

GHANA

Missing Shipwrecks, Methods or Imagining? A Preliminary Report on Maritime Archaeological Surveys in Coastal Ghana, 2009

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Introduction

This report details maritime archaeological fieldwork conducted in coastal Ghana between October and December 2009. Part of the ongoing Central Region Project aimed at investigating cultural contact and change in Ghana, the research continued the search for submerged cultural resources from the period of the Atlantic trade in coastal Elmina (Cook and Spiers 2004; DeCorse et al. 2009). It was framed by hypotheses concerning historical and physical site formation processes (Horlings 2011; Muckelroy 1977; Schiffer 1983). Fieldwork combined remote sensing survey techniques and diver investigations to search for and examine maritime archaeological sites; it also made extensive use of a micro-sampling technique developed in 2007 to investigate details of submerged sites and formation processes (Horlings 2009, 2011). The project was completed by a team including the principal investigator (Horlings) and three volunteers from Canada, Denmark, and the United States, as well as with the assistance of a number of local fishermen. Fieldwork was supported primarily by the *Waitt Foundation/National Geographic Society*,¹ and was conducted with the permission of the Ghana Museums and Monuments Board.

Introduction

Maritime archaeological survey was conducted in both 2003 and 2009 near Elmina, located in central

coastal Ghana; additional underwater fieldwork was carried out in the same region in 2005 and 2007 (Figure 1). Built in 1482, São Jorge da Mina, or Elmina Castle, was the first permanent European trading post established in West Africa and the focus of maritime trade for nearly 400 years (DeCorse 2001). Because of its longevity and importance in the Atlantic trade, coastal Elmina was an ideal location in which to investigate historical maritime trade with West Africa (Cook and Spiers 2004; DeCorse et al. 2009). Using side scan sonar to survey off Elmina, Greg Cook conducted the first maritime archaeological investigation in sub-Saharan Africa in 2003; additional maritime fieldwork took place in the same location in 2005 and 2007 (Cook and Spiers 2004; DeCorse et al. 2009).

Prior to this fieldwork, one mid-17th century shipwreck, called the Elmina Wreck discovered by Cook in 2003 (Cook n.d.; Cook and Spiers 2004) and timbers from an early 18th century vessel discovered by dredgers in the Benya Lagoon in 2007 (see Pietruzska 2011) comprised the only known submerged archaeological sites in Ghana. Three sites related to maritime trade, the Single Anchor Site, the Double Anchor Site, and the Chain Site, were identified in the 2009 season. As of yet, no additional shipwreck sites have been located in coastal Elmina.

2009 Archaeological Site Survey

Diver investigation of survey targets in the 2007 season (based on side scan sonar data collected in 2003) revealed a number of large rocks (DeCorse et al. 2009:89) and one site that was not accurately identified until the 2009 season (the Double Anchor Site), but no additional shipwrecks or other maritime sites were discovered. The lack of additional submerged sites was puzzling, as some objects identified on the seafloor were easily correlated with targets in the survey data, but it was difficult to explain the complete lack of objects at other target locations.

Based on hypotheses developed by Horlings in 2007, the 2009 field season was designed to continue maritime research and to test the hypothesis that shipwrecks and other submerged maritime sites are in fact present in coastal Ghana, but the heavy sedimentation rates of the region are obscuring them. Alternatively, it was also hypothesized that survey methods, both remote sensing and diver techniques, were insufficient for working in the prevailing conditions at the coast.

Figure 1: All maritime archaeological investigations to date have focused on the areas near Elmina that are outlined here. Image adapted from the 1963 US Army Map Service chart.

