Office of National Marine Sanctuaries
National Oceanic and Atmospheric Administration

ARCHAEOLOGICAL EXCAVATION
OF THE FOREPEAK OF THE CIVIL WAR BLOCKADE RUNNER

MARY CELESTIA

SOUTHAMPTON, BERMUDA

June 2016

James P. Delgado, PhD., Philippe M. Rouja, PhD, Dominique Rissolo, PhD,
Rhonda K. Robichaud, David Pybus, Tane Casserley, Isabelle Ramsay-Brackstone,
Jean-Claude Delville, Lionel Nesbitt, and Wayne Lusardi

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The Maritime Heritage Program works cooperatively and in collaboration within the National Marine Sanctuary System and with partners outside of NOAA. We work to better understand, assess and protect America's maritime heritage and to share what we learn with the public as well as other scholars and resource managers.

This is the second volume in a series of technical reports that document the work of the Maritime Heritage Program within and outside of the national marine sanctuaries. These reports will examine the maritime cultural landscape of America in all of its aspects, from overviews, historical studies, excavation and survey reports to genealogical studies.

No. 1: The Search for *Planter*: The Ship That Escaped Charleston and Carried Robert Smalls to Destiny.

No. 2: Archaeological Excavation of the Forepeak of the Civil War Blockade Runner *Mary Celestia*, Southampton, Bermuda

No. 3: Maritime Cultural Landscape Overview: The Redwood Coast

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These reports will be available online as downloadable PDFs and in some cases will also be printed and bound.

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Cover Image - Edward James, the wreck of *Mary Celestia*, 1864 (Godet Family Collection, National Museum of Bermuda)

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Abstract

The 1864 wreck of the iron-hulled side-wheel steamer *Mary Celestia* is a well-known and popular tourist diving attraction on the South Shore of Bermuda almost 1 km due south of Gibbs Hill Lighthouse in Southampton. The wreck was salvaged at the time of the wreck event and also later in the mid-twentieth century. In the 1980s it was the subject of non-intrusive archaeological documentation. Reports of unsalvaged materials, including possible cargo, have circulated in Bermuda for decades. Extreme storm events in 2009-2010 exposed a probable wooden crate in the forepeak of the wreck as well as two corked and sealed wine bottles and an empty demijohn. Danger of loss through unauthorized recovery or ongoing erosion led to a program of excavation in June 2011. Excavation of the forepeak revealed evidence of the site formation process as well as well-preserved wooden joinery, decking and artifacts. The artifacts included additional wine, personal goods (possibly hidden or contraband), and fittings from the area used as the boatswain's locker. This report documents the excavation and analysis of the forepeak and its contents, and updates the archaeological, architectural and historical contexts of *Mary Celestia*.

Lloyd M. Mustin III

Arthur Sinclair, the last master of *Mary Celestia*.

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INTRODUCTION

Bermuda, a mid-Atlantic island noted for its warm waters and welcoming beaches, hosts many shipwrecks, and *Mary Celestia* is one of the best known. A popular dive in its own right, the wreck is sometimes confused with another historic ship, the notorious "ghost ship" *Mary Celestia*, found adrift in the Atlantic without its crew on board. The two vessels are very different. *Mary Celestia*, built to run the northern blockade of southern ports during the American Civil War, was lost in 1864 on a flat calm day off Bermuda's South Shore. The wreck event occurred less than a mile south of Cross Bay beach and almost directly south of the iconic Gibbs Hill Lighthouse.

Now lying in the sand 62 feet (18.89 m) deep, *Mary Celestia* sank in circumstances still not full known. The ship is visited regularly by local and vacationing recreational divers; over the last decade it became apparent that hurricanes and winter storms have caused large volumes of sand to shift at the site, revealing artifacts in one particular part of the wreck.

This report documents the historical and archaeological context of the wreck while specifically focusing on a "rescue" archaeological excavation of the bow's forepeak that was conducted in June 2011. All measurements in this report conform to the English System, as this was the method in use when the vessel was constructed and operated. For our international audience, metric values are included after the English System measurements in brackets.

The Government of Bermuda requested the assistance of the Maritime Heritage Program in the National Oceanic and Atmospheric Administration's (NOAA) Office of National Marine Sanctuaries (ONMS) to conduct the emergency excavation of *Mary Celestia* in conjunction with work by colleagues in Bermuda and the Waitt Institute. The project was undertaken not only through international, inter-governmental cooperation, but also with non-governmental sponsorship which covered all costs except salaries.

In joining this mission, the ONMS Maritime Heritage Program did so not only because of a demonstrated need and a request for assistance, but also because the maritime heritage represented by *Mary Celestia* is shared by Bermuda and the United States. It is also a shared heritage with the United Kingdom. Indeed, most maritime heritage, given the global nature of the sea, is international in character. In this case, *Mary Celestia* also powerfully relates to the maritime cultural landscape of the North Carolina coast, itself the setting for dramatic) stories associated with the ports, coastal inlets, forts and shipwrecks associated with the Civil War blockade of the Confederacy. Bound for Wilmington, *Mary Celestia* instead wrecked in Bermuda. It is, nonetheless, a distant element of the same maritime cultural landscape of the blockade represented on the "Graveyard of the Atlantic" coast and its blockader and blockade runner shipwrecks. That same landscape in North Carolina also includes the historic wreck of USS *Monitor*, protected within the nation's first national marine sanctuary.

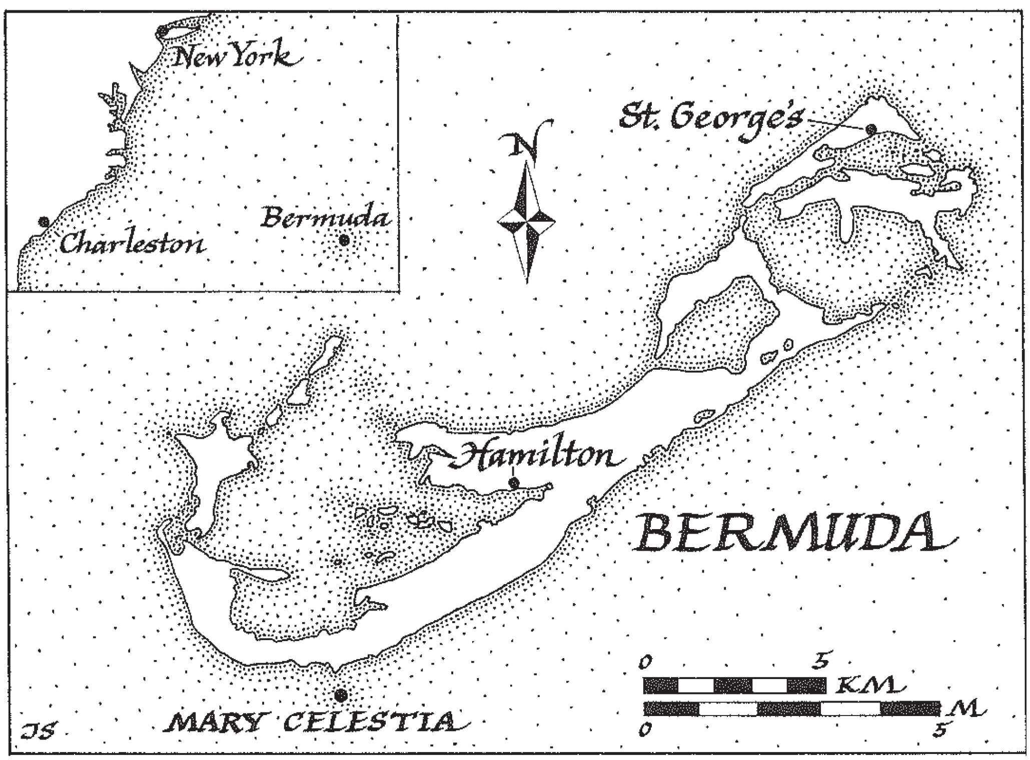
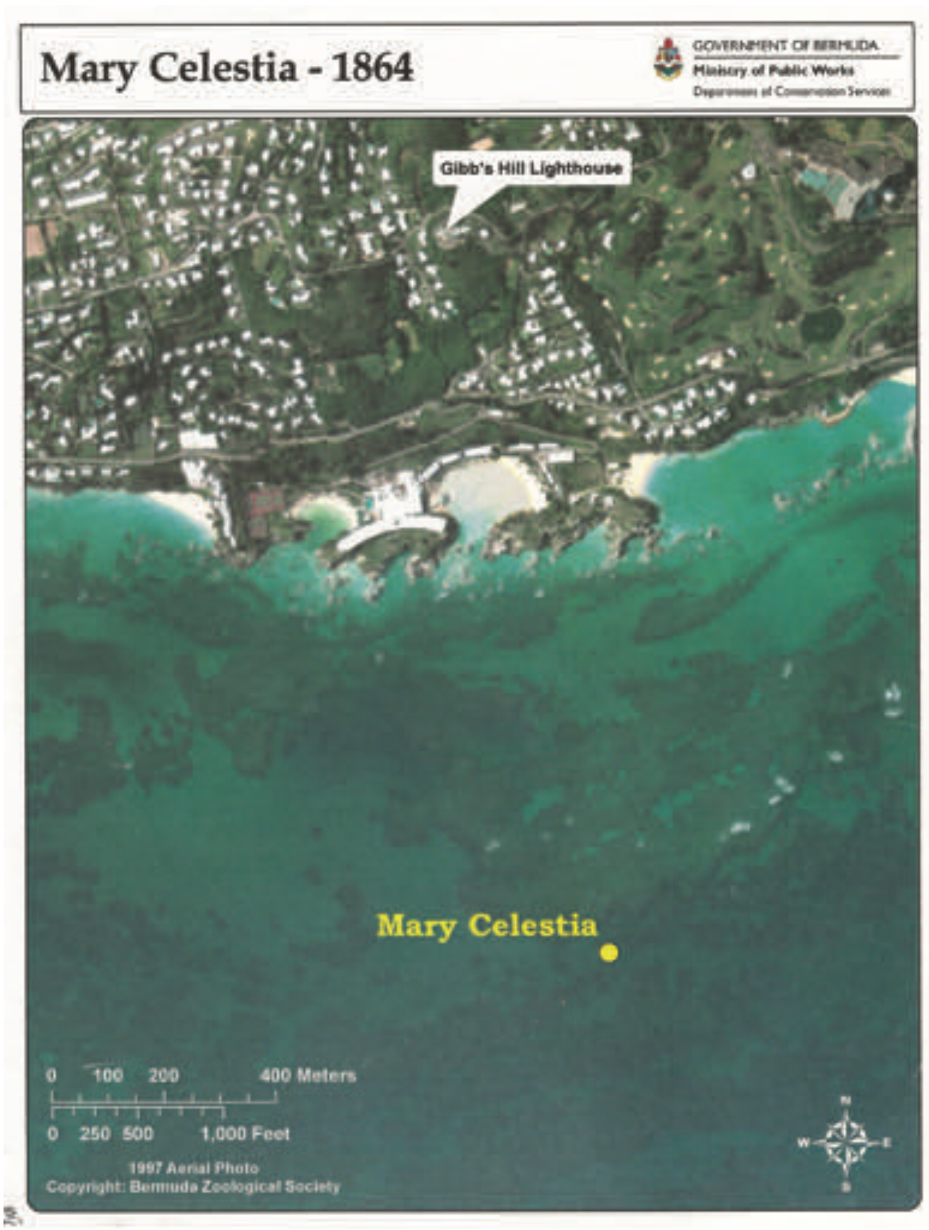


Figure 1: Bermuda and the wreck site of *Mary Celestia.*

Site Location and Environment

The British Dependent Territory of Bermuda is a group of 180 closely linked small limestone islands in the Sargasso Sea of the mid-North Atlantic, approximately 635 miles (1202 k) off the seaboard of the United States and east-southeast at 105 degrees) of Cape Hatteras. The islands are the high spot of the Bermuda Platform, which with Plantagenet and Challenger Banks form the top of the Bermuda Rise, a mid-plate tectonic hotspot. The wreck of *Mary Celestia* lies .33 miles (.53 k) offshore from the Gibbs Hill Lighthouse, on the south shore of Bermuda, in 57 to 62 feet (17.37-18.89 m) of water.



Bermuda Department of Conservation Services

Figure 2: Location of the wreck of *Mary Celestia*.

It lies inside the reef between three large coral and algal heads on a bed of coralline sand and sediment composed of *Homotrema* and *Carpinteria foraminifera* grains. This area of the reef is characterized by "boilers," or breaker reefs, that extend to the surface and interrupt wave surge to create a "boiling" appearance on the surface. The wreck provides habitat for the *lithothamnoid* red algae, brain corals, *vermedtid* gastropods, *serpulid* worms, *bryozoans* and *foraminifera* that compose the surrounding reef. The reef itself is part of a recently discovered network that hosts spawning aggregations every spring and summer of stoplight and queen parrotfish (*Sparisoma viride* and *Scarus vetula*). Black Grouper and large Green Morays (*Mycopterca bonaci* and *Gymnothorax funebris*) have been known to set up residence in portions of the wreck and over the past five years several observations and capture of the invasive Pacific Lionfish have been reported at the site. The site, located on the outward set of boiler reef from which the Bermuda Sea Mount gradually descends, is also host to pelagic fish and an occasional porpoise or whale. The shallow-water environment is characterized by current and annual temperature variations of 66˚ Fahrenheit in winter to 80˚ in summer (18.88˚ to 26.67˚ Celsius).

HISTORICAL CONTEXT OF *MARY CELESTIA*

Figure 3: The Scott "Anaconda Plan" depicted as a "Great Snake" by J.B. Elliot of Cincinnati in 1861.

Library of Congress

With the outbreak of the hostilities in Charleston, South Carolina on April 12, 1861, one of the first responses of the government of the United States was to try to close the ports of the seceding southern states for commerce by means of a naval blockade. President Abraham Lincoln declared a blockade of the coast from South Carolina to Texas on April 19, and several days later on April 27 extended it to North Carolina and Virginia. The blockade was not merely a political move in response to rebellion, it was a deliberate economic tactic; southern states were highly dependent on maritime trade because they possessed little established industrial infrastructure. The blockade's purpose was to strangle secession by cutting off the newly formed Confederate States' ability to generate revenue from exports and taxing imports; it would also deny the influx of war materiel and commodities.

The blockade was first implemented as a paper closure to inhibit shipping, but it became a physical entity over the next several months when the United States Navy created blockading squadrons of warships to patrol the entrances of southern ports – Norfolk, Charleston, Savannah, Mobile and New Orleans. Lesser ports, such as Wilmington, North Carolina and Galveston, Texas, were also situated along the blockaded coast that ran 3,549 miles (5711 k) from the Mason-Dixon Line (Mason and Dixon surveyed the border between the colony of Maryland and the colonies of Delaware and Pennsylvania) to the Gulf of Mexico. In time some of the lesser ports, particularly Wilmington, would assume greater significance as the blockade expanded its scope from interdiction of trade to outright capture of the ports. The Confederate government's first response to the blockade was to encourage private initiative to bring in much needed supplies from Europe, particularly Great Britain, at the time the world's greatest industrial and military power. As the war progressed and supplies became critical to the war effort the Confederate government began to actively back and operate blockade-running operations. The Confederate requirement to run the blockade created the need for fast ships to specifically outrun the ships actively patrolled the southern coast and a new class of British and Scottish built steam driven side paddle steamers, bespoke blockade-runners, was built and put to the service of the South becoming the bane of the northern blockaders.

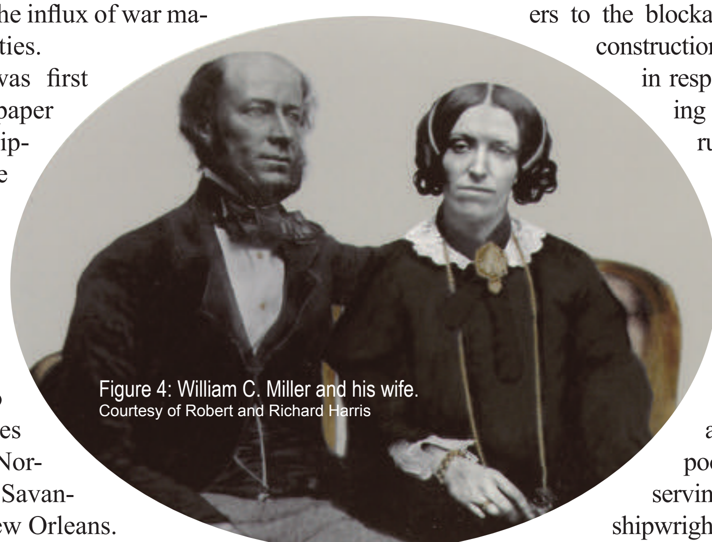


Figure 4: William C. Miller and his wife.
Courtesy of Robert and Richard Harris

Mary Celestia's owners, after losing other steamers to the blockaders, ordered the construction of the steamer in response to the ongoing profit potential in running the blockade. The vessel was laid down in 1863 at the Liverpool yard of William C. Miller & Sons. William Cowley Miller had arrived in Liverpool in 1836 after serving as a Royal Navy shipwright. Working initially in partnership with Thomas Miller Mackay and building wooden vessels, Miller later assumed sole control of the business after Mackay sold his interest, and with his sons Thomas, Henry and Edwin operated the yard as William C. Miller & Sons.

