



Queen Anne's Revenge

Conservation Laboratory Report, October 2012

UAB Conservation Laboratory, Greenville

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It has been an amazing and action packed twenty-two months here at the *QAR* lab since our last report and we would love to share some of the highlights. New crew members have joined our team while others have moved on. There have been three successful field seasons which have brought in a plethora of new artifacts. All the while, conservators continue to process artifacts and pursue new techniques to help with conservation. We have focused not only on conserving artifacts but also getting artifacts ready for the new *QAR* exhibit at the North Carolina Maritime Museum (NCMM) in Beaufort, North Carolina.

QAR Staff, Volunteers and Interns

Many new faces have been added to our *QAR* team. For the year 2010-2011, Courtney Page, ECU Anthropology graduate student, and Laura Kate Schnitzer, ECU Maritime Studies graduate student, became a part of the *QAR* staff from September to May. Also, Myron Rolston and Terry Williams returned for another year. During summer 2011, Elise Carroll, History undergraduate student at the University of Mississippi, and Erik Farrell, Anthropology graduate student at UNC Greensboro, volunteered their time to gain experience.



Unfortunately, Myron left the *QAR* team in June of 2011 and moved to Virginia. He started out as a volunteer in 2005 and became a conservation technician with us in 2006. He was a great asset to our team during his time here. Myron had a key role in conserving, organizing, and researching *QAR* lead shot. He was also a great person to have when we needed something to be made or fixed. He will be missed and the *QAR* staff wishes him well.

With summer 2011 behind us, the *QAR* staff gained a new staff member and lost another. Erin Burnette, ECU Maritime Studies graduate student, joined our team. Also, Courtney and Terry returned for another year. Kate Schnitzer was unable to come back but she continued to come to the lab to analyze cannon aprons for her thesis research. Also, Laurel Seaborn, ECU Maritime Studies graduate student, volunteered her time helping us with various projects.



We were excited to accommodate two internships, both from the [University of Delaware, Winterthur Conservation Master's Program](#) in Newark, Delaware. Bartek Dajnowski, 2nd year conservation graduate student, began his internship in July of 2011 for 8 weeks. Then, in September of 2011, Ellen Promise, 3rd year conservation graduate student, began her internship for three months. They were both involved with all aspects of conservation, including fieldwork. Their projects included desalination processes, conserving copper alloy pins, electrolysis set-up and iron conservation, wood preservation, x-radiography, stain removal from ceramics, and concretion breakdown. The lab was fortunate to have two wonderful interns and wish them well in their studies. Ellen has now graduated and is working as a conservator at the Peabody Museum.



Education and Public Outreach

Education and public outreach continue to be an important aspect of work at the QAR Lab. We had many visitors pass through our doors ranging from college students to professionals in the field. All tours are given a brief history of the project and then escorted around the lab by staff members, who explain different conservation processes taking place at that time. Tours are tailored to fit the group depending on their interest. The lab is not generally open to the public but arrangements are made for educational and special interest groups.

The lab led 34 tours ranging from community tours to school groups totaling 286 people during the last 22 months. Among these groups, ECU classes made up the majority. We have had 12 classes (150 students) tour our lab. These classes included Biology Department's Environmental Lab, Undergraduate Honors course; History Department's Public History, Maritime Studies Conservation, Research and Methodology in Nautical Archaeology; and Anthropology Department's History of Archaeology class. In December of 2010, the lab partnered with ECU to hold a Researcher and Students Open House. This event allowed faculty and students researching QAR artifacts to display and discuss their research, as well as view various artifacts. The event was well received with 40 students and faculty attending.



Many professionals passed through our doors in the last 22 months. In April of 2011, Eric Goldstein, Curator of Numismatics and Edged Weapons at [Colonial Williamsburg](#), toured the lab and helped identify 2 silver coins, as well as examine both the a sword quillion block and a sword grip. We reported about the sword quillion block in [April 2009](#) and [September 2010](#). Also, Dr. Tim Runyan with ECU Coastal Research Management brought a visiting archaeologist, Dr Brian Jordan, from BOEMRE ([Bureau Ocean Energy Management Regulation and Enforcement](#)) by the lab for a tour. In December of 2011, Dr. Pearce Paul Creasman from the [Laboratory of Tree-Ring Research at the University of Arizona](#), dropped by the lab, with Dave Moore from NCMM, to look at some of the ship's timbers to see if further tree-ring research can be accomplished. In January of 2012, Rod Hatt with [Coal Combustion Inc.](#) visited the lab and analyzed most of the QAR coal.