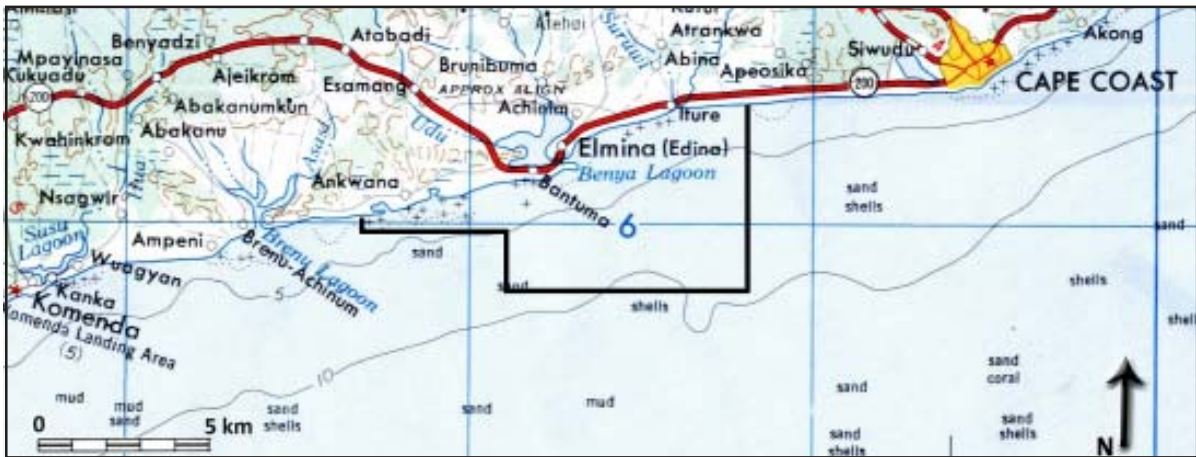


Figure 2: A diver prepares to investigate a remote sensing target; note the reel he is carrying to use in conducting circle searches (photo K. Kaufmann).

As a means of testing these hypotheses multiple types of remote sensing data, including side scan sonar (used to provide an image of the seafloor), magnetometry (used to identify ferrous materials on the seafloor), and echo-sounding (used for shallow penetration of the seafloor sediments to provide an image of subsurface objects), were used in conjunction with diver investigations (Figure 2). The ultimate goal of establishing presence/absence, location, and condition, of submerged sites was then to integrate these data into the investigation of European expansion and West African trade interactions in coastal Ghana.

There were four basic goals for the 2009 season:

1. To re-survey Cook's original (2003) survey area using side scan sonar as a means of creating a comparative data set, and to successfully use a magnetometer and echo-sounder for the first time in the region.
2. To investigate targets identified in the new data.
3. To monitor the known shipwreck site and to build on the baseline shipwreck data collected in 2003, 2005, and 2007.
4. To continue to investigate formation processes and to identify the reason or reasons that no additional cultural material was discovered in the 2007 season.

Over the course of six weeks of fieldwork, each of the outlined goals was accomplished: a) three forms of remote sensing instruments were used over a period of two and a half weeks (Figure 3), spending six

Figure 3: Remote sensing results are continually monitored during survey; the towel is used to shade the computer screen from direct sun to allow more accurate interpretation (photo K. Kaufmann).



days with the side scan sonar (Knudsen 320 B/P, 200 kHz), ten days of magnetometer survey (Marine Magnetism Explorer s/n: 21073) and a single day of echo-sounder (Knudsen 320 B/P, 20/200 kHz) work; b) divers investigated 16 targets from the various remote sensing data sets (including data from 2003), completing 80 individual dives in approximately three and a half weeks, totaling nearly 66 hours under water, and identifying three sites associated with maritime trade and navigation, although none was a shipwreck; c) divers monitored the known shipwreck, collected underwater photos and videos, and identified several unknown features of the site; and d) through environmental monitoring additional data were collected and related to sedimentation and formation processes across the region, and other methodological and environmental factors that may be affecting the visibility and the discovery of additional cultural materials on the seafloor were identified.

Importantly, the work was carried out late in the year, at the start of the dry season; the generally calmer seas (in relation to the summer months) and even some days of visibility exceeding one meter made a significant impact on research, including safer diving and the ability to work more efficiently with less interference from rough conditions.

