1944; Smith 1993). The settlements and villages where ships traded can be considered contact

centers where exchange took place, and in each region of trade a few principal trading ports tended to account for vast majority of the traffic (Eltis et al. 1999: 19). The physical locations in which contact between societies occurs can be conceptualized in a number of ways; they have been described as peripheries, frontiers, boundaries, borderlands or "forward-line contexts" (Rice 1998: 44-47). In Colin Renfrew's discussion of land-based trade, he describes destination centers in trading systems as nodes of exchange (Renfrew 1975: 41-44). Renfrew distinguishes between ten different modes of trade, and uses these modes to predict distinct patterns in the material culture resulting from different ways of organizing trade. Many of these nodal, or destination sites are archaeologically visible and well known in historic documentation. Excavations have contributed to our understanding of the organization and social complexities of these some of these sites in West Africa (DeCorse 2001; 2010; Kelly 1997a; 1997b; Redman 1986). While considerable work remains to be conducted, in archaeological terms the nodes of this transportation system are relatively accessible, at least potentially, for future research.

The other crucial variable in this transportation system is the flow of materials and goods between the trading towns and settlements, or the "nodes of exchange" in Renfrew's words (Renfrew 1975: 41). Retrieving this information from the origins or destinations of trade materials proves somewhat problematic. Many trade goods were dispersed after their arrival at a market center or town, making it unlikely that they ever entered the archaeological record at all. Although evidence of trade materials sometimes survives at the sites of their origin or destination, a large portion of these materials do not preserve well in archaeological strata. Most historic centers of trade and commerce

developed into modern towns or cities today, and expanding construction and populations further obscure archaeological evidence.

Another way to study the material culture of trade would be to target the flow itself, in the form of caravans or convoys which transported these goods between nodes of exchange. On land these types of sites are nearly impossible to find due to their rarity and low visibility. Exceptions exist, such as a cache described as a caravan "shipwreck" (*nauffrage*) found in the southern Moroccan desert, composed of brass rods, coris, rope and packing material (Monod 1969:288). These instances, however, are extremely rare. If there was an interruption in transport within these contexts (a caravan getting lost and failing to make it to its destination, for example), the potential archaeological site resulting from this tragedy would be easily accessible by other contemporary traders or travelers, and sooner or later would be looted and dispersed by passersby. If any aspects of this site were preserved, it would be extremely difficult to locate archaeologically. Only a chance find might bring such a location to light, and even then it would likely not provide a well-preserved record of the transported goods.

These factors challenge our understanding of the flow aspects relating to African-European exchange in coastal Ghana. The study of long distance trade, often conducted via maritime routes, also suffers from handicaps: the documents describing this trade are incomplete and biased; a great deal of illicit trading occurred for which there are no extant records; and trade goods were often dispersed soon after arriving at port destinations, leaving little presence in the terrestrial archaeological record (DeCorse 2001: 147).

A significant advantage that we have in examining maritime trade in West Africa lies in the potential to locate, recognize and excavate intact shipwreck sites representing the flow of goods to trading centers. Sailing vessels provided the means of transporting materials to and from West Africa, under conditions which often proved hazardous along the area's rocky coasts. As a result, many of these vessels never made it to their destinations, and now lie in shallow waters awaiting archaeological investigation. Access to underwater sites has only become possible with the advent of S.C.U.B.A. technology relatively recently. This means potential sites that might document the flow of goods between Europe and Africa have remained relatively unaffected by human activity since their deposit into the archaeological record. Modern remote-sensing and diving techniques render these sites accessible to archaeologists interested in studying long distance trade first-hand. In this context, the material culture of shipwrecks promises to be a crucial source for examining the flow of goods entering or leaving the Ghanaian coast. These unique sites will therefore play a major role in future investigations of culture contact, trade and interaction in West Africa.

Commodities and Shipwrecks

As the remains of trade goods will likely be part of any shipwreck site investigated on the Ghanaian coast, some consideration must be given to commodity exchange and its implications within the context of African-European contact. The primary driving force behind Portugal's maritime enterprises was the quest for profits, typically in the form of gold, spices or slaves. These were acquired through the exchange of European manufactured goods, as well as a variety of items produced in other world

areas such as Indian and North African textiles (Alpern 1995; DeCorse 2001: 145-174; Elbl 1986: 375-415; Herbert 1984: 127; Sundstrom 1974: 155-161; Vogt 1975: 625; 1979: 67-74). A considerable body of literature deals with the study of exchange, with contributions by anthropologists, sociologists, economists and historians (Appadurai 1986; Bohannan 1955; Carrier 1995; Chapman 1980; Douglas 1967; Douglas and Isherwood 1981; Gregory 1982; Malinowski 1922; Marx 1971; Mauss 1976; Pomeranz and Topik 1999; Thomas 1991; 1992; Turgeon 1997; and others).

For the purposes of my research, a commodity can be defined simply as a socially desirable thing with a use value and an exchange value (Appadurai 1986: 6; Gregory 1982: 10; Kopytoff 1986: 64). Commodity exchange is distinct from gift exchange in that the objects involved are not necessarily associated with each transactor, nor do they always reflect any past or future relationships between transactors (Carrier 1995: 20). On the Ghanaian coast, early European merchants frequently traded items manufactured in regions far from their homelands, and coastal Africans generally exchanged gold, slaves or other items that originated from the hinterland (DeCorse 2001: 143).

From earliest contact, European traders sought to anticipate West Africans' tastes in fabrics, beads, ceramics, and other commodities (e.g. Alpern 1995: 6-7; Blake 1967: 54; DeCorse 2001: 143-144; de Mares 1987: 34, 53, 80; Hopkins 1973: 111; Kimble 1967: 120). Merchants went to great effort, and experienced considerable frustration, in attempting to fathom coastal Africans' preferences in trade goods, as this constituted the central factor in the profitability of a voyage. The feedback gained from trading on the coast related directly to the types of goods a captain or merchant would request upon return to Europe for future voyages to the region (de Mares 1987: 51-54). To ignore the

power of African traders in this exchange, and focus solely on trade goods made by Europeans and shipped in European vessels, denies the multicultural context and African agency in this interaction. Trade goods from shipwrecks will not necessarily provide insights into the African consumption of these goods or speak of the impacts that trade had on African societies (these are important contributions made by terrestrial archaeologists working in the region). They will, however, to some extent reflect African agency, desires and tastes which played a key role in the types of things that made their way into West African markets.

In Arjun Appadurai's examination of commodities in cultural perspective, significance of commodities rests in their form, their uses and their trajectories. Thus, though humans encode things with meaning "...it is the things-in-motion that illuminate their human and social context," (Appadurai 1986: 5). Shipwreck sites and their cargoes must be seen as elements in the broader interaction between Africans and Europeans. Trade goods found in an archaeological shipwreck site on Ghana's coast give testament not only to the static commodities making up the cargo of a ship, but of the trajectories of these commodities in a cross-cultural milieu.

Through the investigation of shipwreck sites on Ghana's coast, archaeologists will gain access to commodities whose trajectories were interrupted through the catastrophic loss of the vessels transporting them between social contexts. This quality places archaeological shipwreck sites in a unique position to contribute to our understanding of cross-cultural exchange.

Summary

This dissertation focuses on the examination of shipwreck sites in West Africa contextualized within culture contact, the trade of commodities in the mediation of this interaction, and the flow of goods that literally bridged marine pathways between Europe, Africa and the Americas. As stated above, there are varied theoretical pathways that lead from the specific (the wreck site) to the general, and for this study I rely on a multiscale perspective, drawing on both anthropological and historical theory, to place the shipwreck within the wider historical, cultural, social and economic contexts in which it functioned. Moving from the unit of study (a shipwreck site) to the more nomothetical understanding of its broader social and economic significance is a key to achieving more than a mere descriptive study of a wreck site. These goals are summed up succinctly by Walter Taylor over 50 years ago:⁸

Archaeological data, then, consists of the material results of cultural behavior, and the affinities--quantitative, qualitative, spatial, etc.--which can be found to exist among them, and between them and the natural environment. But mere description of these phenomena cannot satisfy the requirements of archaeological study if the archaeologist is bent upon writing history or studying culture. Description must be made, to be sure; but there is also the need for interpretation and synthesis (Taylor 1948: 112).

Nautical archaeologists are beginning to overcome an emphasis on descriptive analyses and particularistic investigations of shipwreck sites that have drawn criticism from their terrestrial counterparts by contextualizing such sites within the broader social and economic patterns in which such vessels operated. The “description” (as Taylor put it) or the “event” (as espoused by Staniforth) of archaeological sites, while not in

⁸ It should be noted that Taylor expressly advocated for an *anthropological* approach to the study of the past as a means of integrating disciplines and creating a holistic view of past life ways. Though discussions above make it clear that this may not be the only way to an integrative and holistic archaeology, it is clearly a pathway utilized by many scholars.

themselves the final objective, do necessarily become the foundation upon which synthesis and a more complete understanding can be built upon. As seen in the discussion above on microhistory, rather than downplaying the importance of the specific, embracing it as a crucial means of explaining broader phenomena can be a powerful means of conceptualizing the past. Close examinations of localized and specific data sets, which characterize the initial investigative scale of most archaeological research, have the potential to bring new perspectives and give greater relevance to wider patterns of events. This provides a pathway from the specific to the nomothetic, as espoused (albeit not in these terms) by archaeological practitioners as varied as Taylor, Muckelroy and Bass.

My research is informed by this framework; rather than simply describing isolated shipwrecks in West African waters, I will interpret these sites within a broader context of international trade, global markets and African agency. By utilizing a theoretical framework incorporating a microhistorical investigation of a wreck to elucidate anthropological constructs of culture contact, the exchange of commodities, and the flow of goods through nodes of exchange, shipwreck investigations in Ghana will be poised to make significant contributions to the study of African-European interaction and trade.

CHAPTER 3: THE HISTORIC CONTEXT: THE ATLANTIC TRADE WITH WEST AFRICA

Castelo São Jorge da Mina

The coastal town of Elmina, situated in Ghana's Central Region, is the focal point of this research. The African settlement and associated European outpost served as a nexus of African/European interactions for over four centuries, and can be considered among the best places to study the impact of Atlantic trade on African societies (DeCorse 2008: 89; 2001: 7). The trading entrepôt of Elmina was the first European structure built in sub-Saharan Africa, and remained an important component of Portugal's attempt to maintain a trading monopoly in the region until their loss of the site to the Dutch in 1637. Thereafter Elmina served as the headquarters for the Dutch presence on the coast until the British took control of the castle in 1872. This focus upon maritime trade requires a critical examination of topics including: the development of the European presence in coastal Ghana, the types of trade goods brought into West Africa in the holds of sailing vessels, and the African products for which European (and later American) traders hoped to exchange their goods. These issues constitute the primary avenues of historic research in this study, establishing the context for shipwreck sites resulting from the West African trade and the maritime archaeology of coastal Ghana.

European Exploration and Contact

Portuguese interests in Africa began in the early fifteenth century with the conquest of Ceuta in what is now Morocco. The Infante Dom Henrique, third son of King João I, was among the invading force, and would later devote his political power and energies toward the exploration of the African coast. The combination of monetary

gain through military expansion coupled with religious zeal led to the capture of Ceuta and the instigation of a prolonged campaign of exploratory voyages that lasted through much of the fifteenth century (Crone 1967: xvii-xxx; Kimble 1967: 104). The discovery of Madeira and Azores in the 1420s provided key resupply points for African voyages, and further explorations by Gil Eanes in 1434 around the feared Cape Bojador dispelled notions that the waters beyond this point were unnavigable. Exploration continued, despite occasional periods of warfare and diverted interest: in 1460 the Portuguese reached Sierra Leone; by 1471 mariners encountered the gold trade on the Mina coast; Bartolemeu Dias rounded the Cape of South Africa by 1488, and Vasco da Gama completed his two-year voyage around Africa to India in 1499 (Boxer 1969: 15-31; Blake 1967: 3-18; Hair 1994b: 1).

The first Portuguese mariners to sail along modern Ghana's coastline in the late fifteenth century encountered scattered fishing and farming communities near the water and adjacent hinterland (Blake 1937: 11; Chouin and DeCorse 2010: 144; DeCorse 2005: 45-45; DeCorse 2001: 17-20). At this time the largest African settlements were located in the interior, reflecting the importance of ancient trans-Saharan trade networks which had dominated long distance economic exchange of the entire region for centuries. These people spoke Akan, a language family composed of several closely related dialects which today range from the Ivory Coast to eastern Ghana. The dialects and languages spoken in the region generally exhibit a "striking continuity" over time, according to ethnohistorians who have compared modern language distributions to historic evidence in early European accounts (Hair 1967: 247; Chouin and DeCorse 2010: 123). This is even

more remarkable when considering the immense changes that occurred as trade and interaction between Africans and Europeans intensified along the coast.

It is possible to infer more discrete variations within the larger Akan linguistic group during the European contact period by consulting some of the early European descriptions of the coastal peoples they encountered. While a survey of these is deemed useful, it must be kept in mind that European contact affected to some degree the coastal and hinterland regions as trade with Europeans intensified. Although there seems to be continuity in the names of these areas, more research needs to be done to determine just how the organization and population of these states was affected over time (Chouin 1998: 191-193; 2010: 35-36). Several early chroniclers described the principle states or kingdoms along the Gold Coast within a century or two after initial contact. Luis Teixeira's map dating to 1602 shows the location of several kingdoms including Komenda (Comendo) and Fetu (Afutu), both of which still exist today (de Marees 1987: xxiv). In the later seventeenth century Barbot listed forty-nine kingdoms or states, claiming that each was governed separately by kings or lords and most of them were fully independent (Barbot 1992: 333). Of these forty-nine kingdoms, he classified thirteen as "maritime states," including Sakoo, Axim or Atzyn, Warshas or Little Inkassan, Ante or Anta, Guafo or Commendo, Fetu, Sabou, Fanten or Fantin, Aghuwena, Acra, Labade, Ningo and Soko. Eguafo, a settlement still occupied today, was the center of a Fante state that controlled a portion of Ghana's central coast (Chouin 2010: 87-90; Chouin 1998: 191-193; Chouin and DeCorse 2010: 124; DeCorse and Spiers 2009; Spiers 2007).

This is, to the best of our knowledge based on the sources, the situation that the Portuguese faced when they first made contact with coastal Ghana. The Portuguese explorations of Africa, and their decision to establish a permanent presence at Elmina in the 1480s, represent one of the first attempts by a European power to build a distant economic and political empire. A seminal step in this process involved the establishment of the first European structure south of the Sahara Desert, *Castelo de São Jorge da Mina*, in the modern town of Elmina, Ghana. The Portuguese initially referred to the African settlement as the “Village of Two Parts”, possibly owing to the settlement’s placement on the narrow Elmina peninsula (DeCorse 2008: 80). The current name Elmina is a later corruption of the Portuguese “da Mina”. The settlement’s inhabitants were Akan, and today Elmina is Fante, an Akan group, though they maintain a number of distinct traditions (DeCorse 2001: 19; Hair 1967: 265-266).

One of the earliest accounts describing Elmina comes from Eustache de la Fosse, an interloper in the West African trade from Tournai (a city in modern Belgium), who was captured while trading at Elmina in December of 1479. He noted only two significant harbors along the coast, Shama and the “Village of Two Parts”, which later became known as Elmina. Trade with Europeans was only just beginning to be established at this early period—in fact, De la Fosse writes that it took several days for local merchants to get word that there were vessels to trade with and to assemble in the town of Elmina. During his twelfth day of trading on the coast, four Portuguese ships arrived unexpectedly and fired on De la Fosse’s caravel, forcing him to surrender. De la Fosse was forced to sell his own cargo at Elmina and was imprisoned there for a short time (DeCorse 2008: 47-48; Hair 1994b: 130-131).

As the De la Fosse account indicates, despite Portugal's attempt to maintain a monopoly on the *Costa da Mina* outsiders almost immediately sought to gain access to the region's trade. Due to this threat, as well as a need to solidify the Portuguese presence on the coast and increase trading efficiency, the advantages of establishing a fortified structure in the region soon became apparent. Elmina provided a good choice for several reasons; a sizable African settlement promised good access to trade and labor, and the town was located on a rocky peninsula which afforded raw materials for construction as well as some degree of protection of the Portuguese base and shelter for vessels (DeCorse 2010: 215-219; 2008: 78; 2001:21; Hair 1994b: 9-13; Horlings 2011: 67). A well-outfitted expedition led by Diego de Azambuja sailed to Elmina in 1482 to begin construction. After negotiations with Caramansa, described as the 'lord' of the village, and initial stumbles relating to the prerequisite gifts that the Africans demanded and an affront to sacred rocks by Portuguese laborers, construction of *Castelo de São Jorge da Mina* began (Hair 1994b: 17, 32). Within twenty days the rudiments of a wall and tower were completed, representing the first European structure built south of the Sahara. Azambuja remained at Elmina for over two years, overseeing the construction of a gallows and a pillory, and established the administrative and bureaucratic mechanisms of Portuguese-African trade in the region (Hair 1994b: 38).

European Competition on the Ghanaian Coast

Soon after the establishment of the trading fort at Elmina, similar (if smaller) structures were built at Axim (1503) and Shama (1526). Through these satellite forts, and the major settlement of Elmina, Portugal attempted to maintain its trading monopoly

in the region. From the outset, this proved a difficult proposition. The climate proved unfavorable to European settlers, with a high mortality rate due to dysentery, yellow fever and malaria, among other maladies (Curtin 1998: 1-4; DeCorse 2001: 198). These outposts were few with large distances in between, and were typically manned by relatively small numbers of soldiers, government factors and clerks (DeCorse 2010: 210-214; DeCorse 2001: 35-36). Azumbaja retained the services of sixty soldiers after the founding of the fort at Elmina, and through the mid-sixteenth century the numbers in the fort rarely exceeded this (Blake 1967: 50-51). Portuguese influence on the coast depended greatly on their relations with neighboring tribes; the crown did not in fact own the ground on which its garrisons were built, but instead leased or rented this space from local groups (DeCorse 2010: 212-213; Hair 1994b 82). Therefore involvement in local politics was a crucial factor in the continued success of Portuguese, and later, other European powers that sought trade in the region (Blake 1967: 44).

Despite the establishment of satellite forts at Shama and Axim, the interloper threat continued to concern the Portuguese crown. It is likely that Spanish, Flemish and possibly Genoese traders ventured to the Guinea Coast before 1500 (Blake 1977: 37-39). In 1480, King Affonso V ordered his captains that “if they meet any caravels whatever, or any ships... who are on their way out to the said Guinea, or on their way back, or who are in it,... that as soon as such persons shall have been seized, without any further order or course of law, all may be.. forwith cast into the sea, so that they may then die a natural death... for they are to suffer punishment for trying and desiring to do something strictly forbidden and prohibited. It will be a good lesson to those, who may hear or learn of it, to beware of doing the like” (Blake 1967: 245). Portugal attempted to guard its interests

along the coast with rowed galleys as well as sailing ships from Lisbon, and did not hesitate to execute punishment on villages caught trading with interlopers (Feinberg 1969: 22, 30; Jones 1983: 78; Vogt 1979: 96, 103, 109, 129). Despite this, by the end of the sixteenth century Portugal's monopoly on trade in the region was essentially shattered, with interlopers from France, Holland and England frequenting the waters off of the Gold Coast (Blake 1977: 96; DeCorse 2001: 22-23).

With the opening of the seventeenth century, the rise of Dutch supremacy on the seas threatened the Portuguese situation in Guinea in a direct way. Only fifteen years after the first Dutch expedition to the coast, an average of twenty Dutch ships sailed annually, carrying hundreds of thousands of pounds of linen, copper basins, kettles, beads and other goods (Alpern 1995; DeCorse 2001: 147; Daaku 1970: 11). So much gold entered the United Provinces from Guinea that until about 1630, nearly all the gold used for coinage likely came from West Africa (Boxer 1957: 6). By 1612 the Dutch established a fort at Mori, merely ten miles (16 kilometers) east of Elmina Castle (DeCorse 2010: 226; Feinberg 1989: 30). Dutch forces attempted to capture *São Jorge da Mina* on five occasions between 1596 and 1625 (DeCorse 2001: 23). Their sixth attempt in 1637 proved successful; instead of attacking directly from the sea, a force of 800 soldiers landed at the coastal town of Komenda and bombarded Elmina from the top of a nearby hill, quickly overpowering the meager Portuguese garrison within the castle. *São Jorge da Mina* fell to the Dutch, and remained in Dutch control until being ceded to the British in 1872 (Chouin 1998a: 39-45; de Marees 1987: 108; Feinberg 1969: 30-31; Vogt 1979: 166, 187-192).

The ascendancy of Dutch power on the Gold Coast in the seventeenth century reflected political and economic transformations in Europe. Centers of economic power were moving from the Iberian Peninsula to northern and western Europe, specifically Holland, England and France (Wallerstein 1974: 40-71). These areas eclipsed the prior masters of the sea, Spain and Portugal, with expansive merchant fleets and maritime technologies that led to their supremacy on the oceans. Shipbuilders and navigators in particular played a critical role in their expanding the Dutch global presence during the seventeenth century. Along with their maritime capabilities, Holland was able to produce much of the cloth, metals and other commodities that were required for overseas trade (Vogt 1979: 146). Pieter de Marees, who wrote an early account of life on the Mina coast at the dawn of the seventeenth century, summed up the waning Portuguese presence in writing, “They are faring quite badly and are much in decline, so that nowadays the Castle d’Mina gives the King of Spain more loss than profit;... the trade of the Portuguese is totally ruined... as a result of the competition from the Dutch ships, which offer trade-goods here for about the same price as the Portuguese have to pay in Portugal” (de Marees 1987: 214).

The headquarters of Dutch power on the coast moved from Mori to Elmina in 1637, and trade in the area came under the control of the Director-General, who resided at Elmina Castle. By 1642 the other Portuguese forts were under Dutch control, and where there were profitable trading ports with no forts or lodges, the Dutch stationed trading ships for commerce. All commodities along the coast were sent to Elmina except slaves, which continued to be purchased directly from specific outposts (Daaku 1970: 14; DeCorse 2010: 229-230; den Heijer 2003: 90; Porter 1974: 163). While Dutch control

along the coast remained predominant in certain areas, English traders succeeded in making inroads into the gold trade, and English trading forts were established at Anomabo and Kormantse by the 1630s (Lawrence 1963: 245-249; van Dantzig 1980: 21-23). The mid-seventeenth century amounted to an outright struggle between the English and Dutch, each nation attempting to turn local politics against the other in a distant African reflection of their rivalry in Europe. By the last half of the century, however, the slave trade surpassed gold as the primary source of trade, and other players from western Europe took a greater interest in the area.⁹ By the end of the 1600s, the Swedes, Danes, Brandenburgers and French entered into an increasingly competitive trade, and the number of fortified trading entrepôts expanded in a milieu of European competition for the maritime trade of the Gold Coast (Daaku 1970: 15; DeCorse 2010: 230-231).

The seventeenth century also witnessed the increased involvement of private companies and “adventurers” seeking to make profits in the region. The earliest, the Company of Adventurers of London, began trading voyages to northern Guinea in 1618, followed by the Dutch West India Company in 1621. The Company of Adventurers mainly traded in northern Guinea, and thus had little affect on the Gold Coast. The Dutch West India Company, modeled after the successful VOC or East India Company, was aimed at attacking Spanish and Portuguese holdings as much as generating trade or setting up outposts (den Heijer 2003: 79; Boxer 1970: 26; Postma 1990: 15-16). In 1672 the Royal African Company was established by English investors, but by the end of the century their monopoly on the African trade was successfully challenged by other

⁹ For more detailed overviews on the growth of the slave trade, its scope and impacts on West Africa, see Elbl 1997; Eltis 2000; 2001; Eltis and Richardson 1997; Inikori 1982; Manning 1990; Thornton 1996; Tibbles 2005; Monroe 2010; and Ogundiran 2010 among others.

English traders, and the Guinea trade essentially opened to all interested parties (Daaku 1970: 10-13).

By the eighteenth century, the African slave trade dominated the American colonial economies, and its impact on economical and socio-political aspects of life grew to a new height throughout the Atlantic World (e.g. Curtin 1969; Eltis 2001; Eltis and Richardson 1997; Lovejoy 1989; 2000; Lovejoy and Richardson 2001; 2004; Postma 1990; 2003: 117-120; Tomich 2004; Vansina 2005). While government monopolies and joint-stock ventures that had fueled the slave trade in previous centuries were beginning to wane, there was a concurrent increase in independent trader activities. The slave trade led to the expansion of industries in the Americas and Europe dependent on African markets, and those involved in these endeavors would prove highly resistant to rising sentiments for the abolishment of the trade toward the end of the century. Spain's American colonies became heavily involved in the trade, while the Dutch, English, French, Portuguese, Danes, Brandenburgers and others tried to maintain their activities established in the seventeenth century or earlier (Donnan 1965: xiii).

The last of the major coastal forts on what is now coastal Ghana were constructed by the end of the eighteenth century. Over thirty forts, entrepôts, castles and lodges controlled by various European interests lay scattered through the region (DeCorse 2001: 25; DeCorse 2010: 231-232; DeCorse n.d.; Lawrence 1963: 25; van Dantzig 1980: 58). The last nations with holdings on the coast included England, Holland and Denmark, but active trading from nations without landed interests in the region continued with French, Portuguese and private traders. The British and Dutch forts lay spread at irregular intervals to the west of the Gold Coast, with their headquarters at Cape Coast Castle and

Elmina Castle respectively separated by merely eight miles (12.9 kilometers), and the Danish holdings generally lay to the east (DeCorse 2001: 28). By 1872, only the British would remain, the sole proprietors of the end of an era that saw multi-national relations encompassing competition, warfare, antagonism, cooperation, and collaboration for four centuries.

The dawn of the nineteenth century saw the initial attempts at the abolition of the slave trade, and this, along with other events both local and international, engendered significant changes in the social and economic networks in West Africa. Prior to abolition in 1807 the slave trade remained the primary export activity in the region, and though other nations still participated in the trade, the British were the main traders in slaves. Britain was responsible for two-thirds of total slave exports from West Africa in the 1790s (Curtin 1969: 211).¹⁰ Even after abolition, the slave trade continued, and in some areas actually peaked, prompting some scholars to describe post-abolition enslavement of Africans as “the second slavery” (Tomich 2004: 56-71; Tomich and Sueske 2008: 91; Eltis 1977: 409). Regardless, in the nineteenth century the British remained the most heavily invested country in coastal Ghana, and efforts commenced immediately at profiteering from “legitimate” commerce of palm oil and other goods such as ivory, gold and spices (Law 1995: 1; Lynn 1997: 3).

A clear distinction in the interactions between traders and ships of varying nations in the nineteenth century lies in the relative harmonious relationships between them, as opposed to the military conflicts of the preceding three centuries. Forts became administrative centers and bases for anti-slavery squadrons that patrolled the coast

¹⁰ Although the British were the most invested in the region’s slave trade at this time, it should be kept in mind that they did not actually control Elmina until well after abolition.

instead of bases for military operations against other nations. While economic competition remained, outright military conflict remained rare between European powers in the region for most of the century (DeCorse 2001: 29).

Nevertheless, other events external to the coast, including the Anglo-French wars of 1793-1815, as well as internal struggles between the Asante and Fante states, led to considerable turmoil in the region. The rise of the Asante empire during the 1700s in the Ghanaian hinterland was a key development that had ramifications that extended into the nineteenth century. By the beginning of the eighteenth century, the Asante were a loose military alliance made up of several small states in the interior. Under the leader Osei Tutu, these states began consolidating and increasing their power, eventually taking over neighboring states by force and increasing their trading influence. In 1806-1807 the Asante conquered the coastal Fante states, and this conflict disrupted trade in the region until the 1830s at least (Ward 1958: 151-156). Constant clashes on the coast between Fante and Asante forces for much of the early nineteenth century took their toll on trade and exports of the region, already reeling from the impact of the abolition of the slave trade. Trade fell into severe decline as early as the first decade of the century, and many British traders in the area went bankrupt (Lynn 1997: 11).

Despite this turmoil and the impact of the ending of the slave trade, British shipping to the Ghanaian coast increased dramatically, nearly tenfold in terms of tonnage from the early to the late 1800s (DeCorse n.d.; Reynolds 1974: 119; van Dantzig 1980: 53). Although there were considerable apprehensions among established British traders in the region, England was well-situated to capitalize on the new market opportunities, which primarily focused on the palm oil trade. Also, abolition had been debated for a

considerable period of time in Britain and elsewhere before its implementation, giving traders plenty of time to consider other options in the event that it was passed in law. Slave traders did not bother to replace their aging fleets towards the end of the eighteenth century, since they could see that the trade might be eradicated (at least legally). Also, legal slave voyages in the late eighteenth century often incorporated produce, gold and other legitimate items into their holds, which formed as much as 20-30 percent of the profit from a voyage, so the transition to these commodities was not terribly difficult to implement (Drake 1976: 92-97; Lynn 1997: 82-83).

The success of Britain's trade after abolition eventually led to it being the sole European proprietor of trading forts and castles in the region, though other nations remained involved in shipping. Denmark divested itself of Gold Coast holdings, ceding them to Britain by 1850. Dutch outposts experienced frequent shortages of trade goods and supplies in the nineteenth century. With their power waning and increasing threat from African polities, the Dutch gave up the last of their forts to the British in 1872, prompting considerable unrest among the Africans living near Elmina who refused to recognize the British authority. In June 1873, the Asante defeated the Fante, increasing pressure on the British territories, who had traditionally allied themselves with the Fante. These tensions resulted in the bombardment of the town adjacent to the castle (DeCorse 2001: 30-31; Ward 1958: 244-245). While no one was killed, this signaled the end of resistance to the British rule at Elmina, and ushered in the beginning of the colonial era on the Gold Coast.

European competition in West Africa waxed and waned during the nearly four centuries of African-European contact in the region, with different nations gaining and

losing power and influence, and various coastal polities playing key roles in these complex interactions. Though the Portuguese, Dutch and British dominated in different periods on the coast, other nations, including the Brandenburgers, French, Danes, Swedes and Americans found their way to coastal Ghana, all with ambitions to profit from the West African trade (DeCorse 2001; 2010). Commodity exchange predominated in these interactions, calling for a closer examination of the types of materials and goods making up this exchange.

Commodities for Exchange: The West African Trade

Looking at historic maps of West Africa, one is struck by the names Europeans gave to particular areas of the coast; designations such as Grain, Ivory, Gold and Slave Coasts reflect the basic interests in commodities by European explorers and merchants. As the Portuguese and later other European nations ventured into lands previously unknown to them, one can see the dawning of a global economy increasingly centered upon the European core (Wallerstein 1974). In the context of the Ghanaian coast, the presence of European trading vessels created a shift in trade networks that for centuries centered on the trans-Saharan routes. Once-small villages and towns on the periphery of the internally-oriented trading system became key market centers for the purchase and distribution of European goods (DeCorse 2001: 31; Ward 1958: 88). Fishermen and agriculturists became seasoned negotiators and middlemen earning considerable profits from their dealings with Europeans. Pieter de Marees, writing in 1602, provides his perspective regarding the development of coastal trade between the Akan and Portuguese:

Since the Peasants of the Interior did not at first dare to come to the Portuguese to trade with them, because they were unacquainted with other nations and it was something frightful for them to see white people... they brought their money to the Inhabitants of the coastal towns (where the Portuguese were trading), telling them what goods and Wares they wanted for their money. The latter went to the Castles and bought what they [people from the interior] needed, such as Iron, Pewter, brass Basins, Knives, woollen Cloth, Linen, Kettles, Beads and similar Wares; and to the Trader who had despatched them for these [goods] they paid so-and-so-much gold out of every *Peso*; if he bartered many *Pesos*, he also received much Gold as his reward, and in this way they earned a living (de Marees 1987: 44).

Of course by the time de Marees wrote this well over a century of trade had been conducted between Africans and Europeans in the region. As trade with Europeans increased along the coast, however, the Akan gained access to an unprecedented volume of these materials (Bovill 1958; Levtzion and Hopkins 1981). The first Portuguese mariners seeking to trade on the Mina coast found a ready market for items already familiar to Akan coastal traders, including such commodities as textiles, metals (iron and brass) and beads. In fact, this “triad of imports” can be seen as a general trend throughout the period of European maritime trade with the region, as can a countervailing “triad of exports” of gold, slaves and ivory (Herbert 1984: 123).

The sheer volume of trade goods shipped by Europeans to West Africa prohibits simple generalizations. Even a cursory examination of the Guinea trade reveals the massive number and variety of goods involved in exchange between Africans and Europeans, including textiles, glass beads, and a stunning variety of metal goods such as basins and manillas (Alpern 1995; Elbl 1986: 362-448; Eltis and Jennings 1988: 948-951; Sundström 1965: 155-161, 190-200, 228-240). Though an immense number of items made up the material inventory of trade goods exchanged in the region, the initial focus for the European trade in coastal Ghana centered so much on gold that the region became

known as the “Gold Coast.” In fact, before the slave trade eclipsed the exchange in gold in the early eighteenth century, captains of West African traders were often given instructions to only purchase gold along this area of the coast (Daaku 1970:21).

The origins of gold mining and smithing in Ghana remain obscure. Gold ornaments and crucibles that may have been used in gold casting came out of archaeological contexts at Elmina, and a single gold bead from the Coconut Grove site west of Elmina dates to the first millennium A.D. (DeCorse 2001: 126, 127; 2005: 49). References to worked gold worn as ornaments occur in the earliest European descriptions of the region. The prevalence of gold jewelry initially stimulated Portuguese interest in the region, and during the negotiations for building São Jorge da Mina, the Akan ruler Caramansa met the Portuguese delegation covered in gold ornamentation (Hair 1994b: 21). Gold was more plentiful than other, harder metals such as iron and copper that proved useful for utilitarian purposes; it was relatively easy to acquire and had limited practical uses. Thus Akan traders gladly exchanged gold for more "useful" items such as cloth, iron and brass (Hair 1994b: 3).

Gold could be traded in two forms. Many coastal Akan wore gold in the form of bracelets, bangles, and other ornaments, some of which they would trade to Europeans (DeCorse 2001: 143). Most of the gold, however, came in the form of dust from alluvial deposits, most likely originating from the interior (de Marees 1987: 188-191). Other items were traded at Mina besides gold, including ivory and Malagueta pepper. Gold remained the main focus for the initial period of trade in the coast, however, and far outweighed all other African items exported from the region until this was usurped by the slave trade in the seventeenth century (DeCorse 2001: 142-143).

In order to acquire West African products, whether gold, spices, slaves, palm oil, or other commodities, European traders typically tapped into sources far outside any particular nation's own borders (Alpern 1995: 5-6; DeCorse 2001: 147; Hopkins 1973: 87). For example, as the initial trading nation in the region, Portugal itself could only offer a limited number of commodities for the world market, and only one or two of these might find their way to West Africa. Goods originating in Portugal included wines, salt, cork, soap, olive oil, fruits, quince marmalade, and sumac. Though limited in number, these products allowed access to commodity exchanges and trade networks ranging throughout Europe and Asia (Russell-Wood 1992: 129). An impressive variety of trade goods from these networks passed through the entrepot of Lisbon. Portuguese brokers in Venice sent home tons of glass beads, velvets, silks, and faience. Woolen cloths and other textiles shipped from Flanders, France, England and Ireland (Wolf 1982: 196-197). Copper utensils, bowls, brassware and other containers came from Nurnberg (Elbl 1986: 375-415). Other items originating in far reaches of the world included silver, mercury, tin, lead, arms and armor, guns and ammunition, tapestries, cinnabar, amber, clocks and furniture (Russell-Wood 1992: 125). During Portugal's attempted trading monopoly on the Mina coast, these connections to countries such as the Netherlands, England and France remained crucial in their success in the African trade. As Portugal's influence began to wane in the sixteenth century, these very countries became its competitors in an increasingly aggressive trade on Africa's West coast (Hopkins 1973: 91; Wolf 1982: 197).

Regardless of the specific country trading in the region, merchants quickly realized that African middlemen were shrewd negotiators accustomed to barter and

exchange. Many of the coastal Africans who Europeans dealt with harbored conservative and highly selective tastes for specific types of goods, tastes that varied geographically as well as through time. Although the general trend appears to be that the volume of goods increased over time, European traders found their African counterparts to be particularly “tenacious and difficult to persuade”, and they tended to prefer goods they were accustomed with to new ones (Daaku 1970: 24). Pieter de Marees noted that European traders could be mocked in a "scandalous way" if they tried to sell items that were unpopular with the African merchants (de Marees 1987: 51-54). Little had changed by the eighteenth century, as John Atkins noted in 1735 that succeeding in the African trade required timing the arrival of a cargo that “...depends at several places much on Chance, from the fanciful and various Humours of the Negroes, who make great demands one voyage for a commodity, that perhaps they reject next, and is in part to be remedied either by making the things they itch after, to pass off those they have not so much mind to, or by such continual traffick and correspondence on the coast as may furnish the owner from time to time with quick intelligence.” (Atkins 1970: 159).

These factors led to European ships trading in West Africa to be likened to “floating supermarkets” due to the number and variety of goods required to do business in the region (Hopkins 1973: 111). Hopkin’s analysis of the African trade suggested four principal factors in the necessity for such a large variety of incoming trade goods. A large and varied cargo reflected the intense competition on the coast among European traders, giving the captain bargaining advantages and flexibility in pricing these goods. The fact that the African market was situated far from manufacturing centers and supplies made it particularly unpredictable, and any intelligence or news regarding items in

demand was likely to be old and erroneous by the time a ship arrived on the coast. Another factor stemmed from the fact that the coastal African merchants purchasing trade goods were not the final consumers, but wholesalers who were motivated to supply internal markets. Finally, the lack of a standard currency on the coast required a variety of goods to manage complicated and constantly-changing systems of exchange (Hopkins 1973: 109-111).

Though there are some discernible trends in trade to the region, the reality is so complex, even in limiting one's study to the Ghanaian coast as opposed to all of sub-Saharan West Africa, that generalities are difficult. For example, in his list of trade materials, Alpern notes that at the beginning of the Dutch ascendancy on the coast in the mid seventeenth century, 92 different types of trade goods were inventoried at Elmina Castle alone (Alpern 1995: 6). In 1628 the Dutch West India Company castle at Elmina was inventoried with 218 different types of trade goods being stored in the facility (Postma 1990: 103). According to the seventeenth-century chronicler William Bosman, by 1700 around 150 different items were required for trade in the region (Bosman 1967: 91; van Dantzig 1976: 104). In 1725 ships from the Dutch West India Company reportedly carried multiple varieties of at least seventy two categories of commodities for the African trade, including manufactured goods, raw materials, and food items, for exchange in gold, ivory or slaves. Thus, African merchants might have the choice of several different types of textiles or firearms, so the specific varieties could number into the hundreds (Feinberg 1989: 50).

Although Europeans offered a variety of trade goods in exchange for West African products, cloth and metal goods proved by far the most popular items through the

centuries of maritime trade. In total volume these two commodities made up more than seventy-five percent of all the trade merchandise transported to Morocco and West Africa (Elbl 1986: 367; Vogt 1979: 76). Marion Johnson estimates that during the eighteenth century nearly two thirds by value of goods sent to Africa in each decade consisted of textiles (Johnson 1990: 9). Dutch West India Company records show that in 1714-1715, half of the 2000 enslaved Africans acquired were exchanged for textiles, and of the remainder, 800 were purchased with cowrie shells, and 200 with guns and powder (Postma 1990: 103). Over 100 distinct types of fabricated textiles, disregarding size or color variations, were traded by the Europeans in West Africa well into the nineteenth century (Alpern 1995: 6; Vogt 1975: 625). Samuel Swan, in describing goods required for trade in the nineteenth century, wrote that cloth was the primary article of trade on the whole coast, whether in the factory or native trade (Bennett and Brooks 1965: 40-41). Though nearly invisible in the archaeological record except for the presence of bale seals (DeCorse 2001: 14), the preponderance of textiles in the West African trade remained constant for the duration of the trade. A more detailed discussions of cloth, followed by other primary categories of trade goods, continues below.

Cloth

Towards the end of the fifteenth century, various centers in Morocco and West Africa participated in the textile trade. Morocco contained a string of important port cities which served as key centers for inland trade, including Ceuta, Tangier, Arzila, Azamor, Agadir, Mogador, Safi and Mazagão. These locations not only provided a ready market for European trade goods and textiles, they were also the sources for cloth used as

trade items in the Saharan and Guinea trades. The outpost of Arguim, located south of Morocco on the Saharan coast, provided another key market. This site, established in the 1440s, diverted a portion of the trans-Saharan trade in gold and slaves. São Jorge da Mina served as the dominant trading point south of the Sahara, and in Benin a Portuguese factor conducted considerable trade in cloth and textiles (Vogt 1975: 630, 631).

Cloth from northern Africa had been traded as far as the Ghanaian coastline long before European contact, reflecting the strong demand for textiles in the region. Though West Africans made cotton cloth on a limited scale, the volume, varieties, textures, colors and patterns were far more restricted than those of Europe or India (Alpern 1995: 34). Cloth and shawls manufactured in Morocco and Tunisia generated great demand along the coast, and these were among the first marketable goods the Portuguese imported. Though their spellings varied, they were generally known as *aljaravias*, *alquices*, and *lambens* (Elbl 1986: 367). These textiles might be made in several locations; if the demand called for increased production, European traders would supply examples of popular designs to serve as patterns for weavers throughout North Africa and Europe. Thus specific types such as *aljaravias de tenez*, *aljaravias de anhara*, or *lambes de mazione* indicated the origins of textiles (Blake 1967: 97).

Aljaravias were a type of narrow, woolen gown fitted with half sleeves and a hood (Elbl 1986: 385). European merchants purchased these textiles for the Gold Coast trade, where a great demand existed for them. While governor of Elmina, Duarte Pacheco Pereira often presented aljaravias as gifts to local officials (Blake 1967: 97, 130). The *djalabiya*, a modern variant of the aljaravia, is worn throughout the Maghrib

today. Virtually all of the aljaravias marketed by the Portuguese were sold at São Jorge da Mina and the nearby Portuguese garrison of São António de Axem (Vogt 1975: 637).

Alquicés typically came to the Mina coast in the form of white woolen cloth, cut large enough to make a mantle or covering. The vast majority of these textiles were made by weavers at Safi, Benin, though the Portuguese factors utilized other sources when supplies ran low. The sale of alquicés tended to be more restricted in sub-Saharan Africa: though thousands were sold at Arguim, at Elmina they were never as popular as aljaravias or lambens (Elbl 1986: 388-389; Vogt 1975: 639).

North African weavers fashioned lambens out of a single piece of woolen cloth sewn along the sides, with armholes and an opening for the head. Africans tended to wear them wrapped around their bodies and draped to the ground, and they also were used for bedding. Lambens came in a variety of styles and colors, some more in demand than others; the highest quality lambens at one time were valued as highly as a slave from Benin (Vogt 1979: 67, 76). Buyers on the Guinea Coast preferred certain patterns and colors; for lambens, they favored stripes of red, green, blue and white (Elbl 1986: 383; Vogt 1975: 635). Pereira provides a description of lambens and other popular items exchanged for gold at Axim:

The merchandise exchanged for gold consists of brass bracelets, basins of the same metal, red and blue cloth, linen neither very coarse nor very fine, and 'lambens,' that is, a kind of mantle made like the shawls of Alentejo, with stripes of red, green, blue and white, the stripes being two or three inches wide. They are made in the city of Ouram and in the Tenez in the kingdom of Tremecem, in Bona and Estora of the kingdom of Borgia, and also in Tunez and in other parts of Berbery. This is the principal merchandise used for the barter of gold in Axem, besides other articles of less value" (Kimble 1967: 117).

Various types of European cloth also made it into the Gold Coast. Among the most popular fabrics to be shipped to the region included Flemish *toalhas* and *bordates*, as well as textiles from Flanders, Bruges, Germany, Venice and India. Other articles of clothing traded on the coast included capes, leggings, hats and caps, blankets, linen, *bordateis* (cotton fabric in the form of handkerchiefs), *pannas* (lengths of cloth made from finely woven cotton), *pano branco* (white sailcloth), calicoes, neckerchiefs and bournouses, but generally African traders preferred to purchase unfinished cloth which they could dye to their specifications (Alpern 1992; Blake 1967: 450; Vogt 1975: 643).

Metals

Metal objects rank second after textiles in terms of popularity in the region's trade. Most metals traded by Europeans originated in manufacturing centers such as Flanders, Holland or England, depending on the period, with the exception of iron (Elbl 1986: 396). The Akan possessed a considerable degree of skill in smithing, which in turn created a demand for raw materials to work with. Copper and brass were favored due to their utilitarian nature and the ease with which they could be worked. Europeans traded brass *manilhas* or manillas (open-ended bracelets or rings) from the earliest trade through the nineteenth century in vast quantities, as well as brass basins and ingots (Alpern 1995: 13; Herbert 1984: 125-132). Although manillas could be worn around the arms or legs, they also came in smaller sizes. Coastal merchants used them to barter for goods further into the interior, and they also provided a source of metal for smiths. In the early sixteenth century Lisbon was sending more than 100,000 manilas to Elmina annually, and by the 1520s annual sales on the Gold Coast reached 150,000 (Alpern 1992: 13; Blake

1967: 107). Later in the trade manillas made of lead, pewter, iron and tin grew as popular as brass and copper. While earlier manillas tended to be heavier, some weighing as much as 20 oz., while by the end of the nineteenth century manilas shipped to Nigeria weighed as little as 3 oz. (Alpern 1995: 13).

Copper and brass trade items came in a multitude of forms, including rods, basins, pans, pots, kettles, cauldrons, plates, candlesticks, tankards, jugs, bowls, cups, sheets, bells, small boxes, buckets and gold weights, just to name a few (Alpern 1992: 16). In the earliest decades of Portuguese contact, copper was the metal in greatest demand by African traders at São Jorge, particularly basins and other containers (Vogt 1979: 69). Copper and copper alloy items remained popular in the region throughout the historic period; rods, chains, necklace fragments, rings and earrings were uncovered at Elmina in nineteenth-century contexts, most likely representing trade materials reworked by African craftsmen (DeCorse 2001: 134).

Iron also proved popular with the coastal Akan, often in the form of tools (axes and knives being very popular), or coming unworked as ingots or bars which could be fashioned into farm implements, weapons, household utensils, gongs, and many other useful items (e.g. finds noted in terrestrial excavations at Elmina by DeCorse 2001: 18, 111). Bars tended to be shipped flat, but their sizes and weights varied considerably depending on their European source and their destination in Africa. Incidentally, this information is rarely included in documentary records (Alpern 1995: 12). Near the end of Portuguese dominance in the region, iron completely replaced brass as the dominant metal trade item. Other metal items that carried a smaller percentage of the trade

included lead, often in the form of bars and sheets weighing about 3 pounds each, and occasionally tin on a small scale (Alpern 1995: 14).

Other Trade Items

Traders learned early on that certain shells, beads and coral items were highly prized by the Akan, and in fact Pereira compares their taste for these items to Europeans' desire for precious stones (Pereira 1967: 120). Beads were made from glass and stone in a wide variety of shapes, colors and styles (DeCorse 2001: 135-138). Some of the earliest beads to be traded on the coast were African stone beads familiar to the Akan from before European contact (DeCorse 1989b: 41). The Portuguese also successfully traded yellowish-red coral beads from the Mediterranean, and red coral beads were popular among African traders (Alpern 1995: 22). Venice was an important center of bead manufacture, but other varieties were produced in Holland, France, Germany, Bohemia, Moravia and Austria (Alpern 1995: 22). On the Gold Coast long cylindrical glass beads were often broken into smaller pieces, ground smooth on a stone, and strung on bark fiber for resale in the interior. Some beads would be ground into powder and recast by African bead-makers in a different style deemed more valuable for resale (Barbot 1992: 381; DeCorse 1989b: 47-49; 2001: 136).

To a lesser degree a market existed for natural shells such as cowries and conch. The former were used primarily as currency; African traders typically drilled holes into the shells, strung them together on strands of grass, and used them for barter in the hinterland (Arhin 1979: 22; Hogendorn and Johnson 1986: 5-9). The trade in cowrie shells probably was not substantial until large quantities of them could be gathered from

the Indian Ocean in the early sixteenth century, but by the middle of the century Portugal was transporting as many as 130,000,000 cowries a year in their African trade (Alpern 1995: 24).

Alcohol also became a common trade item on the coast. Despite the fact that the Akan produced their own alcoholic drink from the palm fruit, the sweet Portuguese wines quickly became favored by Africans, as did Dutch schnapps and gin, French brandy, New England rum and even English beer (Alpern 1995: 25). Toward the end of the eighteenth century alcohol amounted to over 7% of total English imports into West Africa (Johnson 1990: 9).

An impressive amount of goods found their way to West Africa in the holds of ships. A caravel leaving Arguim bound for Tofia Point in 1514 carried nearly fifty different types of commodities, including various textiles (Moorish *alquices*, *covados*, half *trazcumtes*, and *bordates*), chamber pots, shaving bowls, bridle bits, silver spurs, caps, reams of paper, combs, needles, pack-cloth, collars, fetters, axes, scythes, fishing darts, pistols, kettles, gold weights, manacles, spears, musket balls, hammers and wine (Blake 1967: 119, 120).

This preponderance of goods made up cargoes throughout the historic period, regardless of whether they were trading for gold, slaves, ivory or palm oil. During a slaving voyage in the 1790s the schooner *Swallow* carried tobacco, rum (in puncheons and ankers), Geneva gin, “buccaneer guns”, Dane guns, French guns, fowling pieces, powder in half and quarter barrels, pots, kettles, pans, knives, cutlasses, needles, fish hooks, iron bars, lead bars, agates or aggats (beads), cowries, textiles such as chintz, silesias and linens, and a “great variety of East India cottons” (Plimpton 1930: 380-381).

In 1801 the cost of one slave required the following items: one piece of chintz, 18 yards (16.5 meters) long, one piece of baft, 18 yards long, one piece of chelloe, 18 yards (16.5 meters) long, one piece of bandanoe, seven handkerchiefs, one piece of niccanee, 14 yards (12.8 meters) long, one piece of cushtae, 14 yards (12.8 meters) long, three pieces of romalls, 45 handkerchiefs, one large brass pan, two muskets, 25 kegs powder, 100 flints, two bags of shot, 20 knives, four iron pots, four hats, four caps, four cutlasses, six bunches beads, 14 gallons brandy, for a total cost of £25 (Paine 1907: 34). In 1810 New England merchant Samuel Swan contracted with a factor at Cape Coast to send out a “good fast sailing vessel from sixty to eighty tons burthen” with a cargo including rum, gin, bar crackers, tobacco, Madeira wine, flour, pilot bread, sugar, spermicetta candles, butter, nails, lumber, soap, beef, barrel staves, pork and iron hoops (Bennett and Brooks 1965: 32). Horatio Bridge wrote that illicit slave traders in the mid-nineteenth century found that one adult slave cost “about one musket, twelve pieces of romauls, one cutlass, a demijohn of rum, a bar of iron, a keg of powder, and ten bars of leaf-tobacco, the whole amounting to the value of from thirty to thirty five dollars.” There were exceptions to importing these kinds of goods: Bridge also noted that illicit slavers often sailed from Havana with nothing but dollars and doubloons. They would then buy the trade goods they needed from other vessels or factories on the coast, and then exchange these for slaves (Bridge 1853: 54).

Summary

The above discussion regarding trade goods exchanged on the Gold Coast provides only an overview of the full range of materials exchanged between Africans and

Europeans during four centuries of trade. An astounding variety and number of items were involved in this exchange, and as many examples show, trade cargoes were typically composed of a great variety of materials, regardless of the specific period the ship sailed. Irrespective of the period, however, it was the maritime connections between Europe, the Americas and Africa that drove this exchange and allowed untold thousands of tons of manufactured good to enter the West African market. A discussion of the vessels and technology of the West African trade follows below.

CHAPTER 4: SHIPPING AND MARITIME TECHNOLOGY

The “Guinea” Trade

Detailing the numerous advances in vessel types and sailing rigs from the fifteenth to nineteenth centuries is beyond the scope of this study, however a brief synopsis of the major developments helps put these advancements into context. While some vessels were designed specifically for the African trade, it should be kept in mind that in general the common varieties of sailing ships from any particular period were used (Behrendt 2001: 178; Minchinton 1990: 117; Stammers 2005: 31). Many factors were taken into account in determining the most effective size of vessel for a particular trade, including: natural risks (sea states, frequency of storms); cultural risks (piracy, naval warfare); the harbors used by the ships; the perishability of the cargoes; and the amount of goods needed to be transported. In general, medium-sized vessels proved useful for the African and West Indian trades, whereas small to medium ships were effective in the more regional trade of Europe and the Mediterranean, and the largest vessels were used for the East Indian trade (Davis 1975: 7). Medium-sized vessels were preferred for the African trade because they were small enough to easily navigate rivers and shallow coastal areas to obtain their cargoes (MacGregor 1985: 20).

Another essential factor to consider when reviewing the types of vessels used for the West African trade is that the overall pattern involved importation of manufactured goods to be exchanged for African products such as gold, ivory, palm oil and/or enslaved Africans. Much attention has been focused upon the slave trade and the middle passage, and the fact that the exportation of other African commodities remained a substantial component in this exchange is often forgotten. Barring the specific design changes that

occurred among some slaving vessels after the abolition of the slave trade,¹¹ the general tendency to use medium-sized sailing vessels for the West African trade remained a constant, regardless of whether the vessel loaded commodities or humans upon arrival to Africa's shores. With this said, however, substantial modifications did occur on most slave ships both on deck and below for mass transport of human cargoes. Considering these factors, a more detailed description of shipping used in the West African trade during different periods is provided below, along with a specific discussion of how vessels were adapted for the slave trade.¹²

Ships of the West African Trade

Exploration and Early Trade

Shipping and maritime technology remained a critical factor during centuries of maritime trade, as various nations attempted to capitalize on gold, ivory, enslaved Africans and other commodities of the region. Ship design was crucial in terms of navigation and sailing capabilities, as well as the capacity to transport goods (Ferreiro 2010: 24; Steffy 1994: 5). While the design and evolution of the first reliable, multiple-masted, open-ocean sailing vessels proved particularly crucial during the initial exploration of the coast by the Portuguese, practical and seaworthy vessels remained a central factor throughout centuries of contact and trade. Portugal's successful exploration of the African coastline and the discovery of a sea route to the East were in large part due

¹¹ After the abolition of the slave trade, and as attempts to detain slaving vessels increased, some slave ships were designed explicitly with sleeker lines and greater sail plans in order to outrun or avoid capture (Stammers 2005: 31).

¹² Particular focus is on developments in seafaring technology in the Iberian Peninsula (especially Portugal) and the Low Countries (the Dutch), as these countries played a key role in the West African trade, particularly with regard to Elmina. However, many nations vied for the African trade and the ships of these countries often sailed the same waters.

to the developments in Iberian maritime technology in the fifteenth century. The introduction of ship types such as the *barca*, *barinel*, *caravel* and *nao* allowed Portuguese mariners to make voyages of unprecedented length and duration, culminating in the circumnavigation of Africa and access to the East Indies.

Unfortunately relatively little is known about the construction of these vessels. Shipbuilding in this era was more of an art than a science. Shipwrights made their vessels by eye rather than with plans, guided by tradition, trial and error, and experience (Ferreiro 2010: 1, 22-25; Steffy 1994: 5). A few texts on ship building appear during this period, including the *Livro da Fábrica das Naus*, written around 1580 in Portugal, and a Spanish treatise on ship construction and design titled *Instrucción Náutica para Navegar* in 1587 (Oliveira 1580; Palacio 1587). A key element in these treatises is the description of the proper proportions for ocean-going vessels. In Palacio's account, for example, he describes a typical *nao* of 400 toneladas as good for either warfare or trade, and provides detailed information on the ideal ratios between the vessel's *manga* or maximum beam, its *quilla* or length of keel, and the *esloria* or length of main deck (Figures 4.1 and 4.2). Palacio states that the ideal proportions between the beam, keel and length of the main deck should follow a rough rule of thumb of 1:2:3, or the *as, dos tres* rule (Palacio 1587: 90; Phillips 1987: 294). In the example of the Palacio's *nao*, his ideal dimensions translate to a maximum beam of 9 meters (29.5 feet), a length of keel of 19.2 meters (63 feet), and a main deck length of 28.8 meters (94.5 feet).

The types of ships used by the Portuguese to reach the *Costa da Mina*, explore Africa and eventually sail to India were the result of economic and historical developments that extend back to the Middle Ages. The Portuguese economy in the

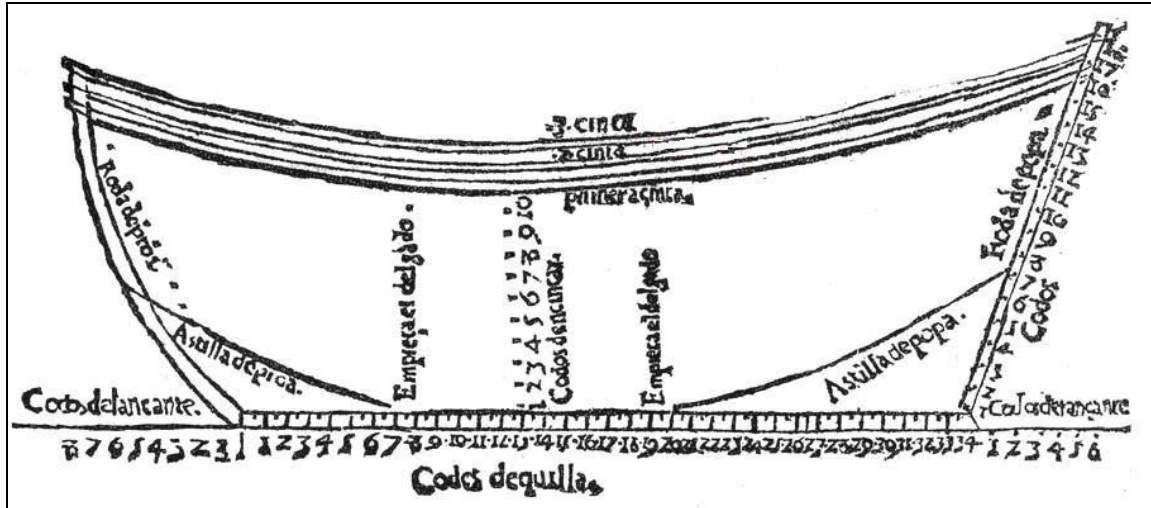


Figure 4.1 Palacio's 400 tonelada *nao* of the late sixteenth century. Among the key measurements he discussed in designing an ocean-going ship of this period is the length of keel or *quilla*, and the length of the main deck or *esloria*, both of which are shown in this view (Palacio 1587: 93).

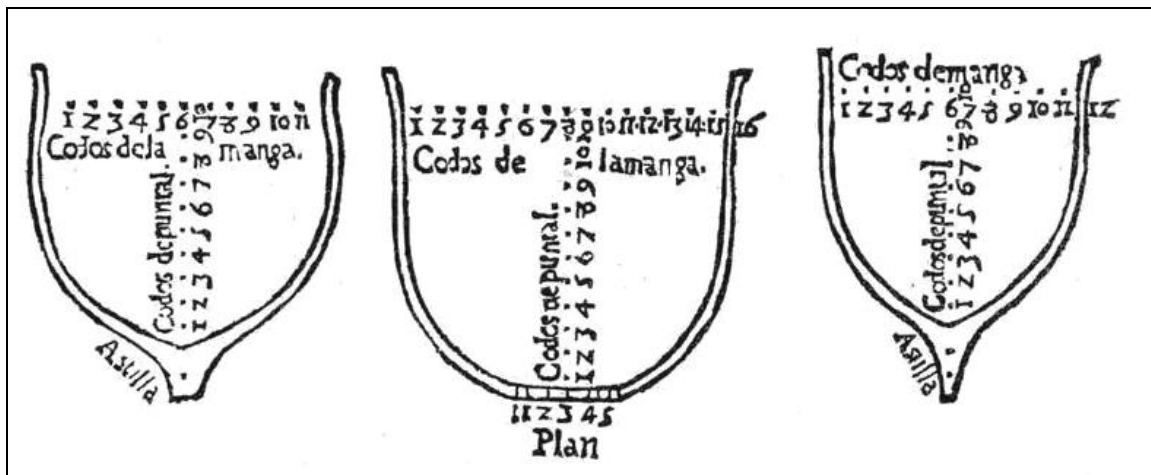


Figure 4.2 Cross-section views of Palacio's 400 tonelada *nao*. In this view can be seen his recommended measurements for the beam, or *manga* of the vessel at the bow, midships and stern (Palacio 1587: 93).

fourteenth and fifteenth centuries revolved around the export of wine, fish and salt, with cork, olive oil and subtropical fruits being of lesser importance (Diffie and Winius 1977: 37-42; Russell-Wood 1992: 129). These economic activities, combined with Portugal's geographic position overlooking the Atlantic on the Iberian peninsula, gave great importance to shipbuilding, fishing and coastal navigation.

