



# *H.L. Hunley Project Update*

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Period: January 2017 – July 2017

# Conservation Team Report

## Deconcretion/Work on submarine:

- Work continue with deconcretion in the forward and aft sections. Conservators have been working on Grid 1 and Grid 8 uncovering different features. New conservator Anna Funke joined the team and she began working on ATS2 (aft top plate 2) removing the concretion. We have had several issues with the tank system and our ability to drain it, which has delayed the work in the submarine. We have also have issues in uploading data of the work done in the submarine in the database due to the malfunctioning of the system and the inability of our database to support the data.
- Corrosion engineer Eddie Piedmont has been helping in adjusting the current and potential of the submarine. We had some issues with the connections so additional adjustment was needed.
- All the copper pipes and features from inside of the submarine have been covered with a protective coating to avoid galvanic corrosion in between the iron and the copper.
- Several iron samples were drilled from the submarine to analyze for chloride content. This will give us an idea the effect of the sodium hydroxide for desalination since the soaking of the submarine began. The results will be available in the coming weeks.

## Artifacts under treatment

- Plate CT2 (snorkel box). Due to the copper valves and cast iron components, this plate is still under electrolysis for desalination (electrolysis is used to protect the copper during this time).
- Spar tip: Under electrolysis for desalination (also has a copper component)
- Rope HL-3143, sections 7-8, 9-10, A-B. These sections have been in water in the lab tables waiting to finish treatment for the last 6 months but due to the failure of the freeze dryer we have been unable to dry them. These ropes have already been deconcreted, desalinated and cleaned using chelating agents. Once the freeze dryer is fixed, the drying process will resumed. Rope sections 1-2, 3-4, 5-6 are also waiting to be dry in the freezer #3. These sections had to be move to the freeze dryer chamber (still functioning) this time due to the malfunction of the freezer #3. Artifacts that were stored in the freezer were moved to the freeze dryer chamber. They remained there for a couple of months until the new freezer was purchased and received about a month ago.
- Pump Cordage HL-3787: Cotton cordage was removed from the pump piston last year and after an extensive cleaning and rinsing it was placed in the freezer for a non-vacuum freeze drying process. \*This process was also delayed due to the malfunctioning of freezer #3.
- Begin conservation and drying of big rubber gaskets removed from pump: HL-3754, HL-3751, HL-3765
- Sodium Hydroxide solutions of artifacts in the tank have been changed and boosted. Cl- levels have been analyzed.

## Conserved artifacts

- All the rubber gaskets treated last year (approximately 50) were placed in conservation boxes, packed and stored in organics storage room.
- Finished conservation of textile HL-3416 (cotton). This artifact was previously entered as a rubber gasket during the excavation but it was changed to textile.

- Finished conservation of textile HL-3460 (cotton/wool). This textile is thought to be two different fragments of a garment. After a lengthy process of non-vacuum freeze-drying, the artifact was removed from the freezer, documented and stored in the organics storage room.

#### Other

- Conservator Anna Funke started as the new conservator for the Hunley project on June 5<sup>th</sup>. She is developing a new plan to conserve the untreated artifacts stored in room B16 including the canteens.
- Archeology and conservation teams have been x-raying samples of concretion from the submarine (removed during the deconcretion process) to look for any artifact or small bone that could have been missed while deconcreting. In addition, we have gone through the sample bags identifying anything that could be conserved or sampled separately.
- RSO Johanna Rivera has trained archaeologists Michael Scafuri, Emily Schwalbe and new conservator Anna Funke, in the use of the X-ray equipment. They had taken the tests required by Clemson University and DHEC and had their new x-ray dosimeter badges assigned.