The 2009 remote sensing and diver surveys were intentionally completed in the same area surveyed by Greg Cook in 2003 (Cook and Spiers 2004) as a means of both creating a comparative data set, and developing an effective methodology for surveying in the difficult and dynamic waters of coastal Ghana. All work was carried out in the vicinity of coastal Elmina, but included additional survey at a reef area more than ten kilometers to the west of the Castle. In addition to the remote sensing and diver surveys, sediment cores, used in micro-sampling, were

collected at nearly every location that was dived. Sediment cores and micro-sampling are keys to understanding the dynamic environment and its effects on submerged cultural resources at the immediate and local levels, as well as regionally.

Results

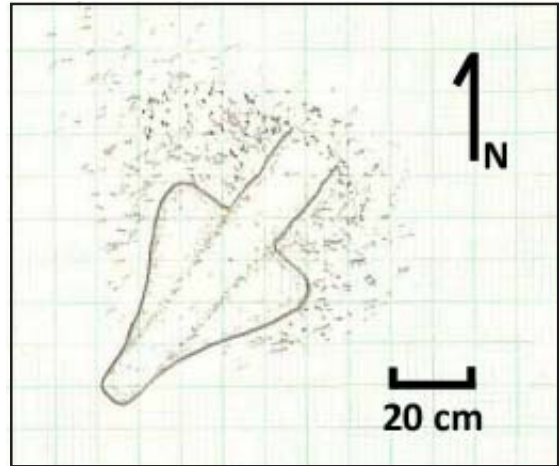
Two new sites (the Single Anchor Site and the Chain Site) were located and a previously discovered site correctly identified (the Double Anchor Site), as the result of remote sensing and diver investigations. Each of these loci represents a separate event likely related to historical maritime trade in Ghana. The identification of these sites brings the known submerged historical sites in coastal Ghana from two, including the mid-17th century Elmina Wreck and the 18th century vessel in the Benya Lagoon, to five, representing a significant increase in both numbers and varieties of known sites. Each of the sites identified in 2009 is unique, and none is easily explained.

The Single Anchor Site

This target was identified in Cook's 2003 side scan sonar data and was dived on several occasions in 2007, although nothing was discovered at the site. In 2009 it was also noted in the side scan sonar data and re-dived, this time resulting in the identification of historical cultural material. The site consists of a single anchor that may have been set, and is located approximately 400 meters ESE from the Elmina Castle, just inshore of a large natural sandbar at the southern end of the Elmina peninsula and in approximately five meters water depth. Only a single fluke was visible above the sediments; it measured approximately 50 centimeters across (Figure 4), suggesting that the total size of the anchor is likely between three and four meters in length (Cotsell 1858:14-17; Curryer 1999:49; Rubin 1971:237).

Interestingly, when the site was discovered, approximately 50 centimeters of the fluke was visible above the sediments, but one week later only 20 - 25 centimeters was visible, a testament to the dynamic nature of the coastal environment. It is possible that there is more cultural material associated with the anchor, but as the project was not equipped to excavate and made little headway with the methods that were attempted, any additional material at the site remains unknown.

Figure 4: A sketch of the Single Anchor illustrates the single fluke that was visible above the sediments. It is not known what, if any, other cultural materials are present at this site (sketch R. Horlings).



The Double Anchor Site

This site was also a prominent and promising side scan sonar target noted in the 2003 data and dived in 2007. When it was dived in 2007, the anchors were discovered but were not identified as anchors, and so the site was not considered historically important. It was re-dived in 2009 because it was also a significant magnetometer target. On the initial dive, a diver discovered a tangled mass of free-floating fishing line, but no other objects; the presence of the line indicated that there was likely something there catching the material, however, and the anchors discovered on a subsequent dive on a different day. This experience confirmed that there are problems with current target-searching techniques, some of which were addressed in later searches.