QAR 2012 Open House

Open House events provide an opportunity for the general public to come behind the scenes and to see what happens to artifacts after they are recovered from the ocean floor. On Saturday April 21, 2012, the QAR lab hosted an Open House with at least 400 people visiting the lab that day. This event was part of the [North Carolina Science Festival](#). This festival offered an opportunity to celebrate science in fun and welcoming settings, providing opportunities for cultivating a positive environment that will encourage children to pursue science-related careers and encourage businesses to invest in NC.



The Open House presented many aspects of science behind the archaeology and conservation of the *QAR* shipwreck site. Visitors were able to see artifacts from the wreck, talk with conservators, archaeologists and scientists including ECU faculty and student researchers about the methods and challenges of conserving artifacts from underwater environments. Interactive activities in which children and parents participated included: viewing the tiniest artifacts

recovered under a microscope, weighing and measuring ballast stones, testing the pH of different conservation solutions, searching for artifacts in x-radiographs, locating artifacts on the site map, identifying marine life on concretions, identifying different archaeological materials, and getting a chance to lay out grids like a real archaeologist would do. There was also a quiz linking to the displays and activities which helped initiate conversations between visitors and scientists.



During this event, we were joined by many of the researchers, at ECU and beyond, who have contributed to the QAR project over the years. Those unable to join us sent posters about their work or made suggestions for activities and props to use. This event involved ECU student volunteers, in addition to the NCDCCR staff. A BIG THANK YOU to all who volunteered and to all the visitors who came to the QAR Lab Open House on Saturday April 21st. We couldn't have done it without you all!



Lectures, Displays, and Conferences

Not only do we entertain tour groups, we also venture out into the public and professional arena to discuss the QAR project. In November 2010, Wendy Welsh gave students from Kill Devils School a "show and tell" lecture about the QAR site and the lab. May 2011, Wendy spoke to visitors at the NCMM in Beaufort before the grand opening of the QAR exhibit. Later that month, staff members were involved in the display of Anchor A1 at the Carteret County Visitors Center where people were able to view the newly recovered anchor and interact with staff.

With the opening of the new QAR exhibit in June 2011 at NCMM in Beaufort, we were involved in a conservation "show and tell" for both the Friends of NCMM and the public. In July of 2011, Sarah Watkins-Kenney was a guest speaker for the Southport Maritime Museum Friends at the Southport Community Building. She spoke about the process of conserving QAR artifacts. Sarah also spoke to the Greenville Rotary Club in December of 2011 on the same topic. In January of 2012, Shanna gave a "show and tell" lecture to 6th, 7th, and 8th grade Gifted and Talented students from HJ MacDonald Middle School in New Bern about the QAR



project. At the time, 8th grade students were researching different artifacts recovered from the QAR shipwreck for a class project. In February of 2012, Shanna was a guest speaker at the Rum Runners Dive Club in Greenville. Then, she gave a "show and tell" lecture to Greenville Montessori School as well as at the 16th Annual Ives Lecture Series at Hope Plantation. Also, Wendy Welsh gave a wonderful "show and tell" lecture to students attending AIG Elementary Camp in July of 2012.



QAR staff members had the opportunity to present at various professional conferences. In October of 2010, Wendy presented, "A Case Study of Insitu Monitoring on an Anchor from the Queen Anne's Revenge", at the ICOM-CC Metals Conference in Charleston, South Carolina. She enjoyed talking with other conservators and learned new and different techniques in metal conservation. Also in October, Sarah presented a paper, "Corrosion of Metals after 300 years on the Ocean Floor" at the NOAA Corrosion Conference in Norfolk, Virginia. In January of 2011, Shanna presented two papers at the Society of Historical Archaeology (SHA) Conference in Austin, Texas. She focused on the analysis obtained by the portable XRF reported in the [December 2009](#) conservation report and how it contributes to conservation. This year at the 2012 SHA Conference in Baltimore, Maryland, Sarah Watkins-Kenney, Mark Wilde-Ramsing, Linda Carnes-McNaught, Lauren Kate Schnitzer, and Courtney Page presented papers during the Pirate Symposium. The papers presented focused on different aspects of the project and the site's artifact assemblage.