The Miller yard was located alongside the Mersey River at the southern edge of downtown Liverpool close to a firm they had done business with in the past, Fawcett & Preston. Together the two enter-


British Library

Figure 5a: Liverpool and the site of the Miller Yard, 1865.

prises had worked circumspectly to build a commerce-raiding wooden-hulled steamer for the Confederate government in 1861, a ship launched as *Oreto* but later fitted out and armed as CSS *Florida*. In addition to the raider and *Mary Celestia*, Miller & Sons also built other blockade runners, notably the steamers *Abigail*, *Alexandra*, *Lelia*, *Let Her Be* (later renamed *Chicora*), *Phantom* and *Ray* (Hussey 2008:136 and Wise 1988: 285,287,293,308, 312,316,317).

The Miller yard was described in 1863 as lying at the Brunswick Dock,

> *in an area that covers about 350 feet by 360, and possesses a river frontage of 350 feet… The firm have been established ten years, and the experience of Mr. W. C. Miller, acquired by several years' occupation in the Devonport Dockyard, is a guarantee of knowledge and capability in building vessels, more especially for war purposes. In addition to the gunboats built by Mr. Miller during the Crimean War, the Government since that period have entrusted him with contracts for two riveted boats, and two large class gunboats. During the last twelve months he has built the first and only iron sailing vessel with an iron deck on Harland's patent principle, named the Huddersfield. This ship has also iron fore and main mast, top-masts, lower and double topsail yards, iron riveted-mast, top-mast, and top-gallant-masts, all in one. The vessel is built on an entirely new principle, combining all the advantages which can be derived from the substitution of iron for wood. Among the number of vessels built in the yard may be mentioned the Phantom, which was constructed entirely for running the blockade. She has made the passage from Liverpool to Madeira in six days nine hours. This vessel is also built entirely of steel, thus showing the advantages of vessels of that material. During the last eighteen months Mr. Miller has turned out twelve vessels of various sizes, steamers and sailing vessels (Barry 1863:306-307).*

The 1863 account also indicated the source of the iron and steel Miller used in his shipbuilding; "The advantages derived from the manufacture of iron on the spot are well attested. Mr. Miller has the Mersey Steel and Iron Works in close proximity to his yard" (Barry 1863:307). The Steel and Iron Works "are capable of turning out 600 tons of malleable iron and puddle steel weekly," the 1863 account noted:

> *Immediately to the north of the puddling furnaces are numerous large furnaces adapted to the heating of the metal preparatory to its being passed through the plate-rolling mills, which in this division of the works are driven by a steam engine of 250-horse power. The motion of the flywheel connected with this engine is somewhat startling. The wheel is 35 feet in diameter, and weighs 60 tons; and while at work it makes thirty-eight revolutions in the minute. The rolling-mills are suited to the production of plates up to 2 inches thick by 5 feet 6 inches wide, and the rolls to the drawing of rod or bar iron. Connected with the same motive machinery, and contiguous to the rolling-mills, is a trimming instrument, or cutting shears, sufficiently large and powerful for paring and trimming iron plates of large dimensions; besides other apparatus (Barry 1863:234-235).*

While the structural iron for *Mary Celestia* came from the Mersey Steel and Iron works for Miller to fabricate the hull and fittings, the machinery for *Mary Celestia* represented another partnership, one with the Liverpool firm of Fawcett & Preston. A well-known and long established company founded in 1758, Fawcett & Preston had built a large number of marine steam engines and boilers since the early nineteenth century. The American Civil War was beneficial for Fawcett & Preston's business, with the firm building engines for blockade runners (such as Miller's *Phantom*) as well as for CSS *Florida*. The foundry at Fawcett & Preston had also provided *Florida*'s guns (Hussey 2008:192-193).

Historical information on the ship's construction is limited. With dates provided by the few newspaper accounts, the time taken to construct *Mary Celestia* was probably about three months. The iron frames were laid down and riveted to form the outline of the steamer before the overlapping strakes of the hull's "in and out" system of plating were bent and riveted into place. The process involved teams of men and boys who worked…

> *…in sets or gangs, five to each, two are adults; they are riveters proper, and hammer down the end of the rivet on the outside. A third is the holder-up, and is generally a young man; he "holds up" the head of the rivet inside, while the other two men hammer it. Besides these there are two boys, one to blow the bellows at the furnace and heat the rivet, and the other to hand the red-hot rivets to the holder-up, for the latter to push through the hole towards the riveters. When they are riveting masts, the holder-up and the hander have to get inside, and the heating boy throws the red-hot rivet up the hollow of the mast to the hander, seizing it with a pair of pincers. The boy inside picks it up in the same way, and hands it to the holder-up. Holding up requires considerable strength, as the first blows of the riveters have to be resisted to prevent the rivet being knocked back out of the hole (Lord 1864:172).*

The historical record is silent on what type of riveting system was employed to build *Mary Celestia*.

Launched from Miller's yard into the Mersey River in January 1864 as *Bijou*, the

British Library

Figure 5b: The Miller Yard at Brunswick Dock, 1865.

new steamer slid down the ways from Miller's yard at the southwest corner of Brunswick Dock into the Mersey before being towed to Wellington Dock, where it lay idle for three months (Liverpool *Telegraph & Shipping Gazette*, January 29, 1864).

The launch and intended trade were noted by U.S. Consul Thomas Dudley in a dispatch to Washington on February 19, 1864 (U.S. Consular Dispatches, No. 233, 19 February 1864). The steamer *Bijou* was then renamed *Mary Celestia* for its actual owners, Crenshaw & Company, when it was registered at London on April 20, 1864 with the official number of 48745. Crenshaw & Company was an Anglo-American venture established by three brothers from Richmond, Virginia, William G., James R., and Lewis D. Crenshaw, wool merchants who had operated a small fleet of sailing vessels prior to the war. The "Crenshaw brothers held solid Confederate credentials" with the Crenshaw Woolen Mill in Richmond "working almost exclusively for the military," and both William and James had excellent connections with the Confederate government's quartermaster and commissary bureaus (Wilson 2002:164).

Confederate agent in Europe James D. Bulloch would later note that William G. Crenshaw…

> *. . . was a merchant of approved skill and experience . . . the War Department made an arrangement with him for the rest of the War, to go to England, and to organize a company for the especial purpose of running the blockade and to personally superintend the purchase of commissary stores and other such articles as might be within the range of his mercantile experience. Mr. Crenshaw was, therefore, in some degree a Government agent, but the essence of the arrangement with him was that he should not act purely in a private character, and that he should draw foreign capital, as well as his own commercial credit into the enterprise. Mr. Crenshaw succeeded in adding some impulse to the trade of blockade-running, and he built or purchased a number of good steamers, which helped to provide the Confederate armies with the means of keeping the field (Bulloch 1883:Vol. 2, 84-85).*

With his "loose agreement" on shared funding to build a fleet of ships and the political support from the Confederacy, as Bulloch noted, William Crenshaw traveled to England in January 1863 to inaugurate what today would be termed a public-private partnership (Wilson 2002:164). Under the terms of their agreement, the Confederate War Department ensured that cargoes of cotton were available for the Crenshaws, who would secure supplies in Europe as well as the ships to serve as blockade runners, connecting to the South through the intermediary ports of Nassau in the Bahamas and St. Georges, Bermuda to Charleston, South Carolina and Wilmington, North Carolina. William acted as the company's agent in Liverpool, while James was the agent in Wilmington. Collecting a 2.5 percent commission on the goods they shipped in and out of the South, and taking a quarter of each cargo, by agreement, as their own private share, imported duty free, the Crenshaws and their British business partner Alexander Collie hoped to not only build up a fleet of runners but also make a profit.

Confederate Secretary of the Navy Stephen Mallory's letter of introduction for Crenshaw to Confederate agent in England James Bulloch spelled out the government's plan and trust in Crenshaw:

> *Captain William G. Crenshaw, a patriotic citizen of this city, who has fought conspicuously in command of a battery, raised and organized at his own expense, and who is an enlightened merchant of large experience and views, is now in England for the purpose of executing a plan for the regular transmission of Army, Navy, and other supplies to our country. The orders which he has from us embrace clothing and other articles of personal use, of which we are greatly in need. The object of this letter is to request that you will see Captain Crenshaw as early as practicable, and learn whether he can transmit such supplies at an early date. Should you find that he cannot do so? Then you will at once purchase six months supplies for 3,000 men, of seamen's clothing and shoes, hats, caps, etc., embracing every article of clothing for seamen, blankets, pea and monkey jackets, Guernsey frocks, etc., all in proper proportion. To send these articles in the best manner your discretion is invoked, and you are authorized to purchase a steamer for this purpose and to place a naval officer in charge of her, and perhaps, in view of the future use*

> *to which such vessel could be put, this would be the best course. A light-draft, fast steamer is desirable, and I perceive that a new class of such vessel, with two propellers, has been successfully devised. Your vessel should come in good sea trim, and, if necessary to fill up, you [can] send such articles of chandlery as seamen most require, soap included, or otherwise, as your judgment may dictate; or a few of the heaviest Whitworth or Blakely guns. You will not hesitate to make the best arrangement you can for funds for this purpose, as we are greatly in want of supplies, and they should come as early as possible. The vessel and cargo should be English and under English colors (Letter, Stephen Mallory to James Bulloch, as reproduced in Marsh 1921:368).*

The inability of the government to meet its payments created initial problems, but by selling cotton and obtaining other private backers, William Crenshaw did not pause in his plans for new ships. Crenshaw borrowed money and sold Confederate cotton to finance five steamers, *Hebe*, *Dee*, *Ceres*, *Vesta* and *Venus*, launched between April and July 1863 to inaugurate the "Crenshaw Line" (Wilson 2002:165-166 and Wise 1988:102). The promise of great profit not only motivated the partners but also their crews; the payroll for the officers and men of their runner *Venus* was $25,000 in gold, the captain being paid $5,000, the pilot $3,500, the chief engineer $2,500, the first officer $1,250, the second and third officers $750 each, and each crew member $250 (Wise 1988:111). The officers were allowed "to carry goods for themselves, which supplemented their income by thousands of

Figure 6: St. Georges, Bermuda, *Mary Celestia*'s port of call during the steamer's short career.

dollars," as the blockade's strictures drove up black market prices for some commodities to 700 percent of their prewar prices (Wise 1988:111). In comparative modern values, using the formulas found on the "Measuring Worth" website (http://www.measuringworth.com/exchange), the salaries in 2011 dollars would be a $527,313 payroll per voyage, with the captain receiving $105,307, the pilot $73,700, the chief engineer $52,731, the first officer $26,287, the second and third officers each receiving $15,866 and each crew member receiving $5,273. Such hefty sums provided the financial incentive that motivated men to take the risks they did in commanding, piloting and crewing blockade runners.

The rewards were potentially huge but so were the risks, as the Crenshaws discovered when some of their steamers were beached and burned by the crews or captured and destroyed in rapid succession. Following the loss of *Hebe* in August 1863 and *Venus* that October, the relationship with Collie was strained. Collie said in a private letter to Confederate diplomat James Mason in December 1863 that "I fear the Crenshaw contract will not work out . . . I regret that I did not claim control over these steamers, as the management which is entirely in Crenshaw's hands in Wilmington has been far from good" (Wise 1988: 137). James Crenshaw reportedly had an "abrasive" personality that did not set well with the community in Wilmington, his crews and his partner. Collie remained a partner in the surviving three vessels but did not venture into any new construction or purchasing for the line. More mishaps followed; *Ceres* ran aground while entering Wilmington in December 1863 and was captured, in January 1864 *Vesta* ran aground and was set on fire by the crew, and in February *Dee* was chased ashore and destroyed attempting to enter Wilmington.

The Crenshaws persevered, in part because a new contract came in from the Confederate government to ship desperately needed meat, especially bacon, in November 1863; they also partook of a £140,000 subsidy to build and operate new ships in the spring of 1864 because of the incessant demand for blockade runners. The new arrangement provided needed capital for the newly launched *Mary Celestia*, "paid for by large advances made by W.G. Crenshaw & Co." (Wilson 2002: 171). In modern terms, the subsidy of £140,000 is equal to $15.6 million 2011 dollars.

On April 27, *Mary Celestia* obtained a Customs clearance at Liverpool's Wellington Dock in ballast (without cargo), and sailed the next day, bound for Bermuda under the command of Captain Walter George Green with a crew of 31 men (Customs Bill of Entry, Liverpool No. 14018).[1] The steamer's maiden voyage took it to Bermuda via the Azores in May 1864. She was reported as "Mary Collert"[2] in a consular dispatch from St. Michael (São Miguel in the Azores) on May 9, 1864. Consular Agent Thomas Hickling reported that on May 3rd, "the (two-masted and two-funnel) schooner Mary Collert [sic] 248 tons, Captain W.G. Green, arrived from Liverpool, bound to Nassau for coal, and departed with upwards of 200 tons. She had the appearance of being destined for a Confederate cruiser; the master said she can steam 18 miles an hour" (Papers Relating to the Foreign Affairs of the United States 1865:303). In a separate dispatch, Hickling noted that the "English steamer Mary Celestina, from Glasgow for Bermuda, took in coal" in the Azores on May 3rd (Rush and Woods 1896:122).

Mary Celestia arrived at Bermuda on May 16, 1864. The U.S. Consul in Bermuda, Charles Maxwell Allen, noted the arrival in his dispatch of May 20, "The British steamer *Mary Celestia* from London or Liverpool arrived here on the 17th [sic], side wheel, two stacks fore and aft, two masts, about 250 tons, is now painted white, and taking in cargo."[3] (Wiche 2008:134) Ten days later he reported that *Mary Celestia* had not spent long in port. "The following steamers have left here to run the blockade, probably for Wilmington…May 24. *Mary Celestia*, Usina, Master" (Wiche 2008:135).

This departure was the first of eight voyages between Bermuda and Wilmington for *Mary Celestia*.[4] A table

[1] Walter George Green was born in Liverpool in 1827, and in 1861 received his Master's Certificate (No. 2981) at Glasgow in 1861. He commanded the steamer *Souchays* from 1862 until May 1862, and then commanded the steamer *Red Jacket* (the alias of the steamer *Dundroon Castle*, a blockade runner) until it was lost by running onto a reef on October 11, 1863. His next command was *Mary Celestia*.

[2] The "Collert" is clearly a transcription error, perhaps for "Cellest," as the same day "*Mary Celestina*" is reported in the port taking on coal.

[3] Allen corrected his error in a tabular list of blockade runner arrivals and departures he maintained. It listed the arrival as May 16, "Str *Mary Celestia*, Usina

[4] There has been some confusion over the number of voyages made by *Mary Celestia*. Captain Michael Usina noted that she ran the blockade eight times; that is correct when one lists each time the blockade was passed going in and out of Wilmington: four trips from Bermuda to Wilmington, and four return trips from Wilmington to Bermuda.

documenting the known characteristics of each of *Mary Celestia*'s blockade-running voyages between Bermuda and North Carolina follows as a table listing the dates, destinations, master, chief engineer, and the source or documentation for the information on the table (Table 1).

The general pattern for the voyages was evening departures, timed as close as possible to new moons or quarters when there was little moonlight. *Mary Celestia*'s runs show a close adherence to this practice, sailing near the last quarter moon of May 28, and the new moons of June 4, July 4, August 2 and September 1.[5]

The first blockade-running cargo carried by *Mary Celestia*, according to a cargo manifest, was:

> *5 cases merchandise, 6 bales merchandise, 21 cases shell, 77 bales blanket and blue cloth, 1 case merchandise, 2 bales merchandise, 39 casks bacon, 137 barrels pork, 1 box medicine, 2 cases merchandise, 1 trunk, 3 cases, 4 cases brandy (Vandiver 1947:131)*

The ship's career would span a brief four months before it was lost in September of that year. Nassau was the preferred port, being a hundred miles closer to the U.S. Coast, but Bermuda had emerged as a blockade-running center beginning in the Spring of 1862 by runners who favored the destination of Wilmington, North Carolina (Deichmann 2003:20). Bermuda also gained favor because, although it was close to the U.S. coast, it was distant enough to discourage visits – or a regular seagoing blockade – by the coal-burning steamers of the U.S. Navy, which needed to refuel in order to remain at station off Bermuda. Even if the U.S. Navy had been able to purchase it, in a market dominated by pro-South Bermudian merchants, they were limited by international law to visits of only 24 hours. The run from Bermuda to Wilmington, North Carolina was a westerly steam of 647 miles (1041 k) (Deichmann 2003:16).

