SHIPBOARD LIFE ABOARD PHOENIX II: CONSERVING AND INTERPRETING THE ARTIFACTS FROM LAKE CHAMPLAIN'S FIFTH STEAMBOAT

An Undergraduate Research Scholars Thesis

by

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Submitted to the Undergraduate Research Scholars program at
Texas A&M University
in partial fulfillment of the requirements for the designation as an

UNDERGRADUATE RESEARCH SCHOLAR

Approved by Research Advisor: Dr. Donny Hamilton

May 2019

Major: Anthropology

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ABSTRACT

Shipboard Life Aboard *Phoenix II*: Conserving And Interpreting the Artifacts from Lake Champlain's Fifth Steamboat

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Literature Review

Dr. Donny Hamilton's *Conservation Research Manual* (1998) compiles the methodologies used at the Conservation Research Laboratory (CRL) at Texas A&M University and in many major nautical conservation laboratories. Not only is there a wealth of conservation research at Texas A&M University, but there is also a collection of research on early 19^{th}-century steamboats on Lake Champlain in Vermont. Part of this research consists of theses and dissertations by students of the Nautical Archaeology Program at Texas A&M University related to Lake Champlain steamboats including *Phoenix II* (Kennedy 2015, 1-2; Schwarz 2016, 1-30). Dr. Carolyn Kennedy's dissertation provides the most information for this thesis about *Phoenix II* and history of Shelburne Bay on Lake Champlain.

Thesis Statement

Several personal items consisting of wood, leather, and ceramics from the steamboat *Phoenix II* (1820-1837) were conserved and researched at the CRL. Once identified, these

artifacts allowed us to peer into the life onboard one of the earliest passenger steamboats in the world.

Project Description

From 2014 to 2016, researchers from Texas A&M University carried out an archaeological survey of the submerged remains of several shipwrecks in Lake Champlain, Vermont. The site, Shelburne Shipyard, contained four steamboat wrecks. The study of the earliest of these steamboats, *Phoenix II*, yielded over 200 artifacts diagnostic to socio-cultural aspects of shipboard life. My research addresses the conservation of the wood, leather, and ceramic artifacts as well as their historical significance and roles in relation to *Phoenix II*.

The leather and wood was conserved using silicone oil, an innovative method developed by the Conservation Research Laboratory at Texas A&M University (Smith 2003). The ceramics were manually and chemically cleaned to remove staining and reveal their original surfaces leading to answers to their origins. Aside from conservation, this research identified these artifacts’ historical significance and their relation to the wreck itself, including how they were likely utilized by passengers and crew.

DEDICATION

To my family- my father for his steadfast support, my mother for her unconditional love, and Penelope for always being by my side.

ACKNOWLEDGEMENTS

First, I would like to thank my chair, Dr. Donny Hamilton. He has provided me with countless opportunities to learn and grow as a conservator. I would also like to thank Dr. Carolyn Kennedy, without whom this project would not be possible. Her endless support and encouragement have propelled not only my research but also my academic career as a whole.

Many thanks go out to members of the Nautical Archaeology Program, who have been incredibly supportive. Especially to Dr. Helen DeWolf, for teaching me much of what I know about conservation. Thanks too to Dr. Cristopher Dostal for taking the time to help with this project, and Dr. Kevin Crisman for allowing me to take it on.

Lastly, thank you to James, for being a caring partner in this, and everything.

CHAPTER I

HISTORICAL BACKGROUND

The Archaeology of Lake Champlain

Lake Champlain is situated between New York, Vermont, and Quebec. The lake's rich nautical history dates from around 9300 B.C., when Indigenous Americans left behind a number of dugout canoes, which are the only watercraft that date to this era (Crisman and Cohn 2002). Over the years, a wide variety of ships navigated the lake, but the arrival of steam technology brought with it a flurry of activity to North American waterways. This thesis focuses on research that may elucidate details of the shipboard activity that characterized life aboard the steamboats of Lake Champlain in the early 19th century.

Phoenix II launched in Vermont in 1820, eleven years after the first steamboat navigated Lake Champlain. Lake Champlain offers a unique environment for waterlogged materials as its cold, fresh water preserves artifacts, shielding them from light and organic activity. Additionally, Lake Champlain is home to over 300 shipwrecks, providing nautical archaeologists with a wealth of well-preserved materials for study. The ships preserved here have the potential to yield critical data on the history of life in the era of early steam technology. Archaeological investigations augment sparse historical documentation on this subject in the early 19th-century (Kennedy 2019: 4). This paper focuses on the archaeological investigation and artifacts recovered by Dr. Carolyn Kennedy and Dr. Kevin Crisman from the Shelburne Steamboat Shipyard Graveyard (Kennedy 2019).

Phoenix II

The Shelburne Shipyard Steamboat Graveyard project focused on four wrecks located in Shelburne Bay on Lake Champlain (Kennedy 2019). Primary investigators Crisman and Kennedy studied the graveyard from 2014 to 2016. The project earned its name because, in the early 19th century, many ships were intentionally sunk at the end of their careers in Shelburne Bay, leaving only the skeletal remains of their hulls behind.

Phoenix II was not immediately identifiable during excavations. Initial historical research indicated that four shipwrecks were located in the Shelburne Shipyard Steamboat Graveyard: *Winooski* (1832-1850), *Burlington* (1837-1854), *Whitehall* (1838-1853), and *A. Williams* (1870-1893) (Kennedy 2019). Researchers realized they were incorrect when, in 2015, they learned the ship identified as *Winooski* was too wide to fit the beam dimension of the actual *Winooski*. In 2016, a comparison of the length of what was thought to be the wreck site of *Winooski* against ship enrollment papers determined that that the dimensions best matched those of *Phoenix II*. The steamboat was conclusively identified when a tool was recovered by diver Daniel Bishop in 2016. This tool, a steel chisel, bore the stamped name “SB Phoenix” (Figure 1). Though it is rare that artifacts that help to identify wrecks so conclusively, this chisel confirmed the identity of *Phoenix II*.

FIGURE 1. Post-treatment documentation of the chisel that helped to identify *Phoenix II*. (Photograph by author)

Primary investigators obtained an artifact permit from the Vermont Division for Historic Preservation and conducted excavations between 2014 and 2016. After the artifacts were recovered during excavation, the next step was to conserve them. The Conservation Research Laboratory (CRL) at Texas A&M University conserved a majority of the iron and glass artifacts. The remaining unconserved artifacts consisted of an assemblage of small personal items including ceramics, leather, and wooden fragments.

Before the Shelburne Shipyard steamers were sunk, valuable items such as outfitting and machinery were removed for repurposing. Relatively few artifacts were left behind or fell through the planking of the ship, and were forgotten until they were excavated between 2014 and 2016. Though they are not large or numerous, these personal items can tell the untold story of passengers and crew aboard *Phoenix II.* Steamboats from the early 19th-century were known to be palatial (Stone 2015), and the small personal items from the wreck may be informative as to the environment onboard. Research on artifacts from this wreck can serve to fill in the blanks left by meager historical documentation. For this undergraduate thesis, the author carried out both the conservation and research on the personal artifact assemblage.