QAR Thesis Projects

We are fortunate to have ECU graduate students from both the Anthropology and Maritime Studies departments become interested in the QAR project, which led to their thesis projects. Here is a short overview of their respective research.

Kate Schnitzer, ECU History/Maritime Studies Graduate Student

In January of 2012, ECU Maritime Studies student Kate Schnitzer defended her Master's thesis, "Aprons of Lead: Examination of an Artifact Assemblage from the *Queen Anne's Revenge* Shipwreck Site." Small finds like lead cannon aprons tend to get less public attention than the large anchors or cannon, but they too can reveal a great deal of information about past technologies and behaviors. The goal of Schnitzer's research was to shed light on cannon aprons, using the assemblage from the QAR as a case study. With a combination of historical research and archaeological documentation, questions were answered about the aprons' original use, manufacture, and surface markings. This study will fill gaps in the current knowledge of 18th century naval ordnance and help tell the story of the unknown sailors or gunners who marked them.

Courtney Page, ECU Anthropology Graduate Student

Today's image of piracy is based on characteristics that are not preserved in the archaeological record and are not necessarily good indicators of a pirate. Pirates differ from other sailors only in the legality of their actions and as a physical activity; piracy does not survive directly in the archaeological record. However, there may be certain behavioral differences between pirates of

the Golden Age [ca. 1680-1730] and contemporary non-pirate sailing crews that may delineate piracy as a distinct maritime culture or behavior that can be identified archaeologically. Page's research looks at the frequency of various types of artifacts representing different behaviors compared among the assemblages of two known pirate ships, Blackbeard's *Queen Anne's Revenge* and Samuel Bellamy's *Whydah*, a merchant vessel, the slave ship *Henrietta Marie*, and the naval vessel HMS *Invincible*. Thus far, the artifact analysis suggests that the pirate and naval vessels are relatively similar, both types having a greater frequency of fighting artifacts, such as cannon shot, lead shot, and personal arms. The pirate vessels, however, have a greater frequency of stored items than is represented on the naval vessel.

Erin Burnette, ECU History/Maritime Studies Graduate Student

Erin Burnette's thesis focuses on the biological activity found on concretions recovered from the *Queen Anne's Revenge* shipwreck. Her thesis concentrates around two questions: 1) do certain species have an affinity for a certain area in the wreck site, and 2) was the number of species found in each area of the wreck site affected by the amount of scouring that the currents and tides perform on different areas of the site. Also, her thesis looks at how long it takes for colonies to develop and grow on concretions and whether being constantly buried and uncovered by storm activity affects the amount of growth.

About 300 QAR concretions have been examined for individual species of mollusk, coral, or sponge. Each species was noted, counted, and measured according to a set scale of common sizes (in mm). The locations of the concretions will be used to plot all the species on spatial maps to show their relation to the site, as well as to indicate if certain species start colonies together. Over fifty species have been identified on the wreck site so far



Interesting QAR Artifacts

Clyster Syringe

Pewter objects QAR1904.000 and QAR3471.000 are particularly interesting artifacts recovered from the site that had us wondering how they would have been used. With the help of [Philippe Boucaud](#), a leading expert in antique French pewter, and other QAR researchers, we were able to determine that these objects are parts of a clyster syringe. QAR1904.000 (recovered in 2007) is the top portion of clyster syringe with visible maker and town marks. These marks reveal details about the production of the syringe. The town mark shows two interlaced C's with a crown and the name ROUEN beneath the C's, which stands for the town of Rouen, which today is the capitol of Upper Normandy region of France. The numbers 9 and 8 appear on either side of the interlaced C's is a control mark for

common pewter during the year 1698. The second mark is a marker's mark with the shape of a crowned duck with a C on the right, which led to the CANU family, probably Pierre CANU who was a master pewterer in the Rouen region between 1659 and 1701 (Daniel and Boucaud 2010). QAR3471.000 (recovered in 2011) would have been the syringe's body which still has the fibrous gasket inside it which would have been part of the plunger. Unfortunately, there are no visible marks on this particular object.





