NORTH CAROLINA
OFFICE OF STATE ARCHAEOLOGY

FALL 2015 FIELD REPORT FOR ARCHAEOLOGICAL SITE 31CR314, *QUEEN ANNE'S REVENGE*

QAR TECHNICAL REPORT SERIES

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Abstract

In the Fall of 2015, staff of the North Carolina Office of State Archaeology under the auspices of the North Carolina Department of Natural and Cultural Resources undertook excavation of state site 31CR314, Blackbeard's *Queen Anne's Revenge*, previously known as the French slave-trade ship *La Concorde*. Efforts were focused on the separation of the large concretion matrix centered at the site. In doing so, methods were developed to effectively separate large objects within the matrix, such as cannon and an anchor, and supplemental mapping techniques were tested. The previous field seasons conducted in 2013 and 2014 are also reviewed.

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Introduction

From September 8 to November 6, 2015, fieldwork was conducted on North Carolina state archaeological site 31CR314, Blackbeard's flagship *Queen Anne's Revenge* (1718), previously known as *La Concorde*, a French merchant ship engaged in the West African slave trade (Moore and Daniel 2001). This ongoing project is led by staff from the Office of State Archaeology under the North Carolina Department of Natural and Cultural Resources. Upon completion of the 2012 field season, an evaluation of project goals and methodologies was undertaken, along with an assessment of the project's progress in the field since 2005, when full excavation began. As a result, new methodological approaches were developed, while adhering to the overall goal of complete site recovery (Wilde-Ramsing and Lusardi 1999). The two previous field seasons in 2013 and 2014 saw the development of a new strategy to focus excavation on the large midships concretion matrix, previously referred to as the main ballast pile. In Fall 2015, disassembly of this matrix continued with the recording and recovery of several artifacts.

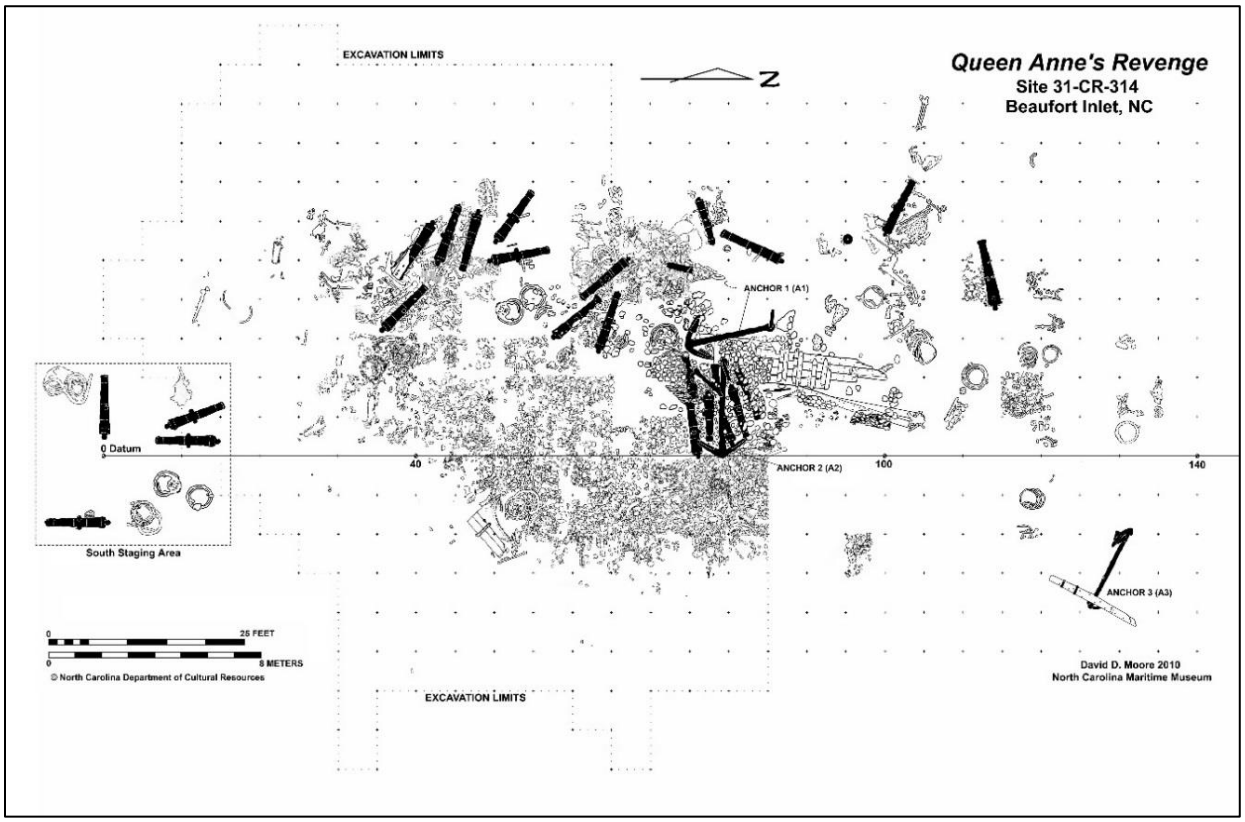

Fig. 1 Site map showing south staging area at left. (Map by NC Department of Natural and Cultural Resources, 2010.)