Confederate blockade runner John Wilkinson noted in his reminiscence that

> *This island is easily accessible on the southern side, and was much resorted to by blockade-runners. Surrounded on all other sides by dangerous coral reefs, which extend for many miles into deep water, a vessel of heavy draft can approach from the south within a cable's length of the shore. A light of the first class at the west end of the group composing the "Bermudas," is visible for many miles in clear weather. It may as well be mentioned here, that the blockade-runners rarely approached any head-land*

Table 1: 1864 runs of the blockade runner SS *Mary Celestia.*

DATE	DESTINATION	MASTER	CHIEF ENGINEER	DOCUMENTATION
April 29 — May 16, 1864	Liverpool for St. Georges	W.G. Green	?	Rush and Woods p. 122, Wiche, p. 134.
May 24-May 27	St. Georges for Wilmington	Michael Usina	John Sassard	Consular dispatch, Wiche, p. 134, 220; Horner, p. 103, Vandiver, pp. 131
June 5 —June 9	Wilmington for St. Georges	Michael Usina	John Sassard	Wiche, p. 221. Vandiver says arrived with 594 bales, fewer than when sailed, having thrown some overboard.
June 20—June 24	St. Georges for Wilmington	W.G. Green	John Sassard	Wiche, p. 140; Vandiver, p. 134; New York Times, July 13, 1864 cites Green as Master; Bermuda papers, Usina is listed as master of Atlanta.
June 25—July 1	Wilmington for St. Georges	Michael Usina	John Sassard	Cotton tossing, Official Records, War of the Rebellion; Middleton letter July 3. Vandiver says sailed June 28 – July 2, with 600 bales, arrives with 450, having tossed 150 overboard.
July 6—July 8	St. Georges for Wilmington	Arthur Sinclair	C.F.Middleton	Wiche, p. 143, Vandiver, pp. 137; Quarantined on arrival until July 24/25. Middleton letter July 8 says Green left and Sinclair his replacement.
July 25-July 29	Wilmington for St. Georges	Arthur Sinclair (NY Times says Green)	C.F.Middleton	New York Times Archive, From the Bermudas: Blockade Runners. PORT OF HAMILTON ARRIVED. PORT OF ST. GEORGE; Wiche, p. 147; Middleton letter July 24. Vandiver says July 24 – July 28 with 683 bales.
August 3-August	St. Georges for Wilmington	Arthur Sinclair	C.F.Middleton	Quarantined in NC. Middleton letters August 14, 17, 19, 21, 22, 23,25, 1864; Vandiver, p. 138; Middleton letter Aug. 17 says left Bermuda on 3rd arrived at quarantine Aug. 7
August 25—August 29	Wilmington for Hamilton	Arthur Sinclair	C.F.Middleton	Middleton letter Aug. 25 says going to sea that night. Vandiver says 550 bales.
September 6	Hamilton for Wilmington	Arthur Sinclair	C.F.Middleton	*Mary Celestia* sinks—Crew quarantined in Bermuda—Middleton letters dated September 13, 20, and 30, 1864.

[5] The precise dates for 1864 phases of the moon come from NASA's website "Moon Phases, 1801-1900) http://eclipse.gsfc.nasa.gov/phase/phases1801.html

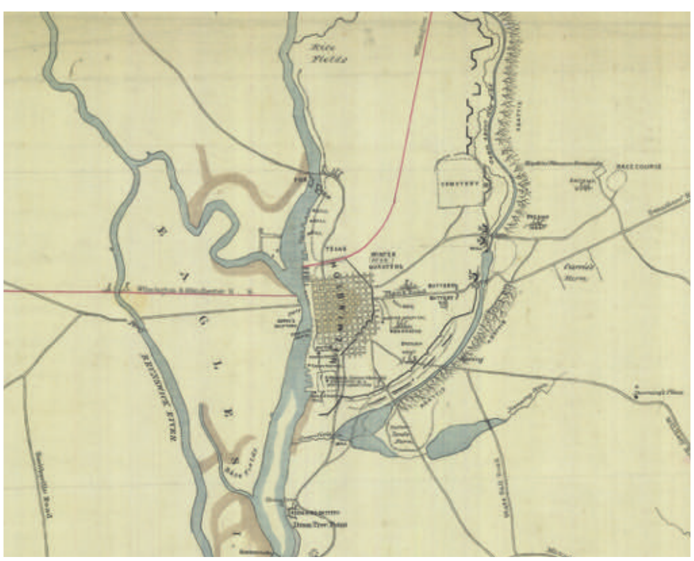
during daylight; "preferring darkness rather than light" (Wilkinson 1877:142-143).

Wilmington, North Carolina and Charleston, South Carolina were the two major southern ports on the Atlantic favored by blockade runners. Following a sustained, albeit unsuccessful Union assault on Charleston that began in July 1863, the number of runners steadily shifted to Wilmington.

At the start of the war, Wilmington, situated 28 miles (45 k) upstream from the mouth of the Cape Fear River, was North Carolina's principal seaport; in 1861 it was the eighth-largest southern port in terms of Customs receipts (Wise 1988:16). By early 1864 when *Mary Celestia* arrived in Bermuda to commence running, the fortunes of war had made Wilmington "the most important blockade-running port of Confederacy" (Wise 1988:124).

Spurling Collection, St. George's Historical Society

Figure 7: Edward James' wartime painting of blockade runners on the St. George's waterfront.



NOAA Central Library

Figure 8: Wilmington during the Civil War.

Library of Congress

Figure 9: Wilmington's waterfront after the Civil War, 1873.

Figure 10: The mouth of Cape Fear and its defenses, 1864.

NOAA Central Library

The sandy stretches of banks at Cape Fear's entrance were fortified by the U.S. government prior to the Civil War. When the war began, Confederate forces occupied forts Johnston and Caswell at the river's mouth, the "Old Inlet," but another entrance at "New Inlet" six miles away was not guarded. Work immediately began to fortify New Inlet. The project did not progress very far until a new commander, Col. William Lamb, arrived in July 1862 and began work on a sand and earthwork fortification, Fort Fisher. This massive structure, joined by a number of smaller earthwork batteries of guns, held the Union fleet at bay and kept Wilmington open to blockade runners well into 1865.

In addition to the forts, the entrance to the Cape Fear was blocked by a complex system of shoals and bars that forced the blockading squadron to spread out along the coast for miles. Entering the river required expert knowledge from locally trained pilots, all of whom save one who served the Confederacy. As other ports fell, and as the blockade tightened with more ships joined the blockading fleets, the number of Union Navy vessels stationed off the Cape Fear increased from a dozen to fifty ships by autumn of 1864, some former blockade runners that had been captured and converted from the hunted to hunters, best suited by their speed to capture the other runners. It was into this steadily tightening noose that *Mary Celestia* sailed in the early summer of 1864. The captain for the first voyage to Wilmington was not Walter G. Green, the master who delivered *Mary Celestia* to Bermuda, but Michael Philip Usina.

The 24-year-old Usina, a native of St. Augustine, Florida, was a former Army private wounded at Manassas who transferred to the Confederate States Navy in 1861. He first served as a pilot at Savannah before heading overseas to captain *Mary Celestia* as well as Crenshaw's *Atalanta* and the runners *Virginia*, *Armstrong* and *Rattlesnake*. Usina assumed command of *Mary Celestia* on May 18. With him were his chief engineer, John H. Sassard, and Assistant Engineer Charles Francis Middleton. The two engineers were from Charleston.

Middleton, the native-born son of an emigrant British mariner, was married and had left the employ of the rice plantation where he had worked as an engineer to offer his services to the Confederacy. In September 1863, he was serving as an engineer on the Confederate government steamer *Robert E. Lee*, a successful blockade runner that began service after arriving in Wilmington in December 1862 (Middleton 1863). After thirteen successful runs, *Robert E. Lee* was captured off Beaufort, en route to Wilmington, on November 9, 1863 by U.S.S. *James Adger*. The crew was imprisoned, the steamer sent north to the U.S. Prize Court in Boston.

Middleton apparently persuaded his captors that he was a neutral British citizen, and he was released. Making his way to Bermuda on the bark *Auctioneer*, he arrived there after a 3½ day passage from New York in mid-December 1863 (*The Royal Gazette*, December 15, 1863). From there, according to his letters home, he worked as an engineer on the blockade runner *Caledonia*, an iron-hulled side-wheeler that had commenced running to and from Bermuda in January.[6] In a letter to his wife dated April 25 from Bermuda, Middleton said he and Sassard were

[6] Middleton referred to the ship as the "little Caledonia." Built in Glasgow in 1856, she was small, registered at 115 tons. *Caledonia* made four attempts and two successful runs before being captured on May 30, 1864 while trying to enter Wilmington (Wise 1988: 291).

American Civil War Museum, Richmond

Figure 11: Michael P. "Mike" Usina as a member of the Oglethorpe Light Infantry, Company A, 1861. Three years after this photograph was taken, Usina commanded *Mary Celestia*.

Courtesy of Philip Middleton

Figure 12: Charles F. Middleton.

on the beach waiting for another ship, the blockade runner *Florie*, and that he had left *Caledonia* (Middleton April 25, 1864). Instead of joining Florie, the two men went on *Mary Celestia*.

Usina later reminisced that *Mary Celestia* made an uneventful voyage to Wilmington, ran the blockade, loaded cotton and proceeded to sea on June 5:

> *We had succeeded in getting through the blockade off Wilmington and shaped a course for Bermuda. Daylight found us in the Gulf Stream, the weather dirty, raining and a dirty sea, our ship small and heavily loaded. The rain clearing away disclosed to our view a large brig-rigged steamer within easy gun shot, with all her canvas set bearing down upon us . . . We altered our course head to wind and sea, causing him to do the same, and to take in her sails, which gave us a little advantage, but she was a large, able ship, and made good weather, while our little craft would bury herself clean out of sight, taking the green seas in over the forecastle. Calling Mr. Sassard, I said, "John, this will never do. That ship will soon sink us or catch us unless we do better." He answered in his quiet manner, "Captain, I am doing all that a sane man dare do." "Then," I said, "you must be insane, and that quick, for it is either hell or Fort Lafayette for us, and I would rather go in the former . . . ." He went below and I took forty-five bales of cotton from forward, rolled them abaft the paddles, cut them open, so the enemy could make no use of them, and threw them overboard . . . About this time Sassard sent for me to come down to the engine-room, where he said, "Captain, I am getting all the revolutions possible out of the engines. I am following steam full stroke; this is a new ship, first voyage, these boilers I hope are good English iron. All there is now between us and eternity are those boilers. How much steam there is on them I do not know. (He had a kedge anchor made fast to the safety valve.) In my opinion it takes a mighty brave man to do that. I went on deck and threw the log and found the ship to be making seventeen an hour into a heavy head sea. "All right," I said, "keep that up a little while, and there is no ship in the United States Navy that can catch her." We were soon out of reach of her guns and enabled to reduce the pressure on the boilers (Sprunt 1916: 422-423).*

Mary Celestia arrived at St. Georges on June 9 with 594 bales of cotton (Wiche 2008:221).[7] A survey of the records of the North Atlantic Blockading Squadron for

[7] The New York Times' Marine Intelligence column on June 16, 1864 also notes the steamer's arrival at Bermuda from Wilmington on June 9. A similar report noting the arrival of "Mary Celestia, Usina" from Wilmington appears in the Boston Daily Advertiser of June 29, 1864. A New York Times article on Bermuda arrivals dated June 28, 1864 notes "On the 9th, steamer Celestia, Capt. USINA, arrived from same port [Wilmington], with 594 bales cotton and a quantity of turpentine."

Library of Congress

Figure 13: Blockaders chase and shoot at a runner.

late May and early June 1864 reveals several chases of blockade runners and the fact that bales of cotton were thrown overboard to lighten loads, but there is nothing that directly correlates with Usina's account. Usina noted the vessel that chased him was the steamer (and then Army transport) Fulton; that steamer did chase a blockade runner that departed Wilmington, but that occurred in September 1864 (Ransom and Stewart 1900: 506). It is possible that his memory, three decades after the event, was faulty, and he was recalling a later and better-documented (in contemporary records) event in which cotton was thrown overboard from *Mary Celestia*. In late May-early June 1864, the steamer Fulton did not chase a Bermuda-bound blockade runner. Blockade runner historian Frank Vandiver, however, notes that *Mary Celestia* arrived with less cotton than she had shipped in Wilmington, "some having been thrown overboard."

On June 20, 1864, Consul Allen again mentioned *Mary Celestia*. "The following blockade-running steamers are now in this port of St. George's, and intend to leave during the old of this moon for Wilmington. *Edith*, *Lynx* (had been on the coast of Wilmington and returned), *Boston*, *Old Dominion* (new), *Little Hettie* (new), *Atalanta*, *City of Petersburgh* and *Mary Celestia*." (Wiche 2008:137) That same day, *Mary Celestia* left with two other blockade runners; "Sailed June 20th *Lynx*, *Mary Celestia* and *Atalanta* for Wilmington." (Wiche 2008:140) The cargo taken through the blockade on this third voyage consisted of:

From Musson's stores, 76 cases and bales merchandise, 2 cases merchandise, 1 case merchandise, 2 casks hams, 1 bale merchandise. From Johnson and Croft's stores, 38 casks – 68 cases bacon (Vandiver 1947:134).

Although Allen did not mention the name of the steamer's master, Captain Usina recalled that he was in command for that voyage and the fourth one. The steamer departed Wilmington on the evening of June 25 on its fourth voyage, again loaded with 600 bales of cotton, arrived back at Bermuda on the evening of Saturday, July 2 and was officially reported in the harbor on July 3.

Charles F. Middleton, writing to his wife on July 3 from Bermuda, reported to her:

We have safely arrived here after a most exciting chase by a vessel equally as fast as ourselves. We were chased from six in the morning until 2 in the evening, and we lightened our ship by throwing overboard some 100 Bales of King cotton. When our pursuer seeing the chances of getting our ship and the balance of the cotton so very poor turned around to pick up what had been thrown overboard and I think he must have had a fine time at it, for we cut the Bonds of most of the Bales, and then you know it was all in loose mass of bulk floating on the sea, so we got clear of her, and. As soon as we arrived everybody appeared surprised to see us as they say a Barque just arrived from New York had reported seeing us going in as she came out. Now is it not provoking to hear such reports, at all events I suppose the Mary Celestia sooner or later will be captured but I hope and trust in God I will not be in her (Middleton, July 3, 1864).

Based on these accounts, *Mary Celestia* is likely the subject of this June 27, 1864 report from the commander of USS *Santiago de Cuba*, then on station off Wilmington:

I have the honor to report that on the 26th instant, 11.30 a. m., we discovered a steamer four points on our starboard bow, we steering west. The strange steamer steering to the southward, with fore and aft sail set; at 11:40 she took in all sail and hauled up S. S. W. ½ W. At this moment we discovered a large steamer in chase astern of the strange steamer. The Santiago de Cuba was then under a full head of steam and gaining rapidly on the chase, the large steamer astern dropping very fast. At 1:30 the chase altered her course to S. E. and set fore-and-aft sail and attempted to cross our bows; fired five shot at her from our forward rifle cannon, all of which fell short. At this time we were about 4 ½ miles from her. At 2 p. m. the chase took in sail and hauled up S. W. and commenced throwing overboard her cargo, consisting of cotton. I should think she threw overboard from 80 to 100 bales. From this moment she began to leave us, and at 9 p. m. she was entirely out of sight, but we continued in chase until the next day at noon, when we were in the latitude 28° N., and the longitude of 78° 05' W., and then we altered our course to N. N. W. for the Frying Pan Shoals. The steamer that was astern of the chase is supposed to be the Quaker City, and she not being able to keep up with us she commenced picking up cotton at 3 p. m., and I am in hopes that she got nearly all that was thrown overboard. The Santiago de Cuba worked well, running at the rate of 12 miles per hour, and at one time was going 13 miles. As soon as our firemen get a little more experience, I am in hopes that we shall be able to keep up to this speed. Every exertion was made on our part, and much credit is due to the chief engineer, Mr. Farrer, for the exertions he made during the chase; he stood at the furnaces all the time, superintending the inexperienced firemen of the vessel, until he was nearly exhausted. The Santiago de Cuba is the fastest vessel on the blockade, and it cannot be many days before we pick up a prize. There are but few blockade runners that go less than 14 miles per hour, so you see that it requires fast vessels for the blockade. Few guns are mounted; speed and men are all that are required to check the blockade runners in a very short time, and I would earnestly recommend that one or two vessels that can run 15 or 16 miles per hour should be obtained with as little delay as possible for the blockade off Wilmington. I have been in chase almost every day since I arrived oft' this port. The offshore blockade is of the most importance, and it is the only one that the blockade runners dread (Rawson and Stewart 1900: 212-213).

The commander of USS *Quaker City* reported that he had indeed chased the same steamer, noting in his report of June 30, 1864 that on June 26:

At 4:30 a. m. latitude 32° 45' N. and longitude 78° 15' W., discovered another large side wheel two masted steamer, with two smokestacks, to the northward, distant some 10 miles, and standing to the southward and westward. Immediate chase was given and by 9 a. m. had gained rapidly upon chase, when her master commenced throwing overboard bales of cotton, amounting in number to upward of 200, we passing through the field over two hours. The steamer then dropped me as rapidly as I had gained upon her previously, during which time the Santiago de Cuba hove in sight from the east-yard and took up the chase. At 2 p. m. we again came up with another lot of cotton, numbering 41 bales in sight, and the chase evidently gaining, I deemed it unadvisable, at 3 p. m., on reaching that point, latitude 31° 42' N. and longitude 78° 12' W., to pursue (lie chase any longer, particularly as the Santiago de Cuba was in pursuit, but with but slight hopes, I think, of overtaking her, the chase appearing to pursue her onward course with great swiftness. I then turned my steamer's head to the northward and eastward, lowered my boats and with slow speed stood in that direction until near dark, gradually securing 30 bales, the outer roping of which had all been cut ere cast overboard, in hopes of destroying and preventing its being again secured. On the following day I cruised in the vicinity in expectation of falling in with the mass of that which had been thrown overboard, but without avail, but yesterday while chasing a steamer, which proved to be the Santiago de Cuba, fell in with 8 additional bales, 3 of which had been cut, while the others were in good condition, iron bound. These 8 bales were picked up in latitude 32° 40' N. and longitude 77° 40' W (Rawson and Stewart 1900: 219-220).

Mary Celestia reloaded at St. Georges, departing on her fifth voyage on July 6, 1864. Around this time *Mary Celestia* was noted in port according to an August 10 London newspaper account republished in the New York Times:

The brig Martha, from Bermuda, has made the run to Liverpool in 24 days, bringing dates up to the 14th of July, or about a week later than our previous advices. She reports having left there the following blockade runners; the paddle steamships North Heath, (about to proceed to Halifax, N.S., for repairs) Lynx, Maria Celestia, and Ada; and the screw steamers Atalanta, Edith and Black Hawk. The Lilian arrived at Bermuda on the night of the 13th, with upward of 900 bales of cotton from Wilmington. A large fleet of vessels were loading cotton for Liverpool, among which the Captain of the Martha mentions the Hamilton, Lady of the Lake, Anna Mary, Ellen, Ida and Sovereign (New York Times, August 24, 1864).