A variety of seafaring influences converged along the Atlantic coast of Iberia beginning in the thirteenth and fourteenth centuries, resulting in a distinct Iberian shipbuilding style (Headrick 2010: 21-23). During the Middle Ages European shipbuilding was divided into two distinct technical traditions: a Mediterranean tradition with round, flush-planked ships carrying triangular lateen sails, and a Northern European style with lapstraked hulls (overlapping planks) and a large square sail on a single mast. Northern vessels steered with stern rudders mounted on massive sternposts, while Mediterranean sailors controlled their vessels with less efficient steering oars mounted on the starboard (or "steering board") side of their ships (Phillips 1986: 34-35; Smith 1993: 27; Unger 1997: 233).

Portuguese mariners found themselves in an ideal position to take advantage of these seafaring traditions. Maritime developments in the region expanded rapidly after the beginning of the fourteenth century, in part due to Portugal's location at the crossroads of Mediterranean and northwestern European trade, and its abundance of wood, iron and other shipbuilding materials (Steffy 1994: 128). Shipwrights experimented with building techniques and ship designs, creating a new and distinctly Iberian hybrid. This new type of vessel combined square and lateen sails on multiple masts; it mounted a sturdy stern rudder capable of surviving heavy Atlantic swells; it

tended to be larger than the Genoese galleys common in the Mediterranean, but had a shallower draft than the huge Baltic cogs that plied northern waters (Smith 1993: 27-32). By the fourteenth century Portuguese vessels made routine voyages to northern Europe and England, transporting goods from Eastern Asia and North Africa that came to Portugal through the Mediterranean trade. The types of ships used for these activities had to be relatively small and shallow-drafted to navigate small bays and inlets, yet hardy enough to navigate the rough coastal waters and to withstand being beached each night.

Defining vessel types based on historical sources can be difficult as few historic documents describe ships in detail, contemporary illustrations are lacking, and generally no ship plans exist until the beginning of naval architecture in the eighteenth and nineteenth centuries. Several early treatises relating to Iberian shipbuilding exist, but these generally contain theoretical rather than practical information, and most of them relate to specialized vessels used in the India trade (Cano 1996; Fernandez 1995; Lavanha 1996; Mendonça 1898; Palacio 1587). As mentioned above, one of the most important sources on the Iberian vessels of exploration is Fernando Oliveira's *Livro da Fábrica das Naos*, published in the last half of the sixteenth century (Oliveira 1580). It is not encouraging to those studying sailing vessels of this era that a contemporary observer such as Oliveira details the confusion regarding vessel types based on hull form or rig, writing:

The names of the kinds, or styles, of ships and boats, of one type or another, are almost incomprehensible; as much because there are so many of them, as because there have been many changes made from time to time, and from place to place. The same kind of ship or boat will have one name in Spain, another in France, and another in Italy. In Spain they call *naos* what in Italy are called *carracas*, and in Germany *urcas*. In Portugal we call *barcas* what in Galicia are called *trincados*, without much difference in features (Oliveira 1580: 168).

Despite this apparent confusion in ship classifications, it is clear that four general types of vessels evolved from the coastal trade and fishing industries, and these would later be the main vessels used for the exploration of the African coast. These were the *barca*, *barinel*, *caravel*, and *nao* (Cipolla 1965: 79-81; Diffie and Winius 1977: 118-119; Prestage 1933: 3-10, 331-335; Smith 1993: 31-34).

The *barca* or "barque" was mentioned throughout Europe as a common ship type in the fourteenth and fifteenth centuries (Elbl 1994: 92). In the Mediterranean the barque was a small fishing boat, in Genoa they were coasting vessels, and in Sicily the "barche" was used in small rivers for transport. It was in a *barca* that the Portuguese mariner Gil Eannes achieved a landmark in navigational history when he rounded Cape Bojador in 1434 and destroyed the myth that it was impossible for ships to return if they sailed past this point (Azurara 1896: 33; Baker 1992: 435; Headrick 2010: 22). Generally barques ranged in size from a tiny 25 tons to massive cargo carriers of 240 tons, a range that makes their classification by hull type problematic. In fact, their defining characteristic may have been the fact that they carried both oars and sails. In the fourteenth century most references to barques note square sails carried on a single mast, but by the end of the fifteenth century they were often designed with up to three masts. They were only partially decked for easier access into their holds (a characteristic reflecting their use as fishing vessels), and could have been crewed by as few as fifteen sailors (Unger 1997: 231, 232).

The *barinel* most likely originated in Biscay Bay as a mid-sized fishing and cargo vessel. It was only rarely mentioned by chroniclers such as Azurara, but the type was likely propelled by oars as well as sails, though by the end of the fifteenth century oars

would have been less common (Azurara 1896: 27-38; Unger 1997: 232). The *barinel* had a similar rig as the *barque* (one or two masts carrying square sails), but carried more cargo and required a larger crew. The ship type was apparently relatively common; the Portuguese *barinel* had counterparts in England known as *balingers*, and a Galician, Catalan and Castilian variant called *balener* (Woodman 2002: 56).

Both *barcas* and *barinels* were typically used in the earliest African voyages, eventually being replaced by the *caravel* and *nao* for more distant exploration (Azurara 1896: 27-38). Exceptions occurred, however; as late as 1499 a *barinel* made the journey from Lisbon to coastal Ghana (Elbl 1994: 92, 93). Regardless, these vessels were not favored by crews voyaging to Africa. They complained about the clumsy square sails and small cargo capacity limiting the amount of provisions that could be carried. This feedback contributed to the modification and adoption of the *caravel* as the main vessel for African exploration (Smith 1993: 37).

The *caravel* appears in documentary evidence during the thirteenth century as a fishing vessel, and its first known use for exploration occurred in 1440 on a voyage past Cape Bojador to the Rio d'Ouro (Unger 1997: 232). It was larger than ships used in previous exploratory voyages, allowing crews to sail for longer periods without running low on supplies. *Caravelas* could be fitted with either square or lateen rigs, and it was common for captains to change the rigs depending on the sailing conditions (Headrick 2010: 23). In fact, Columbus did this with the *Niña* on his first voyage west in 1492 (Morison 1942: 163). The shallow draft of the *caravel* which served it well in coastal fishing waters also provided an advantage in sounding unknown coasts, exploring bays and navigating estuaries. The combination of lateen sails, a low, shallow hull, and a stern

rudder produced an extremely efficient sailing machine, serving as the platform for European exploration and expansion in the fifteenth and sixteenth centuries (Morison 1974:5-6; Smith 1993: 37).

The *caravel* proved by far the dominant exploratory ship from the mid-fifteenth to the mid-sixteenth centuries, initially along the African coast but later with fleets sailing across the open ocean into a “New World” (Diffie and Winius 1977: 118-119; Russell-Wood 1992: 28-29; Parry 1963: 65-67). As voyages extended for longer distances along the African coast, a more weatherly vessel such as the *caravel* was necessary to sail into the adverse winds faced by returning explorers (Baker 1992: 435). Portuguese mariners explored the majority of the African coastline in these vessels, and reached India and Asia hoping to fill the holds of caravels with valuable cargoes for the European market. Ironically, despite their historical importance less is known about the construction of caravels than Viking ships or even medieval cogs, and no archaeological examples have yet been found that can be positively identified (Elbl 1994: 91).

The typical *caravel* reached 50 tons or more, with a length of 20 to 30 meters (65.5 to 98 feet) and a beam of 6 to 8 meters (19.6 to 26 feet). Its sails were rigged on two, three or even four masts, and it often carried a basket-like crow's nest on the main top for observation purposes ("Libro segundo de los gastos de las armadas" 1498, in Smith 1993: 239-256). A single deck covered the hold, with a low sterncastle aft. The improved sailing capabilities combined with a low freeboard (a low profile in the water) increased maneuverability dramatically while decreasing the leeway affecting larger ships with pronounced stern and forecastles, making the *caravel* a versatile tool for exploration (Smith 1993: 41-43; Diffie and Winius 1977: 119; Phillips 1986: 37-38).

As voyages along the African coast extended further and required even longer periods at sea, size limitations of the *caravel* became an issue. Upon Bartolomeu Dias' return from rounding the Cape in 1488, he recommended that fleets include at least one larger vessel for future voyages of exploration. By this time the nature of African exploration was beginning to shift to commercial considerations, and larger vessels were already being used more frequently. These developments led to the greater use of the *nao* or *urca*, larger vessels with a correspondingly greater cargo capacity than the *caravel*.

The *nao* allowed voyages of an even greater duration than the *caravel*, and proved their utility in Vasco da Gama's successful navigation to India in 1498. Bartolomeu Dias' dissatisfaction with *caravels* for voyages of long duration led him to help in the design of two *naos* for da Gama's voyage, the *São Rafael* and the *São Gabriel*. Each of these rated between 100 and 200 tons and carried square sails on their fore and mainmasts with a lateen mizzen (Renault 1956: 317-327). The design of the *nao* sacrificed speed and maneuverability to some extent, but its clumsiness was overcome by the greater cargo space and the continued presence of the *caravel* as a scouting and dispatch vessel in long exploratory or trading voyages. The *nao* also provided a more stable platform for a new trend in naval warfare-- the incorporation of naval ordnance on the decks of ships for military action (Smith 1993: 48, 49).

The Portuguese vessels incorporating multiple masts with square and lateen-rigged sails such as the *caravel* and *nao* ushered in a new era in seafaring, dominated by sailing vessels that were more seaworthy and navigable, carried more cargo with greater efficiency, and afforded greater range and economy than anything that existed prior to the fifteenth century (Figure 4.3). While previous intrepid voyagers set their sails and



Figure 4.3 Sixteenth-century ships offshore of Elmina. In this image, vessels are shown sailing and at anchor offshore of the Castle. The characteristics of the smaller vessels, notably the multiple masts, lack of a forecastle and low sterncastle, are suggestive of *caravels*. The larger vessel, with square sails on the main and fore mast, lateen sail on the mizzen mast, and large fore and sterncastles, is indicative of the *nao* (Braun and Hogenberg 1990: plate XXIX).

headed into the open ocean, many of them were never heard from again. It was only when ships and people were able to return, often against opposing winds and currents, did the age of European expansion truly begin (Barker 1992: 433). Within just a few decades

of their first use in the exploration of the African coast, these craft carried mariners to India and around the world, permanently changing the global maritime landscape.

The evolution of rigging systems through the sixteenth century is still not completely understood, and many of these developments were occurring in other countries and regions, including the Mediterranean Sea and the Arab world. Eventually vessels such as the *galleon* became nearly ubiquitous among different nations trading to the African coast and elsewhere due to the success of the design (Lavery 2004: 109; László and Woodman 1999: 63). With a narrower length-to-beam ratio and reduced fore and stern castles, various countries made use of the *galleon* for both merchant and naval purposes.

As the sixteenth century ended, however, the dominance of Spain and Portugal on the world's oceans was beginning to wane. Increasing competition with other European powers for trades and riches led to advancements in ship design, and new players appeared in the Atlantic world and beyond to challenge Portugal's and Spain's power on the sea. Other nations emulated the success of vessels such as the *caravel* and *nao*, either through the migration of ship builders, the capture and study of Spanish or Portuguese vessels, or the inevitable familiarization that resulted from their spread across the seas (Woodman 2002: 59). Thus while English, French, Dutch, Flemish or Sicilian vessels may have slight variations on the style, multiple-masted vessels employed by the Iberian explorers became ubiquitous among other nationalities on the world's oceans.

The Seventeenth Century

In the seventeenth century, ships sailing on the open ocean for trading in both West Africa and the Americas incorporated continuing developments in rig configurations and hull construction, but generally carried on the trend of multiple-masted sailing vessels incorporating both square sails and fore-and-aft rigs.¹³ Additional texts, such as Mathew Baker's *Fragments of Ancient English Shipwrightery*, give insights into English shipbuilding practices of the later sixteenth and early seventeenth centuries (Baker 1570). Sir Anthony Deane wrote his influential *Doctrine of Naval Architecture* in 1670, in which he espouses an ideal ratio of a merchant vessel's beam as 1/3 the keel length (Lavery 1981: 52; Steffy 1990: 158). Compared to the rules set forth by sixteenth century treatise authors such as Palacio, this would generally make seventeenth-century English vessels narrower than their sixteenth-century Iberian counterparts.¹⁴ The general forms of large, English ocean-going ships were similar to each other, however, and differed little from Iberian vessels of the period (Steffy 1990: 142). Most sixteenth and seventeenth century ships exhibited a full bow or "entrance" and narrow stern or "run", with the maximum beam located slightly forward of the center of the hull.

If general design trends established in the sixteenth century are seen to continue in most of seventeenth-century European shipping, Dutch ship builders were experimenting with new designs as they began encroaching on Portuguese and Spanish trades in the Atlantic, Americas and East Indies. Indeed, a key maritime development during the

¹³ In this discussion, I do not include developments in ships involved in the East Indies trade. Since these vessels sailed further and longer than those involved in the West African or American trades, they are considered a separate class of vessel and are not really pertinent in an examination of the design of West African traders.

¹⁴ It must be kept in mind, however, that shipbuilding treatises cannot represent the wide ranging varieties of vessels built in any period, or the vagaries of individual shipbuilder's preferences in how they designed their vessels.

seventeenth-century was the rise of Dutch supremacy on the seas, with the establishment of the largest merchant fleets in the world and the spread of Dutch settlements into areas where only the Iberian powers tread before (Enthoven 2003: 19; Israel 1989: 6-10). As C. R. Boxer writes in his seminal *Dutch Seaborne Empire*, “The greatest single reason for the Dutch success was the truly remarkable economic development of the two maritime provinces of Holland and Zeeland, the agricultural wealth of the remaining five provinces being of scant importance by comparison. More particularly, the sudden and dramatic upsurge of Dutch maritime trade from 1590 onwards provided something of a surprise for contemporaries and a puzzle for posterity” (Boxer 1970: 4). This preponderance toward maritime enterprise is not actually terribly surprising; the merchants and mariners of Holland and Zeeland enjoyed a large share of the seaborne trade between the Baltic and Western Europe by the middle of the sixteenth century, as well as access to the great fisheries of the North Sea (Boxer 1970: 6).

Dutch ship design advanced significantly in the seventeenth century, which can be seen as a reflection of their greater presence on the world’s seas. Despite the importance of these technological innovations, relatively little is known about the specific distinctions and varieties of vessels used by the Dutch during most of the historical period. As Oliveira warned about the vagaries in ship types in the late sixteenth century, the Dutch shipwright Nicolaes Witsen wrote in 1671 that “the races of the ships are often very much mixed” (Parthesius 2010: 16). Evidence for this conflicting terminology can be seen in seventeenth-century documents relating to vessels entering the Dutch settlement at Fort Amsterdam on Curaçao; the same vessels categorized as barks in one transcript are referred to as sloops elsewhere, and the term *schip* or “ship” is at times used

for yachts, *fluyts*, barks and frigates (Hall 1996: 84). Specific vessel types mentioned in contemporary documentation include the *fluyt*, cat (*katschip*), pink, pinnace (*pinas*), *jacht* (yacht), ketch, frigate (*fregat*), galiot, ketch, bark and *schip* (ship) (Minchinton 1990: 142; Postma 1990: 143; Stammers 2005: 32; Wilcoxon 1991: 53). Chapman listed Dutch merchant vessels such as the Flyboat, Smack, and Hoy in his survey of eighteenth-century merchant craft (Chapman 2006).

Despite this apparent lack of clarity regarding contemporary vessel types, some information is known about what seventeenth-century Dutch shipping looked like. A key consideration is a vessel's size and cargo capacity, which among Dutch shipbuilders during the seventeenth century was known as the *lastmaat*, or tonnage. The *last*, or the unit of dimension used to calculate the overall tonnage, apparently had different meanings depending on different circumstances. It could be a measure of volume, equivalent to roughly 3.5 cubic meters (125 cubic feet), or a measure of weight of around 1.8 metric tons (4000 pounds) (Parthesius 2010: 17; Lane 1964: 225). Whereas the overall length was the principle factor in determining a vessel's tonnage in the seventeenth century, by the beginning of the eighteenth century tonnage was calculated by multiplying length, width, and depth, and dividing that by 200 (Postma 1990: 146). Ambiguity in the conception and calculation of ships' hulls was common throughout the historical period, with rules changing depending on formulas used and the purposes or reasons for calculating tonnage in the first place (Minchinton 1990: 143-144; Steffy 1994: 144, 263; Lane 1964: 213). Regardless, for the purposes of comparison of vessel types, the seventeenth-century Dutch *lastmaat* was approximately twice our modern conception of gross registered tonnage (Parthesius 2010: 19; Wilcoxon 1991: 68).

The *schip* or “ship” could be used for multiple purposes, which may help explain the term’s widespread use for sailing vessels of various types. These were larger than the typical vessels used for northern European trade, and would have been well-suited for the African or Asia trades. Vessels of 200 *last* or more were nearly always designated as ships, while smaller vessels at times were described as ships and at other times yachts or *jachten* (Parthesius 2010: 71). The *het Wapen van Rensselaerswyck*, a ship purchased for trading voyages between Holland and New Netherland was described in 1643 as “80 lasts burthen, well protected with an upper deck, five feet high, extending the entire length, a comfortable forecastle to lodge people in, mounted with six pieces properly supplied with powder, lead and ammunition, and well provided with tackle and sails and all that belongs thereto” (van Laer 1908: 670).

Both the ship and yacht could be used for trade or naval vessels, and their intended use affected their design. Military vessels tended to have stouter timber dimensions and less cargo capacity than their merchant equivalents. Yachts figured prominently in trading fleets to Africa and Asia. Their dimensions could vary widely; the smallest being only 20-25 *last*, and the largest in the seventeenth century reaching 270-280 *last*. While ships generally carried multiple masts, yachts could be rigged as a single or multiple-masted vessel with fore-and-aft sails, semi-enclosed decks, and cannons mounted on their ends and broadside (Stammers 2005: 32; Parthesius 2010: 69-72). The Dutch yacht *Onrust* built in New Netherland had a length of 13.5 meters (44.5 feet) and a maximum beam of 3.5 meters (11.5 feet) (Wilcoxon 1991: 61). Dutch frigates of the seventeenth century were also sizable vessels, generally three masted, square-rigged, heavily armed and known for their speed (Wilcoxon 1991: 59).

The invention of the *fluyt* at the beginning of the century brought about a major advancement in the bulk cargo carrier, with a flat bottom, lower superstructure, simple sail plan and light construction (Postma 1990: 143). Often considered a modification of earlier cargo-carrying vessels referred to as *hulks*, the *fluyt* incorporated greater length-to-beam ratios, often approaching 5:1 or 6:1, with full lines and a bulging bow and stern (Parthesius 2010: 83). It also sported a pronounced tumblehome (the inward curvature of a ship's sides from the maximum breadth up to the bulwarks), two factors which led to greater stability and a maximization of cargo space (de Vries and van der Woude 1997: 357; Steffy 1994: 281). In fact, a key factor in producing a vessel with large carrying capacity and small "on-deck" dimension appears to have been an effort by Dutch shipwrights to take advantage of tax rules based on ship dimensions (Parthesius 2010: 83). Regardless, it led to a mass-produced and widely copied vessel known for its practicality and simple sailing rig, which in turn led to a reduction in crew size and operating costs (Wilcoxon 1991: 57).

Historians have generally treated Dutch trade in Asia under the Dutch East India Company (VOC) with greater attention than their Atlantic activities (Masselman 1966: 382; Parthesius 2010). This realization that the Dutch Atlantic trade had been under-represented led a group of scholars to re-examine the Netherland's Atlantic trade at a symposium on Dutch Atlantic shipping at the University of Leiden in 1996 (Postma 2003: 1). One of the results of this focus on the Dutch Atlantic World involved a closer look at the organization and types of ships employed by the Dutch West India Company (WIC) in the African trade. Since the Dutch were intensely involved in maritime trade

during the seventeenth century, particularly in West Africa, a closer look at how they organized this trade is warranted.

From 1600 to 1800, between 20,000 and 25,000 Dutch voyages lead across the Atlantic to either Africa or the Americas, compared to fewer than 5,000 from the Dutch Republic to Asia (Postma 2003: 12). In 1633 the Dutch West India Company owned approximately 120 well-built ships, the largest approaching 400 *lasts* and the smallest rated at 150 *lasts* or less (Wilcoxon 1991: 53). The West India Company engaged in four different types of shipping activities in its West African trade, including: coastal trade; patrols along the coast to capture foreign traders or interlopers; commodity trade between the Netherlands and Africa; and the triangular slave trade between Europe, Africa and the Americas (den Heijer 2003: 143-144). While some overlap inevitably occurred, certain sizes or types of vessels tended to be used in each type of voyage.

Small, lightly armed vessels were primarily used for trading voyages along the coast, moving between forts and factories for transport of goods and supplies and providing communication links between these stations. The Director General at Elmina typically had four to six ships at his disposal for such purposes (den Heijer 2003: 144). These vessels at times also ventured beyond Dutch-controlled waters to the Ivory Coast, Grain Coast, QuaQua Coast, Niger Delta and elsewhere. They were small enough to safely navigate small inlets and rivers when necessary, and voyages might last as little as a few weeks to several months. The vessels utilized for these routes included types that evolved from fishing vessels and workboats, such as *buizen* (busses), *hoekers* (hookers), and *pinken* (pinks), but occasionally larger vessels were utilized for this trade, such as barks and yachts. Crew sizes tended to be small, ranging from five to fifteen sailors

depending on the size of the vessel, and armaments were correspondingly sparse; usually only one or two small cannon, small arms (muskets), machetes and swords (den Heijer 2003: 144-146).

Coastal patrols were typically conducted with frigates, which were tasked with limiting the activities of competing national powers as well as private interlopers or *lorrendraaiers*. The latter often sailed from Zeeland in order to trade illegally on the African coast. With a length of around 38 meters (125 feet), a crew of over 100 sailors and soldiers, and armed with 25 guns or more, these vessels were fitted out for armed intervention if the need arose. Their cruises lasted 18 months before returning to the Netherlands for refitting and resupply. Outfitting these vessels proved an expensive proposition for the WIC, and there was not always a cruiser available to patrol the Mina coast. But between 1674 and 1730 coast patrolling vessels captured 98 interlopers, proving their effectiveness at protecting the West African trade for the WIC (den Heijer 147-148).

Economically the most important WIC shipping activity involved the commodity trade between the Dutch Republic and West Africa, wherein vast amounts of goods for the African trade were exchanged for gold, ivory, and other products. Over 300 ships made trading voyages to the African coast between 1674 to 1740, most of these bound for Elmina (den Heijer 2003: 149). The vessels most commonly used for the commodity trade were medium-sized frigates and yachts, averaging 20 to 34 meters (70 to 110 feet). The typical complement for these vessels was a crew of 30-35 sailors and 15-20 guns (den Heijer 2003: 149-150).

In terms of investment and trading volume, the triangular slave trade comprised the most active element of the WIC trading strategy, with 383 vessels fitted out for slaving between 1674 and 1740 (Postma 1990: 110). In the seventeenth century the Slave Coast and Loango-Angola Coast were the most common destinations for obtaining slave cargoes, but after 1715 the Gold Coast became the most important slave embarkation point.¹⁵

As with the Iberian ship types of the previous century, these Dutch developments found their way into other nations' navies and merchant fleets through emulation or capture as prizes during periods of warfare. By the close of the seventeenth century and the start of the eighteenth, the rig of vessels was beginning to hold as much, if not greater, importance on their classifications as their hull did in previous centuries. Regardless, the combination of square and fore-and-aft sails arranged on single or multiple masts remained the touchstone in these advances, as they had during the Iberian voyages of discovery in the fifteenth and sixteenth centuries.

The Eighteenth Century

The eighteenth century saw continued improvements in rigs and hull design, notably an increasing size of vessels and added sail area in the form of top masts carrying topgallant and royal sails above the standard main and top sails (MacGregor 1985: 344). There is also a plethora of contemporary documents that exist, including the first true ships' plans, contracts, naval records and ship models that amply illustrate developments in this period.¹⁶ The Swedish naval architect, Frederik Chapman, in his 1768 master

¹⁵ More information on Dutch slave ships is included later in this chapter.

¹⁶ For a more thorough treatment on eighteenth-century documentary sources, see Steffy (1990: 160).

work *Architectura Navalis Mercatoria*, summed up the ideals of eighteenth-century merchant ship design by describing “ships of good qualities”, namely: that a ship with a certain “draught of water”, should be able to contain and carry a great lading in proportion to its size; that it should have a sufficient stability; that it should be easy at sea, or its “rolling and pitching not too quick”; that it should sail well before the wind, and close to the wind, and work well to windward; that it should not be too ardent, and yet come easily about; that it should require a small crew in proportion to its cargo capacity; and that it should sail with a small quantity of ballast to maximize cargo space (Chapman 2006: 126, 133).¹⁷

Chapman admits that at times these qualities are at “variance with one another”, and it is impossible to design a vessel maximizing all of these characteristics. Instead, he offers four “species” of ships that are designed with specific purposes in mind. These include frigates, barks or cats, heckboats or pinks, and flat-bottomed vessels. Each of these vessel types are listed in tables with formulas for determining their principal dimensions based on desired tonnage, a significant departure from earlier treatises with simplistic ratios that were to be applied to any vessel on the seas. In Chapman’s case, frigates are designed for naval operations, requiring the carrying of considerable weaponry but at the same time also needing to sail well for maneuvering in combat. Barks or cats are designated as “solely for trade”, and therefore their main purpose is to carry the greatest amount of cargo and sail with the smallest number of crew, even though this will make the sailing capability of such vessels suffer. Heckboats or pinks are ranked between frigates and barks/cats as to their requirements and design, and are

¹⁷ The fact that Chapman, a Swedish naval architect, illustrates and describes vessels from a variety of national origins, suggests that these developments were occurring throughout the European seafaring world, though inevitably there must have been regional variations.

also primarily merchant vessels. Lastly, flat-bottomed vessels have the same qualities as barks/cats but are designed with flatter bottoms and a correspondingly lighter draft (Chapman 2006: 134-137).

In an example of using these formulas, he offers dimensions for a 100 ton bark, producing a vessel with an overall length of 47.25 meters (155 feet), 9 meters (30 feet) beam, and 4.25 meters (14 feet) depth of hold (Chapman 2006: 136-137). This length to beam ratio of 5:1 is considerably narrower than the typical sixteenth or seventeenth century vessel design. In his 1794 *Treatise on Naval Architecture*, however, William Hutchinson echoed Deane's recommendations, writing "to proportion the dimensions of ships, their breadth should always be one third the length of their keels, to prevent them from being too crank."¹⁸ And what should be always aimed at to proportion them, that when light to shift themselves without ballast, and when loaded stiff enough to carry away their masts, before they overset" (Hutchinson 1970: vi). While the reality undoubtedly led to a considerable amount of variation from these formulas, Chapman and Hutchinson provide insights into the ideals that eighteenth-century ship designers sought at the dawning of the science of naval architecture.

As in earlier eras, ships utilized for the West African trade in the eighteenth century were typically the common merchant vessels of the period, rather than specialized vessels designed and built specifically for African voyages. Vessel types voyaging to West Africa would include sloops, schooners, brigs, brigantines, snows,

¹⁸ The term "crank" or "cranky" in referring to a vessel meant that she was top-heavy and consequently incapable of carrying sufficient sail. This could lead to excessive heeling and a long rolling period, where the vessel rolls excessively, while a "stiff" vessel tends to stay upright despite sea conditions. Both conditions are considered undesirable in their extremes (McEwen and Lewis 1953: 111, 538).

barks, barkentines, and full-rigged ships, some of which are shown in Figure 4.4 (Chapman 2006; MacGregor 1985; Postma 1990: 142; Rediker 2007: 52; Stammers 2005: 35). Chapman listed barks, flutes, pinks, cats and hagboats, among others (Chapman 2006: 1). Certain types and sizes of vessels tended to be built in particular ports; for example, London was known for producing large ships both for the African and East Indian trades, and in Lancaster shipyards produced smaller brig or snow-rigged vessels for the Africa routes (Elder 1991: 40-41). As seen in earlier periods, compared to the broad spectrum of ship types and sizes, from small coastal vessels to the large East Indiamen, West African traders or 'Guineamen' tended to be medium-sized vessels, larger than those involved in Northern European or Mediterranean trades, but smaller than those voyaging around the world to the East Indies (Burnside 2002: 78; Rediker 2007: 63). According to Stewart-Brown's study of Liverpool ships, vessels averaged 70 tons burthen in the early 1700s, and around 200 tons by the end of the century (Stewart-Brown 1932: 19). There were few safe harbors along the West African coastline to offer shelter to larger ships, and the expansive cargo capacities of these vessels required longer stays on the coast for gathering full cargoes, increasing the danger of diseases to the crew and greater wear on the hulls (Minchinton 1990: 145).

These developments, among others, found their expression in the African trade, whether for gold, ivory, produce or the ever increasing trade in enslaved Africans, which was at its peak in this century (DeCorse 2001: 10; Richardson 2005: 67). Forcibly transporting hundreds of individuals in a vessel crossing the Atlantic Ocean required considerable modifications to ships involved in this nefarious trade. Since this was a

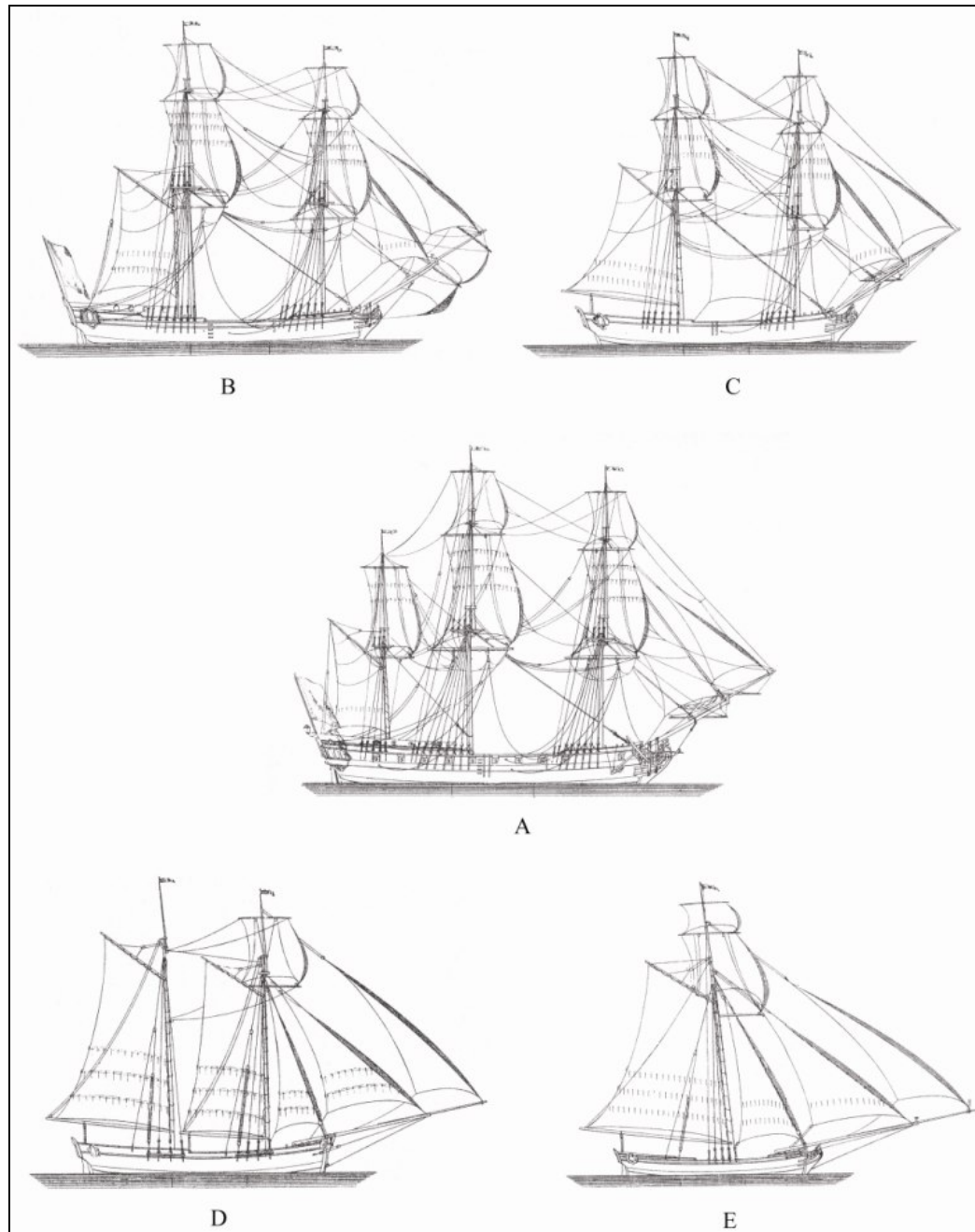


Figure 4.4: Common vessel types of the eighteenth century. Pictured include A) Ship, B) Snow, C) Brig, D) Schooner, and E) Sloop (After Chapman 2006: Plate LXII).

crucial component of the West African exchange, a brief discussion of the slave trade follows.

The Slave Trade

The first successful attempt by Europeans to seize and enslave Africans can be traced to 1441, when Antam Gonçaves, a Portuguese sailor, captured twelve men and women near Cape Bojador during a voyage of exploration (Azurara, in Donnan 1965: vol. 1, p. 18; Massing 2009: 333; Reynolds 2005: 25.)¹⁹ Although the slave trade would not reach its peak until centuries after this event, Gonçaves' voyage can be seen as the beginning of the Atlantic slave trade.

As noted earlier in the overview of sixteenth-century ship design, the same vessels used to explore and initiate trade with West Africa were the typical sailing vessels of the period, and these were the same ships used to transport the first enslaved Africans back to Europe. The *caravelas* used by Gonçaves and later mariners became the first slave ships, a symbol which conjures an image of hundreds of enslaved Africans chained in the holds of filthy vessels bound for the Americas in the middle passage. While the trade in enslaved Africans and the infamous "middle passage" did not reach such a scale until centuries later, the fact remains that the forced migration of Africans began almost immediately after Iberian mariners initiated voyages of exploration along the African coast (Rawley and Behrendt 2005: 10).²⁰ Just three years after Gonçaves' voyage,

¹⁹ Prior to Goncalves' raid, there were sporadic attempts to capture Canary Islanders to provide laborers for sugar plantations in Madeira, as well as opportunistic seizures of Moors on the Moroccan coast. Ultimately these sources of labor proved unsatisfactory, and the 1441 slave raids of Goncalves are widely seen as the beginning of the Atlantic slave trade (Russell-Wood 1978: 17-18).

²⁰ Some early slave trade conducted by the Portuguese was internal to the continent: slaves were brought to coastal Ghana for trade to African merchants there as early as the 1470s (DeCorse 2010: 213-214).

Portuguese captain Lançarote des Ilha offloaded over 200 Africans from his fleet of six *caravelas* at Lagos (Russell-Wood 1978: 16). With the establishment of a trading fort on the island of Arguin in 1448 and the building of São Jorge de Mina in 1482, the African trade became more secure and established (DeCorse 2010: 210; Rawley and Behrendt 2005: 20). A rough average of 500 slaves per year were imported into Lisbon during the late fifteenth and early sixteenth centuries (Curtin 1969:18).

Although the general types of vessels that would have been used during this period would likely include the *caravelas* and *naos* described above, little is known regarding any modifications or special procedures that may have been involved in these early slave voyages. While the trade in slaves could be lucrative, during Portugal's initial contact with West Africa and attempts to maintain its trade monopoly in the region, gold and other commodities comprised the bulk of the trade. It is likely that steps were taken in the stowage of the human cargo in the hold, or to prevent slaves from jumping from the ships as is seen in later periods; in the case of Lançarote's 1441 voyage, keeping scores of enslaved Africans alive for the return trip to Portugal would have required at minimum additional food and water to sustain the slaves for the voyage. But making cargo-specific types of arrangements would likely have been commonplace on any trading voyage, and would be seen as standard measures that captains of vessels would take in securing any type goods they were transporting, whether it be palm oil, food stuffs, perishable goods or humans.

The Dutch followed the tendency to utilize general cargo ships for the slave trade, though by the seventeenth century there is evidence of specific modifications for the vessels participating in forced transport of human cargo. Slave ships were fitted with a

diep verdeck, or a narrow, temporary deck set up between the lower and upper decks for housing the slaves. Vessel types listed in seventeenth century WIC documents as conducting slave voyages include the *fluyt*, *hekboot*, *katschip* and *pinas*, all typical merchant ships of the period (Postma 1990: 143-144). By the eighteenth century there is a clear tendency to use the faster and generally smaller *fregat*, and vessels such as the *fluyt* were apparently rarely sent on slaving voyages. Other vessel types for slaving during this period include the *bark*, *snauw*, *hoeker*, *galjoot* and *yacht*. The latter vessel was used for special slave shipments initiated by the WIC out of Elmina, and was also a popular vessel for free traders. WIC documents from 1675 describe yachts as being approximately 18 meters (60 feet) in length, where *fregats* reached 23 meters (75 feet) and *barks* could be over 30 meters (100 feet) (Postma 1990: 144). Smaller vessels could hold around 400 slaves while larger ships might carry as many as 600, though one vessel was listed as transporting over 900 slaves in a voyage to Dutch Guiana. Crew sizes and numbers of guns varied depending on the size of the vessel, with the larger ships manned by up to 60 sailors and 20 guns, and smaller slavers having 30 sailors and armed with 10 guns or less (den Heijer 2003: 150-151).

During a slaving voyage, the ship's carpenter oversaw the gradual modifications of the decks as trade cargo was brought up for purchasing slaves, and the human cargo began trickling onboard. Wood shelving would be installed to create the *diep verdeck*, and the slaves would be housed on this temporary platform. As is seen in other nationalities participating in the trade, many vessels might be used for only one or a few slaving voyages, a testament to the use of general cargo carriers for the trade rather than specially-designed ships. Other vessels made repeated slaving trips; between 1675 to

1738, eighteen WIC vessels made five or more slaving voyages, reaching a total of 105 trips and carrying more than one-third of the total slaves transported by the company in this period (Postma 1990: 144-145).

By the eighteenth century, the African slave trade dominated colonial economies, and its impact on economical and socio-political aspects of life grew to a new height. While government monopolies and joint-stock ventures that had fueled the slave trade in previous centuries were beginning to wane, there was a concurrent increase in independent slave trader activities, particularly among Dutch traders. The slave trade market led to the expansion of industries in the Americas and Europe dependent on African markets, and those involved in these endeavors would prove highly resistant to rising sentiments for the abolishment of the trade toward the end of the century. Spain's American colonies became heavily involved in the trade, while the Dutch, English, French, Portuguese, Danes, Brandenburgers and others tried to maintain their activities established in the seventeenth century or earlier (DeCorse 2010: 231-232; DeCorse n.d.: 9; Donnan 1965, II: xiii).

While trends changed over time, notably with larger vessels being involved as the trade expanded in later years, there were regional variances as well. There were also notable exceptions: Thomas Clarkson, an abolitionist who spent time gathering evidence on the slave trade, was shocked to note two small sloops being fitted out for the trade in Bristol in the late eighteenth century (Clarkson 1808: 327). One, of only 25 tons, was said to be capable of carrying 70 slaves, and an even smaller vessel of 11 tons was prepared to transport a cargo of 30 slaves. The owner of the smaller vessel was planning to sell her upon completion of her slaving voyage from West Africa to the West Indies as

a pleasure vessel to accommodate six passengers! Clarkson was able to board the vessels and conduct measurements of their holds, writing:

In the vessel of twenty five tons, the length of the upper part of the hold, or roof, of the room, where the seventy slaves were to be stowed, was but little better than ten yards... The greatest breadth of the bottom, or floor, was ten feet four inches, and the least five. Hence, a grown person must sit down all the voyage, and contract his limbs within the narrow limits of three square feet. In the vessel of eleven tons, the length of the room for the thirty slaves was twenty-two feet. The greatest breadth of the floor was eight, and the least four. The whole height from the keel to the beam was but five feet eight inches, three feet of which was occupied by ballast, cargo, and provisions, so that two feet eight inches remained only as the height between the decks. Hence, each slave would have only four square feet to sit in, and when in this posture, his head, if he were a full grown person would touch the ceiling or upper deck (Clarkson 1808: 329).

One of the best primary documents relating to specific attributes for a slaving vessel is included in Donnan's *Documents Illustrative of the History of the Slave Trade to America*. In 1745 the Liverpool trader Joseph Manesty corresponded with his Rhode Island agent John Bannister regarding the construction of two vessels for the West Africa trade (Donnan 1965, III: 137-138). He requested gross dimensions of "58 feet long in the keel, 22 feet beam, 10 feet hold and 5 feet twixt decks.... Main mast 60 feet long, main yard 44 feet long, main top mast 30 feet long, all the other masts and yards in proportion..." Further instructions included:

"...[build them of] the best white oak timber at Rhode Island, both to be square stern'd with 2 ½ and 3 inch plank with good substantial bends or Whales. They are for the Affrican trade, to have middling bottoms to have a full Harpin and tumbled in as common for the more commodious stowing Negroes twixt decks. To have snug heads without rails, plain sterns, Firm Quarter pieces, no Quarter Windows nor Joiners work in the Cabbin (except so much as to sit in the Cabbin Windows), to Stern with a tiller over the Round house, to be sheath'd on the stocks."

The type of vessel Manesty describes is a medium sized ship compared to some of the large slavers that were coming out of London and other ports during the eighteenth

century. This vessel would be a stout ship without much adornment (no quarter windows and relatively little internal joiner's work for the comfort of officers or captain). The substantial wales he requests would provide considerable longitudinal stiffness to the hull and help support the decks (Falconer 1780: 1461; Steffy 1994: 281). His request to have the hull "tumbled in" likely refers to an inward curvature of the upward portion of the hull, also known as "tumble home" which would have reduced the center of gravity and allowed the lower decks to remain wide for the "commodious stowing of Negroes" (Steffy 1994: 281). He mentions sheathing several times in the document, and is clearly concerned that the vessel be properly protected with (likely) thin wooden planks to protect the hull from marine borers common in tropical latitudes. In a separate letter, he makes an additional request that "...as both ships are design'd for Guinea a great regard must be had to the goodness of their masts on the whole" (Donnan 1965, III: 137-138).

The Newport merchant Bannister corresponded with other Liverpool traders, keeping them informed on the progress of their vessels in Rhode Island shipyards. Writing to James Pardoe in April of 1747, "Your orders came just in time to make your ship 24 feet beam, she'll be launch'd in Septem'r, and I am well assured the Compleatest Guinea Man that was ever built, she'll mess at least a fourth more Negroes on the Deck than any one I ever yet met with" (Donnan 1965, III: 140).

Another excellent description relating to slaving voyages lies in the account by John Riland, son of a Jamaican planter who was ordered by his father to sail in 1801 from his schooling in London back to Port Royal via the slaver *Liberty*, so that he could witness the details of the slave trade firsthand. The *Liberty* took on 170 male and 70 female slaves (he does not mention from which port), and he notes that the captain

assured him that the “smell would be unpleasant for a few days, but when we had got into the trade winds it would no longer be perceived” (Riland 1827: 51). Shortly after sailing four slaves had already died and a woman had been flogged and remained handcuffed for attempting to drown herself. During the voyage man of the slaves refused to eat. Despite an attempt at insurrection, *Liberty* arrived at Port Royal, and before leaving the ship, Riland noted the arrangements onboard:

The accommodations for the slaves were arranged in the following manner. The men’s room was immediately below the main-deck, and extended all the way forward from the main-mast. Its height below the beams was only four feet and a half. A large grating was placed over it; through which, while at sea, a sufficiency of air might in general be admitted: but in harbour, or on the coast... the poor slaves confined in it must have often breathed a most impure and stifling atmosphere. There were, in the side, two or three small scuttles, or holes for admitting air, which were occasionally opened. In this room 140 men were stowed: and certainly the space allotted to them was far too small, either for comfort or health. The men were always fastened together, two and two, by means of iron shackles; the right leg and hand of one being attached to the left leg and hand of the other... While they were on deck their apartment was always cleaned out; but towards morning the smell of it became necessarily very offensive; and it was still more so if the weather at any time prevented their being brought on deck. The main deck was entirely separated from the part of the ship abaft the main mast by a strong barricade about ten feet high, and extending about two feet over the ship’s side. In this barricade was a little door, capable of admitting one person; at which two sentinels were placed during the time the men slaves were on deck. Four more were placed, with loaded blunderbusses in their hands, on the top of the barricade above the heads of the slaves: and two cannons, loaded with small shot, were pointed towards the main deck through holes cut in the barricade to receive them. A very strong bulk-head, but so formed as to admit the circulation of air, bounded the after-part of the men’s room; between which and a bulk-head of the same kind which formed the fore-part of the women’s room, was a space of about ten feet, which served for a passage into the hold. From this second bulk-head the women’s room extended to the mizzen-mast. This apartment was more commodious in proportion than that of the men, as in general not more than forty-five persons slept in it. The women were not in irons, one excepted, who had attempted to drown herself. The grating was raised about three feet above the deck and admitted a good deal of air. The quarter-deck was raised about seven feet above the main deck, and extended forward so as to afford two additional compartments. The aftermost formed the cabin. Here hung the captain’s cot and mine; and underneath these, on the floor, during the night time, lay twenty five little girls. Before the cabin was another apartment, quite open

forward, in which the first mate and surgeon hung their cots, and where the boys, to the number of twenty-nine, lay during the night. The ship's company had their hammocks hung over the main-deck, under the long-boat, on each side of which a kind of awning was extended a little way, in order to defend them from the dews... The sick, especially those with dysentery, were kept separate from the others: the men in the long-boat, over which was thrown an awning; the women under the half-deck. None of the slaves had any clothing allowed them, and they all slept on the bare boards... From the above account it will be conceived that my situation could not have been a pleasant one. During the night I hung over a crowd of slaves huddled together on the floor, whose stench at times was almost beyond endurance. During the day, indeed, I had the cabin a good deal to myself: but the noise of the slaves on the deck was excessive, especially when they were dancing. There was no possibility of my having any exercise, as the quarter-deck was so fully occupied by the slaves during the day as to render it difficult to move without treading on them (Riland 1827: 53-57).

There were inevitably trends that waxed and waned through the era of the African trade, including the prominence of particular shipping ports, vessel types used, routes followed, and the specific African ports that engaged in trade. For example, for much of the seventeenth and early eighteenth century, English slavers routinely sailed from Bristol or London. By the mid 1700s, however, Liverpool emerged as the primary home port for outbound slavers, and as we see in the Bannister and Manesty correspondence, this in turn would eventually change to 'plantation-built' vessels or New England craft coming out of the American colonies due to cheaper materials, in particular timber (Rediker 2007: 53). After 1807, French and Iberian ports sent out most of the vessels participating in the waning years of the slave trade. Illicit slavers operating out of Havana or ports in Brazil continued the slave trade into the last half of the nineteenth century (Eltis et al. 1999: 4898, 4899, 4998).

Accurate drawings of three slaving vessels, the *Brooks*, *Aurore* and *Vigilante*, depict typical slavers and the changes seen in the trade once it was outlawed. The *Brooks* and *Aurore* represent an English and French slaver typical of the eighteenth century,

during the height of the trade and when slavers generally reached their maximum dimensions. The *Brooks* was built in Liverpool in 1781, named after its co-owner Joseph Brooks who was a local merchant, and participated on multiple slaving voyages. While laid up in 1788, this vessel was measured at the request of Parliament during hearings on the British slave trade. The ship measured 297 tons, with a lower deck reaching 30.5 meters (100 feet) in length and 7.8 meters (25 feet, 4 inches) in breadth, 3.4 meters (5 feet 8 inches) of height between the main and lower deck. During its slaving voyages, the *Brook's* crew built wooden platforms between these decks to increase the carrying capacity for enslaved Africans. With these decks, and the slaves arranged "spurnwise" or spoon-ways, the ship carried 650, 619, 740 and 609 slaves on four of its voyages. Even after the 1788 regulations passed by the British parliament that reduced the carrying capacities of British slavers, the *Brooks* could legally carry over 450 slaves in its hold. Depictions of the ship as it would be loaded with slaves became an infamous propaganda tool for the abolitionist movement. On its last slaving voyage in 1804 the vessel was captured and detained by authorities in Buenos Aires (Eltis et al. 1999).

The *Aurore* sailed from La Rochelle in August of 1784, and apparently participated in a single slave voyage, taking 500 slaves from Malimbo, north of the Congo River, to St. Domingue. Sketches show it ship-rigged (three masts with square sails on each mast, main, top and topgallant courses, and topsails on its mizzen mast), and it was listed as having a crew of 50. Cutaway views of the vessel shows its slaves stored on the orlop deck above cargo, with additional temporary slave decks running along the sides of the hold (Eltis et al. 1999).

Depictions of the *Vigilante* were also created by abolitionists, who measured the vessel after its capture by British anti-slave trade squadrons off of the Bonny River in 1822. Although at this time British forces could not legally take a French vessel suspected of being involved in the trade, the French captain opened fire on the British vessels when they approached a nearby Spanish slave ship, prompting the squadron to attack and capture *Vigilante*. The vessel was taken to Freetown, Sierra Leone, where the 298 surviving slaves were liberated. Data included with the abolitionists' pamphlet indicates that the *Vigilante*'s slave deck measured 24.8 meters (81 feet, 7 inches) in length, with 1.45 meters (4 feet 8 inches) in height. The men's and women's "rooms" were separated with a bulkhead, and together they had the capacity to carry nearly 350 slaves. The two-masted vessel exhibits sharper lines than those of the *Brooks* or *Aurore*, suggesting a sacrifice of cargo capacity in favor of speed to avoid capture now that the slave trade was illegal (Eltis et al. 1999).

As seen with the *Vigilante*, the abolition of the slave trade led to faster ships designed with sharper bows, greater deadrise and narrower hulls to outrun patrolling squadrons off the African coast. Howard Chapelle, in his work *Search for Speed Under Sail*, includes a list with the attributes of American-built slave ships that were captured by British cruisers between 1836 and 1841. They provide an interesting overview of the types of vessels built in American ports and used for the illicit slave trade, including specific details as to their dimensions, and are summarized in Table 2.1.

Table 2.1: American-built Slaving Vessels, 1836-1841

Ship Name	Rig/Type	Year Built	Dimensions (length on keel x beam x depth of hold, tonnage)
<i>Catherine</i>	brig	1839	86'3" x 24'2 x 11' ¾", 242 60/95
<i>Clara</i>	schooner	1838	58'10" x 7'10" x 7'10" 88 88/95
<i>Hazard</i>	schooner	1838	72'6" x 19'6" x 8'3", 114
<i>Anaconda</i>	schooner	1836	60'6" x 19'3" x 7'6", 91 89/95
<i>Delorez</i>	schooner	1838	62'8" x 21'1" x 8'7", 119 57/95
<i>Emanuel</i>	schooner	1836	61'1" x 21'2" x 8'6", 115 64/95, 28 sweeps
<i>Viper</i>	schooner	1836	60'6" x 19'3" x 7'6" x 91 89/95, 26 sweeps
<i>Ontario</i>	schooner	1833	72' x 21'2" x 7'2", 95 37/95
<i>Eagle</i>	brig	n/a	92'7" x 22'8" x 10'11", 205 73/95
<i>Euphrates</i>	schooner	1833	69'6" x 21'6" x 6'8" x 85 78/95, "very sharp"
<i>Florida</i>	schooner	1838	74'6" x 19'1" x 6'7", 99 21/95
<i>Laura</i>	schooner	1838	83'6" x 20'8" x 6'5", 99 21/95
<i>Perry Hall</i>	schooner	1837	60' x 18'6" x 5'9", 57 28/95
<i>Venus</i>	ship	1838	125'4" x 28'9" x 14'3", 466 9/95 "very sharp"
<i>Wyoming</i>	brig	1838	88'5" x 22'2" x 8'10", 154 71/95
<i>Asp</i>	schooner	1839	87' x 21'10" x 8'3", 140 14/95
<i>Asp</i>	schooner	1839	81'2" x 21'4" x 9'2", 140 63/95
<i>Lark</i>	schooner	1839	72'4" x 19'3" x 7'8", 94 35/100 tons

Chapelle notes that many of these vessels were designated as "sold to foreigners" or "sold at Havana." The majority were schooners, which was an extremely popular rig during the nineteenth century. As their dimensions indicate, most of the vessels are of medium size; the single ship noted in the data reaches 38 meters (125 feet) in length, but the remaining schooners and brigs range from 18.25 to 24.4 meters (60-80 feet) long. Some appear to be so shallow that they may have required centerboards which would have increased sailing efficiency in deep water, yet could be drawn in for shallow water approaches which would be beneficial for coastal sailing in West Africa (Chapelle 1967: 301-303).

A final consideration regarding vessels involved in the slave trade relates to the modifications of ships for their human cargo, many of which were temporary and occurred during the course of a voyage. The Dutch *diep verdeck*, described above, was apparently a standard means of modifying the space between decks to hold additional slaves throughout the era of the slave trade and even on ships illegally carrying slaves after abolition. These “slave decks” or platforms were often erected while anchored offshore after the removal of trade cargo and in preparation for boarding slaves, and consisted of temporary wooden platforms below the main deck and above the cargo hold (Garland and Klein 1985: 240-247).

Another modification was the construction of the “house”, a timber shelter that typically ran the length of the main deck and served as a temporary shelter for slaves during the one or two months that it often took to assemble a full slave cargo. Once filled to capacity with slaves, they would be placed below on the slave decks and the house would be disassembled in preparation for departure (Webster 2008: 7). Prior to leaving the African coast another wooden structure often called a “barricado” was often erected on the quarter or half deck, and served to separate the male slaves from the females, or to provide a secure boundary between slaves and the rest of the ship whenever they were brought up to get fresh air. Alexander Falconbridge served as a surgeon on slave ships in the 1780s, and wrote this description of the barricade:

Near the main mast, a partition is constructed of inch deal boards, which reaches athwart the ship. This division is called a *barricado*. It is about eight feet in height, and is made to project near two feet over the side of the ship. In this barricade there is a door, at which a sentinel is placed during the time the negroes are permitted to come upon deck. It serves to keep the different sexes apart, and as there are small holes in it, wherein blunderbusses are fixed, and sometimes a cannon, it is found very convenient for quelling the insurrections that now and then happen (Fyfe 2000: 97).

Insights into the types of equipment or supplies often carried by slave ships can be gleaned from various “equipment treaties” or “equipment clauses” enacted by the British Parliament, as patrols and boarding of suspected slaving vessels grew more frequent after the abolition of the slave trade (Bethell 1966: 86). Though initially British slave patrols could only board and seize vessels actually carrying slaves, laws were eventually passed allowing them to capture vessels with the apparatus or equipment indicating that they intended to load a slave cargo. A treaty between Britain and the Netherlands signed in 1823 reads in part:

And it is hereby further agreed, that upon proof being duly given before the Mixed Court, whereupon it shall appear that any Ship or Vessel... detained hovering or sailing upon the Coast of Africa...or at anchor within any of the Rivers, Bays, or Creeks of the Coast... in her outfit and equipment, shall fall within one or more of the following designations, namely: 1- Having her hatches fitted with open gratings instead of being close hatches as usual in Merchant Vessels. 2- Having more divisions or bulk heads in the hold or on deck than necessary for Trading Vessels. 3- Having on board spare plank, either actually fitted in that shape, or fit for readily laying a second or moveable deck, or Slave deck. 4- Having on board shackles, bolts or handcuffs. 5- Having on board an unreasonable quantity of water in casks or in tanks, more than sufficient for the consumption of her Crew as a Merchant Vessel. 6- Having on board an unreasonable number of water casks or other vessels for holding water... 7- Having on board a greater number of mess-tubs or kids than requisite for the use of her crew as a Merchant Vessel. 8- Having on board two or more copper boilers, or even one of an unreasonable size, larger than requisite for the use of her Crew as a Merchant Vessel. 9- Having on board an unreasonable quantity of rice or farinha... or Indian corn, beyond any probably requisite provision for the use of her Crew... The proof of these, or of any one or more of these several indications, shall be considered as *prima facie* evidence of her actual employment in the Slave Trade... the Ship or Vessel shall thereupon be condemned and declared Lawful Prize. (British and Foreign State Papers 1822-1823: Vol. 10 554-561).

Although the commoditization of enslaved Africans constituted only a portion of the overall exchange involved in the West African trade, it remained a constant, at ever expanding scales, from the initial voyages of exploration to the late nineteenth century,

when the slave trade was finally and fully abolished. This discussion on shipping involved in the West African trade now turns to technological developments associated with this era of “legitimate commerce” (Law 1995), in particular the introduction of iron in shipbuilding, and the revolution of steam propulsion.

Steam Production and Iron Ships

Though evidence is scant, it appears that sailing vessels participating in the early nineteenth-century West African trade changed little from their eighteenth-century counterparts. Generally the trend of larger vessels in the trade that was occurring the previous century held for vessels sailing in the 1800s as well, particularly those transporting bulk cargoes such as palm oil, though little changed in ship design relating specifically to the African trade (Lynn 1997: 106). Samuel Swan, a New England merchant who traded for ivory and palm oil on the Gold Coast, wrote in 1810 that “a vessel of 170 to 185 tons can be advantageously employed in the general [African] trade. A smaller one of 70 tons or thereabouts to Sierra Leone, and another to the Gold Coast about 90 tons” (Bennett and Brooks 1965: 43).

While wooden sailing vessels apparently maintained their form and function, two nineteenth century developments would hasten the demise of the classic sailing ship: steam propulsion and iron hulls. As technologies improved in the production and quality of iron, more components made of this material found their way into the construction of wooden steamships as early as the late eighteenth century. Iron canal boats were being built by the 1780s, and the first iron vessels operating in the open sea appear in the 1820s (Corlett 1990: 21-24).

The earliest attempt to use iron and steam power in West Africa occurred in 1832, when MacGregor Laird and R. A. K. Oldfield took the iron steamers *Quorra* and *Alburkah* up the Niger River in 1832. While the vessels fared quite well, making eight to nine knots while under steam and arriving at the coast in just over a month from Liverpool, the expedition proved a failure. Disease took its toll in the crew, killing 40 out of 49 before the expedition made its way back to England (Laird and Oldfield 1837: 12, 351).

Although many saw great promise in steamships from early on, the dawning of the iron ship required developments in steam propulsion and alternatives to the sidewheel and stern wheel propulsion systems initially used with steam technology (Greenhill 1993: 11-12). The high-pressure compound engine of the 1860s and the triple expansion engine in 1861, coupled with the widespread use of the screw propeller for ocean-going vessels by 1865 saw the broad acceptance of the iron-hulled steamer on a global scale (Corlett 1990: 100).

In 1852 the British government offered a contract to establish the first regular steam service to West Africa to the African Steam Ship Co., directed by MacGregor Laird, who had headed the unsuccessful steam expedition to the Niger River 20 years earlier (Lynn 1997: 108). The contract's provisions called for making 12 trips from Europe to West Africa each year for 10 years. Laird built five steamers initially, ranging in tonnage between 400 and 1,062 tons, and was generally successful in this venture. By the 1880s other British firms had steam service to various ports in West Africa, and there were foreign companies out of Germany, Portugal and France as well.

The advantages of steam over sail for the African trade were considerable. Steam vessels proved quicker, allowing traders to maintain lower inventories on the coast and reduce their costs. Cargo turnover increased as well, meaning that palm oil could be converted to capital much quicker. Technologically, iron ships could be built much bigger than wooden ships. In 1880 the average size of iron vessels reached 822 tons, and this passed 1000 tons by 1885 (Lynn 1989: 233). Being faster, cheaper, and more navigable, steam transport began to out-compete sail-powered vessels throughout the world's markets, including the West African trade, by the last decades of the nineteenth century.