The site is comprised of two anchors with their shanks standing (relatively) vertically out of the sediments, which is particularly strange because anchors are *designed* to tip over (Pering 1819:59; Thomson 1902:1401); their arms and flukes (the wide parts of the anchor that are used to grip the seafloor) are completely buried. The site is located approximately two and a half kilometers directly south of the Elmina Castle in 12 meters of water. The anchors are two different sizes: the smaller of the two is rectangular in cross-section and stands nearly two meters out of the sediments; the larger is round or octagonal in

cross-section and stands approximately 2.65 meters above the sediments. They are positioned ten meters apart and oriented in the same direction, indicating that they are associated. The anchors would have had wooden stocks, as indicated by the scar on the smaller anchor; the area of the stock is obscured by barnacle growth on the larger. It is also interesting to note that neither anchor had a ring in it, which is unusual, as they tend to survive relatively well in the marine environment due to their thickness/size, and it is unlikely that they would have been intentionally removed before being lost. The differences between these anchors do not preclude them from being associated with the same vessel; in fact, it was a regulated practice on European vessels for the main starboard anchor to be the largest, with the port anchor second in size, but generally drastically smaller (Pering 1819:63-64; Rubin 1971:233; Tinniswood 1945:87; Upham 2001:13).

Once it was determined that the site was culturally significant, it nonetheless has proven difficult to interpret. The presence of two unsupported anchors standing up from the sediments is so unusual that there is no parallel incidence of this yet found. The basic assumption upon discovery of this site was that since the anchors were still vertical, there was likely ship structure between them that had supported them long enough to allow them to set in the sediments, even as the wood from the vessel gradually disappeared. However, there is no additional cultural material located on the surface either between or around the anchors. A small test excavation (15 centimeters across and 50 centimeters deep) was dug adjacent to the smaller anchor to investigate any material near it; in the process it was discovered that that simple action had loosened the anchor significantly, so it was immediately halted. Coring and probing across the site produced no ship remains or any other cultural material, and it was concluded that there is no additional cultural material present at the site.

The Chain Site

The final site was discovered during the 2009 magnetometer survey carried out in an area not previously surveyed along the coast, ten kilometers west of Elmina Castle. It is located in a shallow bay separated from the sea by a rock reef nearly one kilometer long, which lays in an east-west orientation, parallel

to the coast (Figure 5). Approximately 50 meters in-shore from the lee side of the reef, near the only possible inlet into the bay coming from the west (the direction of predominant current and winds), the team discovered a very large anchor chain lying in approximately five meters water depth. The chain measures at least 18 meters long, with links more than 19 centimeters in length, and more than five centimeters in section diameter; one end of the chain consisted of a link that had been broken or cut, and the other had a ring with a diameter of more than 30 centimeters. Poor visibility did not allow an assessment of whether the chain was cast or molded; the lack of studs in links and the presence of a ring as opposed to a shackle on the end, however, suggest that it could be of early 19th century construction (Curryer 1999:90-106; White 1995:21), although this does not mean that it was deposited at this location at that time. It appears to have been either snapped over the reef, or cut and discarded, and is firmly concreted to the sandstone bedrock below it in a configuration that suggests that it was pulled taut and then suddenly released.

Three meters of the chain were visible on the bedrock, but the majority of its length was covered by more than 30 centimeters of sediment. The sediment was hand-fanned away in order to follow the chain, but new sediments re-covered the chain in seconds, making it extremely difficult to map in high turbulence and low visibility waters. Interestingly, there is a ring on the end of the chain, but no anchor is present. It is possible that this ring was originally the end attached to a vessel or some other object and the snapped end to the anchor, but without further investigation it is difficult to say. No other cultural material was discovered in the area, and further magnetometer surveys were negative. The chain could only have been carried by a very large vessel, but whether its presence on the inside of the reef is the result of a shipping incident or not is not possible to say, particularly since there do not appear to be any shipwreck remains in the area. It is possible that the remains of the vessel are still located nearby, but if that is the case, they are well hidden either under sand or among the rocks of the reef.