On July 13, Allen reported that "The following vessels have left this port for Wilmington, viz. 8th, *Mary Celestia*, Greene and *Lynx*, Reid." (Wiche 2008:143) According to the Consul, the steamer was again under the command of Walter G. Green. Assistant Engineer Middleton, writing his wife on July 9, 1864, however noted that the Consul had missed a change in the ship's commanders:

Capt. Green and Col. Crenshaw have had some misunderstanding, and he, Capt. G. left her and has gone home, and now we are commanded by Capt. Sinclair, of the C. S. Navy, a very smart clever gentleman. I do like him very much indeed, for you know I prefer being commanded by our own officers (Middleton July 9, 1864).

With Arthur Sinclair was in command, *Mary Celestia* departed Bermuda with a cargo described as:

From Musson's warehouse, imported per Harkaway, value £3,019.2.10: 12 cases merchandise, 44 bales merchandise, 34 casks bacon, 2 half chests tea, 1 barrel sugar, ½

> *barrel coffee, 1 box merchandise, 5 boxes soap, 1 barrel whisky (Vandiver 1947:136).*[8]

The voyage lasted longer than the Crenshaws or the crew had planned. When *Mary Celestia* departed Bermuda, Pilot John W. Anderson and apparently some of the crew were stricken with yellow fever. According to an account by former blockade runner James Sprunt (who was not on board *Mary Celestia* but who knew many of the characters involved), as the steamer approached Wilmington, Anderson roused himself from his sickbed, even though he was dying, to guide *Mary Celestia* past the shoals that made entering the Cape Fear area dangerous.[9] According to Sprunt, a blockading steamer spotted *Mary Celestia*, then opened fire and pursued her:

> *Like a scared greyhound she made straight for New Inlet bar, then visible several miles away, and after her steamed the blockader, from whose bow gun every few minutes would leap a flame followed by a shell which would pass over or through her rigging and burst in the air, or, striking the sea, would flash a great column of spray towards the sky. By this time poor Anderson was dying in his berth, and the officers of the ship began to realize the terrible situation in which they found themselves, with the enemy in pursuit and before them a bar over which it was almost certain destruction for any one aboard except Anderson to attempt to steer the Mary Celeste. Anderson heard the firing and knew what it meant before they told him. He knew, too, that he was dying and had no further interest in this world's affairs, but the sense of duty asserted itself even in the presence of death. He was too weak to go up, but he demanded to be taken on deck and carried to the man at the wheel. Two strong sailors lifted him and carried him up to the wheelhouse. They stood him on his feet and supported him on either side. His face was as yellow as gold, and his eyes shone like stars. He fixed his unearthly gaze upon the long line of breakers ahead, then upon the dim line of pines that stood higher than the surrounding forest, then at the compass for a moment, and then said calmly, "hard starboard!" Quickly revolved the wheel under the hands of the helmsman; slowly veered the stem of the rushing steamer, and a shell hurtled over the pilot-house and went singing toward the beach. Anderson kept his gaze fixed on the breakers and in the same calm tone said, "steady." On ploughed the steamer straight for her goal, while the group of men in the pilot-house stood in profound silence, but fairly quivering with suppressed excitement. The blockader, finally seeing that it was impossible to overtake her and not desiring to come within range of the big guns of Fort Fisher, abandoned the chase with a farewell shot, and the Mary Celeste, now nearly on the bar, slacked her pace a little, and nothing but the swash of the sea and the trembling thud of the ship under the force of the engine could be heard. The dying pilot, though failing fast, continued in the same calm tone to give his directions. They were now crossing the bar, but had passed the most dangerous point, when he bent his head as if to cough, and the horrified men saw the last fatal symptom which immediately precedes dissolution—black vomit—and knew that the end was very near. He knew it, too, but gave no sign of fear and continued at his post. His earthly home was now visible to his natural eye—he was almost there where loved ones awaited his coming—but nearer still to his spiritual vision was the 'house not made with hands, eternal in the heavens.' At last the bar was safely crossed, smooth water was reached, the engine slowed down, the Mary Celeste glided silently into the harbor, stopped her headway gradually, lay still, loosed her anchor chains, dropped her anchor, and as the last loud rattle of her cable ceased, the soul of John William Anderson took its flight to the undiscovered country (Sprunt 1916: 370-371).*

The death of the pilot was reported by engineer Charles F. Middleton, who wrote to his wife from quarantine on July 9:

> *Here we are again, only we are forced to remain where we would rather not be, that is in quarantine. We arrived here on Saturday night, and our Pilot, my friend John Billy Anderson very sick with yellow fever, and poor fellow he died on Sunday night and buried shortly after, and really we have been treated more like Lepers than anything else no one not even a physician coming to see us and not permitting us to communicate ashore. We have had a good many sick, but thank God they are all getting better and I never was in better health, and sincerely hope you all are the same. I think I will be able to see you all this trip again, if they don't keep us too long in quarantine. Really this is awful lying away from shore and not allowed to leave the vessel. They will not even allow us to send our clothes ashore to be washed, and now we are obliged to go away up the Beach where no one lives to get our water and wash our own clothes (Middleton July 9, 1864).*

There is no mention in the dispatches from the blockading fleet of any encounters, chases or shots fired at an inbound steamer during this period, but a detailed report on an unsuccessful chase of a steamer leaving Wilmington and bound for Bermuda on July 11 takes up several pages in the official record. It is possible that James Sprunt's account was embellished (he was not onboard *Mary Celestia* for this voyage) perhaps unnecessarily adding a chase that did not occur. Pilot Anderson may have simply and dutifully manned his post to safely guide *Mary Celestia* in to the river's mouth even though he was dying.

Departing Wilmington on July 25 after being laid up in quarantine for nearly three weeks, *Mary Celestia* returned to Bermuda with 683 bales of cotton (Wise 1998:248). On July 29, Allen reported in his dispatch that "since my No. 130 of July 19 the following blockade-running steamers have arrived here . . . Falcon and *Mary Celestia*." The *New York Times*, citing Bermuda papers, also twice noted the July 29 arrival, claiming the steamer had come in under the command of Captain Green with 683 bales of cotton consigned to C.L. Hobson (*New York Times*, August 24, 1864 and September 5, 1864).[10] Allen reported that waterfront talk disclosed that when leaving Wilmington, "*Mary Celestia* was chased and threw overboard 150 bales of cotton" (Wiche 2008:147). Allen was off by a voyage; as previously noted, the bale-tossing incident had occurred on the fourth voyage a month earlier.

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[8] The reference "per *Harkaway*" reflects the role of Bermuda as an entrepôt, or a port of exchange. The ship *Harkaway* had taken cargo from another port and left it in a warehouse (in this case, Musson's) in St. George's. *Mary Celestia* had taken on a smaller amount of the higher valued cargo to run through the blockade. As the £3019 value indicates, it was a lucrative trade, especially if some goods sold in Wilmington for a 200 to 700 percent mark-up. £3019 when calculated using the formulas found on the website results in a 2011 value of $337,000.

[9] Sprunt claims this incident took place in August 1863; Captain Usina's memory was mistaken, as it was in July 1864.

The next voyage, the seventh one, departed St. George's on August 2, 1864, under the command of Arthur Sinclair, with a cargo listed as:

> *From J.W. Musson's warehouse, imported per Levant, 392 barrels pork, 27 bales blankets (duty paid, value £1864.10.11) From same warehouse, imported per J.W., 1 tierce[11] hams, 1 case glass pipes, 1 bale clothing, 1 bale clothing (Vandiver 1947:138).[12]*

Mary Celestia arrived off Cape Fear and entered the river on August 7 only to be immediately placed in quarantine. On the nearby steamer *Advance*, awaiting a chance to leave, diarist Mary Johnston White noted "not far behind us is the *Mary Celestia*, just from Bermuda, in quarantine. It is reported that the yellow fever is at Bermuda and a man died on board the *Mary Celestia* this morning, it was thought from yellow fever. Three more cases of yellow fever were reported on the *Mary Celestia*" (Culpepper 2004: 22). On board *Mary Celestia*, engineer Middleton again wrote to his wife on August 15:

> *The Quarantine fleet as we call them, has now been increased, and there are no less than nine of us here in a Bunch, and they are the Mary Celestia, Will o' the Wisp, Old Dominion, Petersburg, Lester B., Elsie, Annie, Florie and. Edith. Some have the fever and others are healthy, but we thank God are able to eat all set before us, and our ship is about the healthiest and cleanest among them, and we are painting and cleaning still. Only I wish I could get a chance to take a run home to see you all (Middleton, August 15, 1864).*

Middleton wrote several letters to his family expressing his frustration and his shipmates' as they waited for clearance to load 550 bales of cotton and depart. Finally, after more than two weeks of enforced waiting in quarantine, loaded and ready to go, *Mary Celestia* departed the Cape Fear on the evening of August 25. The steamer's quarantine and impending departure were commented on by Sidney Lanier, a signal officer stationed ashore who in an August 24 letter noted that between ten to twelve blockade runners had been held up in quarantine, but he explained:

> *The vessels having developed no serious cause of alarm after riding out a Quarantine-term of fifteen days, [they] are being released and allowed to discharge cargo and reload. The "Lilian" went out last night, and tomorrow night two of our party, Richardson and Langhorn, go out as passengers on the "Mary Celeste" to bring in two new steamers now ready at Bermuda (Clarke 1906: 1096-1097).[13]*

As *Mary Celestia*'s crew readied to depart in the evening darkness on August 25, Charles Middleton wrote another letter to his wife, noting that he had sent $600 to the ship's agent, Mr. Evans. He had also sent a "splendid" gold watch and chain that "my dear departed friend Anderson our pilot [had] made me a present when in Bermuda" (Middleton, August 25, 1864). The watch and chain remain in the hands of the Middleton family in Charleston, South Carolina.

Returning to Bermuda on its eighth voyage, *Mary Celestia* diverted from St. Georges to Hamilton near the center of the island, where it was loaded for another trip through the blockade at Wilmington. The steamer's final voyage (which would have been the ninth if successfully completed) began when it departed Hamilton on September 6, 1864, officially bound for Nassau but actually headed for Wilmington. The cargo was listed as 125 boxes of bacon and 534 boxes of "merchandise" (Bermuda Royal Gazette, September 13, 1864). Clearing Hamilton harbor, *Mary Celestia* steamed west to the island's south shore under the direction of Bermuda pilot John Virgin. Approaching the shore to land the pilot and the owner, Col. William Crenshaw, *Mary Celestia* struck the reef at high speed and sank quickly as the crew scrambled into the boats. Engineer Middleton wrote his wife to report he would not be home soon:

NOAA Central Library

Figure 14: Smithville, (now Southport), *Mary Celestia*'s quarantine port, as mapped during the war.

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[10] *The London Times* of August 25, 1864, noted that *Mary Celestia*, with 683 bales of cotton, had arrived in Bermuda with five other blockade runners between July 26 and 30. The same report ran in the Boston *Daily Advertiser* of August 9, 1864.
[11] A tierce is a barrel capable of holding 35 Imperial gallons.
[12] The outbound cargo of *Mary Celestia* was drawn from cargoes shipped to Bermuda in two separate vessels, *Levant* and *J.W.*
[13] Lanier (1842-1881) later served as a pilot on blockade runners. He gained fame post war as a poet.

Through the sheer carelessness of the pilot we were thrown on a rock and in five minutes from the time she struck she was out of sight, and now the poor little steamer Mary Celestia lies in her home at the bottom of the Ocean off Bermuda. We were all saved, with the exception of the 1st cook, by taking to the boats. I saved my clothes but nothing else (Middleton, September 13, 1864).

The Royal Gazette reported the wreck in its September 13 edition:

LOSS OF STEAMER MARY CELESTIA. It is our painful duty to record the loss of that beautiful little steamer "Mary Celestia," so long and favorably known as one of the swiftest and most fortunate of her class. She left Hamilton harbor on Tuesday last, under very promising auspices, with a full cargo, and, we understand, one passenger, a gentleman. The "M.C." had a clearance for Nassau, N.P., and was in charge of one of our most experienced Pilots (John Virgin). The vessel made an unusual quick run through the East-end Channels and up the South-side of the Islands gliding gracefully along under a good head of steam at the rate of about thirteen knots. At six o'clock, everything apparently in readiness, the ship was headed for the shore for the purpose of allowing her gentlemanly owner, Colonel Crenshaw, and the Pilot, to disembark in the vicinity of the Lighthouse. After running in this director a few minutes, the First officer, Mr. Stuart, politely called the Pilot's attention to some breakers which he saw ahead to which it seems the Pilot replied "I know every rock about here as well as I know my own house." No further notice being taken of the warning, and Mr. Stuart seeing the danger, immediately ordered the helm to be put hard down, but scarcely had this order been given when the vessel struck, drove on to a rock, and in from six to eight minutes afterwards sunk in about seven fathoms water. Fortunately, however, the boats were cut loose, and all on board were saved with the exception, we are sorry to say, of the Chief Cook who we are informed, notwithstanding the entreaties of his shipmates to the contrary, went to his state room to save some articles which he valued very much, and the door closing tightly after him was there carried down with the vessel. The ship's Chronometer was saved by Mr. Henry Adams, one of the crew, who courageously jumped into the sea and swam to one of the boats then making for the shore, holding the Chronometer in the meantime out of the water in his hands . . . It seems to us very mysterious how such an accident should occur in the broad daylight and in smooth water, too. We trust that the Pilot Commissioners will investigate the matter in a rigid, impartial and satisfactory manner and thus throw light upon a subject of the most vital importance to the community at large and especially to the Commercial class of this Colony.

The loss was also reported in the St. John's *Newfoundlander*:

The steamer Mary Celestia *was lost on Tuesday [last] week in running out of the harbor, bound for Nassau. The day was clear, and she had on board an experienced pilot, who was warned of breakers ahead by the first officer. The vessel was going at the rate of 13 knots an hour, the warning was disregarded, she struck on a rock near the Light-house and sank in about seven fathoms of water. All hands, save the chief cook, were saved in what they stood in. There appears to be some mystery in reference to the conduct of the pilot (The Newfoundlander, October 6, 1864).*

An abbreviated and incorrect report also appeared in the *New York Times* on September 15; "the blockade-runner steamer *Mary Celestia*, from Wilmington, N.C., via Bermuda, for Nassau, sunk off the south side of Bermuda on the 9th inst."

U.S. Consul Charles Maxwell Allen was circumspect when he forwarded his September dispatch to Washington:

Godet Family Collection, National Museum of Bermuda

Figure 15: Watercolor by Edward James of *Mary Celestia* sinking off the Gibbs Hill Lighthouse, September 6, 1864.

The only vessel from Wilmington since July was the steamer Mary Celestia belonging to the Crenshaw Brothers. She lost several men by the epidemic while here, took in a cargo principally of canned meats and left for Wilmington, came onto a rock off these islands and sank in twenty fathoms in six minutes – vessel a total loss, cargo nearly so. Much indignation has been manifested towards me on account of the loss of this vessel by Southern parties and I am charged by them with having bought the pilot. I am happy to say there is no evidence to substantiate their charge. The pilot has been suspended for eighteen months (Wiche 2008:153).

Contemporary Salvage

In the aftermath of the sinking, Crenshaw & Co. made arrangements to salvage the cargo, sending local mariner W.S. *Doe*, to supervise diving. A legally required notice of salvage was placed in The Royal Gazette of September 13:

All persons saving any portions of the cargo or appurtenances of the Steamship "Mary Celestia" are required to report the same to W.S. Doe, and place then under his care. And all persons are forbidden to interfere with the vessel, or any portion of the cargo on board, without the permission of the owner's agent, Mr. W.S. Doe, alongside the said ship. CRENSHAW BROTHERS, Agents Steamer "Mary Celestia""

The Royal Gazette reported that "the vessel is said to be laid open from her bows to abaft her wheel-house, and hence there seems but little chance of saving the hull. The cargo, however, is being floated out with all possible dispatch, and hopes are entertained that the whole of it may be saved, though of course in a somewhat damaged state" (*The Royal Gazette*, September 13, 1864). The majority of the cargo was reportedly salvaged at this time.

As noted by Consul Allen, Pilot John Virgin was suspended for eighteen months for the loss of *Mary Celestia*. Speculation and rumors about his conduct followed him for the rest of his life, and persist to the modern day. Local tradition stressed the suspicious nature of the loss, as captured in a contemporary ballad by "Blind Isaac" (Isaac Harvey of Somerset, Bermuda):

The Mary Celest' was run ashore
She never will run the block any more
So Johnny fill up the glass
Johnny fill up the glass
And we'll all drink stone blind.

How did the Mary Celest' get ashore?
Oh, Pilot Virgin runned her ashore-
She'll never run the block any more
So Johnny fill up the glass
Johnny fill up the glass
And we'll all drink stone blind.