In order to record and disassemble the concretion matrix, the use of pneumatic tools and a more precise system of recording were adopted. Before starting excavation, however, previously excavated and repositioned material would be recovered from a staging area located at the south end of the baseline (Fig. 1). The south holding area was established during the 2007 excavation season, when two large cask hoop concretions and cannon C12, C14, C17, C18, and C20 were relocated there (Wilde-Ramsing *et al* 2007). Cannon C18 was subsequently recovered in 2009, but the other staged artifacts would remain until recovery was possible.

2013 Field Season Summary

The 2013 excavation season comprised two field periods. From May 27 to June 20, the team recovered two cannon (C12 and C20) from the south holding area, with significant loss of days due to unfavorable sea conditions. From August 6 to October 29, two staged cannon (C14 and C17) and two large cask hoop concretions were recovered from the south holding area, and divers completed the recording and recovery of five cannon (C1, C6, C8, C26 and C27) still *in situ*. The team also discovered three new cannon (C28, C29, and C30), initiated detailed recording and disassembly of the midships matrix, and collected *in situ* monitoring data for anchor A2 and cannon C6, C7, C8, C11, C12, and C20 (Watkins-Kenney et al 2015).

Fig. 2 Cannon aboard *Smilax* with USCG and QAR team. (Image by NC Department of Natural and Cultural Resources, 2013.)

The United States Coast Guard (USCG) Station Fort Macon near Atlantic Beach, NC served as the base for the 2013 field season. Diving was conducted from R/V *Jones Bay*, a work barge on loan from the North Carolina Department of Environmental Quality – Division of Marine Fisheries (DMF). On June 20, QAR project conservators oversaw the recovery of C12 and C20 aboard R/V *Dan Moore* from Cape Fear Community College, and USCG Cutter *Smilax* provided extensive logistical support during the second field period (Fig. 2). On October 23, under the command of Chief Warrant Officer 4 Scott McAloon, the crew of *Smilax* lifted five cannon and two cask hoop concretions, with QAR conservators aboard to ensure the safety of the artifacts.

Fig. 3 Salt-glazed stoneware jug partial. (Image by NC Department of Natural and Cultural Resources, 2015.)

Fig. 4 Copper alloy powder ladle. (Image by NC Department of Natural and Cultural Resources, 2015.)

Artifacts recovered in 2013 include: nine cannon, two large cask hoop concretions, 354 other unique artifact numbers (termed "QAR numbers"), and 15 buckets of dredge spoil to process (Kenyon and Daniel 2013). Notable finds from the season included a salt-glazed stoneware jug neck and partial handle (Fig. 3), a copper alloy serpentine side plate which would have secured the gunlock to a musket, and a copper alloy powder ladle (Fig. 4).

The excavation of 5 five-foot by five-foot grid squares (Units 16, 266, 267, 270, and 271) south of the midships matrix was completed, with all visible artifacts removed and sediment dredged down to an artifact-sterile layer. Completion of these units leaves approximately 50% of the site yet to be investigated (Fig. 5). The season validated the use of handheld pneumatic tools to safely free individual artifacts from the concreted matrix without damaging them, while serving to train crew members in this new approach.