CHAPTER II

CONSERVATION

Introduction

While archaeologists who already handled the artifacts in the field were able to draw preliminary conclusions while excavating the site, it is the job of the conservator to ensure that these artifacts remain stabilized for future study. The relationship between the excavation of materials recovered from underwater sites and their conservation is delicate. Due to the condition of the artifacts, conservation in this case is different from the conservation practiced in terrestrial settings. When artifacts are wet, it is imperative to conserve them using a methodology that keeps them structurally intact as they dry.

Artifacts from *Phoenix II* were recovered from a freshwater environment, so the main worry in this case was preventing dimensional change due to drying before conservation. After excavation, the iron and glass artifacts were conserved by the Conservation Research Laboratory (CRL) at Texas A&M University and by project co-director Kennedy. The CRL undertook the conservation of iron tools using electrolytic reduction, while Kennedy conserved the glass bottles found at the site using polyvinyl acetate as a sealant (Kennedy 2015). For this thesis, the author conserved an assemblage of ceramics, glass, leather, wood, and a textile fragment. The following sections outline the different methodologies carried out with each material. Each treatment is a standard CRL treatment for artifacts recovered from underwater environments (Hamilton 1998). These treatments were approved by Dr. Donny Hamilton, and supervised by Dr. Helen DeWolf of the CRL.

Following treatment, all artifacts were stored in archival packaging. The artifact tags used at the laboratory contain acidic adhesives, so they were traded for paper tags. The artifacts and tags were then placed into four-millimeter resealable polyethylene bags. In order to ensure the safety of the artifacts, bags were no more than two-thirds full, and the artifacts were padded with archival foam. These preventative conservation measures ensure the artifacts are prepared for long-term storage.

Ceramics

Ceramic conservation is carried out both manually and chemically. The manual component is undertaken using tools such as dental picks and toothbrushes. Large amounts of algae were removed from the surfaces of the ceramics using these implements. After mechanical cleaning, significant staining was removed using chemical methods. Ceramics from *Phoenix II* were generally stained with black sulfides, orange iron oxides, or a combination of the two (Figure 2) subsequent to sinking. Before chemical treatment, the stained ceramics were pre-wetted. This ensures that the chemical treatments are active at the surface of the artifact and do not soak into the center of the ceramic matrix (Hamilton 1998). Next, iron oxide staining was removed using a five percent concentration of oxalic acid ($C_2H_2O_4$) diluted in deionized water. In order to remove light staining, cotton swabs were used to apply the acid locally for periods of ten minutes until the staining was removed. For heavier stains, artifacts were submerged in a bath of the oxalic acid solution for periods of ten minutes.

FIGURE 2. Iron oxide and sulfide staining on a pearlware base fragment. (Photograph by author)

After treatment in oxalic acid, the ceramics were rinsed in a running bath for thirty minutes. If the sherds had any remaining black sulfide or organic staining after oxalic treatment they were then treated with a ten percent solution of hydrogen peroxide (H_2O_2). Cotton swabs were used to apply the acid locally for periods of ten minutes until the staining was removed.

Consolidation is advised for ceramics recovered from marine environments (Hamilton 1998). *Phoenix II* ceramics were consolidated in three consecutive baths of a five percent concentration of Paraloid B-72 which is a thermoplastic acrylic resin diluted in acetone. Following consolidation, they were placed into archival packaging and prepared for storage.

Glass

Glass, in general, is one of the sturdiest materials to undergo conservation (Hamilton 1998). The glass from *Phoenix II* was well-preserved; it did not show signs of deterioration such as lamination or iridescent surface layers. The current condition of the glass artifacts, however, did not prevent them from being susceptible to devitrification. In order to prevent deterioration, glass artifacts from *Phoenix II* were consolidated in Paraloid B-72 as outlined in the Conservation Research Manual (Hamilton 1998).

Before consolidation, the glass conservation process began with a rinse in distilled water. They were then dried before being submerged in three baths of a five percent concentration of Paraloid B-72, much like the ceramics. Following consolidation, they were placed into archival packaging and prepared for storage.

Organic Material

The conservation of waterlogged organic materials is complex due to the cellular interactions between water and artifacts. The cellular walls of organic materials degrade while submerged, leaving only thin lignin structures to support the materials (Smith 2003). This process creates intermolecular spaces and cell cavities which fill with water. In combination with the lignin structures, this water holds the shape of the organic materials (Smith 2003). The shape holds as long as the artifacts are submerged. This is due to issues in conservation that begin when materials are removed from water. As water leaves the artifacts, surface tension causes the thinned walls to collapse, resulting in warping and dimensional change.

To combat this issue, the author conserved organic materials from this site using silicone oil. The process of conserving artifacts in silicone oil, also known as polymer passivation, was developed at the CRL at Texas A&M University by Drs. Wayne Smith and Hamilton (Smith 2003). When treating an object with silicone oil, it is imperative to consider that this process is not reversible, but any artifact can be retreated with silicone oil if necessary in the future. In recent years, the concept of retreatability has become as important as reversibility because most treatments are not truly reversible (Hamilton, pers. Comm).

Conservators are constantly striving to find the ideal balance between reversibility and practicality. We must acknowledge and account for our shortcomings by trying to use reversible treatments, allowing future conservators to remove or expand upon our work with improving technology. In the case of conservation of waterlogged materials, this balance is strained due to the delicate condition of the cellular structure of organic materials. It is therefore vital to first consider which treatment would best preserve the artifact in addition to which is most easily reversed.

According to the Code of Ethics of the International Council of Museums (ICOM), "conservation procedures should be documented and as reversible as possible, and all alterations should be clearly distinguishable from the original object or specimen" (ICOM 2013; §2.24). Although reversibility of treatment is always preferred, the use of the phrasing "reversible as possible" leaves room for conservators to determine appropriate priorities for each artifact. This flexibility is necessary in the conservation of waterlogged materials due to their degree of degradation.

There are few methodologies that preserve the structural integrity of waterlogged organic material. Widely used techniques available to conservators can be harmful to some artifacts. This is true in the case of Polyethylene Glycol (PEG). Although PEG is an affordable, widely used method of conserving organic materials from underwater sites, silicone oil is preferable in some cases due to its efficacy and longevity.

Because the cellular structure of waterlogged material is so delicate, PEG can cause cellular distortion. Depending on the viscosity of the PEG solution, it can cause cellular walls to collapse during treatment (Smith 2003). This potential for damage is magnified by the probability of further degradation such as in the case of composite artifacts. PEG is corrosive to all metals, especially iron (Hamilton 1998), so it is imperative to use a different method on composite artifacts.