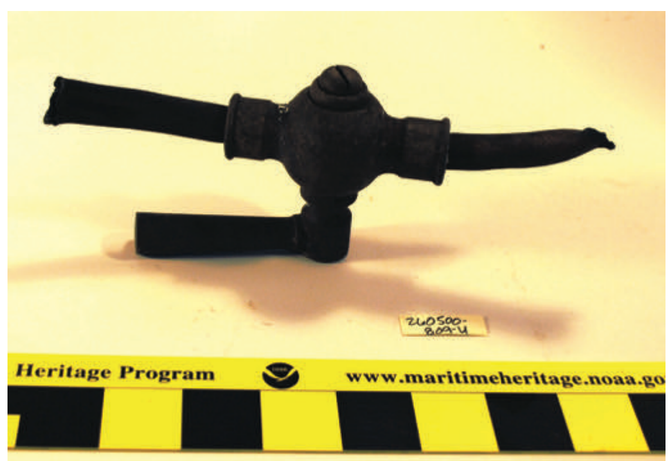
Us boys may just as well go ashore
We won't be wanted on board anymore
Now boys we need not mind
So Johnny fill up the glass
And we'll all drink stone blind.

Modern (Secondary) Salvage

Following the Second World War, additional salvage of the wreck was reportedly done by a British firm in the late 1950s and early 1960s (Elmore et al. 1984:20). In the early 1960s, Edward "Teddy" Tucker and associates recovered steam valves, bottles, and a case of Enfield rifles from the wreck, excavating in one area to find the rifles (Tucker 2011). This suggests that not all of the cargo of *Mary Celestia* had been recovered during the primary and secondary salvage attempts before Tucker's dives. The bottles are displayed in the Bermuda National Trust's Globe Hotel blockade-running museum, and the steam valves are held in the collection of the National Museum of Bermuda.

NOAA//Wayne Lusardi

Figure 16: Brass globe valve recovered by Teddy Tucker in the collection of the National Museum of Bermuda, Acc. 260500, Cat. No. 808-4.



NOAA/Wayne Lusardi

Figure 17: Brass water feed line with valve recovered by Teddy Tucker in the collection of the National Museum of Bermuda, Acc. 260500, Cat. No. 809-u.

Architectual context of *Mary Celestia*

Mary Celestia was designed and built during a transitional period in naval architecture, marine engineering and shipbuilding. During that period, iron and steel-hulled steam-powered vessels were becoming more common and more efficient in operation, and traditional shipbuilding was giving way to a mechanized, industrial process. The Industrial Revolution of the late nineteenth century had in particular shifted the iron production from small forges and blacksmith shops to factories where improvements in refining and strengthening metal led to increasingly larger castings and massive iron fittings forged with huge hammers or rolled into large plates. The casting of larger cylinders for more powerful steam engines in the mid-nineteenth century led to increased power for forced-air blowers, which in turn provided the heat for Henry Bessemer's 1855 process that turned large amounts of iron into steel. Previously produced in small amounts in the past, the Bessemer process transformed steel from an expensive luxury into a mass-produced commodity. Lighter and stronger than iron, steel was also about to transform shipbuilding starting in the 1860s.

In the last decade of the eighteenth century, the "Age of Iron" created new forms of transportation, as cast-iron bridges, statues and fireproof roof frames joined castings for steam engines that were designed to ventilate and pump water from mines. These innovations were applied to the railroad as well as the marine steam engine, which by the end of the first quarter of the nineteenth century had begun to emerge. Britain took the lead in adapting iron for maritime purposes. The demand for high-quality shipbuilding oak for the Royal Navy over the last century had made hardwood a rare and expensive material. The introduction of iron, at first to reinforce and augment wooden warships, and then to build small boats and barges as early as the 1780s, in time led to larger craft such as Vulcan, a 61-foot (18.59 m) long, 11-foot (3.35 m) wide vessel built in 1818 by Thomas Wilson near Glasgow. The initial slow acceptance of iron vessels increased through the 1820s and '30s, with the first iron ship built at Liverpool sliding down the ways in 1829. In 1838 the launch of the 264-ton ship Ironsides of Liverpool introduced "the first iron sailing vessel of any significance that was employed for sea voyages" (Grantham 1859:13-14). The steamer *Sirius*, built in 1837 and registered out of Marseilles, and Ironsides were the first iron vessels listed in Lloyds' *Register of Shipping*.

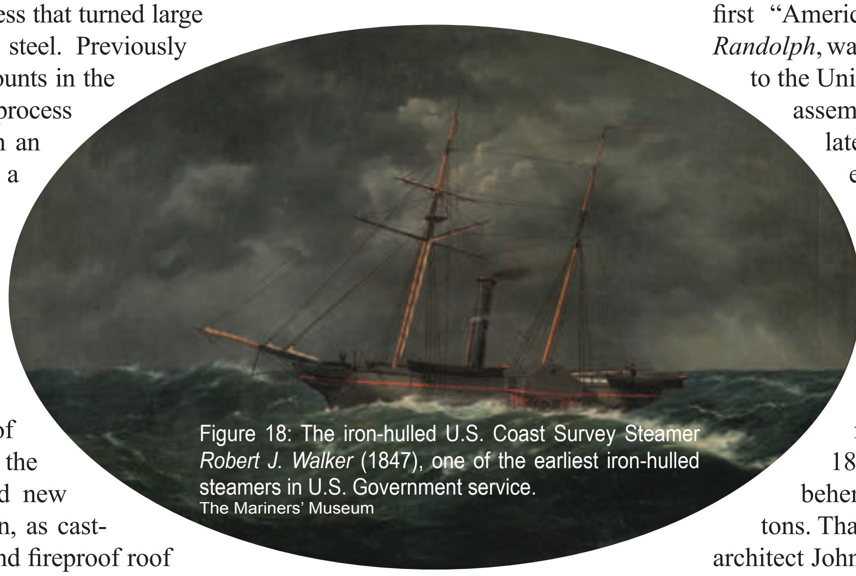


Figure 18: The iron-hulled U.S. Coast Survey Steamer *Robert J. Walker* (1847), one of the earliest iron-hulled steamers in U.S. Government service.
The Mariners' Museum

Aaron Manby, a 120-foot (36.57 m) vessel launched from Rotherhithe in 1821, is credited with being the first iron-hulled steamer. Two years later, a second iron steamer, *Marquis Wellesley* was launched. Over the next four decades, increasing numbers of iron steamers were built, including the massive, 322-foot (98.14 m) long, 3,675 ton (displacement) wrought-iron steamer *Great Britain*, built at Bristol by Isambard Kingdom Brunel in 1843. *Great Britain* was the world's first ocean-going steamship, and was described in contemporary accounts as "the boldest effort in iron ship building" since previous vessels had been limited to smaller craft limited to inland waters and the English Channel (Grantham 1858:15).

Other nations followed suit, although a ready supply of wood in the United States stalled the American move to iron. The first "American" iron steamship, *John Randolph*, was built in Britain and shipped to the United States in pieces to be re-assembled in 1833. Through the late 1860s American shipbuilders launched wooden steamers in increasing sizes up to more than 300 feet (91.44 m) in length. British shipbuilders, meanwhile, constructed similarly sized or even larger steamers, including Brunel's huge *Great Eastern* in 1858, a 692-foot (210.92 m) behemoth that displaced 32,160 tons. That same year Liverpool naval architect John Grantham commented that "numerous iron steamers and iron sailing vessels of large tonnage are now afloat, or building. Great numbers of iron steamers are plying on the Thames, the Mersey, the Clyde, and on nearly all of the continental rivers. Large fleets are to be seen navigating nearly every sea, the property of every nation; the most satisfactory proof of their success" (Grantham 1858:13-14). The move to iron for warships followed a similar path, with experimental iron craft in the 1840s giving way to armored warships that had just begun to emerge as the American Civil War broke out in 1861.

Another innovation adopted at the time of the Civil War was steel. The invention of the Bessemer Convertor allowed for steel production at an industrial pace as opposed to the previous minute quantities, albeit steel remained an expensive product. The advantages of steel for lightness and strength were apparent, but there were few opportunities to use it in vessel construction until the Civil War and the rise of the blockade runner. The first steel steam vessel, constructed in 1858, was a small paddlewheel launch known as *Ma Robert*, which was built in sections and transported to Africa's Zambesi River. Built by the Laird yard in Liverpool, *Ma Robert* was a modest harbinger of the future of shipbuilding, a future more fully foreshadowed by the Civil War.

The Civil War propelled iron and steam into the forefront of the naval and maritime world. The demands of war spurred not only the acceptance of new technology and materials but also technological innovation, as evidenced dramatically in 1862 with the construction and battle-testing of ironclad warships. The March 8-9, 1862 Battle of Hampton Roads, Virginia blew the winds of change, when the armored Confederate steamer CSS *Virginia* destroyed and damaged wooden-hulled U.S. Navy warships, only to be fought to a standstill the following day by the just launched and newly arrived turreted Union warship USS *Monitor*. This first clash of ironclads marked the death knell for wooden sailing warships.

Another example of rapid technological adaptation in the naval and maritime world during the Civil War was the development of torpedoes, or undersea explosives, and the construction and use of several submarines, culminating in the February 1864 foray of the Confederate submarine *H.L. Hunley*, which deployed a spar-mounted torpedo to sink the Union warship USS *Housatonic* off Charleston Harbor, the first time in history a submarine had sunk an enemy warship. That feat would not be repeated until the First World War, fifty years later. Another technological shift was the role of the blockade in pushing not only the adoption of the steamer but also the development of faster, more efficient steamships that utilized both paddlewheels and propellers.

At the outset of the war and the blockade in 1861, the small U.S. Navy's fleet was insufficient to blockade effectively all the ports of the Confederacy. Wooden-hulled sailing vessels, which represented the majority of the world's (and Britain's) merchant marine in 1861, made up the bulk of the first blockade runners. The increasing effectiveness of the blockade led to the capture of large, slow-moving ships, however, and as a result their number dropped in favor of steamships. This change is seen in the rapidly decreasing number of sailing ships that are known to have run the blockade of the North and South Carolina coast between 1861 and 1864 and the increasing number of steamers (Table 2).

YEAR	SAIL	STEAM
1861	253	21
1862	145	49
1863	53	73
1864	14	98

Price 1948: 199-200

Table 2: Number of sailing versus steam blockade runners on the Carolina coast, 1861-1864.

The first steamers employed in blockade-running were a mix of older wooden-hulled American and British steamers as well as more modern British iron-hulled craft. The first British blockade-running steamer was Bermuda, built in 1861 at, England and put into service as a runner in August that same year. The factors that curtailed the use of sailing runners also affected the large, slower wooden steamers. At best capable of eight to ten knots, they were easily spotted and chased down the Union blockade increased the number of ships watching Confederate ports and turned to faster steamers to chase and capture runners. The Confederacy's next move was to turn to small, fast British-built steam packets in late 1861. Vessels like the steamers *Kate* (one of Crenshaw's first vessels), an older, wooden-hulled pre-war-built steamer, were capable of beating the blockade, but they could not carry sufficient cargo to make a difference in supplying the South (Wise 1988:59-61).

The Confederacy and its partners next turned to another type of paddlewheel packet in the larger, sleek steamers being built in Britain's industrial shipbuilding centers of Glasgow and environs on the Clyde River, and Liverpool and Birkenhead on the Mersey. The "Clyde Steamers" in particular proved effective, with their long, sleek hulls, shallow draft, a low freeboard but good cargo capacity, and powerful and fast machinery; they became the template for what would evolve into the typical blockade-running steamer.

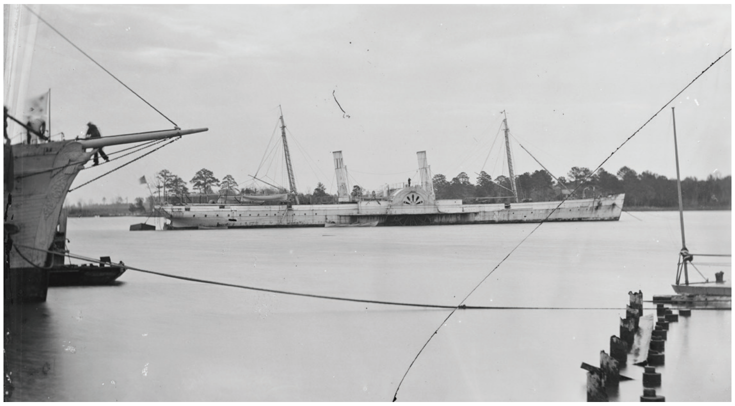
The form of these vessels, defined by a fine entry and run aft, or "long and lean" (Allington and Greenhill 1997:35), was described by John Bourne in 1867:

> *[They] will disturb the surface of the water as little as possible. This will be a body with a considerable proportion of length to breadth, so that the vessel may be sharp at the ends. A length of seven times the breadth is found to be a good proportion for such speeds as 15 or 16 miles per hour. But the proportional length that is advisable will increase with the intended speed (Bourne 1867:218).*

The first of the "new" type of blockade runner was John Reid & Sons' Clyde-built steamer Herald, launched in 1861. Herald led the way in March 1862 when it made the first of what in time would be 24 successful runs. Other Clyde and Mersey-built steam packets followed through late 1862 and into early 1863. Shipyards modified them for their new, illicit trade. In addition to cargo capacity and speed, stealth was a necessity as slipping into port was preferred to being chased at high speed while being shot at.

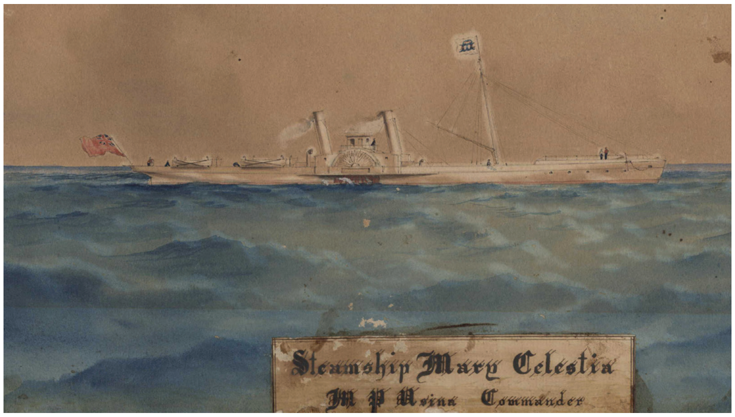
> *On some vessels, telescopic smokestacks were employed so that they could be lowered while running the blockade. Masts and spars were reduced to a minimum, with some masts being placed on hinges or in sockets so that they could be removed when not in use (Wise 1988:108).*

Additionally, experimentation with camouflage led to a specific color scheme for the blockade runners, with the vessels "painted a light gray or bluish green and stocked with smokeless anthracite coal" to blend into with the sea (Wise 1988:108).



Library of Congress

Figure 20: Glasgow-built Blockade Runner *Robert E. Lee* after being captured, ca. 1864-1865.

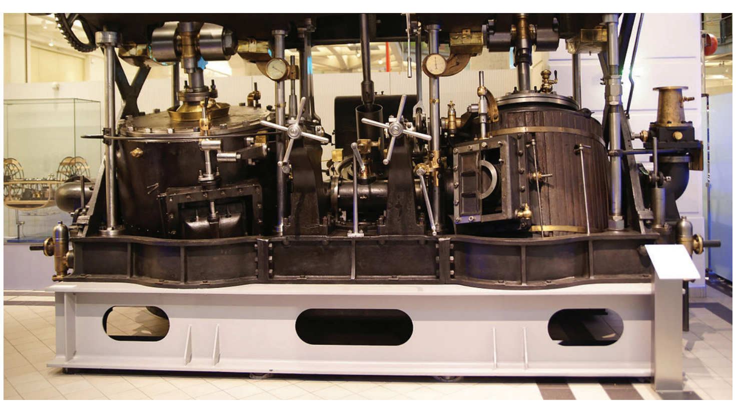


American Civil War Museum, Richmond

Figure 21: *Mary Celestia.*

Tane Casserley

Figure 22: Portside view of *Mary Celestia*, showing the upright starboard paddlewheel attached to the shaft and engines between the twin sets of boilers in the narrow confines of the 22.1-foot wide hull amidships.



Wikipedia

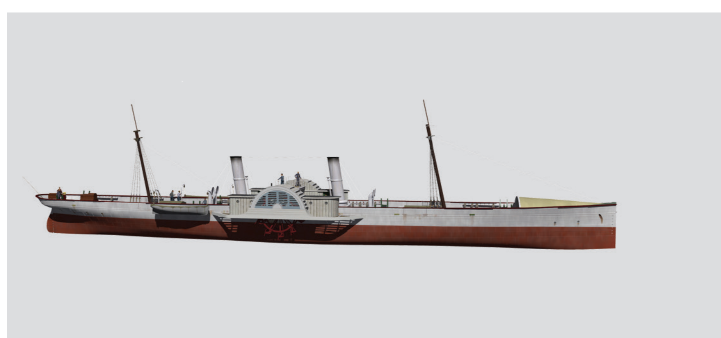
Figure 24: Oscillating marine steam engine arrangement like that on *Mary Celestia*.

Modification of existing steamers gave way by early 1863 to runners specifically designed and built for the blockade, beginning with Banshee, a 200-foot (60.96 m long, 20-foot (6.09 m) wide, 8-foot (2.43 m) draft, 325-gross ton steel-hulled steamer built at the Jones, Quiggen and Company Yard in Liverpool and launched in January 1863. Banshee combined the strength of the earlier packets with a sleeker hull that gave better hydrodynamic performance, that is, faster speeds. The ship's four water-tight compartments offered sufficient cargo space to make a single run economically worth it to the owners and speculators who sent ship and cargo through the blockade.

The form of the later war "typical" blockade runner had emerged, as seen in the Confederate government's blockade runner *Robert E. Lee*.