Monitoring the Elmina Wreck Site

The primary goals of monitoring the Elmina Wreck site included noting any intentional distur-

Figure 5: Rock reefs are visible in the background as the inside of a reef is surveyed; the Chain Site is located on the inshore side of this reef (photo R. Hurlings).



bance, disruption or looting, and monitoring sediment changes. Only eight dives were completed at the site, but unusually, visibility for several of the dives reached up to three meters, allowing for some photography and video documentation of parts of the site.

While it was expected that there would be some sedimentation of the shipwreck site, the changes that had occurred on the site in just over two years (since it was dived in 2007) were far more drastic than anticipated: the site was nearly two-thirds covered in sediment; in addition, the northeastern side of the wreck had been deeply scoured. In the scouring process a number of different features were more exposed than they had been in the 2007 season, including numerous amorphous concretions and an anchor and cannon in the north portion of the site. In addition, it revealed one feature that had not been recognized before, a unique object that has yet to be conclu-

sively identified. It is likely that if trends continue, the shipwreck site will be entirely covered by sediments in the next several years. There were no obvious signs of recent intentional disturbance of the site.

Testing Methodologies

Two primary methodological approaches were evaluated during this project: the use and comparison of three different remote sensing instruments, two of which had not been successfully used in Ghana; and the effectiveness of established target-searching methodologies. Results of the remote sensing surveys confirmed the usefulness of all three instruments in this difficult environment, although in different capacities, and provided comparative data for present and future investigations. Assessment of target-searching techniques pinpointed some of the

potential factors in error, including possible GPS inaccuracies, remote sensing data analysis errors, the lack of visibility and rough conditions, ineffective tools (including a non-weighted search line), and diver errors. In addition, while it is likely that the heavy sedimentation in the region is obscuring or contributing to the difficulties in discovering and identifying submerged cultural resources, this has not yet been officially confirmed. It is an ongoing effort to identify and test methodologies that are efficient and accurate in this environment.

Micro-Sampling across the Region

The continued development and application of the micro-sampling coring technique developed in 2007 provided a great deal of data for the 2009 project. The cores collected at the various sites across the coastal Elmina region provided insights into environmental conditions, formation processes, and submerged cultural resource sites that were not visible or accessible on the surface. These data are contributing to a growing database of environmental and cultural materials in the seascape, and serving to help to answer questions concerning the historical maritime trade in Ghana.

Conclusions

Analysis and interpretation of the results of the 2009 field season are ongoing. While it is most likely that the Anchor and Chain sites are related to historical navigation and trade, other possibilities, including their association with colonial navigational marker buoys, for instance, are also possible. The evidence for the burial of the Elmina Wreck site demonstrates the necessity of developing even more creative, expanded and refined repertoires of tools and methods for the survey and exploration of the region; identification and recording of additional submerged cultural resources; and adaptations to working in and with an incredibly dynamic environment that may expose a site at one moment and hide it at the next. The existence of additional submerged cultural resources is evident, but there are also numerous factors contributing to the difficulties in finding and identifying sites, suggesting that a combination of formation processes in the incredibly dynamic coastal environment and research methodologies may be responsible.

This research is contextualized within a long-term, large-scope project concerning African-European interactions within the maritime political economy of West Africa during the Atlantic trade. This particular project was focused not only on answering questions concerning the presence/absence and condition of submerged maritime sites (including shipwrecks) and their environments, but also with establishing methodologies and techniques that are efficient and easily applied in this environment. Remote sensing instruments proved to be a valuable means for investigating both large and small areas. Used in conjunction with micro-sampling, which provides detailed information concerning site extents, conditions, and formation processes, these tools produced unique and valuable data concerning submerged historical resources in a region of immense historic importance.

Future work should include continued monitoring of the sites, documentary and historical investigations, and continued surveys over expanded areas. Investigations into the intriguing and complex history of international maritime trade in coastal Ghana have provided glimpses, but there is clearly a great deal of work yet to do.

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Footnote

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