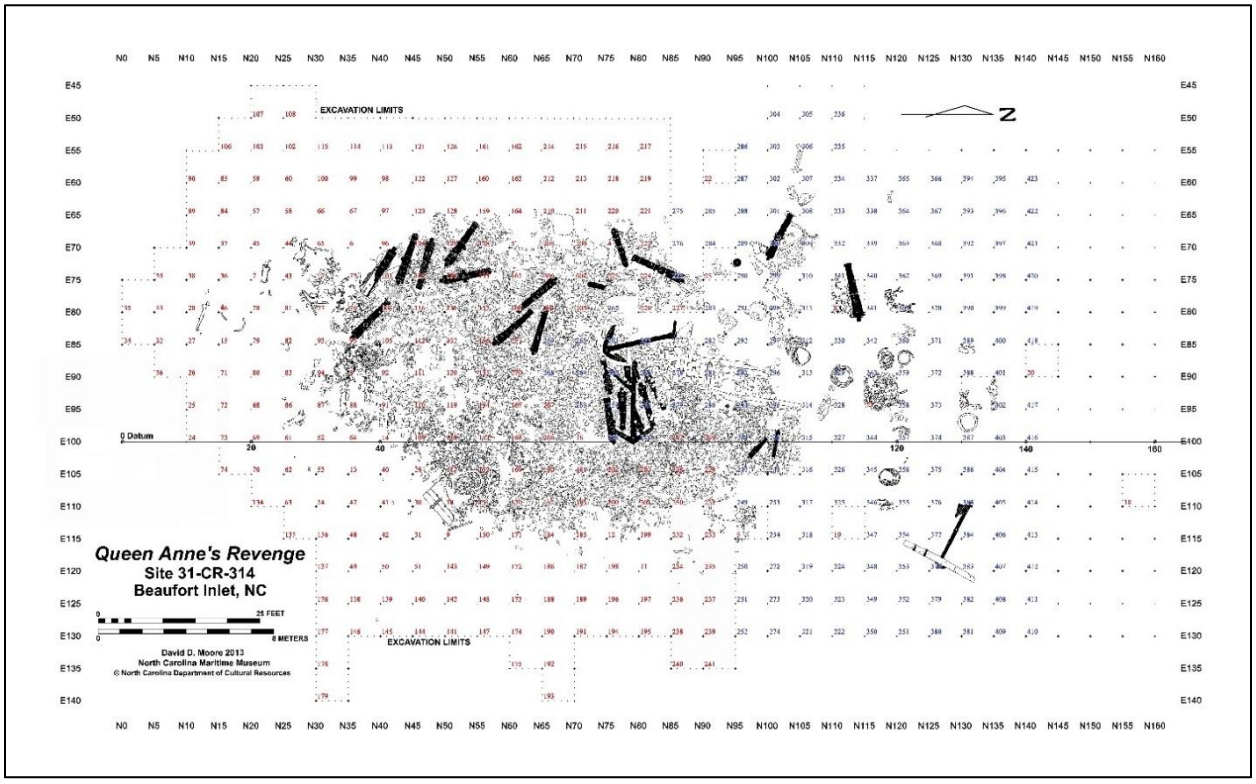

Fig. 5 Site map with completed units in red and incomplete units in blue. (Map by NC Department of Natural and Cultural Resources, 2013.)

2014 Field Season Summary

Although only a three-week field season was financially viable in 2014, the truncated season from October 7-27 was still productive. Work was again conducted from USCG Station Fort Macon, with invaluable support from base personnel. For this season's fieldwork, DMF provided a larger

work platform, R/V *Shell Point*, a vessel equipped and crewed for heavier recovery than R/V *Jones Bay*. Several days were lost to poor weather conditions in the second week, therefore only ten working days were spent on site. Despite the lost time, excavation of the central area continued with pneumatic disassembly of the midships matrix, resulting in the recovery of a single cannon (Fig. 6) and 17 other QAR numbers, including multiple cannon shot and a grenade. The 2014 season brought the total of recovered cannon to 23 of the 30 verified to be on site (Kenyon 2014).

Fig. 6 Cannon C29, partially cleaned. (Image by NC Department of Natural and Cultural Resources, 2016.)

2015 Field Season Preparations

The research goal for 2015 was to expose, record, and recover a known section of hull and framing timbers pinned beneath the midships concretion matrix. The team was to begin by recording and removing cannon C28 and C30 from the concretion, with the two cannon being recovered as one object. This would minimize the time-consuming removal of the encompassing encrustation *in situ*. Following recovery of the two smaller guns, cannon C9 would then be chiseled free of anchor A2 and relocated to a holding area fifty feet east of 80' N on the primary baseline. Cannon C10 and C11 would also be recorded and removed from their locations directly atop the hull remains and staged in the same holding area. Finally, the remaining concretion consisting of a composite of anchor A2 and cannon C7 would be relocated, fully exposing and freeing the timbers for recording and recovery. Any remaining smaller artifacts would be mapped, and the area would be dredged and sluiced to collect microartifacts (Price 2016). The excavation and recording of the immediately adjacent excavation units (246, 255-265) would then be completed. Recovery of A2, C7, C9, C10, and C11 would be scheduled for a later date when more storage space for large artifacts at the QAR Conservation Lab could be created.

An additional research goal for the 2015 field season included obtaining corrosion potential and pH readings for A2, C7, C9, C10 and C11 to further the ongoing study of *in situ* preservation on the QAR site through the attachment of sacrificial zinc anodes (Welsh 2010). Previously, zinc anodes were attached to cannon C1, C6, C12, and C20 and anchors A2 and A3, which have since been recovered. Anchors A2 and A3 remain the only artifacts *in situ* with anodes attached, and cannon C7, C9, C10, and C11 continue to serve as experimental controls. A new component to the study would be the collection of sediment adjacent to, and at set distances from, anode placement locations. This would provide baseline data in determining the presence of zinc on site due to efforts to stabilize large iron artifacts (Rousseau *et al*., 2009). Offsite sediment would be collected as control samples.

Fig. 7 R/V *Jones Bay*. (Image by NC Department of Natural and Cultural Resources, 2013.)