Mary Celestia was an exemplar of this emerging "typical" blockade runner. Laid down as an iron-hulled side wheel steamer with a low, sleek profile and rigged with two fore-and-aft masts, *Mary Celestia*'s was described as "schooner-rigged" as well as "rakish" in contemporary accounts. The only known portraits of the steamer illustrate the reduced silhouette with its small masts and cabins and low freeboard.

Mary Celestia was 221 feet (67.36 m) in length, with a beam of 22.1 feet (6.73 m), a depth of hold of 10.4 feet (3.17 m), a gross tonnage of 314 and a registered tonnage of 207 (Wise 1988:312). The length-to-beam ratio of 10:1



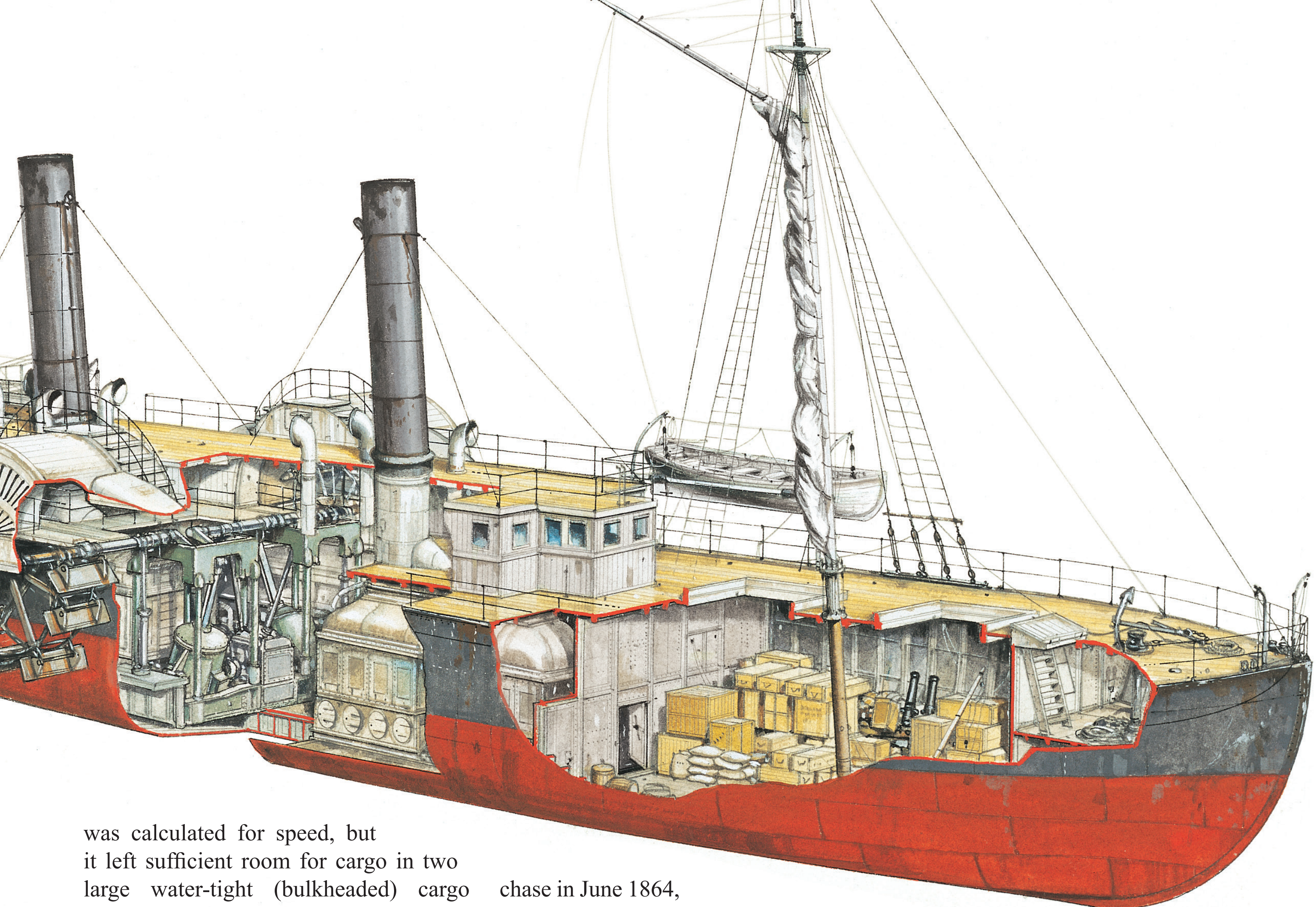


Figure 23: Cutaway of a typical blockade runner.
Tony Bryan, Courtesy of Osprey

was calculated for speed, but it left sufficient room for cargo in two large water-tight (bulkheaded) cargo holds fore and aft of the machinery spaces amidships. The registered tonnage of 207 reflected the amount of cargo that *Mary Celestia* ostensibly could fit into those holds, although more could always be added. Additional space existed in the hull, but it was given over to coal bunkers, a necessity as the high-functioning boilers required significant amounts of fuel to make the run, especially when there was a need to build up steam for faster speeds when being chased.

The machinery was large, powerful and tightly packed into the narrow confines of the hull. The rectangular boilers were efficient and could build up a large head of steam, and as Engineer John Sassard demonstrated in *Mary Celestia*'s chase in June 1864, quality boilers could be pushed well past their rated capacity. The boilers and engines in *Mary Celestia* seem oversized when one considers their relatively tight fit in the hull, but this was a deliberate decision by the builders to over-power the vessel so that it could achieve the high speeds necessary to outrun the blockaders. The over-crowding of the machinery spaces is evident in Figure 22.

The engines were a deliberate and ideal choice. Twin oscillating cylinder steam engines rated at 140 horsepower provided *Mary Celestia*'s propulsion through twin feathering paddlewheels. The low-profile oscillating engine was effective and strong; it sat low in a hull, a desirable quality when a blockader might send a shot through a hull to try and disable a steamer's machinery. Figure 23 shows the outline of a typical Glasgow-built steamer of the period with the same arrangement as *Mary Celestia*. The engines rest on keelsons at the bottom of the hull, with few moving parts above the waterline. The double-oscillating arrangement also allowed for independent movement of each paddlewheel, desirable when maneuvering a steamer in tight circumstances – an important consideration for a blockade runner.

In addition to the high-power boilers and engines, the other element in *Mary*

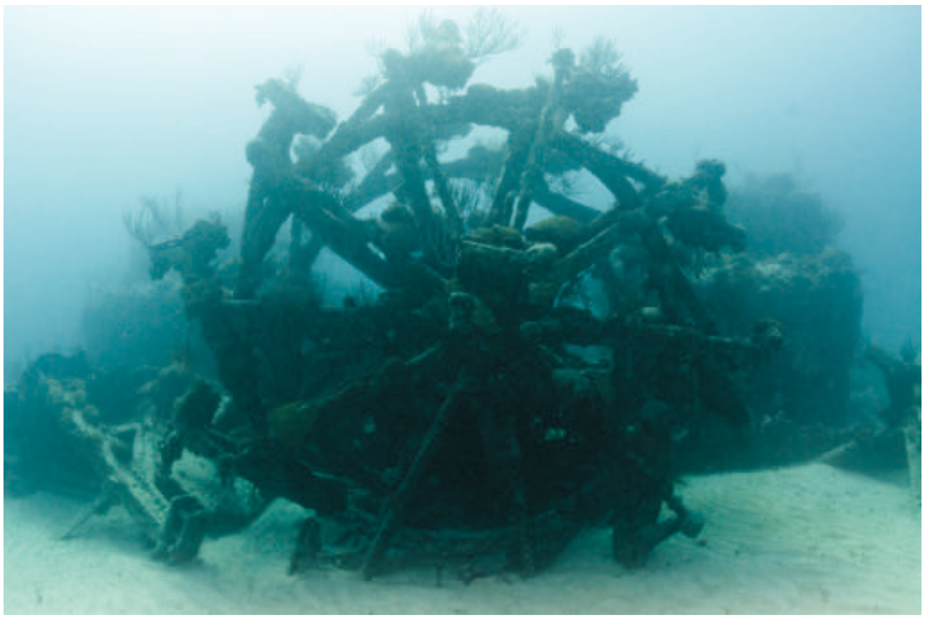
Figure 19: The blockade runner *Will o'the Wisp*.

Andrew Hall

Celestia's ability to achieve high speeds was the feathering paddlewheels. Unlike earlier wheels that remained fixed and hit the water at an unchanging angle, feathering wheels tilted and met the water more effectively, causing less resistance and increasing the speed. While experiments with propeller-driven blockade runners showed that the "screw" could be effective, especially when configured as a dual twin screw, paddle steamers were found to run faster and require less draft than screw steamers, therefore most blockade runners were sidewheelers (Wise 1988:108).

The moveable "arms" that maneuver the floats (paddles) of the feathering wheel are also evident in the oblique view of the starboard wheel (Figure 26).

In conclusion, *Mary Celestia* was in many ways a "typical" British-built blockade runner of its time and an exemplar of this type of vessel. It should be noted, however, that while the basic parameters of the "typical" blockade-running steamer of 1864 are well documented, the specifics and details of their construction are not, due to wartime secrecy and the near-complete destruction of this class of vessel during and after the Civil War. It is here, therefore, that archaeology plays one of its roles in the particular, more accurate and better documentation of the vessel.



Tane Casserley

Figure 25: Profile view of *Mary Celestia*'s starboard feathering paddlewheel.

Tane Casserley

Figure 26: Oblique view of the starboard paddlewheel.

Archaeological Context of *Mary Celestia*

By the end of the Civil War and the formal end to the blockade on June 23, 1865, the U.S. Navy had captured more than 1,100 blockade runners and had destroyed or run aground another 355 vessels. Of that number, a smaller percentage of the lost ships were steamships. Wise notes that some 300 steamers tried the blockade, making some 1300 attempts, 1000 of which were successful (Wise 1985:124). In all, 136 blockade-running steamers were captured, and 85 were destroyed (Wise 1988:221). Of the 85 "destroyed" blockade runners, some continued to exist as archaeological resources with various levels of integrity.

An overview of Civil War shipwrecks (Gaines 2008) lists the 85 blockade-running steamship shipwreck sites worldwide, most (N = 69) in United States waters, four in the United Kingdom, one in Cuba, one in the Azores, four in the Bahamas, four on the high seas, and two in Bermuda, of which *Mary Celestia* is one.

The largest concentration of Civil War blockade-running steamship wrecks is off the coast of North Carolina, centered on the approaches to the Cape Fear (N = 31), followed by the approaches to Charleston, South Carolina (N = 20), and then the approaches to Galveston, Texas (N = 6), which was the last Confederate port to remain open before it fell to the Union on June 5, 1865 (Hall 2014).

A landmark development in the study of blockade runners – and the blockade – was the work of the State of North Carolina's Underwater Archaeology Branch in the Division of Archives and History. The work of the branch, beginning with the pioneering work of then-head Gordon P. Watts Jr., and continuing under Richard W. Lawrence and Mark Wilde-Ramsing, with significant contributions made by Leslie Bright, Richard H. Kimmel (U.S. Army Corps of Engineers), Charles Peery and Stephen Wise, focused on the role of these ships and their cargoes as the "backbone of our understanding of the material needs of the South" (Kimmel 1985:119). As Kimmel (1985) noted, the information contained in the wrecks of the blockade runners demonstrated that they were more than "repositories for curios" but joined with the archival record to:

> *preserve fragments of information indicative of who was shipping, what was being shipped, and, in many cases, to where; they preserve information about engineering, cargoes and strategies for entering ports, and they allow yet another source for constructing or testing inference . . . each simply a unique piece in the larger whole (Kimmel 1985:119).*

An assessment of the wrecks off the Cape Fear in 1985 noted that nearly fifty vessels, both sail and steam, lay off those shores, and that "these wrecks represent a unique repository and cross-section of vessel types, occurring during a transitional period in maritime architecture," and "within their hulls, there remains a vast inventory of mid-19th century material culture" (Bright 1985:130). At that stage, the underwater archaeology branch was preparing a National Register of Historic Places district nomination for the Civil War wrecks to encapsulate within a single zone these important sites (Wilde-Ramsing 1985:132). The National Register nomination, which was successfully listed, includes 15 blockade-running steamer wrecks, which in *toto* accounts for nearly 20 percent of all blockade-running steamer wreck sites, all clustered in their

Library of Congress LC-B811-3411 [P&P] LOT 4182

Figure 27: Two views of the wrecked blockade runner *Ruby* near Sullivan's Island, South Carolina, 1865.

historical, archaeological and geographical context. At the same time, a reassessment of these sites and ongoing historical research on them demonstrated tremendous potential for important new revelations about the blockade, the blockade runners, and the importance of the North Carolina collection (Watts 1985:134-136).

To date (2014), the only Civil War blockade runner collection to be extensively documented is the 753-ton *Modern Greece*, which ran aground near Fort Fisher to avoid capture on June 27, 1862. A considerable amount of cargo was salvaged at the time of loss, as well as the steamer's machinery, but the hull, sanded in and buried, remained more or less intact. Uncovered by shifting sand on April 20, 1962, the exposed hull was hastily excavated through 1963 by U.S. Navy divers who turned their finds over to the State of North Carolina. While recovered without detailed provenience, the *Modern Greece* collection (N=11,000) includes weapons, tools, hardware and supplies that is the largest Civil War blockade-running cargo assemblage (Bright 1977). Other blockade-running cargoes and material have been recovered privately by salvagers and avocational archaeologists as well as projects conducted by academic and government archaeologists, such as work on the Canadian-built wooden-hulled blockade runner *Acadia*, lost on February 6, 1865 while running toward Galveston, Texas. A dentist and avocational archaeologist, Wendell Pierce, excavated and recovered a range of material primarily focused on hardware and ship's fittings, including a ship's head (toilet), steam valves and rigging blocks, an earthenware jug and a ceramic olive jar (Hole 1974; Hall 2014:112-114). Another avocational archaeologist, E. Lee Spence, working with associates, excavated cargo from the blockade runners *Mary Bowers, Constance Decima* and *Georgiana* (Gaines 2008:144, 146, 151). Other divers have also recovered artifacts from *Mary Bowers* and *Georgiana* (Gaines 2008:146, 151).

More detailed archaeological work on blockade runners has been the focused and ongoing documentation of a variety of steamers off Cape Fear that are now part of the Civil War Shipwreck District listed in the National Register of Historic Places, some by Gordon P. Watts, Jr. during his tenure as State Underwater Archaeologist and afterward through his archaeological consulting firm, Tidewater Atlantic Research (TAR), and by others from the State's Underwater Archaeology Branch, as previously noted. Among the wrecks that undergo periodic inspection and documentation as sand moves off them during periodic storms are *Arabian* (1863) *Bendigo* (1864), *Condor* (1864), *Douro* (1863), *Elizabeth* (1863), *Ella* (1864), *General Beauregard* (1863), *Hebe* (1863), *Modern Greece* (1864), *Phantom* (1863), *Ranger* (1864), *Stormy Petrel* (1864) and *Wild Dayrell* (1864), all listed in the National Register along with the wrecks of *Lynx, Venus, Fanny & Jenny, Kate* and *Georgiana McCaw*. The Cape Fear Civil War Shipwreck District is a particularly significant collection of sites, not only in terms of their collective representation of the blockade and its effects, but also as an assemblage of wood (N=2) iron (N=12) and steel (N = 1), sidewheel (N = 11) and screw (N = 4) steamships built between 1851 and 1864, most (N = 11) in 1863-1864. The dates of loss for these fifteen steamers are also temporally tight, ranging from June 27, 1862, to December 15, 1864, with the majority (N = 13) dating from the fifteen-month span from September 1863 to December 1864. Assessment of the wrecks has documented exceptionally well-preserved machinery on several wrecks, such as *Condor*'s engines, one boiler and a paddlewheel; the well-preserved twin-bladed propeller of *Modern Greece*; the well-preserved machinery and bow of *Stormy Petrel*; the machinery of *Bendigo*; the well-preserved bow and stern and twin-screw machinery of *Hebe*; a 20-foot intact section of bow at the *Duoro* site; and the well-preserved hull and machinery of *Wild Dayrell*. Extensive hull remains and some cargo at the *Ella* site, and the same state of preservation (including the survival of several crates of rifles recovered in the 1960s-1980s from *Ranger*) are some of the pertinent observations made at the time of the National Register nomination (Wilde-Ramsing and Angley 1985).

Another notable archaeological project on blockade runners in the United States is the 1998-2000 site documentation work on the wreck of the runner *Denbigh*, an iron-hulled sidewheel steamer built by Laird and Sons of Birkenhead in 1860 that ran aground and was lost on Bird Key at the entrance to Galveston Bay on May 23, 1865. The hull is preserved beneath sand, although portions of the machinery – such as the top of the sidewheels, boiler and engines – rise above the level of the seabed. Led by J. Barto Arnold III, the project included non-intrusive survey as well as test excavation of three areas inside the hull, and the recovery of the connecting rod from the engine (Arnold et al. 2001 and Hall 2014: 114-118). Ongoing archival research, analysis and publication continue in 2014. As well, work in 2009 off Galveston documented an exposed site which is likely the remains, usually sand-buried, of the blockade runner *Will o' the Wisp*, lost when it ran aground on February 3, 1865 (Hall 2014: 87-90, 118-121).

Another project, in Alabama, was undertaken by Florida State University in 1991-1992 to plot the presumed (and buried) remains of the blockade runner *Ivanhoe* off the entrance to Mobile on what is now dry land (Gaines 2008:3).