So...what is a clyster syringe? A clyster is another word for enema which are liquid remedies administered into the colon through the use of a syringe to help with some illnesses. These syringes consisted of a simple hand-powered piston pump with a plunger located inside a cylindrical tube or barrel. The syringe had a threaded opening at the end where different apparatus or nozzles could be attached to direct the liquid's flow (Friedenwald 1940). These particular syringes were a common medical instrument found in an apothecary's medical chest in the 17th and early 18th century so it is no surprise to find this on the wreck site.

**Daniel, Shanna and Philippe Boucaud. 2010. QAR Clyster Syringe from the Queen Anne's Revenge Site. QAR Research and Bulletin Series QAR-B-10-01. NC Underwater Archaeology, Kure Beach, NC*

**Friedenwald, Julius and Samuel Morrison. 1940. The History of the Enema with Some Notes on Related Procedure. Bulletin of the History of Medicine, Vol. 8, pp. 68-114, 239-276*

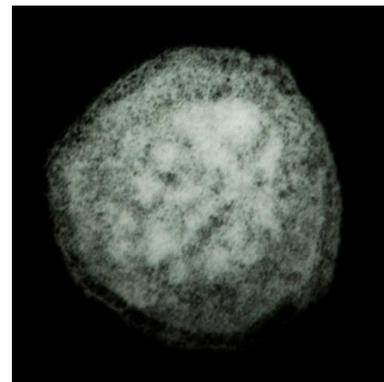


Silver Coin

In 2007, the first coin was recovered from the *QAR* wreck site. By the end of the 2008 field season, a total of four possible coins had been recovered. At first glance, it was not possible to identify the coins or even to be certain what they were made of as any surface detail was completely obscured by corrosion and concretion.

X-radiography revealed that these objects were indeed coins ([April 2009 Conservation Report](#)), but the material type was still unknown.

Based on overall appearance of the corrosion products, it was suspected the coins might be made of silver. Dr. Bill Miller at UNC Asheville analyzed QAR3233.001 by using SEM/EDS revealing between 7% and 60% by weight of silver (Ag) depending on the area analyzed. Further surface analysis of coins QAR3233.001 and QAR2003.024 using a portable XRF confirmed silver present at the surface.

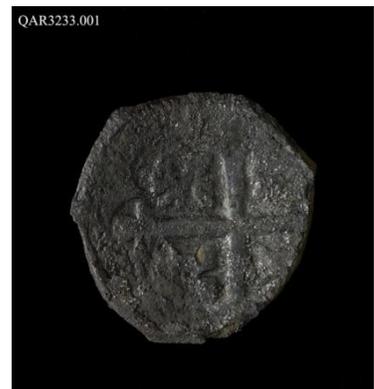


To clean the silver coins, it was decided to use a combination of chemical and mechanical cleaning developed by MacLeod and North (1979) and later modified for single items by Museum of London conservators (Ganiaris 1998:29-34). The method aims to reduce corrosion products on the object to reveal surface details. First to remove or soften the outer corrosion and concretion layer using hydrochloric acid (HCl) for 24 hours or even up to 1 week replacing with fresh HCl solution if it becomes spent. The second stage is to remove any copper (green) corrosion products present in order to prevent reduction and redeposit by using *Alkaline Rochelle*. (Plenderleith and Werner 1971:250). The final stage aims to reduce silver sulfide to silver by immersing the object in an alkaline dithionite solution in a sealed container (Ganiaris 1998:31-34; North 1987:242-243). When chemical cleaning is complete, the objects are thoroughly rinsed. Final stage is a protective acrylic lacquer coating to consolidate fragile surfaces (Ganiaris 1998:32).



Two of the QAR coins (QAR3233.001 and QAR2003.024) so far, have been cleaned by the method previously described. As cleaning progressed it became increasingly apparent that there was no underlying solid silver metal core to these coins, so they were never going to shine like bright polished silver. But some of the remaining surface survived with identifiable marks visible. Erik Goldstein, Curator of Numismatics and Edged Weapons at [Colonial Williamsburg](#), was able to provide identification and information about both the cleaned and un-cleaned coins.