Summary

Ships remained an integral element in the West African trade from the earliest voyages by the Portuguese through the advent of iron hulled steamers at the close of the nineteenth century. While few developments in maritime technology can be ascribed as being specifically due to the African trade, voyaging to this area of the world required certain characteristics whether in sailing or steaming vessels, which spurred on developments in maritime technologies. Portuguese mariners exploring the coast experimented with particular rig types and sought increases in vessel capacity as they ventured further from Portugal's shores, culminating in voyages to the East Indies and regulations for some of the largest European sailing vessels of their time. Mariners participating in the West African trade throughout the Atlantic era utilized a variety of vessels, placing their investments in the holds of ships destined for an area of the world known for dangerous coastal sailing and high mortalities among crews. An overall trend,

however, was the use of typical ships of the period, and a preference for medium-sized vessels capable of navigating the offshore seas and coastal currents to ports of trade in coastal Africa, and bringing home sufficient commodities to insure a profit. Shipowners participating in the transatlantic transport of human cargoes sought vessels capacious enough to carry hundreds of enslaved Africans in their holds, while making the crossing to the West Indies in a relatively quick time to lessen the effects of mortality on their profits. Those involved in the illicit slave trade used vessels that favored speed over cargo capacity as a means of avoiding capture. By the nineteenth century bulk cargo carriers loaded their holds with palm oil and other legitimate commodities, until being replaced by vessels built of iron and powered by steam. The West African trade played a role in all of these maritime developments, and sunken evidence of these advances can still be found in offshore graves along the African coast.

CHAPTER 5: METHODOLOGIES FOR STUDYING THE MARITIME TRADE WITH WEST AFRICA

Introduction

The methodology for this research stemmed from the initial research questions discussed above, specifically: Are there submerged archaeological sites in the region? What is the best method for finding sites? Are underwater sites in the area exposed or buried by seafloor sediments? To what extent are underwater sites preserved off the coast of West Africa? And finally, how can these resources be used to reveal the region's past?

Another consideration affecting methodological choices for this project relates to the specific chronological focus of my research in the region. Along with the basic research questions noted above, my original desire was to focus on the earlier period of European/African interaction, the initial Portuguese exploration and trade with coastal Ghana. While the broader, theoretically driven research questions regarding culture contact and exchange could be applicable to virtually any site discovered in the region regardless of time period, my initial focus on early Portuguese contact stems from the general lack of documentation relating to this era (see the review provided in Chapter 4). The absence of historic sources, coupled with our incomplete understanding of vessel design in the fifteenth and sixteenth centuries, served to focus my initial attention on potential destinations in coastal Ghana frequented by Portuguese mariners in the first two centuries of European contact. Specifically, these locations were Elmina, Shama and Axim. Each of these locations was a node of early Portuguese trade and the site of a Portuguese outpost. Though the Portuguese remained active traders on the coast through the nineteenth century, Portuguese outposts date between 1482, with the establishment of

Castelo São Jorge da Mina, and 1683 when their brief occupation of fort St. Francis Xavier ended (van Dantzig 1980: 31). The Portuguese founded *São Antonio* at Axim in 1515, and it remained in Portuguese hands until its capture by the Dutch in 1642. Fort *São Sebastião* was built at Shama in the 1550s or 1560s, and abandoned unchallenged in 1637 (DeCorse 2010: 220-223).

Typically field research is conducted after careful review of previous work in the region of study, building upon the techniques and findings of those whose work came before. In the search for historic wreck sites in Ghana, however, no such body of work exists. While conducting exploratory research carries with it exciting possibilities, it also suffers from significant disadvantages. Although considerable historical archaeological fieldwork relevant to African-European interactions has been conducted on terrestrial sites in Ghana's Central Region (most recently, see Carr 2001; Chouin 1998; Chouin and DeCorse 2010; DeCorse 1987; 1989; 1992; 1993; 1998; 2001; DeCorse and Spiers 2009; Spiers 2007) there had been no investigation of underwater sites in the country. Research in the broader West African region is also limited, consisting of excavations on a wrecksite off Gabon identified as the Dutch East India Company ship *Mauritius* (L'Hour et al 1989; 1990), a small survey off of Goreé Island in Senegal (Guérout 1996: 99-121), and some unpublished diving projects by avocational archaeologists. Thus for nautical archaeological investigations in Ghana, there exists no body of literature, site inventories or accumulated knowledge on which to base one's research design.

The state of diving in Ghana exacerbates this problem. Discussions with the owner of one of the few commercial diving operations in the country (Bob Millikin of Aquatec Diving Services, Ltd.), indicated that the only current diving activities are

associated with the offshore oil industry and modern tanker repairs in shipping ports such as Takoradi and Tema, as well as small-scale gold-dredging operations in scattered locations in the country. Sport diving is essentially nonexistent; therefore there are no facilities for scuba tank air fills, equipment purchases and repair, and there is no local body of diving “lore” on which many nautical archaeologists in other world areas have depended on to learn about underwater conditions or potential wreck sites (e.g. Throckmorton 1987: 14).

Because of these disadvantages, I focused on three potential survey areas that could be pared down to two or even a single area if budget and time proved limited. Not knowing which method of nautical archaeological survey might prove the most effective, I initially planned on magnetometer and side-scan sonar remote sensing, with a more low tech standby of towed snorkeler/diver investigations if nothing else worked and if offshore conditions allowed. This method, though useful in other contexts where calmer waters and greater visibility prevail, proved useless in the high energy and limited visibility environment of coastal Ghana. More extensive examination of potential sites, whether through surface collection or excavation, required an initial familiarity with diving conditions and site preservation before a more informed plan of investigation could be implemented. The research design was formulated to follow three phases:

Phase I: Identification of potential remote sensing survey areas and execution of survey off of Elmina utilizing magnetometer and side scan sonar equipment (July-August, 2003).

Phase II: Diver investigation of anomaly/ies, limited test excavations on shipwreck site/s (July-August, 2003 and June-August 2005).

Phase III: Surface collection and limited excavation of the most promising site (July-August 2005)

This methodology is oriented toward the location and investigation of historic shipwrecks. Other types of submerged cultural materials may be encountered, although the probability of this occurring is low. Indigenous watercraft have been in use for thousands of years throughout the continent; one canoe discovered during the excavation of a well in Nigeria proved to be 8,000 years old (Breunig 1996). Unfortunately, the most useful remote sensing technologies for nautical archaeologists rely on magnetic or sonar signatures in locating sites. Assuming that pre-contact watercraft were similar to canoes used throughout Africa today, they would likely contain little ferrous metals, making them virtually invisible in a magnetometer survey. High resolution side-scan sonar could detect a canoe exposed on the seafloor, however its signature would resemble a log or some other natural object and thus would not likely be prioritized for diver investigation by archaeologists. The fact that indigenous African craft would contain virtually no ballast would also make their preservation less likely. With European shipwreck sites, often the only preserved portion of the hull lies under the ballast pile. In fact, without ballast a capsized canoe would probably not even sink. Even an old, waterlogged vessel would likely contain enough buoyancy to keep it from sinking to the sea floor, even if most or all of the structure were under the surface of the water.

Additional survey work in the Elmina area by Horlings in 2009 resulted in the location of three isolated features, consisting of historic anchors and an anchor chain (Horlings 2011: 135-145). Given the extensive role of Elmina in the maritime trade, it is likely other artifacts might also be uncovered. In addition, other types of submerged cultural remains may exist, such as inundated land sites or disposal features from settlements or forts. While it is possible that these sites may be found during a remote

sensing survey, the survey techniques utilized for my research were selected with the expressed aim of locating historic wreck sites. I feel it is imperative, however, to keep in mind the possibility of discovering these other types of underwater sites, and any anomalies that do not necessarily fit the profile of a European shipwreck should be investigated whenever possible.

In creating the research design for the project, an attempt was made to integrate a degree of flexibility to allow for adaptation or restructuring in the field. Site investigations usually involve several steps or phases, and the results of previous work affect the planning and execution of subsequent phases of research (Hester et al 1997: 22; Binford 1964: 438). Since no underwater archaeological fieldwork had been conducted prior to these investigations, the first attempts to survey and locate submerged historic sites in 2003 represented an initial effort to determine if sites existed offshore of Elmina, if they could be detected using the remote-sensing methods described below, and to what extent they might be preserved on the seafloor.

Research Design

Phase I: Survey Strategies

Two guiding principles in the survey strategy involved focusing on areas holding the highest probability for shipwreck remains in general, with a secondary goal of investigating areas with a high potential to contain evidence of early European contact on the coast, primarily the Portuguese period. The coastal waters off Elmina Castle afforded an excellent opportunity to find shipwrecks spanning four centuries of maritime trade, making this an obvious choice for an initial survey area. Two other ports, Axim and

Shama, were frequented by the early Portuguese traders but not used as intensively in later periods, and therefore were considered secondary survey areas. These three areas constituted the initial survey strategy for shipwreck investigations off of the Ghanaian coast.²¹

Archaeological surveys for shipwreck sites are typically carried out with one of two objectives in mind; either the archaeologists seek a specific wreck known to have sunk in a particular location, or they search for unspecified wreck sites in areas likely to contain sunken vessels (Tuttle 2011: 115; Watson 1998: 319). Site-specific surveys often seek to identify shipwrecks of particular historic importance, while regional studies tend to look at broader issues such as wreck patterning and trade. Examples of the former include investigations of such well-known sites as Henry VIII's flagship *Mary Rose* (Rule 1982), La Salle's ship *La Belle* (Arnold 1996), the Civil-War submersible *H. L. Hunley* (Conlin and Russell 2006; Wilbanks and Hall 1996), and H.M.S. *Titanic* (Ballard 1988). The second category encompasses a more regional approach, for example George Bass' work on numerous ancient wreck sites in Turkey (Bass 1966: 1967: 1973; 1986; 1988a; Pulak and Frey 1985; Throckmorton 1964;), as well as broadly-focused surveys carried out in South Africa (Werz 1999), British Columbia (Moore and Mason 2012) and the Gulf of Mexico (Garrison 1998). The survey for shipwreck sites in Ghana followed the

²¹ As my research design involved searching for vessels dating to the earliest period of European contact with the coast, Elmina, Shama and Axim were identified as potential survey areas due to the Portuguese activity at these trading stations. From the initial planning stages of this research, however, I argued that virtually *any* vessel found on Ghana's coast would be significant. As is detailed below, survey work for this research was only conducted at Elmina due to budget and time constraints, but the discussion here includes Shama and Axim since they were originally part of the research design. Note that Horlings returned in 2009 and conducted additional survey off of Elmina, including areas not covered in the 2003 survey (Horlings 2011). To date no additional work has been done off of Shama or Axim. A proposal for 2007-2009 fieldwork would have included work off of Komenda, along with offshore control areas to complement the Central Region Project and terrestrial survey work (DeCorse et. al 2009). However, aside from the work at Elmina, no other marine survey has yet been undertaken.

example set by Bass, Garrison, Werz and others by focusing on areas likely to contain shipwreck sites, rather than attempting to locate a particular wreck mentioned in historic sources.

Another consideration in planning archaeological surveys relates to whether they are probabilistic or non-probabilistic in nature. In general, probabilistic sampling is more of a random examination of an area resulting in a representative sample of sites in the region, whereas non-probabilistic sampling is used when visible or suspected sites constitute the focus of the researcher (Flannery 1976: 131-133; Renfrew and Bahn 1991: 66-67). While a large, random, probabilistic survey covering the broader region of coastal Ghana would contribute greatly to our understanding of the maritime landscape of the area (and this is in fact a research goal for future investigations in the region), this initial attempt at conducting nautical archaeological research in Ghana was based more on nonprobabilistic factors. Namely, I intended to focus on known trading entrepôts or nodes of trade, principally Elmina Castle, with potential secondary surveys at the trading ports of Shama and Axim. This consideration was based on the limited budget and time constraints for this study, and the following advantages of non-probabilistic surveys in this context:

Non-probabilistic surveys, or reconnaissance projects, can provide useful information on the conditions of the archaeological sites in a region and an indication of the culture history in a short time and at low cost. A reconnaissance is especially appropriate when the archaeologist is unfamiliar with the setting, vegetation and environmental conditions, and site visibility... Sampling in such instances is based on personal judgments or informal criteria such as accessibility or visibility (Hester et al. 1997: 26).

I had to consider the fact that no previous attempts at nautical archaeological surveys have been conducted in Ghana, and we were largely unfamiliar with diving

conditions and the local offshore environment. There were also basic questions regarding potential site visibility. Would magnetometers work in the iron-rich soils of West Africa?²² Do potential wreck sites exist offshore, and if so, are their structures exposed or buried (and thus invisible to side scan sonar)? For these reasons, a non-probabilistic or reconnaissance survey scheme seemed the most appropriate for this stage of the research. Focusing on the trading entrepôts of Elmina, Shama and/or Axim, with their high priority of associated wreck sites, was the most practical approach considering the limited time, funding and knowledge of the local environment.

Another factor leading me to choose a regional, non-probabilistic survey relates to historical documentation of shipwreck sites. Though historical references to specific wrecks on the Ghanaian coast exist, they are relatively scarce and lacking in detail. In 1608 for example, the Portuguese *nao Nuestro Senore de Ajuda*, captained by Miguel Correia Baharem, sank off the "Costa da Mina" due to poor navigation by its captain (Guinote et. al. 1998: 236). Although the crew and part of the cargo was saved, the vessel proved an entire loss. Other ships fell victim to naval warfare on the coast. In 1557 a naval battle occurred between a squadron of Portuguese ships and a group of interlopers composed of both English and French vessels. Both sides suffered losses, and a French ship sank "near Cape Three Points" (Hakluyt 1905: 216-230). The lack of detail in describing the locations of shipwrecks is unfortunate but not surprising. Survivors of shipwrecks usually described wrecking events in relation to landmarks, and their wording tended to be vague; phrases such as "lost on the Gold Coast" or sinking "near Elmina"

²² While not entirely understood, effects of natural geological formations have been known to impact magnetometer remote sensing surveys. Discussions with marine surveyors support this (Enright, personal communication; Tuttle, personal communication), and this phenomenon has been noted in cultural resource management surveys (Enright and Foster 2001).

afford little help in determining precise shipwreck locations. In the event that the crew went down with the ship, only the vessel's intended route and destination might give clues as to its whereabouts. Many wrecks that occurred in the region are simply described as "lost in Guinea" or "lost on the coast of Africa" (e.g. Ellis 1893: 30; Guinote et al. 1998: 236; Hair 1994b: 94; Inikori 1996: 63). There are exceptions: the loss of the Dutch West India Company ship *Groeningen*, discussed in more detail below, is mentioned as specifically occurring off Elmina Castle in related documents. Generally this is an exception, however, and data on sinkings often tends to be too obscure for a research design based on accounts of specific wrecks. Instead, a broader, regional survey was considered the most appropriate approach for the initial search for shipwreck sites off Ghana's coastline.

Studies in the spatial patterning of shipwreck sites identify several key variables in the locations and densities of wreck sites. These involve historic factors such as shipping routes and the locations of trading locations or ports, as well as natural dangers including shoals, rocks, reefs, sand bars, currents, winds and storms. In regions as variable as South Africa, the Gulf of Mexico and the Mediterranean Sea, shipwreck distributions tend to occur more frequently in coastal waters near shipping ports (Garrison 1998: 305; Throckmorton 1987: 34, 35; Werz 1999: 45-51). The approach to land brought on numerous dangers to shipping, while deep water offered relative safety and security. This tendency for shipwrecks to occur near shore not only prevailed during the age of sail, but remains a distinct pattern in modern examinations of shipwreck distributions despite advances in steel hulls, propulsion systems and navigational technologies (Garrison et. al. 1989: 115).

The establishment of a maritime route between Europe and West Africa in the fifteenth century ushered in a new era of contact, and the driving forces in this interaction lie in the trading of commodities and the desire for profit on both sides of the exchange. On the Ghanaian coast, isolated outposts such as Elmina, Shama, Anomabu, Cape Coast, Dixcove, Accra and many others provided the setting for much of the African-European interaction and trade in the region (DeCorse 2010: 211-214; 2008: 88; Dickson 1965: 98-99; van Dantzig 1980). These trading centers served as the foci for exchange, and they were also the primary destinations for ships plying the West African trade. Considering the historical development of trading ports along the Ghanaian coast, the shallow waters near trading centers carry the highest probability of containing shipwreck sites.

Focusing on coastal waters near trading entrepôts makes sense considering the nature of coastal seafaring throughout the historic period. As described above (see Chapter 3), the most dangerous part of a voyage was the coastal navigation enroute to a trading port and the time spent anchored offshore. Natural hazards to navigation in shallow water, along with potential conflict with other vessels trading in the area, compounded the risk of sailing in coastal waters, making this the most dangerous segment of a trading voyage. Deep water generally afforded security for ships involved in the trade, allowing greater maneuverability if attacked or increased safety if caught by a storm. Thus the shallow coastal waters near trading ports should be the primary search areas for the proposed shipwreck survey in Ghanaian waters. With these considerations, a nonprobabilistic, regional survey close to historic shipping ports on the Ghanaian coastline was deemed the most promising strategy for the discovery of shipwrecks involved in the West African trade.

Phase I: Survey Methodologies

Nautical archaeologists have relied on relatively sophisticated remote sensing equipment since the beginning of the discipline over four decades ago.²³ This research utilized a standard, field-tested combination of an EG&G 866 Marine Magnetometer²⁴ and a Marine Sonic Technology Digitized Side Scan Sonar²⁵ with a 600 kHz tow-fish sensor. For positioning control we relied on a Differential Global Positioning System which will allow us to accurately plot the positions of underwater cultural resources as well as relocate sites for further investigation. We also incorporated a depth finder in our methodology to record water depths during the survey. For practical reasons, the planned survey was limited to coastal waters with a depth of 20 meters (65 feet) or less, primarily due to the assumption that ships were more likely to wreck in shallow water, but also keeping in mind conservative safe diving depths for the investigations of anomalies.

²³ Much of the published work in the discipline, particularly in its early years, focused on the technological means of conducting underwater archaeology. This has been rightly criticized in some circles (e.g. Flatman 2003:143-144; Gearhart 2011: 90; Pietruszka 2011: 19). Technology remains a defining aspect of the discipline, however, and the particular instruments and equipment used impacts research results to some extent. Thus I provide a brief discussion of the specific tools and approaches taken in my dissertation research.

²⁴ The magnetometer is used to search for ferrous (iron) objects on or below the sea floor by measuring both the Earth's ambient magnetic field at the sensor, as well as any anomalous magnetic forces, or deviations from the ambient magnetic background (Gearhart 2011: 91; Green 2004: 62). These measurements are recorded in gammas, the standard unit of magnetic intensity. As the sensor passes through the magnetic field surrounding a ferrous mass, the strength, or intensity, of that anomaly is recorded on the computer, and in the case of the EG&G 866 magnetometer, on a hard copy strip chart. Iron elements common on historic ships such as chain, anchors, cannon, fasteners and even ballast stone affect the signature received by magnetometers, indicating a magnetic anomaly which may suggest the presence of significant archaeological remains (Murphy and Saltus 1998: 358).

²⁵ Side-scan sonar detects anomalies by sending out acoustic energy into the water column on either side of the sensor or tow-fish (Atherton 2011: 1.7). These acoustic signals are processed to compensate for signal attenuation (weakening of the signal due to the pulse traveling through water). The sea/river/lake bottom and any objects lying on the bottom or within the water column will reflect some of this energy, and after processing results in a plan view of the bottom made by combining the acoustic pulses in order. This typically shows up in the sonar readings as a bright area signifying the physical object that reflected the sonar energy (also called a "hard return") beyond which is an area of shadow where the acoustic energy was reflected (Green 2004: 76; Mazel 1985: 2-6). Under ideal circumstances side scan sonar is capable of providing near-photographic images of the bottom on either side of the trackline of a survey vessel. The primary drawback with side scan sonar is its inability to detect buried sites (Atherton 2011: 1.8).

Lane spacing is a key consideration for any remote sensing survey. To adequately cover a survey area, the research vessel must follow a series of tracks or lanes that should be parallel and run at a slow enough speed (generally 8 kilometers/5 miles per hour or slower) to enable good data recovery (Atherton 2011: 9.55). Lane spacing must be less than the coverage or swath width of the survey instrument to allow sufficient overlap, and compensate for vessel navigation errors as well as, in the case of sonar data, the blind spot or “nadir” directly below the survey fish (Fish and Carr 1990: 61-62).

Although the proper lane spacing for remote sensing surveys is still debated among nautical archaeologists, I designed the Elmina survey based on 30 meter (98 feet) line spacing, which is generally considered appropriate for magnetometer and side-scan sonar surveys with an acceptable degree of overlap to insure complete coverage (Murphy and Saltus 1998: 359). Approximately 16 kilometers (10 miles) can be covered in an average day of surveying, with 80 kilometers (50 miles) possible in a five-day week.²⁶ These are conservative estimates; survey coverage of twice this distance is not unrealistic with ideal weather and water conditions (e.g. Tuttle 2001). Using this as a guideline, I plotted out two survey grids in each survey area corresponding to two weeks of survey (one week per grid). Two main survey patterns are shown in the survey areas; a square and a rectangular pattern. In the square pattern the research vessel would run 50 transects of 1,500 meters (4,920 feet) each. The rectangular survey pattern requires that the research vessel make 25 transects each with a length of 3,000 meters (9,850 feet). The total distance for each pattern calculates to 46.5 miles (75 kilometers), well within the

²⁶ Figuring a survey speed of 8 kilometers (5 miles) per hour, in an eight hour day it is theoretically possible to survey 40 kilometers/32 miles. Accounting for setup/breakdown time, travel time, weather and other complications, however, this figure is typically halved or divided into thirds for a conservative estimate of actual coverage or survey time.

estimate of weekly survey coverage of 50 miles (80 kilometers). Two survey patterns, rather than a single one, were developed to allow maximum flexibility in covering areas containing potential submerged cultural resources. A more detailed discussion of each survey area is included below.

The three areas targeted for initial survey work in 2003 constituted the three earliest locations along the coast in which Portuguese trade was conducted, specifically the towns of Elmina, Axim and Shama, (see Figure 5.1). Below I present a separate survey plan for these areas, and I prioritize them based on the following criteria:

1. The degree to which these areas were involved in the early Portuguese maritime trade.
2. Specific accounts relating to naval actions and the loss of vessels.
3. References in West African "rutters," or pilot books warning of submerged hazards or obstacles to navigation which posed a danger to shipping and, by extension, may have lead to Portuguese shipwrecks in these locations
4. Examinations of nautical charts which indicate shipwreck sites and navigational hazards.

Survey Area 1: Elmina

The Portuguese selected Elmina for the construction of *São Jorge da Mina* in 1482, the first and largest European outpost in sub-Saharan Africa (Hair 1994b: 1). The fort provided a focal point for Portuguese trade, and remained an active center in African-European contact for over four centuries (DeCorse 2001: 18-43). Although the area falls short of being a safe harbor, the Benya River outlet provides one of the few relatively secure anchorages for vessels trading in the region (Bold 1819: 57).

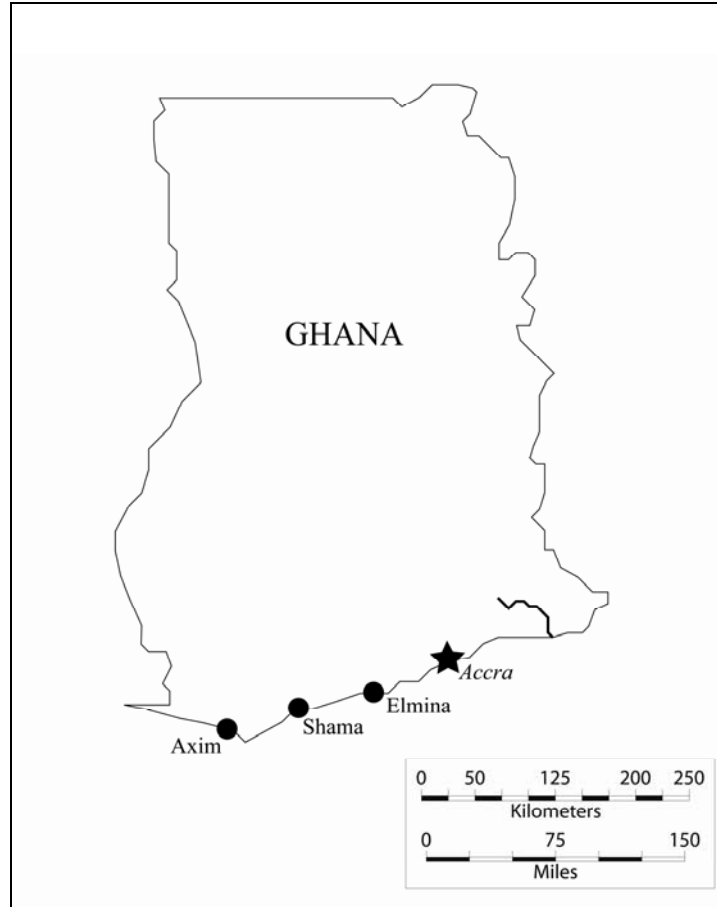


Figure 5.1 Survey locations of Elmina, Shama and Axim. Map by G. Cook.

Several naval actions and ship losses are recorded near Elmina, including the first recorded instance of ship to ship warfare in the region when Portuguese ships captured a Castilian fleet trading for gold at Elmina (Hair 1994b: 4). In the 1580s Portuguese galleys encountered several French ships, including the *Esperance* off Mina, "... which they shot to the bottom, letting most of the crew drown and taking prisoner the others, whom they [sent to] the Galleys... Several other French Ships and Yachts [underwent this fate]..." The British brig *Matthew* was lost off of Elmina in 1766, "... the people all saved with six slaves, but stripped naked by the inhabitants; the brig with some goods and

provisions were entirely lost” (Inikori 1996: 66). In addition to these known losses, natural hazards exist including the Busum Accra reef system, which is a hazardous navigational obstacle encountered approximately three kilometers (1.86 miles) to the west, and in the path of any ships sailing too close to shore (Africa Pilot 1953: 376). The outermost reaches of the reef extend about 800 meters (.5 miles) offshore and lie in approximately 7.5 meters (25 feet) depth, gradually sloping up to where the breakers begin closer to shore (British Admiralty Chart 3113). The presence of such hazards would have remained a threat throughout the centuries of maritime trade in the region, and such “ship traps” have proven a likely location for historic wreck sites (Throckmorton 1964: 51-61).

Considering these factors, the coastal waters off Elmina are likely to contain significant historic shipwreck sites (Figure 5.2). Survey Area 1A was the highest priority, and includes the waters directly offshore of the castle which saw extensive maritime activity for over four centuries of European/African contact, and served as the main anchorage for vessels involved in trade at the entrepôt. Available published data indicated that the seafloor here is composed of sand and shell, with a mud/silt outflow from the Benya River (Africa Pilot 1953: 375; Bold 1819: 57).²⁷ Survey Area 1B lies near the Busum Accra reef system, which is a hazardous navigational obstacle encountered to the west, and in the path of any ships sailing too close to shore (Africa Pilot 1953: 376). The potential for shipwreck sites in the area is considered high, but this high energy zone would likely be challenging for diving activities.²⁸

²⁷ More recent work by Horlings has indicated a primarily sandy bottom with discrete areas of mud (Horlings 2011: 232).

²⁸ As part of Horlings’ dissertation research, she conducted additional surveys in this region in 2009, and studied site formation processes related to finds resulting from both the 2003 and 2009 surveys. She also

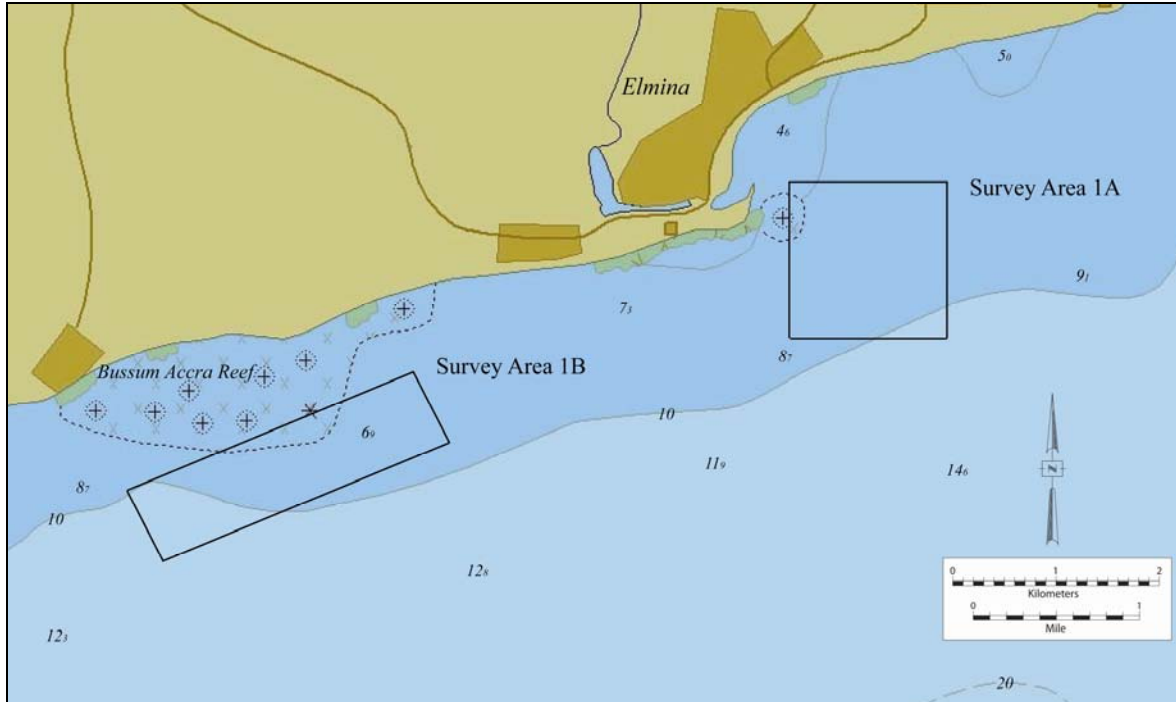


Figure 5.2 Survey areas offshore of Elmina. Soundings are in meters. Map by G. Cook using digital British Admiralty Chart 3113.

Survey Area 2: Shama

Shama is located approximately 45 kilometers (28 miles) west of Elmina, next to the Pra River. The African village at this location provided the setting for some of the earliest contacts between Africans and Portuguese mariners in the 1470s (Blake 1967: 4; Hair 1994b: 43; Kimble 1967: 118). It also attracted illicit traders intent on tapping into the gold trade, and in 1479 naval actions between Portuguese warships and interlopers resulted in two caravels from Spain being captured and their crew placed in irons (Blake 1967: 240). The coastline near Shama curves dramatically from east to north, providing a rare shelter for ships in the region. The Portuguese established a fortification/trading post

gained firsthand knowledge regarding dive operations in shallow water high energy zones (Horlings 2011: 137-141).

here in the mid- sixteenth century, and the Dutch fought Portuguese forces in their takeover of the area in 1664 (DeCorse 2010: 223-224; Vogt 1979). Historically Shama provided a useful shelter where vessels typically took on water and supplies (de Marees 1987: 203, 204). While other types of trade were conducted here, the volume of goods exchanged at Shama was likely considerably less than Elmina (Blake 1967: 40).

Nonetheless, Shama remains an important area for underwater survey, due to the early activity here by the Portuguese and the dangerous reef systems surrounding the village and Pra River mouth. Survey Area 2A is a rectangular grid running northeast, allowing access to the coastal front of the village as well as the area directly opposite the Pra outflow (Figure 5.3). Potential sites in this area would likely be well preserved due to sedimentation from the Pra River. Several hazards lie in this area, including rock outcroppings and reef structure. One conspicuous navigation hazard labeled “Mamua rock” or “Pra Rock” depending on the chart referenced, is located near the center of the survey grid, and is noted as dangerous to navigators both on nautical charts and pilot books (Africa Pilot 1953: 374; British Admiralty Chart 3113).

Survey Area 2B is located further south, and covers a broad approach to the village. It incorporates the Bassubu rock outcrop, located northeast of the point where the coast turns from east to north (also known as Aboadi Point). Lines of shallow reef systems marked as dangerous on nautical charts extend nearly 1,000 meters (3,280 feet) to the east of these rocks, and were a known navigational hazard to mariners (Africa Pilot 1953: 373-374; British Admiralty Chart 3113). The southeast corner of the survey grid overlaps with the historic anchorage for ships trading with Shama.

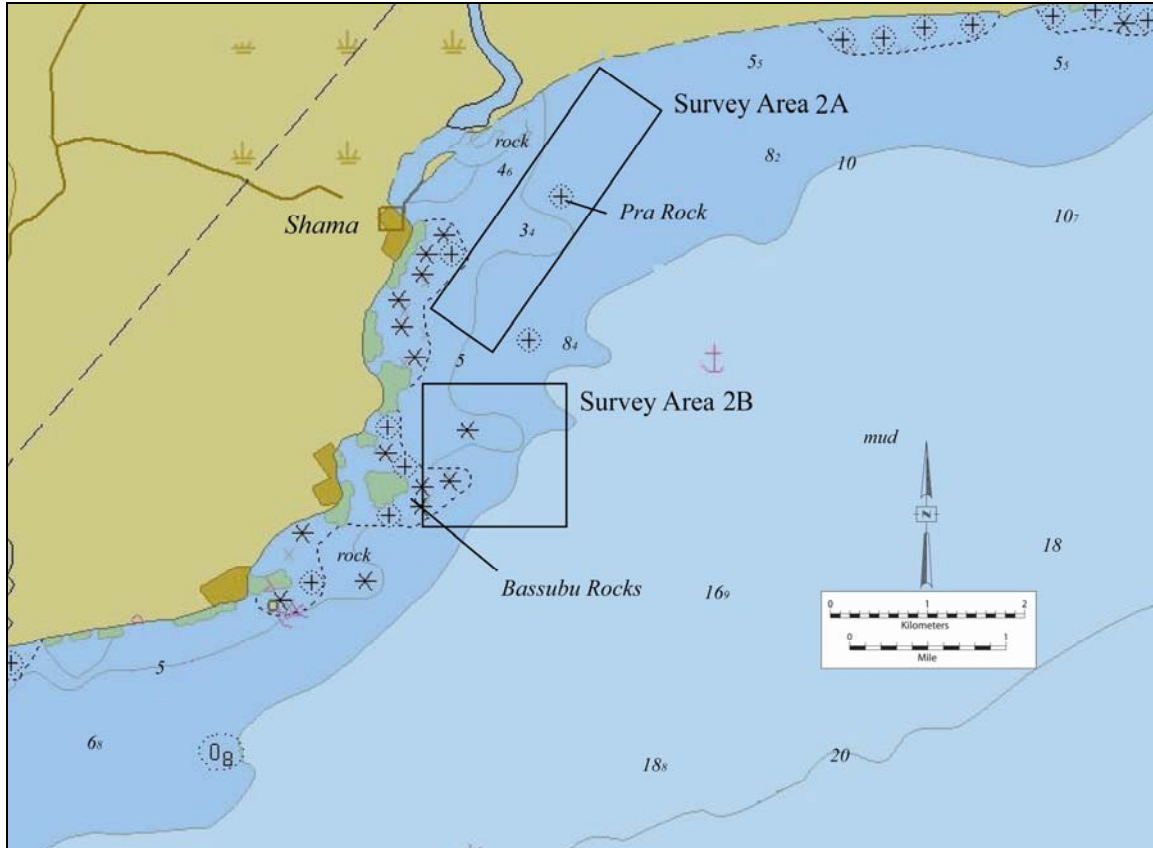


Figure 5.3 Survey areas offshore of Shama. Soundings are in meters. Map by G. Cook using digital British Admiralty Chart 3113.

Survey Area 3: Axim

Portuguese contact with Akan traders at Axim began in the early sixteenth century, leading to the construction of a trading fortification here in 1503 and later the founding of fort *São Antonio* in 1515 (DeCorse 2010: 220-221). The village was known as an early center for the gold trade (Kimble 1967: 116-117). Significant maritime activity took place at Axim, both in terms of trade and warfare; there were violent naval encounters here by the Dutch in 1642 and the English in 1664 (Vogt 1979: 110-112).

This historic maritime activity, combined with the extensive navigational hazards in the area, make Axim a very likely site for submerged shipwreck remains. British Admiralty charts for the area show numerous rock outcrops rising from the sea floor, as well as the locations of several wreck sites (Blake 1967: 331; British Admiralty Chart 3113). As was seen with offshore hazards at Elmina, these hazards could have constituted a significant threat for ships navigating along the coast near Axim, and should be considered a priority for survey.

Survey Area 3A is set out as a rectangular grid oriented northwest by southeast, and covers a considerable portion of Axim's coastal area (Figure 5.4). The five meter (16.5 feet) contour runs through the grid, along with submerged rock peaks. According to Admiralty charts, the rock outcrop near the southwestern extent of the grid contains the wreck of a vessel (British Admiralty Chart 3113).

The grid for Survey Area 3B is a square which encompasses six prominent rock outcrops, two of which are named in the nautical charts for the area (Engwanga Rock and Hedwig Mensell Rock). A sunken wreck with masts is also indicated in the charts, apparently having hit one of these dangerous underwater formations (British Admiralty Chart 3113). This area extends several thousand meters from shore, and would have been a serious navigational hazard for vessels approaching Axim, as well as those attempting to weather Pepré Point to the southeast of the town.

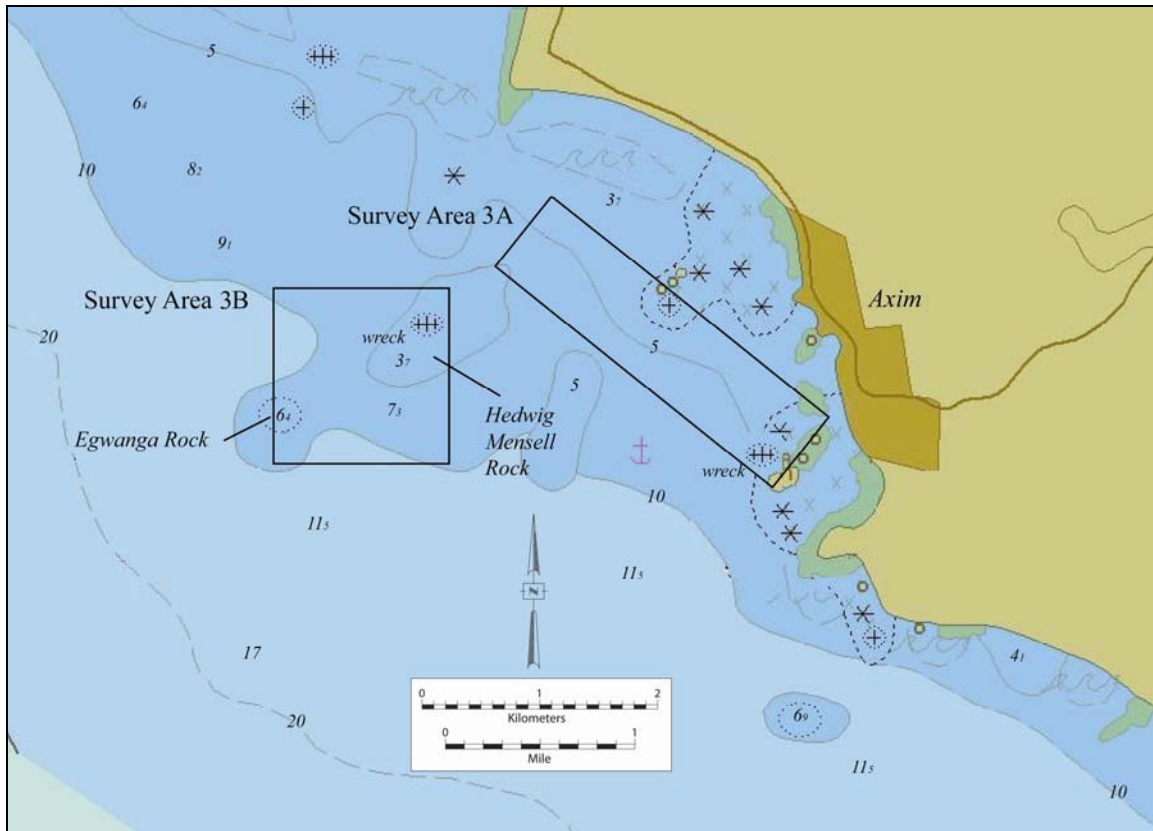


Figure 5.4 Survey areas offshore of Axim. Soundings are in meters. Map by G. Cook using digital British Admiralty Chart 3113.

Phase II: Diver-Investigation and Testing of Targets

As any marine remote-sensing survey progresses, magnetic and sonar anomalies will be discovered and should be analyzed and prioritized for further diver investigation. Goals for diver investigation include site assessment, measurement of site extents, pre-disturbance mapping, and recovery of diagnostic materials (Bowens 2009: 114-122; Green 2004: 87-91).

Upon identification of a submerged archaeological site, sampling of surface artifacts and/or test excavations are generally conducted to recover diagnostic artifacts that will aid in dating and identifying the site. A variety of methods exist to aid nautical archaeologists in the removal of bottom sediments, including airlifts, water induction

dredges, and manual excavation/hand-fanning (Green 2004: 252-258). Determining the best technique for excavation requires familiarity with the local environment, but likely choices for excavating in the shallow waters of coastal Ghana include hand-fanning/manual excavation, an airlift, or a water induction dredge. The dredge, which consists of a water pump forcing water through hoses and into a venturi-type suction nozzle controlled by the diver, is relatively cheap to construct, its components are generally easy to find, and requires a relatively small space on the diving platform for operation (Green 2004: 256). This dredge design allows controlled excavation of underwater sites, while being powerful enough to move significant amounts of material in a short time. The exhaust is usually fitted with a removable mesh bag to collect small finds for screening at the surface. Previous trips to Accra indicated that the requisite pumps, hoses and other supplies required for a water induction dredge were available if needed for test unit excavations. An airlift uses the same principle as the water dredge, but functions through the forcing of air into a vertically-oriented pipe via an air compressor on the surface, and generally requires a minimum amount of depth to work properly (Green 2004: 252).

Archaeological testing involves excavating a series of units or areas oriented longitudinally along the ship's axis (when this is possible to determine). This orientation allows archaeologists to sample material from different areas of the ship, potentially gathering data from the bow, stern and cargo area of the vessel. In the case of coastal Ghana, an added concern related to the conservation and storage of artifacts recovered during these investigations. With no established conservation laboratory for the treatment and preservation of artifacts recovered from submerged contexts, we planned

on recording finds and redepositing them when possible, and transporting the most diagnostic materials back to the University of West Florida for full conservation and stabilization. Ultimately diagnostic materials recovered and conserved will be turned over to Ghana's Museum and Monuments Board for display or curation.

Phase III: Excavation and Artifact Recovery

It was hoped that research phases I and II would result in initial data on submerged cultural material for the Ghanaian coast. Further investigation depended on the results of these two earlier phases. Keeping in mind budgetary and time constraints, two potential scenarios existed following the Phase II investigation. If a number of historic shipwreck sites were located, the material recovered during the testing phase may be sufficient for dissertation research. It was hoped that the end result would be a regional analysis of shipwreck sites in the three areas surveyed, with diagnostic artifacts indicating date ranges for each shipwreck and possibly the identification of vessel nationality. Analysis would have centered on shipwreck distributions, factors affecting these distributions, and the relationship between vessel losses and trading ports.

If fewer sites were located in the first two phases of research (as eventually proved to be the case), then a more in-depth study of a particular site or sites was a possibility. In this scenario a single wreck could be selected based on date, nationality or preservation, and more intensive excavations conducted. A number of excavation units oriented longitudinally on the site would be appropriate for Phase III investigations, allowing archaeologists to sample a significant portion of the site. In addition, such a strategy has the greatest potential to reveal patterns in hull organization, with the

potential to reveal portions of the bow (possible living area for lower-ranking crew), amidships (cargo storage and possibly the ship's galley), and stern (where higher-ranking officers generally lived). Relevant research questions might focus on the individual vessel, including such aspects as the ship's cargo, trade goods, interior organization, subsistence, and armament.

While the research design presented above provided a framework for conducting the first nautical archaeological investigation in Ghana, the uncertainty of the fieldwork conditions required flexibility and adaptations dependant on the actual research findings. The following discussion details the initial findings in the 2003 survey, and further investigations of the Elmina wreck site conducted during the 2005 diver investigations.

Phase I: Field Results

2003 Survey

For the 2003 survey I was assisted by my colleague Michael Tuttle, who at the time was the chief marine surveyor for Panamerican Consultants Inc. We arrived in Ghana in July of 2003, and began meeting with GMMB officials and planning field work that would last through September (Figure 5.5). After consultation with GMMB personnel and conducting an initial inspection of the potential survey areas, I decided to focus the initial fieldwork on Elmina, considering its preeminent role in African/European interactions, the magnitude of maritime trade conducted there, and references to possible shipwrecks in the area. The limited availability of the side scan sonar and magnetometer equipment proved another key factor in this decision. Steve

James of Panamerican Consultants, Inc., graciously provided the survey gear for the project free of charge, but there was only a thirteen day window for the equipment loan.

The purchase and transport of a vessel into Ghana for our operations was prohibited by budget constraints,²⁹ therefore we arranged for a 15 meter (50 feet) long, open ocean Fanti dugout canoe as a survey vessel (Figure 5.6). These traditional canoes are descendants of watercraft used by coastal Africans prior to European contact (Breunig 1996: 462; DeCorse 2010: 84-85; Smith 1970: 515). Many builders typically expand the sides of the vessels with wooden planks, and the larger canoes incorporate outboard motors for their journeys offshore. Although other, more conventional vessels are available to a limited degree, the dugout is still the most popular (and affordable) craft in Ghana, and the canoe served our needs. We modified the canoe for our research by adding a small deck to keep equipment secure and dry, installing an outboard motor mount, building a removable spray shield for the computers and electronics, and designing outriggers to stabilize the vessel at sea. Upon completion of the canoe modifications we followed traditional Akan customs by pouring a libation over the vessel, and then began the survey.

We quickly realized that our goal of surveying out to the 18.25 meters (60 feet) depth contour for all three areas was unrealistic; due to the gradual slope of the seafloor on the Ghanaian coastline, this depth contour is located over two miles offshore. With time and budget restraints, it would be impossible to survey out this far for any single site, let alone all three. By focusing exclusively on the Elmina survey area, we could cover a greater amount of seafloor surrounding the most heavily-used historic

²⁹ Eventually for the 2007 and 2009 projects, a Zodiac Hurricane was purchased through a National Science Foundation Major Research Instrumentation grant.



Figure 5.5 The 2003 field crew. The landrover was provided courtesy of the Archaeology Department, University of Ghana, Legon. Photograph by David Arhin.



Figure 5.6 The 15 meter (50 feet) Fanti canoe provided by Papa Kofi Arhin for the 2003 survey. Photograph by G. Cook.

trading fortification on the coast. This strategy also avoided the inevitable loss of survey time caused by demobilization, transport to another site, and remobilization required when switching survey operations to a new location.

We conducted survey operations every day, unless weather or ocean swells prohibited working (Figure 5.7). A global positioning system, integrated with the survey computers, guided us in plotting survey areas, running lines, and locating targets. Three car batteries provided power for our equipment. We averaged between four to six hours of actual survey time in a typical eight to ten hour day. Because of security issues, every piece of equipment was removed at the end of the day, including the canoe motor, the petrol and even the removable wooden spray guard for the computer; and every morning we had to set up our equipment from scratch. On the few days we could not work, project personnel took advantage of the time to purchase petrol and other supplies for the canoe, analyze survey data, and catch up on notes.

Researchers experimented with both the magnetometer and side scan sonar to evaluate which tool performed best (Figure 5.8). During the magnetometer survey, test readings varied dramatically, ranging up to 100 or more gamma per second; since the presence of a shipwreck may be indicated by a considerably smaller value, this clearly presented an interpretive and methodological problem for the survey. Despite several attempts and modifications to the equipment, we considered the readings too erratic to identify magnetic anomalies consistent with shipwreck sites. Considering the limited amount of time available for the survey, we felt considerable pressure to get the best results with the tools we had, therefore after these trials we abandoned the magnetometer in favor of the sonar. Future magnetometer work may provide better results in the region,

as most newer models incorporate more flexibility in filtering noise in the data, and are generally more reliable than the EG&G 866 magnetometer used in this research.³⁰



Figure 5.7 The survey setup during 2003 field work. The author is in front of the desktop computer running the sonar software, with the sonar “fish” by his right hand and GPS antennae behind him. Photograph by Michael Tuttle.

³⁰ Horlings conducted remote sensing survey in the area in 2009 using a side-scan sonar, magnetometer and echo-sounder (Horlings 2011: 122-145). She succeeded in acquiring stable magnetometer data that resulted in the discovery of a length of chain approximately 10 kilometers west of Elmina Castle, proving that magnetometers can be used in the region effectively. The erratic performance of the magnetometer in the 2003 survey may have been due to malfunction or older design.



Figure 5.8 Survey assistant Isaac Abban holding the EG&G 866 magnetometer sensor. Photograph by G. Cook.

In contrast to the magnetometer, the side scan sonar performed extremely well (Figure 5.9). We adjusted the 600 kHz unit to cover 50 meters (165 feet) of seafloor on either side of the fish, allowing us to examine large swaths of ocean bottom in every survey run. It is common on marine remote sensing surveys to limit coverage to the survey lines (when the sensor is being towed in a controlled, straight orientation for maximum positional accuracy and data reliability), and to not record data during turns, when the boat is being repositioned for the next survey line. We opted to continuously survey through the turns in order to maximize coverage, realizing that the sonar images would be distorted to some degree and positional accuracy may be slightly off. When faced with limited



Figure 5.9 Michael Tuttle preparing the side scan sonar fish for survey. Photograph by G. Cook.

access to equipment and restricted survey times, such a strategy has proven effective in other archaeological investigations (e.g. Skowronek and Fischer 2009: 61).

Each day we established a block of survey area using the computer software integrated with the GPS unit, and surveyed until completing the block. Using this method, we surveyed over four square kilometers of seafloor surrounding Elmina (Figure 5.10). In addition, a day was spent investigating the Bussom Accra rock system, a hazard to navigation that lies offshore to the west of Elmina. Fortunately, the seafloor surrounding Elmina is characterized by a relatively flat, sand/silty bottom, with



Figure 5.10 Sonar mosaic of 2003 side-scan survey. Map by G. Cook.³¹

occasional mud flats and rock outcrops (see Horlings 2011: 180), making it an ideal environment for side scan sonar surveys. After each day we reviewed the data, prioritizing anomalies based on their physical characteristics, and noting their corresponding coordinates based on the global positioning system.

Analysis of the sonar data led to the identification of 58 anomalies, broadly defined as any bump, shape, or object that does not appear to be part of the natural seafloor (Figure 5.11). Despite advances in sonar technologies and increasing experience of sonar operators, interpretation of side scan sonar records remains a qualitative, rather than quantitative, process (Fish and Carr 1990: 81).

Numerous factors affect the sonar image; “false images” can be generated due to schools of fish, acoustic noise from dolphins or whales, the wakes of passing boats,

³¹ Horlings resurveyed this area, and provides additional mosaics combining the 2003 and 2009 survey data, along with additional analyses regarding bottom types and their distribution (Horlings 2011: 147).



Figure 5.11 Plot of sonar targets resulting from the 2003 survey. Map by G. Cook using digital British Admiralty Chart 3113.

surface conditions, thermoclines or density changes in the water, etc. It is not uncommon for different operators to interpret the data differently, though the more ‘obvious’ targets are generally self-evident. Ideally it is best to make several sonar passes over a potential anomaly to get a better understanding of its features. This was not generally possible with the Elmina survey, in which our goal was to cover as much seafloor as possible in a systematic way. Despite these disadvantages, the sonar survey generated a number of potential targets for further investigation via diver groundtruthing.

2003 Diver Investigations

Due to personnel, budget and time constraints, diving was not considered a priority during the 2003 season. In fact, we decided not to include diving investigations in the initial research proposal, intending instead to conduct diving operations and site testing during subsequent investigations. An opportunity arose, however, near the end of the field research to make limited dives thanks to the donation of diving equipment from Bob Milikin, president of Aquatec Diving Services of Tema, Ghana.

The methodology for diving operations involved dropping a weighted buoy from our dugout canoe on the GPS position of the target noted from side scan sonar data (Figure 5.12). Two divers then descended on this line, and attached a tape reel to the buoy line. Extending the tape several meters out from the buoy weight, divers then conducted circle searches for the anomaly, extending their tapes (and thereby the radius of their circle searches) with the completion of each circle. This standard “circle search” pattern is commonly used by underwater archaeologists to systematically search an area for the magnetic or sonar anomaly detected during remote sensing survey (Bowens 2009: 101). Using this methodology, divers conducted searches out to a diameter of 40 meters (130 feet).

We first attempted to investigate anomaly 5.9, located close to the castle in only 5.8 meters (19 feet) of water, but due to equipment problems the dive was aborted and the anomaly was never verified. The second dive occurred on site 10.1, located in 10 meters (33 feet) of water further offshore of Elmina. This dive proved more successful; despite limited visibility, divers descended the buoy line and began a circle-search pattern, continuing out to the end of the search line without encountering the anomaly.



Figure 5.12 The author preparing to dive on target 12.1, or the Elmina Shipwreck Site. Note the weighted buoy (a reused water bottle) used as a surface marker for the site position. Photograph by Barnabus Akon.

The next target for diver investigation was designated anomaly 12.1, a linear-shaped feature approximately 18 meters (60 feet) in length located slightly closer to shore than 10.1 (Figure 5.13). After dropping a marker buoy at the anomaly's position, we descended the line and encountered iron cannon and artifacts approximately 6 meters (20 feet) east of the buoy location. A strong surge continually stirred up fine sand into the water column which limited visibility to a few feet, but we could clearly make out the murky shapes of cannon and scores of brass basins, bowls and pans covered with

rope, fishing line and nets. We recovered a sample of brass basins, and then marked the location of the artifacts by dragging the buoy to the anomaly. Upon return to the canoe it was apparent that we had recovered six brass bowls, still stacked together as they were stowed in the ship. These wares were commonly traded on the coast, making it very likely that this anomaly represented the wreck of a West African trading vessel. After getting a second GPS reading on the new buoy location, the crew returned to Elmina.

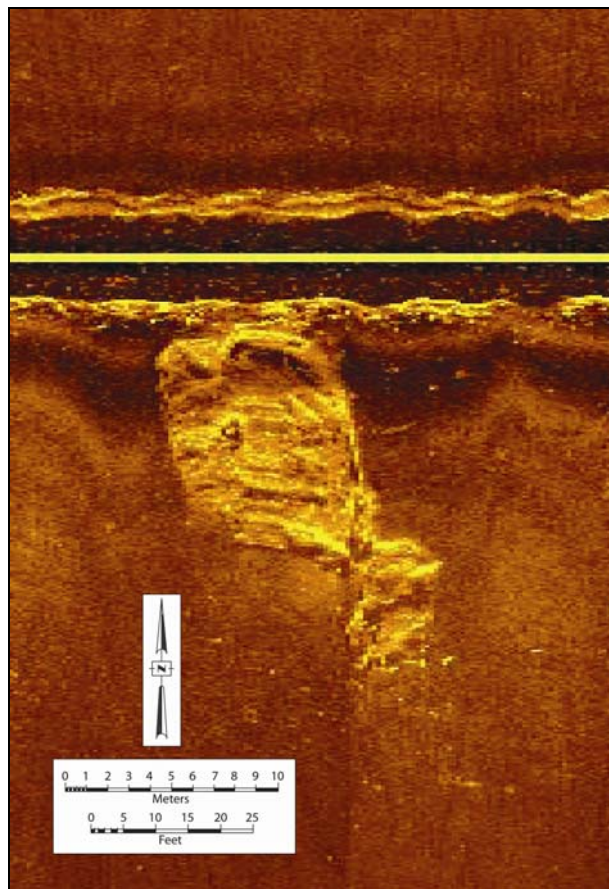


Figure 5.13 Sonar image of side-scan anomaly 12.1, which was verified to be the Elmina Shipwreck Site. A mass of cannons and trade goods lay exposed on the seafloor, causing enough of an acoustic reflection to show up in this sonar image.

The crew returned to the site with a very flat sea, dived on the target and noted that visibility had increased significantly, with minimal surge. The site is composed of a dense mass of cultural material, the most prominent being metal trade goods and iron cannons (Figure 5.14).

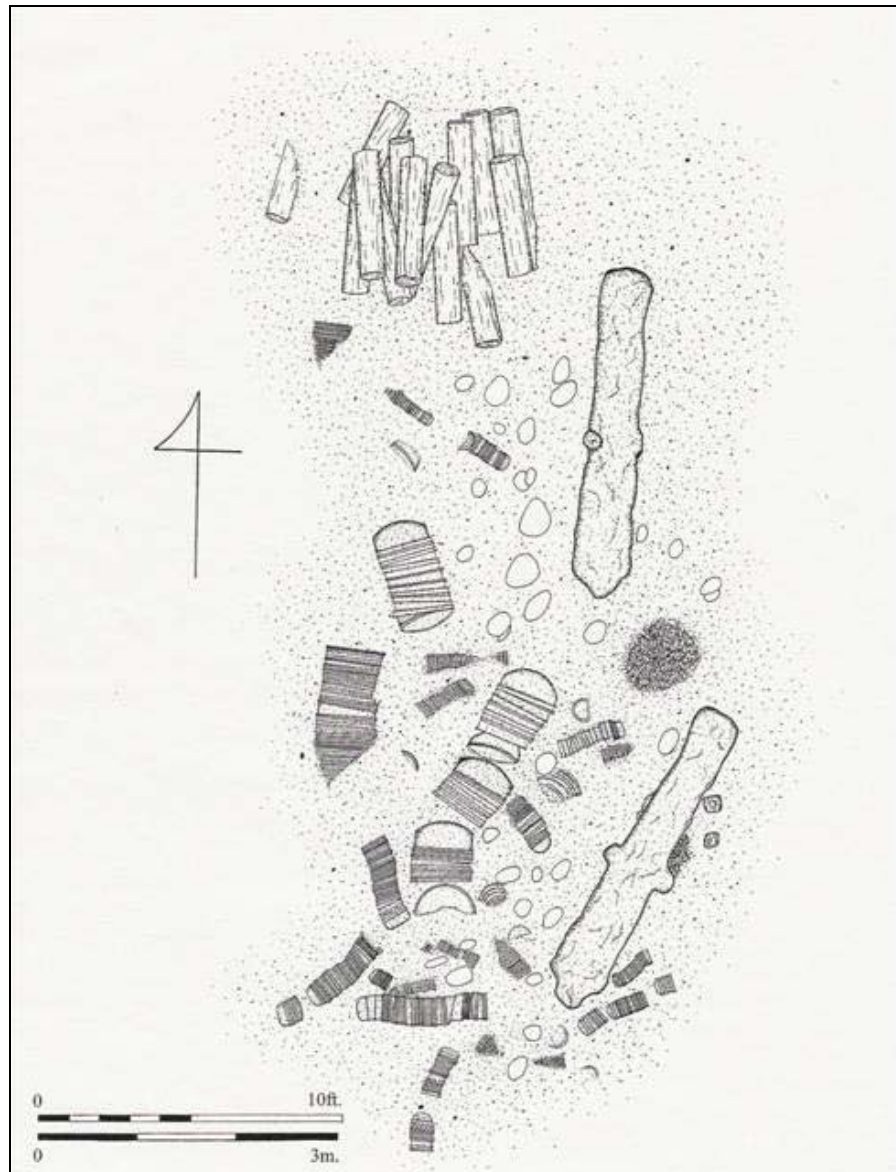


Figure 5.14 Preliminary sketch map of the eastern portion of the site made after the 2003 dives on the Elmina Shipwreck. Note that this plan was revised by subsequent work in 2005, 2007 and 2009 (as shown in Figure 5.19 and 7.1). Map by G. Cook.

We noted at least four different sizes of brass basins, ranging from six inches (15.2 centimeters.) to over two feet (61 centimeters) in diameter, arranged in stacks by the hundreds (Figure 5.15). In addition, we discovered two piles of brass manillas; one partially covered by an iron cannon, and the second stack sitting upright, still in the shape of the cask that they were originally stowed in. These open-ended bracelets were extremely popular in West Africa as trade items and for raw material to be reworked by African blacksmiths.



Figure 5.15 Stacks of brass basins encountered during 2003 investigations of the Elmina Shipwreck Site. The basins (bottoms are pointing up) measure approximately 18 centimeters (7 inches) in diameter. While the image clarity is poor, this is one of the better examples of underwater visibility on the site. Photograph by G. Cook.

To the north of these features lay a second iron cannon; archaeologists measured the length at 2.9 meters (9.5 feet) from muzzle to base, and 3.2 meters (10.5 feet) from muzzle to cascabel. Slightly northeast of the second cannon divers encountered a stack of rolled sheet lead, approximately 1.22 meters (4 feet) in length and rolled into cylinders. Ten rolls lay exposed on the seafloor, and more may extend under the sand. After these final observations, divers surfaced and ended the investigations.