The half-life of PEG is only twenty-five years, so any artifact treated in PEG must be allotted funding to be re-conserved in order to prevent destruction of the artifact. Due to issues found in treatment with PEG, the reversibility of methods of conserving waterlogged organic material has "never been an absolute fact using traditional processes" (Hamilton 1998: 29). In combination with a 25-year half-life, trace amounts of PEG may stay chemically bonded with wood, leading to inevitable deterioration over time.

Silicone oil is preferable for materials from this project because it has proven to result in structurally intact wood with a remarkably small amount of dimensional change. In addition to dimensional stability, there are a number of composite artifacts in this assemblage, some of which have iron components. Silicone oil allows for the conservation of these without worry of future damage due to iron corrosion. In addition to being an effective treatment for waterlogged materials, the effects of silicone oil are also long lasting.

According to extensive testing, the half-life of silicone oil is at least two hundred years (Hamilton 1998). While silicone oil is not a preferred treatment for every project, it is ideal for the artifacts from *Phoenix II*. In addition to keeping waterlogged materials intact, it also ensures that they will be stable for years to come, as there is not currently a plan or budget to re-conserve these artifacts.

Attempts were made to remove iron and corrosion products from composite artifacts. Since silicone oil is not corrosive to iron, these composite artifacts were conserved intact without removing some metal components. After mechanical cleaning, the process of conserving artifacts in silicone oil begins with solvent dehydration. When water evaporates, the surface tension is forceful enough to leave behind collapsed cells in the artifact. Solvent dehydration combats this issue with the much lower surface tension of acetone and ethanol. Before beginning dehydration, the artifacts were gently brushed, and metal tools were used to remove surface dirt and concretion. The artifacts then began the six-week CRL solvent dehydration schedule. Through this process, the artifacts were gradually transitioned from tap water to deionized water to ethanol and then to acetone in increments of 25 percent.

Cases of warping during solvent dehydration can be prevented by using gradual, exact increments. The process begins with the cleaned artifacts in a bath of deionized water. They then move to a bath of 25 percent of ethanol in 75 percent deionized water. The artifacts moved through a series of baths consisting of increasing increments of ethanol until they reached a solution of 100 percent ethanol. They then went through a second bath of 100 percent ethanol before beginning the transition to acetone. Beginning in 25 percent acetone/75 percent ethanol, the artifacts go through a set of baths slowly increasing in acetone until they reach 100 percent saturation in ethanol.

DeWolf noted that the acetone is vital because it acts as a mechanism to pull silicone oil into the cellular structure of artifacts (pers. comm). After the acetone-soaked artifacts are submerged in silicone oil, the next step is to allow the silicone oil solution to integrate into the artifacts. The oil is mixed with the crosslinking agent Methyltrimethoxysilane (MTMS), making a solution of 80 percent oil and 20 percent MTMS.

Before submersion in the silicone oil solution, the *Phoenix II* artifacts were carefully packaged. Fragile leather and cloth items were packaged between sheets of mesh. This allowed them to be protected while giving them room to make slight movements without tearing. The wooden artifacts were wrapped in a cloth mesh to protect painted artifacts from being scratched.

Once packaged, they were ready to begin treatment. Before this step, the solution was tested by exposing a sample to a catalyst. In this case, dibutyltin diacetate (DBTBA) was used. Upon exposure to the catalyst, the oil polymerized, signaling that it was ready to be used for conservation (DeWolf 2010). The step ensured that the oil would also catalyze within the artifacts once exposed after conservation.

The artifacts were submerged for six weeks. Upon removal, excess oil was drained, and the artifacts were bathed and swabbed with 100 percent MTMS. This process ensures there is no silicone oil left on the surface of organic materials when it begins to polymerize. After an MTMS bath, artifacts were drained of any remaining oil and exposed to 15 ccs of DBTBA in an aluminum sampling dish to complete the catalyzation process.

The fumes of DBTBA are enough to polymerize silicone oil treatment. DBTBA has a working life of 24 hours (DeWolf 2010), so it was switched out every day for five days. The artifacts were then allowed to off-gas over the weekend. After off-gassing, conservation was complete. The artifacts were then re-bagged in archival packaging and prepared for shipment.

CHAPTER III

RESULTS

Introduction

While conserving and researching these artifacts, their disposition and context were assessed in relation to the wreck. Through the process of stain removal and handling, some of the artifacts' previously-unseen diagnostic details were revealed. There is a potentially complicated context of artifacts from the bay in which *Phoenix II* lies because it has been in continuous use from before the time of the wreck to today. Over time, more recent artifacts that were not originally associated with the steamer may have been deposited onto the wreck. This is especially true towards the stern (Figure 3) because a modern dock extends over this part of the wreck.

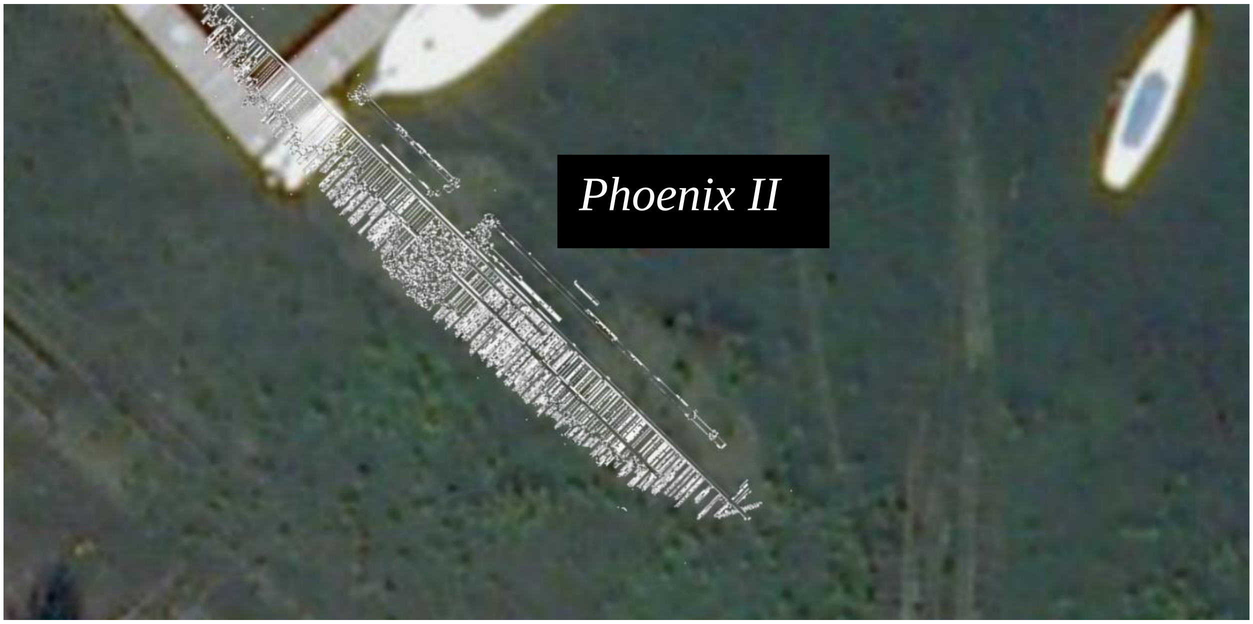

FIGURE 3. Overlay of preliminary ship lines drawn by Kennedy on a satellite map of the wreck site. (Image courtesy of Carolyn Kennedy)

Ceramics

Intrusive Artifacts

Prior to conservation, several of the ceramic sherds could conclusively be marked as intrusive artifacts. Two of these ceramics bore datable maker's marks that indicated they were made in the years since *Phoenix II* sank. Although it was unfortunate that the clear marks were not associated with the wreck, they helped a great deal with narrowing down the distribution of the rest of the ceramics. This allowed me to determine patterns of distribution of the ceramics that were likely on the ship.