#### Publications

- Rivera, Johanna. *"The use of refurbished marine containers as a permanent storage solution for the maritime collection of the H.L. Hunley submarine"*. Journal of the American Institute for Conservation. Especial edition on collections. 56:2 2017
- Rivera, Johanna; Scafuri, Michael. *"The Sea, the Sub, and Maritime Collaboration: How conservators and archaeologists worked together to recover and conserve the H.L. Hunley submarine"*. To be published in proceedings, Engaging Conservation: Collaboration Across Disciplines. University of Pennsylvania Museum of Archaeology and Anthropology 2017
- Rivera, Johanna; Kasprzok, Lisa M.; Boussert, Stephanie; Crette, Stephanie. *"Restoring the Light to a 19<sup>th</sup> Century Candle Lost at Sea: Conservation and Chemical Analysis of a Candle recovered from the H.L. Hunley Submarine"*. Proceedings of the 13<sup>th</sup> ICOM-CC Group on Wet Organic Archaeological Materials Conference. Florence, Italy.
- Upcoming presentation at the ICOM-CC conference in Denmark:
  - Rivera, Johanna; Kasprzok, Lisa. Mass treatment of waterlogged rubber gaskets and seals from the American submarine H.L. Hunley (1864).

# Archaeology Team Report

Michael Scafuri, Frank Johnson

## Hull Deconcretion Documentation and Analysis

- Interior Deconcretion: WLCC conservation staff continued to remove concretion from the interior of the submarine. Specific areas of focus included the remaining portions of the captain's (Dixon's) area and the rear of the crew compartment including the flywheel and rudder-control levers. The archaeological team continued to provide daily support for this conservation work.
- Documentation: Documentation by the archaeological team of the deconcreted areas continued with notes, illustrations, and photography. All material removed by the conservators has been screened and interesting objects sub-sampled.
- X-ray imaging: All concretion material removed from the submarine is being X-rayed to find any potential hidden artifacts or other material of additional relevance.

## Research Projects and Collaborations

- H.L. Hunley Excavation and Crew Report: WLCC scientists have begun planning and preparation work, in collaboration with the Naval History & Heritage Command (NHHC) and various other partners, for the next volume of final reporting for the Hunley project. This will be the second of three volumes covering all aspects of the project. The editors of this volume will be Heather Brown and Robert Neyland of NHHC.
- Paint and Caulking: Researcher Isabel Giraldo continued analysis of paint and caulking samples recovered from the submarine. Archaeologists are looking to determine what materials and types of paint and caulking were used on the submarine.

## 3D Documentation and Metrology

- Photogrammetry Documentation and Modeling(Agisoft Photoscan):
  - Archaeological team began a series of test projects to evaluate the best techniques for documenting the interior of the submarine – the next major documentation project. This involved determining the best techniques for image capture and for processing using Agisoft Photoscan.
  - Grid 1 (Dixon) area test photography and modeling.
  - Grid 8 (flywheel and gears) area test photography and modeling.
  - Propeller and stern cap photography.
- 3D Processing and Site Plan Modeling (Polyworks and Rhinoceros)
  - Ongoing Grid 1 study and adjustment of 3D artifacts related to Dixon and the captain's area (forward crew compartment). This includes finalization of human remains, artifacts, and block lifts from this area.
  - Modeling of Singer and Lee spar torpedoes in Illustrator and incorporated them in the Rhino site plan. This is to enhance visualization and understanding of the attack.

## General Research

- Reviewed and confirmed GPS coordinates and orientation of the submarine, as located on the seabed, in relation to Housatonic, Breach Inlet, and Fort Sumter.

- Compiled an updated artifact spreadsheet and information relating to Dixon's area (G1) and the components used in navigation of the submarine.