While conclusions remained very tentative, indications were that the artifacts recovered likely came from a ship that sank either while inbound to the coast or while actively trading, since most of the cargo noted appeared to be manufactured goods that would have been destined for exchange on the West African coast. Potential questions that remained unanswered related to the vessel's nationality, its date, what it was trading for, and the cause of its sinking. Unfortunately the limited dive time only allowed a glimpse of the exposed material, but by the close of the 2003 season we had verified the presence of a shipwreck site off of Elmina Castle, and had proof that our methodology was working.

Phase II: Field Results

2005 Archaeological Investigations

With the initial remote-sensing survey completed and an intact wreck site confirmed, goals for the 2005 season centered on exploring the Elmina shipwreck and finding out as much as possible about the vessel. With these aims in mind, archaeologists established the following priorities: 1) Map the exposed features of the wreck; 2) Determine the maximum extent of the site; 3) Conduct test excavations in different areas

of the site to recover diagnostic artifacts and uncover intact hull structure, and; 4) If time allowed, investigate other high priority sonar anomalies located during the 2003 survey. Using this methodology we hoped to gain more data on the Elmina shipwreck, while leaving open the possibility of ground-truthing other potential shipwreck sites as time allowed.

Crew members arrived in mid-July, met with colleagues at the Ghana Museums and Monuments Board in Accra and Cape Coast, and reunited with contacts among the fishing community of Elmina. The 2005 crew included graduate students from Syracuse University (Andrew Pietruszka and Gregory Cook), as well as students and faculty from the University of West Florida; Nickie Hamann, Lisa Hopwood, Dr. Amy Mitchell-Cook, Jason Raupp, Paul Sjordal, and Hiroshi Toshikage (Figure 5.16). Our central tasks involved arranging housing, transportation and the research vessel/diving platform. Papa Kofi Arhin, our main contact and advisor to the Chief of the Fishermen at Elmina, once again offered the use of his open ocean Fanti dugout canoe for our research vessel. As in 2003, we modified the canoe for our needs by building a flat deck along the length of the canoe, making it easier to stow dive gear and improving the general comfort and ease of movement for diving operations. We also added outrigger planks for stabilizing the canoe at sea (Figure 5.17).

Other logistic activities included the preparation of diving gear. We utilized a surface-supplied “hookah” system, which allowed us to dispense with tanks and air fills while providing an adequate amount of air for up to four divers at one time on the site. To avoid the expense and annoyance of transporting extensive amounts of dive weights

to Ghana, arrangements were made with Elmina fishermen to fabricate dive weights from lead used in their fishing operations.

With the commencement of diving operations, divers immediately encountered a much heavier degree of surge, or wave action than experienced in the initial exploratory dives in 2003, as well as a significantly greater amount of silt covering the site. In the previous season the seafloor was composed primarily of sand, but divers found extensive amounts of soft silt that covered portions of the site. Either recent rains had deposited a layer of silt on the site despite its considerable distance offshore, or there was some other sort of siltation event occurring over time. Regardless, this provided baseline data that the Elmina Wreck was located in a dynamic environment with drastically changing



Figure 5.16 Part of the 2005 field crew. Pictured include, from upper left: Andrew Pietruszka, Isaac Abban, Amy Mitchell-Cook, Paul Sjoldal, Joseph Annan, Papa Kofi Arhin, Barnabus Akon, Nicole Hamann, Lisa Hopwood, and Benjamin Kankpeyeng. Photograph by G. Cook.



Figure 5.17 The canoe used in the 2005 diver investigations of the Elmina Shipwreck. Note Elmina Castle in the background. Photograph by G. Cook.

conditions. Over the course of the 2005 season, it became apparent that the state of any day's diving depended on factors such as the time of day, wind, waves, surge, amount of daylight, etc (Figure 5.18). As diving progressed visibility on site would remain essentially zero; even on calm, bright days enough surge existed on the seafloor to keep a layer of silt suspended above the wreck. Divers often encountered 1 to 1.2 meters (3 to 4 feet) of visibility while descending, only to experience blackout conditions on the wreck site.

The extensive amount of net material and fishing line that lay across the wreck site compounded the poor visibility problem. Apparently the wreck site is exposed for long enough periods to collect nets and line from fishing boats. These materials could easily get caught up in a diver's equipment, creating a potential hazardous situation if a diver could not extract him/herself and return to the surface before running out of air. In addition, dives in 2003 verified the presence of moray eels; although not considered a

threat by most divers if left alone, inadvertent contact in low visibility while trying to record or excavate the site could lead to bites on hands, feet, etc.



Figure 5.18 Diving on the Elmina Shipwreck Site. Pictured include Andrew Pietruszka, Jason Raupp, and Barnabus Akon. Note the surface air supply or “hookah” unit beside the canoe. Photograph by G. Cook.

Faced with these conditions, we initially conducted a series of acclimation dives to allow crewmembers to get familiar with the wreck features and site conditions. We tied the buoy to one of the cannons on the eastern edge of the site. This became our standard descent point, giving divers an easily-recognizable position to start each of their

Crewmembers learned to recognize certain landmarks (piles of manillas, stacks of basins, a particular cannon, etc.) by touch.

Site Mapping

To establish the extent of the site, divers placed a series of datums around its perimeter by driving sections of rebar into the bottom, and connecting the datums with line that provided a safe means of circumnavigating the site in zero visibility. While there are a number of ways of defining an underwater site's boundaries, this perimeter-datum system has been used successfully in other situations (Green 2004: 89). This also gave us a general idea of buried remains, as we attempted to drive the rebar datums into the sediments at the edge of the site. Datums were numbered and labeled with a system designed to allow divers to recognize any particular datum by feel. Lines with knots tied every foot between the datums essentially created a comprehensive baseline that extended around the site's perimeter, and divers could keep track of their position (and any features being recorded or recovered artifacts) based on this tactile system of datums and lines.³²

Eventually, as divers became more familiar with the site, and after removing an extensive amount of net material, we extended knotted lines across the wreck, allowing greater access to interior features for mapping and recording. As a means of protection from moray eels, divers carried a small section of rebar that they used to bang on the area that they were working in, with the hopes that this would cause any eels to retreat to safety and leave the immediate area. The effectiveness of this technique is debatable, but

³² When Horlings conducted coring operations on the Elmina Wreck, she determined that the site boundaries actually extend 10 to 15 meters (33 to 49 feet) further than the surface scatter indicates (Horlings 2011: 114).

it provided at least a sense of security while on the site, and luckily no one suffered any eel bites during the investigations, (a couple of divers accidentally grabbed eels, and an eel did surface in a diver's "goodie bag" with recovered artifacts).

This methodology proved adequate for generating a preliminary site plan with minimal risk to divers (Figure 5.19). We recorded all exposed features on the site which included five large iron cannons, several types of brass basins, pans and bowls, numerous cask features of manillas, an area of concreted barrel hoops, and rolls of sheet lead. These were features generally appearing on the surface of the seafloor, and limited probing suggested substantial quantities of material lay buried below the silt and sand.

Artifact Recovery

Excavation unit locations were determined with both methodological and practical concerns in mind. Ideally, we wanted to test different areas of the site along the longitudinal axis of the vessel in an attempt to recover a range of artifacts that might provide clues regarding the layout of the ship (i.e. trade items shipped as cargo, items used onboard the vessel by its crew, victualing-related artifacts, personal items, armaments, etc.). Practical considerations (diver safety) included excavating in areas relatively clear of net material, and working around heavy structures for support in extremely strong surge. For example, divers found that kneeling over cannon or holding onto manilla features proved very helpful in maintaining stability while excavating. Without such supporting structures, divers faced the risk of being flung uncontrolled across the site by heavy surge.

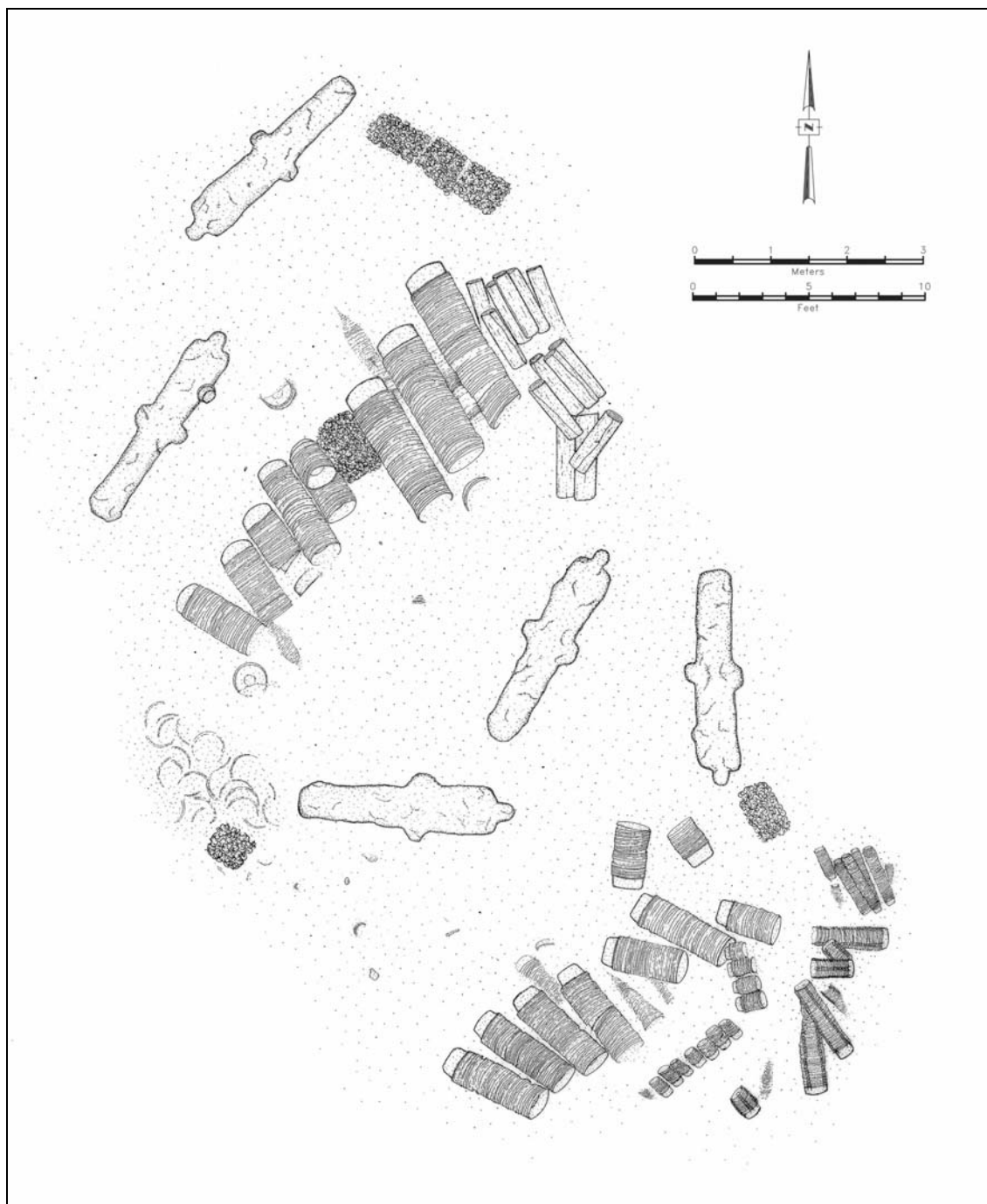


Figure 5.19 Site plan of the Elmina Wreck after the 2005 season. Note that this map was modified slightly with additional field work in 2007 and 2009. Map by G. Cook.³³

³³ Note that this plan differs considerably from the sketch map made in 2003, which was drafted after only two dives on the site (Figure 5.14). The lead rolls are shown in both maps, and the two cannons sketched

Though archaeologists commonly use water induction dredges or airlifts for underwater excavation, manual excavation by hand provided a satisfactory method of testing different areas of the site. A potential problem with using a traditional dredge on the site relates to the significant surge in the area; this would create tremendous drag on hoses and divers, and would likely make it very difficult for divers to control the dredge. In fact, the surge occasionally becomes so violent that hoses might, in fact, rip apart. While future work in the region should include setting up and testing dredging activities, for 2005 we opted for manual excavation, or digging “by feel” in areas mapped in with our datum and knotted-line system.³⁴ Recovered artifacts were deposited into mesh bags for retrieval back to the surface upon completion of the dive.

After each day’s diving, the crew returned to our field headquarters in the nearby village of Biriwa, where they cleaned, photographed and recorded artifacts, and stored them in water-filled vats. At the end of the diving season the GMMB permitted us to ship a sample of diagnostic artifacts to the U.S. for conservation and analysis; conservation took place at the University of West Florida. Upon completion of the analysis, all artifacts will be returned to the GMMB for curation and/or exhibition in their museums at Elmina Castle, Cape Coast Castle, or the National Museum in Accra.

Summary

The 2005 archaeological investigations of the Elmina shipwreck site proved very successful, and resulted in the mapping of exposed features of the wreck and test

in the 2003 drawing correspond to the two eastern-most cannons shown in the 2005 plan, with obvious measurement error in the 2003 sketch.

³⁴ A water induction dredge was unsuccessfully tested by Pietruszka in the 2007 fieldwork (Horlings 2011: 107).

excavations that indicated a substantial number of artifacts were preserved beneath the sea floor. Despite difficult conditions, archaeologists from Syracuse University, the University of Ghana and the University of West Florida successfully recorded the first example of a cargo destined for the West African trade.

While thrilled with the success of the research, the experience gained from two seasons of work in Ghana illuminated the challenges of conducting maritime archaeological investigations in this region. The general lack of visibility and the violence of the surge resulted in relatively dangerous diving conditions, and more intensive underwater research would be greatly aided by surface communications, tethered divers and perhaps hardhat diving equipment. The recovery of anything more extensive than what could be brought up in dive bags would require a more substantial platform than the dugout canoes we utilized, though they did prove their practicality for these initial phases of research. Investigation or recovery of the masses of concreted material that could be felt by divers would require underwater pneumatic tools or other methods.

Still, I was very pleased with our findings after the 2005 dive season, and returned to the University of West Florida with plans to conserve the artifacts and begin analysis of the assemblage recovered from the wreck. I was eager to determine the nationality and date of the vessel, if possible, though this would prove more difficult than originally thought. With the initial recovery of artifacts, it was apparent that there was a mix of materials, and much of it likely dated to the late eighteenth or early nineteenth centuries. The cannon appeared to be earlier than this, though it was difficult to garner specific details on the guns due to the mass of concretion covering them. Many of the bottles

showed characteristics of nineteenth-century manufacturing techniques, while two onion bottle fragments from what was considered secure contexts on the site were also recovered. One blue transferware sherd exhibited an image of a sidewheel steamship! Puzzling through these finds would prove more complicated than originally anticipated, and a more complete understanding of the Elmina Wreck Site would require extensive analysis and additional seasons of fieldwork.

CHAPTER 6: MATERIAL CULTURE OF THE ELMINA SHIPWRECK SITE

Cargo on the Seafloor

With the successful completion of Phases I, II and III investigations on the first wreck site discovered in coastal Ghana, our knowledge concerning submerged archaeological sites in the region had advanced tremendously. Surface sampling and excavations had not only allowed the recovery of an initial artifact assemblage from the wreck site, but also led to a baseline dataset of tested methodologies and insights into diving conditions and submerged environments that would prove crucial to research in the region.³⁵ As the initial exploratory research on underwater sites off Elmina, the findings generated by these two field seasons were necessarily preliminary. The limited budget restricted our time on the site, and while shallow excavations were conducted via the manual removal of sediments by hand, most of the artifact assemblage was recovered in limited surface sampling. The low visibility and high energy environment severely affected archaeological work on the wreck (Horlings found that conditions did improve later in the year). Regardless, analyses of the initial artifacts recovered from the wreck of a merchant vessel involved in the West African trade could begin.

From the very initial recoveries of material from the Elmina Wreck, however, it became apparent that the analysis of diagnostic artifacts from the site would not be a straightforward endeavor. Items dating to hundreds of years ago were recovered adjacent to modern items. Even in buried contexts there appeared to be a significant degree of disturbance. During an early dive on the site in 2003, we noted a portion of a white,

³⁵ This research would be followed up by successive field seasons directed by Syracuse graduate students Andrew Pietruszka in 2007 (Pietruszka 2011) and Rachel Horlings (Horlings 2011) that would further add to our understanding of the Elmina Wreck site and site formation processes in the region.

circular object exposed under a cannon. Assuming it might be a porcelain plate or bowl, further investigation revealed it to be the lid from a plastic bucket that had become deeply lodged under the cannon muzzle. Regardless, the artifacts recovered in 2005 allowed for the initial analysis of the wreck of a merchant vessel involved in the West African trade to begin.

The artifact assemblage resulting from the 2005 surface collection as well as excavation clearly represented a broad expanse of time, including onion bottles, blue transferware ceramics, late nineteenth and early twentieth-century bottles, and modern debris that had become entrapped in the wreckage. These initial interpretive challenges were paralleled in later work by Pietruszka (2011: 94-95) and Horlings (2011: 107). As will be discussed in more detail in Chapter 7, their additional and more intensive excavations on the site produced artifacts of mixed ages as well, even extending down to the lowest limits of their excavations. These difficulties led to an evolving understanding of the nature of the Elmina Wreck and its origin and date, which have been resolved to a large degree by re-evaluating the overall dataset based on the additional work of Pietruszka and Horlings, as well as archival research conducted by DeCorse and radiometric dating conducted on wood samples recovered by Horlings. This research established a probable mid-seventeenth century date for the Elmina Wreck. In 2005, however, the age of the wreck was far from clear. The following description details the various finds recovered from the Elmina Wreck site in the 2005 field season. A more thorough discussion of our current state of knowledge regarding the site in light of additional work is provided in Chapter 7.

2005 Elmina Wreck Artifacts

The artifacts from the 2005 season were recovered through surface collection and shallow excavation. Rather than attempting to establish a grid on a dynamic site with zero visibility and extensive amount of net and rope material covering the cargo and other artifacts, divers recovered material based on specific landmarks and using the line system described above to record provenience relative to seven specific loci on the site.³⁶ The wide variety of materials recovered from the site, are summarized in Table 6.1.

Table 6.1: Artifact Types and Counts Found on the Elmina Wreck

Artifact Class	Count
Bone	16
Brass Basins	74
Brass Pins	17
Bricks	5
Ceramic-Imported	12
Ceramic-African	2
Glass Beads	3000+
Glass Bottles/Fragments	20
Iron Concretions	24
Lead Sheathing	1
Manillas	44
Pewter Basins	19
Shell (cowries)	32
Stone/Ballast	1

Recognizing the need to conserve any artifacts recovered from the site and the associated expense of transporting objects to the United States for treatment, only potentially diagnostic artifacts were kept for analysis. Diagnostic artifacts were considered objects whose age and/or origin might be determined and thereby help in the

³⁶ In the 2007 excavations, this problem was addressed by constructing an adjustable metal grid that was placed over excavation areas (Pietruszka 2011: 88-92).

interpretation of the vessel's likely date, nationality and intended trade. The following discussion focuses on each of the specific artifacts types found on the wreck site in 2005.

Ceramics

A total of 14 ceramic samples composed of sherds and complete vessels were recovered across the site during the 2005 fieldwork. These include items of varied age and illustrate the amount of intrusive, disturbed material present and the interpretive problems encountered. Diagnostic types include Nassau reddish brown stoneware jugs with small lug handles, sponge-stamped whiteware with a hand-painted floral design, a cabled annularware cup, tin enamel majolica (possibly a drug jar base), blue transferware, a white stoneware food or preserves container marked "Price Bristol", and a complete olive jar. The dates for the ceramics range throughout the historic period, with a majority of the sample dating to the nineteenth century (see Table 6.2). More detailed descriptions of the potentially diagnostic ceramics are included below.

Drug Jar (*Albarelo*)

The lower portion of an *albarelo*, or "drug jar" was recovered in 2005. The vessel form, probably Moorish in origin, became common in the fifteenth century, and tended to be cylinder-shaped without a lid (Noel Hume 1980: 203). Taller vessels contained powders and balms, while shorter versions held unguents. In Spain they were apparently used exclusively for drugs, while in Mexico they often held spices or served as vases (Lister and Lister 1987: 129; Lister and Lister 1976: 13).

**Table 6.2: Diagnostic Ceramics Recovered from the Elmina Shipwreck Site
2005 Season**

Artifact No.	Description	Date Range
325a	Cut-sponge stamped floral, purple and green, whiteware bowl sherd	1845-1900
325b	Small grey stoneware body sherd	1500-1900
327	Nassau stoneware bottle base	1800-1900
334	Nassau stoneware bottle, small lug handle	1800-1900
336	Nassau stoneware bottle, small lug handle	1800-1900
346a	Annular decorated mug sherd	1780-1815
348	Iberian polychrome majolica, drug jar base	1550-1700
349	Whiteware, blue transfer print (steamboat)	1820-1900
360	Bowl sherd, coarse earthenware, African-produced w/incised lines	
364	White stoneware jar, ironstone?	1840-1900
367	Nassau stoneware bottle, small lug handle	1800-1900
373a	Nassau stoneware bottle, small lug handle	1800-1900
379	Olive jar, late period	1780-1850
403	Coarse earthenware, African-produced	

The Elmina *albarello* is the base of an incomplete majolica vessel, with approximately 12 centimeters (4 $\frac{3}{4}$ inches) preserved above its base, a maximum diameter of 10.5 centimeters (4 $\frac{1}{4}$ inches), and wall thickness of 7.4 millimeters (Figure 6.1). The vessel has a pinkish paste, and is glazed with a white background, gray-blue hand-painted floral designs with an orange line running horizontally beneath them. The closest match to this pattern appears to be Fig Springs Polychrome, with a production range of 1540-1650 (FMNH digital type collections 2012). This date range makes it possible that the *abarello* is part of the original contents of the Elmina Shipwreck site.



Figure 6.1 Drug jar or *albarello*. Photograph courtesy of the Archaeology Institute, University of West Florida.

“Nassau” Stoneware Bottles

Eight stoneware bottles with small lug rings were brought up from the site in 2005. We redeposited three and retained five for transport to conservation facilities and further analysis (Figure 6.2). The samples recovered are surprisingly intact, and two examples even contained corks discovered when their insides were cleaned out. Due to

the number of these vessels on the site (additional stoneware bottles of the same type were noted on the site but not recovered in the 2005 and 2007 seasons), initially they were considered to likely be part of the ship's cargo, which led to further analysis into the date and origin of these bottles.



Figure 6.2 An example of a “Nassau” stoneware bottle recovered from the 2005 Elmina Shipwreck investigations. Photograph courtesy of the Archaeology Institute, University of West Florida.

All of the vessels exhibit markings. Two have stamps of a crowned lion facing to the left, with the name “SELTERS” surrounding the lion in a circle. Under the circle, both are stamped “Herzogthum Nassau”, and on the back of the bottles one (373a) is inscribed “W Num. 93” and the other (334a) “Hs Num: 22”, which are batch numbers for the mineral waters bottled in these vessels. This type of selters mark is known from mineral water producers dating from 1836-1866, and the batch/scribe marks on the back of the bottles stand for the villages in which they were produced; “W” for Wirges and “Hs” for Hillscheid (Wieland 1980: 291). A third bottle (367) is stamped with a crowned lion facing to the left, but with the word “Fachingen” encircling the lion, and the Wirges village inscription, batch no. 150 in the back. This spring was owned by the Duke of Nassau, and was contemporary (1836-1866) to the other selters bottles recovered from the wreck (Barfues personal communication 2006).

A final stoneware bottle (336) of similar type carries no markings other than “1/2 kan”. The “kan” referred both to a type of jug/container as well as a liquid volume measurement, extending from the Middle Ages until well into the nineteenth century in Holland and neighboring areas. In 1820, the French metric system was introduced, but for a period the more archaic measurement systems co-existed, and were frequently added to labels in order to verify capacities. Though its measurement varied in earlier times, by the nineteenth century 1 kan was equivalent to one liter (Laurie and Balbi 1842: xv). Thus it is likely that this bottle dates to the early to mid-nineteenth century as well. Since the Elmina Wreck site likely dates to the mid-seventeenth century, these bottles are considered intrusive.

Olive Jar

A single olive jar was recovered from the central portion of the site. Olive jars, globular-shaped vessels that evolved from Mediterranean amphora, are ubiquitous among Iberian ceramics in the Americas (Avery 1997: 1; Deagan 1987: 30-31). Although closely associated with Spanish and Portuguese sites, they have been found on wrecks and terrestrial sites of other nationalities. Fragments of olive jars were found on the wreck of the English ship *Sea Venture*, lost off of Bermuda in 1609 during a voyage to resupply the Jamestown colony (Wingood 1982: 341), as well as in excavations at the Elmina town site (DeCorse 2001: 152). Primarily used to contain liquids such as olive oil, olives in brine, and wine, they could also be utilized for transporting condiments and vegetables such as beans and chick peas, as well as lard, pitch and tar (Fairbanks 1972: 142; Goggin 1964: 256).

As an evolutionary derivative from Mediterranean amphora, they are well suited for storage and shipping containers. Their thick walls and rounded form resulted in considerable structural integrity, they fit well in limited cargo space, stacked efficiently against rounded hulls, and their round opening was easily secured with minimal airspace to protect against spoilage (Marken 1994: 43). Secondary uses, other than as utilitarian storage containers, have included their incorporation in house walls or structural supports in roof vaults (Goggin 1960: 6-7; Deagan 1987: 32; Lister and Lister 1987: 132; Marken 1994: 42). Their presence on archaeological sites, particularly Spanish Colonial sites in the Americas ranging from 1490 to 1850 or later, have prompted several studies of their forms, functions and chronologies (Avery 1997; Fairbanks 1972; Goggin 1960; 1964; James 1988; Lister and Lister 1980; Martin 1979; Skowronek 1987).

John Goggin (1964: 263-275) originally defined chronologies of olive jars based on form, paste and surface treatment, dividing the vessel type into early (1490-1580), middle (1580-1780) and late (1780-1850 or later), with the Elmina Wreck sample most resembling his middle style forms. Additional studies include James' analysis of what is arguably the largest collection of olive jars from shipwrecks (from the *Tolosá* and *Guadalupe* sunk in the Dominican Republic) dating to 1724 (James 1988: 43), as well as Mitchell Markens' (1994) analysis of pottery from a variety of Spanish shipwrecks. These more recent analyses have identified potential new forms and slightly revised our understanding of olive jar variations.

The Elmina Shipwreck olive jar measures 44 centimeters (17 ¼ inches) in length, 18.9 centimeters (7 ½ inches) maximum diameter (at shoulder), 8.5 centimeters (3 ¼ inches) rim width and 4.5 centimeters (1 ¾ inches) mouth opening (Figure 6.3). Tool marks are evident on its exterior surface, but there are no other marks or inscriptions on its body or rim. Based on comparisons with olive jars described in the above sources, the examples that match closest with the Elmina Shipwreck olive jar are from the early eighteenth century, specifically vessels recovered from the 1724 *Tolosá* or *Guadalupe* shipwrecks. Included as part of Marken's "Type C" typology, the 1724 olive jars are of almost identical size and proportions, have similar rim designs, and exhibit the same slightly inward-curving sides as the Elmina example (Marken 1994: 102, 136-137). This eighteenth-century style appears to correspond closest to the Elmina Wreck olive jar. It should be kept in mind, however, that we have only a limited understanding of the production ranges of olive jars, and most of the relatively few dated examples are from shipwreck contexts in the Americas. The chronological implications of the dissemination

of such Iberian wares into West Africa, as opposed to the Americas, is also unclear, thus we cannot tell for certain whether the Elmina Wreck olive jar is intrusive or associated with the site.

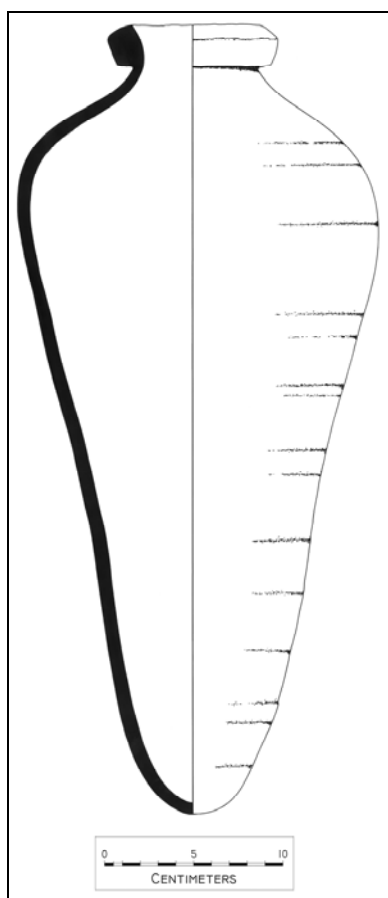


Figure 6.3 Intact olive jar recovered in 2005. Photograph courtesy of the Archaeology Institute, University of West Florida. Drawing by G. Cook.

Glass Bottles

Divers recovered a total of 20 glass bottle fragments and complete bottles from the site, 14 of which were identifiable. Like the ceramic assemblage from the wreck, these also present a broad date range. While a majority of specimens likely date to the nineteenth century or later, two types (onion bottles and case bottles) were analyzed in detail to determine their dates and origins (see Table 6.3). These are described in more detail below.

Table 6.3: Diagnostic Glassware Recovered from the Elmina Shipwreck Site, 2005 Season

Artifact No.	Description	Date Range
309	Case bottle base fragment	1700-1870
311	Case bottle base fragment	1700-1870
312	Bottle, rickets mould	1870-1900
324	Bottle base fragment, bare iron pontil	1830-1870
329	Onion bottle base, blowpipe pontil	1680-1750
331	Bottle base fragment, turn mould	1880-1900
337	Bottle neck fragment, down-tooled finish	1840-1880
352	Bottle, applied tool finish, snap case	1850-1900
359	Bottle, applied square band on neck	1850-1900
372	Hochwein bottle, flat top finish	1850-1900
374	Bottle, dip mould	1840-1880
383	Bottle base, turn mould	1880-1900
387	Onion bottle base, similar to #329	1680-1750
421	Bottle neck fragment, down-tooled finish	1840-1880

Onion Bottles

Two onion bottle fragments, found adjacent to each other on the southwest portion of the site, were recovered from the wreck and conserved for further analysis. Unfortunately the fragments are composed of the bases and partial remains of the sides, with none of the

neck or finish remaining (see Figure 6.4 and 6.5). Globular-shaped bottles, commonly known as “onion bottles” began to appear in the mid-seventeenth century in England, and transitioned to straight-sided bottle forms by the first quarter of the eighteenth century (Dumbrell 1983: 29-30; Noel Hume 1980: 63-66). Glass bottle manufacturers in Holland and other continental production centers tended to follow English designs but lagged by several decades (Dumbrell 1983: 128; Noel Hume 1980: 70).³⁷

As with other artifact categories, analyses of the onion bottles from the Elmina Wreck site was conducted with the aim of determining potential dates or origins of the bottles. This has proved problematic due to the limited sample size and fragmentary nature of the bottles. Interpretation is also made difficult by the widespread trade of bottles and their contents between the continent and England. In fact, in his authoritative study of antique wine bottles, Dumbrell notes that wine bottles used throughout Europe, England and the colonies likely became more or less integrated (Dumbrell 1983: 128-130). As an example of this, he discusses the fact that many of the bottles recovered from the *Hollandia* appear to align more with English than Dutch forms, though this is clearly cargo associated with the Dutch East India vessel that sank in 1743 (Dumbrell 1983: 129; Gawronski et al. 1992: 395-402; Pietruszka 2011: 142).

Despite the imperfect state of knowledge regarding English and continental onion bottle types and production, an examination of the literature relating to these vessels indicates that two potential diagnostic characteristics are based on glass color and shape. The Elmina Shipwreck onion bottles are both base fragments: # 387 is composed of its

³⁷ As Pietruszka notes (2011: 140-141), there are indications that Dutch onion bottles may begin earlier than this. For example, Dapper (1676) shows a Dutchman using what appears to be an onion bottle on the West African coast.

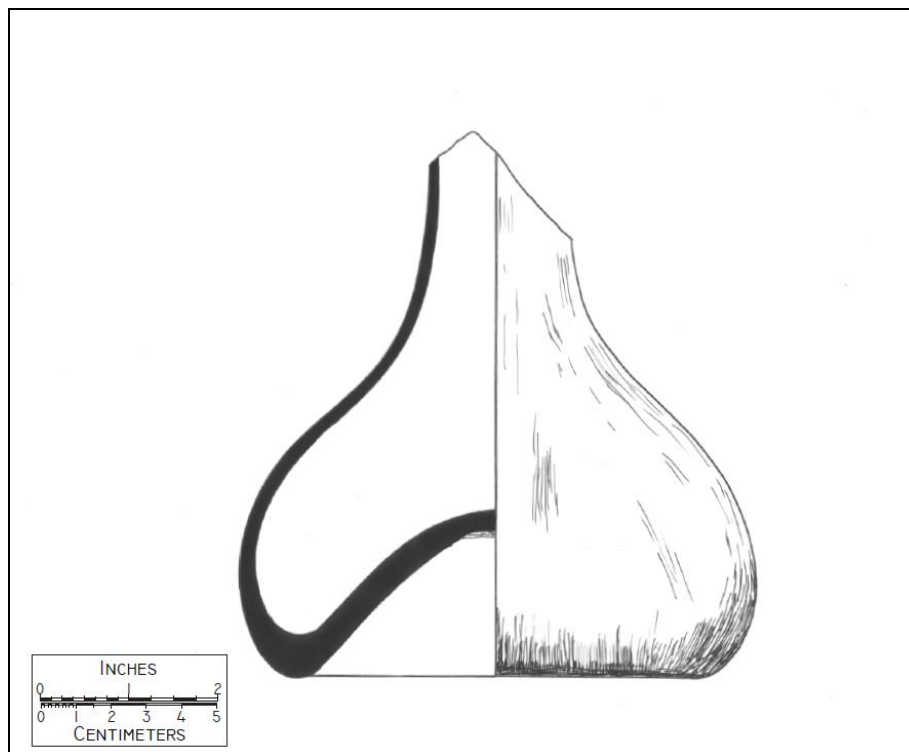


Figure 6.4 Partial onion bottle #329, recovered in the 2005 Elmina Shipwreck investigations. Drawing by G. Cook.

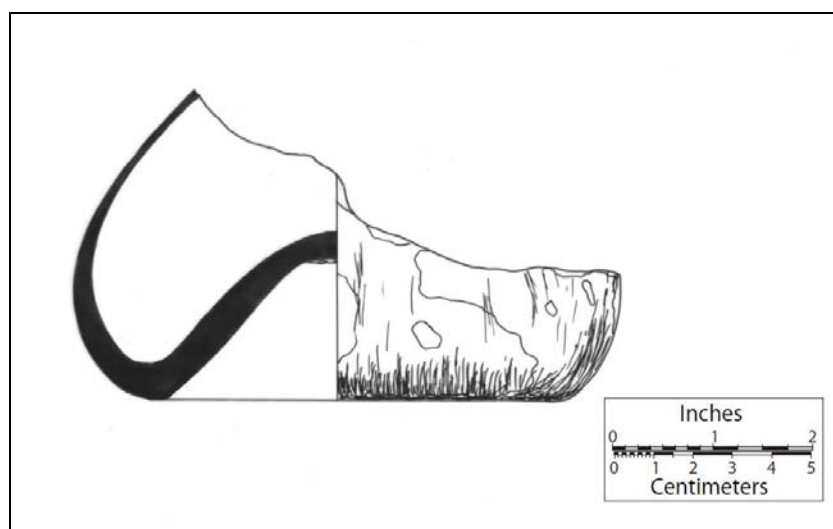


Figure 6.5 Onion bottle base # 387, recovered in the 2005 Elmina Shipwreck investigations. Drawing by G. Cook.

base and part of the side below its missing shoulder; #329 complete up to the upper portion of its neck. The bases are 12 centimeters (4 $\frac{3}{4}$ inches) in diameter, with a 4 centimeter (1.5 inches) basal kick on #329, and 3.5 centimeter (1 $\frac{1}{4}$ inches) kick on #387. Their green color would tend to make them more likely to be Dutch in origin, as English bottles tended to be darker (Dumbrell 1983: 128). Stylistically, the Elmina Wreck onion bottle bases match closest to early eighteenth-century continental and English examples, specifically English bottles dated to 1708 and 1714 (Noel Hume 1980: 63-64), McNulty's Dutch bottle No. 14 dating to 1700-1705 (McNulty 1971: 115), McNulty's Dutch bottle in Fig. 71 dating to 1710-1720 (McNulty 1972: 142-143), and Bossche English styles #7 and #9 dating from 1700-1735, his Belgium style #6 from 1710-1760, and Dutch style utilitarian bottles from the first half of the eighteenth century shown in plates 70-73 (Bossche 2001: 30, 31, 119-122). Pietruszka examined nine onion bottles recovered during his fieldwork, ascribing a date between 1680-1750 for the assemblage (Pietruszka 2011: 148). DeCorse found onion shaped wine bottles dating to the late seventeenth and early eighteenth centuries at Elmina (DeCorse 2001: 160). Keeping in mind the limitations of assessments based solely on bottle bases, as well as broad dispersal of onion bottle types that likely occurred between England and continental sources, the dating of the two incomplete bottles from the Elmina Wreck is imperfect at best. Our best guess based on the above sources is that the Elmina Shipwreck onion bottles are later than the likely date of the wrecksite.

Case Bottles

Fragmentary bases of two case bottles were recovered during the 2005 season (Figure 6.6). These flat sided, moulded bottles were first produced in Germany during the second half of the sixteenth century, and by the mid-seventeenth century had become common in both England and the Netherlands (McNulty 1971: 103; Noel Hume 1980: 69). They are characterized by a square cross section, often widening from base to shoulder, with a short neck and indented base, and were often made of dark green glass (Jones and Sullivan 1989: 72). Their square section allowed them to be packed securely in wooden crates for transport. Although they eventually became closely associated with the transport of gin, initially square-sided bottles were used extensively by chemists and apothecaries, and eventually would see use as containers for wine, brandy and other spirits (Munsey 1970: 84).

Determining dates and origins of case bottles, as with onion bottles described above, is problematic. The bottles were traded extensively across borders, and Dutch craftsmen tended to migrate to glassworks in England and the Americas, making the determination of nationality based on form or other characteristics difficult (Munsey 1970: 84). A general trend seems to be an increasing amount of taper from the neck to the base over time. Early bottles were free blown with essentially straight sides, while later bottles were blown in dip moulds, and have a tapered bottom that allowed for easier removal from the mould (McNulty 1971: 107). The base apparently became more arched by the second quarter of the eighteenth century, allowing bottles to rest on the four corners of their base (McNulty 1971: 107). Finishes can also provide chronological

indicators, however this portion of both case bottle examples from the 2005 Elmina Wreck excavations are missing and therefore do not factor into the analysis.

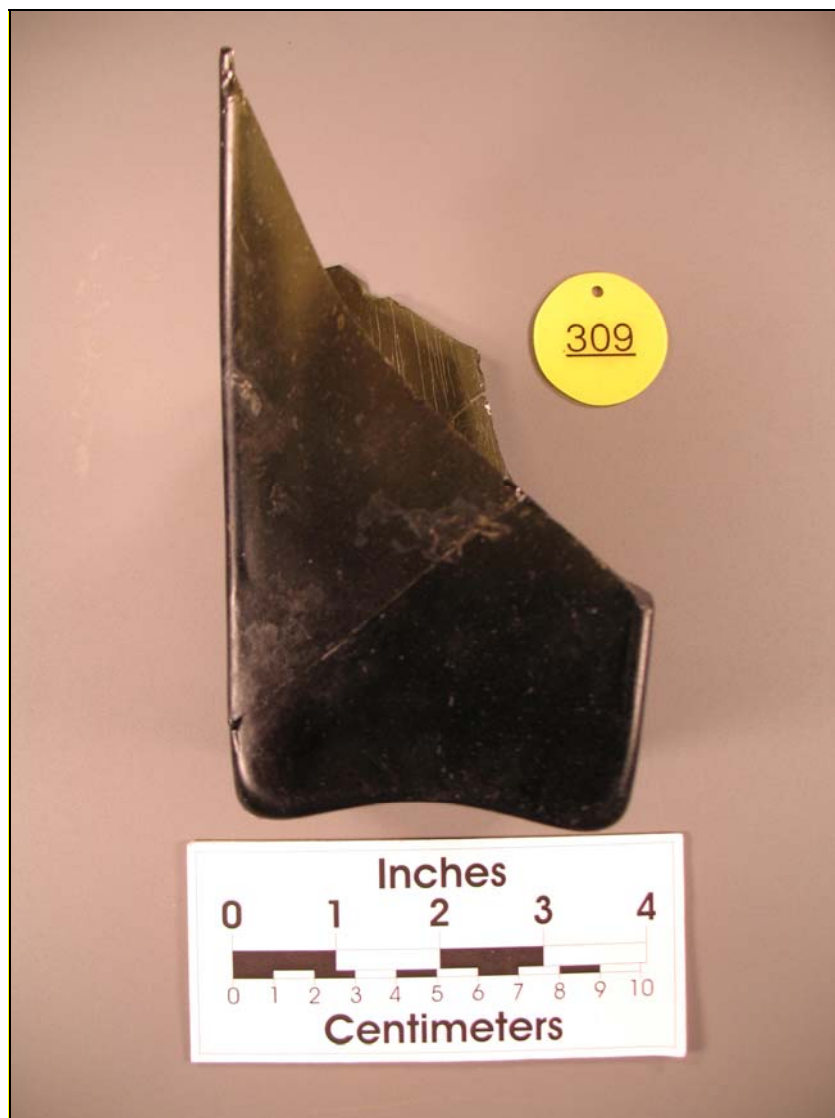


Figure 6.6 Case bottle fragment # 309, comprised of the base and part of the bottle's side (recovered in 2005). Photograph courtesy of the Archaeology Institute, University of West Florida.

The Elmina case bottle fragments are broken just over 10 centimeters (4 inches) from their base. Artifact #309 measures 7.5 centimeters (3 inches) square at its base, and #

311 is 8 centimeters (3 1/8 inches) square, and both are made from dark green glass.

Both exhibit subtle round pontil scars . Based on their four-point base, they likely date to post-1700, making it possible that they are intrusive to the Elmina Shipwreck site.

Glass Beads

Glass beads numbering well into the thousands were recovered by divers during the 2005 season as individual finds, as accidental finds in sediments associated with other artifacts, and as masses of beads in concretions (Figure 6.7). These last artifacts are particularly significant as the numbers, and the presence of stringing patterns in concretions, indicated they are likely associated with the wreck and therefore date to the mid-seventeenth century. The beads were analyzed as part of UWF graduate student and Elmina Shipwreck Project crew member Lisa Hopwood's M.A. thesis (Hopwood 2009).

Hopwood identified 16 separate type-varieties of beads from the wreck site, and analyzed them using Kidd and Kidd's 1983 typology and Karklins 1985 asterisk system to classify beads not included in Kidd's typology (see Figure 6.8 and Table 6.4). Four primary methods of production are included in the assemblage, including 2,384 simple beads (single layer of glass with no designs), 1,030 compound beads (multiple layers of glass with no designs), 9 complex beads (one layer of glass with designs), and 396 composite (more than one layer of glass with designs). Nearly all of the beads from the Elmina Shipwreck site are considered small, measuring 2-4 mm in diameter (Hopwood 2009: 60; Kidd and Kidd 1983).

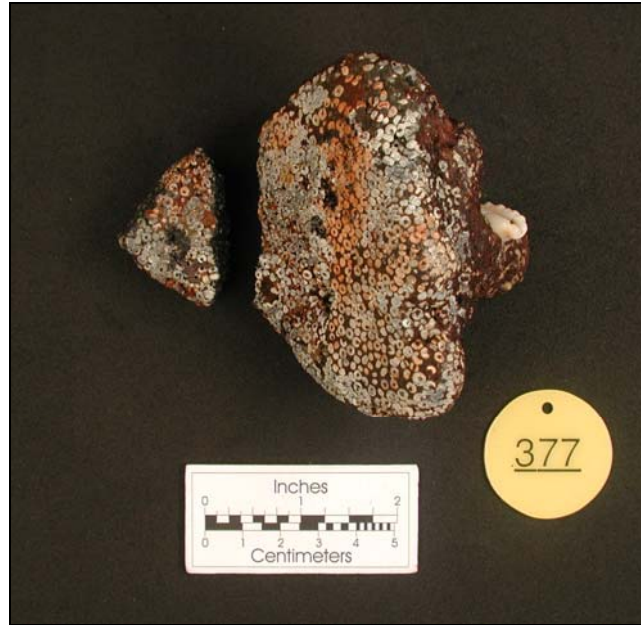


Figure 6.7 Bead concretion recovered from the 2005 Elmina Shipwreck investigations. Note the cowrie shell that formed into the concretion along with the vast quantity of beads. Photograph courtesy of the Conservation Laboratory, University of West Florida.

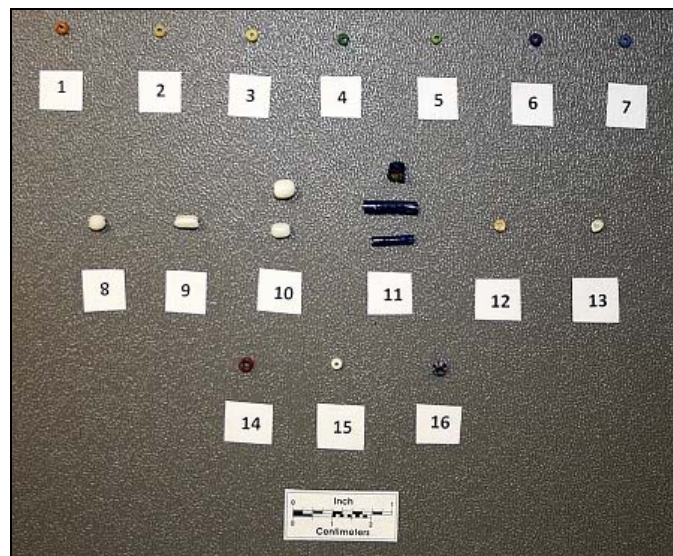


Figure 6.8 The bead assemblage from the 2005 Elmina Shipwreck investigations. Photograph courtesy of the Conservation Laboratory, University of West Florida.

Table 6.4: Elmina Wreck Bead Assemblage³⁸

Type	Count	Manufacture	Structure	Shape	Length	Diameter	Diaphaneity	Color
1(IIa*)	51	D	S	DN	1.1-2.3	1.9-3.4	TL	Orange
2(IIA*)	92	D	S	DN	1.0-2.4	2.0-3.1	TL	Yellow
3(IIA*)	14	D	S	DN	0.9-2.1	2.2-2.9	OP	Yellow
4(IIa*)	57	D	S	DN	0.9-2.3	1.9-3.5	TL	Dk Grn
5(IIa*)	60	D	S	DN	0.9-1.9	2.0-2.9	OP	Lt Grn
6(IIa*)	1,985	D	S	DN	0.7-2.2	1.7-3.6	TP	Blue
7(IIa*)	71	D	S	DN	0.8-2.0	2.0-3.2	OP	Lt Blue
8(IIa13)	3	D	S	GL	2.8-4.1	2.6-3.9	OP	White
9(IIa15)	1	D	S	CL	6.3	3.2	TL	Yellow
10(IIa*)	4	D	S	SB	4.6-5.5	3.5-4.5	OP	White
11(IIbb*)	1	D	CPX	CL	1.7	3.2	OP	Blue
12(IIbb*)	8	D	CPX	DN	1.5-2.2	2.2-3.3	OP	Ylw/Green
13(IIIa10)	38	D	CPD	CL	4.9-13.8	2.1-4.2	OP	Blue/Wht
14(Iva6)	71	D	CPD	DN	0.9-2.0	2.0-3.3	OP	Red/Green
15(Iva11)	921	D	CPD	DN	0.9-2.5	1.9-3.6	OP	White
16(IVb16)	199	D	CPE	DN	1.5-3.1	2.5-4.1	OP	Red/Blue
I	209			DN				

The bead masses or concretions contain linear patterns of beads indicating that they were shipped strung together. Although how they form is not entirely understood, similar bead concretions have been found on the seventeenth-century Dutch “Pipe Wreck” located in Monte Cristi Bay, Dominican Republic (Hall 1996: 218) as well as the early eighteenth-

³⁸ Table 6.4 utilizes data taken from Hopwood (2009: 61), but the format here follows DeCorse’s Systematic Bead Description System (DeCorse et al. 2003). The Type number designates the classification of the Elmina Wreck bead assemblage as determined by Hopwood, with the number in parentheses referring to comparable types in Kidd and Kidd (1983) or Karklins when indicated with an asterisk (Karklins 1985). All beads recovered from the wreck are of drawn manufacture, and bead structure is designated as simple (S), compound (CPD), complex (CPX) or composite (CPE). Shape designations follow DeCorse (2003: 91-101) and include doughnut (DN), globular (GL), cylindrical (CL), and short barrel (SB). Diaphaneity refers to the ability of the bead to transmit light, and is designated as opaque (OP), translucent (TL) or transparent (TP). Colors are determined using the *Munsell Book of Colors*. For more specific information on the bead assemblage from the Elmina Wreck, see Hopwood (2009: 60-76).

century slaving vessel *Henrietta Marie* which sank in the Florida Keys (Moore and Malcom 2008: 29).³⁹

Hopwood's Elmina Wreck Types 1-7 are equivalent to Kidd and Kidd (1983) Types IIa, classified as small monochrome drawn beads averaging 2-3 mm in diameter and 1.5-2.5 mm in length, and are represented by the following diaphaneity and color: Elmina Wreck Type 1 translucent orange; Type 2 translucent yellow; Type 3 opaque yellow; Type 4 translucent dark green; Type 5 opaque light green; Type 6 transparent blue; and Type 7 opaque light blue. Elmina Wreck Type 8 is equivalent to Kidd Type variety IIa13 and is opaque white and round, and Type 9 is similar to Kidd Type variety IIa15 but is opaque white and ellipsoidal. Elmina Wreck Type 10 is opaque white and short tubular or barrel-shaped, and is classified as Kidd Type IIa* (Hopwood 2009: 62-63).

Elmina Wreck Types 11 and 12 are small striped beads similar to Kidd Type IIbb. Type 11 is opaque yellow with an inlay of three stripes, though the middle stripe is missing (likely due to deterioration in the marine environment). Type 12 beads have an opaque green core and an opaque red stripe centered between two yellow stripes. Elmina Wreck Type 13 is a cylindrical compound, multilayered bead of blue/white/blue layers equivalent to Kidd Type variety IIIa10. Types 14 and 15 are compound beads, the former composed of opaque red on transparent green glass, and the latter are opaque white and opaque bright white, and match Kidd Type varieties IVa6 and IVa11. Elmina Wreck Type 16 is a composite (layered and striped) bead, equivalent to Kidd Type

³⁹ The bead masses from *Henrietta Marie* were apparently formed due to beads being strung with iron wire, as examples of beads still strung in this fashion were noted among the finds on the site (Moore and Malcom 2008: 29). Though the linear patterns of beads and possible string remnants on the Elmina Wreck beads suggest that they were strung with string, if portions of the bead cargo were strung with iron wire, this could explain the concretions noted.

variety IVb16. These are opaque white on transparent blue with alternating stripes of blue and red.

Unfortunately, small glass beads of the types found on the Elmina shipwreck were common for the entire contact period, with “many billions landing in barrels, cases and casks from start to finish of the Atlantic slave trade” (Alpern 1995: 221; also see DeCorse 1989b: 41-43; DeCorse et al. 2003). Additional research on bead chronologies offers some promise in using bead assemblages for potential dating of sites. While the presence of a limited number of beads carries little information relating to a site’s chronology, looking at larger assemblages, and in particular the frequencies of specific bead types, may lead to more fruitful findings (DeCorse 1989b: 49-50). While many European bead production centers existed during the mid seventeenth century, Dutch manufacture is clearly a possibility for the national origin of the Elmina Shipwreck bead assemblage. Dutch bead production reached a peak during the seventeenth century in centers such as Brussels, Namur, Amsterdam, Haarlem and Rotterdam, among others, but had essentially ceased by the end of the century due to foreign competition (Karklins 1974: 64-66). However, the production of the Dutch bead factories are poorly documented and the beads from the Elmina Wreck may equally represent Venetian production. Regardless, the bead assemblage from the Elmina Shipwreck site will hopefully provide additional data for a broader understanding of European bead importation in the West African trade.

Manillas

Manillas can be defined as open brass bracelets cast in the form of a horseshoe with lozenge-shaped feet. They were likely among goods that made their way across the

Sahara to the coastal peoples of West Africa prior to European maritime contact, and remained in the West African trade from the discoveries to the twentieth century (Herbert 1984: 201). Some forms are of indigenous manufacture and likely predate European contact (Ballarini 2009: 134). The linguistic origin of the term is unclear, but it may derive from Portuguese for “little hand” (Davies 2002: 46). Literally millions of manillas entered the West African market during this period, though archaeological visibility is typically low for these artifacts (DeCorse 2001: 147). Masses of manillas were noted during the initial dives on the Elmina Wreck, including a group laying under one of the easternmost cannons, as well as others in circular formations which likely formed when the wooden casks containing them degraded over time, leaving the concreted manillas in the shape of a barrel (Cook and Spiers 2004: 20).

During diving operations in 2005 four separate “manilla features” were recorded on the site composed of distinct masses of the brass trade goods, along with individual manillas spread over the site. A total of 44 manilla samples were recovered, analyzed and conserved at the University of West Florida. Of this total, 28 of the manillas were complete, and 16 were fragmentary. Some of the manillas showed signs of either intense sand abrasion or galvanic reaction to other metals on the wreck site leading to considerable degradation of their metal content. For the analysis of manillas from the Elmina Wreck, I selected only those complete examples with little to no galvanic degradation, so that dimensions and weights are considered to be closely accurate to their original specifications after manufacture.

With these considerations, analysis was conducted on 21 manillas (see Figure 6.9). Measurements for each included maximum diameter, weight, width of the opening



Figure 6.9 A selection of manillas recovered from the Elmina Wreck in 2005. Photograph courtesy of the Conservation Laboratory, University of West Florida.

between the two feet, gauge at center, and diameter of the feet (see Table 6.5). A considerable amount of variation is evident in the ranges of these measurements. Maximum diameter ranged from 84.43 to 100.27 millimeters (3.32 to 3.95 inches), with an average of 93.33 millimeters (3.67 inches). Weights ranged from 127.2 to 196.6 grams (4.49 to 6.93 ounces), and an average of 162.2 grams (5.72 ounces). Opening between the feet varied between 20.8 and 57.51 millimeters (.82 to 2.26 inches), with an average of 44.27 millimeters (1.74 inches). The gauge at center ranged from 8.65 to 10.94 millimeters (.33 to .43 inches), with an average of 9.91 millimeters (.39 inches). Feet diameter ranged from 16.35 to 22.38 millimeters (.64 to .88 inches), with an average

of 20.01 (.79 inches).⁴⁰ Other observational details include occasional voids from bubbles in the casting process, and marks on the arms and faces of the feet from filing down and smoothing the pieces after casting.

Table 6.5: Elmina Wreck Manillas

Artifact No.	Diameter	Weight	Opening	Center Gauge	Feet Diameter
302a	92.76	155.5	51.62	9.55	22.38/21.4
302b	93.54	163.9	51.76	10.12	21.0/21.37
302c	100.27	183.9	57.51	10.52	20.33/18.22
302d	n/a (bent)	158.8	n/a (bent)	9.93	19.86/21.22
307a	89.3	161.1	47.49	9.58	20.97/20.93
307b	88.37	153.1	44.74	9.31	20.1/20.15
307c	87.45	159.7	37.08	9.25	19.65/18.85
310a	88.54	143.7	28.31	10.12	20.41/20.55
318a	99.65	196.6	42.27	10.07	20.55/19.35
318b	94.87	140.4	47.76	10.01	16.35/17.92
318c	97.98	187.1	51.14	10.32	19.5/19.46
369a	84.43	156.3	20.8	9.8	21.53/20.4
369b	90.25	143.8	34.11	9.37	20.53/20.69
369c	97.42	166.6	51.13	10.12	20.42/21.3
369d	94.33	171.1	44.94	10.56	19.53/19.12
369e	94.42	154.1	47.92	10.0	18.69/19.05
369f	96.74	176.4	43.31	10.68	21.92/20.22
369g	93.73	150.2	45.0	9.54	20.73/20.56
369h	94.07	165.8	41.96	9.77	20.71/19.34
369i	96.4	190.8	48.07	10.94	19.58/19.4
385b	92.13	127.2	48.43	8.65	18.65/17.42

⁴⁰ In 2007 Pietruszka noted that over 600 manillas were recovered during excavation, though most were redeposited and 8 manillas were retained for analysis and conservation. He does not include individual figures, but notes the following measurements: diameters ranged from 82.5 to 96.5 millimeters, averaging 91.625 millimeters; weight ranged from 83 to 145 grams, with an average of 113.73 grams; gauge at center ranged from 7.5 to 8.5 millimeters, averaging 7.875 millimeters; and foot diameter ranged from 14.5 to 20.5 millimeters, averaging 17.25 millimeters (Pietruszka 2011: 102).

While it was considered from the outset of the research that the discovery of a wrecksite offshore of Ghana may yield a greater understanding of the material culture involved in West African trade, we were still thrilled to actually encounter the number of manillas preserved on the Elmina Wreck. Unfortunately, relatively little is known about manillas in general, and there is no clear understanding of the varieties that existed throughout the historic period, or the variations that may have been traded in different geographical regions. As Eugenia Herbert writes in her *Red Gold of Africa*, “manillas were the most common form of copper-ring currency along the west coast...but it is remarkable how little is actually known about them: most authors simply repeat the same handful of sources...” (Herbert 1984: 201). They are mentioned in historic documents relating to the West African trade, but usually in frustratingly general terms that provide little concrete information. A contract between the Portuguese crown and a brass manufacturer in Antwerp distinguishes brass rings intended for “the commerce of São Jorge da Mina” as well as brass rings for the “rest of Guinea”, with the Mina manillas described as weighing heavier than the Guinea manillas (10 ounces and 8 ½ ounces respectively), and all of the rings having smooth and well-filed heads. It also mentions that the manufacturers were assumed to already be familiar with metals suitable for the African trade, and that they should conform to the “size and sorts and perfection as has always been the custom” (Herbert 1984: 128, 201). If this appears vague, many seventeenth-century sources simply mention “brass bracelets” or “metal bracelets” as desired items in the West African market, with no further description (Jones 1995: 176; Tilleman 1994: 41).

Archaeologically, manillas have only been found on rare occasions, and little definite information exists regarding their varieties or characteristics. Surprisingly little evidence of manillas has been recovered in terrestrial excavations in West Africa, including the town of Elmina itself (DeCorse 2001: 147; Kelly 2001; Stahl 2001: 92-93). The commercial salvage company Arqueonautas recovered 238 manillas off a sixteenth century wreck in Getaria Bay, northern Spain, and has published a brief report (Benito and Ibáñez Artica 2005: 63-81). The wreck is significant in that it was likely a Flemish vessel chartered by Portugal to ship its cargo to São Jorge da Mina, and the manillas appear to be similar in form to those from the Elmina Wreck, despite their earlier date. Manillas were also found on the 1629 wreck of the Dutch East Indiaman *Batavia*, but these are strikingly different from manillas recovered from the sites mentioned above, and exhibit a more circular diameter and claw-foot ends (Green 1989: 191). A single manilla was recovered from an early eighteenth-century wreck off Saint-Quay Islands in Brittany that is similar in form to the manillas from the Elmina Wreck (Herry 2004: 97). Finally, a “large number” of manillas and trade beads were discovered in association with 24 cannon by sport divers 6 miles (9.6 kilometers) northeast of Bermuda. Dubbed the “Manilla Wreck”, the site was investigated archaeologically in 1998-1999 and determined to likely represent material cast overboard during a grounding incident in the middle eighteenth century (Smith and Maxwell 2002: 61-62). In an article on the analysis of the beads found at the site, Karklins includes an image showing a variety of the recovered finds, including a stack of manillas that are comparable in form to the type found on the Elmina Wreck (Karklins 1991: 39).