The first was found on artifact 05-12, a plate recovered in 2015. The maker's mark reads: "National China Company ELO: Western Gem" (Figure 4). This is the insignia for the National China Company, which was founded in East Liverpool, Ohio in 1899 (Gates 1982). This date excludes the plate from the context of *Phoenix II,* which sank in 1837.

FIGURE 4. The maker's mark on SG 05-12. (Photograph by author).

The second mark was researched during conservation. It is stamped onto a fragment of a stoneware crock with a gray salt glaze on its exterior (Figure 5). It reads, Norton & Fenton

East Bennington, VT

2

Lumen Norton came from a family of Bennington potters dating back to 1785 when his father, Captain John Norton, moved to Old Bennington, Vermont and built a ceramic studio. Lumen carried on his father's work alone until he went into business with his son-in-law Christopher Webber Fenton (Pitkin 1918). They created the maker's mark in Figure 5, which was only in use between 1845 and 1847 (Pitkin 1918). This confirms it was not associated with *Phoenix II*. Crock fragments make up about one third of the assemblage, so identifying them as intrusive helps to give a better idea of the way ceramics were distributed on *Phoenix II* due to the high quantity of intrusive artifacts.

FIGURE 5. Maker's mark on SG 05 17. (Photograph by author)

The stoneware fragments were in relatively good shape before conservation. Their main conservation issue was a small amount of iron oxide staining. It was easily removed during one ten-minute treatment in oxalic acid. The gray stoneware responded well to treatment, and after conservation, they did not show signs of residual staining.

The base in Figure 6 (05-01) was the first ceramic recovered during excavations at *Phoenix II.* Identifying the maker's mark on 05-01 proved difficult because it is impressed into the artifact. There was an attempt to make a rubbing of the mark, but the clear glaze filled in the impression too well to determine any details. The only legible portion read:

-AME-
-TEN-
1849
BENNINGTON, VT

FIGURE 6. Maker's mark on Benningtonware base (05-01). (Photograph by author)

In researching the ceramic collection, there was a wealth of literature on the Norton & Fenton business including histories of the professional lives of each potter after their partnership. In Pitkin's (1918) publication on the marks of American potters, there was a mark from one of Fenton's pottery firms after his split with Norton, Lyman Fenton & Co. Their 1849 maker's mark (pictured in Figure 7) matched the legible portions of the mark on 05-01.

FIGURE 7. Drawing of a mark similar to 05-01. (Pitkin 1918)

After severing ties with Norton, Fenton was in business alone for about a year before going into business with A. P. Lyman to form Lyman Fenton & Co (Pitkin 1918). Two of three maker's marks of intrusive ceramics from this site come from the same potter. Fenton did not seem to stay in partnerships for very long, but his partnerships tended to be prolific, at least in the Shelburne Shipyard Steamboat Graveyard. Although these artifacts were not associated with the wreck, they confirm the idea that the port has been in constant use since directly after *Phoenix II* sank.

Pearlware

The stain removal process brought to light diagnostic information about several of the ceramic artifacts. For example, chemical cleaning helped to identify details of the plate numbered SG 05-380 (Figure 8). In this case, a removal of iron oxides and nitrogen sulfides not only protected the artifact from further damage, but it also revealed blue pooling around its footring, indicating that it is a pearlware plate.

FIGURE 8. Post-treatment documentation of SG 05-380. (Photograph by author).

The blue glaze pooling on 05-380 (Figure 8) matched the pooling on 05-028 (Figure 9). The two undecorated pearlware fragments also fit perfectly together, meaning that both fragments originally belonged to a single seemingly undecorated pearlware plate. Undecorated pearlware was primarily produced between 1760 and 1830 (Noël Hume 1970), fitting both pieces within the context of the wreck.

Figure 9. Post-treatment documentation of SG 05-028. (Photograph by author)

A third piece of pearlware, 05-159 (Figure 10), was found at the wreck, in close proximity to 05-028 and 05-380. Unlike the other two pearlware fragments, this one is decorated. Blue feather-edged pearlware was produced between 1780 and 1830 (Noël Hume1970), making it later in date than the undecorated pearlware but early enough to have been present onboard *Phoenix II.*

FIGURE 10. Post-treatment documentation of SG 05-159. (Photograph by author)

The pearlware fragments responded well to treatment, though there were traces of iron oxide remaining after three baths in oxalic acid. Treatment removed a majority of staining, revealing identifying features such as glaze pooling. Rather than risk over-treating these artifacts, they were consolidated as they were.

Delftware

The seven delftware fragments from *Phoenix II* are small and lack an abundance of detail. All visible decorations on the delftware sherds are blue, and two pieces have blue dashes around their edges as seen on artifact 05-390 (Figure 11). This decoration is characteristic of blue delftware dash chargers, which were most commonly produced between 1620 and 1802, but were still common to the mid 1850's.

FIGURE 11. Post-treatment documentation of delftware fragments 05-390. (Photograph by author)

The production dates of this ceramic type predate *Phoenix II,* but it leaves room for the possibility of these artifacts being aboard the ship. It is possible that the delftware was carried aboard by a passenger, or that it was a part of the kitchenware onboard the ship.

Pipes

Pipes were used ubiquitously in the early 19th-century, so it was no surprise to find them aboard *Phoenix II*. The most reliable method of dating kaolin pipes is through identifying maker's marks. Only one pipe stem was recovered (05-036) with a maker's mark. It reads "RAY" on one side, and "GOW" on the other (Figure 12).

FIGURE 12. Post-treatment documentation of pipestem fragment 05-036. (Photograph by author)

These are fragments of the words "MURRAY" and "GLASGOW," meaning the pipe was produced by William Murray in Glasgow, Ireland (Williamson 2006). This maker's mark was in use between 1830 and 1891. Since *Phoenix II* sank in 1837, it is possible that it was aboard the wreck, although it cannot be conclusively associated with the wreck because they were in production for seven years while *Phoenix II* was in use.