QAR3233.001 was identified as a 1 real silver coin from Mexico City Mint. The Mexico mint being identified from the knobbed end of the cross on the reverse side of the coin. Symbols in the quadrants of the cross were identified as castles and lions. The obverse revealed an "M" with a circle above it, and the letter I or J below the M next to a shield. The coin was also clipped such that the right side of the shield was lost, as was its denomination and date. Thus with the details provided, both David Moore, Curator of Nautical Archaeology at NC Maritime Museum (NCMM), and Erik Goldstein proposed a date range around 1714-1718. The other cleaned coin QAR2003.024 was identified by Erik as a ½ real coin, possibly again from Mexico City mint. These two coins are now on display at the NCMM Blackbeard exhibit.



The two un-cleaned coins were identified from their x-radiographs, Erik identified QAR2224.017 as possibly a ½ real, on the basis of its size in the x-ray image and QAR1462.002 was identified as possibly from a Mexican Mint, with a shield –possibly Hapsburg - visible in the x-radiograph.

**Ganiaris, Helen. 1998. Reduction with Gain: The Treatment of Excavated Silver Coins with Alkaline Dithionite. In Dana Goodburn-Brown and Julie Jones (editors), 1998, Look After the Pennies. Archetype Publications, London, UK, 29-34.*

**MacLeod, I.D. and N.A. North. 1979. Conservation of Corroded Silver. Studies in Conservation 24, 165-170.*

**North, N.A. 1987. Conservation of Metals. In Colin Pearson (editor). Conservation of Marine Archaeological Objects. Butterworths, London, UK, 238; 242-243)*

**Plenderleith, H.J. and A.E. Werner. 1971. The Conservation of Antiquities and Works of Art. Oxford University Press, London, UK.*

Museum Update

Artifacts to North Carolina Maritime Museum (NCMM)

In preparation for the anticipated new *QAR* exhibit at the NCMM in Beaufort, North Carolina, QAR staff members, with the help of NCMM staff members, stayed busy conserving, documenting and photographing artifacts scheduled for display. Overall, 254 QAR numbered artifacts were transferred or loaned to the museum for this exhibit of which one transfer consisted of 60,000 individual lead shot. Some of the more interesting



artifacts sent to the museum were [cannon C3](#) which has the numbers '1,7,3' etched into the cannon's surface. Three of the ship timbers were transferred along with other organics including textile and rope. Two silver coins and one silver buckle were sent along with many other artifacts that are now on display at the *Blackbeard's Queen Anne's Revenge 1718* exhibit at NCMM.

In February 2012, an additional 34 QAR numbered artifacts were transferred and 3 were loaned to the museum for the Blackbeard exhibit. Among those transferred, the most notable was cannon C25, a copper alloy swivel gun with an iron yoke. Other interesting artifacts were 3 [cannon wads](#) recovered from the bore of [cannon C19](#) and a wooden handle with decorative pewter inlay. The swivel gun and the wooden handle are now on display at the museum.



NCMM Blackbeard's Queen Anne's Revenge 1718 Exhibit Grand Opening

The evening before the grand opening, NCMM had a preview event where certain members of the public were able to view the exhibit and conservators were on hand to answer any questions. Then, the following day, June 11, 2011, the [Blackbeard's Queen Anne's Revenge 1718 exhibit](#) opened to the general public. People were already lining up outside before the doors even opened. The atmosphere was very festive with Blackbeard making appearances throughout the day. There were activities for kids and weapons demonstration as well. We had a few tables set up showing different x-radiography of artifacts, electrolysis set-up, artifact displays, and kid-friendly demonstrations. At the end of the day, 3,600 people had survived long lines and the June heat to view the QAR exhibit. It was quite an amazing day for all involved!



Wood Update

QAR Frames Complete Conservation

We reported in [September 2010](#) that the QAR frames were still at the [Maryland Archaeological Conservation \(MAC\) Laboratory](#) finishing the freeze drying process. The frames returned to the QAR lab in December of 2010. Upon arrival, they were examined, photographed and placed in a storage area where the relative humidity (RH) stays around 50-60%. This is important because PEG (polyethylene glycol) is hygroscopic, meaning that if the RH increases, PEG could slowly make its way to the surface. If the RH is less than 50%, then moisture will be removed from the wood causing some shrinkage and cracking. Three of the ship frames have been transferred to NCMM and are now on display.