Other sources of information include the collector market, which is hampered by inadequate provenience information and a tendency to focus on relatively modern materials (e.g. Semans 2008; see Pietruszka 2011: 104 for a more detailed discussion of these sources). Ethnographic studies such as Sven-Olaf Johansson's *Nigerian Currencies*, are often cited as authoritative sources, but as Pietruszka points out, he illustrates only 9 of the many types he describes, and his discussion is restricted to manillas of late nineteenth and early twentieth century Nigeria, thus both the geographical and chronological range is limited (Pietruszka 2011: 104). The nine varieties Johansson illustrates includes the *Okpoho*, *Abi*, *Okombo*, *Atoni*, *Onoudu*, *Ejema*, *Mkporo*, *Nkobnkob* and *Popo*, and he also mentions the *Nwohuru*, and *Okporo Kiet* (Johansson 1967: 13-15). In *Peoples of Southern Nigeria*, Talbot lists a variety of terms used for specific manilla types, but offers little in what makes them unique, does not include illustrations, and none of his types match Johansson's. Among the types he lists include the *Antony manilla*, *Congo Singolo* or "bottle necked", *Onadoo*, *Finniman Faidfilla*, and *Cula Antony* (Talbot 1927: 875-876).

While any classification of manillas from the Elmina Wreck is imperfect at best due to the lack of comparative collections and the current incomplete understanding of the development of the manilla trade, the assemblage most closely matches Johansson's *popo* type, which is associated with the nineteenth century (Johansson 1967; Semans 2008; Pietruszka 2011: 105). The Elmina Wreck manillas indicate that this type dates significantly earlier, and similar forms on the sixteenth and eighteenth century wrecks illustrate how little the development and evolution of manillas is understood.

Brass Basins

Brass basins were among the first artifact types encountered by divers in the 2003 discovery of the Elmina Shipwreck site (Cook and Spiers 2004: 20). The recovery of five basins from a dense feature of trade goods and cannons provided the first tangible evidence that a historic wreck involved in the West African trade had been located. The fact that a large number were found in stacks as they were stored in the ship's hold was a good indicator that they were associated with the wreck and date to the mid-seventeenth century.

Upon return to the Elmina Shipwreck site in 2005, mapping the stacks of nested basins *in situ* was a key component in the overall goal to create a predisturbance map of the site. Divers recorded 34 stacks of nested brass basins on site, ranging from stacks several meters long to fragmented sections and individual basins scattered on the seafloor. More of this cargo clearly lay buried beneath the sediment and could be detected through probing or hand excavation, making the overall number and variety of brasswares impossible to estimate. Archaeologists attempted to recover samples of each type, though considering the site conditions, limited visibility and extent of buried material, it is unlikely that the collection reflects the complete diversity of brasswares contained in the cargo. A total of 74 basins were recovered from the site, and after initial measurement, processing and photography in the field laboratory, 50 were set aside for transport to the University of West Florida for conservation and further study, and the remainder was redeposited on the site (Figure 6.10). This collection was analyzed as part of a University of West Florida M.A. thesis by Nicole Hamann, one of the crewmembers of the 2005 field season (Hamann 2007).



Figure 6.10 The basin assemblage from the 2005 Elmina Shipwreck Site investigations. Photograph by Nicole Hamann.

Hamann divided the collection of brassware into four distinct types based primarily on form and morphological traits (Figure 6.11). Type 1 is characterized as a medium-sized brass kettle exhibiting two riveted rolled handles, similar in form to Brain's Type B, Variety 2 kettles recovered as part of the mid-eighteenth-century Tunica collection (Hamann 2007: 138-140; Brain 1979: 175). The Elmina Wreck kettles measure 22.34 centimeters to 27.35 centimeters (8 $\frac{3}{4}$ inches to 10 $\frac{3}{4}$ inches) in diameter, and 10.90 centimeters to 12.25 centimeters (4 $\frac{1}{4}$ in to 4 $\frac{3}{4}$ inches) in depth. The terms

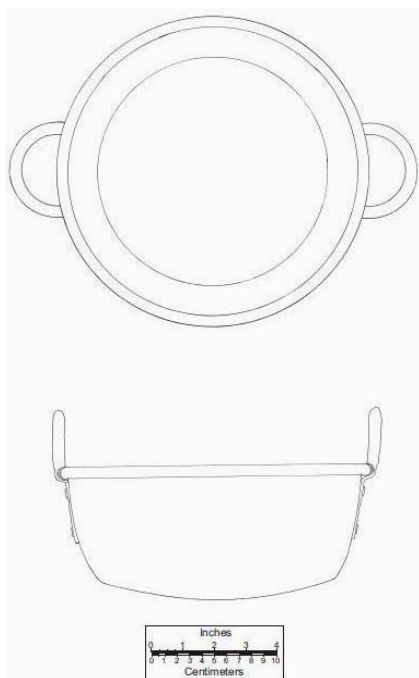
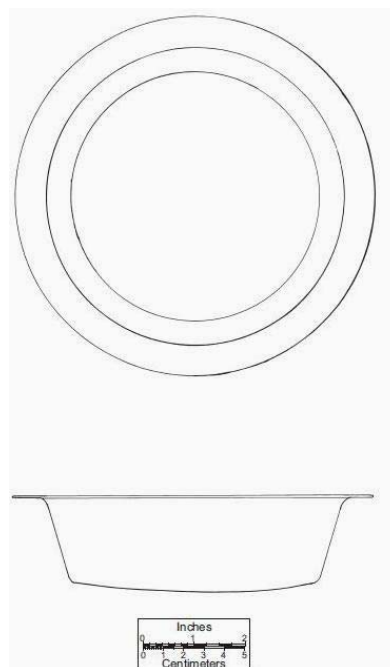
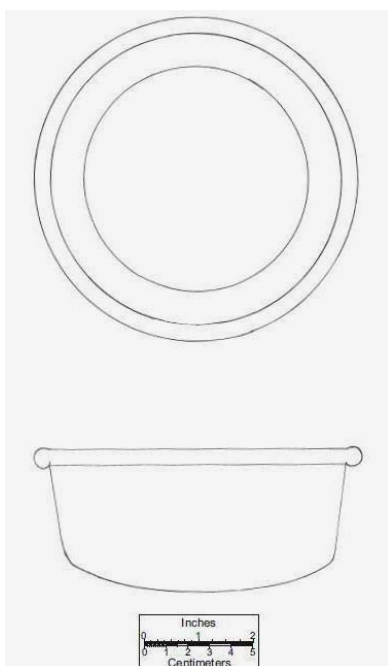
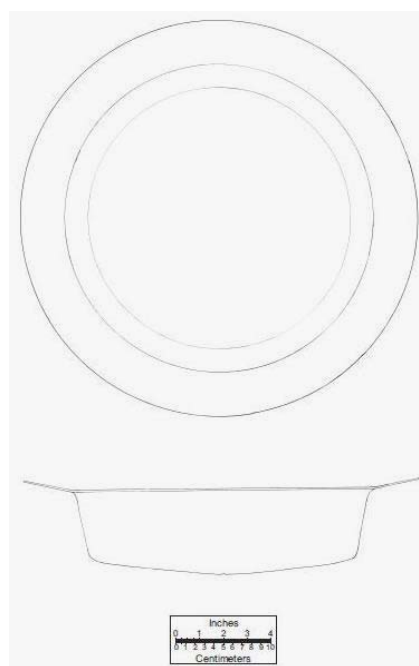
**Type 1****Type 2****Type 3****Type 4**

Figure 6.11 Brass basins recovered from the 2005 Elmina Shipwreck investigations. Drawings by Nicole Hamann.

“kettle” and “cauldron” appear to have been used interchangeably, and were applied to a variety of vessels with or without handles or lids (Alpern 1995: 16).

Hamann’s Type 2 is made up of brass basins with slightly convex sides, flat rims averaging from 13.75 to 19.60 centimeters (5.41-7.72 inches) in diameter and 4.0 centimeters to 4.8 centimeters (1 5/8 to 1 7/8 inches) in depth (Hamann 2007: 140-141). Type 3 wares have rolled rims and straight sides sloping into round bases, and measure 14.95 centimeters (5 5/8 inches) in diameter and 6.8 centimeters (2 3/4 inches) in depth (Hamann 2007: 140-142). Several of these vessels exhibit dents, cuts and other damage that appears to have occurred prior to their transshipment, since they were recovered in a nested stack and the damage varies between individual pieces. Interestingly, De Marees mentions the import of badly cracked and repaired brasswares into West Africa during his tenure as governor at the Castle of Elmina in the seventeenth century (de Marees 1987: 55), and mid-seventeenth century Dutch trade lists from Elmina describe “reject stewpans” *stoofbeckens refuys* and “reject copperware” *coperwercq refuys* being inventoried in the Castle (Jones 1995: 164, 173). Also, the presence of striae or annular grooves is less pronounced on these examples; faint, closely spaced grooves are evident on some of the basins on their interior, and exterior grooves, when present, are spaced wider than the other basin types from the site, and are more irregular. De Marees mentions the popularity of “small rimless cups” for cooking, and that coastal Africans preferred them without handles (de Marees 1987: 52).

Hamann’s Type 4 constitutes the largest brasswares recovered from the Elmina Shipwreck site, averaging 41.87 centimeters (16 1/2 inches) in diameter and 8.5 centimeters (3 3/8 inches) in depth, (Hamann 2007: 143-144; Herbert 1984: 151). These

vessels have been described as shallow dishes with diameters up to 76 centimeters (30 inches) originally exported to the East for tea drying and to Africa for salt evaporation (Day 1973: 169).

Brass basins of various types proved very popular in the West African trade. Sixteenth-century Portuguese contracts for trade goods bound for Elmina noted large-rimmed basins, barbers' basins and brass kettles with handles among the list of goods to be purchased (Herbert 1984: 127). A suggested list of goods for trade at Elmina compiled in the mid-seventeenth century noted a number of types of basins that held great demand on the coast, including small and large neptunes (*nepten*), pans (*taatsen*), brown kettles (*ketels*), barber's basins (*barbier beckens*), and hammered basins (*gedreve akers*) (Jones 1995: 150-182). De Marees wrote in considerable detail regarding the uses of brass basins in coastal Africa during the early seventeenth century, noting that:

... all sorts of basins are brought there, such as small and large Neptunes, Barber's Basins, cooking Basins, *fater*-basins, chased basins, big Scottish pans not less than 2 fathoms in circumference, and small rimless Cups. These Basins they use for various purposes: they use the small Neptunes to store Oil with which they rub themselves; the big Neptunes to immure in Tombs on the graves of the dead, and also to carry something or other in. They use Barber's basins to wash and shave; *Fater*-Basins as lids, to cover other basins, so that no dirt may fall into them; on chased Basins they put their ornaments and trinkets; those big Scottish pans they use for slaughtering a Goat or Pig and cleaning it in, instead of a tub; small rimless cups to cook in; for them, these are quite convenient and they do not want handles on them, like those we use in our Country. Such Brass Basins, which the Ships bring there in large quantities, have become so common in the Country that people often sell brass-ware as cheaply (to the Negroes or their Landsmen) as it is bought in Amsterdam. Although these Basins are brought there in such quantities and are not as perishable a commodity as Linen, one does not see much old brass-ware there; so there must be a huge population in the Interior which uses and employs such quantities of imperishable goods. Furthermore great heaps of Cauldrons are brought there, which they use a lot for fetching water from Wells and Valleys, as well as red copper stewing pots, coated with tin on the inside, which they use to store water, instead of putting a beer Barrel in their house (de Marees 1987: 51-52).

Some of the brass basins recovered from the wreck site exhibit compression marks indicative of the battery process, while others have smooth surfaces with no obvious hammer marks. The battery process began in the mid-seventeenth century, and involved hammering either by hand, or more efficiently by large water-powered wooden hammers, flat circular sheets of brass (the “nap”) into hollow forms or plates. This took place in a series of steps that gradually produced hollow-ware of certain desired specifications. The blows of the hammer would radiate from the center of the vessel to its circumference as the nap revolved, then the vessel would be heated or annealed to prevent cracking. These steps would be repeated, often using different hammer weights separated by a number of annealings. Once the desired size and depth were achieved, the rim was finished, and the vessel was complete (Day 1973: 167-168).

All of the vessels recovered from the Elmina Wreck site have concentric circles on their interior and exterior surfaces to varying degrees, with Type 2 vessels being most noticeable, and Type 3 basins being more obscure. In Hamann’s initial analysis of the brasswares, she posited three potential causes for these circles or “annular grooves”: they may simply be a decorative addition, they may represent finishing techniques employed in an attempt to smooth the surface of battery-produced brassware, or they may be indicative of a manufacturing process known as spinning, in which sheets of brass are forced into a form or chuck while rotating, with various hand tools leaving the circular impressions on the metal’s surface (Hamann 2007: 119; Day 1991: 177; Hull and Murrell 1884: 85; Ward et al. 1995: 237).

Subsequent investigations of the Elmina Shipwreck site in 2007 resulted in the recovery of additional samples of brass basins, though these were limited and did not

significantly expand Hamann's typology. In his analysis of the brasswares, Pietruszka argues that they were the result of the spinning process (Pietruszka 2011: 107-113). Elements of Pietruszka's argument are convincing, particularly the clear use of lathes for turning metalwares dating back to at least Roman times (Pietruszka 2011: 108; Hull and Murrell 1984: 13; Woodbury 1961: 22-23). While it is clear that work remains to be done in understanding the vagaries of brassware manufacture as it applies to archaeological finds, considerable historical information is available in the form of various eighteenth-century technological encyclopedias, such as Diderot's *L'Encyclopédie*. These sources describe and illustrate the battery process of manufacturing brass basins in detail, however any description of the spinning process is conspicuously absent. Pietruszka postulates that the technique of spun metalwares waned after its invention in the Roman period, and then surfaced again in Germany in the sixteenth century. Kept under tight secrecy, this technology remained a German monopoly until its diffusion to England in the nineteenth century (Pietruszka 2011: 113; Day 1991: 177). The process of spinning pewterwares was expressly banned by pewter-makers guilds in London in the mid fifteenth century in order to standardize manufacturing techniques, which implies that spinning was known at this time as a means of forming pewter objects (Hull and Murrell 1984: 15).

In an effort to gain additional insight into the manufacture of the Elmina Shipwreck site brass basins, samples of each type as defined by Hamann were xrayed at the University of West Florida's conservation laboratory. In the resulting digital radiographs, a regular pattern of impressions circulating around the center bottom of the vessels and continuing up their sides was apparent (Figures 6.12 and 6.13). These

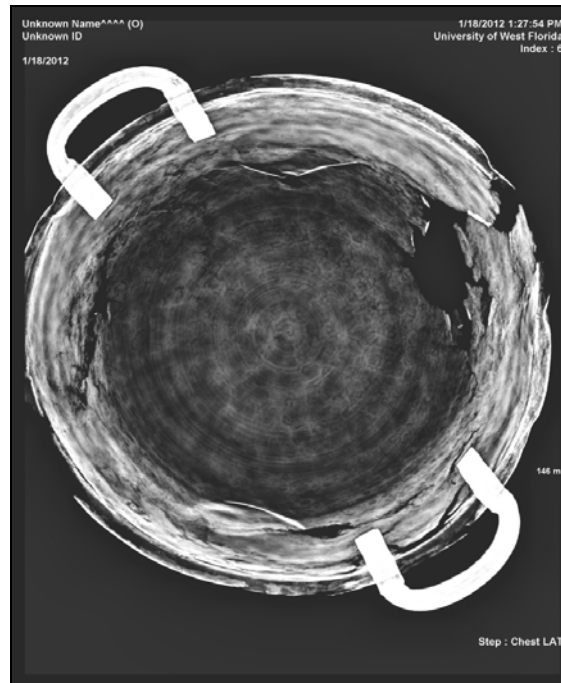


Figure 6.12 Radiograph of Type 1 brass basin recovered in 2005. Note hammer marks on bottom and sides of vessel. Image courtesy of the University of West Florida Archaeological Conservation Laboratory.

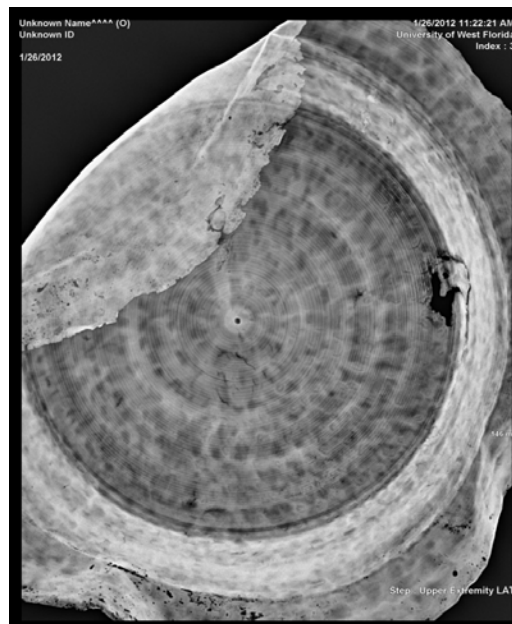


Figure 6.13 Radiograph of Type 4 brass basin recovered in 2005. Note hammer marks radiating outwards from the vessel's center. Image courtesy of the University of West Florida Archaeological Conservation Laboratory.

impressions are consistent with the hammering, or battery process in the manufacture of the basins.

Similar battery-produced brasswares with grooves apparently applied as finishing marks have been found in the archaeological record. At the mid-seventeenth-century Grimsby cemetery site in Ontario, Canada, European trade goods found in the context of Native American burials included multiple brass kettles produced by the battery method. The author notes that in some vessels the hammer blows are "...largely obliterated by a subsequent smoothing process which left parallel and horizontal striae on both the interior and exterior surfaces of the vessel" (Kenyon 1982: 218). Brain's *Tunica Treasure* has examples of 18th century brass basins made by the "battery method" that clearly show the parallel rings seen on the Elmina examples (Brain 1979: 166-167). Brain writes, "In this process, circular brass disks were beaten into kettle shapes by machine; next, irregularities were smoothed out by pounding; finally, the rough kettles were mounted on a lathe to be smoothed and polished" (Brain 1979: 166).

As part of the Quetico-Superior Underwater Research Project, divers in the 1960s and 1970s recovered artifacts from the fur trade beneath the waters of the Horsetail rapids on the Granite River, which was once part of the Grand Portage trade route on the border between Minnesota and Ontario. Along with flintlock muskets, axe heads, lead shot, iron files and other trade goods that became lost when canoes overset in the rapids, they found nested stacks of basins in several locations (Wheeler et al. 1975: 7). One graduated stack of 17 brass kettles is described as battery-ware likely dating to 1785-1820. They exhibited "a series of spiral marks about 5mm apart on the interior" that the authors attributed to a finishing process in which the hammered brass vessels were turned on a

lathe for polishing and inscribing of grooves by a finishing tool (Wheeler et al 1975: 57-58). A history of the brass industry produced by the Bridgeport Brass Company includes an image of a “machine for finishing brass kettles and other vessels”, which scored parallel horizontal lines in brass hollow-ware as a finishing technique (Bridgeport Brass Company 1920: 14).

Finally, a group of bowls and incense burners from collections at the British Museum produced between the fourteenth and sixteenth centuries was analyzed for information regarding their manufacture and decoration. Known as “Veneto-Saracenic” metalwork, these items display a mixture of Middle Eastern and European elements in their style and technique, and are strikingly beautiful examples of inlay and decorative motifs that serve as a contrast to utilitarian vessels such as the Elmina Wreck brasswares. Interestingly, their manufacture method is very similar, evidently composed of hammering followed by lathe-finishing. The turning left “a lathe-centering pip and concentric marks inside many of the vessels, which might be taken as signs of spinning, but hammer marks remain visible on the majority of bowls from all groups.” This distinctive pattern is apparent as the metalworker turned the bowl on the finishing lathe (Ward et al. 1995: 237).

The brass basins recovered from the Elmina Shipwreck site are indicative of a similar process. Initially shaped by hammer blows as part of the battery process, the vessels were subsequently finished by being turned on lathes where workers using hand tools smoothed the vessels’ surfaces, and applied the concentric grooves or striae to obscure the hammered surfaces of the brass.

Pewter

Archaeologists recovered 19 examples of pewter ware from two locations on the site (Figure 6.14). As in the case of the beads, the large amount of pewter noted, and its presence within nested stacks indicates its likely association with the wreck and therefore dates to the mid-seventeenth century. Analysis of these artifacts indicated two specific types within the pewter assemblage, and these comprised part of UWF Anthropology graduate student Nicole Hamann's M.A. thesis on basins recovered from the Elmina wreck (Hamann 2007). Hamann's analysis of the pewterwares from the Elmina Wreck site are also discussed in Pietruszka (2011: 98-101).



Figure 6.14 University of West Florida student Nicole Hamann analyzing pewterware from the Elmina Shipwreck site. Photograph by G. Cook.

Eighteen identical pewter basins found nested together constitute Hamann's "Type 5", and these represent a medium sized dish characterized by a plain rim and a rounded base with a boss or raised well (Figure 6.15). The dishes measure 28.61 centimeters (11.26 inches) maximum overall diameter, with a well diameter of 23.17 centimeters (9.33 inches), 2.80 centimeters (1.10 inches) wide rims, and depths of 4.95 centimeters (1.95 inches). The dishes average 1,014.10 grams (35.77 ounces) in weight (Hamann 2007: 131).

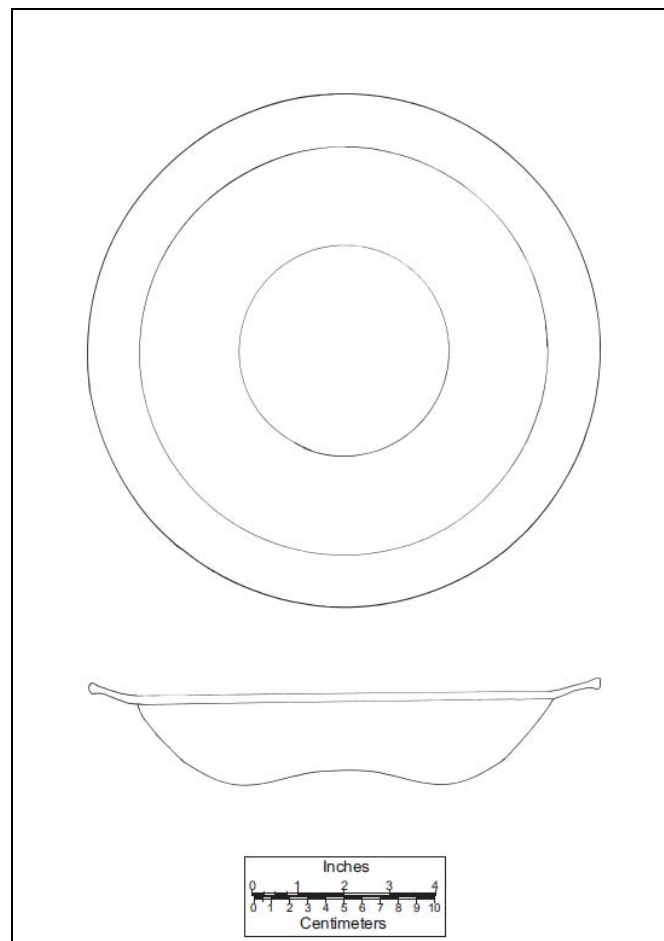


Figure 6.15 Hamann's Type 5 pewter dish from the 2005 Elmina Shipwreck investigations. Drawing by Nicole Hamann.

A single larger pewter basin, designated “Type 6” in Hamann’s study, was found by divers at the foot of a basin stack in the central area of the site, between datums #0 and #4 on the northern end of the wreck (Figure 6.16). Overall diameter of this basin measures 33 centimeters (12.99 inches), with a 27.05 centimeters (10.65 inches) well diameter, 8 centimeters (3.15 inches) depth, and a rim width of 2.84 centimeters (1.12 inches), and it weighs 1,275.80 grams (45 ounces) (Hamann 2007: 131).

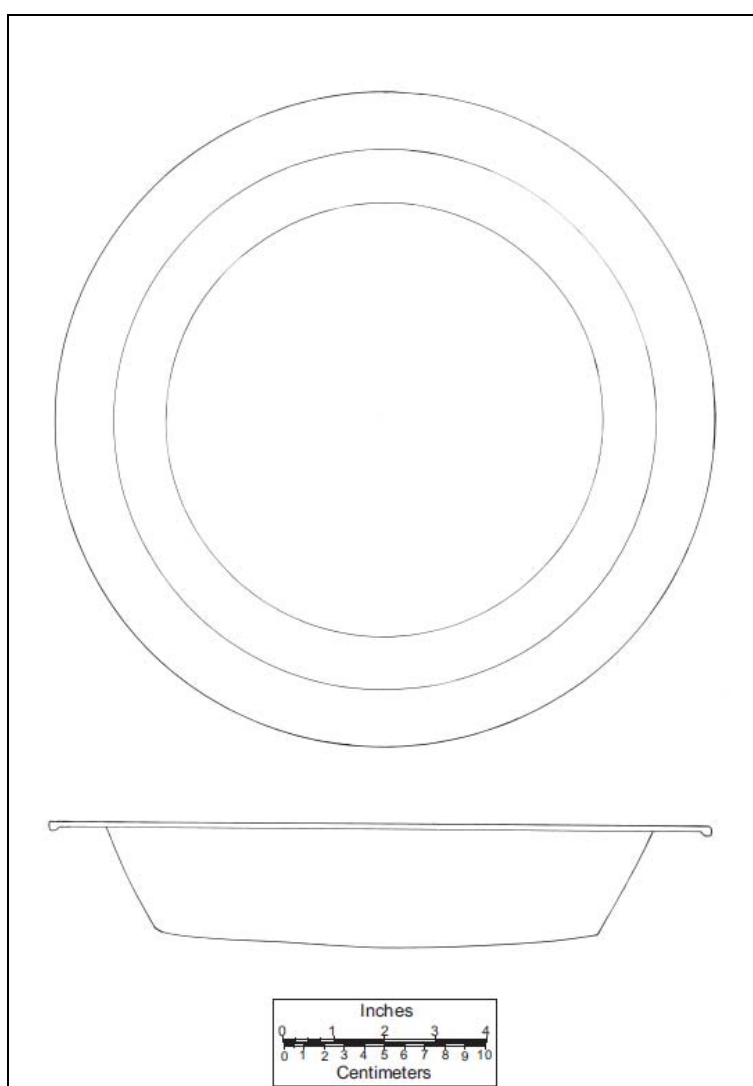


Figure 6.16 Hamann’s Type 6 pewter dish from the 2005 Elmina Shipwreck investigations. Drawing by Nicole Hamann.

All of the pewter recovered from the Elmina wreck bears a mark showing a crowned Tudor rose with the initials “B” and “H” in the crown (Figure 6.17). Research on this mark, and on the general style of the pewter basins found on the site, was conducted with the goals of determining likely origin of manufacture and a potential date for the pewter. Sources are nearly universal in regarding the mark found on the Elmina pewter as continental in origin (Hamann 2007: 157-158). Howard Cotterell states in his *National Types of Old Pewter* “...we will take the mark of the Tudor Rose and Crown, and I lay it down as an incontrovertible fact that, where initials appear either in the crown, or on the head of the rose, such pieces are either of Belgian, Dutch, French, German or Swiss origin” (Cotterell et al. 1972: 4). Initials inserted in the base of the crown are generally considered a characteristic of Dutch marks in particular (Barkin 1987: 16; Brett 1983: 235; Cotterell 1929: 48; 1972: 49; Hornsby 1983: 74). Though initially the Tudor rose marked English pewter, the symbol was widely utilized by Dutch pewterers to compete with the flood of imports from England. The mark began to be used in the Netherlands as early as the 1520s, and was nearly universal by 1550. The addition of a crown to the Tudor rose is mentioned in documents by the 1590s (Dubbe 1978: 454).

Attempts to determine the specific manufacturer using the crowned rose with a “B” and “H” mark have been unsuccessful. Most records of Dutch pewterer guild marks have been lost, and accurate attribution of marks to specific makers is very tenuous except in rare cases where names are provided in full. This is due to several reasons, including: the widespread use of patronymics in the sixteenth and seventeenth centuries;



Figure 6.17 Crowned tudor rose maker's mark on pewterware from the 2005 Elmina Shipwreck investigations. Note the initials "B" and "H" within the crown above the rose. Photograph by Nicole Hamann.

the fact that the first initial may not have been that of the master's official name; initials often embodied shortened forms of names; and the fact that a single pewterer may have owned up to ten different punches (Dubbe 1978: 470). Also, there simply is not a large amount of historic utilitarian pewter remaining for comparative analysis. The survival rate of pewter tended to be low compared to more highly valued items made from silver or gold. Pewter was not a luxury item for most owners, thus it was not likely to be cared for or hoarded as more valuable items were. It could easily be recycled, so damaged pieces could be melted down and recast for minimal costs. Unlike gold, pewter oxidizes and can ultimately disintegrate over time (Barkin 1987: 9). So, though the Elmina pewter

ware seems likely to be of Dutch origin, any further avenues of research based on the touch mark exhibited on the basins have so far been unproductive.

The style of the pewter vessels is also consistent with a probable seventeenth century Dutch origin. Stylistically the basins can be considered a dish or deep dish. More plates, dishes, chargers and saucers were made than any other category of pewter, and they are collectively known as flatware or sadware (Brett 1983: 47; Hornsby 1983: 124). Unfortunately, the boundaries between types of sadware were often not clearly defined. Assessments of production ranges are also contradictory in some cases. Some sources claim that deep-bowled plates did not appear until well into the eighteenth century, and they were more common among British and American manufacturers than European (Hornsby 1983:126-128). In contrast, Brett (1983: 37) states that the raised boss in the center of the dishes, as seen on the Elmina Wreck examples, occurred in English pewter until about 1670, and on continental pewter until 1720. He further suggests that typical mid-seventeenth century plates and dishes had broad rims with plain borders, unlike the narrow-rimmed examples from the Elmina wreck (Brett 1983: 48). The lack of hammer marks around the bouge (the curved transition between the rim and the well of a plate or dish) likely implies a continental origin (Cotterell 1972: 5).

A final source of information relates to documented archaeological sites with similar material. The late seventeenth-century slave ship *Henrietta Marie* carried a considerable amount of pewter in its cargo, including basins measuring slightly larger than the Elmina Wreck pewterware (Moore and Malcom 2008: 31). Another similar dish, described as a “large basin” with a raised boss and comparable in size to the Elmina dishes, is shown among the pewter recovered from the Dutch frigate *Utrecht* which sank

off the coast of Brazil in 1648 (Barkin 1987: 25, 71), while a nearly identical specimen with a crowned rose mark was found on the Dutch VOC ship *Batavia*, lost in 1629 (Green 1989: 155; Pietruszka 2011: 101). Similar pewter wares classified as deep dishes were also found at the seventeenth-century site of São Julião da Barra at the mouth of the Tagus River in Portugal (Castro 2000: 10). Hence, despite the assessment of some sources, it is apparent that the pewter wares found in stacks as they were shipped on the Elmina Shipwreck site should be considered consistent with the seventeenth-century date of the wreck.

According to de Marees' account of trade on the coast, pewter was not a popular trade item in the early seventeenth century; he notes that "they use Pewter articles, such as Pewter Bracelets, but not in great quantities" (de Marees 1987: 53). By the mid-seventeenth century, however, they are considered an important trade item in the expanding variety of goods that vessels carried in their cargo holds for the West African trade. The list of proposed trade goods compiled at Elmina Castle in 1653 noted that 6000 lbs of "assorted pewter basins" was considered a good amount for a trading voyage (Jones 1995: 176). Tilleman included pewter "plates, bowls, canisters and other things" in his list of proposed trade goods at the end of the seventeenth century (Tilleman 1994: 91), and they are also included in Dapper (1676) and Barbot (1992) as noted by Pietruszka (2011: 120).

Brass Straight Pins

Although they were never noted in the field due to poor visibility, small finds such as beads, charcoal, bones, etc. were discovered in the laboratory either within

concretions or inside of vessels/containers. Among these were 17 straight pins made of a copper alloy material, likely brass found in the concretion formed between basins recovered during the 2005 season (Figure 6.18). The pins are still sharp on one end, and the other is characterized by a small wire wrapped around its head. They average 5.28 centimeters (2.08 inches) in length and .11 centimeters (.04 inches) in diameter. Heads are .32 centimeters (.13 inches) in diameter, .22 centimeters (.09 inches) wide, and each wrap .1 centimeters (.04 inches) wide in gauge. The concretions also yielded a variety of glass beads, seeds and other organics (Hamann 2007: 113).

Although medieval pins were typically made of iron, brass pins with solid or hollow cast heads have been found dating to the sixteenth century, and by the beginning of the 1600s the head was composed of a piece of wire wrapped around the shank (Noel Hume 1980: 254). The manufacture of brass pins was labor-intensive. The brass wire forming the pin would be cut into the desired length, then one end would be filed to a point. A shorter, thinner piece of wire would be wrapped around the head end, and then this would be secured with a blow from a treadle-operated stamp. By the eighteenth century, this wrapped head design was replaced by a simple flat head (Hall 1996: 198). Brass straight pins remained relatively expensive until the early nineteenth century, when pins stamped with solid heads became common (Brain 1979: 189).



Figure 6.18 Brass pins recovered from the Elmina Wreck in 2005. Photograph courtesy of the University of West Florida Conservation Laboratory.

Numerous archaeological sites have produced similar pins dating to as early as the fifteenth century, though most wrapped pins date to the seventeenth and eighteenth centuries (Caple 1991: 242-245). Comparable examples have been recovered from excavations at the Elmina settlement (DeCorse 2001). Wrapped pins interpreted as trade goods have been found at Jamestown (Cotter and Hudson 1957: 189) and Fort Michilimackinac (Stone 1974: 162). Nearly 16,000 small pins were found in the cargo hold of *La Belle*, the French exploratory ship that sank in Matagorda Bay in 1686 (Bruseh and Turner 2005: 88). Other wrecks containing brass pins include the *Sea Venture* that sank in 1609 off of Bermuda (Wingood 1986: 154), the *Lastrager*, a Dutch *fluyt* lost off Western Australia in 1656 (Green 1977), a mid-seventeenth-century shipwreck off Cornwall (McBride and Davis 1972: 137), and the Beaufort Inlet Wreck

that sank in the early eighteenth century off North Carolina (Lusardi 2000: 64-65). Straight pins had obvious utility in the West African trade; de Marees specifically mentions their modification as fish hooks (de Marees 1987: 53). Based on the wrapped head design, seen in multiple seventeenth-century archaeological contexts, it is possible that the pins are associated with the Elmina Shipwreck site.

Concretions

A number of iron concretions were recovered from the Elmina Shipwreck site, and were analyzed upon return to the University of West Florida conservation laboratory. Analysis typically included x-rays of the objects to determine if any iron remained inside the concretion, and casting or recording of voids in the case of hollow concretions. This lead to additional insights into some of the iron objects included on the ship. It should be kept in mind that subsequent work by Pietruszka in 2007, discussed below, noted a mass of concreted material underneath sediments which likely represents intact portions of the ship's cargo. There is likely potential for the discovery of substantial cargo elements which either aided in the formation of the concreted mass in the case of iron objects, or which may be preserved within the concretion as has been seen with other non-ferrous artifacts such as beads, brass pins, etc. Further work might elucidate the degree to which such material is preserved on the wreck site.

Iron Bar Stock

After cleaning and processing in the conservation laboratory, one identifiable concretion consisted of a square void subsequently cast and determined likely to represent iron bar stock being imported into the West African market. The cast measures

3 centimeters (1 ¼ inches) x 3.5 centimeters (1 3/8 inches), and is an incomplete section measuring 5 centimeters (2 inches) in length.

Iron bars of comparable dimensions have been recovered from the slave ship *Henrietta Marie* (DeCorse 2001: 125; Moore and Malcom 2008: 33; Shaughnessy 1995: 61). Scholars have argued convincingly that by the end of the sixteenth century and throughout the seventeenth century, iron imports actually surpassed copperwares in volume (Goucher 1981: 179-189; Herbert 1984: 135). Dimensions and weights varied over time: some bars approached six meters (20 feet) in length, shipped en masse for African metal smiths to cut into smaller sections for working, and weights varied from 5 to 29 kilograms (11 to 64 lbs) (Alpern 1995: 12). These would have been brought in great amounts for the West African trade; in 1680 a single English ship carried 32,000 bars to Cape Coast Castle (Donnan 1965: 262). The Dutch West India Company slave ships *Oinera* and *Clara*, sailing in the second decade of the eighteenth century, carried iron bars which were traded for nearly 20 percent of their total slave cargo (Postma 1990: 104).

Knives

Knives of numerous types were sent into the West African trade by the millions. Types included large, small, “best, ordinary, old, bread knives, table knives, trade knives, negro knives, cleavers, slope-pointed, inlaid, burnt-haft, sailer’s, bosuns’ or boatsmen’s” knives, and could be transported in chests, cases, barrels, often sold by the dozen (Alpern 1995: 16-17). De Marees noted that on the Gold Coast “They take many knives, which we make in our lands, of the type we call *Dock-messen*” (de Marees 1987: 53). Trade

lists dating to the mid seventeenth century from Elmina note that “boatswain’s and other knives” (*bootsmans als andre messen*), “long knives” (*lange messen*), and “burnt-haft knives” (*gebrande messen*), were popular trade items (Jones 1995: 142). The Royal African Company sent nearly 1.5 million knives to West Africa, between 1673-1704, with a peak export of 218,544 in 1698 (Davies 1999: 356). In 1662 an English vessel brought in nearly 25,000 knives to Cormantin in a single voyage (Makepeace 1991: 120). Flemish knives were often mentioned, likely designating a particular type as well as origin in Holland. Alpern notes that the blades were presumably of iron or steel, though this is rarely mentioned (Alpern 1995: 17).

The knives from the Elmina wreck come in the form of concretions, and nothing remains of their blades or handles other than the voids within the concretions that were cast as part of the conservation process at the University of West Florida Archaeological Conservation laboratory. They were either composed entirely of iron with no wooden or bone handles, or these organic elements decomposed prior to the formation of concretion around the blades.

Faunal Remains

The faunal remains found on the Elmina Shipwreck site were recovered in the center of the site, and were analyzed by zooarchaeologist Cathy Parker at the University of West Florida. All recovered samples are from the family bovidae, or the cattle family. The family bovidea includes domestic cattle and the Water Buffalo. There are at least two separate animals represented in the faunal collection; one bone represents a juvenile and all the other bones are from full grown, but young adult (possibly from the same animal

since the size of the bones would fit such a scenario). The adult bones had epiphyses that were not fused or partial fused. Of the 16 bones excavated, two are identified as right femurs, two are ribs, one is a pelvis, two are lumbar vertebra, two are cervical vertebra, one is a left humerus, one is an indeterminate vertebra, two are indeterminate caudal epiphyses, and three fragments are indeterminate. Most of the bones show evidence of cutting, fracturing and/or saw marks as would be expected during the butchering process, and similar examples have been recovered from terrestrial excavations at Elmina (DeCorse 2001: 114). The faunal remains were recovered adjacent to concreted barrel hoops, however it is still unclear if they are associated with the site.

Cowries

A total of 32 cowrie shells were recovered from the site, either in the sediment matrix itself, inside of containers, or conglomerated with iron or bead concretions (Figure 6.19). All examples recovered from the Elmina Wreck in 2005 are identified as *Cypraea moneta*, or the traditional “money cowrie” indigenous to the Indian Ocean and Pacific (Lorenz and Hubert 1993: 205).⁴¹ These cowrie shells were imported by the billions into the West African market for use as currency, one advantage being that they could not be counterfeited since no similar shells exist in West Africa (Johansson 1967: 34). While small items such as cowries could easily be transported by currents and surge, their

⁴¹ During the 2007 excavation, Pietruszka recovered 145 samples, and his analysis indicated that 95% of these were *Cypraea moneta*, with four *Cypraea annulus*, two *Trona stercoraria*, and one *Zonaria zonaria* represented in the collection. *T. stercoraria* and *Z. zonaria* are indigenous to Ghana and thus are not likely associated with the wreck. *C. annulus* was imported as currency beginning in the mid-nineteenth century; Pietruszka attributes their presence on the Elmina Wreck as evidence of unintended collection with *C. moneta*, since their geographical ranges can overlap (Lorenz and Hubert 1993: 204-205; Pietruszka 2011: 115-116).

numbers and context within concretions suggest that they are likely associated with the Elmina Wreck.

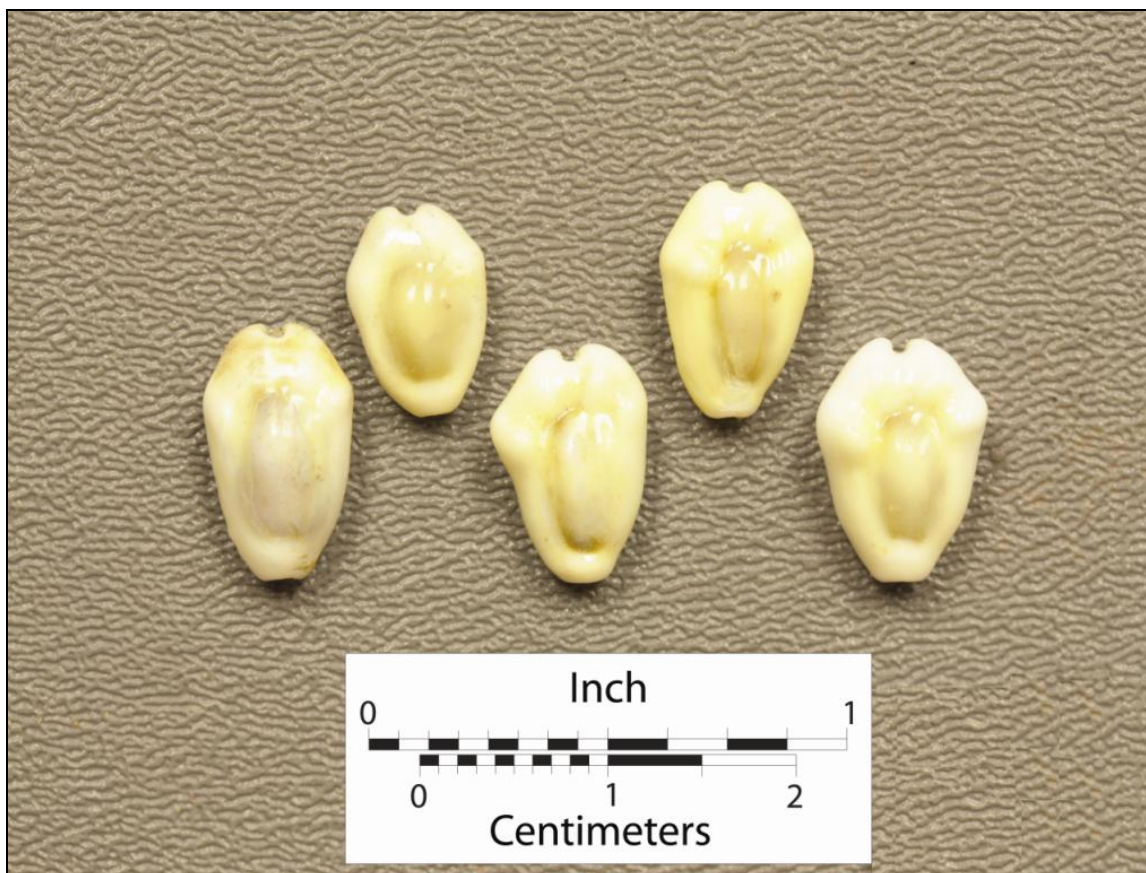


Figure 6.19 *Cypraea moneta*, or “money cowries” recovered from the Elmina Wreck site in 2005. Photograph courtesy of the University of West Florida Conservation Laboratory.

Cannon

Iron cannon were noted upon the initial discovery of the site in 2003, and a total of five were plotted and recorded by divers during the 2005 investigations.⁴² The guns are heavily concreted, and substantial efforts were made to remove concretion from one

⁴² A sixth cannon, smaller in size to the five described here, was discovered in 2007 when more of the northern extent of the site was exposed (Pietruszka 2011: 96).

of the guns underwater to allow more precise measurements of the piece, as well as possibly determining if any markings are extant on the gun. These efforts proved more or less futile—the concretion is just too thick, and without the use of pneumatic tools (our attempts were limited to hammers and chisels), or the recovery of a gun for proper cleaning and preservation in a conservation laboratory, only a limited amount of information was possible from their study *in situ*. It was even impossible to determine accurately whether the guns' trunnions lay along the centerline of the pieces or were off-center, which could be an indication of manufacture or date. Future work and possible recovery of some of the cannon could shed light on these factors and provide a greater understanding of this critical artifact class.

The guns were numbered from 1 through 5, and are indicated on the 2005 site plan (Figure 5.19). Data acquired related primarily to their overall length (from muzzle to cascabel), and their dimension from base ring to muzzle, which historically was the more commonly-noted dimension (Lavery 1987: 96). Measurements for each gun are noted below in Table 6.6. Due to the extent of concretion, actual dimensions could be several centimeters smaller than the indicated measurements.

Table 6.6 Measurements of Cannon Recorded during the 2005 Elmina Shipwreck Investigations.

<u>Gun #</u>	<u>Overall Length</u>	<u>Base Ring to Muzzle</u>	<u>Maximum Diameter</u>
1	2.87m / 9ft 3in	2.60m / 8ft 6in	.55m / 1ft 9 1/2in
2	2.90m / 9ft 6in	2.58m / 8ft 5in	.59m / 1ft 11in
3	2.86m / 9ft 4in	2.47m / 8ft 1in	.63m / 2ft 3/4in
4	2.93m / 9ft 8in	2.64m / 8 ft 8in	.54m / 1ft 9in
5	2.96m / 9ft 8 1/2in	2.59m / 8ft 6in	.62m / 2ft 1/2in

While few definitive conclusions can be made regarding the guns on the Elmina Wreck without raising them and removing their concretion, some inferences can be made based on their disposition and orientation. In 2003 divers noted that the guns lay on top of cargo: in fact, what initially appeared to be links of chain lying under cannon #1 turned out, after closer inspection, to be a concentration of brass manilas. Further investigations in 2005 bore this initial observation out, and divers noted the presence of basins, pewter ware, and other cultural material lying under the guns as they were being measured and studied. Thus it is likely that these weapons were part of the ship's complement of cannon, rather than being transported in the hold for use on land. The orientation of the guns provides another clue, as most of them lie with their muzzles pointing outward toward the site extents. As has been noted on other sites when cannon were placed in the hold of ships for transport, rather than being used on the gun deck of a vessel, they typically rest on the bottom of the ship or on ballast, and are often oriented parallel to the ship's midline, as seen on the 1686 ship *La Belle*, for example (Bruseth and Turner 2005: 92-93).

The size of the guns unfortunately give little clear indication as to their caliber or the weight of shot they could have fired. While guns used for land fortifications tended to be proportioned relative to the weight of ball they fired, the length of naval guns tended to vary considerably relative to its poundage. Captain Thomas Lawson of the Royal Artillery noted this relative to eighteenth-century guns, writing that "In the land service, the different natures have a fixed proportion assigned to them, but here, guns carrying the same ball are frequently cast of various lengths, in order to accommodate the rate of the ship designed for, and the local situation on board. From the necessity of this

variety in the lengths of ships' guns, very few of them are properly proportioned to the magnitude of their shots..."(Lavery 1987: 96). This can partially be explained by the fact that, on a wooden ship with flammable materials such as cordage, rigging and sail cloth in close proximity to gun muzzles, a certain length was required to allow the muzzle flash to project far enough away from the ship's side to minimize the chance of the vessel catching on fire. Naval guns therefore tended to have exaggerated lengths in relation to their calibers or poundage compared to pieces designed to fire on land. This had its limits, however: guns approaching 3.4 meters (11 feet) in length increased the likelihood of their impacting masts, hatches, capstans or other fittings along the centerline of a ship when they recoiled after firing. Due to these concerns, guns rated at 6 pounds or higher tended to approach the 2.7-3 meter (9-10 feet) length for naval use, but only the largest ships would likely have guns with greater lengths than this (Lavery 1987: 96).

Discussion

A total of 267 objects make up the artifact assemblage from the 2003 and 2005 seasons, not counting the thousands of glass trade beads. Items considered diagnostic, or most likely to indicate the vessel's origin or date, were brought back to the University of West Florida for conservation. Other materials were redeposited on site due to the costs of transport and conservation treatments. While this provides an accurate count of artifacts recovered, in reality the numbers of objects extend into the thousands. A single bead concretion, for example, might contain hundreds of individual beads within the concretion, and nearly every intact bottle or ceramic vessel contained beads, pins, cowries or other small items. The concretion formed between nested basins proved to

contain hundreds of small items as well, which were only discovered during the conservation process.

As noted, further work on the artifacts recovered, historical research, and particularly AMS dates undertaken in later work resolved some of the ambiguities related to the vessel's date. Horling's work in 2009 also delved considerably deeper into the site formation processes in the region. However, following the 2005 project researchers were left puzzling over the date of the site. Initial signs of the site's complexity related to the variety of materials recovered by archaeologists in the 2003 and 2005 investigations, and which comprise the principal data for this dissertation. As artifacts were recovered, it soon became apparent that the finds represented a dramatic chronological span that essentially covered a period spanning initial European contact to the present. If one of the benefits of archaeological shipwreck research involved their time capsule-like quality and the potential of tight temporal contexts and concrete national identities, as stated at the beginning of this dissertation, the initial results were not terribly promising. It was apparent that a significant degree of disturbance existed on the site, and while several potential explanations exist that may account for this, at this stage of the research it remained unclear what was causing it.

Initial attempts to come to terms with the vessel's date led to the chart shown in Figure 6.20. Diagnostic ceramics and glassware are shown, and the proposed date ranges for the pewter dishes and brass basins, pins and manilas are also indicated. Admittedly the sample size for artifacts was small, and one must keep in mind that artifacts recovered from the 2003 and 2005 seasons consisted of a surface collection and material from

shallow excavations. Regardless, taking the data as a whole, an attempt was made to come to determine the likely date or range of dates for the Elmina Wreck.

Possibilities for these date ranges based on the preliminary 2003 and 2005 data are provided in Figure 6.21. While the manufacturing ranges of some artifact types date to the earliest period of European contact on the coast, the greatest alignment of dates appears to occur in the nineteenth century, with fewer correlations as one goes back in time toward 1500. Of the 33 separate chronological indicators shown in the chart, there is a clear cluster of alignment in the mid-nineteenth century. Specifically, the highest number of correlations in the chart occurs in 1875 with 26 out of 33 (79%), and a date of 1850 produces 25 matches (76%). For comparison, two arbitrary dates, 1750 and 1650 are plotted, with 14 (42%) and 10 (30%) correlation rates respectively.

Based solely on this chronological data, there would be a good argument that the Elmina Wreck could represent a nineteenth century vessel. Historically this is clearly a possibility: seaborne trade in the region continued until well into the twentieth century (DeCorse 2001: 145), and in fact expanded significantly in the late nineteenth and early twentieth centuries as commodities such as palm oil, gum and ivory grew in demand due to the industrial revolution (Hopkins 1973: 120; Lynn 1997: 3). Despite advances in pilot books and navigational developments during this period, there are documented accounts of vessels lost on the Gold Coast in the nineteenth century. In 1804 the *Earl St. Vincent* was “totally lost off the Gold Coast of Africa” (Inikori 1996: 71), and a schooner from the Netherlands named *Axim* was lost on the Gold Coast in 1857 (ADM 1-1-16: 36-37). As with most documented accounts of specific wrecks, these losses were not necessarily

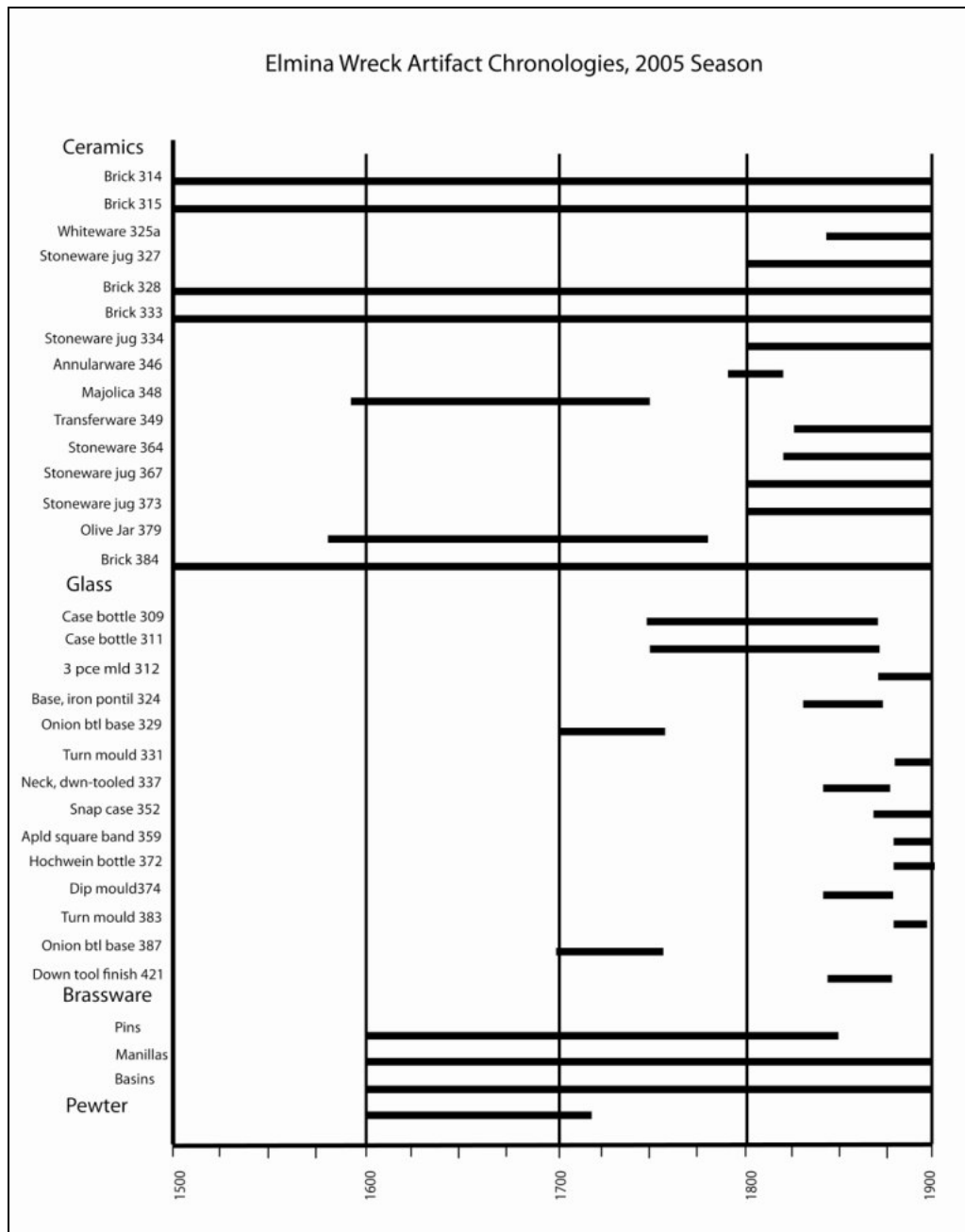


Figure 6.20: Chronological Chart Showing Diagnostic Artifacts Recovered from the Elmina Wreck in the 2003 and 2005 Field Seasons.

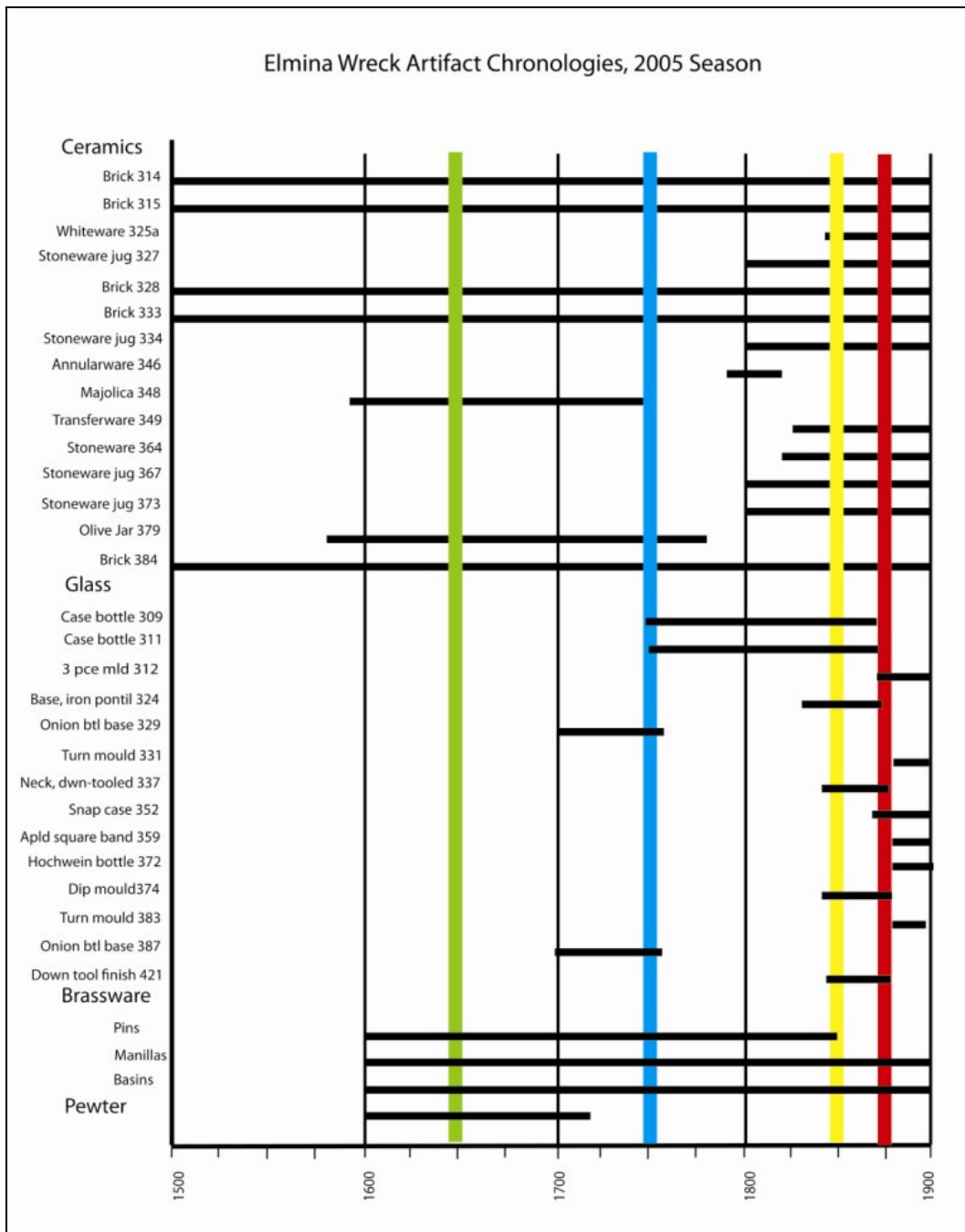


Figure 6.21: Chronological Chart with Showing Intersections Between Artifact Classes for 1875 (red), 1850 (yellow), 1750 (blue) and 1650 (green), for the Assemblage Recovered from the 2003 and 2005 Field Seasons.

off Elmina, but they verify that ship losses were known this late in the maritime trade of the region.

If this initial hypothesis places the site in the 1850-1875 range, then where did the earlier materials recovered from the wreck come from? After decades of nautical archaeological research on shipwreck sites, the formation of submerged archaeological sites has been a key interest to a number of scholars (Muckelroy 1978; Bowens 2009; Murphy 1990; Parker 1981; Tomalin et al. 2000). The conventional notion of site formation processes starts with the wrecking event itself, the initial loss of buoyant materials as the vessel settles on the bottom, followed by a slow degradation of the exposed hull and collapse of superstructure. Often the vessel sinks deeper into the seafloor, becoming buried, with non-floatable cargo/ballast exposed and hull preserved below the ballast pile (Throckmorton 1970: 20-27). In time the site potentially reaches stabilization unless further disturbed by natural forces such as storms or human interference, which could include fishing, dredging or salvage activities (Bowens 2009: 29). Put another way, a shipwreck can be conceptualized as the event in which a highly organized assemblage of material culture (the vessel itself) is transformed into a “static and disorganized state with long-term stability” (Muckelroy 1978: 157; Gould 2000: 86). This is admittedly a simplistic model of site formation processes, but it provides a starting point for a discussion of intrusive material on the Elmina Wreck.