After researching maker's marks, the next most accurate method of determining the dates of a collection of pipes is through determining the form of a pipe bowl, followed by pipe stem dating (Noël Hume 1970). There were two partial pipe bowls recovered from *Phoenix II (*Figures 13 and 14*)*. They were both produced in a style mainly used between 1780 and 1820 (Noël Hume 1970). This date range indicates that this style of pipes were in use while *Phoenix II* sailed.

FIGURE 13. Post-treatment documentation of SG 05-287. (Photograph by author).

FIGURE 14. Post-treatment documentation of SG 05-348. (Photograph by author)

The third most accurate way to date pipes from an archaeological assemblage is by measuring bore holes from pipestems. Since the diameters of pipestems changed over time, their measurements can say a lot about the time from which they came. The bores of all four pipe stems (Figure 15) measured to 4/64ths of an inch.

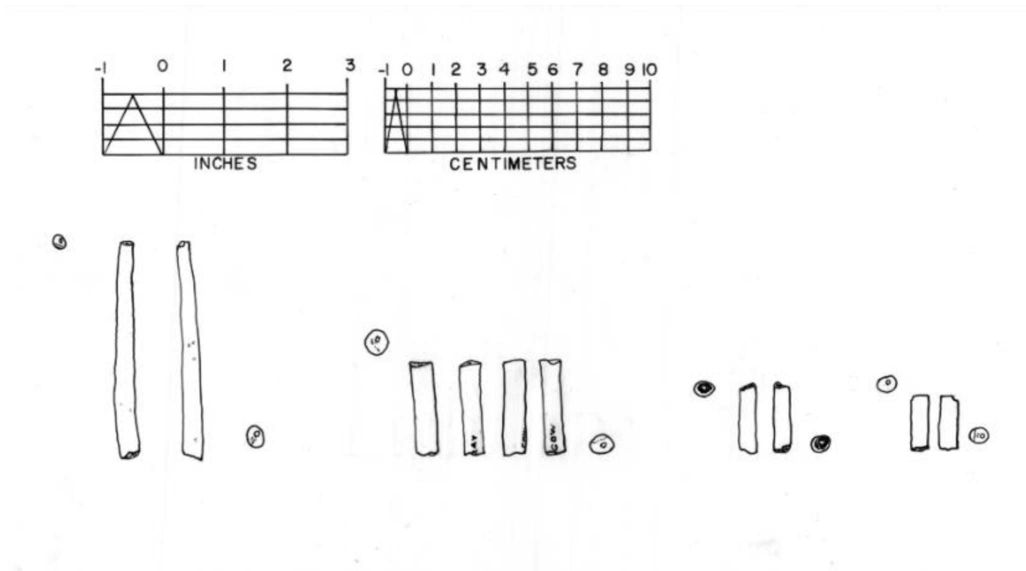

FIGURE 15. A drawing of four pipestems from the assemblage. From left to right: SG 05 386, SG 05 287, SG 05 391, SG 05 340. (Drawing by author)

According to Noël Hume's (1970) ceramic typology, this style of pipe was manufactured beginning in 1710, reaching widespread popularity between 1750 and the early 1800s. Though the dates are too broad to make a conclusive statement about the pipe's context, these dates do not exclude any pipes from the context of *Phoenix II* since after the mid-1700s the system of dating becomes more unreliable.

Organic Materials

Textile & Leather

There was only one textile fragment recovered on *Phoenix II,* 07-395 (Figure 16). The material was friable before conservation, proving too fragile to unfold. It responded remarkably well to a simple rinse in water followed by treatment in silicone oil. After conservation, it was pliable and was easily manipulated.

FIGURE 76. Post-treatment documentation of the textile (07-395) recovered from Phoenix II. (Photograph by author)

When conserving waterlogged leather, it is imperative to prevent drying to protect the material from drying and cracking. Leather conservation resulted in little-to-no dimensional change and a natural coloration (Figure 17). Both the textile fragment and leather from *Phoenix II* were found clustered together near engine components of the wreck. They are of the right size and shape to have been used as gasket or padding material in or near the engine.

FIGURE 87. Post-treatment documentation of a leather fragment (04-401) recovered from *Phoenix II*. (Photograph by author)

Wood

Many of the wood fragments recovered from *Phoenix II* had a coat of lead paint on their surfaces (Figure 18). Prior to conservation, Kennedy set aside six of these painted wood fragments for X-ray fluorescence (XRF) analysis. XRF is a non-destructive analytical method which can determine the discrete elements in a material. There were two goals for this analysis: to see if the paint from different fragments were similar in elemental composition and what that elemental composition was.

FIGURE 18. Post-treatment documentation of a wooden fragment recovered from *Phoenix II*. (Photograph by author)

Dr. Christopher Dostal of Texas A&M University's Analytical Archaeological Laboratory analyzed one piece of wood from each lot of painted material. This data was compiled into a spectrum for each piece of wood. These spectra were then compared to each other in order to determine if lead or any other element were present.

A quick look at the compiled spectra (Figure 19) answers the question of if the paint samples are the same. They each have very similar high lead elemental compositions, meaning that it is likely that these wood samples, or at least the paint on them, are associated with each other.

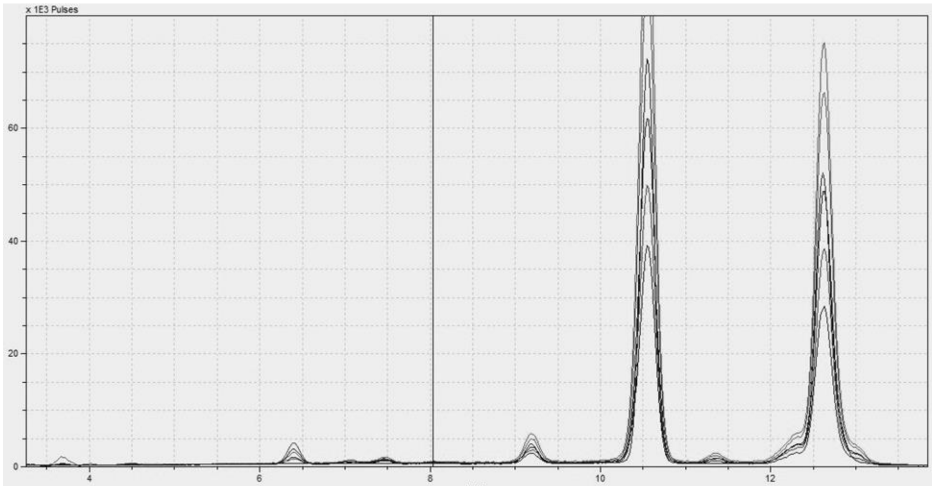

FIGURE19. Compiled spectra from the XRF analysis of six artifacts. (Photograph by author)

Due to the prevalence of lead-based paint at the time, it was expected that lead would be in these readings, therefore caution was exercised in both handling the artifacts and analysis of its readouts. While caution in handling lead artifacts was for safety purposes, caution in reading the analyses was necessary due to the interaction between lead and X-rays. Lead can have a deceptively high reading on XRF analyses (Dostal 2015), so a high reading of lead is more indicative of the way it interferes with X-rays rather than its concentration in the samples.

