Queen Anne's Revenge

Conservation Laboratory Report, July/August 2005

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Cannon Update: C2 (QAR232.001); C3 (QAR233.001); C4 (366.001)

Amongst the many challenges in the conservation of cannon two major ones are to ensure that the bore is cleaned free of concretion and that all chlorides have been removed from the metal around the bore. The bore is a narrow, deep space, which makes it difficult to clean, access or even see. If a wooden tampion plugged the mouth of the cannon at the time of sinking, and remained in place through wrecking, burial and recovery, then the bore would remain largely free from concretion formation; the tampion would prevent entry of sand or sea life. Cannon C19 (QAR418.001) and C21 (QAR418.012) were recovered with their tampions in place and had no concretion inside their bores.

The August 2004 Conservation Report explained the processes that C3 and C4 underwent to get to the final stages of electrolysis. One aspect of these two cannon not mentioned in that report was the condition of their bores, cleaned prior to transfer of the cannon to the *QAR* Lab in Greenville. C2 has experienced similar desalination treatments as C3 and C4 however very little of its bore had been cleaned. In October of 2004 we got our first glimpse inside the cannon bores with a "See Snake," a plumber's tool used to see inside underground pipes. The bores of C3, C4, C19 and C21 appeared free of concretion, but C2 was concreted along the entire length of the bore. The former conservator's cleaning efforts were evident in C2 when two band clamps and a piece of wood at the back of the bore appeared on the screen. It was clear C2's bore would need much more attention.

C4 is a four-pounder, a smaller caliber gun than C2 and C3 which are six-pounders. We reported in March 2005 that C4 was out of desalination, drying and being monitored at the lab. Five months later the cannon appears to be stable, despite some initial spots of active corrosion inside the bore. C4's bore is 3.25" in diameter and just over 5' long. The lack of airflow into the bore hindered it from drying thoroughly, possibly causing the minor corrosion. A desiccant, calcium sulfate, has been placed up the bore to aid the drying process. The loose desiccant was contained in a tube made from mosquito netting wrapped with absorbent white paper which would indicate any actively corroding areas (orange stains) as well as prevent desiccant dust contaminating the bore surface. Since the desiccant has been placed in the bore of C4 there have been no signs of active corrosion.

It is difficult to completely remove chlorides from objects recovered from a marine environment, though that is the goal. The larger the object the longer it takes for chlorides to be removed. Our experience with C4's bore has prompted us to take an additional approach with C2 and C3 that are still undergoing electrolysis. The bores of C2 and C3 are 0.5"-0.75" larger in diameter and 6-7' long. As noted in last year's report the cannon sit between two mild steel anodes (+ charge) that help draw the negatively charged chloride ions (Cl^-) out of the object. The outer surfaces of the cannon are continually exposed to the treatment but chlorides in the metal closer to the bore surfaces are further from the pull of these anodes. An additional anode placed inside the bore would give chloride ions closer to the bore surfaces a source to migrate towards instead of going through the cannon thickness; as a result removing more chlorides into solution.

The clean bore of C3 allowed us to easily insert a mild steel rod and connect it as an anode in July. Conservators carefully placed spacers along the anode to prevent it from touching the bore's surface. Monitoring chloride levels in the solution over the next few weeks reflected a noticeable increase after remaining constant for some time before the bore anode was inserted.

The spacers and anode rod could not be fitted up the bore of C2 until some of the concretion was cleaned away. In August, conservators cleaned concretion out of the bore with running water, long metal augers and manpower to turn the auger down the bore. A fair amount of concretion was removed along with the band clamps and wood. Not all of the concretion was cleaned out but enough was removed so the anode and spacers could fit up the bore. The tough concretion left behind will hopefully be softened as a result of the bubbles created at the iron surface and make it easier to remove.

C3 and C2 will continue the electrolytic process, though C3 will complete the process before C2. C3 is expected to be dehydrated by the end of the year and plans are being put together to finish the cleaning of C2's bore. With two cannon at the museum, and one only a few months away, 2006 is looking like a good year for cannon viewing at the North Carolina Maritime Museum.

Cannon C22 (QAR509.000) - a.k.a. Bertha

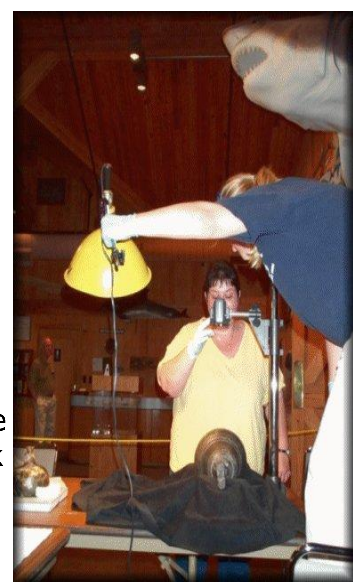
The third layer of Bertha consisted of 61 ballast stones and revealed the basic outline of C22. The cast iron surfaces of the button, breech and muzzle have been partially exposed and appear to resemble C19. C22 and C19 are the same length and are similar in shape at the breech and muzzle. The trunnions have not yet been uncovered nor have any other areas that may contain identifying marks. There are small sections of wood in various places though nothing appears to have definite shape or seem connected. The fourth layer was documented with drawings, photographs and tri-lateration. The cleaning of Bertha will continue in September.