Since that time, one of the ship's hull planks and other various wood artifacts have gone through the same two part conservation process using PEG which was finally completed in March of 2012. They were then transferred to the MAC lab for freeze-drying in May.

QAR Wood Identification

We were fortunate to visit Dr. Lee Newsom's [Environmental Archaeology Laboratory](#) located at Pennsylvania State University in May of 2012. We transported 32 wood artifacts and samples to be analyzed for wood species identification. The importance of knowing the wood's species was explained in both the [August 2004](#) and [July 2008](#) conservation reports. The most intriguing artifacts were a gunstock QAR2452.001 and a deadeye QAR2385.000. Lee was quite the host showing us how to use her light microscope which is her primary instrument in identifying wood species. Also, it was great to see all the other projects she had going on at her lab. It was a wonderful experience and we hope to visit her again soon.



Cannon Update

Cannon 24 (C24)

The last we reported on Cannon 24 (C24) was in [July 2008](#) and 45% of concretion was still left to be removed. In May 2009, the exterior surface of C24 was free of large concretions and it started the lengthy process of [electrolytic reduction to remove salts](#). During this process the gun is periodically rotated to expose all exterior surfaces to surrounding anodes evenly. At one point the chloride levels rose to approximately 2000 ppm. Once the chloride readings started to level out, the next step in the conservation plan was to clean the bore free of concretion. The importance of removing concretion from a cannon bore has been discussed in our [July/August 2005 conservation report](#).

In [July 2008](#), our first experience with using a horizontal core drill to remove the concretion inside the bore of C2 was discussed, but the core drill mentioned was rented. In the spring of 2011 funding became available to acquire our very own horizontal core drill that can be used on

all our cannon bores that possess concretion. A Husqvarna DM 280 core drill motor with a DS 50 Gyro Stand that extends horizontally with core bits ranging in size from 1.00 inch to 3.75 inches was obtained for cannon boring purposes. This range of core bits will allow us to clean any size bore we encounter from this site.



In July 2011, Richard Tremain, Product Manager for Husqvarna, traveled to the lab and trained lab staff on the proper use of the core drill equipment. C24 was leveled by referencing the center of the button and the center of the muzzle with a laser. Once the core drill motor and bit were level and centered to the bore, the drilling could begin. The diameter of C24's bore is roughly 3.75 inches so a 3.00 inch core bit was first used to travel about 7 feet down the bore.



A 3.50 inch core bit was then used to make the final pass which left about an eighth of an inch (1/8") of concretion on the bore walls. While the setup is tedious and a little difficult, the payoff is enormous as this process only took a day. The lab staff is very grateful to Mr. Tremain for his instruction.

C24 is still undergoing electrolysis and now has an anode within the cleaned bore to further extract chlorides from the cannon. It is the largest cannon recovered from site and will most likely take the longest to desalinate. C24 is three years into electrolytic treatment and a clean bore puts it one step closer to dehydration.

Cannon 25 (C25)



Cannon 25 (C25) is the only bronze rail mounted cannon that has been recovered from the site and its full story was written about in the [Summer 2007 Queen's Report](#). C25 in concretion and C25 x-radiography pictures here It was also reported in [July 2008](#) conservation report where the iron yoke was going through electrolysis with sodium hydroxide as the electrolyte.

The bronze itself however was not hooked up to a current. In July 2011, chloride levels within the electrolyte were as low as 1 ppm so electrolysis was suspended. Once the electrolyte was rinsed from the object, both metals were treated. C25 after rinsed free of the electrolyte picture here The difference in material type requires different treatments for stabilization; as one metal was treated, the other was wrapped in parafilm wax to protect its surface. The iron was treated with tannic acid in ethanol. Once dry, the iron was coated with acryloid B-72 following with a coat of microcrystalline wax as a final sealant. The bronze was treated with citric acid, thiourea, benzotriazole (BTA), and finally sprayed with acryloid-B72. In August, C25 was completely dry and as is standard for all our [cannon](#), a tube of desiccant was placed inside the bore to maintain the relative humidity to prevent any further corrosion. C25 was transferred to the NCMM in February of 2012 and is now on display for the public.