The other detailed study of blockade-running steamships has been the work led by Gordon P. Watts Jr. in Bermuda through his association with the Program in Maritime History and Underwater Research (now the Program in Maritime Studies) at East Carolina University (ECU). Under Watts, graduate students dived and documented the wrecks of *Mary Celestia* as well as the steamer *Nola*, an iron-hulled 750-ton sidewheeler built by Caird and Sons of Glasgow and wrecked off Ireland Island 8 miles northwest of the Naval Dockyard on December 30, 1864. Resting in 30 feet of water, *Nola* was salvaged at the time of the wreck, and much of the cargo of dry goods was recovered. The machinery was blasted and the cylinders, pistons, paddlewheel shaft were recovered. The documentation of the site by ECU in 1986, following an earlier project that mapped and documented *Mary Celestia*, provided a very detailed assessment of a "typical" late-war blockade runner of the Clyde/Glasgow "type" through merging the data gathered from the well-preserved machinery of *Mary Celestia* and the better-preserved of the two hulls, *Nola* (Watts 1988 and Watts 1989).

In addition to the documentation of the two sites, work on the Bermuda blockade-runner wrecks also included anthropologically centered research by Richard A. Gould and his graduate students from Brown University (Providence, RI). Gould has commented that contemporary (1864) accounts of the loss stressed the controversy of the sinking and whether the pilot, ostensibly in the pay of the United States, had deliberately run it on to the reef to stop the shipment of war materiel it was allegedly carrying. “Archaeology has not yet resolved this controversy, although it might one day if excavations were to locate remains of weapons or other military goods . . . [but] evidence suggests that divided authority under hazardous circumstances was a factor in the ship’s loss” (Gould 2000:260). Gould also noted, when assessing *Mary Celestia* and the other blockade runner wreck in Bermuda, *Nola*, that the physical characteristics of both steamers “provided material evidence of specific shipbuilding techniques intended for the unique circumstances of the blockade-runner’s trade,” namely the narrow, sleek lines of the hulls and their machinery (260-261).

The wreck of another blockade runner, *Runner* (1865), located in Angra Harbor on the Island of Sao Miguel in the Azores, was the subject of a brief archaeological investigation along with nearby older wrecks by Kevin Crisman and Alexandre Monteiro in 1997. Only a portion of the hull and one boiler were observed, and these were subsequently buried by the placement of a harbor breakwater (Monteiro 2011). The wreck of the blockade runner *Iona II*, which lies off Lundy Island in Bristol Channel, was discovered in 1976. Since then, small-scale excavation has taken place, some of it illicit. The Archaeological Diving Unit of the United Kingdom investigated the wreck in 1989 and periodically monitored it with other dives at the site through the 1990s. The site was documented by Ian Cundy of Malvern Archaeological Diving Unit in 2000-2001. The site was investigated in 2004 for English Heritage by Wessex Archaeology; their report noted the wreck was defined by the machinery rising above the seabed, along with the bow and stern, and with much of the hull collapsed and presumably buried in bottom sediment (Wessex Archaeology 2005). The site is now interpreted by an illustrated, diver-held wreck map and is open for visitation.

In summary, in the assemblage of Civil War blockade-running steamers (N = 85) and the subset of iron or steel-hulled steamers, *Mary Celestia* stands out as a significant site in terms of its level of preservation, relatively easy access, and, with the 2011 project work, as one of the few sites of its type to yield cargo or personal effects through professional archaeological excavation and study. We now turn to the specifics of the archaeology of *Mary Celestia*.

Figure 28: The wartime map plots the location of blockade runners lost at the mouth of North Carolina’s Cape Fear River.

NOAA Central Library

PREVIOUS ARCHAEOLOGICAL INVESTIGATIONS OF *MARY CELESTIA*

The first archaeological investigation of *Mary Celestia* was undertaken by graduate students from ECU (Greenville, North Carolina) under the supervision of Gordon P. Watts, Jr. in late October 1983 (Elmore et al. 1984 and Watts 1988). The project resulted in the first overall documentation of the wreck and an assessment of several key features of the exposed hull and machinery. A baseline was laid to tie together the three major exposed areas of the wreck; using trilateration, a three-dimensional scale drawing of *Mary Celestia* was produced (Fig. 27). The drawing was made to record both design and construction details (Watts 1988: 18).

Watts, drawing on his extensive experience with Civil War wrecks including blockade runners, worked with his graduate student team to make a series of observations about the site that are astute and pertinent, not only in terms of what site conditions were in 1983, but also about the nature of the visible remains. The remains visible in 1983 were the bow, engineering space and the stern; limited probing showed that "more than three feet of sediment" covered buried structure in the engineering space and forward of it (Watts 1993:18). The bow was measured and drawn, with Watts and team noting the bow section terminated at the aft collision bulkhead, which lay aft of the anchor windlass. An anchor, "partially embedded in the bot-

Figure 29: East Carolina University site drawing, 1984.
Gordon P. Watts/ECU

tom sediment," was also noted, along with some remnants of oak deck planking that survived due to ferrous infusion from the corrosion of the deck beams (Watts 1993: 20).

Watts reported:

> *Little of the ship was visible between the bow and the engineering space, except exposed fragments of hull . . . hull plate, iron frames, knees and deck beam fragments . . . an athwart ships coal bunker forward of the forward boiler [which] survived to separate the forward cargo hold from the engine room machinery. From the forward coal bunker to a second bunker aft of the engine room, the hull survived below the turn of the bilge (1993: 20).*

Watts and team documented the machinery, which consists of two horizontal fire tube boilers measuring 16 feet 2 inches (4.93 m) by 10 feet 8 inches (3.29 m) with two-foot-high steam chambers equipped with two blow-off valves, with each boiler accommodating a smoke pipe 3 feet 6 inches (1.09 m) in diameter (1993: 20).

Between the two boilers, a composite paddle-wheel shaft formed offset bell cranks for two air pumps amidships and two [4-foot-diameter] steam cylinder pistons nearer the turn of the bilge. Each piston operated in an inverted oscillating cylinder. Both paddle wheels were found to have separated from the shaft at the bell cranks. The starboard wheel remained upright, while the port wheel lay outside the wreck amid fragments of the hull and deck structure. Each wheel was fitted with eccentric operated 36-inch-wide feathering buckets (Watts 1993:20).

The wheels are 14 feet (4.26 m) in diameter and fitted with ten floats, each of them a plank measuring 2 feet 2 inches (.67 m) wide by 2 inches (5.08 cm) thick (Elmore et al. 1984:37). Watts also noted that 98 feet 7 inches (30.08 m) aft of the aft coal bunker lay the remains of the stern, not apparently attached to the hull and listing to port. Despite burial by bottom sediments, what lay exposed in 1983 was a "limited portion of the starboard plate, frames and deck beams" as well as the rudder head and crank, all lying within an area measuring 32 feet 7 inches (9.96 m) (20). The stern had presumably separated from the hull at the time of sinking by coming to rest, unsupported, on nearby coral heads. In addition to examining the visible area of the wreck and probing the buried sections of wreckage, limited test excavation on the port side of the forward boiler determined it lay on a wooden platform, perhaps in association with mastic cement (Elmore *et al.* 1984:37).

Watts and his team commented on the survival of much of the machinery, noting that additional documentation of the site could focus on the detailed documentation of the engineering space and machinery. Additionally, excavation of "selected portions of the wreck, inclusive of the boiler platforms and stern section" was recommended . . . [which] will possibly provide details of the cargo the ship was transporting and the men who served in the vessel," because while the 1983 survey uncovered no artifacts, "sediment covers much of the cargo area, and further excavation . . . may uncover this needed information" (Elmore *et al.* 1984:50-51).

The ECU project of 1983 was an excellent initial assessment that also included archival work. A series of other projects on other sites ensued, and since 1983 a wide range of archaeological work has ensued with a variety of sites ranging from the seventeenth to the nineteenth centuries. Apart from brief visits by Watts (1983-1986) and other archaeologists in the intervening decades to visually assess changes in the *Mary Celestia* site, no further work was conducted on the wreck due to other priorities until the 2011 project. Comments on the wreck based on a visit by Richard A. Gould (2000) have been cited in pertinent sections of this report.

2011 Archaeological Study

The 2011 project was initiated by Rouja, as Conservator of Historic Wrecks for Bermuda in response to storm-induced erosion of the *Mary Celestia* site that uncovered artifacts in the forepeak. On September 5, 2003, Hurricane Fabian, a Category Three storm with winds of 120 miles per hour, struck Bermuda and caused widespread damage. Following the hurricane, local divers reported that storm surges of up to eleven feet in height had eroded large amounts of sand and that they had gained access into the previously sand-sealed bow of *Mary Celestia* where they had observed two wooden ship's blocks, a large glass demijohn, and a brass-hooped wooden wash bucket. In his discussions with older members of Bermuda's dive fraternity, Rouja learned that after previous storm events other divers had recovered artifacts from the wreck, reportedly including bottles of wine and perfume from the bow. 30

Rouja's reconnaissance of the site confirmed the divers' reports, but he found the continuing wave action had shattered the demijohn and there was no trace of the bucket except for fragments of a brush. Rouja collected the fragments as well as the two blocks, placed them in labeled mesh bags, and reburied them at the site, placing twelve sandbags over them before refilling the bow with sand.

The bow area's erosion stabilized, until Hurricane Bill passed 80 miles (128.75 k) off Bermuda on August 22, 2009. Diving on the site after the storm, Rouja with dive buddy Stuart Joblin saw that some eight feet of sand had been washed away, exposing the sand bags and the corner of a wooden crate or box. He recovered a single corked bottle of wine. Rouja recovered the bottle, placed more sand bags and closed the site for two days until sufficient sand had migrated back into the bow.

The sand over the ship and in the bow remained stable through the relatively benign hurricane season of 2010 but the recovery of the bottle of wine lent veracity to the stories of other significant artifacts having been found in the bow. Rouja and the Historic Wrecks Authority began questioning whether preservation *in situ* was the best approach in this dynamic situation. In January 2011 during a lull between significant winter storms, Rouja and a film crew from LookBermuda dove *Mary Celestia* in order to collect high-definition footage of the wreck in the clear winter waters; they banked the footage for a film they hoped to make on Bermuda's role in the Civil War. *Mary Celestia* was covered in sand once again, the stern com-

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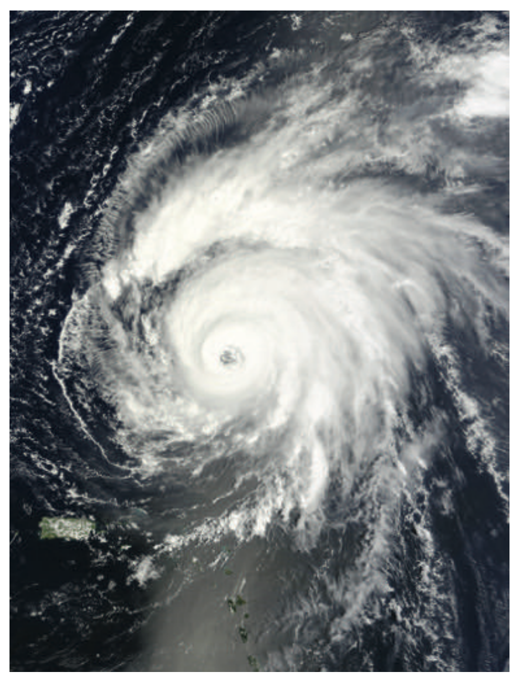
Figure 30: Hurricane Fabian hits Bermuda, September 5, 2003.



NOAA

Figure 31: Hurricane Bill, August 22, 2009.

pletely buried, but in the very front section of the bow it appeared that a significant amount of sand had been washed away.

Inside the bow, as he peered past the deck beams and into the gloom, Rouja saw wooden planks, and up in one corner, the top of a wooden crate rising out of the sand and, lying adjacent, another corked bottle of wine. Rouja kept the site open, but closed the bow to diver access and began consulting with colleagues to assemble a project team and support to excavate the bow. In the case of popular wreck sites, the Bermuda diving community has evolved to become self-policing, with dive shops and recreational divers demonstrating a high degree of stewardship toward Bermuda's most iconic sites. As before, Rouja covered the exposed artifacts with a fresh layer of sandbags in the bow; he deemed the risk to any potential human interference with the artifacts to be quite low. However, given the high-profile historical nature and the potential value of artifacts from the site, he decided to add an extra level of visible security to the site. The closure was carried out by securing a net across the large openings to the interior of the forepeak with signs indicating the area was off limits. The net was secured in such a way as to require at least one full dive to remove it. The high visibility of the site from land and its almost daily use by the nearby dive shops guaranteed that any boat remaining at the site for more than a single dive would be noticeable. In short, Rouja wanted to guarantee that the area inside the bow would remain as it was left until an excavation could be carried out.

Rouja then contacted both the Waitt Institute and ONMS in the United States for assistance in recovering the exposed artifacts inside the bow. The Waitt Institute agreed to fund the project and to send Dominique Rissolo and Joe Lepore, and NOAA agreed to send three field archaeologists, Delgado, Casserley and Lusardi, all with experience in sites of the period, underwater excavation, and artifact care and documentation. All three had previous experience with *Mary Celestia*. Delgado had experience in the archaeological recovery of intact, sealed wine from another site dating to 1851.

Rouja arranged for support from Bermuda's Ministry of Public Works, which included the vessel R/V *Calamus* captained by Anson Nash, as well as gaining the participation and support of volunteer divers and vessels. He obtained sponsorship from the adjacent Southampton Fairmont Princess for reduced lodging rates for the team and arranged dive tank support from Dive Bermuda. The National Museum of Bermuda also provided research and conservation laboratory support and storage for all of the recovered artifacts. All field activities were filmed by LookBermuda.

The project took place June 16-23, 2011.

Philippe Rouja

Figure 32: The hurricane exposed remains of *Mary Celestia* at the wreck site in February 2011.

Excavation Area and Protocols

The first dives to the site were made to visually inspect the entire wreck, assess the relative level of site erosion and exposure of the steamer's hull and machinery, and then to inspect the forepeak, which remained sealed from unauthorized access with the netting and formal closure notice intact. Following the inspection, the netting and notices were removed to allow for documentation and the commencement of excavation. Prior to the arrival of the archaeological team Rouja installed three permanent mooring buoys at the site to ensure that, regardless of wind direction, the support vessels could link up between buoys and be held directly over the bow of the wreck in any wind direction. In this way divers working at the bow would have direct vertical access to the support boat; the arrangement provided for health and safety as well as the effective recovery of artifacts to the surface. An added benefit was that the dredge while in use could not be suddenly dragged away from the bow.

The bow of *Mary Celestia* was the only visible and substantially intact portion of the vessel other than the boilers, engines and paddlewheels. The bow rests on its port side at an extreme angle. As observed in June 2011, the starboard side of the bow is exposed, but the keel is buried in sand and sediment immediately aft of the stem. The anchor cat-davit noted in 1983 remains mounted to the bow on the starboard side, as does the steam anchor winch/windlass. The decking is missing, but the iron deck beams remain intact. Immediately off the port side of the bow, the fluke of an anchor is exposed above the level of the sand, as

NOAA/Tane Casserley

Figure 33: Bow of *Mary Celestia*, June 2011.


NOAA/Tane Casserley

Figure 34: Excavation of the forepeak.

was noted in 1983. The bow is oriented in a way that suggests that it may be attached to the rest of the hull at the keel, but there is no visible hull plating or frames aft of the collision bulkhead that terminates the surviving bow section. The length of this section of the hull is 28 feet, 10 inches (8.80 m). The ends of iron frames are visible in the sand aft of the bow in direct orientation, although separated by several meters' distance.

The survival of the structure of the bow and its narrow confines led to the selection of an irregularly shaped unit measuring six by ten feet(1.82 by 3.04 m), delineated by the deck and the port and starboard sides of the hull from the forepeak to the third frame, just forward of the kingpost. We also made the decision to not completely excavate the entire confines of the bow but rather to focus the excavation on the area of active erosion and artifact exposure, which was forward of the partially intact wooden kingpost and at the extreme forward area of the bow.

As excavation proceeded, the forepeak's confines were identified through surviving joinery. Internal bulkheads remained intact, and all artifacts recovered were confined within the boundaries of the forepeak. As noted, excavation took place only within the forepeak and not the other areas of the bow, which included the tip of the stem behind a half-intact wooden bulkhead and the area aft of the kingpost, which during excavation appeared to be another compartment with a possible fallen door extending into the forepeak. These features, partially exposed, were large and fragile, and were below the active zone of erosion exposure, so after documentation they were reburied and covered with sand bags.

Excavation techniques were hand-fanning and brushing to remove sand and sediment, which was evacuated from inside the confines of the bow by a water induction dredge. Areas of recently deposited sand were noted by "clean" sand, as opposed to darker sand mixed with sediment that appeared to be an older deposition trending to dark silt; it marked previously unexposed areas of initial deposition of artifacts and sediment. The dredge's exhaust was monitored by divers to retrieve any artifacts not observed during the excavation, since visibility was at times extremely limited inside the bow. A few artifacts, as discussed later, were recovered from the dredge spoil; these were two buttons and a small perfume bottle.

Following excavation of the forepeak, which was completed to all surviving hull structure, decking and joinery, this area of the bow was documented and then reburied with sand bags and by pumping sand back into the space. The bow was then reopened to the public.