Logistical Preparations

Improving efficiency was a key component in preseason planning, with changes to equipment design implemented in advance of the season start date. The dive platform, R/V *Jones Bay*, is a 40-foot by 20-foot open barge (Fig. 7), capable of supporting eight divers and topside crew and housing all dive and excavation equipment. With limited deck space, it was imperative that equipment be compact and lightweight, while still capable of accomplishing required tasks. Equipment was examined for improvements, redesigned, and rebuilt if necessary, to increase deck space and improve maneuverability in the water.

In prior seasons, dredging equipment required almost all available deck space, presenting a safety hazard. Therefore, the water induction hoses were exchanged from heavy 3-inch ridged plastic to 2-inch synthetic fabric, which could be rolled up and stored when not in use. The former iron power dredges weighed approximately 50 pounds each; these were substituted for an alloy power jet from Keene Engineering weighing less than 10 pounds. Securing the dredge exhaust was previously accomplished by outfitting a wooden box with a 20-pound lead weight and attaching it to the exhaust, then driving a U-shaped rebar stake through the box into the seafloor. This season, setting up the dredge exhaust was streamlined by way of screwing a 30-inch earth anchor into the sea floor and shackling the exhaust to it.

Pneumatic equipment for dismantling the midships concretion was also refined. A gas-powered compressor replaced the combination of generator and electric compressor used previously. The Ingersoll-Rand 116K air hammer was selected due to simplicity of design and use. Chisel tips of varying shapes were purchased to increase the versatility of the air hammer, with additional tips custom shaped by the crew for specific applications.

In the weeks prior to beginning fieldwork, QAR Lab staff and graduate assistants gathered supplies (containers, photography equipment, artifact labelling tools, etc.) and prepared the facility to receive hull timbers and up to two cannon. This entailed filling one storage tank with corrosion-inhibitive alkaline solution for cannon and another large tank filled with water to store timbers.

2015 Team

The season was marked by a shift in leadership style from a single director to a hierarchical approach and delegation of certain responsibilities. John Morris served as the Project Director and Principal Investigator, ensuring that the overall goals for the season could be met and that the new methodologies were safely implemented with the redesigned equipment and procedures. Kimberly Kenyon, as Field Supervisor and Site Conservator, oversaw the archaeological direction of the project, guaranteeing continuity of data and safe handling of artifacts from field to conservation lab. Greg Stratton served as Lead Field Technician, organizing and maintaining excavation equipment, training divers on archaeological technique, and implementing changes to equipment as discussed above. Julep Gilman-Bryan, in her final season before retirement, served as the Dive Safety Officer, assuring that all divers and dive equipment were operating safely.

The remainder of the dive team consisted of current students and recent graduates of East Carolina University's (ECU) graduate program in Maritime Studies: Jeremy Borelli, Nick DeLong, and Bernard Howard. Molly Trivelpiece, a graduate of Longwood University, joined the team as an intern. Working with the team on a rotational basis, in order to learn about and participate in topside duties, were current ECU Maritime Studies graduate students Elise Carroll, Katie Clevenger, Sean Cox, Mateusz Polakowski, Allyson Ropp, and Emily Schwalbe. Other crew included captains Kevin Oliver and Buck Wilde, and Dave Moore, Curator of Nautical Archaeology at the North Carolina Maritime Museum in Beaufort. Also participating were Rick Allen of Nautilus Productions and John Masters of Intersal, Inc.

In addition to diving, team members were responsible for different tasks which varied from day to day, with duties being assigned at the morning briefing. Daily assignments included: cleaning the barge at the end of the day, stowing and maintaining gear, filling tanks, helping with artifact photography and storage, tending sluice boxes, and manning surface-to-diver communications on the barge.

Methodology

On September 8, the QAR team assembled at USCG Station Fort Macon to begin setting up, including outfitting R/V *Jones Bay* as a dive platform. With new moorings and the north-south baseline set the week before, excavation began in earnest on September 9. The first mission on site was to employ two five-inch water induction dredges near the midships concretion matrix. In the interim following the previous season, sediment had completely covered the site, and the dredges were used to find the boundary of sandbags under exposed cannon indicating the end of excavation in Fall 2014. Once the work area was uncovered, the next phase of the season's plan could proceed.

In situ Preservation: E_{corr} and Sediment Sampling

As the second week of excavation commenced, data was collected for the long-term *in situ* preservation study (Watkins-Kenney et al 2015). In 2010, following the collection of corrosion potential data for anchor A3 and establishment of a protocol (Welsh 2010), a sacrificial zinc anode was attached to anchor A2 and four cannon (C7, C9, C10, and C11). This season, QAR Lab Supervisor Sarah Watkins-Kenney and QAR Conservator Erik Farrell joined the team on site, operating the multimeter and pH meter topside and preparing storage containers for sediment samples. Kimberly Kenyon and Greg Stratton dived with a pneumatic drill, flashlight, and electrodes for measuring both corrosion potential (E_{corr}) and pH. Holes previously drilled into the concretion for this purpose were used where possible, drilling through newly formed concretion; new drill locations were chosen when necessary. A previously drilled hole was located on A2, but

existing sites were not found on any of the four cannon. New locations were chosen, avoiding reinforce rings and seeking areas which would clearly expose the metal of the cannon rather than additional concretion, or other artifacts concreted to the exterior. The only portion of cannon C10 visible within its massive concretion matrix was in the area around the breech. It was deemed unwise to drill directly into the breech face; thus, data was not collected for C10. While drilling C11, the generator malfunctioned and therefore pH values could not be acquired. All other recordings (E_{corr} and pH for A2, C7, C9 and E_{corr} for C11) were taken over the course of two minutes, with data logged by topside staff.