The readings were transferred into a graph (Figure 20) indicating the elemental composition of the painted samples. Like in the compiled spectra, the presence of lead is clear. The overwhelming number of artifacts with similar paint samples indicated that the painted wood samples are associated with each other and the wreck. The samples that contained paint range from numerous fragments of wooden trim to furniture pieces.

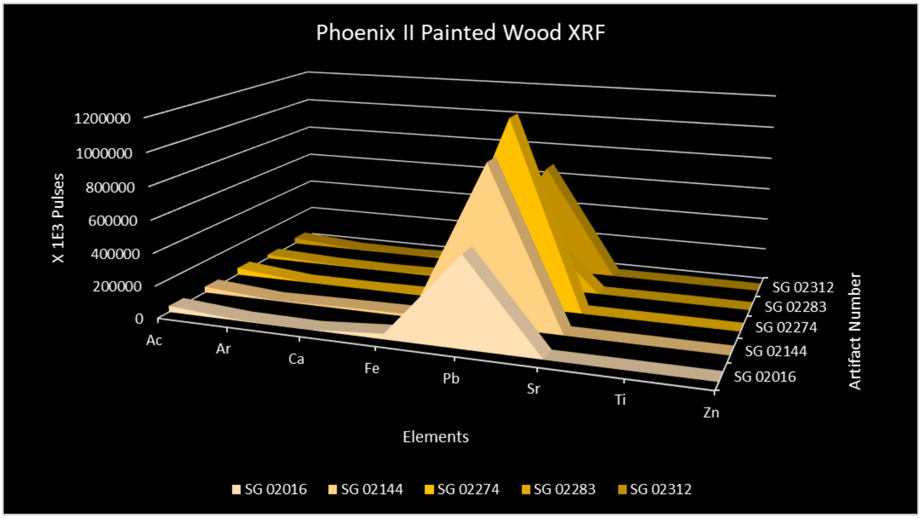

Figure 20. Graph of the compiled spectra from the XRF analysis of six artifacts. (Graph by author)

Only two furniture fragments were recovered from *Phoenix II*, 02-16 and 02-117. Initially, it seemed that only one fragment, 02-16, likely a spindle from the back of a chair (Figure 21a), was coated in white paint. The second fragment of wooden furniture (Figure 21b) seems to be a leg to a chair or chaise lounge. It has a hole bored 2.5 inches (6.35 cm) into the bottom, indicating that it could have once housed a wheel or an angled foot. Initial observations did not note any paint on this piece, but mechanical cleaning revealed paint in the crevasses of the furniture leg. If the only two fragments of wooden furniture recovered from the wreck were painted, it is likely that much of the furniture on the wreck was painted.

FIGURE 21a. Post-treatment documentation of a painted chair spindle 02-16. FIGURE 21b: Post-treatment documentation of a furniture leg 02-117. (Photos by author)

The iron rod through the furniture leg in Figure 21b was too fragile to remove without damaging both metal and wood. Attempts were made to remove all metals from composite artifacts before conservation, but only the iron from 02 299 could be removed without harming the artifact. Since silicone oil is not corrosive to iron, the composite artifacts were conserved intact.

Three square-cut nails were removed from a wooden block. 02-299. After the wooden artifacts began dehydration, the three nails removed from 02 299 were assessed. Their structure indicates that the nails were likely made prior to 1800. These nails help to tie the artifact to the site, but they were too small and too degraded to survive conservation.

In order to ensure that the information they revealed was not lost, they were cast and epoxy resin replicas were made. This allows researchers and the public to view and handle these artifacts for years to come, even though the nails were too fragile to conserve. Once the wooden piece they were extracted from completed conservation, the nails were reunited with the artifact.

There are a variety of methodologies that can successfully prevent dimensional warping of waterlogged wood and other organic artifacts; however conservation using silicone oil was successful in conserving wood from this project because it prevented cellular collapse while not adversely affecting any metal components at present.

CONCLUSIONS

Mapping out the way the artifacts on *Phoenix II* were distributed helps us to understand the layout of the vessel based on historical documentation of other steamboats, such as *Phoenix I* (Schwarz 2016). This wreck is particularly helpful because the *Phoenix I & II* wrecks have similar structures (Kennedy 2019), so research on *Phoenix I* can shed light on life aboard *Phoenix II*. Previous research by Schwartz (2012) determined details of the layout of *Phoenix I,* which Kennedy prepared to make a graphic outlining an estimation of the layout of the wreck (Figure 22). The distribution of artifacts recovered in the different areas of the ship can be compared to this estimation to determine if any patterns exist.

After determining the context of personal items from *Phoenix II,* this estimation was used to assess the distribution of artifacts at the site. Artifacts from this assemblage were often found in one of three areas: near the captain and passengers' cabins (towards the stern), the engine area, or towards the bow where the crews' quarters were.

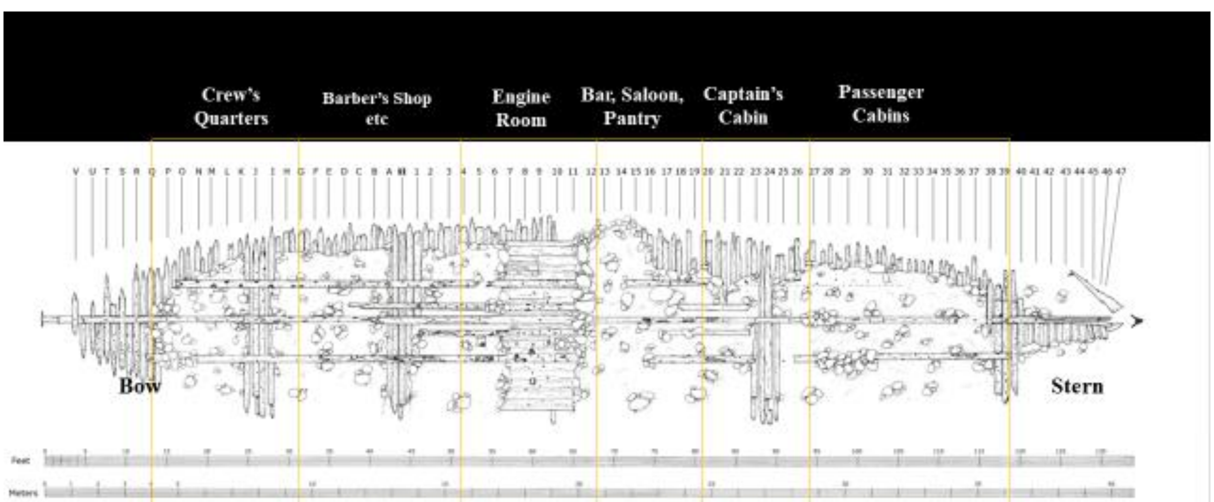

FIGURE 22. An estimated layout of *Phoenix II* superimposed over the wreck site plan. (Image courtesy of Kennedy).