Following the typical events of shipwreck site formation, my initial hypothesis was that the heaviest and/or earliest material would most likely be associated with the vessel. Newer, intrusive artifacts can be explained by the fact that, once the ship structure is deposited on the seafloor, this creates an obstruction that can then capture or

entrap loose material moving in currents or waves. Whether an object is prone to movement in a high energy environment (such as glass bottles) or not (such as cannon) should also figure into which items were originally associated with the site or not.⁴³

The phenomenon of newer material being found on older wreck sites has been noted frequently. Nineteenth-century bottles, including ginger beer containers, have been found in association with the hull timbers of the Beaufort Inlet wreck, which is believed to be the remains of *Queen Anne's Revenge* that sank off of Okracoke Inlet in 1718 (Lusardi 2000: 65). During investigations of the *Nuestra Señora Rosario y Santiago Apostol*, a Spanish frigate wrecked in Pensacola Bay in 1705, archaeologists excavated two intact bottles with manufacturing dates no earlier than 1720 (Bratten: personal communication). Along with the expansive collection of early seventeenth century porcelain recovered from the VOC ship *Witte Leeuw*, divers recovered a surprising assemblage of late eighteenth century dinner service and tea porcelain as well (Spruyt-Ledeboer 1982: 250). Finally, for a more amusing example, archaeologists studying the remains of *Manuela*, an iron-hulled steamship scuttled at the entrance to San Juan Harbor, Puerto Rico in 1898 during the Spanish-American War, found the site covered with underwear, doll heads and plastic toys dating to the 1970s (James et al. 2003: 51).

Following this hypothesis, items securely dated to earlier periods should be considered to be part of the original wreck assemblage. These would include the pewter basins (1600-1730), the brass basins (1600-1900), the olive jar (1700-1750), the majolica drug jar or “albarello” (1580-1750) and the two onion bottle bases (1700-1760). An early

⁴³ Pietruszka and Horlings, after conducting more intensive surface collection and systematic excavation in 2007, discovered that the degree of intrusive mixing of artifacts extends completely through the site's stratigraphy. This prompted Pietruszka to examine the issue of *in situ* vs. intrusive artifacts in greater detail (Pietruszka 2011: 127-165).

eighteenth century date would place the Elmina Wreck securely within the manufacturing ranges for this material, and if only non-mobile items are considered (i.e. the nested stacks of pewter and brass basins), this could extend into the seventeenth century. If this is true, however, then where did the artifacts clustering in the nineteenth century come from? While some of the artifacts dating to this later period are fragmentary and worn, which corresponds with the idea that they rolled along the seafloor until getting caught up in the Elmina Wreck remains, a significant number of objects appear to be in pristine shape. In fact, several of the nineteenth-century glass bottles and Nassau stoneware bottles were found with corks intact, and much of this later material is preserved with very little damage or evidence of wear. The intact nature of much of the nineteenth-century artifacts seems contradictory to the notion that these items were discarded and found their way over a kilometer offshore through wave action and surge to the Elmina Wreck, where they were entrapped in exposed cargo and hull structure.

Analysis of the artifact assemblage from the 2003 and 2005 field seasons led to several possible hypotheses relating to the date of the Elmina Wreck, none of which seemed to completely explain the assemblage. These hypotheses are outlined below.

Hypothesis A): The wreck site is associated with the oldest reliably-dated artifacts.

While there are clearly artifact types with manufacturing ranges covering the entire 500 year span indicated in the chart, the most likely cluster of dates would include the pewter and brass basins, manilas, pins, basins, onion bottles, olive jar and majolica drug jar, producing a date range of 1700-1725 (Figure 6.22). As noted above, if only non-mobile items are considered, such as the nested stacks of pewter and brass basins and concreted

masses of manilas, a seventeenth century date is possible. Problems with this hypothesis include the high numbers and intact nature of many later artifacts that are presumably discards and intrusive to the site. One potential explanatory factor relating to the later material is the fact that the wreck is in an area likely frequented by other vessels either trading with the port or at anchor, and the inevitable dropping overboard of goods either accidentally or through disposal behavior could introduce significant amounts of intrusive material to the site. A mid-seventeenth century trade account lists costs for goods classified as fallen overboard (*overboort gevallen*), providing an indication that this did indeed occur on occasion (Jones 1995: 135). Still, the relatively pristine nature of some of the material interpreted as intrusive remains problematic.

Hypothesis B): The preponderance of nineteenth-century material in the artifact assemblage suggests that the site dates to this period, with most evidence lining up for a date range from 1850-1875. If this is so, the presence of outlier artifacts with manufacturing dates ranging considerably earlier than the mid-late nineteenth century is problematic, especially as much of this earlier material clearly appears to be *in situ*, and associated with the wreck (e.g. the stacks of brass and pewter basins). While there have

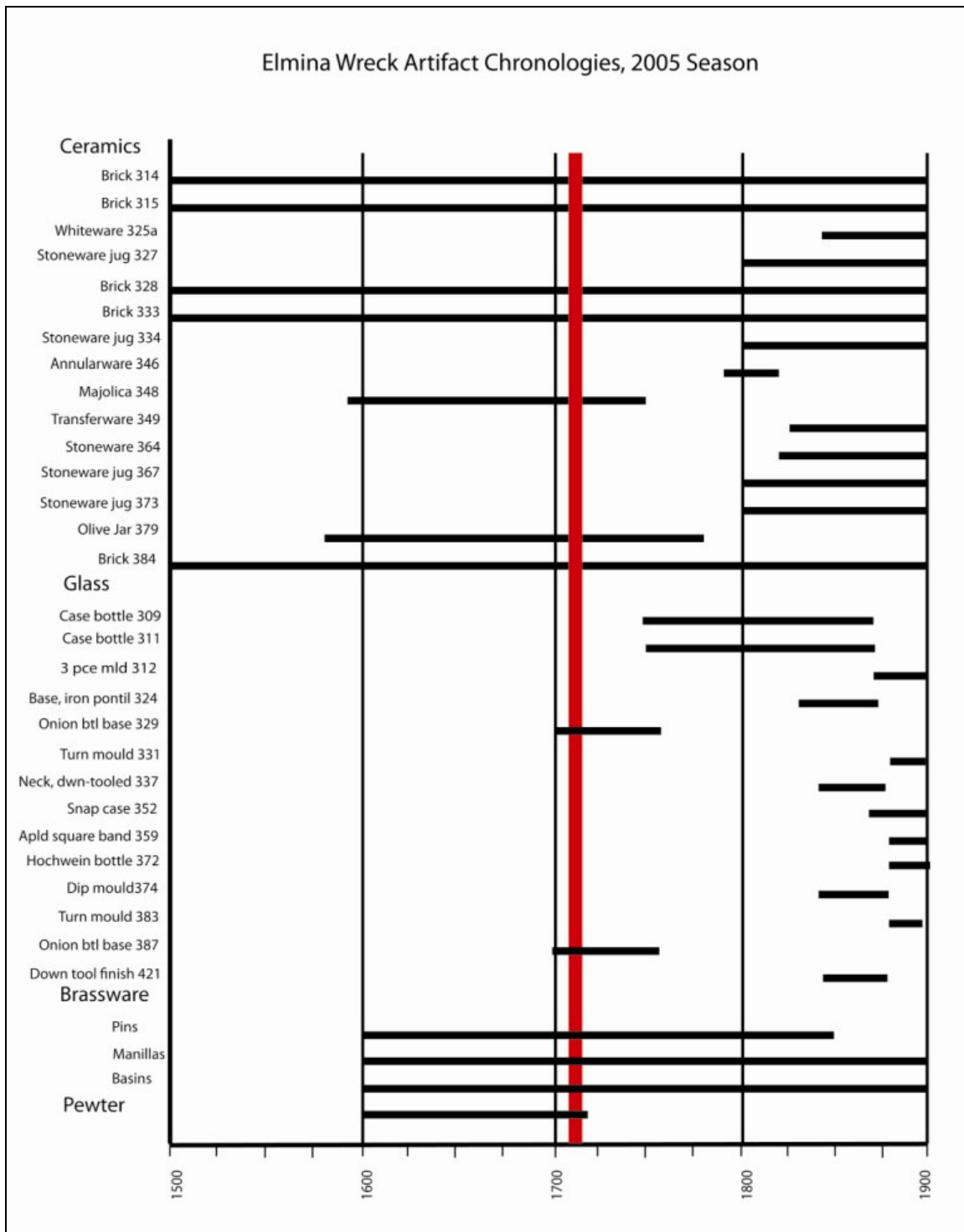


Figure 6.22 Chronological Chart Showing the Best Intersection of Dates in Hypothesis A.

been occasions where archaeologists have discovered artifacts significantly older than the main deposit, these tend to be more rare than finding intrusive material that dates after the primary site. A coin identified as a *blanca* dating between 1471 and 1474 was found in the stern of the Emanuel Point shipwreck, the first vessel discovered from the 1559 Spanish colonization fleet of don Tristán de Luna y Arellano. This disparity of over eighty years is considerable, even considering the extended circulation of these coins in fifteenth-century Spain. Researchers considered that the coin may have been a keepsake, or may have been lost in the vessel early in its career and continued with the ship until its sinking in Pensacola Bay (Smith et al. 1998: 117-118). An even more striking example is a Roman denarius found in the excavation of *La Belle*, an exploratory French vessel that sank in Matagorda Bay, Texas in 1686. Dating to A.D. 69, the coin was a common denomination throughout the central and western Mediterranean. Archaeologists assume that it came from a Roman ruin in France and was carried along by a crewmember for good luck (Bruseth and Turner 2005: 110).

In both of these examples, the anomalous artifacts were few in number and were interpreted as being associated with the primary site, and their presence was ascribed to the vagaries of human behavior. This is a very different context than we see on the Elmina Wreck, in which there are considerable numbers and varieties of pre-nineteenth-century artifacts. While some of these may be intrusive, other items such as the nested stacks of pewter basins must be interpreted as original cargo associated with the wreck. Their presence needs to be explained in some other fashion.

One potential explanation relating to Hypothesis B that should be considered is the documented practice of transporting older or used items for the West African trade

(DeCorse 2001: 145). Old or pre-used textiles were popular items of trade, and included bedclothes, table linens, carpets, and apparently worn sheets were particularly popular (Alpern 1995: 11). In 1659 an English ship brought over 20,000 used sheets to the Gold Coast (Makepeace 1991: 32). Used knives also apparently found a place in the West African market, and West India Company trade accounts from Elmina dating to the mid-seventeenth century list reject stewpans (*stoofbeckens refuys*) and reject copperware (*copperwercq refuys*) as well (Alpern 1995: 16; Jones 1995: 164). The damage seen in some of the Elmina Wreck brass basins suggests that they had been heavily used or discarded prior to the wrecking event; at least five individual basins show signs of repair and/or patching, and apparently were shipped this way from Europe (Hamann 2007: 255, 259, 261, 265, 270). These repairs to the basins may reflect to a larger degree the “reject copperware” noted above as manufacturing defects, however, rather than archaic items of considerable age being sent to the West African market. Regardless, the utilitarian nature that made used items such as these marketable in West Africa did not likely extend to artifacts such as the pewter ware and glass bottles seen on the Elmina Wreck, and there is no documentary evidence that old pewter or glassware was routinely sent to West Africa as trade items. While such items were likely curated for extended use in West Africa, it is unlikely that they would have been sent in large amounts in matching stacks in a cargo originating in Europe. When discussing this as a possibility, the Principal Investigator of the Central Region Project recalled seeing gin case bottles dating to the nineteenth century or earlier being used as containers in a market in Sierra Leone, but they were of different styles and likely a result of local curation processes (DeCorse: personal communication).

Hypothesis C): A third hypothesis brought forth is the possibility that there are multiple shipwrecks dating to various periods in the vicinity, and that the Elmina Wreck assemblage contains elements from these other sites. This again infers that the primary wreck site is likely represented by the stacked pewter basins, cannons and other older material, and has ‘collected’ material over time from nearby, more recent, sites. This may help explain the intact and pristine nature of some of the more recent materials; if they came from a nearby wreck, they would not have traveled as far before becoming entangled in the Elmina site.

Areas of multiple ship sinkings have been documented before: sometimes navigational hazards such as rock outcrops or partially submerged obstacles can create threats to vessels known as “ship traps”, causing shipwrecks in concentrated areas (Throckmorton 1964: 51-61). These are generally geographical or geological features, as opposed to anchorages (Gould 2000: 83). Still, the possibility of multiple ships sinking while anchored in the roadstead of Elmina is a potential explanatory factor in the Elmina Wreck assemblage. Unfortunately, there are no other apparent sites in the immediate area of the Elmina Wreck site based on the 2005 and 2009 remote sensing data, though this is not conclusive proof that buried sites, exposed upon occasion, might contribute to the wreck’s assemblage.

Horlings offered several possible explanations for the preponderance of intrusive material present on the Elmina Wreck based on her 2009 coring data and overall analysis of the site formation processes in the region. She presented eight scenarios where intrusive material could be introduced into the wreck site, including: random events of

items falling out of boats and/or canoes; jettisoning events; canoes capsizing; items dropped as off-loaded from large trading vessels; a shiptrap scenario, or presence of other wrecks in the area; multiple wrecking events near the Elmina Wreck site; spoil from dredging activities in the Benya lagoon; and loose/ambient material (Horlings 2011: 272). She concluded that “none of these arguments can prove or disprove what the source(s) of intrusive materials are, but they are all factors that need to be considered, and, as noted earlier, it is likely that a range of factors has contributed” (Horlings 2011: 275).

Summary

When only considering data from the 2003 and 2005 field seasons, none of the above hypotheses can be considered a definitive explanation for the material assemblage recovered without certain reservations. As Horlings points out, numerous potential mechanisms and sources must be considered in order to explain the high number of intrusive materials on the site. The Elmina Wreck represents the pristine archaeological remains of a trading vessel that has remained undisturbed by modern salvage or looting, with exposed cannon, stacks of nested basins, casks of manillas and other trade goods in their original stowage contexts as trade cargo. However, there are clearly mixed contexts in terms of the artifact assemblage preserved on the site, with date ranges spanning the entire contact period. Faced with these incongruities, I held the conviction that a clear determination of the ship’s date, nationality and intended cargo would only be possible with further fieldwork. Fortunately, additional research was conducted by two colleagues in the Syracuse University Anthropology Department, Andrew Pietruszka and Rachel Horlings. Their findings augmented work done in 2003 and 2005, expanding our

understanding of the likely origin and date of the Elmina Wreck. These data, including additional artifactual material and radiometric analyses, suggested that the wreck likely dates to the mid-seventeenth century, and led to a tentative identification of the ship as a Dutch West India Company vessel documented as sinking off of Elmina after arriving to the coast in 1647. This additional fieldwork is discussed in greater detail in the following chapter.

CHAPTER 7: NEW DISCOVERIES

Return to the Elmina Wreck Site

New discoveries and answers to some of the questions regarding the Elmina Wreck were resolved by additional research. Further work was carried out in 2007 by Pietruszka and Horlings, followed by additional survey and site formation processes investigations by Horlings in 2009 (Pietruszka 2011; Horlings 2011). These additional seasons of fieldwork led to the uncovering of new information related to the vessel's origin and date, as well as a fuller understanding of site formation processes in the region. These data along with Dutch archival records and AMS dates suggested that the Elmina Wreck is the *Groeningen*, a Dutch West India Company vessel that sank in front of Elmina Castle in 1647. This chapter evaluates the data from the 2003 survey and 2005 diving investigations in light of all the data recovered thus far.

Both Pietruszka's and Horlings' research was also conducted as part of the Central Region Project. In 2007 Pietruszka directed further diving operations on the sonar anomalies detected in 2003, and returned to the Elmina Wreck for more intensive surface collection and excavation when no additional sites were discovered. He also recorded the remains of an early eighteenth-century vessel discovered through commercial dredging activities in the Benya Lagoon north of Elmina Castle, and utilized these data for his dissertation.

Pietruszka's excavations on the Elmina Wreck site resulted in a significant addition to the overall artifact assemblage recovered from the site, and the majority of his finds were in buried contexts up to approximately 40 centimeters (15 ¾ inches) in depth (Horlings 2011: 107). The analysis of these artifacts reinforced our perceptions of the

disturbed nature of the site, with evidence of modern intrusive material extending to the deepest levels of excavation. This led to a critical evaluation regarding which objects were associated with the original wrecking event, with the assumption that large, immovable objects were most likely associated with the wreck, and any smaller, lighter objects should be considered intrusive (Pietruszka 2011: 95). Exceptions to this general theory include beads, cowrie shells and brass pins that were found in large numbers and are contained in concretions on the site, and thus are likely also associated with the wreck.

Along with serving as a field director for terrestrial field schools in the Central Region conducted by Syracuse University in 2007, Horlings assisted Pietruszka and initiated her own work on site formation processes during the 2007 season. In 2009, Horlings returned to Ghana for additional survey and diver investigations of the area. For her dissertation, Horlings focused on site formation processes related to submerged sites on Ghana's coast, and she attempted to apply her findings from micro to macro scales in the region, spanning historical and environmental contexts. Her methodologies included remote sensing survey and microsampling of sites, and applying multiscale perspectives in the interpretation of this data. Horlings' overall goal is to examine West African shipwreck sites to determine the processes that impact them and to better understand the questions that can be asked from the data and what can be learned from it (Horlings 2011: 101; Gould 2000: 1-2).

In addition to this fieldwork, archival research and radiometric dating of wood samples recovered by Horlings was conducted which provided further insight into the origins and date of the Elmina Wreck site. This new information allowed for the ship to

be dated to the mid-seventeenth century, and also raised the possibility that the wreck is the Dutch West India Company ship *Groeningen*, whose loss is recorded in documents dating to 1647. A more detailed description of each of these aspects of research is included below, followed by a discussion regarding overall findings and our current understanding of the wreck site and its tentative identification as the *Groeningen*.

Archaeological Fieldwork

2007 Season

Pietruszka's and Horlings' 2007 fieldwork was supported by a National Science Foundation Major Research Instrumentation Grant awarded to Christopher DeCorse for maritime archaeology in Ghana's Central Region (MRI 0521121). With these funds, an 8.5 meter (28 feet) inflatable Zodiac Hurricane was purchased for the project, along with SCUBA tanks and an air compressor to fill tanks. The primary goals for the 2007 season involved investigating additional sonar targets recorded during the 2003 survey, investigating other wreck sites if they were identified, further study of the Elmina Wreck if other sites were not found, as well as initial attempts to study site formation processes.

Armed with the 2003 survey data, a priority for the 2007 field season was to conduct further investigations of sonar anomalies that may represent historic wreck sites. If further wrecks were identified, these would be prioritized for excavation. Pietruszka, Horlings and I conducted independent analyses of the 2003 side-scan sonar data, ranking sonar anomalies on a scale of one to five. Not surprisingly, there was some degree of variation regarding which anomalies were considered priorities for investigation.⁴⁴ In an

⁴⁴ Although side-scan sonar has proven an excellent tool for underwater remote sensing survey, interpretation of data remains a qualitative, rather than quantitative process (Fish and Carr 1990: 81). Intact

effort to simplify the identification process and focus on what each investigator deemed to be the highest priority targets, Pietruszka and Horlings decided to prioritize their 2007 fieldwork on targets falling within the top two tiers of each investigator's rankings. This methodology insured that no individual's analysis outweighed another, and provided confidence that after three independent analyses, the most promising targets were not overlooked and could be prioritized for diver investigation (Pietruszka 2011: 86; Horlings 2011: 104).

Pietruszka directed diving operations from July to October, 2007, assisted by Horlings and several volunteers. Initially dives were conducted from the Zodiac, though engine problems frequently required the hiring of local watercraft, and eventually the research was conducted solely from local dugout canoes (Horlings 2011: 105; Pietruszka 2011: 86-87). Diver investigations were conducted using surface-supplied air from a hookah system as in 2005, but with the addition of SCUBA backup for an additional safety margin. Diving methodology involved navigating to a target location using a handheld global positioning system and dropping a weighted surface marker buoy on the location for diver reference. Divers then deployed and descended on the buoy line to perform circle searches by attaching a guide line to the buoy weight, and swimming circles around this central point. Once a full 360° circle was completed, the diver extended the guide line and swam additional circles until the target area was sufficiently covered. Unfortunately, despite investigating 50 targets designated as high priority by at

hulls, especially those made of iron or steel, often generate sonar records that allow accurate identification of wreck sites, while wooden wrecks, with less elevation above the seafloor, generally produce more subtle signatures. Often any anomaly that appears distinct from the natural bottom is considered for diver groundtruthing, and the priority for investigation can vary significantly between analysts based on their perceptions of the data and the parameters used for identifying sites.

least one of the investigators, no additional wreck sites were located (DeCorse et al. 2010: 88-89; Pietruszka 2011: 86; Horlings 2011: 106).

As the Elmina Wreck remained the only verified site, Pietruszka and Horlings returned to the wreck to assess and record any changes to the site, conduct a systematic surface collection, and attempt more substantial excavations (Pietruszka 2011: 87). Upon relocating the site, divers found striking changes in the bottom composition, specifically a buildup of sediment on the southern portion of the site and scouring in the northern extent. Large stacks of basins on the southern perimeter recorded in 2005 were now buried, and new materials on the northern extents were exposed, notably an additional cannon and an anchor. With the advantage of an extended fieldwork period provided by the support of the NSF grant, Pietruszka initiated a more intensive examination of the site than was possible in the 2005 field season. Divers established a grid on the site using two perpendicular baselines as a reference, and conducted a systematic surface collection over the entire site, recovering any surface artifacts and mapping them relative to 1 x 1 meter (3.28 feet) grid squares (Pietruszka 2011: 87-88).

Pietruszka followed the surface collection with controlled excavation on the site. Using these two methodologies, he hoped to be able to evaluate different sampling strategies, identify biases in each strategy, and determine how these biases affect archaeological interpretation of wreck sites. His alternative goal was to add to our collection of artifacts from the Elmina Wreck in order to determine with greater accuracy the temporal and cultural parameters of the wreck (Pietruszka 2011: 88). Although Pietruszka originally planned on excavating trenches spanning the site along both perpendicular baselines, time and budgetary constraints combined with difficult diving

conditions resulted in completion of a single 22 meter (72 feet) trench along the baseline and a 5 meter (16.5 feet) trench extending to the eastern portion of the site (Figure 7.1). As discussed below, coring data undertaken by Horlings indicates that the wreck was substantially larger than estimated after the 2005 investigations.

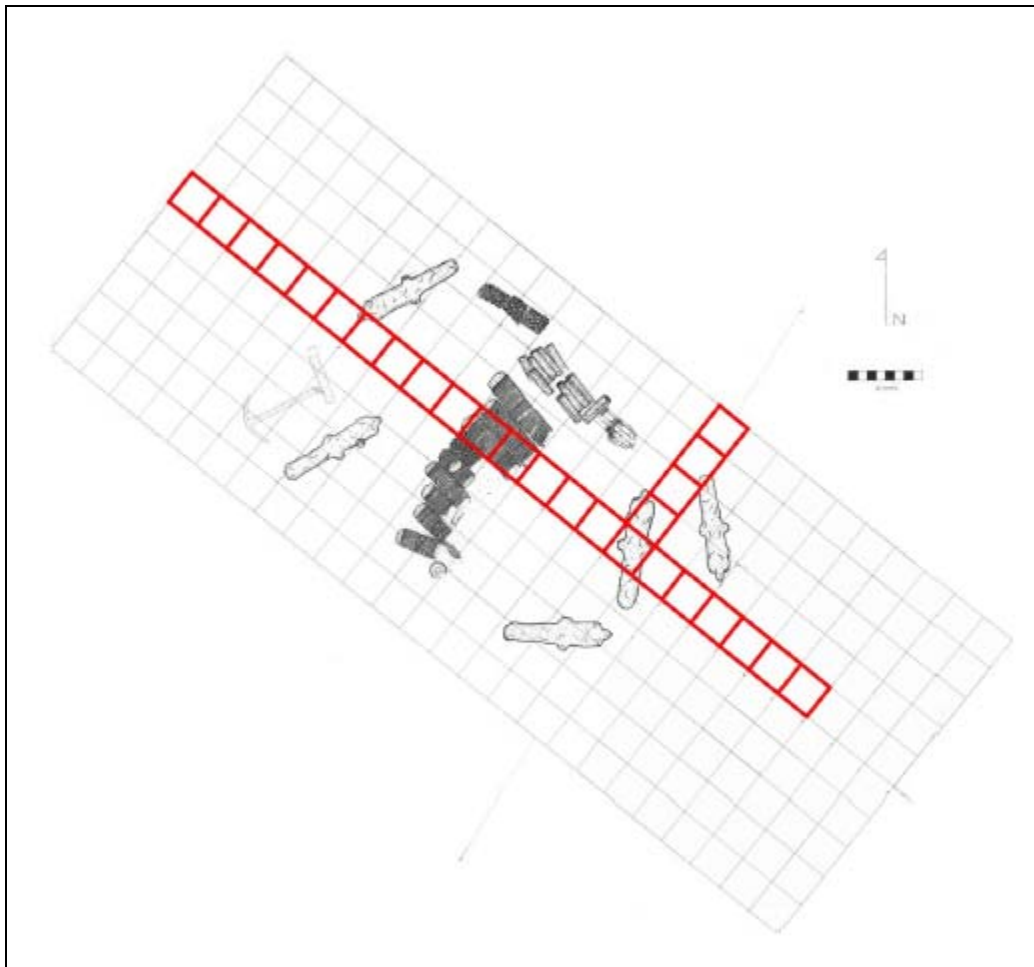


Figure 7.1 Modified version of Cook's 2005 site plan with additional finds and corrections made from the 2007 and 2009 seasons. Units outlined in red indicate trenches excavated in 2007 (Map by R. Horlings).

Divers excavated by hand and used spades, cooking pots and metal cups to remove sediments from the grid squares. Excavation grids used an adjustable frame constructed from iron rebar, and excavation was carried out in arbitrary stratigraphic levels. Essentially, divers filled a 30 gallon barrel with as much material as they could during a dive, and this was considered a level. After lifting the barrel to the surface, its contents were sorted and screened. Provenience of excavated artifacts was recorded with regards to unit and level. Using this methodology, Pietruszka and his crew excavated 26 units and recovered over 1000 artifacts (Pietruszka 2011: 92).

The findings from the 2007 field season supplemented data recovered previously, and provided new insights into the artifact assemblage of the Elmina Wreck. Additional items recovered include an intact martavan jar (storage jar made in southeast Asia or China), pewter bottle caps, lead bale seals, a brass fish hook and a pipe bowl (Pietruszka 2011: 137-163).

The additional excavation revealed that most of the wrecksite is covered by no more than 30-40 centimeters (12-15 ½ inches) of sediment, below which divers encountered a solid mass of concretion in nearly all of the excavation units (Horlings 2011: 107). Though not investigated extensively, the concretion likely resulted from corroding iron objects carried in the vessel's cargo hold. Ferrous concretions of iron corrosion products made of calcium carbonate and debris typically form around iron objects in salt water, and can spread across the site, embedding other material until the whole deposit is sealed by a concrete-like layer (Cronyn 1990: 181; North 1987: 207-208). The deepest units were located toward the ends of the excavation trenches,

suggesting that this represented the site limits and there was less hull structure or cargo material in these areas. It was noted that a considerable degree of disturbance indicated by the intermixture of historic artifacts and modern debris characterized the excavations regardless of depth (Horlings 2011: 112).

Along with the excavations supervised by Pietruszka, coring activities directed by Horlings provided additional information relating to the shipwreck site and site formation processes in the wider survey area. Horling's research design for the 2007 season involved exploring the site formation processes of wreck sites in Ghana, and developing methodologies to study them. Fieldwork consisted of diver investigation of potential shipwreck targets noted in Cook's 2003 survey data, developing micro-sampling techniques using sediment cores, conducting experimental archaeology relating to site formation processes, and monitoring a modern shipwreck on a beach near Elmina (Horlings 2011: 104). Her research was guided by five central questions: 1) How did the vessels wreck and was it possible to investigate those causes in this environment? 2) What are the basic site formation processes that have affected the sites since the wrecking event? 3) What is left of them and how do we find them? 4) What questions can the extant remains help to inform about historical cultural processes in the region? 5) What is the best way to investigate and study submerged cultural resources in the region? (Horlings 2011: 103).

Using a modified, diver-operated coring device, Horlings collected 32 sediment cores on and adjacent to the wreck (Figure 7.2). Although she attempted to core the central portion of the site, the mass of concretion made this impossible. Cores were successfully conducted along the perimeter and outskirts of the wreck site, however, and

Horlings' work indicates that the extent of the wreck site is at least 10-15 meters (33-49 feet) larger than the surface scatter indicates. Horlings was also able to recover wood samples in the cores, which evidently derive from buried hull structure (Horlings 2011: 114). These wood samples provided mid-seventeenth century radiometric dates that led to crucial evidence as to the date of the vessel (this is described in more detail below).

In order to accumulate more data related to site formation processes in the area, Horlings recovered sediment core samples from two different control areas, designated C1 and C2. The locations for these control areas were chosen based on their distance from any known sites and their depths, with C1 being deeper than the Elmina Wreck site, and C2 being shallower and closer to shore. Horlings also conducted experiments with two partial mock-ups of shipwreck models, consisting of wooden bulkheads with a variety of cultural materials placed inside, positioned on the seafloor and weighted down with stone. Horlings' intention was to monitor these shipwreck models and note any degradation or changes to the sites. The dynamic conditions of the area essentially dismantled the experiments after a short interval on the seafloor, however. Divers returned to the model deployed at C1 after three days and found that the wood and most of the artifacts had disappeared. After two weeks, the model at C2 was missing entirely. A final experiment, involving the monitoring of a modern wreck outside off the Benya lagoon, provided some insights into the breakup of vessels in the surf zone (Horlings 2011: 117-118).

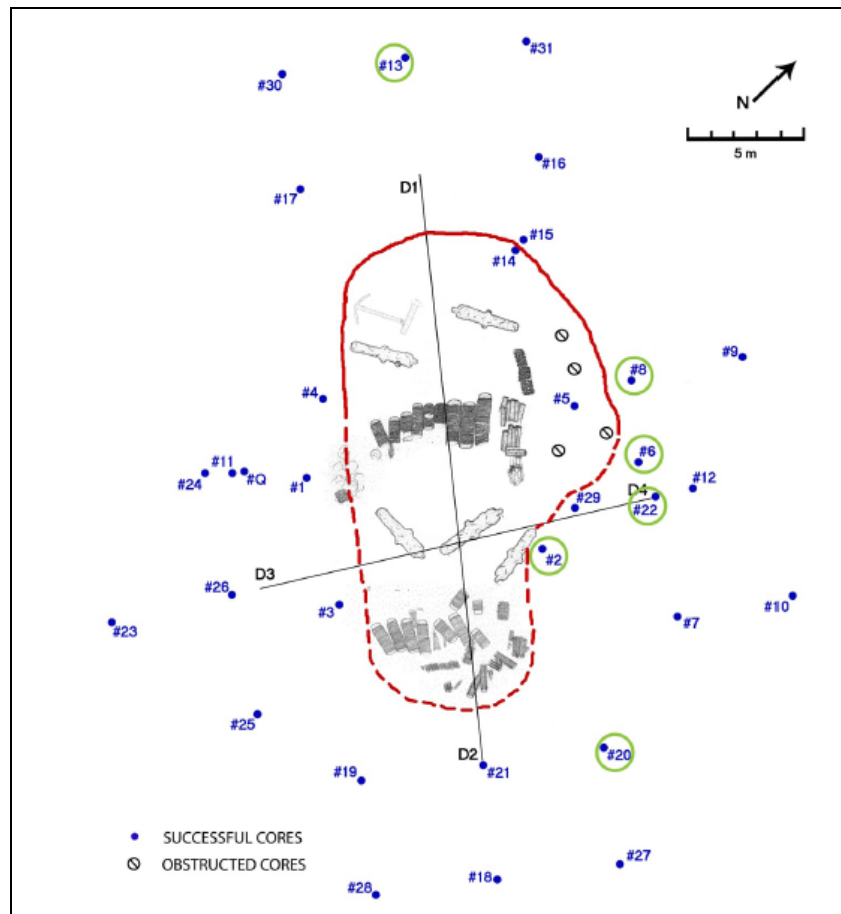


Figure 7.2 Plot of sediment cores taken on and adjacent to the Elmina Wreck site. Red lines indicate approximate extents of concreted material covering the site as indicated by excavation and coring. Map by R. Horlings.

2009 Season

Horlings returned to Ghana in 2009 for six weeks to direct further fieldwork including additional remote sensing survey and diver investigation. The four goals of the 2009 season included: 1) re-survey of Cook's 2003 survey area to create a comparative data set, and to successfully utilize magnetometer and echo-sounder in the region; 2) Investigate targets identified in the new data; 3) Monitor the Elmina Wreck site and build on baseline data recovered in 2003, 2005 and 2007; 4) Continue to investigate formation

processes to explain the lack of any new sites discovered during the 2007 season (Horlings 2011: 121).

The remote sensing tools at Horlings' disposal for the 2009 survey included a Marine Magnetics Explorer magnetometer, and a Knudsen side-scan sonar/ echo sounder combination. Though originally Horlings intended to use multiple remote sensing devices concurrently for the entire survey, complications arose such that the side-scan and echo sounder could not be used together, and neither the echo sounder nor the magnetometer data could be georeferenced with the global positioning system (Horlings 2011: 128). Regardless, Horlings was able to add significantly to the baseline remote sensing data of the area. She not only re-surveyed Cook's 2003 project area, but also covered previously unsurveyed areas as well, and accomplished six days of survey with the side-scan sonar, ten days with the magnetometer, and a single day with the echosounder.

In addition to the remote sensing, Horlings also directed diving operations on 16 targets, including previously uninvestigated targets from 2003, new anomalies detected during her 2009 survey, and dives on the Elmina Wreck site. Using circle search techniques similar to searches conducted in 2003 and 2007, Horlings and her crew conducted circle searches on suspected anomaly locations. These investigations led to the discovery of an anchor set in the seafloor located approximately 400 meters (1,312 feet) ESE from Elmina Castle, and an 18 meter (59 feet) length of iron chain located 10 kilometers (6 miles) west of the Castle. In addition, she also reinvestigated a site that revealed two vertical anchors approximately 2.5 kilometers (1.5 miles) south of Elmina Castle. This site had been identified in the 2007 project but not recognized as historic

anchors. The anchors of the “Double Anchor” site as designated by Horlings, are 10 meters (33 feet) apart and are oriented in the same direction, suggesting that they are associated and may have been deployed in the same event (Horlings 2011: 135-145).

After conducting remote sensing survey and diver groundtruthing of anomalies, Horlings returned to the Elmina Wreck and her crew conducted eight dives on the site. Visibility on some of the dives approached 2-3 meters (6.5-10 feet), allowing visual inspection of the site and the recording of video and still photography. Horlings found striking differences in bottom sedimentation on the site, and in fact initially was unsure if she was on the Elmina Wreck. Much of the southwest portion of the site was covered in over 1 meter (3.28 feet) of sediment, and key features such as stacks of basins and three of the cannon were no longer visible (Figure 7.3). The northeast portion of the site exhibited considerably more scouring than noted on previous investigations, exposing features never before seen including several amorphous concretions, an anchor, and other unidentified features (Horlings 2011: 149-150). Coring operations conducted on the site succeeded in recovering samples of wood, presumably from the vessel’s hull, a substance Horlings identifies as gunpowder, and melted material suggesting that the ship burned (Horlings 2011: 253, 260-261).

Additional data acquired by Pietruszka and Horlings during the 2007 and 2009 field seasons significantly expanded our baseline knowledge relating to the Elmina Wreck site and Ghana’s submerged coastal environments. The use of different methodologies and perspectives, and the varying questions being asked of the data, contributed to a broader understanding of coastal archaeology in the region. Although each used specific approaches in their research, both Pietruszka’s and Horlings’ findings

emphasize the dynamic nature of the Elmina Wreck site, and the degree of disturbance and intrusive artifacts found on the site.

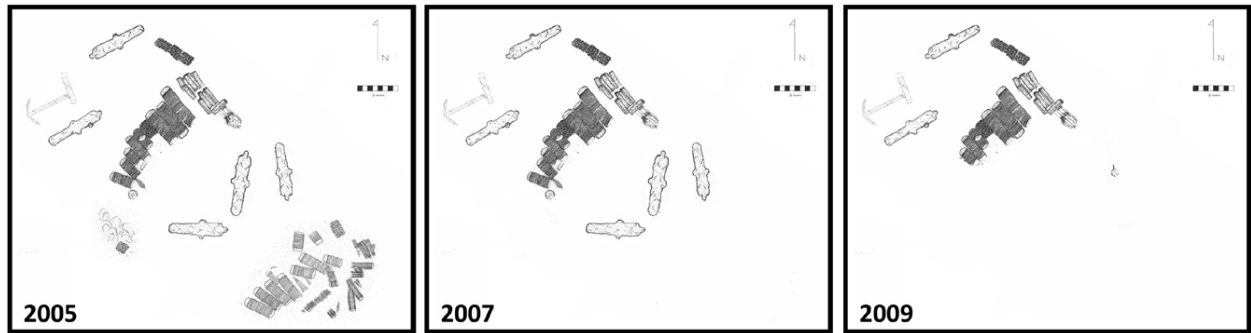


Figure 7.3 Site plans from the 2005, 2007 and 2009 diving investigations of the Elmina Wreck indicate changes in visible structures due to burial and scouring. The anchor and small cannon adjacent to it shown in the 2005 and 2007 plans were actually either buried or insufficiently exposed for identification until scouring in 2009 exposed them (Map by R. Horlings).

Interpretive Syntheses

With four field seasons of investigations on submerged sites in coastal Ghana, including two remote sensing expeditions offshore of Elmina and four separate diving projects on the Elmina Wreck site, we now have accumulated a significant amount of data and baseline information related to the wreck specifically, and maritime landscapes and formation processes generally, in the region. While there is clearly much more to learn, and future research projects will undoubtedly continue to shed light on Ghana's maritime archaeological sites, at this time we can begin to synthesize the work done to date in coastal Ghana.

Chronology of the Elmina Wreck Site

Additional Artifact Analyses

Pietruszka hoped that by comparing the results of surface collection to controlled excavation, he could evaluate different sampling strategies, identify any bias inherent in these strategies, and determine how best to test submerged sites in Ghana. This research design was developed partially in response to the degree of intrusive materials noted during surface collections and shallow excavations in 2003 and 2005. Surprisingly, Pietruszka discovered that even when excavating down to the concretion layer, the chronological range of artifact types still spanned five centuries (see Figure 7.4). This suggests that the disturbance on the site is present even in the deepest deposits (Pietruszka 2011: 94). This may be partially explained by Horlings' research and observations on the site, which suggests that the cycles of exposure and burial may repeatedly expose the site down to its base concretion layer, essentially scouring the site and allowing intrusive materials to become trapped between and within permanent features such as stacks of basins, cannons, manillas and lead rolls.

In an attempt to determine which objects were associated with the vessel and which were intrusive, Pietruszka considered several characteristics that suggested they might be *in situ*. He first considered large, immovable objects as more impervious to wave action and bottom movement, as well as nested stacks of metal wares and large concretions of manillas. These items, he argued, were more likely related to the original wrecking event. He assigned the site's cannon, manillas, lead rolls, nested brasswares and pewterwares in this category. In addition, he considered beads and cowries



Figure 7.4 Chronological chart showing artifacts recovered in 2007 (Pietruszka 2011: 289).

associated as well due to their sheer numbers, and also included small finds such as a fishhook, pipe bowl, pewter tops, and lead seals to be likely associated with the wreck due to their manufacturing ranges (Pietruszka 2011: 167). By focusing on these categories of artifacts and placing less confidence on bottles, ceramics and other smaller, more movable objects, Pietruszka began to consider that the Elmina Wreck may date to the seventeenth or early eighteenth century (Pietruszka 2011: 128).

Archival Research

Additional clues as to the site's date came from primary and secondary research related to losses in the region. Cook, Horlings and Pietruszka each compiled references to losses of vessels as part of their ongoing research, and though many exist for the region, few have specific locational detail.⁴⁵ A reference for the loss of the ship *Groeningen* in 1647 directly off of Elmina is one of the exceptions.⁴⁶ The reference was made in a letter written by Hendrick Caarlof, a governor at Elmina dated March 5, 1647. The document is part of the Furley Collection at the Balme Library, University of Ghana, and proceeds as follows:

For that Factor reported to me that the ship *Groeningen*, having anchored on the last day of February before Del Myna, wished to fire 5 shots, as is customary, had caught fire from the last cannon, which had burst. Whereupon proceeding at once to Del Myna it was reported to me on arrival there that 4 cannon had already been fired, the fifth and last had burst throwing the shot into the Constable's

⁴⁵ My research has located 18 references to vessel losses in the region, though specific locational references vary, some being as vague as "lost on the Gold Coast" or "near Elmina." Sources detailing these losses include Ellis 1893: 30; Guinote et al. 1998: 236; Hakluyt 1905: 216-230; Hair 1994b: 94; Inikori 1996: 64-67, 71, 73-74; Vogt 1979: 114.

⁴⁶ The reference for the loss of the *Groeningen* was initially found by Pietruszka in a reference to the Furley Collection at the University of Ghana and cited by Porter (1974); DeCorse followed up with archival research in the Furley Collection, verifying the account and transcribing the initial description of the wrecking event. In the historical documents, the name *Nieuw Groningen*, *Groeningen*, and *Groningen* are used interchangeably. For this dissertation, the vessel will be referred to as the *Groeningen*. The strike-outs in the text presented here are reproduced as they appear in the Furley translation.

(gunner's) room. The hatch of the orlop flew overboard; but the worst of all was that the blow took its chief force downwards, breaking the orlop in pieces which fell into the hold where it made a fearful fire. And as the bursting of one gun could not easily cause such a fire, (as the "~~maats~~"^{now} often conceal their liquor between the guns and gun carriages)⁴⁷ some anchors of it had lain about there, had spouted into the gunner's room ~~where the gun in breaking~~ as also in the hold, the gun (~~stuck~~) broke some large casks of liquor belonging to the Company lying thereabouts. The descending fire progressing so strongly caused the crew, through sheer amazement to get into perplexity. For such combustion [start page 164] *dapare rappicheyt van dempen en loschen vereischeende*,⁴⁸ some, to save their lives, went off by boat and "schuyt", whereby the others, seeing themselves past help through the fire getting the upper hand, each worked for his own life *om een goet heen coomen sagen*. Nevertheless, 11 seamen and eight soldiers perished in the fire and water, which number could have been greater if the factor Coymans had ~~not~~ not quickly sent out some canoes for salvage. Neither letters nor papers from YHH or anyone were saved. In the blowing up of the ship some goods flew up and got into the hands of the Blacks, part of which has been taken from them, and some fished up by dredging, which we will continue to do; amounting to what YHH can see from the accompanying lists.⁴⁹ I also suspect that as the same cannon had already shortly before been fired a short distance ~~from~~ above Del Myna, as a signal that it came from home, it had then been overloaded through carelessness. And as the skipper is coming over personally, I refer further to his own report.⁵⁰

Following DeCorse's findings, additional archival research was pursued relating to the loss of the *Groeningen*, as well as other potential ship losses off of Elmina.⁵¹ This research led to information relating to a voyage the *Groeningen* had previously taken from Brazil to Holland in 1645, and a few details of salvage attempts that were conducted

⁴⁷ Comments by DeCorse: This text is a bit unclear. "maats" is crossed out and (I think) "now" inserted. I think the phrase should read: "(as they now often conceal their liquor between the guns and gun carriages)".

⁴⁸ Here Furley appears not to have provided a translation, which seems to be a phrase describing the fierceness and intensity of the fire.

⁴⁹ Comments by DeCorse: Again, this is likely Furley's own abbreviation, "YHH" referring to Hon. Hon^d Sirs in the salutation. No accompanying lists of the salvaged goods was located.

⁵⁰ Comments by DeCorse: The skipper's report was not located in the Furley collection or in subsequent archival research in the Netherlands. Note, however, the context suggests that there will be a report, not necessarily that one was already in hand or it would have been noted as accompanying the document.

⁵¹ Funding for the archival work was provided through a Scholarly and Creative Activities Faculty Grant awarded to Cook through the University of West Florida. The research was carried out by Eric Ruijssenaar at the Dutch Archives.

after the sinking, including some of the “lists” mentioned by Caarlof in his 1647 letter. The documents mention that the *Groeningen* carried a “goet cust cargesoen [good coast cargo]”, and all indications suggest that the ship had just arrived on the coast and had not exchanged its cargo of European trade goods. Items recovered consisted mainly of textiles, including rotten linen, half-burnt cloth, blue cloth, sleep sheets, blankets, Turkish textiles, clothes from Haarlem, lemon paste, orange paste, palm oil or palm oil presses, sheep skins. Also mentioned is *violet wasgoet* which may be a reference to alluvial gold dust, and a chest of medicines (Nationaal Archief, Den Haag [NL-HaNA], Oude Westindische Compagnie (WIC), 1621-1674, nummer toegang 1.05.01.01, inventarisnummer 11 (-14, h).

Micro-coring and Radiometric Dating

As part of her strategy to study site formation processes in the region, Horlings conducted 32 cores on the Elmina Wreck site, and also core-sampled across her 2009 survey area in order to get a better understanding of regional site formation processes (Horlings 2011: 117, 157). Her work indicates that the submerged bottom offshore of Elmina is composed primarily of fine-grained quartz and feldspar sandstone, with most of the area covered by fine to medium grained sand and to a lesser extent areas of silts and clays, which she grouped under the term of mud for her study (Horlings 2011: 180-182). She also re-analyzed the side-scan data from the 2003 survey and compared this with her 2009 survey data, providing a glimpse into sedimentation rates over a six year span. The results of her comparison show significant changes in sedimentation types and rates in different areas offshore of Elmina. She concludes her discussion of site formation

processes based on remote sensing data and diver groundtruthing by stating, “What can cause these sediments at widely different locations to change in such a short period of time needs to be further investigated, but at present it must be sufficient to attribute the changes to the highly dynamic environment of coastal Ghana” (Horlings 2011: 190).

One of the most intriguing finds in Horlings’ cores on the Elmina Wreck was the presence of wood in six of her cores, the majority of which was identified as northern white oak, and one core produced white oak and red pine with a layer of caulking between them (Horlings 2011: 263-264). Since this is not a native wood species for West Africa, and white oak is a commonly used wood type for ship construction, this was the first indication that portions of the vessel’s hull might be preserved underneath the sediments covering the wreck.

As a final avenue of research, the three field directors and Christopher DeCorse, Principal Investigator of the Central Region Project, decided to attempt radiocarbon dating of the wood samples that Rachel Horlings recovered. The radiocarbon dates were funded through support from the University of West Florida Archaeology Institute. Five samples were sent to the Beta Analytic Radiocarbon Dating Laboratory. Due to the small size and preservation of the samples, Beta Analytic recommended Accelerator Mass Spectrometry processing of the samples. This analysis resulted in the following conventional radiocarbon dates for each sample: #285980 (280 +/- 40 BP); #285981 (220 +/- 40 BP); #285982 (220 +/- 40 BP); #285983 (250 +/- 40 BP); #285984 (310 +/- 40 BP). The two sigma plots for four of the five samples resulted in a “multi-modal” grouping of likely date ranges (Figure 7.5).

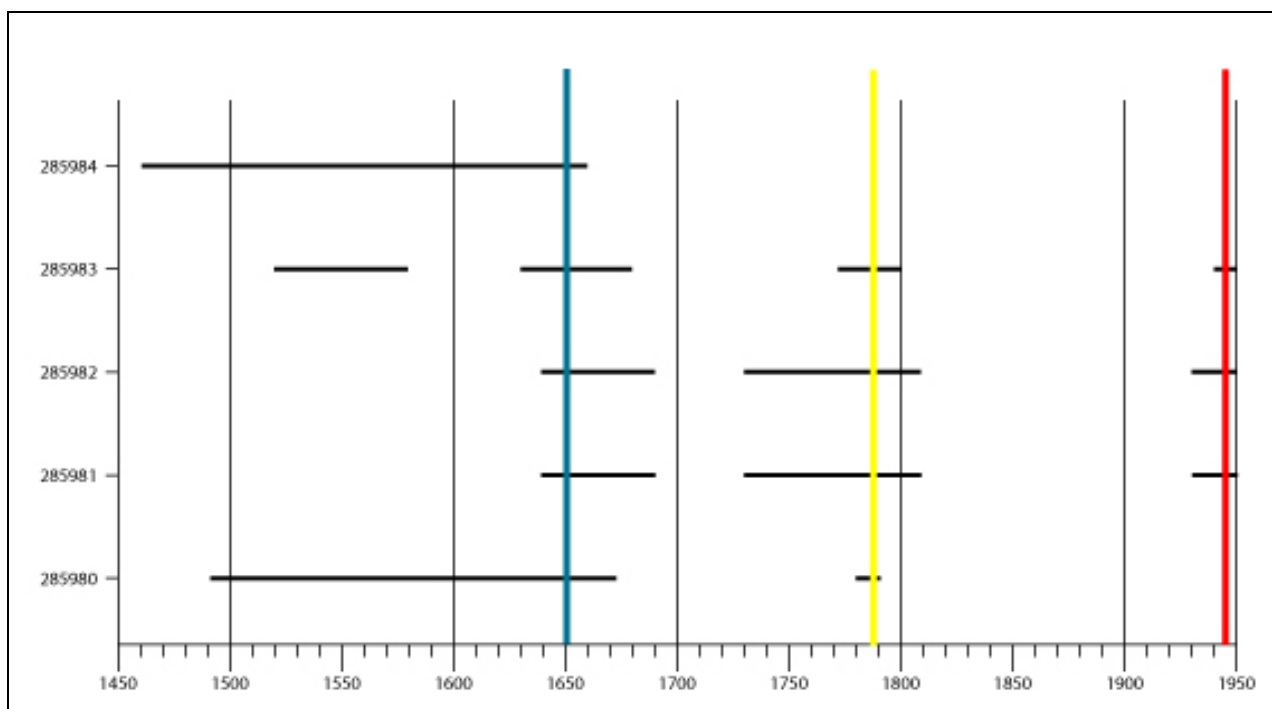


Figure 7.5. Accelerator Mass Spectrometry Results of Five Wood Samples Recovered from the Elmina Wreck. The “Multi-Modal” Result Shows Potential Date Clusters Shown Here in Red, Yellow and Blue (Chart by G. Cook).

Only sample #285984 has a single date range, extending from 1460-1660.

Plotting these ranges allows the identification of likely date clusters when comparing the five samples. These clusters are indicated with vertical bars in Figure 7.5, with red indicating a cluster around 1945, yellow indicating 1790, and blue lining up with 1650.

The conventional radiocarbon date is not calendar calibrated: when the calendar calibrated result is calculated from the conventional radiocarbon age, it is listed as the “Two Sigma Calibrated Result” for each sample, which statistically represents a 95% probability that the sample dates within these ranges. The two sigma average of all five samples indicates a 95% probability that all five samples date between 1642 and 1664 (see Figure 7.6).

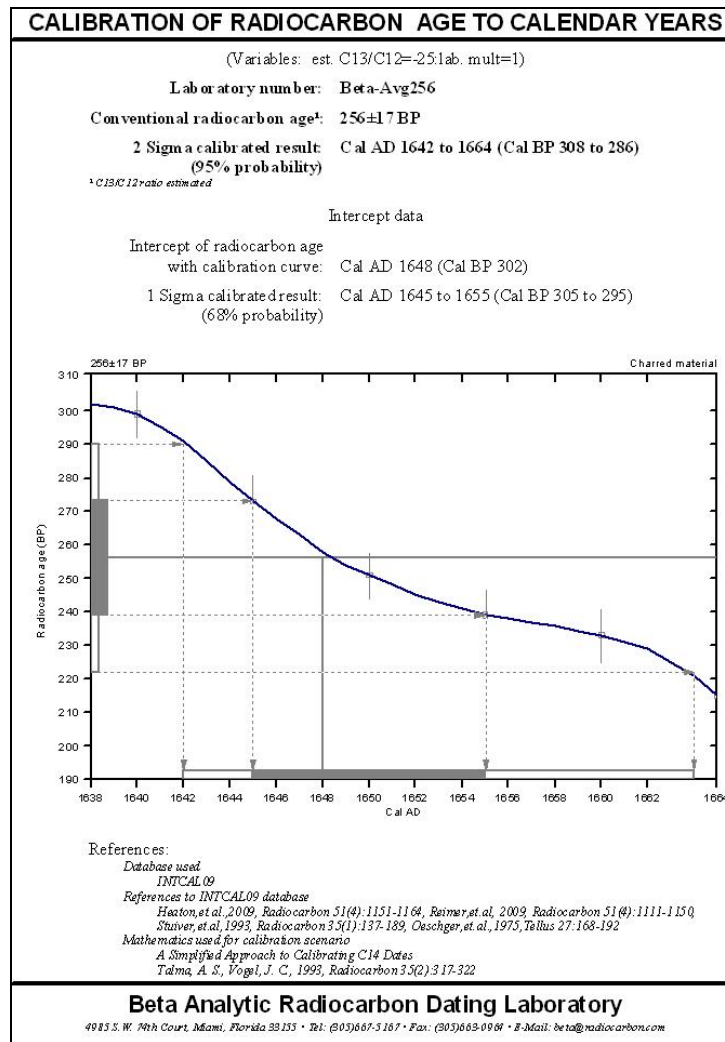


Figure 7.6 Average 2 Sigma Calibrated Result of the Five Wood Samples Recovered from the Elmina Wreck. Chart courtesy of Beta Analytic, Inc.

These additional analyses have resulted in a clearer estimation of the Elmina Wreck's chronology and origin. Although there is a considerable amount of intrusive material in the assemblage, a critical evaluation of the associated artifacts indicates a continental, and likely Dutch, origin for the vessel, and the pewter wares suggest a seventeenth-century date. This is further narrowed down by radiometric dating, which provides a 95% likelihood of a date ranging between 1642 and 1664. Archival research, while not conclusive, led to a tentative identification of the wreck as the Dutch West

India Company ship *Groeningen*, which sank offshore of Elmina after a gun exploded during a salute to the Castle in 1647. While further work would be required for a more definitive association with the *Groeningen*, these additional avenues of research have led to a more complete understanding of the chronological context for the Elmina Wreck.

Site Formation Processes

One of the most challenging aspects of the interpretation of the Elmina Wreck site was understanding the formation processes involved. The high energy, dynamic environment of coastal waters alternatively scoured and buried the wreck, providing a confusing artifact assemblage of mixed age and origin. The area where the wreck was found was likely an anchorage for ships spanning centuries of trade and contact, which is a key factor in the amount of intrusive material and associated mixing noted in each season of investigation. Horling's research on the Elmina marine environment and utilization of a sediment coring device led to a greater understanding of the site. Her team's diving activities on other sites in the region provides insight into the range of conditions and bottom types offshore of Elmina, and her coring of the wreck site indicated that wooden structure of the ship's hull was preserved, and that the ship had apparently burned (Horlings 2011: 253).

Horlings' work in 2009 verified the dynamic nature Ghana's coastal offshore environment and documented the dramatic changes taking place on the Elmina Wreck site in particular. On a broader scale, her sediment coring activities and diver investigations of other areas have added significantly to our understanding of the bathymetry and seafloor conditions in the region. Horlings differentiated between three

general bottom types as evidenced in the sonar data and verified via diver investigation. These include areas consisting of rock outcrops and low relief sandstone formations, large expanses of sand, some flat and some formed into ripples of various sizes, and a few, relatively small patches of black, sticky mud (Horlings 2011: 180). She was also able to determine sediment movement patterns for the area, specifically noting that in coastal Elmina sediments are transported in a predominantly eastward direction following the prevailing Guinea current. There is also shoreward and/or seaward movement driven by coastal surge and storms (Horlings 2011: 183).⁵²

Another important contribution of Horling's work has been her comparison between the 2003 and 2009 sonar datasets and their indications of bottom structure. Briefly, she discovered that distinct areas of sedimentation that show up in the side-scan data remain relatively consistent over time, and that while there may be seasonal variations in intensity and movement, the "factors that control the creation and maintenance of these features appear to be consistent" (Horlings 2011: 148-149). This has implications in terms of submerged site preservation, as well as remote sensing strategies based on whether sites in specific areas are likely exposed or buried.

The dynamic nature of the coast, experienced by divers as early as the 2003 fieldwork and further studied by Horlings' research, is likely a prime factor in the disturbed nature of submerged archaeological sites in the region. As Horlings points out, nearly every site investigated offshore of Elmina contains evidence of constant exposure and reburial. The movement of materials caused by currents and storms can easily become lodged or captured in any structure on the seafloor, such as shipwrecks. Sand

⁵² For a more thorough treatment of the site formation processes and issues related to sedimentation rates off of coastal Elmina, see Horlings 2011: 168-225.

and sediments shift and migrate, and can result in striking changes in bottom composition and the degree of exposure of sites over a relatively short period of time (Horlings 2011: 222).

With the documented changes in overall site composition and exposure, Horlings compared her 2009 sonar data with 2003 acoustic images of the Elmina Wreck site (Figure 7.7). The northern majority of the site is surprisingly similar, showing a roughly

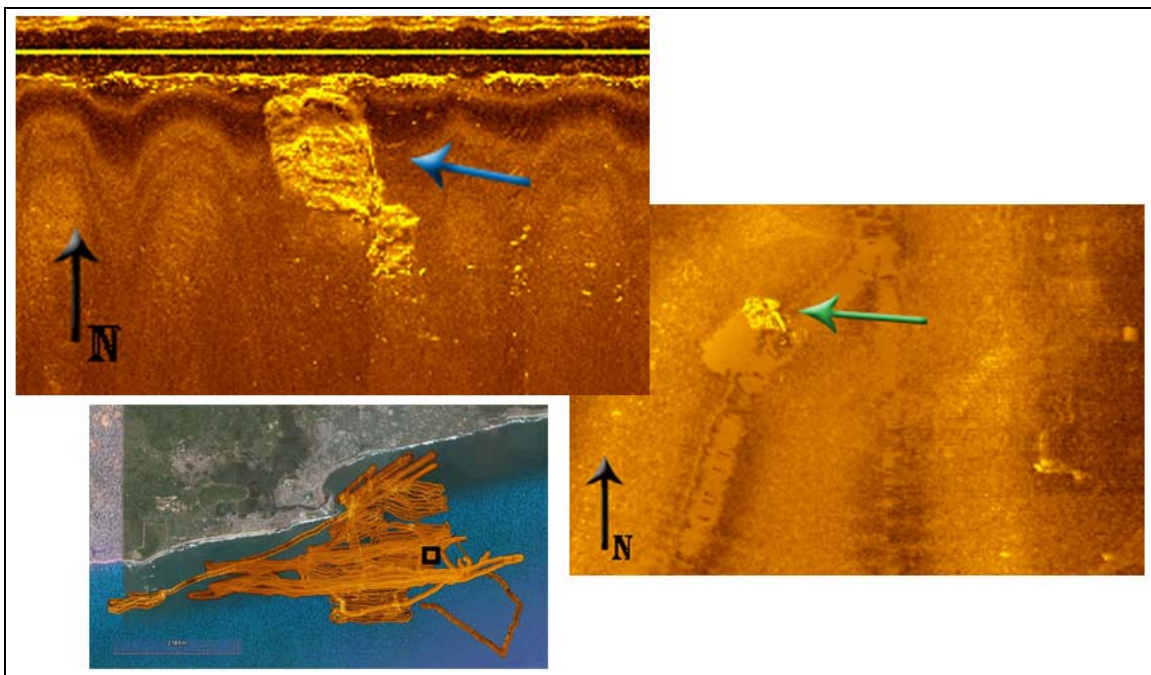


Figure 7.7 Side-scan sonar images of the Elmina Wreck site recorded in 2003 (left) and 2009 (right) show somewhat similar signatures. It does appear that the southern portion of the site is buried in the 2009 image, along with an associated mass of softer material extending to the southwest and northeast of the site. (Image by R. Horlings).

diamond-shaped mass of material oriented northwest/southeast (Horlings 2011: 231).⁵³

A close examination of the southern portion of the site, however, does indeed show some differences. In 2003, a rectangular portion of the site extends south, and a number of small, isolated hard returns to the south and east of the main mass may represent a debris field. In the 2009 data, this appears to be covered by a smooth/soft looking mass on the southwest portion of the site, which may very well be some of the mud/soft sediments Horlings mentions observing during her dives in the region (Horlings 2011: 180).