No study has yet been performed on QAR to ascertain whether the anodes are causing zinc to be deposited into the surrounding sediment as they corrode. In order to determine the presence of zinc (Rousseau et al. 2009), sediment samples were collected immediately adjacent to and at set distances from the midships concretion matrix. Two samples taken offsite (30 feet east of baseline 30 and 30 feet west of baseline 130) serve as control data for the natural environment, and six samples were collected at pre-selected locations, mapped relative to A2.

The Wildco® Hand Core Sediment Sampler was employed for the purpose, as it is reputedly able to be used by divers as well as in shallow water. It was found that to collect a sample, divers had to be severely over-weighted in order to get purchase and force the sampler into the compacted sandy bottom. Unfortunately, the sampler was determined to be ineffective for packed sand, because fine grains tended to slip out of the sediment catcher instead of producing a distinctly stratified sample. After many attempts, small amounts of sediment were finally obtained and brought to the surface where they were immediately placed on ice before returning to the QAR Lab. Samples will be kept refrigerated until they can be tested for zinc content. Due to the broad scope of *in situ* monitoring data and its interpretation, particularly with the added study of zinc presence and possible impacts, results and ensuing discussion will be addressed in subsequent reports.

Disassembly of the Midships Concretion Matrix

Following the collection of raw data for *in situ* monitoring, attention was turned to disassembling the midships concretion matrix containing at least four cannon and one anchor. Based on finds in previous seasons, other artifacts were anticipated within the matrix. Following on-site testing in 2013, the systematic de-concretion of this mass using pneumatic chisels was perfected during the short 2014 field season, which culminated in the careful removal and recovery of cannon C29. Teams of three divers were ideal for this painstaking procedure. One diver operated the chisel, a second focused a dive light on the work area, while a third employed a three-inch dredge to keep the water column free of debris and improve water clarity (Fig. 8). On days of poor visibility (less

than one foot), chiseling was halted, to ensure team safety and to protect artifacts from inadvertent damage.

Fig. 8 Jeremy Borrelli (left) and Greg Stratton (right) chiseling between A2 and C28. (Image by NC Department of Natural and Cultural Resources, 2015.)

In 2014, much of the fine concretion debitage, observed in the form of a dark cloud of particles suspended in the water, was removed using the five-inch dredge to clear the water column and improve visibility for the chiseler, but the debitage was not collected. In 2015, three-inch dredges connected to sluice boxes topside, were employed so that loosened concretion debris could be collected and explored for microartifacts (Krop and Nordgren 2004; Price 2016; Weiner 2010). Upon returning to the lab, this debitage was processed using the standard practice for dredge spoil already established for the QAR site (Price 2016). All collected material was passed through two screens to catch larger objects, with shell hash being discarded, followed by the panning of sediment to wash it of lighter particulate. Concretions recovered during screening were x-rayed to determine contents. Remaining fine debitage was examined under a microscope for the smallest artifacts, namely gold grains, which are regularly found in sediment and occasionally in concretion.

Upon close scrutiny of C28 and C30, the decision was made to separate and recover them individually rather than as a single large concretion. This was primarily due to the positioning of A2, C7, and C30 in relation to one another. While C28 was largely cleared of all other objects, C30 partially underlies A2, making its separation and removal more difficult. With the state of

preservation for A2 largely unknown, it is preferable to leave as much of its encrustation in place as possible until it can be removed in a controlled manner in the lab (Hamilton 1996:9).

As work continued with a focus on the removal of C28, dozens of artifacts were found within the concretion matrix. Each was individually mapped and numbered prior to being dislodged. Divers were required to record in detail all artifacts tagged, mapped, and raised. As part of the daily dive log, the work area was drawn, with important features and artifacts labeled. The logs included measurements and mapping data for everything uncovered within the concretion matrix and the surrounding area. At the end of each workday, artifact mapping data was transposed onto a site map encompassing only the area immediately surrounding the midships concretion matrix, at a scale of 1:10 (Fig. 9).