The distribution of items at the site revealed trends in the way the artifacts were situated. Many of them, though small and broken, speak to a degree of luxury aboard *Phoenix II.* Economically significant items such as ceramics and furniture fragments were found in areas where the captain and passengers would have been. In drawing conclusions about this distribution, the functional capacity and economic trend of assemblages was considered. There was a visible concentration of each material in different areas of the wreck. This distribution was initially obscured in some cases due to intrusive artifacts (Figure 23) and therefore it was necessary to remove them from the distribution before any significant conclusions were drawn.

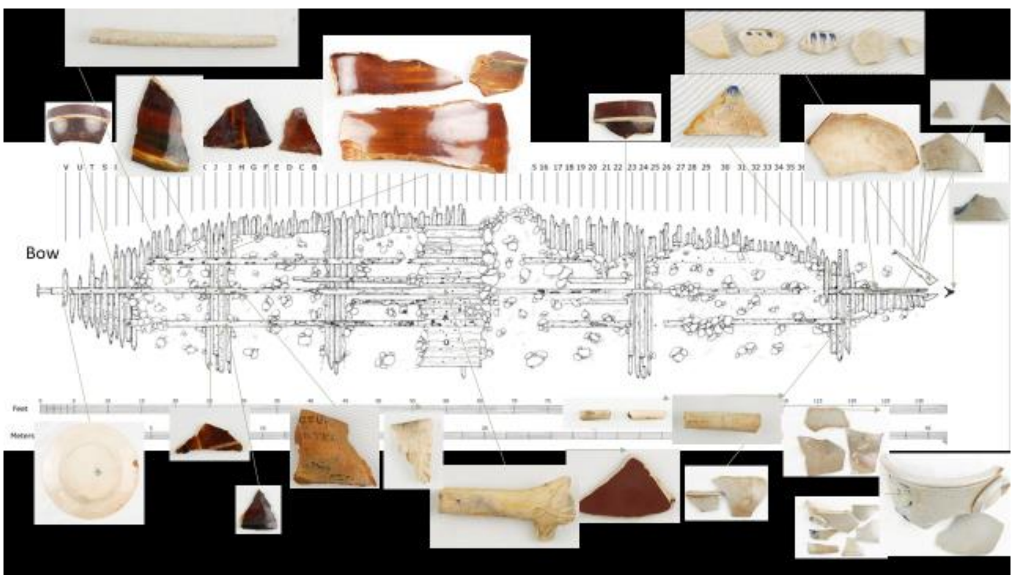

FIGURE 23. Ceramic distribution including intrusive artifacts superimposed over the wreck site plan. (Image by the author, using site plan from Kennedy, 2019)

In the case of ceramics, intrusive artifacts made up over half of the ceramic assemblage, so excluding them helped to give a much better idea of the artifact distribution at the site. Once adjusted, the ceramic distribution (Figure 24) was more informative. Most of the ceramic artifacts were concentrated towards the stern of the wreck. This is where the captain's and passenger’s quarters, along with the pantry and bar, were expected to be. Tobacco pipes were ubiquitous throughout the wreck, and they made up a majority of the ceramic assemblage forward of the passenger’s and captain’s quarters.

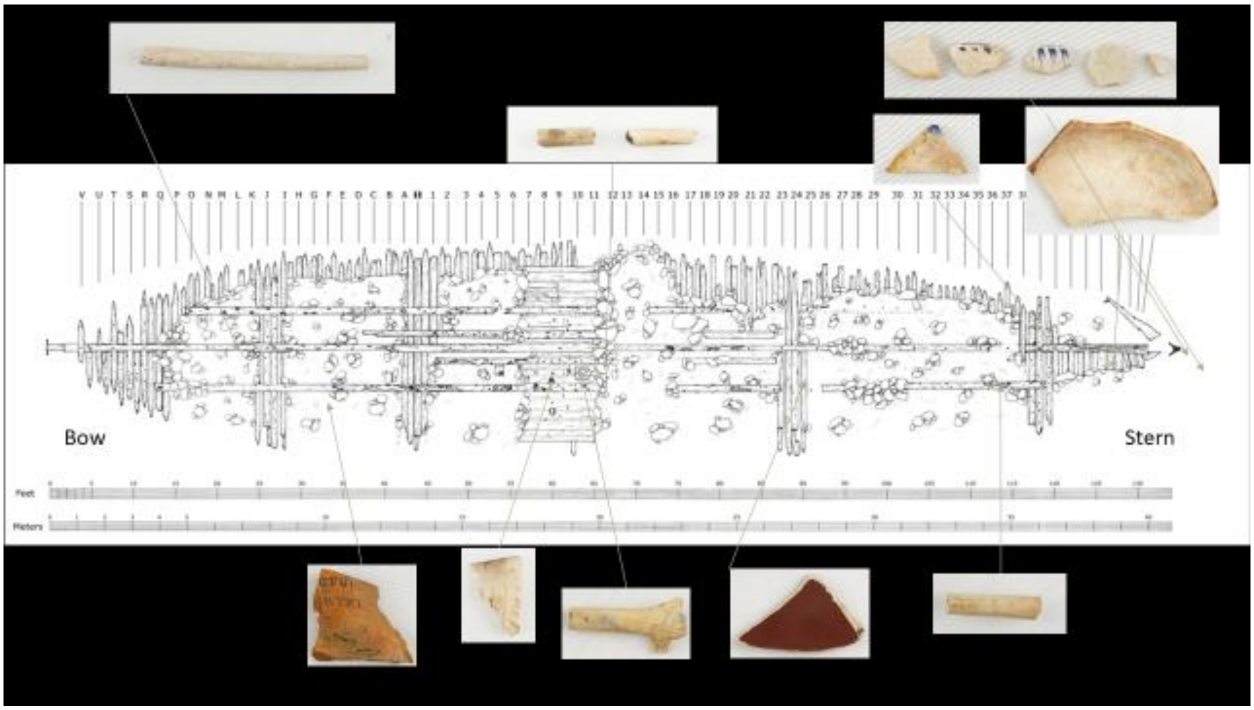

FIGURE 24. Leather and textile distribution superimposed over the wreck site plan. (Image by the author, using site plan from Kennedy, 2019)

This split between pipes and dinnerware confirms Kennedy’s estimation of the layout of *Phoenix II*. There is an economic trend to the ceramic distribution, with high quality ceramics like pearlware and delftware present in the pantry and by the passengers' and captain's quarters. In addition to this pattern, there is a notable lack of ceramic artifacts towards the bow where the crew would have resided.