## **Papers and Publications**

- Michael Scafuri published a PAPER "H.L. Hunley Revealed: documentation, deconcretion, and recent developments in the investigation of an American Civil War submarine from 1864." *International Journal of Nautical Archaeology* (2017).
- Johanna Rivera and Michael Scafuri published a PAPER "The Sea, the Sub, and Maritime Collaboration: How conservators and archaeologists worked together to recover and conserve the H.L. Hunley submarine." In *Proceedings of Engaging Conservation: Collaboration Across Disciplines, University of Pennsylvania Museum of Archaeology and Anthropology, October 6th-8th 2016* (2017).
- Michael Scafuri presented a PAPER "The Integration of Multiple 3D Documentation Methodologies in the Modeling and Analysis of an American Civil War Submarine" at the 2017 Computer Applications and Quantitative Methods in Archaeology (CAA) Conference, Atlanta, GA, March 14-16, 2017.
- Michael Scafuri presented a PAPER "Insights from the Investigation of the Interior of H.L. Hunley" at the 43rd Conference of the North American Society for Oceanic History (NASOH), Charleston, SC, May 15-17, 2017.
- Michael Scafuri submitted an ABSTRACT "Under the Concretion: Examining New Evidence for H.L. Hunley's Attack on USS Housatonic," to be presented at the *Society for Historic Archaeology 2018 Conference* in New Orleans, Louisiana January 3-7, 2018.

## **Education, Public Outreach, and Media**

- February 16, 2017. Michael Scafuri interview with CNET magazine.
- April 18, 2017. Michael Scafuri presentation to the SCV Secession Camp.
- June 7, 2017. Press day on mezzanine. Michael Scafuri and Johanna Rivers provided comments and interviews about the project to various news sources.
- June 26, 2017. Michael Scafuri interview with FF Journal, discussion regarding article on metal working of the Hunley.

## Emily Schwalbe

### **Reporting**

Four reports have been written since January that can be included in the final report. These include: fixed ballast, full ballast system, steering and propulsion, and navigation.

1. The fixed ballast report examines the 95 pieces of iron ballast found inside *H.L. Hunley*. It makes assessments about the source of the ballast, its purpose, and the order it was probably included based on the ballasts' location, material, and dimensions. It additionally ties in discussions about iron production during the Civil War, and addressed the hypothesis that some of the fixed ballast was repurposed from ironclad armor, concluding that this is a possibility, but cannot be definitively proven. What the iron ballast does demonstrate, however, is resource prioritization towards technology in which the Confederacy saw potential.

2. The full ballast system report ties in research done during the summer of 2016 and the fixed ballast research. It reconstructs the fixed, water, and keel ballast system of *Hunley*, describing each element, explaining how they functioned, and assessing the distinct purposes of each part. It is intended to be a synthesis of research about the complete ballast system, rather than an in depth investigation into its different parts.
3. The steering and propulsion report mechanisms the *Hunley* crew used to maneuver and propel the submarine. It examines the continuities from earlier submarines, such as a hand crank, screw propeller, and dive planes. However, it also examines variations in *Hunley*'s design, as well as difficulties encountered largely due to the submarine's length and the arrangement of the crew, which increased the extent and complexity of the assemblages.
4. The final report written thus far this year assess the navigational capabilities of *Hunley*, and how this might have effected strategic decisions by the crew. It places these capabilities within a larger, historical context of naval strategy.

### **Artifact Recording and X-Rays**

The 95 iron ballast blocks were recorded for basic dimensions and weights post-conservation. This information was placed in a table that can be included in the final report as an Appendix. Additionally, photographs of notable features, such as potential foundry marks and manufacturing marks, were taken. Photographs of the potential foundry marks were taken with raking light in an effort to illuminate any marks that had been worn down due to the site formation or conservation process.

Work on the forward ballast pump continued with conservators, and we continued to monitor the cracks on the surface of the piston body that appeared over the summer of 2016 using photography and sketches.

X-Raying of screened concretion bags removed from *Hunley* during the deconcretion process continued.

### **Conference Presentation**

The research on the ballast system, entitled "Iron Ballast on *H.L. Hunley*: An Examination of Resource Prioritization", was presented at the North American Society for Oceanic History Annual Conference in May 2017.

### **Grants**

The author and conservator Anna Funke are compiling a National Parks Service Maritime Heritage Grant to procure funds for a conservation fellow as well as digital recording technology. The conservation fellow would work with Anna on treating the iron plates removed from *Hunley* and the tin canteens. The digital technology would be used to record the interior of the submarine. The author and Ana would also use photogrammetry to monitor the conservation process and ensure sustainable preservation of the pre-conservation artifacts. An initial draft of the grant has been completed, and the final draft is due September 1, 2017.