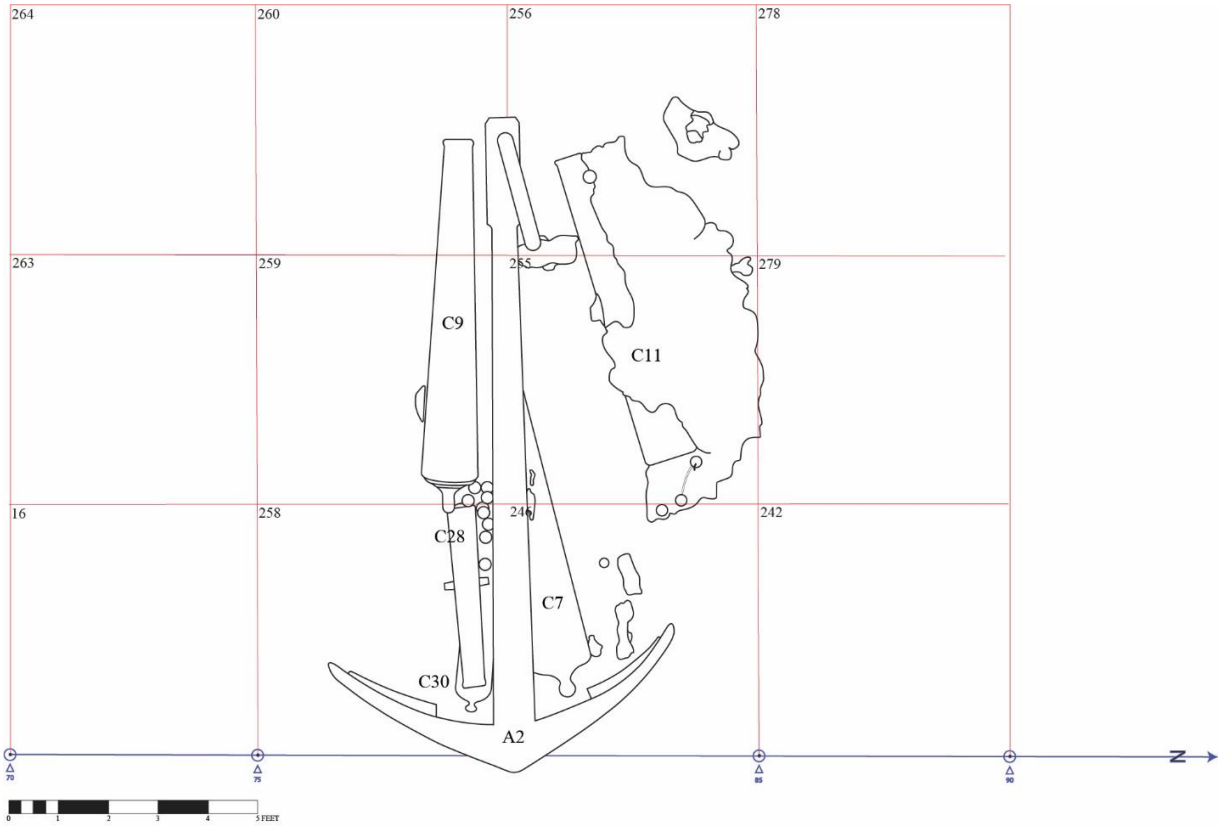

Fig. 9 The midships concretion matrix consisting of A2, C7, C9, C28, and C30. Note the cluster of cannon shot found between C28 and A2. (Map by NC Department of Natural and Cultural Resources, 2015.)

To improve accuracy in site recording, two methodological approaches were adopted to supplement the established practice of total unit documentation (Wilde-Ramsing 2006; Wilde-Ramsing and Ewen 2012). Trilateration from two baseline stakes using a level line and plumb bob eliminated errors in horizontal and vertical data acquisition, and direct offsets were taken from

the primary baseline. While working on a discrete assemblage within a unit, such as the cluster of objects surrounding A2, a secondary baseline was used to take direct line offsets over shorter distances. These techniques were implemented to verify each artifact's positioning prior to recovery (Fig. 10). Additionally, artifact provenience was previously recorded to the nearest three inches; this season marked the start of recording to the nearest one-eighth inch, in an effort to improve mapping precision.

Fig. 10 John W. Morris III, Greg Stratton, and Kimberly Kenyon (left to right), mapping the north fluke of anchor A2. (Image by NC Department of Natural and Cultural Resources, 2015.)

Hurricane Joaquin and the Remainder of the Season

Week four (beginning September 28) brought news of a tropical depression forming in the South Atlantic. The depression quickly developed into Hurricane Joaquin and was projected to hit the North Carolina coast as a Category 2 storm. Hurricane force winds and flooding called for a complete evacuation of the area, including the removal of all equipment from site and from USCG Station Fort Macon. At the request of DMF, arrangements were made to lift R/V *Jones Bay* and stow it safely at Jarrett Bay Industrial Marina. Luckily, the storm tracked farther east than anticipated, and North Carolina avoided the brunt of the strongest winds. However, due to higher than normal rainfall and high tides, diving was postponed until storm waters receded, leading to an unfortunate but unavoidably foreshortened excavation season. Finally, on October 8, *Jones Bay* was refloated and re-outfitted to continue excavation as planned, with what little time remained.