Core sample for analysis
Conservators have been curious, and a bit concerned, about the possibility that the ships timbers and other wooden artifacts recovered from the site may contain significant amounts of sulfur and iron minerals. Wood recovered from some other wrecks, notably the *Wasa* in Stockholm, Sweden, has become very acidic years after treatment. Research is indicating that high sulfur and iron content in the wood, in combination with environmental factors, are contributory factors. Sulfur can enter the wood from its burial environment on the sea bottom, and its presence or absence depends much on local environmental conditions.

Aided by advice and equipment from East Carolina University's Department of Biology, *QAR* conservators recently took three core samples from QAR434.000, one of the White Oak hull planks. Dr. David Knowles visited the lab and instructed the staff on the use of an increment borer to take cylindrical cores from wood. Normally used in forestry to study the health and growth of trees, this device proved equally useful for taking precise samples of our archaeological timbers for chemical analysis.

In order to determine whether sulfur or iron minerals could be a problem for the wood, conservators plan to team up with colleagues at The Mariner's Museum in Newport News and Old Dominion University, Norfolk, Virginia, who are doing chemical analyses on wood recovered from the *USS Monitor*. It is very much hoped that this collaboration will not only shed further light on the condition of the QAR wood, but also allow for an interesting comparison with wood from the *Monitor*.

Image Database
When an object is recovered from the marine environment it goes through a series of processes before it is transferred for storage and display at the museum. Photography is an essential and invaluable part of the documentation of artifacts as they go through these processes. So far there are 2,536 *QAR* artifact numbers, which translates to about 20,500 individual pieces.



Many have debated the pros and cons of film photography versus digital photography for recording archaeological artifacts. The *QAR* project converted to digital in 2000 for the lab and fieldwork. In August of 2002, Karen Browning was hired at the Morehead field office and organized all the photos with any relevance to the project from the beginning and created a system to keep track of them all. The organization has been an ongoing process from straightening out the old photos and scanning slides into digital to keeping the new photos organized.

The number of images, instant results and relative ease of managing the image archive are the main reasons that digital photography has been chosen as the means of producing a photographic record for the *QAR* Project. Currently, all images of artifacts taken at the conservation lab or in the field are taken with a Nikon Coolpix 995. The digital photographs are taken in high resolution. Most images are reduced in size for storage in the computer database with the exception of the more important artifacts. The Artifact Image Database consists of about 7,000 images of artifacts (c. 700 MB). In addition there are the photos taken around the lab and at events associated with the project.

Once artifacts are recovered and numbered, a digital image is taken to record its condition once brought onboard. Most objects tend to change in appearance when removed from the marine environment. Initial photographs also help should an object lose its label and number. Once in the lab, all artifacts are properly photographed in their in situ position and from at least three other views, with a black background and a scale. Any ceramic, glass, lead, bone or other identifying artifacts protruding from concretions are photographed in detail.

Digital images are also used to record artifact relationships within concretions as they are broken down (as with C22 described above). Different objects of different materials may have to be separated for treatment - photographing the artifact relationships and seeing the results on the computer screen reassures the conservator that the image and relationship is documented. Different materials such as iron and rope have different conservation processes and when objects are separated they are put into different storage mediums to await their treatment. In that time, a different conservator can come along and the images provide a basis of where the artifact came from and an idea of what was found near it that could contribute to its condition.

If an object is in storage for a period of time, conservators consult previous photographs to identify any changes that may have occurred. With the transfer from an anoxic environment at the wreck site, or within a concretion, to an aerobic one in the lab, depending on the time an object spends in storage its appearance can change dramatically from what it looked like after initial recovery or removal from concretion. Once the current status of the object is photo documented, the conservator can proceed with treatment. Treatment processes are documented thoroughly and when the object is dry and stable, a photograph is taken to note its condition prior to reaching the museum.

The images not only help conservators but aid others in their research as well. Researchers who cannot come to the lab or the museum can be emailed photos to help them in their study of *QAR* artifacts. The *QAR* archaeologists use the images to interpret the finds through the study of artifact relationships.

Media

The filming in November of 2004 produced the film titled "*Q.A.R.*" by East Carolina University. The 30-minute documentary aired in the beginning of July and showed numerous times before the last showing on August 25th. The film will air in the future and you can find out when at www.ecu.edu/ecutv. The Conservation Lab would like to thank ECU for the recognition, portrayal of the project and what it is we do at the lab.

The History Channel's Deep Sea Detectives contacted the *QAR* project and was interested in doing a story. July 15th the Lone Wolf crew showed up to dive and film on the site. Site conditions could not have been any better with 30 feet of visibility and the south cannon were still exposed. The Lone Wolf crew interviewed the proper individuals and filmed artifacts at the museum. Saturday, July 16th they made their way out to the Greenville lab to film some of the finds in their treatment processes. The show is said to be airing sometime in January of 2006.