Marine Remote Sensing Survey in Ghana

The additional research on the Elmina Wreck greatly added in the site's interpretation. The 2007 and 2009 research also aided in the further understanding of the wider cultural and environmental landscapes of the Elmina survey area. An area measuring approximately 10 square kilometers has been surveyed so far offshore of Elmina, based on the 2003 and 2009 remote sensing field work (Figure 7.8). While there is clearly more survey to be done offshore of Elmina, this amounts to a substantial initial attempt at gathering baseline data regarding submerged cultural resources and seafloor bathymetry in the region. Considering the intensity and duration of maritime activity in the area, many more sites are undoubtedly awaiting discovery at Elmina and other historic seaports along Ghana's coastline.

⁵³ Horlings characterizes the imagery as being essentially similar, and contends this is due to the acoustic energy of the sonar penetrating soft bottom sediments and generating a reflection off of the buried mass of material. While this is possible, I feel that her 2009 sonar imagery does show the southern portion of the site covered, and is in accordance with her observations of the site during this season. Both of these scenarios may carry weight; regardless, this illustrates the subjectivity inherent in the interpretation of sonar data.



Figure 7.8 Mosaic showing side-scan sonar coverage combining the 2003 and 2009 surveys (After Horlings 2011: 147).

As noted in Chapter 5, I attempted to utilize both side-scan sonar and magnetometer remote sensing survey techniques in 2003, but made the decision to focus exclusively on side-scan sonar due to erratic performance of our magnetometer. This was a practical decision based on the realities of equipment issues in the field, and I realized that this essentially meant that any buried sites would not be locatable. Sonar survey resulted in the identification of 58 sonar anomalies or targets. Although diver investigation of targets was not a priority for the 2003 fieldwork, an opportunity to conduct diver groundtruthing presented itself, and the third anomaly investigated proved to be a historic shipwreck site approximately 3.25 kilometers (2 miles) southeast of Elmina Castle.

Additional diver groundtruthing was undertaken in 2007 by Pietruszka and Horlings with the intention of locating other wreck sites, however no additional sites were discovered (Horlings 2011: 107; Pietruszka 2011: 86). This was a rather surprising finding, and one potential explanation related to the fact that only side-scan sonar survey had been successfully completed in the region, and therefore buried sites would remain undetected until a magnetometer survey could be conducted that might indicate the presence of sub-surface wrecks.

This was Horling's assumption at the outset of her 2009 research, and her surveys were conducted in part with the aim of determining why no additional sites were discovered during diving operations on sonar anomalies in 2007. Utilizing side-scan sonar, magnetometer and echo-sounder data, she re-surveyed the area covered in 2003, and extended her survey to new areas offshore of Elmina as well.⁵⁴ No additional wreck sites were located, though she did verify the presence of two anchor sites and a length of iron chain. During the 2007 and 2009 diving seasons, Horlings mentions that the use of floating line for the circle searches may have led to anomalies not being located. Specifically, if circles of too large a diameter are being covered by the diver and the line floats up in the water column, it is less likely the line will 'snag' on any object proud of the seafloor and the anomaly may be missed (Horlings 2011: 131-132). This is indeed a possibility, and may be a factor for the lack of new sites being discovered in 2007. The fact that Horlings and Pietruszka did find targets only slightly elevated off of the seafloor,

⁵⁴ Horlings encountered problems as well with georeferencing the magnetometer and echo sounder, and ended up using the magnetometer for 10 days of survey, the side-scan sonar for 6 days, and the echo sounder for a single day. Despite these technological issues, her work is the first use of multiple marine remote sensing survey techniques so far in coastal Ghana.

however, suggests that their methodology was probably sound.⁵⁵ The successful use of the magnetometer produced excellent results, and Horlings succeeded in acquiring magnetic signatures on the Elmina Wreck as well as the double anchor site and length of chain.⁵⁶

While one of Horlings' research goals was to significantly augment the number of shipwreck sites in order to create a predictive model for determining trade patterns and for cultural resource assessment, the lack of new wreck sites in the survey area off of Elmina suggests that the 2003 survey data, though not perfect, was sound. In spite of problems, including utilization of a Fanti dugout canoe as a survey vessel, a permanent heavy sea state, and lack of magnetometer data, the 2003 survey data led to successful identification of the single offshore wreck site identified to date. Horlings' work verified the utility of side-scan sonar in the search for historic wreck sites in the region. It also indicates that significant sites were not missed during the 2003 sonar survey. This corresponds with her analysis of coring data both on the Elmina Wreck as well as in the broader region, which suggests that there is generally not a large amount of sedimentation covering the site (Horlings 2011: 114). If this is indeed the general case for the region, then side-scan sonar, with its ability to cover wide swaths of seafloor in a time-efficient manner, may be a preferred method of remote sensing survey in coastal Ghana. The fact that upon every visit to the site (2003, 2005, 2007 and 2009), divers found substantial portions of the wreck visible and thus detectable by sonar, supports these findings.

⁵⁵ During the 2003 and 2005 diving operations, divers utilized a standard metric tape reel, which does not float and therefore avoids this potential problem.

⁵⁶ Interestingly, the two anchor sites both were noted as anomalies in the 2003 sonar data and investigated in 2007 but not recognized as an historic feature. Horlings also acquired magnetic signatures on the double anchor site, and the length of chain was discovered in a previously unsurveyed area using the magnetometer alone.

Regardless, I concur with Horlings' contention that multiple remote sensing methodologies should be employed whenever possible in future marine survey work in Ghana.

Summary

The additional research conducted, both on site as well as in archival repositories and through radiocarbon analysis of wood from the site, has yielded substantial new insights into the potential date and origin of the Elmina Wreck. The AMS dates from Horling's wood samples provide the most objective indication of the potential date for the Elmina Wreck. With a 95% probability of dating between 1642 and 1664, there is a distinct likelihood that the wreck does indeed represent the remains of the Dutch West India Company ship *Groeningen*. There is no "smoking gun" within the documentary evidence that ties the *Groeningen* to the Elmina Wreck conclusively. More excavation needs to be conducted on the wrecksite for tangible clues as to the ship's identity, or to determine without any doubts that evidence of fire and/or explosion was the reason the vessel sank. If the wreck did indeed sink in the mid seventeenth century, it has 'collected' a surprising variety of intact glass and ceramic vessels from later periods, which must be considered when explaining the site formation processes for the region. Clearly the likelihood of the area serving as an anchorage throughout the historic period would make the intrusion of unassociated material onto the wreck site a probability, and this site formation process should be studied in more detail in the future.

Horlings' work provides significant evidence for explaining this, and also presents avenues for future research regarding the dynamic forces at work that have

resulted in the current site configuration. Regardless, the correlation between the artifact analyses, radiometric dates, archival research and site formation processes is supportive of this identification. Multiple investigations on the Elmina Wreck specifically and offshore of Elmina in general have led to compelling insights into the Atlantic trade with West Africa and the formation and preservation of submerged archaeological sites offshore, and is the first indication of the potential for nautical archaeological investigations in coastal Ghana.

CHAPTER 8: CONCLUSIONS

Questions Answered

The initial investigations into the maritime archaeology of Ghana answered many of my initial research questions. These questions included: Are there submerged archaeological sites in the region? What is the best method for finding them? Are underwater sites in the area exposed or buried by seafloor sediments? To what extent are underwater sites preserved off the coast of West Africa? How can these resources be used to reveal the region's past?

There are indeed historic wreck sites preserved on the seafloor off of Elmina, and the state of preservation, at least in regards to the Elmina Wreck, appears to be remarkable. The lack of sport diving or modern salvage groups working in the area helps to preserve the site integrity of submerged resources in Ghana. On the Elmina Wreck site artifacts are clearly exposed on the seafloor, and include stacks of nested basins, cannons, casks of manillas and other materials that have apparently lain largely undisturbed since the sinking of the vessel in the mid-seventeenth century. In much of the world these kinds of items would be easy prey for casual divers or treasure hunters. The lack of visibility, violent surge and otherwise challenging diving conditions that has prevented the development of sport diving in the area is likely a factor in the remarkable preservation of sites such as the Elmina Shipwreck.

While my attempt to use the magnetometer met with unsatisfactory results, the side-scan sonar proved to be an effective means of locating sites, and at least one submerged archaeological site- the Elmina Wreck- was exposed to a sufficient degree to generate a recognizable anomaly. Of the three additional sites verified by Horlings in

2009, two of these were noted in the original 2003 side-scan data. Horlings proved that magnetometer surveys can indeed be conducted successfully, and as she argues, future surveys should incorporate sonar and magnetometer techniques whenever possible (Horlings 2011: 124). Other potential “low tech” methods that were considered for the initial survey of the area, such as diver transects and visual survey of the bottom using diver-towed planing boards, would likely be useless in the low-visibility environment offshore of Elmina. Interviews with fishermen conducted in 2003 in an effort to locate known net snag areas proved of limited use; while such snag areas are known, the positional accuracy seems to be of insufficient quality for diver investigations.⁵⁷

Horling’s work also provided critical baseline data regarding site formation processes in the area, sediment movement, and bottom composition. Sedimentation movements are likely a key factor in archaeological visibility of sites and site formation processes in the region, though she writes that it is still unclear exactly how much sedimentation, methodological factors or the presence/absence of buried sites factor into the discovery of submerged archaeological sites off of Elmina (Horlings 2011: 173). What we do know, using the Elmina Wreck as a key benchmark related to bottom composition and sediment movements, is that diver investigations of the site in 2003, 2005, 2007 and 2009 indicate a dynamic seafloor environment that was essentially strikingly different each time divers visited the site. In 2003 the wreckage sat high off of the seafloor, and the surrounding sediments appeared to be very sandy, with visibility from 0 to 2 meters (6.5 feet) depending on the amount of surge that tended to suspend

⁵⁷ Discussions with Papa Kofi Arhin and others did suggest that certain areas were known as net snags and were avoided by fishermen. Without the use of GPS technology, however, these areas were identified in a general sense and defined by landmarks on shore. In 2003 an attempt was made to conduct side-scan survey in some of these areas, and no discernible anomalies were noted in the data.

sediment in the water column. In 2005 a considerable amount of soft sediments and mud covered the bottom, though the exposed features on the site correspond closely with the 2003 sonar data, suggesting that most of the site was still as exposed in 2005 as in 2003 (see Figure 8.1). When Pietruszka and Horlings returned in 2007 they found most of the

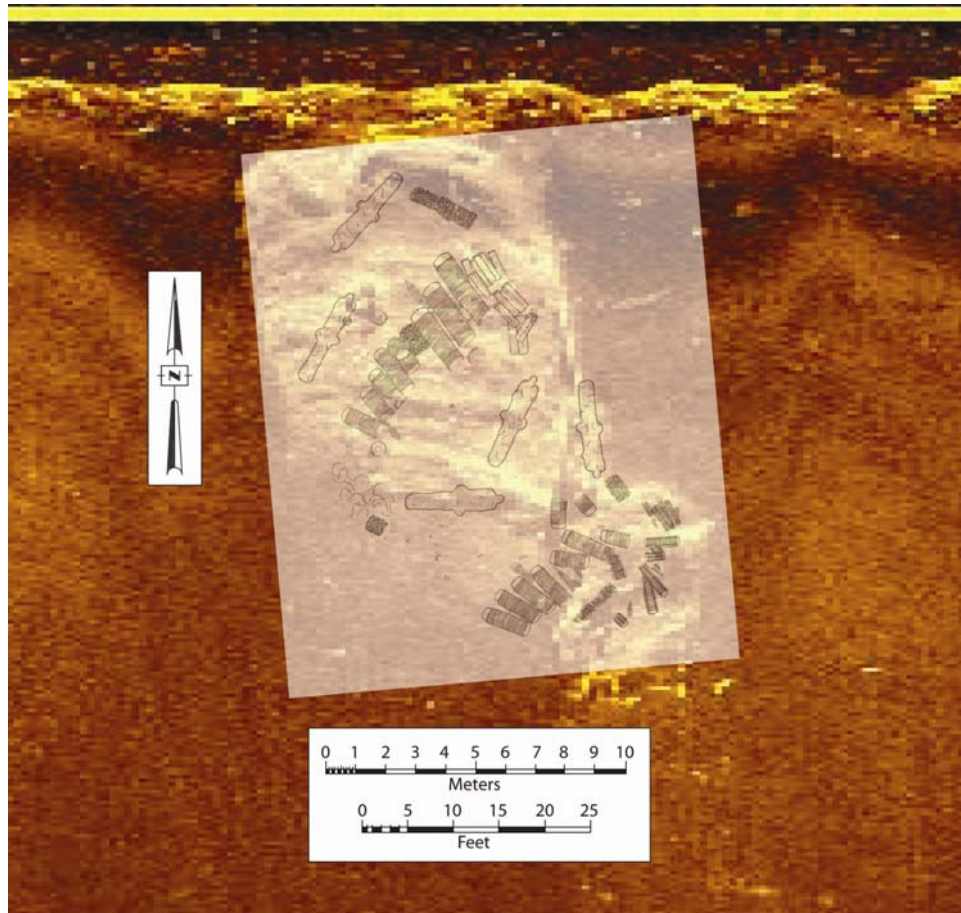


Figure 8.1 The 2005 site plan overlaid on the 2003 side-scan sonar image of the Elmina Wreck. The overall size and shape of the anomaly corresponds closely with the measured site plan. A number of stacks of basins, recorded in the southwest area of the site plan but not evident in the 2003 sonar image, may suggest that a portion of the southern extent of the site was buried in 2003. Pietruszka noted that the southern area of the site was completely obscured by sediments in 2007, and Horlings found approximately half of the site buried in 2009 (Horlings 2011: 151; Pietruszka 2011: 91).

southern portion of the site buried, and additional scouring occurring in the northern extents (Pietruszka 2011: 91). During Horling's final dives on the site in 2009 she observed that essentially half of the site was buried, as indicated above in Figure 7.3 (Horlings 2011: 109, 150).

The 2007 excavations as well as cores on the site show that only about 40 centimeters (15 ¾ inches) of sediment cover the wreck, and below this the cargo is largely concreted into a solid mass. Excavation and cores also provided evidence of mixed context in artifacts, with modern material even at the deepest levels, suggesting that the site is likely scoured out and buried repeatedly over time. Interestingly, with this said, it should be noted that elements of the Elmina Wreck's cargo were visible during each investigation of the site, meaning that a side-scan anomaly would likely be discernible on the site regardless of the specific period of investigation. The underwater context offshore of Elmina is clearly a dynamic, constantly changing environment that directly impacts the site formation and preservation of submerged archaeological sites in the region.

The Elmina Wreck

After multiple seasons of fieldwork undertaken from varying perspectives, some definitive conclusions can be made regarding the Elmina Wreck. Although the site exhibits evidence of considerable disturbance and intrusive artifacts spanning the entire contact period, a critical examination of the assemblage suggests a seventeenth century date for the wreck. Analysis of the pewter wares in particular indicates a likely seventeenth century date and continental origin for the vessel. Radiometric dates

conducted on wood recovered by Horlings supports this date, with a 95% probability that the vessel dates between 1642 and 1664. This fits nicely with historic descriptions of the loss of the Dutch West India Company ship *Groeningen*, which sank in 1647 after catching fire when a cannon exploded during a salute to Elmina Castle soon after its arrival on the coast. The predominance of European manufactured trade goods among the cargo reinforces this tentative identification, suggesting that the ship sank before exchanging most of its trade goods for whatever its intended African cargo would have been. We do not know what the Elmina vessel was in the region to trade for; neither archaeological evidence, nor archival evidence (if the wreck is in fact the *Groeningen*) provides insight into its intended trade.

This is frustrating, as a key question regarding the Elmina Wreck relates to its intended cargo. An obvious question that has already been asked of me repeatedly relates to whether the Elmina Wreck was a slave ship. While this cannot be discounted, it should be kept in mind that many vessels trading in the region at this time were there for the commodity trade in ivory, gold and other African products. When the Dutch West India Company was founded in 1621, its directors initially considered the enslavement of humans as immoral, and avoided the trade in slaves for nearly a decade.⁵⁸ Yet by the middle of the 1630s and with the capture of Elmina, the Dutch began to actively participate in the slave trade (Postma 1990: 10-11). Between 1674 and 1730, the Dutch West India Company equipped 383 vessels for the slave trade, and 334 vessels for the commodity trade (den Heijer 2003: 148-150; Postma 1990: 100). While slaves could

⁵⁸ The Dutch entrance into the slave trade has been traced to the voyage of Pieter van der Haagen in 1596, who shipped 130 African slaves to Middelburg, Zeeland, though city officials refused to allow them to be sold and released them as free men. There have also been cases of independent Dutch captains trading in slaves prior to the 1630s, but these were relatively few in number (Postma 1990: 11-13).

technically be bought anywhere along the West African coast, for most of the seventeenth century the Slave Coast and Loango-Angola coast were the main destinations for slave ships.⁵⁹ Elmina was a central source for the commodity trade in the seventeenth century, however, with 296 out of 334 WIC ships (nearly 90%) sailing directly to this port, 5 vessels making a combined stop at Elmina and another port, and only 33 vessels bypassing Elmina entirely. Although the specific timing of the shift from the gold trade to the slave trade in the broader region is still debated, there is general consensus that this occurred on the Gold Coast in the second half of the seventeenth century (DeCorse 2001: 26, 201). While we may never know if the captain of the Elmina Wreck was intent upon purchasing slaves or commodities for his cargo, when considering the overall trends for the mid-seventeenth century it is probably more likely that the Elmina vessel was in the region for the commodity trade. Further assessment of this issue might serve as one of the research questions for future archaeological investigation of the site.

WIC records for vessels trading to West Africa indicate that frigates and yachts with lengths of 21-34 meters (70-110 feet) were the preferred vessels for the commodity exchange. Larger vessels such as *fluyts*, *pinnaces* and frigates tended to be used for slaving voyages, and ranged from 33.5-36.6 meters (110-120 feet), though the sizes of ships for both the commodity and slave trades could vary considerably (den Heijer 2003: 149-151). Since the Elmina Wreck site is predominantly defined by the mass of cargo and cannon exposed on the seafloor, it is difficult to determine with great certainty the original size of the vessel. The sonar image from the 2003 survey measured 18 meters

⁵⁹ Tracing slave origins can be an ambiguous exercise. Hall discusses “Mina slaves” as a designation seen in Latin American documents. In this case, ‘Mina’ is an ethnic designation rather than a description of the geographical port of origin, and these people were largely speakers of Gbe languages on the slave coast (Hall 2004: 64-66).). For more discussion on this topic, see DeCorse 2001: 26-28.

(59 feet) in length, and the measured site plan created in 2005 corresponds closely to this (see Figure 8.2).⁶⁰ As mentioned above, visits to the site in 2007 and 2009 indicated that substantial portions of the southern extents of the site were buried. Although additional scouring had occurred in the northern extents of the site in 2007 and 2009 which exposed specific items not encountered during the 2003 and 2005 investigations, the overall northern extents had not changed. Thus it appears that the site extents as shown in the 2003 sonar data and 2005 site plan provide our best estimate of the overall dimensions of the wreck site.

When coring the site, Horlings noted that the extent of the wreck is at least 10-15 meters (33-49 feet) larger than the surface scatter indicates (Horlings 2011: 114). This provides a figure of 28-33 meters (92-108 feet) for a gross approximation of the original size of the Elmina Wreck. While admittedly an imperfect estimate, this does correspond well to the larger range of commodity traders, as well as to the smaller size of slaving vessels according to WIC documents. Regardless of the specific type of ship, this estimate is also compatible with the historic trend for using typical, medium-sized vessels for the West African trade, as opposed to smaller ships for regional European trades and larger vessels for East Indian voyages (Davis 1975: 7).

The Elmina Wreck's Cargo

Although my original intentions for this research involved studying historic vessels dating to the earliest period of contact on the Ghanaian coastline, from the outset I

⁶⁰ The 2007 site plan, compiled by Pietruszka, is substantially smaller than this, measuring only approximately 13 meters (42.5 feet). This is due to the southern portion of the site being obscured by sediments, however. Since the 2003 sonar data and the 2005 site plan correspond rather closely, I am considering this a more accurate estimation of the overall limits of the site.

argued that essentially *any* vessel found within the context of Atlantic trade offshore of Elmina would be significant, regardless of date or origin. This has certainly proven to be the case with the discovery of the Elmina Wreck. The investigation of a seventeenth-century trading vessel off of Elmina has opened a window into the dynamic nature of the trade in this era, and the ramifications of this find for regional archaeological comparisons as well as the broader field of nautical archaeology is significant. I state in the introduction of the dissertation that a potential contribution of nautical archaeological research in Ghana related to the likelihood of recovering a large amount of material culture involved in the African-European trade with the possibility of tight temporal contexts and concrete national identification of the wrecks investigated. This potential for nautical archaeology in Africa has long been recognized, as Posnansky and DeCorse state in their review of historical archaeology in sub-Saharan Africa, “Closely dated European trade goods provide a means of dating African sites of the past 400-500 years which are often difficult to date by other means. Potential research in this area includes underwater projects at the wreck sites of European ships and at the remains of the trading hulks once moored in the mud of the Niger Delta that have not as yet been located or studied” (Posnansky and DeCorse 1986: 11).

While this has proven more difficult than originally imagined and multiple seasons of investigations were required to fulfill these goals, the research conducted by my colleagues Rachel Horlings, Andrew Pietruszka and I have achieved this result. Radiometric data indicating a mid-seventeenth century date, cargo representing a likely Dutch origin for the vessel, and a potential identification as the Dutch West India Company vessel *Groeningen* all contribute to establish excellent context for the finds

associated with the wreck. This allows us to examine tangible remains of the West African trade as it existed in the middle of the seventeenth century.⁶¹

With the Elmina Wreck investigations, we now have a cache of objects definitively associated with the vessel that can be utilized by archaeologists throughout the region for comparative studies. The brass ware, pewter ware, manillas, beads, and brass pins, to name just a few of the cargo items discovered so far, are among the largest number of such finds associated with the Atlantic trade ever found, and represent the most extensive study of trade goods from a shipwreck in all of West Africa. While terrestrial excavations may on rare occasions unearth examples of these items,⁶² they lie preserved in a remarkable state on the seafloor off of Elmina, where they have remained relatively undisturbed for over three centuries.

The discovery of a historic trading vessel such as the Elmina Wreck is providing access to the tangible remains of the goods involved in African-European exchange in the Atlantic era, as mundane objects such as brass basins, brass manillas and beads served as material elements in this exchange. In essence, we are looking into the shopping cart of the “floating supermarkets” vessels employed in the African trade had to become in order to insure successful trading in the region (Hopkins 1973: 111). As Hopkins argued, the varieties of goods required to trade successfully on the coast were a result of several factors, including: intense competition among European traders; the unpredictability of

⁶¹ Or, if indeed this vessel is the wreck of the *Groeningen*, then the temporal context is narrowed down to the last day of February, 1647.

⁶² As Pietruszka points out, items such as manillas, which were imported by the millions throughout the contact period in West Africa, only rarely show up in terrestrial excavations, and often are completely absent from the archaeological record due to their dissemination into interior trade network, reworking by African brass smiths, or other factors (Pietruszka 2011: 245). Manillas have not been found in excavations at several key trading centers, including Savi in Benin (Kelly 2001: 94), Banda, Ghana (Stahl 2001), and only two fragments have been recovered at Elmina (DeCorse 2001: 124) despite indisputable evidence that vast numbers of manillas passed through these centers.

West African market demands; the poor intelligence regarding changing tastes of African merchants; the fact that African merchants were middle-men who in turn had to satisfy demands of interior traders; and the lack of a standard currency on the coast. Because of these factors, vessels bound for West Africa were loaded with an astounding variety of goods to manage complex systems of exchange (Hopkins 1973: 109-111).

A consideration of the brass basins recovered from the Elmina Wreck serves as an example of the ramifications of this find. We know from seventeenth-century documentary sources that a variety of brass basins were required for fitting out a cargo bound for the West African market, including small and large neptunes (*nepten*), pans (*taatsen*), brown kettles (*ketels*), barber's basins (*barbier beckens*), hammered basins (*gedreve akers*), cooking basins, *fater*-basins, chased basins, "big Scottish pans," red copper stewing pots, among others (de Marees 1987: 51-52; Jones 1995: 150-182). Trying to define exactly what these varieties meant or what they looked like, in any meaningful way, is nearly impossible due to the inadequacies of such descriptions in the documentary record and general lack of visibility in archaeological contexts. De Marees even noted at Elmina in 1602 that "Although these Basins are brought there in such quantities and are not as perishable a commodity as Linen, one does not see much old brass-ware there; so there must be a huge population in the Interior which uses and employs such quantities of imperishable goods" (de Marees 1987: 51-52).

In essence, these items that were transported by the millions into the West African market "disappeared", possibly through dissemination into interior trade networks after arriving at Elmina, by being melted down and recast, or were simply used, repaired, reused, in a repeated cycle until there was essentially nothing left (or a combination of all

of these). The assemblage from the Elmina Wreck has produced four distinct types of brass basins based on form and morphological traits so far, and considering the varieties mentioned in documentary sources, there may be other forms as yet undiscovered within the ship's cargo. While correlating specific forms of basins with their historic descriptors will present a challenge to archaeologists,⁶³ recovering samples of the actual objects used in the Atlantic trade is a critical first step in gaining a better understanding of the material culture involved.

Beyond the Elmina Wreck

The examination of a specific wreck site that sank at a specific time near a specific port can offer more than a magnifying-glass look at a wreck site and its assemblage. Critical analysis of both the archaeological and historical data allows inferences into the broader context of African-European exchange on the coast during the Atlantic era, and the intersection of Europe, Africa and the Americas and the creation of an Atlantic World. This is the mediation between Braudel's three scales of history, namely a dialogue between the short term event or *événements*, the medium term concerned with processes or social time (*conjunctures*); and the long term dealing with structures and world views, or the *longue durée*.

As I state in Chapter 2, there are varied theoretical pathways that lead from the specific (the wreck site) to the general, and for this study I rely on a multiscale perspective, drawing on both anthropological and historical theory, to place the shipwreck within the wider historical, cultural, social and economic contexts in which it

⁶³ Hamann, in her study of the basins from the Elmina wreck, provides tentative identifications for the type varieties she identified in the assemblage (Hamann 2007: 138-144).

functioned. Moving from the unit of study (a shipwreck site) to its broader social and economic significance is a key to achieving more than a mere descriptive study of a shipwreck. In doing this, the specific wreck becomes a metaphor for examining and understanding concepts such as culture contact, the role of commodities in this exchange, and the flow of goods between cultural contexts.

If one's interest relates to how material culture is used in the mediation of culture contact, then it would be difficult to find a more appropriate regional or chronological focus of study than West Africa during the contact period. An intriguing aspect of the European trade with West Africa lies in the relative simplicity of Europe's demands on the African market, as opposed to the rather complex nature of West Africa's demands from Europe (Herbert 1984: 123). Rather trading for gold, slaves, ivory, palm oil or other commodities that did not change drastically over the centuries of contact, European merchants hoping to profit from the West African trade had to supply a bewildering variety of goods, subject to change overnight and from port to port, on both chronological and geographical grounds.

The cargo of a West African trading vessel preserved on the seafloor reflects the social and economic aspects of not only the vessel's port of origin, but also its intended destination and potential market for its cargo. Items shipped in the holds of European vessels plying the West African trade must be seen as "entangled objects," with multiple meanings and values created by their intercultural context (Thomas 1991: 4-6). If the significance of commodities rests in their form, their uses and their trajectories (Appadurai 1985: 5), shipwreck sites and their cargoes off of the West African coast must be seen as elements in the broader interaction between Africans and Europeans. It must

be kept in mind that vessels such as the Elmina Wreck were not directly involved in the dissemination of these goods into the broader West African context. Instead, these ships brought in large masses of trade goods, exchanged them with the coastal forts, picked up return cargoes, and departed for the next leg of their destination. Still, in the broader exchange system of the region, trade goods found in the Elmina Wreck testify not only to the static commodities making up the cargo of a ship, but of the trajectories of these commodities in a cross-cultural milieu. As mentioned in my theory discussion, this perspective requires a realization that objects are not necessarily what they were made to be, but what they have become, and examining their trajectory across geographical and social space is as important as their final context in the archaeological record (Appadurai 1986: 5; Thomas 1991: 4).

Interpreting material culture from the Elmina Wreck through this lens leads to a richer understanding of this contact, and also speaks to the West African merchants who drove the demand in this complex commodity exchange. African states trading with European ships along the Ghanaian coast were not simply passive recipients of western trinkets for which they traded their gold and slaves, but were active agents who maintained a large degree of influence and power in these interactions (e.g. McGhee 2010: 389). The sophisticated traders and merchants who met European sailors on West African beaches were part of vast trade networks ranging across the Sahara into Northern Africa and beyond, long before European contact (Curtin 1984: 21-24). In the centuries following this contact, coastal African states manipulated their social, economic and political relationships with Europeans to consolidate their power in the region (DeCorse

2001: 13). Any study of African-European interactions must be firmly rooted within this dynamic context of power relations, trade and agency.

We know from historic documentation that West Africans were adept at indoctrinating themselves as crucial members of the exchange system, and profited handsomely in doing so. Quacounoe Abracon served as the Royal African Company's chief broker at the Little Komenda factory from 1681 to 1683, an influential position that brought him considerable gold stipends and sales commissions that made him a wealthy man (Northrup 2002: 56). John Kabes, another trader at Komenda who was the *de facto* ruler of his own settlement, played English-Dutch rivalry to his advantage in the late seventeenth century (Henige 1977: 1-19). These opportunities came into play due to the tendency for Africans, rather than Europeans, to take the roles of linguistic and cultural liaisons (e.g. Northrup 2002: 59), which is yet another reflection of their astuteness, abilities and *agency* that has all too often been overlooked in studies of the Atlantic World.

Materially, this agency can be expressed in a variety of ways, and one of the most direct examples relates to the West African merchants' demands for specific items of sufficient quality that would appeal to the interior market trade. There are numerous examples of European observers noting the sophistication of African merchants in their trading activities. De Marees hints at the agency of the coastal African describing the complexities of the trade in 1602:

When the Portuguese first began to trade with the inhabitants of these lands, the natives had little choice of goods to barter for their own. They only had those which were supplied to them by the Portuguese, and with these they had to be content. But since we began to trade there, one has gradually given in to their desires to such an extent that they have now become so clever and subtle in trading that one can hardly supply or give them any commodity they want to buy

without them wanting it to be changed two or even three times before they are pleased and satisfied with it. Thus they are now beginning to acquire as good a knowledge of the commodities which they are sold as we Dutchmen ourselves have...In the first place, when they buy linen, they check if it is weatherworn and if it is white and broad, for they are very particular... They pull knives out of their sheaths and look if they have rusted in them. They inspect the basins one by one to see if they have holes or cracks; and if a basin has the slightest hole, they reject it and want it exchanged for another; furthermore, if they are the least bit dirty, they do not want them either. They are able to remeasure your linen to the last fathom and tell you whether they have received their measure or not. Iron bars they measure with their feet, checking whether they are long and the proper size. Cauldrons they put on the ground, turned upside down, and lying down on it they push both thumbs into its bottom to see whether it bends like a sheet of French parchment; if so, they do not want it; but they like those with a hard bottom, which they cannot push in... And even if they have bought some commodity from you often, they will select it carefully and not buy everything at the same time. They also count the beads on every string to check whether each has its full number of beads, and even if only one bead is missing, one has to give it to them (de Marees 1987: 55-56).

Other seventeenth-century writers noted that African merchants were known to inspect each manilla in a shipment, rejecting hundreds of them if they were not made to particular specifications (Johansson 1967: 16). Historical accounts are also peppered with the threats from African merchants, voiced through the frustrated writings of the Europeans they dealt with, that they would simply refuse to trade if their demands were not met (Ryder 1969: 196-212). This can be seen as a give-and-take between what Europeans sought to provide to the African market, and how African market desirability drove this exchange through the demands of seasoned coastal African merchants in a particularly challenging area of the world to trade in.

The cargo preserved on the Ghanaian seafloor serves as mute testimony regarding the multiscalar aspects of Africa's role in the Atlantic World. Whether the Elmina Wreck turns out to be the Dutch vessel *Groeningen* or not, it was apparently the victim of severe misfortune over 350 years ago, arriving on the West African coast only to sink suddenly,

before any substantial offloading of its trade cargo. The disaster undoubtedly dashed the hopes, profits and most likely lives of individuals caught up in these events. With the loss of this ship, the normal flow of goods that characterized West Africa's material exchange within the Atlantic World was momentarily halted, their trajectories disrupted forever. These tangible symbols of commodity exchange lay undisturbed until archaeologists and fishermen in a dugout canoe motored near their resting place, and decided to investigate an anomalous feature on the seafloor.

With four field seasons completed on the Elmina Wreck, a precedent has been set which realizes the great potential for nautical archaeological studies in West Africa. The utilization of a multiscale approach, tying the event to the broader chronological and regional contexts of the Atlantic World, has also proven its effectiveness. The utility of this approach can be seen, albeit in different ways, in the work of each project director involved in teasing out the mysteries of the Elmina Wreck. More work remains to be done; only a small portion of the site has been investigated, and there are more questions to be answered regarding this shipwreck, as well as others potentially lying in wait offshore of Ghana. But the work to date on this remnant of Africa's maritime connections to the broader Atlantic World has provided a glimpse of this fascinating exchange, and offers tantalizing potential for future discoveries.

BIBLIOGRAPHY

Adams, Jonathan

2001 "Ships and Boats as Archaeological Source Material" *World Archaeology* 32: 292-310.

The African Pilot

1856 *The African Pilot, or Sailing Directions for the Western Coast of Africa. Part I: From Cape Spartel to the River Cameroons* (London: Hydrographic Office, British Admiralty).

Africa Pilot

1953 *Africa Pilot, Volume I: Comprising Arquipélago dos Acores, Arquipélago da Madeira, Arquipélago de Cabo Verde, and Islas Canarias: also the West Coast of Africa from Cabo Espartel to Calabar River* (London: Hydrographic Department, Admiralty).

Alpern, Stanley

1995 "What Africans Got for Their Slaves: a Master List of European Trade Goods" *History in Africa* 22: 5-43.

Appadurai, Arjun

1986 *The Social Life of Things: Commodities in Cultural Perspective* (Cambridge: Cambridge University Press).

Arhin, Kwame

1979 *West African Traders in Ghana in the Nineteenth and Twentieth Centuries* (London: Longman Inc.)

Armstrong, Douglas and Ken Kelly

2000 "Settlement Patterns and the Origins of African Jamaican Society: Seville Plantation, St. Ann's Bay, Jamaica" *Ethnohistory* 47 (2): 369-397.

Arnold, Barto

1996 "The Texas Historical Commission's Underwater Archaeological Survey of 1995 and the Preliminary Report on the *Belle*, LaSalle's Shipwreck of 1686". *Historical Archaeology* 30(4):66-87.

Arnold, J. Barto and Robert Weddle

1978 *The Nautical Archaeology of Padre Island; The Spanish Shipwrecks of 1554* (New York: Academic Press).

Atherton, Mark

2011 *Echoes and Images: The Encyclopedia of Side-Scan and Scanning Sonar Operations* (Vancouver: OysterInk Publications).

Atkins, John

1970 *A Voyage to Guinea, Brazil, and the West Indies; in His Majesty's Ships the Swallow and Weymouth* (London: Frank Cass & Co., Ltd.). Originally published 1735.

Auret, Chris

1977 "Preliminary Notes on the Msikaba Wreck Site," *Africana Notes and News* 22(6): 231-255.

Avery, George

1997 *Pots as Packaging: The Spanish Olive Jar and Andalusian Transatlantic Commercial Activity, 16th-18th Centuries* (Ph.D. Dissertation, University of Florida).

Azurara, Gomes Eannes

1896 and 1899 *The Chronicle of the Discovery of Guinea* C. Beazley and E. Prestage, trans. and eds. (London).

Babits, Lawrence and Hans Van Tilburg (editors)

1998 *Maritime Archaeology: A Reader of Substantive and Theoretical Contributions* (New York: Plenum Press).

Baker, Daniel

1992 *Explorers and Discoverers of the World* (Farmington Hills: Thompson Gale).

Baker, Mathew

1570 *Fragments of Ancient English Shipwrightery* (MS in the Pepysian Library of the Magdalenean College, Cambridge University CB3 OAG.PL 2820).

Ballard, Robert

1988 *Exploring the Titanic* (New York: Scholastic).

Ballarini, Roberto

2009 *The Perfect Form: On the Track of African Tribal Currency* (Milano: Africa Curio Sas).

Barbot, Jean

1992 *Barbot on Guinea: the Writings of Jean Barbot on West Africa 1678-1712 P.* Hair, A. Jones and R. Law trans. and eds. (London: the Hakluyt Society).

Barfues, Bernd

2006 Personal Communication (site owner,

Barker, Richard

1992 "Shipshape for Discoveries, and Return" *The Mariner's Mirror*, vol. 78, no. 4, 433-447.

Barkin, Kenneth

1987 *European Pewter in Everyday Life, (1600-1900)*. (Riverside: University of California).

Basch, Lucien

1972 "Ancient Wrecks and the Archaeology of Ships" *The International Journal of Nautical Archaeology and Underwater Exploration* 1(1): 1-58.

Bass, George

1966 *Archaeology Under Water* (London: Thames and Hudson).

1967 "Cape Gelidonya: A Bronze Age Shipwreck" *Transactions of the American Philosophical Society* 57 (part 8).

1972 *A History of Seafaring Based on Underwater Archaeology* [cite]

1973 "Cape Gelidonya and Bronze Age Maritime Trade" in Harry Hoffner (ed.) *Orient and Occident* (Festschrift Cyprus Gordon: Kevelaer).

1975 *Archaeology Beneath the Sea* (New York: Walker and Company).

1983 "A Plea for Historical Particularism in Nautical Archaeology" in Richard Gould (ed.) *Shipwreck Anthropology* (Santa Fe: University of New Mexico).

1986 "A Bronze Age Shipwreck at Ulu Burun (Kas): 1984 Campaign." *American Journal of Archaeology* 90: 269-96.

1988a "Return to Cape Gelidonya." *INA Newsletter* 15.2: 2-5.

1988b *Ships and Shipwrecks of the Americas* (London: Thames and Hudson).

2011 "The Development of Maritime Archaeology" in Alexis Catsambis, Ben Ford and Donny Hamilton (eds.) *The Oxford Handbook of Maritime Archaeology* (Oxford: Oxford University Press): 3-24.

Bass, George and Frederick van Doorninck

1982 *Seventh Century Ship at Yassi Ada* (College Station: Texas A&M University Press).

Beaucaire, René

1964 "The Fos Underwater Excavations" *Bulletins de la Societe des Amis du Vieil Istres*, Tome Quatorzieme (Aix-En-Provence: La Pensee Universitaire).

Behrendt, Stephen

2001 "Markets, Transaction Cycles and Profits: Merchant Decision Making in the British Slave Trade" *The William and Mary Quarterly* 58(1): 171-204.

- Benito, Ana and Miguel Ibáñez Artica
 2005 “‘Promenadas’ Portuguesas Destinadas al Comercio del Oro en la Costa Africana in el sigly XVI: Estudio de la “manillas” y calderos hallados en un pecio de Getaria (Guipúzcoa)” *Gaceta Numismática* 157: 63-81.
- Benjamin, Thomas
 2009 *The Atlantic World: Europeans, Africans, Indians and Their Shared History, 1400-1900* (Cambridge: Cambridge University Press).
- Bennett, Norman and George Brooks
 1965 *New England Merchants in Africa: A History Through Documents, 1802 to 1865* (Providence: Brown University Press).
- Bethell, Leslie
 1966 “The Mixed Commissions for the Suppression of the Transatlantic Slave Trade in the Nineteenth Century” *The Journal of African History* 7(1): 79-93.
- Binford, Lewis
 1964 "A Consideration of Archaeological Research Design" *American Antiquity* 29: 425-441.
- Blake, John
 1937 *European Beginnings in West Africa* (London: Longmans, Green and Co.).
 1967 *Europeans in West Africa, 1450-1560* (Nendeln/Kiechtenstein: Hakluyt Society, vol. 1).
 1977 *West Africa: Quest for God and Gold, 1454-1578* (London: Curzon Press Ltd.).
- Bohannon, Paul
 1955 “Some Principles of Exchange and Investment Among the Tiv” *American Anthropologist* 57: 60-70.
- Bold, Edward
 1819 *The Merchant's and Mariner's African Guide: Containing and Accurate Description of West Africa, with their Corrected Longitudinal Positions, Comprising a Statement of the Seasons, Winds and Currents Peculiar to Each Country...* (London: Cushing & Appleton).
- Bosman, William
 1967 *A New and Accurate Description of the Coast of Guinea* (London).

Bossche, Willy Van den

2001 *Antique Glass Bottles: Their History and Evolution (1500-1850), A Comprehensive, Illustrated Guide with a World-wide Bibliography of Glass Bottles* (Suffolk: Antique Collector's Club).

Bovill, William

1958 *The Golden Trade of the Moors* (London: Oxford University Press).

1957 *The Dutch in Brazil, 1624-1654* (London: Oxford University Press).

Bowens, Amanda

2009 *Underwater Archaeology: the NAS Guide to Principles and Practice* (Oxford: Nautical Archaeology Society).

Boxer, C. R.

1934 "Portuguese Roteiros, 1500-1700" *The Mariner's Mirror* 20, 171-186.

1957 *The Dutch in Brazil, 1624-1654* (Oxford: Clarendon Press).

1969 *The Portuguese Seaborne Empire, 1415-1825* (New York: Alfred A. Knopf).

1970 *The Dutch Seaborne Empire, 1600-1800* (New York: Alfred A. Knopf).

Brain, Jeffrey

1979 *Tunica Treasure* (Salem: Peabody Museum of Salem).

Braudel, Fernand

1984 *Civilization and Capitalism: 15th-18th Century* (New York: Harper and Row).

Braun, Georg and Franz Hogenberg

1990 *Civitates Orbis Terrarum: Cities of the World, Europe, Africa, Asia* (Leicester: Magna Books).

Brett, Vanessa

1981 *Phaidon Guide to Pewter*. Phaidon Press, Oxford.

Breunig, Peter

1996 "The 8000-year-old dugout canoe from Dufuna (NE Nigeria)" in G. Pwiti and R. Soper (eds.), *Aspects of African Archaeology. Papers from the 10th Congress of the PanAfrican Association for Prehistory and related Studies*. (Harare: University of Zimbabwe Publications) 461-468.

Bridge, Horatio

1853 *Journal of an African Cruiser: Comprising Sketches of the Canaries, the Cape de Verds, Liberia, Madeira, Sierra Leone, and Other Places of Interest on the West Coast of Africa* (New York: George P. Putnam & Co.).

- Bridgeport Brass Company
1908 *Seven Centuries of Brass Making* (Bridgeport: Lillibridge).
- British Admiralty Chart 3113
1995 *Africa: West Coast, Ghana; Cape Three Points to Cape Coast* (London: Hydrographer of the Navy).
- British and Foreign State Papers 1822-1823: Vol. 10.
- Brooks, George
1962 "The Letter Book of Captain Edward Harrington" *Transactions of the Historical Society of Ghana* 6: 71-77.
- Bruseth, James and Toni Turner
2005 *From a Watery Grave: the Discovery and Excavation of La Salle's Shipwreck, La Belle* (College Station: Texas A&M University Press).
- Burnside, Madelaine
2002 "The *Henrietta Marie*" in *Captive Passage: The Transatlantic Slave Trade and the Making of the Americas* (Washington: Smithsonian Institution Press).
- Cañizares-Esquerria, Jorge and Erik Seeman
2006 *The Atlantic in Global History: 1500-2000* (Princeton: Prentice Hall).
- Cano, Tomé
1996 *Arte para fabricar, fotificar, y apareiar naos de guerra merchante, con las reglas de arquearlas reduzido a toda cuenta y medida...* (1611) transcribed by Cesário Fernandez Duro in *Disquisiciones nauticas*, 5 vols. (Madrid: Instituto de Historia y Cultura Naval), vol. 5:36-97.
- Caple, C.
1991 "The Detection and Definition of an Industry: The English Medieval and Post Medieval Pin Industry" *Archaeology Journal* 148: 241-255.
- Carr, Edward
2001 "They Were Looking for White Jobs": *The Archaeology of Postcolonial Capitalist Expansion in Coastal Ghana*. Ph.D. Dissertation, Syracuse University.
- Carrier, James
1995 *Gifts and Commodities: Exchange and Western Capitalism Since 1700* (London: Routledge).
- Castro, Felipe
2000 "Pewter Plates from São Julião da Barra, a 17th Century Site at the Mouth of the Tagus River, Portugal" Paper on file, Texas A&M University, College Station, TX.

2005 *The Pepper Wreck: A Portuguese Indiaman at the Mouth of the Tagus River*. College Station, Texas A&M University Press.

Catsambis, Alexis, Ben Ford and Donny Hamilton

2011 *The Oxford Handbook of Maritime Archaeology* (Oxford: Oxford University Press).

Cederlund, C.

1994 "The Regal Ships and Divine Kingdom" *Current Swedish Archaeology* 2: 47-85.

1995 "Marine Archaeology in Society and Science" *International Journal of Nautical Archaeology* 24.1: 9-13.

Chapelle, Howard

1967 *The Search for Speed Under Sail* (New York: Norton).

Chapman, A.

1980 "Barter as a Universal Mode of Exchange" *L'Homme* 20(3): 33-83.

Chapman, Frederik

2006 *Architectura Navalis Mercatoria: The Classic of Eighteenth-Century Naval Architecture* (New York: Dover Publications, Inc.).

Chouin, Gerard

1998 "Eguafo, un royaume africain au 'coeur français', 1637-1687" *Mutations socio-économiques et politique européenne d'un état de la Côte de l'Or (Ghana) au XVIIIe siècle*, Afera, Paris.

2002 "Sacred Groves as Historical and Archaeological Markers in Southern Ghana" *Ghana Studies* 5: 177-196.

2008 "Archaeological Perspectives on Sacred Groves in Ghana" in M. J. Sheridan and C. Nyuamweru (eds.) *African Sacred Groves: Ecological Dynamics and Social Change* (Oxford: James Currey).

2010 *Forests of Power and Memory: An Archaeology of Sacred Groves in the Eguafo Polity (c. 500-1900 AD)*. Unpublished Ph.D. dissertation, Department of Anthropology, Syracuse University, Syracuse.

Chouin, Gerard and Christopher R. DeCorse

2010 "Prelude to the Atlantic Trade: New Perspectives on Southern Ghana's Pre-Atlantic History (800-1500)" *Journal of African History* 51: 123-145.

Cipolla, Carlo

1965 *Guns, Sails and Empires: Technological Innovation and the Early Phase of European Expansion* (New York: Pantheon Books).

Clarkson, Thomas

1808 *The History of the Rise, Progress and Accomplishment of the Abolition of the African Slave-Trade by the British Parliament* (London: Longman, Hurst, Rees and Orme).

Conlin, David and Matthew Russell

2006 "Archaeology of a Naval Battlefield: *H. L. Hunley and USS Housatonic*" *International Journal of Nautical Archaeology* 35.1: 20-40.

Cook, Gregory and Samuel Spiers

2004 "Central Region Project: Ongoing Research on Early Contact, Trade and Politics in Coastal Ghana, AD 500-2000" *Nyame Akuma* 61: 17-28.

Corlett, Ewan

1990 *The Iron Ship: The Story of Brunel's S.S. Great Britain* (London: Conway Maritime Press, Ltd.).

Cortezão, João

1937 *The National Secret of the Portuguese Discoveries in the Fifteenth Century*, Translated by W. A. Bentley (London).

Cotter, John L. and J. Paul Hudson

1957 *New Discoveries at Jamestown* (Washington D.C., National Park Service).

Cotterell, Howard

1972 *National Types of Old Pewter* (Princeton: The Pyne Press).

1929 *Old Pewter, Its Makers and Marks In England, Scotland, and Ireland: An Account of the Old Pewterer and His Craft*. Charles E. Tuttle, Rutland.

Crone, George

1937 *Cadamosto and Other Documents on Western Africa in the Second Half of the Fifteenth Century* (London: Hakluyt Society, Series 2, vol. 80).

1967 *The Voyages of Cadamosto* (Nendelin, Liechtenstein: Kraus Reprint).

Cronyn, J. M.

1990 *The Elements of Archaeological Conservation* (New York: Routledge).

Crumlin-Pedersen, Ole

1970 "The Viking Ships of Roskilde" *National Maritime Museum Monographs and Reports* I: 7-23.

- Crumlin-Pederson, O. and B. Munch-Thyre (eds).
1995 *The Ship as Symbol* (Copenhagen: National Museum).
- Curtin, Philip
1964 *The Image of Africa: British Ideas and Action, 1780-1850*. Vol. 1 (Madison: University of Wisconsin Press).

1969 *The Atlantic Slave Trade: A Census* (Madison: University of Wisconsin Press).

1984 *Cross-Cultural Trade in World History* (Cambridge: Cambridge University Press).

1998 *Disease and Empire: the Health of European Troops in the Conquest of Africa* (Cambridge: Cambridge University Press).
- Daaku, Kwame Yeboa
1966 *Trade and Politics on the Gold Coast 1600-1720* (London: Oxford University Press).
- Dapper, Olfert
1676 *Naukeurige Beschrijvinge der Afrikaensche Gewsten* (Amsterdam: Second Edition).
- Davies, Glyn
2002 *History of Money: From Ancient Times to the Present Day* (Cardiff: University of Wales Press).
- Davies, K. G.
1974 *The North Atlantic World in the Seventeenth Century* (St. Paul: University of Minnesota).

1999 *The Royal African Company* (London: Routledge).
- Davis, Ralph
1975 *English Merchant Shipping and Anglo-Dutch Rivalry in the Seventeenth Century* (London: Her Majesty's Stationery Office).
- Day, Joan
1973 *Bristol Brass: A History of the Industry*. Latimer Trend, Plymouth.

1990 "Brass and Zinc in Europe from the Middle Ages until the 19th Century" in P. T. Craddock (ed.) *2000 Years of Zinc and Brass* (British Museum Occasional Paper No. 50): 123-150.

1991 Copper, Zinc and Brass Production. In *Industrial Revolution in Metals*, edited by Joan Day and R. F. Tylecote, pp. 131-199. Institute of Metals, London.

Deagan, Kathleen

1987 *Artifacts of the Spanish Colonies of Florida and the Caribbean, 1500-1800* (Washington: Smithsonian Institution Press).

1988 "Neither History nor Prehistory: The Questions that Count in Historical Archaeology" *Historical Archaeology* 22, No. 1: 7-12.

DeCorse, Christopher R.

1980 "An Archaeological Study of Protohistoric Defensive Sites in Sierra Leone" *Nyame Akuma* 17: 48-53.

1987 "Excavations at Elmina, Ghana" *Nyame Akuma* 28: 15-18.

1989a *An Archaeological Study of Elmina, Ghana: Trade and Culture Change on the Gold Coast Between the Fifteenth and Nineteenth Centuries* (Ph.D. Dissertation, Department of Anthropology, University of California, Los Angeles).

1989b "Beads as Chronological Indicator in West African Archaeology: A Reexamination" *Beads: Journal of the Society of Bead Researchers* 1:41-53).

1992 "Culture Contact, Continuity and Change on the Gold Coast, 1400-1900" *African Archaeological Review* 10 (1992) 163-196.

1993 "The Danes on the Gold Coast: Culture Change and the European Presence," *African Archaeological Review* 11: 149-173.

1996 "Documents, Oral Histories, and the Material Record: Historical Archaeology in West Africa" *World Archaeological Bulletin* 7: 40-50.

1997 "Western African Historical Archaeology" in J. Vogel (ed.) *Encyclopedia of Precolonial Africa: Archaeology, History, Language, Cultures, and Environments* (Walnut Creek, CA; Altimira Press) 545-549.

1998a "African Historical Archaeology: Coastal Ghana" *Society for Historical Archaeology Newsletter* 32(4): 28-29.

1998b "Culture Contact and Change in West Africa" in James Cusick (ed.) *Studies in Culture Contact* (Carbondale: Southern Illinois University Press) 358-377.

2001 *An Archaeology of Elmina: Africans and Europeans on the Gold Coast, 1400-1900* (Washington: Smithsonian Institute Press).

2005 "Coastal Ghana in the first and second millennia AD: Change in Settlement Patterns, Subsistence and Technology" *Journal des Africanistes* 75.2: 43-52.

2008 “Varied Pasts: History, Oral Tradition and Archaeology on the Mina Coast” in James Brooks, Christopher R. DeCorse and John Walton (eds) *Small Worlds: Method, Meaning and Narrative in Microhistory* (Santa Fe: School for Advanced Research): 77-93.

2010 “Early Trade Posts and Forts of West Africa” in eric Klingelhofer (ed.) *First Forts: Essays on the Archaeology of Proto-colonial Fortifications* (Leiden: Brill), pp. 209-234.

n.d. *Tools of Empire: Trade, Resources and the British Forts of West Africa*

DeCorse, Christopher R., Edward Carr, Gérard Chouin, Gregory Cook, Sam Spiers
2000 “Central Region Project, Coastal Ghana” *Nyame Akuma* 53: 6-11.

DeCorse, Christopher R., F.G. Richard and I. Thiaw
2003 “Toward a Systematic Bead Description System: A View from the Lower Falemme, Senegal” *Journal of African Archaeology* 1(1): 77-110.

DeCorse, Christopher R., Greg Cook, Rachel Horlings, Andrew Pietruszka and Samuel Spiers
2009 “Transformation in the Era of the Atlantic World: the Central Region Project, Coastal Ghana 2007-2008” *Nyame Akuma* 72: 85-93.

DeCorse, Christopher R. and Samuel Spiers
2009 “A Tale of Two Polities: Socio-political Transformations on the Gold Coast in the Atlantic World”. *Australian Historical Archaeology* 27: 29-42.

de Marees, Pieter
1987 *Description and Historical Account off the Gold Kingdom of Guinea (1602)*
Translated and annotated by A. van Dantzig and A. Jones (Oxford: Oxford University Press).

de Oliveira Marques, A. H.
1972 *History of Portugal* (New York: Columbia University Press).

Delino-Musgrave, Virginia
2006 *Maritime Archaeology and Social Relations: British Action in the Southern Hemisphere* (New York: Springer).

de Vries, Jan and Ad van der Woude
1997 *The First Modern Economy: Success, Failure and Perserverance of the Dutch Economy, 1500-1815* (Cambridge: Cambridge University Press).

den Heijer, Henk

2003 "The Dutch West India Company, 1621-1791" in Johannes Postma and Victor Enthoven (eds.) *Riches from Atlantic Commerce: Dutch Transatlantic Trade and Shipping, 1585-1817*, pp. 77-112 (Leiden: Brill).

Dickson, K. B.

1965 "Evolution of Seaports in Ghana: 1800-1928" *Annals of the Association of American Geographers* 55, no. 1: 98-111.

Diffie, B. and G. Winius

1977 *Foundations of the Portuguese Empire, 1415-1580* (Minneapolis: University of Minnesota Press).

Donnan, Elizabeth

1965 *Documents Illustrative of the History of the Slave Trade to America* (New York: Octagon Books, Inc.).

Douglas, Mary

1967 "Primitive rationing: a study in controlled exchange" in Raymond Firth (ed.) *Themes in Economic Anthropology* (London: Tavistock) 119-147.

Douglas, Mary and Baron Isherwood

1981 *The World of Goods* (New York: Basic Books).

Drake, B. K.

1976 "Continuity and Flexibility in Liverpool's Trade with Africa and the Caribbean" *Business History* 18: 85-97.

Dubbe, B.

1978 *Tin en tinnegieters in Nederland*. Tijdstroom, Lochem.

Dumbrell, Roger

1983 *Understanding Antique Wine Bottles* (Suffolk: Antique Collector's Club).

Egerton, Douglas

2007 *The Atlantic World: A History, 1400-1888* (New York: Harlan Davidson).

Elbl, Ivana

1986 *The Portuguese Trade with West Africa: 1440-1521* (Ph.D.Dissertation, University of Toronto).

1997 "The Volume of the Early Atlantic Slave Trade, 1450-1521" *Journal of African History* 38(1): 31-75.

Elbl, Martin

1994 "The Caravel and the Galleon" in R. Gardiner (ed.) *Cogs, Caravels and Galleons: the Sailing Ship, 1000-1650* (London: Conway Maritime Press).

Elder, Melinda

1991 *The Slave Trade and the Economic Development of 18th Century Lancaster* (Halifax: Keele University Press).

Ellis, A. B.

1893 *A History of the Gold Coast of West Africa* (London: Chapman and Hall: republished 1969 in New York by Negro Universities Press).

Eltis, David

1977 "The Export of Slaves from Africa, 1821-1843" *The Journal of Economic History* 37, no. 2, p. 409-433.

1999 "Atlantic History in Global Perspective" *Itinerario* 23, no. 2, p. 141-161.

2000 *The Rise of African Slavery in the Americas* (Cambridge: Cambridge University Press).

2001 "The Volume and Structure of the Transatlantic Slave Trade: A Reassessment" *The William and Mary Quarterly* 58" 17-46.

Eltis, David, Stephen Behrendt, David Richardson, Herbert Klein

1999 *The Trans-Atlantic Slave Trade: A Database on CD-ROM* (Cambridge: Cambridge University Press).

Eltis, David and L. Jennings

1988 "Trade Between Western Africa and the Atlantic World in the Pre-Colonial Era" *American Historical Review* 93: 936-959.

Eltis, David, Paul Lovejoy and David Richardson

1999 "Slave Trading Ports: Towards an Atlantic-Wide Perspective, 1676-1832" in Robin Law and Silke Strickrodt (eds.) *Ports of the Slave Trade (Bights of Benin and Biafra)* (Centre of Commonwealth Studies, University of Stirling): 12-34.

Eltis, David and David Richardson (eds.)

1997 *Routes to Slavery: Direction, Ethnicity and Mortality in the Atlantic Slave Trade* (Portland: Frank Cass).

Enright, Jeffrey and Eugene Foster

2001 *Historical and Remote-Sensing Investigations for the Proposed South Carolina Highway 274 Bridge Expansion Area Across Big Allison Creek, Lake Wylie, York County, South Carolina* (Prepared for the South Carolina Department of Transportation, PBS&J Document 010283).

Enthoven, Victor

2003 “Early Dutch Expansion in the Atlantic Region” in Johannes Postma and Victor Enthoven (eds.) *Riches from Atlantic Commerce: Dutch Transatlantic Trade and Shipping, 1585-1817*, pp. 17-48 (Leiden: Brill).

Fairbanks, Charles

1972 “The Cultural Significance of Spanish Ceramics”, in I. Quimby (ed.) *Ceramics in America* (Charlottesville: University of Virginia Press), pp. 141-174.

Falconer, William

1780 *An Universal Dictionary of the Marine* (London: T. Cadell).

Falola, Toyin and Kevin Roberts (eds.)

2008 *The Atlantic World: 1450-2000* (Bloomington: Indiana University Press).

Feinberg, Harvey

1969 *Elmina, Ghana: A History of its Development and Relationship with the Dutch in the Eighteenth Century* (Ph.D. Dissertation, Boston University).

1989 *Africans and Europeans in West Africa: Elminans and Dutchmen on the Gold Coast During the Eighteenth Century* (Philadelphia: The American Philosophical Society).

Fernandez, Manoel

1995 *Livro de traças de carpintaria* (1616) transcription and translation into English (Lisboa: Academia de Marinha).

Fernández-Armesto, Felipe

2006 *Pathfinders: A Global History of Exploration* (New York: W. W. Norton & Co., Inc.).

Ferreiro, Larrie D.

2010 *Ships and Science: The Birth of Naval Architecture in the Scientific Revolution, 1600-1800* (Cambridge: the MIT Press).

Fish, John and H. Arnold Carr

1990 *Sound Underwater Images: A Guide to the Generation and Interpretation of Side Scan Sonar Data* (Orleans, MA: Lower Cape Publishing).

Flannery, Kent

1976 *The Early Mesoamerican Village* (Boston: Academic Press, Inc.).

Flatman, Joe

2003 “Cultural Biographies, Cognitive Landscapes and Dirty Old Bits of Boat: ‘Theory’ in Maritime Archaeology” *The International Journal of Nautical Archaeology* 32.2: 143-157.

Florida Museum of Natural History Digital Type Collection

http://www.flmnh.ufl.edu/histarch/gallery_types/, accessed 1/31/2011.

Franklin, M. and L. Mckee

2004 "African Diaspora Archaeologies: Present Insights and Expanding Discourses" *Historical Archaeology* 38(1):1-9.

French, Charles

2003 *Geoarchaeology in Action: Studies in Soil Micromorphology and Landscape Evolution* (London: Routledge).