Cannon C28 was chiseled free of its final barrier of surrounding encrustation on October 27. The full team participated in a comprehensive briefing and walkthrough on the barge dockside prior to recovery. This training ensured that all team members were aware of hazards and safety concerns for both personnel and artifacts during heavy lifting operations. The cannon was rigged with two eight-foot straps and a 250-pound lift bag and was raised to the surface horizontally. On the surface, a davit and electric winch was used to recover C28 and place it safely on prepositioned blocks on the deck. After returning to shore, the cannon was covered with wet rags and transported immediately to the QAR Lab by the end of the day. Upon removing C28 from directly atop C30, it was possible to reassess the condition of the latter. Its close proximity to A2 and the presence of other faintly visible artifacts which would slow progress considerably led to the decision to forego recovery. Since C30 would remain *in situ* until the next excavation season, and with only three diving days remaining, it was decided to discontinue further removal of concretion, which would risk exposure of more iron to the elements.

The final days of fieldwork, from November 2-4, were spent examining and mapping C11 and A2. Cannon C11 has an immense outer concretion, from which 41 objects were recovered in 2013. It has been theorized that the concretion may contain two cannon, but this hypothesis will not be further explored or verified until recovery. A baseline was laid down the shank of A2, at 80’ 1” N on the primary baseline. This secondary baseline was used to take direct offsets and verify placement of features for nearby cannon and concretions.

Diving ended on November 5, with all reference lines removed and recovered. Mooring lines were also removed, after recording coordinates so that the moorings could be found upon returning to site. By measuring from baseline stakes to precisely recorded mooring locations, it was discovered that one of the moorings placed by ANT had been dragged fifty feet away from the site by Hurricane Joaquin. The team spent the following few days on shore cleaning up and removing gear and vessels from USCG Station Fort Macon.

Results

One cannon (Fig. 11) and 28 other QAR numbers, including one bucket of dredge spoil per unit from Units 246, 255, 256, 258, 259, and 260 were recovered. Of note were ten cannon shot removed from the concretion surrounding C28, adding to the ten cannon shot recovered in the same area in 2014. The sizes of cannon shot (Henry 2011) recovered in 2015 include one 4-pounder and nine saker/6-pounder shot, compared to one 4-pounder, five saker/6-pounder, and two 6-pounder shot recovered in 2014. Two cannon shot from 2014 remain unidentified. Sediment from the six units listed above has produced an array of artifacts including: pipe stems, animal bone, brick fragments, gunflints, animal hair, a lid for a nesting weight set, a button,

straight pins, a ceramic rim sherd with green glaze on both interior and exterior surfaces, glass bead fragments, and gold grains. Ballast stones were placed in sandbags by unit and were relocated 25 feet due east of the crown of anchor A2 (primary baseline point 80' N). These will be recovered during a subsequent field season.

Fig. 11 Cannon C28. (Image by NC Department of Natural and Cultural Resources, 2015.)

Processing of sluiced material from the de-concretion of C28 produced 57 small wood fragments and 6.0 kg of concretion debitage. Also found during sifting were 13 small lead pellets resembling Rupert-method lead shot. However, it was noted that one diver's soft weight ruptured on deck, and some lead pellets made it to the site to rest directly atop C28. Since no lead corrosion or superficial iron concretion was observed, it is more likely that the pellets found in the sluice belong to the latter category instead of having been within the C28 concretion matrix. The sluiced and sieved debitage was x-rayed to identify obscured objects: two additional lead pellets were observed, which were likely missed during sieving, but no other objects were noted. Further microscopic exploration of the finer silts yielded no other artifacts. Microscopically, the silt debris looked to be nothing more than heavily iron-stained grains of lightweight sand.

Daily mapping of artifact coordinates facilitated immediate recognition and acknowledgment of errors in measurement, enabling divers to return the next working day to re-measure and correct those errors prior to removing artifacts from the seabed. All measurements henceforth will be recorded to the nearest one-eighth of an inch, to improve precision of mapping data.

Conclusion

Preseason discussions, planning, and re-evaluation of protocols and equipment greatly improved productivity over the course of the season. Individual team members were given additional responsibilities, and communication was improved, thereby enhancing team cohesion and generating a more organized approach to excavation and site recording. Modifications and streamlining of equipment not only increased workspace on the cramped barge but made work safer and much more efficient.

Daily scheduled maintenance of tools ensured their longevity and continued performance, particularly with air hammers, which were stored in lubricant to arrest corrosion to interior components caused by continuous immersion in saltwater. Chisel tips were sharpened daily to minimize the risk of damaging artifacts while in use. Thirty percent more usable deck space was created through the reduction of equipment size and design, specifically by utilizing a gas-powered compressor and lighter, more flexible dredge hoses. Equipment organization was achieved through the simple use of well-labeled bins. The reduction in weight to dredging components gave divers more maneuverability on the seabed and allowed a single person topside to easily recover the dredge at the end of the day. Moreover, changes to equipment in the event of a malfunction were efficiently facilitated by the standardized placement of male and female couplings in both dredge and pneumatic hoses.