Like the ceramics, the leather artifacts and the single textile were concentrated in one area of the wreck (Figure 25). According to Kennedy’s (2019) research, this is where the engine likely was. One piece, artifact 04-401, was found attached to hull remains and was cut from the wreck during excavation for further analyses. The three leather artifacts found near what is believed to have been the engine room were likely associated with the engine machinery, either acting as buffers or gaskets between the iron components (Kennedy, pers. comm.). Their precise functions are yet unknown.

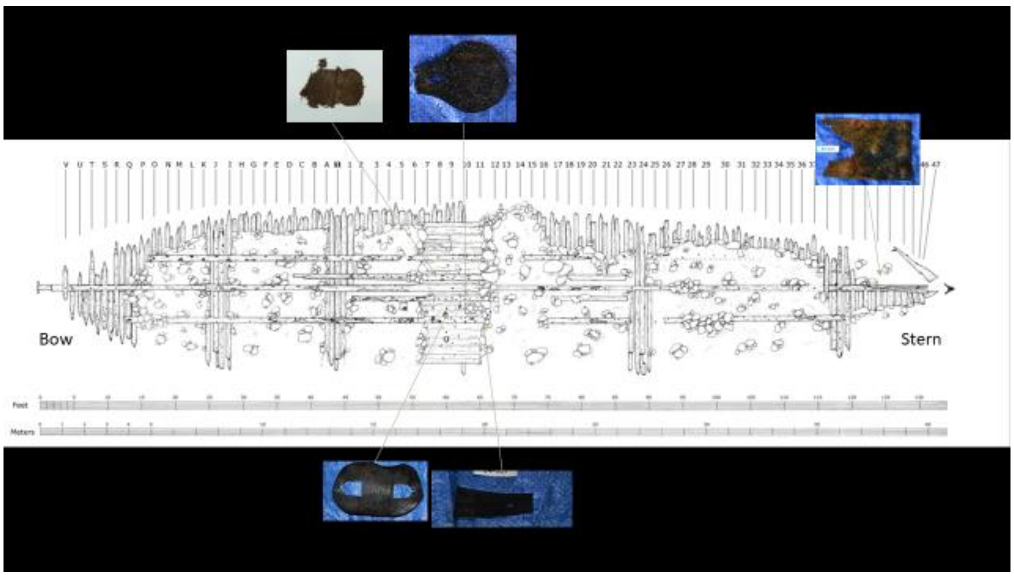

FIGURE 25. Leather and textile distribution superimposed over the wreck site plan. (Image by the author, using site plan from Kennedy, 2019)

Unlike the ceramics and leather, many of the wood artifacts such as floor planking and trim fragments were found throughout the ship (Figure 26). There are a few wooden fragments that were found toward the center of the wreck near the tool cache that held the “Phoenix” chisel. These pieces were less ornamental than the furniture fragments and could have been used by the crew onboard due to their makeshift design. The furniture leg and a wooden bottle stopper were found in the vicinity of the passengers and captain, which is expected, given the function of the ship.

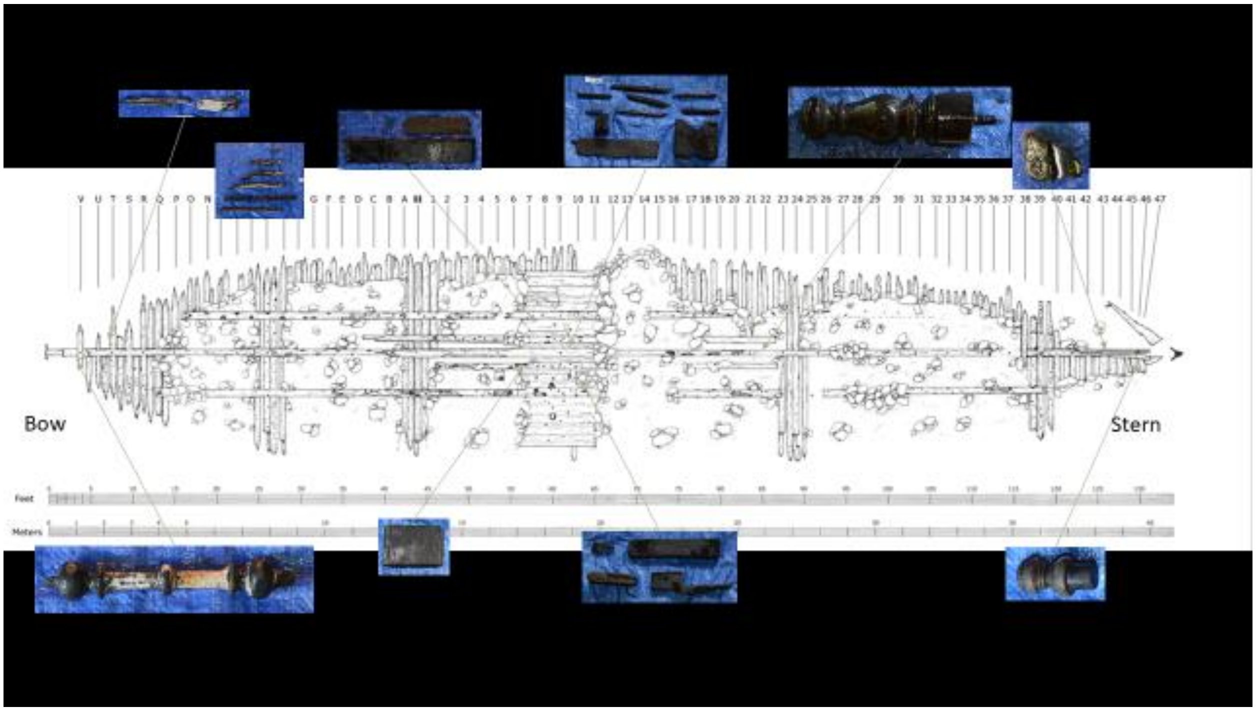

FIGURE 26. Wooden artifacts distribution superimposed over the wreck site plan. (Image by the author, using site plan from Kennedy 2019)

In combination with the palatial reputation of early steamboats, the wooden artifacts are indicative of luxury aboard *Phoenix II* (Stone 2015). Although dangerous due to the use of lead-based paint typical of the period (and the potential for lead contamination) the gleaming white paint on wooden trim, furniture, and various wooden components of the steamboat would have created an impressive sight. Not only would the elegantly painted wood have contributed to the luxury aboard *Phoenix II*, the high-quality ceramics would have added to the glamorous shipboard experience for the passengers and crew.

Since *Phoenix II* was scuttled, only the small number of artifacts discussed in this thesis are available to help interpret life aboard this early steamboat. Since there are so few it is vital to conserve them for future studies on life aboard early steamboats. These artifacts are chemically stable and prepared for long-term storage in archival materials. The artifacts, the research on them presented here, and treatment reports are now ready for shipment to the Lake Champlain Maritime Museum for storage or display.

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