Fyfe, C. (ed.)

2000 *Anna Maria Falconbridge: Narrative of Two Voyages to the River Sierra Leone During the Years 1791-1793. With an Account of the Slave Trade on the Coast of Africa by Alexander Falconbridge* (Liverpool: Liverpool University Press).

Garland, C. and H. S. Klein

1985 "The Allotment of Space for Slaves Aboard Eighteenth-Century British Slave Ships" *William and Mary Quarterly* 42: 238-248.

Garrison, Ervin

1998 "A Diachronic Study of Some Historical and Natural Factors Linked to Shipwreck Patterns in the Northern Gulf of Mexico" in L. Babits and H. Van Tilburg (eds.) *Maritime Archaeology: A Reader of Substantive and Theoretical Contributions* (New York: Plenum Press).

Gawronski, Jerzy, Bas Kist, and Odilia Stokvis-van Boetzelaer

1992 *Hollandia Compendium: A Contribution to the History, Archaeology, Classification and Lexicography of a 150 ft. Dutch East Indiaman* (Amsterdam: Elsevier Science).

Gearhart, Robert

2011 "Archaeological Interpretation of Marine Magnetic Data" in Catsambis, Alexis, Ben Ford and Donny Hamilton (eds.) *The Oxford Handbook of Maritime Archaeology* (Oxford: Oxford University Press): 90-113.

Gibbons, David and Jonathan Adams

2001 "Shipwrecks and Maritime Archaeology" *World Archaeology* 32: 279-291.

Gilchrest, Roberta

2005 "Scales and Voices in World Historical Archaeology" *World Archaeology* 37 (3): 329-336.

Gilroy, Paul

1993 *The Black Atlantic: Double Consciousness and Modernity* (Cambridge: Harvard University Press).

Ginzburg, Carlo

1993 "Microhistory: Two or Three Things that I know About it" *Critical Inquiry* 20(1): 10-35.

Goggin, John

1960 *The Spanish Olive Jar: An Introductory Study* (New Haven: Yale University Publications in Anthropology no. 62, Yale University Press).

1964 *Indian and Spanish Selected Writings* (Coral Gables: University of Miami Press).

Goucher, Candice

1981 "Iron is Iron 'til it Rusts: Trade and Ecology in the Decline of West African Iron-working" *Journal of African History* 22, no. 2: 179-189.

Gould, Richard

1983 *Shipwreck Anthropology* (Santa Fe: University of New Mexico).

2000 *Archaeology and the Social History of Ships* (Cambridge: Cambridge University Press).

2007 *Disaster Archaeology* (Salt Lake City: University of Utah Press).

Green, J.

1977 *The Loss of the Verenigde Oostindische Compagnie Jacht Vergulde Draeck. Western Australia 1656: An Historical Background and Excavation Report with an Appendix on Similar Loss of the Fluit Lastdrager*. British Archaeological Reports Supplementary Series 39 (London).

1987 "Remote Sensing in Shipwreck Archaeology: Locating the Mahogany Ship" in B. Potter (ed.) *The Mahogany Ship Relic or Legend? Proceeding of the 2nd Australian Symposium on the Mahogany Ship* (Victoria: The Mahogany Ship Committee and Warrambool Press).

1989 *The Loss of the Verenigde Oostindische Compagnie retourschip Batavia, Western Australia 1629 an Excavation Report and Catalogue of Artifacts*. BAR International Series 489. British Archaeological Reports, Oxford.

2004 *Maritime Archaeology: a Technical Handbook* (New York: Elsevier Academic Press).

Greenhill, Basil

1993 "Steam Before the Screw" in Robert Gardiner and Basil Greenhill (eds.) *The Advent of Steam: The Merchant Steamship Before 1900* (Annapolis: Naval Institute Press).

Gregory, Chris

1982 *Gifts and Commodities* (London: Academic Press).

Guerout, Max

1996 "Prospections Archéologiques Sous-Marines Aux Abords de L'île de Gorée (Sénégal) *West African Journal of Archaeology* 26, no. 2: 99-121.

Guinote, Paulo, Frutuoso, Eduardo, and Lopes, Afonso

1998 *Naufragios e Outras Perdas da Carreira da Índia* (Lisboa: Ed. Grupo de Trabalho do Ministerio da Educacao para as Comemoracoes dos Descobrimentos).

Hair, Paul

1967 "Ethnolinguistic Continuity on the Guinea Coast" *Journal of African History* 8: 247-268.

1994a "Early Sources on Guinea" *History in Africa* 21: 87-126.

1994b *The Founding of the Castelo de São Jorge da Mina: An Analysis of the Sources* (Madison: University of Wisconsin).

Hakluyt, Richard

1905 *The Principal Navigations, Voyages, Traffiques, and Discoveries of the English Nation* (Glasgow: James MacLehose and sons).

Hall, E.

1966 "The Use of the Proton Magnetometer in Underwater Archaeology" *Archaeometry* 9: 32-44.

Hall, Gwendolyn

2004 "African Ethnicities and the Meanings of 'Mina'" in Paul Lovejoy and David Trotman (eds.) *Trans-Atlantic Dimensions of Ethnicity in the African Diaspora* (London: Continuum International Publishing Group): 65-81.

Hall, Jerome

1996 *A Seventeenth-Century Northern European Merchant Shipwreck in Monte Cristi Bay, Dominican Republic* (Ph.D. Dissertation, Texas A&M University).

Hamann, Nicole

2007 *Forging an Atlantic World: An Historical Archaeological Investigation of African-European Trade in Metalwares*. M.A. Thesis. Department of Anthropology, University of West Florida, Pensacola.

Hamilton, Donny

1996 *Basic Methods of Conserving Underwater Archaeological Material Culture* (Washington D.C.: U.S. Department of Defense, Legacy Resource Management Program).

Headrick, Daniel

2010 *Power Over Peoples: Technology, Environments and Western Imperialism, 1400 to the Present* (Princeton: Princeton University Press).

Henige, David

1977 "John Kabes of Komenda: An Early African Entrepreneur and State Builder" *Journal of African History* 18: 1-19.

Herbert, Eugenia

1984 *Red Gold of Africa: Copper in Precolonial History and Culture* (Madison: University of Wisconsin Press).

Herry, Nolwenn

2004 "Report on the Finds from the Saint-Quau-Portrieux Wreck, France" *The International Journal of Nautical Archaeology* 33.1: 96-105.

Hester, Thomas, Harry Shafer and Kenneth Feder

1997 *Field Methods in Archaeology* (Toronto: Mayfield Publishing Company).

Hogendorn, Jan and Marion Johnson

1986 *The Shell Money of the Slave Trade* (Cambridge: Cambridge University Press).

Hopkins, A.G.

1973 *An Economic History of West Africa* (New York: Columbia University Press).

Hopwood, Lisa

2009 *Glass Trade Beads from an Elmina Shipwreck: More Than Just Pretty Trinkets* M.A. Thesis. Department of Anthropology, University of West Florida, Pensacola.

Horlings, Rachel

2011 *Of His Bones are Coral Made: Submerged Cultural Resources, Site Formation Processes, and Multiple Scales of Interpretation in Coastal Ghana* (Ph.D. Dissertation, Department of Anthropology, Syracuse University).

Hornsby, P.R. and R.G. Hornsby

1983 *Pewter of the Western World, 1600-1850* (New York: Schiffer).

Hull, Charles and Jack Murrell

1984 *The Techniques of Pewtersmithing* (London: B.T. Batsford).

Hunter, James

1994 "Maritime Culture: Notes from the Land" *International Journal of Nautical Archaeology* 23.4: 261-264.

Hutchinson, William

1970 *A Treatise on Naval Architecture* (London: Conway Maritime Press).

Inikori, Joseph

1982 *Forced Migration: The Impact of the Export Slave Trade on African Societies* (New York: Hutchinson).

1996 "Measuring the unmeasured hazards of the Atlantic slave trade: documents relating to the British trade" *Revue Francais D'Histoire D'Outre-Mer*; 53-92.

Isherwood, Baron

1981 *The World of Goods: Toward an Anthropology of Consumption* (New York: Routledge).

Israel, J.I.

1989 *Dutch Supremacy in World Trade, 1585-1740* (Oxford: Clarendon Press).

James, Stephen

1988 "A reassessment of the Chronological and Typological Framework of the Spanish Olive Jar" *Historical Archaeology* 22.1, pp. 43-66.

James, Stephen, Gregory Cook and Chuck Meide

2003 *Archaeological Data Recovery of the Iron-Hulled Vessel Manuela and Documentation of the Cristóbal Colón in the Entrance Channel to San Juan Harbor, San Juan, Puerto Rico* (Final Report: U.S. Army Corps of Engineers, Jacksonville District, Contract No. DACW 17-99-C-0060).

Jasinski, M.

1993 "The Maritime Cultural Landscape: An Archaeological Perspective" *Archaeologia Polski* 38: 7-21.

1999 "Maritime Archaeology and Underwater Cultural Heritage into the 21st Century: Proceedings of the 4th World Archaeology Conference, University of Cape Town, South Africa, <http://www.wac.uct.ac.za/wac4/symposia/papers/SO32jsk>.

Johansson, Sven-Olof

1967 *Nigerian Currencies: Manillas, Cowries and Others* (Skolgatan, Norrköping: Alfa-Tryck).

Johnson, Marion

1990 *Anglo-African Trade in the Eighteenth Century: English Statistics on African Trade, 1699-1808* (Leiden: Intercontinenta No. 15).

Jones, Adam

1983 *German Sources for West African History, 1599-1669* (Wiesbaden: Franz Steiner Verlag GMBH).

1986 "Semper Aliquid Veteris: Printed Sources for the History of the Ivory and Gold Coasts, 1500-1750," *Journal of African History* 27, 215-235.

1994 "Drink Deep, or Taste Not: Thoughts on the Use of Early European Records in the Study of African Material Culture," Paper presented at the Workshop on Resources and Documentation in the Study of African Material Culture, Bellagio, May 25-27.

1995 *West Africa in the Mid-Seventeenth Century: An Anonymous Dutch Manuscript* (Emory University: African Studies Association Press).

Jones, Olive and Catherine Sullivan

1979 *The Parks Canada Glass Glossary* (Ottawa: Parks Canada).

Karklins, K.

1974 "Seventeenth Century Dutch Beads" *Historical Archaeology* 8: 64-82.

1985 *Glass Beads* (Ottawa: Parks Canada Studies in Archaeology).

1991 "Beads from the Mid 18th-century Manilla Wreck, Bermuda" *The International Journal of Nautical Archaeology* 20.1: 33-42.

Kelly, Kenneth

1997a "The Archaeology of African-European Interaction: Investigating the Social Roles of Trade, Traders, and the Use of Space in the Seventeenth and Eighteenth-Century Hueda Kingdom, Republic of Benin" *World Archaeology* 28: 351-369.

1997b "Using Historically Informed Archaeology: Seventeenth and Eighteenth Century Hueda/European Interaction on the Coast of Benin" *Journal of Archaeological Method and Theory* 4 (3/4): 353-366.

2001 "Change and Continuity in Coastal Bénin" in Christopher R. DeCorse (ed.) *West Africa During the Atlantic Slave Trade: Archaeological Perspectives* (London: Leicester University Press): 81-100.

Kenyon, W. A.

1982 *The Grimsby Site: A Historic Neutral Cemetery* (Toronto: Royal Ontario Museum).

Kidd, K.E. and M.E. Kidd

1983 "A Classification System for Glass Beads for the Use of Field Archaeologists" in C.F. Hayes III (ed.) *Proceedings of the 1982 Glass Trade Bead Conference, Research Records 16* (Rochester: Rochester Museum and Science Center): 219-257.

Kimble, George (ed.)

1967 *Esmeraldo de Situ Orbis* (Weisbaden: Kraus Reprint Limited).

Klein, Martin

1998 "New Capabilities for Side-Scan Sonar" in L. Babits and H. Van Tilburg (eds.) *Maritime Archaeology: A Reader of Substantive and Theoretical Contributions* (New York: Plenum Press): 357-362.

Laird, MacGregor and R.A.K. Oldfield

1837 *Narrative of an Expedition into the Interior of Africa, by the Niger River, in the Steam Vessels Quorra and Alburkah, in 1832, 1833 and 1834* (London: 1837).

Kopytoff, Igor

1986 "The cultural biography of things: commoditization as process" in Arjun Appadruai (ed.) *The Social Life of Things: Commodities in Cultural Perspective* (Cambridge: Cambridge University Press) 64-94.

Lane, Frederic

1964 "Tonnages, Medieval and Modern" *The Economic History Review* XVII, no. 2: 213-233.

László, Veres and Richard Woodman

1999 *The Story of Sail* (Annapolis: Naval Institute Press).

Laurie, James and Adriano Balbi

1842 *System of Universal Geography: Founded on the Works of Malte-Brun and Balbi* (London: Longman, Brown, Green and Longmans).

Lavanha, João Baptista

1996 *Livro primeiro de architectura naval*, transcription and translation into English (Lisboa: Academia de Marinha).

Lavery Brian

1981 *Deane's Doctrine of Naval Architecture, 1670* (Greenwich: Conway Maritime Press).

1987 *The Arming and Fitting of English Ships of War, 1600-1815* (Annapolis: Naval Institute Press).

2004 *Ship: The Epic Story of the Maritime Adventure* (New York: Smithsonian).

Law, Robin

1995 *From Slave Trade to 'Legitimate Commerce': The Commercial Transition in Nineteenth-Century West Africa* (New York: Cambridge University Press).

Lawrence, A. W.

1963 *Trade Castles and Forts of West Africa* (London: Jonathan Cape).

Lenihan, Daniel

1983 "Rethinking Shipwreck Archaeology: A History of Ideas and Considerations for New Directions" in Richard Gould (ed.) *Shipwreck Anthropology* (Santa Fe: University of New Mexico): 37-64.

Levtzion, Nehemia and J. F. P. Hopkins (eds).

1981 *Corpus of Early Arabic Sources for West African History* (New York: Cambridge University Press).

L'Hour, M., L. Long and E. Reith

1989 *Le Mauritius: La Mémoire Engloutie* (Paris: Casterman).

1990 "The Wreck of an 'Experimental' Ship of the Oost-Indische Companie: The Mauritius (1609). *International Journal of Nautical Archaeology and Underwater Exploration* 19: 63-73.

Lister, Florence and Robert Lister

1976 *A Descriptive Dictionary for 500 Years of Spanish-Tradition Ceramics, 13th Through 18th Centuries* (The Society for Historical Archaeology Special Publication No. 1).

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

Little, Barbara

1994 "People with History: an Update on Historical Archaeology in the United States" *Journal of Archaeological Method and Theory* 1, No. 1: 5-40.

Little, Barbara and Paul Shackel

1989 "Scales of Historical Archaeology: An Archaeology of Colonial Anglo-America" *Antiquity* 63: 495-509.

Lorenz, Felix and Alex Hubert

1993 *A Guide to Worldwide Cowries* (Wiesbaden: Verlag Christa Hemmen).

Lovejoy, Paul

1989 "The Impact of the Atlantic Slave Trade on Africa: A Review of the Literature" *Journal of African History* 30: 365-394.

2000 *Transformations in Slavery: A History of Slavery in Africa* (Cambridge: Cambridge University Press).

Lovejoy, Paul and David Richardson

2001 "The Business of Slaving: Pawnship in Western Africa, c. 1600-1810" *Journal of African History* 42: 67-89.

2004 "'This Horrid Hole': Royal Authority, Commerce and Credit at Bonny, 1690-1840" *Journal of African History* 45: 363-392.

Lusardi, Wayne R.

2000 "The Beaufort Inlet Shipwreck Project" *International Journal of Nautical Archaeology* 29.1: 57-68.

Lynn, Martin

1989 "From Sail to Steam: The Impact of the Steamship Services on the British Palm Oil Trade with West Africa, 1850-1890" *Journal of African History* 30(2): 227-245.

1997 *Commerce and Economic Change in West Africa: The Palm Oil Trade in the Nineteenth Century* (Cambridge: Cambridge University Press).

Maarveld, T.

1995 "Some Thoughts on Boat and Ship Finds as Indicative of Cultural Traditions" *International Journal of Nautical Archaeology* 24.1: 3-7.

MacGregor, David

1985 *Merchant Sailing Ships: 1775-1815, Sovereignty of Sail* (Annapolis: Naval Institute Press).

Maggs, Timothy

1984 "The Great Galleon *São João*: Remains from a Mid-Sixteenth Century Portuguese Wreck on the Podoland Coast" *Annals Natal Museum* 26.1: 173-186.

Maggs, Timothy and Chris Auret

1982 "The Great Ship *S. Bento*: Remains from a Mid-Sixteenth Century Portuguese Wreck on the Podoland Coast" *Annals Natal Museum* 25.1: 1-39.

Makepeace, Margaret

1991 *Trade on the Guinea Coast 1657-1666: the Correspondence of the English East India Company* (Madison: University of Wisconsin).

Malinowski, Bronislaw

1922 *Argonauts of the Western Pacific* (London: Routledge).

Manning, Patrick

1990 *Slavery and African Life: Occidental, Oriental and African Slave Trades* (Cambridge: Cambridge University Press).

Marken, Mitchell

1994 *Pottery from Spanish Shipwrecks 1500-1800* (Gainesville: University Press of Florida).

Martin, Colin

1975 *Full Fathom Five: The Wrecks of the Spanish Armada* (New York: Viking Press).

1979 "Spanish Armada Pottery" *International Journal of Nautical Archaeology and Underwater Exploration* 8 (4): 279-302.

Marx, Karl

1971 *Capital: Vol. I. A Critical Analysis of Capitalist Production* (Moscow: Progress Publishers). Original publication 1887.

Masselman, George

1966 Book Review, "The Dutch Seaborne Empire" *The Journal of Economic History* 26(3): 381-382.

Massing, Andreas

2009 "Mapping the Malaguest Coast: A History of the Lower Guinea Coast, 1460-1510 Through Portuguese Maps and Accounts" *History in Africa* 36: 331-365.

Mathews, Gordon

2000 *Global Culture/Individual Identity: Searching for Home in the Cultural Supermarket* (New York: Routledge).

Mauss, Marcel

1976 *The Gift* (New York: Norton).

Mazel, Charles

1986 *Side Scan Sonar Training Manual* (Salem: Klein and Associates, Inc.).

McBride, R. Larn and R. Davis

1972 "A Mid-17th Century Merchant Ship Found Near Mullion Cove, Cornwall" *International Journal of Nautical Archaeology* 1.1, 135-142.

McErlean, T., R. McConkey and W. Forsythe

2002 *Stragford Lough: An Archaeological Survey of the Maritime Cultural Landscape* (Belfast: Blackstaff).

McEwan, W. A. and A. H. Lewis

1953 *Encyclopedia of Nautical Knowledge* (London: Cambridge Maritime Press).

McGhee, Fred

2010 "Maritime Archaeology and the African Diaspora" in Akinwumi Ogundiran and Toyin Falola (eds.) *Archaeology of Atlantic Africa and the African Diaspora* ((Bloomington: Indiana University Press): 384-394.

McNulty, Robert

1971 "Common Beverage Bottles: Their Production, Use and Forms in Seventeenth- and Eighteenth-Century Netherlands: Part I" *Journal of Glass Studies* 13: 91-119.

1972 "Common Beverage Bottles: Their Production, Use and Forms in Seventeenth- and Eighteenth-Century Netherlands: Part III" *Journal of Glass Studies* 14: 141-148.

Meinig, D.W.

1988 *The Shaping of America: A Geographical Perspective on 500 Years of History* (New Haven: Yale University Press).

Mendonça, Henrique Lopes de

1892 *Estudos Sobre Navios Portuguezes nos Séculos SV e SVI* (Lisboa: Academia Real das ciencias).

Milo, T. H.

1961 "Portuguese Trade and Shipping with the Netherlands After the Discoveries" *Congresso Internacional de Historia dos Descobrimentos* 3: 423-432.

Minchinton, Walter

1990 "Corporate Ship Operation from the Late Sixteenth to the Late Eighteenth Century" *International Journal of Maritime History* II, No. 1: 117-154.

Mintz, Sidney

1977 "The So-Called World System: Local Initiative and Local Response" *Dialectical Anthropology* 2: 253-270.

Monod, T.

1969 "Le 'Ma'den Ijafen,' une épave caravanière ancienne dans la Majâ al-Kourbrâ. In Actes du premier colloque internationale d'archéologie africaine (Fort-Lamy: Institut National Tchadien pour les Sciences Humaines) 115-124.

Monroe, J. Cameron

2010 "Dahomey and the Atlantic Slave Trade: Archaeology and Political Order on the Bight of Benin" in Akinwumi Ogundiran and Toyin Falola (eds.) *Archaeology of Atlantic Africa and the African Diaspora* (Bloomington: Indiana University Press): 100-121.

- Moore, Charles and Andrew Mason
2012 "Demonstration Survey of Prehistoric Reef-Net Sites with Sidescan Sonar, Near Becher Bay, British Columbia, Canada" *International Journal of Nautical Archaeology* 41.1: 179-189.
- Moore, David and Corey Malcom
2008 "Seventeenth-Century Vehicle of the Middle Passage: Archaeological and Historical Investigations on the *Henrietta Marie* Shipwreck Site" *International Journal of Historical Archaeology* 12: 20-38.
- Morison, Samuel Eliot
1942 *Admiral of the Ocean Sea: A Life of Christopher Columbus* (Boston: Little, Brown and Company).

1974 *The European Discovery of America: the Southern Voyages* (New York: Oxford University Press).
- Muckelroy, Keith
1978 *Maritime Archaeology* (Cambridge: Cambridge University Press).
- Muir, Edward and Guido Ruggiero (eds.)
1991 *Microhistory and the Lost Peoples of Europe*. Eren Branch, trans. (Baltimore: Johns Hopkins University Press).
- Munsey, Cecil
1970 *The Illustrated Guide to Collecting Bottles* (New York: Hawthorn Books, Inc.).
- Murphy, Larry
1990 *8SL17: Natural Site Formation Processes of a Multiple-Component Underwater Site in Florida* (National Park Service: Submerged Resources Center Professional Report No. 12).
- Murphy, Larry and Allen Saltus
1998 "Considerations of Remote Sensing Limitations to Submerged Historical Site Survey" in L. Babits and H. Van Tilburg (eds.) *Maritime Archaeology: A Reader of Substantive and Theoretical Contributions* (New York: Plenum Press): 357-362.
- Myhre, B.
1985 "Boathouses as Indicators of Political Organization" *Norwegian Archaeological Review* 18.1: 36-59.
- Noel Hume, Ivor
1980 *A Guide to Artifacts of Colonial America* (New York: Alfred A. Knopf).

North, N. A.

1987 "Conservation of Metals" in Colin Pearson (ed.) *Conservation of Marine Archaeological Objects* (London: Butterworths): 207-252.

Northrup, David

2002 *Africa's Discovery of Europe* (Oxford: Oxford University Press).

Ogundiran, Akinwumi

2010 "Living in the Shadow of the Atlantic World: History and Material Life in a Yoruba-Edo Hinterland, ca. 1600-1750" in Akinwumi Ogundiran and Toyin Falola (eds.) *Archaeology of Atlantic Africa and the African Diaspora* (Bloomington: Indiana University Press): 77-99.

Ogundiran, Akinwumi and Toyin Falola

2010 "Pathways in the Archaeology of Transatlantic Africa" in Akinwumi Ogundiran and Toyin Falola (eds.) *Archaeology of Atlantic Africa and the African Diaspora* (Bloomington: Indiana University Press): 3-45.

Oliveira, F.

1580 "Livro da Fábrica das Naos," in H. de Mendonca (ed.) 1898 *O padre Fernando Oliveira ea sua obra Nautica, Memoria, Comprehendendo um esudo Biographico sobre o Afamdo Grammatic e Nautographo, e Aprimeira Reproducao Typographica do seu Tratado Inedito Livro da Fabrica das Naos...* (Lisbon: Academia Real das Sciencias).

Orser, Charles

1996 *A Historical Archaeology of the Modern World* (New York: Plenum Press).

Paine, Ralph D. (ed.)

1907 *The Romance of an Old-Time Shipmaster* (New York: The Outing Publishing Company).

Palacio, Diego Garcia de

1587 *Instrucion Nautica para el Buen Uso de las Naos, su Traça, y Gobierno Conforme á la Altura de Mexico* (1587), transcribed by Cesário Fernandez Duro 1996 *Disquisiones Nauticas* (Madrid: Instituto de Historia y Cultura Naval).

Parker, A.J.

1981 "Stratification and Contamination in Ancient Mediterranean Shipwrecks" *International Journal of Nautical Archaeology* 10.4: 309-335.

Parry, John

1963 *The Age of Reconnaissance* (London: Weidenfield and Nicholson).

1981 *The Discovery of the Sea* (Berkeley: University of California Press).

Parthesius, Robert

2010 *Dutch Ships in Tropical Waters: The Development of the Dutch East India Company (VOC) Shipping Network in Asia, 1595-1660* (Amsterdam: Amsterdam University Press).

Pereira, Duarte Pacheco

1967 *Esmeraldo de Situ Orbis*. George H. Kimble, trans. (Nendelin, Liechtenstein: Kraus Reprint).

Phillips, Carla Rahn

1986 *Six Galleons for the King of Spain: Imperial Defense in the Early Seventeenth Century* (Baltimore: Johns Hopkins University Press).

1987 "Spanish Ship Measurements Reconsidered: The *Instrucción Náutica* of Diego García de Palacio (1587)" *The Mariner's Mirror* 73(3): 293-296.

Piercy, Robin

1977 "Mombasa Wreck Excavation: Preliminary Report" *International Journal of Nautical Archaeology* 6(4): 331-347.

1978 "Mombasa Wreck Excavation: Second Preliminary Report" *International Journal of Nautical Archaeology* 7(4): 301-319.

1979 "Mombasa Wreck Excavation: Third Preliminary Report" *International Journal of Nautical Archaeology* 8(4): 303-309.

1980 "Mombasa Wreck Excavation: Fourth Preliminary Report" *International Journal of Nautical Archaeology* 10(2): 109-118.

Pietruszka, Andrew

2011 *Artifacts of Exchange: A Multiscalar Approach to Maritime Archaeology at Elmina, Ghana* (Ph.D. Dissertation, Department of Anthropology, Syracuse University).

Plimpton, George

1930 "The Journal of a West African Slaver, 1789-1792" *Proceedings of the American Antiquarian Society*.

Pomeranz, Kenneth and Steven Topik

1999 *The World that Trade Created: Society, Culture and the World Economy, 1400-the Present* (London: M.E. Sharpe).

Porter, Robert

1974 *European Activity on the Gold Coast, 1620-1667*. Unpublished Ph.D. dissertation. Faculty of Arts, Pretoria, University of South Africa.

- Posnansky, Merrick and Christopher R. DeCorse
1986 "Historical Archaeology in Sub-Saharan Africa: A Review" *Historical Archaeology* 20 (1): 1-14.
- Postma, Johannes
1990 *The Dutch in the Atlantic Slave Trade, 1600-1815* (Cambridge: Cambridge University Press)
- 2003 "A Reassessment of the Dutch Atlantic Slave Trade" in Johannes Postma and Victor Enthoven (eds.) *Riches from Atlantic Commerce: Dutch Transatlantic Trade and Shipping, 1585-1817*, pp. 115-138 (Leiden: Brill).
- Pulak, Cemal and Donald A. Frey
1985 "The Search for a Bronze Age Shipwreck." *Archaeology* 38.4: 18-24.
- Prestage, E.
1933 *The Portuguese Pioneers* (London: Black).
- Rawley, James and Stephen Behrendt
2005 *The Transatlantic Slave Trade: A History* (Lincoln: University of Nebraska Press).
- Redman, Charles
1986 *Qsar-es-Seghir: An Archaeological View of Medieval Life* (New York: Academic Press Inc.).
- Rediker, Marcus
2007 *The Slave Ship: A Human History* (New York: Viking Penguin).
- Renault, G.
1956 *As Caravelas de Cristo* (Lisbon: Livraria Bertrand).
- Renfrew, Colin
1975 "Trade as Action at a Distance" in J. A. Sabloff and C. C. Lamberg-Karlovsky (eds.) *Ancient Civilizations and Trade* (Albuquerque: University of New Mexico press): 1-59.
- Renfrew, Colin and Paul Bahn
1991 *Archaeology: Theories, Methods and Practice* (New York: Thames and Hudson Ltd.).
- Reynolds, Edward
1974 *Trade and Economic Change on the Gold Coast, 1804-1874* (London: Longman).

2005 "Human Cargoes: Enslavement and the Middle Passage" in Anthony Tibbles (ed.) *Transatlantic Slavery: Against Human Dignity*. London: National Museums Liverpool: 25-30.

Rice, Prudence

1998 "Context of Contact and Change: Peripheries, Frontier and Boundaries" in James Cusick (ed.) *Studies in Culture Contact: Interaction, Culture Change and Archaeology* (Carbondale: Center for Archaeological Investigations).

Richardson, David

2005 "Liverpool and the English Slave Trade" in Anthony Tibbles (ed.) *Transatlantic Slavery: Against Human Dignity* (Liverpool: National Museums): 67-72.

Riland, John

1827 *Memoirs of a West-India Planter* (London: Hamilton, Adams & Co.).

Robinson, Wendy

1981 *First Aid for Marine Finds* (Greenwich: National Maritime Museum).

Rodgers, Bradley

2004 *The Archaeologist's Manual for Conservation* (New York: Plenum Publishers).

Rodney, Walter

1970 *A History of the Upper Guinea Coast, 1545-1800* (Oxford: Clarendon Press).

Rule, Margaret

1982 *The Mary Rose: The Excavation and Raising of Henry VIII's Flagship* (London: Conway Maritime Press).

Russell-Wood, A. J. R.

1978 "Iberian Expansion and the Issue of Black Slavery: Changing Portuguese Attitudes, 1440-1770" *The American Historical Review* 83 (1): 16-42.

1992 *A World on the Move: The Portuguese in Africa, Asia and America, 1415-1808* (New York: St. Martin's Press).

Ryder, Alan

1969 *Benin and the Europeans, 1485-1897* (London: Longmans).

Sella, Domenico

1977 "The World System and its Dangers" *Peasant Studies* 6: 29-32.

Semans, Scott

2008 www.coincoin.com

Shaughnessy, Carol

1995 "The Archaeology of the *Henrietta Marie*: A Conversation with David Moore" *A Slave Ship Speaks: The Wreck of the Henrietta Marie* (The Mel Fisher Maritime Heritage Society): 40-52.

Silva Marques, João Martins

1944 *Descobrimentos Portugueses: Documentos Para a sua História* (Lisboa: Instituto Para a Alta Cultura).

Singley, Katherine

1988 *The Conservation of Archaeological Artifacts from Freshwater Environments* (South Haven: Lake Michigan Maritime Museum).

Skowronek, Russell

1987 "Ceramics and Commerce: The 1554 Flota Revisited" *Historical Archaeology* 21(2): 101-111.

Skowronek, Russell and George Fischer

2009 *HMS Fowey, Lost and Found* (Gainesville: University Press of Florida).

Smith, B.S.

2002 "An Astrolabe from Passau Pau, Cape Verde Islands" *International Journal of Nautical Archaeology* 31.1: 99-107.

Smith, C.E. and C.V.H. Maxwell

2002 "A Bermuda Smuggling-Slave Trade: The 'Manilla Wreck' Opens Pandora's Box" *Slavery and Abolition* 23: 57-86.

Smith Robert

1984 "Fathoming Columbus' Caravels" *Américas* 35:5, 18-23.

1985 "The Highborn Key Wreck: Further Exploration of a 16th-Century Bahaman Shipwreck" *International Journal of Nautical Archaeology* 14, 63-72.

1993 *Vanguard of Empire: Ships of Exploration in the Age of Columbus* (New York: Oxford University Press).

Smith, Robert (translator)

1993 *Libro Segundo de los Gastos de las Armadas de las Yndias del ano de icccxcv anos en Adelante* (author unknown) 1498, trans. by R. Smith, 1993 *Vanguard of Empire: Ships of Exploration in the Age of Columbus* (New York: Oxford University Press).

Smith, Robert

1970 "The Canoe in West African History" *Journal of African History* XI, 4: 515-

533.

- Smith, Roger, John Bratten, Joe Cozzi and Keith Plaskett
 1998 *The Emanuel Point Ship: Archaeological Investigations, 1997-1998*
 (Tallahassee: Florida Department of State, Division of Historical Resources, Bureau
 of Archaeological Research).
- Spiers, Samuel
 2007 *The Eguafu Kingdom: Investigating Complexity in Southern Ghana* (Syracuse:
 Ph.D. Dissertation, Syracuse University).
- Spruyt-Ledeboer, Mieke
 1982 "18th Century Porcelain" in C.L. van der Pijl-Ketel (ed.) *The Ceramic Load of
 the Witte Leeuw (1613)*, pp. 250-260 (Amsterdam: Rijksmuseum).
- Stahl, Ann B.
 1999 "The Archaeology of Global Encounters Viewed from Banda, Ghana" *African
 Archaeological Review* 16(1): 5-81.
- 2001 *Making History in Banda: Anthropological Visions of Africa's Past* (New York:
 Cambridge University Press).
- Stammers, M. K.
 2005 "Guineamen: Some Technical Aspects of Slave Ships" in Anthony Tibbles (ed.)
Transatlantic Slavery: Against Human Dignity. London: National Museums
 Liverpool: 31-36.
- Staniforth, Mark
 2001 "The Archaeology of the Event: the Annales School and Maritime
 Archaeology" in Mark Staniforth (ed.) *Maritime Archaeology in Australia*
 (Blackwood: Southern Archaeology): 159-164.
- 2003a *Material Culture and Consumer Society: Dependent Colonies in Colonial
 Australia* (New York: Plenum Publishers).
- 2003b "Annales-Informed Approaches to the Archaeology of Colonial Australia"
Historical Archaeology 37: 102-113.
- Steffy, J. Richard
 1994 *Wooden Ship Building and the Interpretation of Shipwrecks* (College Station:
 Texas A&M University Press).
- Stewart, David
 2007 "Gravestones and Monuments in the Maritime Cultural Landscape: Research
 Potential and Preliminary Interpretations" *International Journal of Nautical
 Archaeology* 36.1: 112-124.

Stewart-Brown, R.

1932 *Liverpool Ships in the 18th Century* (Liverpool: University Press of Liverpool).

Stone, Lyle M.

1974 *Fort Michilimackinac, 1715-1781: An Archaeological Perspective on the Revolutionary Frontier* (East Lansing: Michigan State University Press).

Sundström, Lars

1974 *The Exchange Economy of Pre-Colonial Tropical Africa* (New York: St. Martin's Press).

Sutton, Mark and Robert Yohe II

2006 *Archaeology: The Science of the Human Past* (Boston: Pearson Education, Inc.).

Talbot, Percy

1926 *The Peoples of Southern Nigeria* vol. 3 (London).

Taylor, Walter

1948 *A Study of Archaeology* (Carbondale: University of Illinois Press).

Teixeira da Mota, A. and P. Hair

1988 *East of Mina: Afro-European Relations on the Gold Coast in the 1550s and the 1560s* (Madison: African Studies Program).

Thomas, Nicholas

1991 *Entangled Objects, Exchange, Material Culture and Colonialism in the Pacific*. Cambridge, Harvard University Press.

1992 "The Cultural Dynamics of Peripheral Exchange" in C. Humphrey and S. Hugh-Jones (eds.) *Barter, Exchange and Value: An Anthropological Approach* (Cambridge: Cambridge University Press).

Thornton, John

1996 *Africa and Africans in the Making of the Atlantic World, 1400-1680* (Cambridge: Cambridge University Press).

Throckmorton, Peter

1964 *The Lost Ships: An Adventure in Underwater Archaeology* (Boston and Toronto).

1970 *Shipwrecks and Archaeology: the Unharvested Sea* (London: Victor Gollancz).

1987 *The Sea Remembers: Shipwrecks and Archaeology* (New York: Weidenfeld & Nicholson).

- Tibbles, Anthony (ed.)
2005 *Transatlantic Slavery: Against Human Dignity* (Liverpool: National Museums).
- Tilleman, Erick
1994 *En Kort Og Enfoldig Beretning Om Det Landskab Guinea Og Dets Beskaffenhed (1697), A Short and Simple Account of the Country Guinea and its Nature*. Translated by Selena Axelrod Winsnes (Madison: African Studies Program, University of Wisconsin-Madison).
- Tomalin, D.J., P. Simpson and J.M. Bingeman
2000 "Excavation Versus Sustainability *In Situ*: A Conclusion on 25 Years of Archaeological Investigations at Goose Rock, a Designated Historic Wreck-site at the Needles, Isle of Wight, England" *International Journal of Nautical Archaeology* 29.1: 3-42.
- Tomich, Dale
2004 *Through the Prism of Slavery: Labor, Capital and the World Economy* (Lanham: Roman & Littlefield).
- Tomich, Dale and Michael Zeuske
2008 "The Second Slavery: Mass Slavery, World-Economy and Comparative Microhistories" *Review- Fernand Braudel Center for the Study of Economies, Historical Systems, and Civilizations* XXXI, No. 2, p. 91-100.
- Turgeon, Laurier
1997 "The Tale of the Kettle: Odyssey of an Intercultural Object," *Ethnohistory* 44:1, 1-29).
- Tuttle, Michael
2001 *Archaeological Remote Sensing Survey of Selected Channels, Chesapeake Bay and Norfolk Harbor, Virginia*. (Memphis: PanAmerican Consultants, Inc., for the U. S. Army Corps of Engineers, Wilmington District).
- 2011 "Search and Documentation of Underwater Archaeological Sites" in Alexis Catsambis, Ben Ford and Donny Hamilton (eds.) *The Oxford Handbook of Maritime Archaeology* (New York: Oxford University Press); 115-132.
- Unger, Richard
1997 *Ships and Shipping in the North Sea and Atlantic, 1400-1800* (Basingstoke: Vaviorum Press).
- van Dantzig, Albert
1976 "English Bosman and Dutch Bosman: A Comparison of Texts, II" *History in Africa* 3: 92-126.

1980 *Forts and Castles of Ghana* (Accra: Sedco Publishing Limited).

van Laer, Arnold

1908 *Van Renssalaer Bowier Manuscripts* (Albany: University of the State of New York).

Vansina, Jon

2005 "Ambaca Society and the Slave Trade c. 1760-1845" *Journal of African History* 46" 1-27.

Vogt, John

1975 "Notes on the Portuguese Cloth Trade in West Africa, 1480-1540" *The International Journal of African Historical Studies*, VIII (4), 623-651.

1979 *Portuguese Rule on the Gold Coast, 1469-1682* (Athens: University of Georgia Press).

Wallerstein, Immanuel

1974 *The Modern World System I* (New York: Academic Press).

Walton, John, James Brooks and Christopher R. N. DeCorse

2008 "Introduction" in James Brooks, Christopher R. N. DeCorse and John Walton *Small Worlds: Method, Meaning and Narrative in Microhistory* (Santa Fe: School for Advanced Research Press): 3-12.

1976 *The Modern World System: Capitalist Agriculture and the Origins of the European World-Economy in the Sixteenth Century* (New York: Academic Press).

Ward, W. E. F.

1958 *A History of Ghana* (New York: Frederick A. Praeger).

Ward, Rachel, Susan La Niece, Duncan Hook, and Raymond White

1995 'Veneto-Saracenic' Metalwork: An Analysis of the Bowls and Incense Burners in the British Museum. In *Trade and Discovery: The Scientific Study of Artefacts from Post-Medieval Europe and Beyond*, edited by Duncan R. Hook and David R. M. Gaimster, pp. 235-258. BM Occasional Paper No. 109. British Museum Press, London.

Watson, Kimberly

1998 "Nautical Archaeology Survey Methods" in L. Babits and H. Van Tilburg (eds.) *Maritime Archaeology: A Reader of Substantive and Theoretical Contributions* (New York: Plenum Press).

Watters, D.R.

1985 "Terms and Concepts Related to Marine Archaeology" *Oceanus* 28 (1): 13-17.

Webster, Jane

2002 "Slave Ships and Maritime Archaeology: An Overview" *International Journal of Historical Archaeology* 12: 6-19.

Wedde, M.

1996 "From Classification to Narrative" *Mediterranean Historical Review* 11: 117-164.

2000 *Towards a Hermeneutics of Aegean Bronze Age Imagery* (Mannheim: Bibliopolis).

Werz, Bruno

1999 "Diving up the Human Past: Perspectives of Maritime Archaeology, with Specific Reference to Developments in South Africa until 1996" *British Archaeological Reports* (Oxford: BAR 749).

Westerdahl, Christer

1991 "Norrlandsleden: The Maritime Cultural Landscape of the Norrland Sailing Route" in O. Crumlin Pedersen (ed.) *Aspects of Maritime Scandinavia AD 200-1200. Proceedings of the Nordic Seminar on Maritime Aspects of Archaeology* (Roskilde).

1992 "The Maritime Cultural Landscape" *The International Journal of Nautical Archaeology* 21: 5-14.

1994 "Maritime Cultures and Ship Types" *The International Journal of Nautical Archaeology* 23: 265-270.

Wheeler, Robert, Walter Kenyon, Alan Woolworth and Douglas Birk

1975 *Voices from the Rapids: An Underwater Search for Fur Trade Artifacts, 1960-1973* (St. Paul: Minnesota Historical Society).

Wieland, Von Ulf

1980 "Mineralwasserkrüge aus Selters" *Der Mineralbrunnen* 10, pp. 286-292.

Wilbanks, Ralph and Wes Hall

1996 "The Discovery of the Confederate Submarine *H. L. Hunley*, *Underwater Archaeology Proceedings* 1996: 82-87.

Wilcoxon, C.

1991 "Ships and work Boats of New Netherland, 1609-1674" in Funk, Elisabeth and Martha Shattuck (eds.) *A Beautiful and Fruitful Place: Selected Rensselaerwijck Papers, Volume 2*: 53-72.

Wiley, Gordon R. and Philip Phillips

2001 *Method and Theory in American Archaeology* (Tuscaloosa: University of Alabama Press).

Wiley, Gordon R. and Jeremy A. Sabloff

1993 *A History of American Archaeology* (New York: W.H. Freeman and Company).

Wingood, A.J.

1982 "Sea Venture: An Interim Report on an Early 17th Century Shipwreck Lost in 1609" *The International Journal of Nautical Archaeology and Underwater Exploration* 11.4: 333-347.

1986 "Sea Venture: Second Interim Report—Part 2, the Artifacts" *The International Journal of Nautical Archaeology and Underwater Exploration* 15.2: 149-159.

Wolf, Eric

1982 *Europe and the People Without History* (Berkeley: University of California Press).

Woodbury, Rober S.

1961 *History of the Lathe to 1850: A Study in the Growth of a Technical Element of an Industrial Economy* (Cambridge: M.I.T. Press).

Woodman, Richard

2002 *The History of the Ship: The Comprehensive Story of Seafaring from the Earliest Times to the Present Day* (New York: Conway Maritime Press).

Young, Crawford

1994 *The African Colonial State in Comparative Perspective* (London: Yale University Press).

Gregory D. Cook

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EDUCATION

Syracuse University Ph.D. awarded December 2012
Major: Anthropology
Dissertation Title: *The Maritime Archaeology of West Africa in the Atlantic World: Investigations at Elmina, Ghana*

Texas A&M University MA awarded August 1997
Major: Anthropology
Thesis Title: *The Reader's Point Vessel: Hull Analysis of an Eighteenth-Century Merchant Sloop Excavated in St. Ann's Bay, Jamaica*

Indiana University BA awarded December 1989
Major: Anthropology Minor: African Studies

RESEARCH INTERESTS

Anthropological archaeology, historical archaeology, maritime archaeology, remote sensing, culture contact, maritime trade, ship construction, Atlantic World, with geographical foci in southeast United States, West Africa (Ghana) and West Indies (Jamaica), Gulf of Mexico

TEACHING EXPERIENCE

August 2004-Present: *Maritime Archaeologist, University of West Florida*

Courses Taught: ANT 2000 Introduction to Anthropology
ANT 3137 Shipwreck Archaeology
ANT 4835 Maritime Archaeological Field Methods
ANT 4990 Archaeological Field Survey
ANG5990 Ship Construction and Recording in Maritime Archaeology

January-May 2004: *Adjunct Lecturer, College of Southern Maryland*

Courses Taught: SOC 2010 Technology and Society

January 1999: *Syracuse University's Future Professoriate Program*

The program is "an honor awarded to graduate students with strong teaching records and a high level of commitment to developing their skills as university teachers."

Faculty mentor: Christopher R. DeCorse

Spring, 1999: *Graduate Assistant, Anthropology Department, Syracuse University*

Courses Taught: ANT 145 Introduction to Historical Archaeology

Fall, 1998: *Graduate Assistant, Anthropology Department., Syracuse University*
 Courses Taught: ANT 141 Introduction to Archaeology and Prehistory

Fall 1994: *Instructor, Discovery Bay Marine Laboratory, Jamaica*
 Taught informal course in nautical archaeology and maritime history as part of
 Discovery Bay Marine Laboratory's Maritime Studies course

Summer 1991-1992: *Graduate Assistant, Columbus Caravels Archaeological
 Project, Jamaica*
 Courses Taught: ANT 330 Field Research in Archaeology

FELLOWSHIPS, HONORS AND AWARDS

2011: *United States Department of Interior Partners in Conservation Award*
 Award given "In recognition of the outstanding contributions to the mission of the
 Department of the Interior" (Project in partnership with Tesla Offshore, LLC and the
 Bureau of Ocean Energy Management, Regulation and Enforcement)

1995: *Cutty Sark Tall Ships Races*
 Selected as U.S. team crewmember on the square-rigged ship *Dar Mlodziezy*

1994: *Fulbright Fellowship*
 M.A. research on the Readers Point Shipwreck Project, Texas A&M University

1994: *Marian M. Cook Fellowship*
 M.A. research on the Readers Point Shipwreck Project, Texas A&M University

1992-1994: *Graduate Assistantships*
 Nautical Archaeology Program, Texas A&M University

1988-1989: *Overseas Study Fellowship*
 First student selected to participate in the Indiana University Overseas Study Program
 in Malawi, southeast Africa

GRANTS AND CONTRACTS

2011-2012: *NOAA Office of Ocean Exploration and Research* \$21,665
Small Grants for Marine Archaeological Exploration # NA11OAR0110186
 Grant awarded for the search for the H.M.S. *Mentor*, lost in Blackwater
 River, 1781. Archaeology Institute, University of West Florida.

2011: *Archaeological Investigations in the Vicinity of the B Street* \$6,622
Schooner and Barge, Bruce Beach Wetlands Mitigation Area,
Community Maritime Park, Pensacola Florida
 Archaeology Institute, University of West Florida

2010-2011: <i>Archaeological Analysis of Submerged Sites on the Gulf of Mexico Outer Continental Shelf</i> Archaeology Institute, University of West Florida	\$20,098
2009: <i>University of West Florida Faculty Scholarly and Creative Activities Grant #164084</i> Grant for archival research related to Ph.D. research on the Elmina shipwreck. Archaeology Institute, University of West Florida.	\$2000
2006-2009: <i>Florida Department of Historical Resources, Historic Preservation Special Category Grant, "Investigation of Underwater Anomalies Near the Emanuel Point Shipwreck" # SC716</i> Grant supported archaeological investigations of the 1559 Luna Shipwrecks, Pensacola, Florida. Co-Principal Investigator: John Bratten Archaeology Institute, University of West Florida.	\$203,368
2006: <i>Phase I Cultural Resources Survey of the Proposed Martinique on the Bayou Development, Escambia County, FL</i> Archaeology Institute, University of West Florida.	\$9,850
2005: <i>Underwater Cultural Resources Survey of the Trillium Dredging and Disposal, Pensacola.</i> Archaeology Institute, University of West Florida.	\$9,715
2005: <i>National Geographic Society Research Grant #7550-04</i> Grant supported continuing archaeological investigations of a merchant trading vessel, Elmina, Ghana. Syracuse University.	\$20,000
2005: <i>University of West Florida Faculty Scholarly and Creative Activity Grant,</i> Grant supporting the participation of UWF students in shipwreck discoveries Ghana, West Africa. Archaeology Institute, University of West Florida.	\$2000
2003: <i>National Geographic Society Research Grant #7338-02</i> Grant supported the first shipwreck survey in Ghana, resulting in the discovery of a seventeenth-century trading vessel off of Elmina. Syracuse University.	\$18,000
2002, 1999: <i>Roscoe Martin Committee Research Grant</i> Syracuse University	\$1500
1998: <i>Graduate School Research Project Grant</i> Syracuse University	\$1000

PUBLICATIONS

- Cook, Gregory D., Rachel L. Horlings, Andrew Pietruszka
 n.d. "Underwater Archaeology and the Atlantic Trade: Research at Elmina, Ghana" *International Journal of Nautical Archaeology*. Anticipated publication date 2012.
- Gregory D. Cook and Lois Swanick
 n.d. "To Discover the River *Misisipi*: Navigational Artifacts from *La Belle* in the Context of La Salle's Final Voyage" Chapter on the final publication of the excavation of *La Belle*, title to be determined. Texas Historical Commission, publication in progress.
- Cook, Gregory D.
 2010 "Luna's Ships: Current Excavation on Emanuel Point II and Preliminary Comparisons with the First Emanuel Point Shipwreck" *Florida Anthropologist* 62, no. 3-4, 93-101.
- Smith, Roger C. and Gregory D. Cook
 2010 "Luna's Fleet and the Discovery of the First Emanuel Point Shipwreck" *Florida Anthropologist* 62, no. 3-4, 79-81.
- Cook, Gregory D. and Amy Rubenstein-Gottschamer
 2009 "Maritime Connections in a Plantation Economy: Archaeological Investigations of a Colonial Sloop in St. Ann's Bay, Jamaica" Mark Houser and Jim Delle (eds.) *Current Trends in Jamaican Historical Archaeology* (Tuscaloosa: University of Alabama Press).
- DeCorse, Christopher, Greg Cook, Rachel Horlings, Andrew Pietruszka and Samuel Spiers
 2009 "Transformation in the Era of the Atlantic World: the Central Region Project, Coastal Ghana 2007-2008" *Nyame Akuma* 72: 85-93.
- Cook, Gregory D. and Sam Spiers
 2004 "Central Region Project: Ongoing Research on Early Contact, Trade and Politics in Coastal Ghana, AD 500-2000" *Nyame Akuma* 61: 17-28.
- DeCorse, C. R., E. Carr, G. Cook, and S. Spiers
 2000 "Central Region Project, Coastal Ghana-- Perspectives 2000" *Nyame Akuma* 53:6-11.
- Cook, Gregory D.
 1998 "The Reader's Point Project" in James Delgado (ed.) *Encyclopedia of Underwater and Maritime Archaeology* (Yale University Press).

- 1997 *The Readers Point Vessel: Hull Analysis of an Eighteenth-Century Merchant Sloop Excavated in St. Ann's Bay, Jamaica* (M.A. Thesis, Texas A&M University).
- 1996 "Sailing into Adventure: The 1995 Cutty Sark Tall Ships Races," *The INA Quarterly*, Vol. 23, No. 1.
- 1995 "The Reader's Point Project: The Excavation of an Eighteenth-Century Sloop in St. Ann's Bay, Jamaica," *Underwater Archaeology Proceedings from the Society for Historical Archaeology Conference* (Society for Historical Archaeology: Washington D.C.) 101-105.
- 1994 "The Reader's Point Vessel: Preliminary Field Report on the Excavation of an Eighteenth-Century Sloop in St. Ann's Bay, Jamaica," *The Institute of Nautical Archaeology Quarterly*, Vol. 21, No. 3.

TECHNICAL REPORTS

Cook, Gregory, Elizabeth Benchley, Brian Mabelitini, Sarah Mitchell, Colin Bean, Matt Gifford and Erica Smith

- n.d. *Phase II Archaeological Investigations at the Proposed Ferry Pier, Fort Pickens, Santa Rosa Island, FL*. University of West Florida, Archaeology Institute, Report of Investigations 177.

Cook, Gregory and Elizabeth Murphy

- 2010 *Underwater Cultural Resources Reconnaissance Survey at the Proposed Pier Construction Near Fort Pickens, Santa Rosa Island FL, for the National Park Service, Gulf Islands National Seashore*. University of West Florida, Archaeology Institute, Report of Investigations 169.

Cook, Gregory D., John Bratten, John Worth, Kendra Kennedy, Dean Nones and Scott Sorset

- 2009 *Emanuel Point II Underwater Archaeology: Grant No. SC716*. University of West Florida, Archaeology Institute, Report of Investigations 164.

Cook, Gregory D., Christopher Mickwee, Cindy Somerkamp and John Phillips

- 2007 *Phase I Cultural Resources Survey of the Proposed Martinique on the Bayou Development Escambia County, Florida* University of West Florida, Archaeology Institute, Report of Investigations 149.

- 2006 *Underwater Cultural Resources Reconnaissance Survey of the Trillium Dredging and Material Disposal, Pensacola, Escambia County, Florida* Archaeology Institute, Report of Investigations 145.

James, Steven R., Gregory D. Cook, and Chuck Meide

- 2003 *Archaeological Data Recovery of the Iron-Hulled Vessel Manuela and the Documentation of the Cristóbal Colón, in the Entrance Channel to San Juan Harbor, San Juan, Puerto Rico* (Panamerican Consultants Inc. Prepared for U.S.Army Corps of Engineers, Jacksonville District).

Judy L. Wood, Richard W. Leech, Jr., and Gregory D. Cook

- 1994 *Archival Research, Archaeological Survey, and Site Monitoring: Back River Chatham County, Georgia and Jasper County, South Carolina* (US Army Corps of Engineers, Savannah District).

Gregory D. Cook

- 1990 "Maravi Settlement Patterns of the Southern Lakeshore and Mtakataka Areas, Malawi," *Malawi Department of Antiquities Bulletin* (Lilongwe, Malawi).

Gregory D. Cook

- 1989 "The Fickas Farm Project: Mississippian Farmsteads in the Vicinity of the Angel Site, Vanderburgh County, Indiana," in Christopher S. Peebles (ed.) *Current Research in Indiana Archaeology and Prehistory: 1987 & 88*. (Bloomington: Indiana University Glenn A. Black Laboratory of Archaeology Research Reports, No. 10).

Gregory D. Cook

- 1987 "Little Pigeon Creek Cemetery: An Archaic Midden in Warrick County, Indiana," in Christopher S. Peebles (ed.) *Current Research in Indiana Archaeology and Prehistory: 1986*. (Bloomington: Indiana University Glenn A. Black Laboratory of Archaeology Research Reports, No. 7, 1987).

BOOK REVIEWS

Skowronek, R. and G. Fischer 2009 *The HMS Fowey: Lost and Found: Being the Discovery, Excavation and Identification of a British Man-of-War Lost off the Cape of Florida in 1748* (Gainesville: University of Florida Press). *International Journal of Maritime History*, vol. XXI, No. 2 (December 2009).

Robert Grenier, Marc-André Bernier, and Willis Stevens (eds.) *The Underwater Archaeology of Red Bay: Basque Shipbuilding and Whaling in the 16th Century. Volume III: The 24m. Hull*. Ottawa: Parks Canada, 2007, for *The Northern Mariner/Le marin du nord*, Vol. XIX 2009.

Shomette, Donald

2008 *Shipwrecks, Sea Raiders and Maritime Disasters along the Delmarva Coast, 1632-2004*. *International Journal of Maritime History* XX, No. 2, 438-439.

Stanbury, Myra and Jeremy Green

2005 *Lapérouse and the Loss of the Astrolabe and the Boussole (1788): Reports of the 1986 and 1990 Investigations of the Shipwrecks at Vanikoro, Solomon Islands*.

International Journal of Maritime History XVII, 427-429.

SELECTED CONFERENCE PAPERS/PANELS

“The Emanuel Point II Shipwreck: Updates on Recent Excavations of the Second Ship from the Doomed Luna Expedition to Florida in 1559”, Society for Historical Archaeology, Amelia Island, FL 2010.

“Investigating Luna’s Ships: the Discovery and Excavation of Two Vessels from the 1559 Fleet”, Gulf South History and Humanities Conference, Pensacola, FL 2009.

“Nautical Archaeology in Ghana: Analysis of a Trading Cargo from the Elmina Shipwreck”, Society for Historical Archaeology, Williamsburg 2007.

“West Africa and the Atlantic World” for “Diving for History: The 2007 Northeast Florida Symposium on Underwater Archaeology”, Northeast Florida Symposium on Underwater Archaeology, St. Augustine, FL 2007.

“Nautical Archaeology in Ghana: Problems and Prospects”, Conference on Archaeology and Heritage Management in Ghana, Accra 2006.

“Nautical Archaeology in West Africa: Ongoing Investigations of an Historic Shipwreck off of Elmina, Ghana”, Society for Historical Archaeology, Sacramento 2005.

“The Pensacola Waterfront Shipwreck Survey: a New Look at Pensacola’s Maritime Past”, Florida Anthropological Society, Gainesville 2005.

“The Ghanaian Archaeological Shipwreck Survey”, Society for Historical Archaeology, St. Louis 2004.

“Portuguese Ceramics in the Age of Exploration and Expansion: the Evidence from Shipwrecks”, Society for Historical Archaeology, Providence, 2003.

“Final Report on the Reader’s Point Vessel, an 18th Century Sloop Excavated in St. Ann’s Bay, Jamaica”, Society for Historical Archaeology, Cincinnati, 1996.

“The Reader's Point Project: The Excavation of an Eighteenth-Century Sloop in St. Ann's Bay, Jamaica”, Society for Historical Archaeology, Washington, D.C., 1995.

“The Columbus Caravels Archaeological Project, 1992 Season: Description of the Hull Remains Uncovered from Three Eighteenth-Century Vessels”, Society for Historical Archaeology, Kansas City, 1993.

"Survey and Underwater Archaeology," Texas A&M University, 1992.

"Survey Techniques on Land and Underwater," Archaeological Fieldschool, St. Ann's Bay, Jamaica, 1991, 1992.

UNIVERSITY/DEPARTMENT SERVICE

2005-present: Chair, University of West Florida Dive Control Board

2005-present: Board Member, Florida Public Archaeology Network

2008: Underwater Program Chair, Society for Historical Archaeology, Albuquerque

2007-2008: Board Member, UWF Excellence Matters Committee

2005-2009: Board Member, Pensacola Archaeological Society

PROFESSIONAL ARCHAEOLOGICAL EXPERIENCE

2004-present: Maritime Archaeologist, Archaeology Institute, University of West Florida

2004-present: Co-Director, University of West Florida Maritime Archaeological Field School

2006-2010: Co-Director, Archaeological Investigations of the Emanuel Point II Shipwreck

2005: Project Director, Elmina Shipwreck Project

2003: Project Director, Ghanaian Archaeological Shipwreck Survey

1998-2003: Maritime Archaeologist, Panamerican Consultants

1997: Research Fellowship, Syracuse University Dept. of Anthropology

1996-1997: Archaeologist, Field Supervisor, LaSalle Shipwreck Project

1995: Archaeologist, U.S.S. *Eastport* Project

1994: Project Director, Readers Point Shipwreck Project, St. Ann's Bay, Jamaica

1994: Scientific Diver, Discovery Bay Marine Laboratory, University of the West Indies, Discovery Bay, Jamaica

1993: Archaeologist, U.S. Army Corps of Engineers: Internship with U.S.A.C.E., Savannah District

1991-1992: Archaeologist, Columbus Caravels Archaeological Project

ORGANIZATIONAL MEMBERSHIPS

Society for Historical Archaeology
Florida Archaeological Council
Florida Anthropological Society
Pensacola Archaeological Society

SKILLS

Diving Certifications: P.A.D.I. Open Water, Advanced Open Water, Rescue Diver, Environmental Protection Agency Scientific Diver, E.P.A. Certificate of Training in Emergency Oxygen Administration for Diving Accidents, E.P.A. Certificate of Training for Compressed Gas Fillers and Handlers, E.P.A. Certificate of Training in Diving Accident Management, S.E.I. Full-face Mask Diver, S.E.I. Drysuit Diver, N.A.U.I. and S.E.I. Nitrox Diver, experience on surface-supplied air diving systems, proficient in the use of Kirby Morgan band mask and Superlite 17 diving helmet, proficient in underwater photography, mapping, dredging, coring, search and recovery, navigation, CARICOMP coral reef surveys, extensive archaeological shipwreck experience, small boat operation, small pump and compressor operation, mechanical drafting, conservation of artifacts from marine and fresh-water environments, hyperbaric lab technician, C.P.R. and first-aid. Languages: reading comprehension in Spanish, French.