Every morning prior to departure, a team briefing was held. The day's goals, each diver's responsibilities, dive team assignments, and dive rotation were reviewed and posted. This ensured that the crew remained informed of expected workflow and individual duties, both underwater and topside. These briefings also kept everyone aware of activities site-wide and not solely focused on his or her assigned duties. This improved personal accountability and created a sense of responsibility to the rest of the team.

Assigned dive team rotations significantly improved overall efficiency and organization. Teams of three divers, with each diver responsible for a specified task, were found to be ideal for chiseling. This ensured that the greatest care was exercised when using a high impact piece of equipment near heavily corroded and therefore easily damaged iron surfaces. Due to the extensive concretion matrix, it is essential to disassemble and de-concrete objects *in situ*. Although this practice has been previously avoided due to the possibility of damage to delicate artifacts (glass, textile, leather, beads, etc.) commonly found within other QAR concretions, this approach is a viable procedure when executed correctly. The decision was not made lightly; however, the lack of lifting gear in the QAR Lab capable of maneuvering the weight of the midships concretion as a single artifact necessitates dismantling it *in situ* at the risk of exposing small finds. Using the

three-inch dredge and sluice combination not only improved water clarity but also ensured that no artifacts were lost during chiseling, as evidenced by objects found upon thorough screening in the lab.

By November 5, the final day of planned fieldwork, all artifact provenience and the site map were up to date and accurate, thanks in large part to the daily dive logs. These logs demonstrably aided in the reduction of mapping errors. As photography on QAR is perpetually unreliable due to poor visibility, divers' notes and drawings proved to be instrumental in reconstructing and interpreting site data. The simple practice of holding individual divers responsible for producing precise data helped the team to function as an integrated unit and enabled more accurate mapping practices.

The use of trilateration and direct offsets in combination with total unit documentation provided a way to verify data before artifacts left the seabed. Improved precision in measuring (from three inches to the nearest one-eighth inch) ensured more accurate mapping. These practices will be continued for the duration of the excavation. Recording was further improved by daily plotting of all data on the master site map. To further mitigate data errors, a new baseline will replace the current baseline arrangement. This will entail sinking new galvanized posts every ten feet north of the 70-foot post, the positions of which will be verified weekly for migration and disturbance. A stronger baseline material will also be explored, as the polypropylene lines previously used tend to stretch and sway in even the gentlest of swells and currents. In protecting the baseline positioning, it is imperative that divers be trained at the beginning of each season to use the baseline as a measuring device and not rely on it as a travel line.

Poor weather was the major contributing factor to loss of work time. Out of 42 scheduled diving days, only 17 were full works days, with five additional half days. Twenty-one and a half days were lost due to unfavorable winds, high swells, and the effects of Hurricane Joaquin. Two half days were lost because of poor visibility during chiseling, primarily due to the ship channel being dredged a half mile away. Despite losing half of the season, several processes were improved upon, which will allow the remainder of the excavation to proceed more efficiently.

With the 300th anniversary of the loss of *Queen Anne's Revenge* approaching in 2018, departmental resources are dedicated to expanding the QAR exhibit at NCMM. One day is planned on site in the coming year (2016-2017), to observe environmental changes due to storms and/or human activity. Upon returning to excavate the QAR site in the future, the team will resume this season's established methodical approach and operational efficiency for the duration of fieldwork.

Acknowledgments

Many people and entities contributed to the success of the last three seasons on QAR. Deputy State Archaeologist-Underwater John W. Morris III and Field Technician Greg Stratton contributed content to the field report. Funding for 2015 was provided through the diligent efforts of the Friends of Queen Anne's Revenge, who received a generous contribution from the Eddie Smith Foundation. Work would not be possible without the support of the United States Coast Guard Station Fort Macon in various capacities. Commander Carrie Trebbe (2013-2014) and Commander Javier Delgado (2015), allowed access to the base and other permissions, from providing docking privileges to helping solve logistical concerns. The Aids to Navigation team under Chief Brian Porter provided tremendous assistance in 2015 for setting moorings. The crew of USCGC *Smilax* under the command of Chief Warrant Officer 4 Scott McAloon was crucial in raising five cannon in 2013. CWO4 McAloon continued to coordinate and facilitate the joint operations of QAR and USCG through 2015. Cape Fear Community College, and the crew of R/V *Dan Moore* under Captain Steve Beuth, lifted two cannon in 2013. The NC Division of Marine Fisheries under the Department of Environmental Quality continues to generously provide use of their vessels as dive platforms. A special thanks should be extended to the crew of R/V *Shell Point*, Captain Tom Piner and First Mate Joe Carraway, for their patience and hard work in 2014. Fort Macon State Park continues to provide much-needed affordable housing for the excavation crew and graciously allowed access to tools when necessary. The QAR archaeology and conservation staff, including students, volunteers, and interns continue putting all of their energy into this project, and everyone's efforts are fully appreciated.

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