Material Culture Assessment

Excavation of the forepeak revealed a small but diagnostic series of assemblages that related to the use of the forepeak as a storage locker for the steamer's boatswain. This locker, a small compartment in which the boatswain kept tools and supplies for repairing and making up rigging and cargo gear, would have been immediately forward of the forecastle, an area in which some members of the crew would have lived. These assemblages, along with Rouja's previous discoveries of storm-exposed blocks and the brass-bound bucket, indicate that the area was such a locker and not a cargo space. This is an important distinction. In addition to the artifacts in those assemblages, others were present that could not be ascribed to the function of the space as the boatswain's locker; these items were luxury commodities and personal effects that suggested either personal storage inside the forepeak or the illicit caching of goods, which at the time of the ship's loss would have been considered illegal contraband by both the United States and Confederate States governments. This aspect of *Mary Celestia*'s material culture will be more fully discussed in the concluding section of this report.

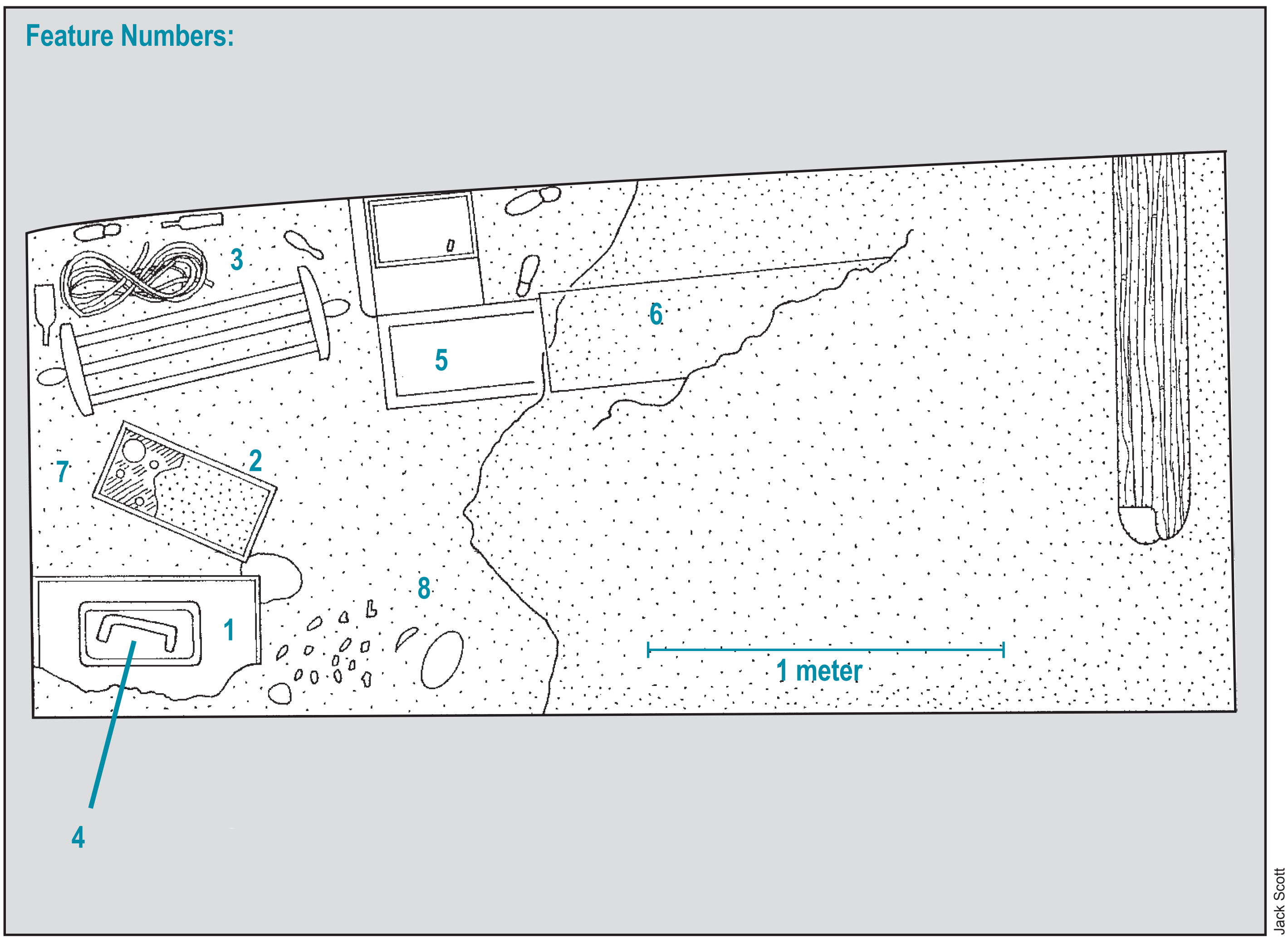


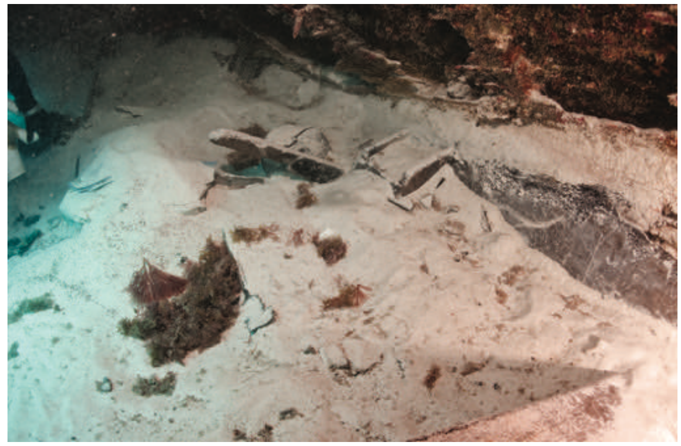
Figure 35: Features as excavated, June 2011.

Features

Excavation of the forepeak exposed a series of features that were sequentially numbered as they were exposed. A more detailed description of each feature follows.

Feature 1

Lying within a matrix of sand, Feature 1 was an irregularly shaped plank (MC-1864-2011-001) with two long narrow boards lying atop it and a single leather shoe (MC-1864-2011-002). Upon recovery and analysis in the laboratory, it was determined to be a wooden shelf that had at some time detached from its original position inside the forepeak. It is likely that this shelf was exposed during previous erosion events, dislodged, and fell into the sand that encased it when excavated in 2011.



NOAA/Tane Casserley

Figure 36: Feature 1.

Feature 2

This feature, partially exposed in January 2011 and subsequently reburied, was completely excavated and found to be a rectangular wine crate (MC-1864-2011-004) lying on its side with five corked, sealed bottles of wine (MC-1864-2011-005 to MC-1864-2011-008). The "top" (actually the uppermost side) of the crate was damaged and missing some of its planks. The top layer of the crate was filled with loose sand; the bottom three inches of the crate was filled with dense silt that included organic matter appearing to be straw, which was recovered for analysis. The bottles were recovered and the crate was disassembled and recovered.

NOAA/Tane Casserley

Figure 37: Feature 2.

Feature 3

This feature was a tumbled mixture of artifacts that had come to rest on the deck of the forepeak and the port side of the bow immediately adjacent to the wine crate. They were the wooden reel from a chip log (MC-1864-2011-010), a coil of line (cordage) (MC-1864-2011-011), a corked, sealed and embossed bottle of cologne (MC-1864-2011-014), a wooden hairbrush (MC-1864-2011-015), a leather shoe (MC-1864-2011-012), and, lying at the forward end on loose sand, a corked, sealed wine bottle (MC-1864-2011-013)that presumably had been displaced from the wine crate. During excavation, a corked and sealed perfume bottle (MC-1864-2011-003) was recovered from the dredge "spoil" that presumably came from this area and that may be from this feature. All of these artifacts were recovered.

Feature 4

Excavation beneath the fallen shelf revealed a shallow oval iron tub or pan with a curled lip measuring 15 by 20 inches (39 cm by 53 cm) and 3 15/16 inches (10 cm) deep. Lying inside the pan was a U-shaped iron bar measuring 15 ¾ inches (40 cm) in length with 4-inch (14 cm) arms and 1 ½ (4 cm)-inch diameter. Heavily corroded and concreted to the exposed iron plating of the interior surface of the port side of the bow, these artifacts were documented and left in situ.

Feature 5

This feature consisted of fallen and still-fitted joinery, including a small stanchion and what appeared to be a fallen door with a decorated edge that lay on the interior of the port side of the bow adjacent to the deck. A small square box, without its lid and filled with loose sand, was found adhering to the deck in close association with the joinery; it is a cruder, soft wood object and not part of the ship's hardwood joinery. The box had the appearance of having been disturbed and may have held contents lost to erosion or through intervention/collecting. The box was not large enough to be the source of the cologne bottle, but it was of approximate size to have held a number of objects the size of the perfume bottle. Feature 5 also included a pair of leather shoes, one with its heel (MC-1864-2011-018), and a wooden shoe "last" (MC-1864-2011-017). The joinery and the box were left in situ, but the shoe and shoe last were recovered.

The larger piece of joinery that may have been a door or panel may be associated with a bulkhead that separated the boatswain's locker from the forecastle. This feature was not completely excavated but rather was documented in situ and then reburied.

Feature 6

This feature was the 7½ (19/05 cm) by 9-inch (22.86 cm), 4-foot, 3-inch (1.31 m) long stub of the wooden kingpost, with its proximal end fitted through the deck and into the keel, and its distal end eroded. It was documented and left in situ.

Feature 7

This feature was a wooden plank bulkhead fitted at the deck level at the forward end of the forepeak. The bulkhead sealed off the extreme end of the bow, and while eroded and missing its starboard side, was intact and fitted to the interior of the port side of the hull. The surviving planks suggest that the bulkhead was solid. The area forward of it is filled with dense silt that lies behind the bulkhead's surviving planks; the area on top of this was filled with loose sand. The bulkhead was left in situ and the silt behind it was not excavated.

Feature 8

A loose collection of artifacts that appeared to have been displaced in loose sand were found aft of features 1 and 4 near on the interior of the port side of the hull near the deck level. These consisted of two large pieces of coal (MC-1864-2011-020); a shoe; fragments of thin metal with what appeared to be paint adhering to their surfaces (MC-1864-2011-019); the concreted fragment of an iron-hooped wooden cask or bucket (MC-1864-2011-021); and loose concretions (MC-1864-2011-022). All of these artifacts were recovered.

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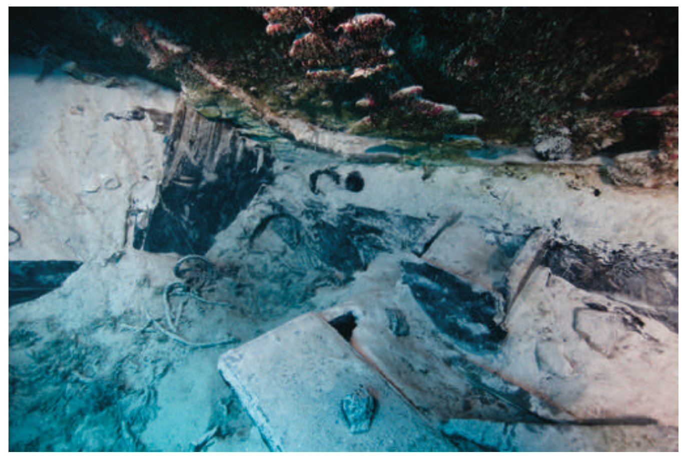
Figure 38: Feature 4 being documented.



NOAA/Tane Casserley

Figure 39: Feature 5 and Feature 7.

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Figure 40: Documenting Feature 8.

Observations on Site Formation Process

In assessing the site formation processes at the *Mary Celestia* site, we have followed the approach taken by McCarthy (2000) in his analysis of the 1872 wreck of the iron-hulled steamer *Xantho* in Australia. Drawing on the work of Schiffer and Muckelroy, McCarthy noted the importance of determining the cultural and natural factors (C- and N-transforms) involved in the transformation of *Xantho* over time. He specifically noted three transformations in the lifetime of *Xantho* after its construction in 1848: its modification in 1861, its sinking in 1872, and its break up and salvage between 1872 and 1979, when it was archaeologically documented for the first time.

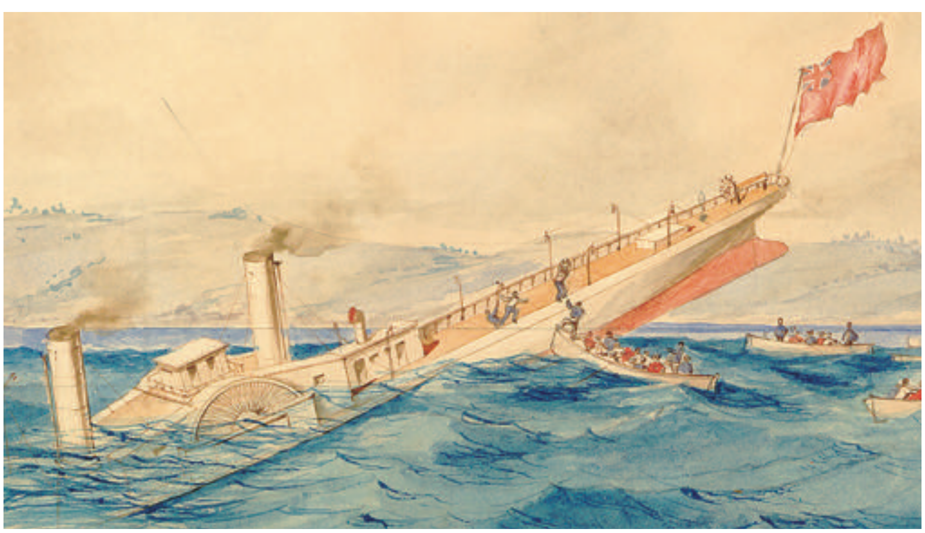
As McCarthy noted with *Xantho*, there is an apparent pattern to iron and steel wrecks as they are transformed by break up and salvage. Based on observations made by John Riley's study of over 100 shipwrecks off the coast of New South Wales, McCarthy observed that "ships generally sink to the waterline when they lie upright on a seafloor of sand or similar soft sediment" (McCarthy 2000:97). When they lie upright on a hard unyielding bottom, the midships hull breaks at the turn of the bilge, while the bow and stern "triangles," which are stronger, remain upright before breaking at the keel/keelson and falling over, leaving a characteristic appearance of "bow and stern triangles lying on their side, separated by flattened cargo holds, and (if they are present) a machinery section dominated by engines and boilers" (McCarthy 2000: 101). This is the overall appearance of the *Mary Celestia* site.

Mary Celestia had a short life of less than a year and hence did not undergo any major modification (and C-transform) such as *Xantho*'s hull modifications and new engine. Like *Xantho*, however, it did undergo a major transformation (both a C- and an N-transform) in the sinking event, and again with its subsequent salvage and break-up. In the case of *Mary Celestia*, the salvage process involved multiple salvages over the course of a century.

There are two contemporary written references to the wrecking event – a brief mention in a letter from Chief Engineer Charles F. Middleton to his wife, and a lengthier account in *The Royal Gazette*. Both agree on the specifics. After leaving Hamilton harbor and running at a speed said to be 13 knots, the vessel turned in toward shore to land the owner and pilot. Despite a warning of imminent danger from the coral heads in the vicinity, which the pilot disregarded, "the vessel struck, drove on to a rock, and in from six to eight minutes afterwards sunk in about seven fathoms water" (The Royal Gazette, September 13, 1864). Middleton told his wife the vessel sank in five minutes. There is also a contemporary watercolor by artist Edward James which depicts the sinking, with the vessel down by the head as the crew race for the ship's boats.

The damage to the hull would have been substantial and located forward where the steamer struck; according to the Bermuda Royal Gazette's account, "the vessel is said to be laid open from her bows to abaft her wheel-house" (The Royal Gazette, September 13, 1864).

The 221-foot-long(67.36 m) vessel sank in 57 feet (17.37 m) of water, with the bow making contact with the seabed first. The weight of more than half of the steamer pivoting on the bow would have strained the hull to the breaking point both fore and aft. While making our initial observations of the wreck, we noted a buckled section of the keelson adjacent to the step for the mainmast. The keelson was curved up, indicating that, before *Mary Celestia* was completely submerged, the keel had started to fail at this location. Had the vessel remained afloat longer than the five to seven minutes it did, complete failure and separation was possible. At the same time, the collision damage and stresses on the bow caused a near separation abaft the forecastle bulkhead and the bow rolled over on to its port side.



Godet Family Collection, National Museum of Bermuda)

Figure 41: Detail from Edward James' painting of the sinking of *Mary Celestia*.

The current position of the bow is therefore not the result of years of C- and N-transforms, but rather we hypothesize that it is temporally associated with the wrecking event. The position of the artifacts found in situ in the forepeak indicates that they came to rest in their final positions at a time when the bow was flooded but not filled with sand or sediment, which slowly accumulated in the compartment after *Mary Celestia* sank. A layer of fine sediment no more than one to three inches deep lay at the bottom of each feature up against the capsized port side of the hull. An intermixed layer of silt and sand several inches to a foot in depth overlaid the silt, followed by "clean" sand intermixed with fragments of sargassum which suggested more recent exposures and reburial.

More detailed analysis of the hull of *Mary Celestia* through excavation, documentation and forensic analysis is required to determine the complete sequence of the site formation process. Some hypotheses and preliminary conclusions at this time, other than those discussed above, are that *Mary Celestia* settled on the seabed, lying in a hollow between coral heads, with the stern striking or coming to rest against a coral head and the rest of the hull clear and in an open patch of sand and sediment. The bow, as previously suggested, was probably twisted to port but not completely detached. The stacks and masts would have protruded above the surface of the sea, although the main mast may have fallen given the visible damage and twisting of the keelson by its mast-step. As the contemporary newspaper accounts noted, the vessel was "laid open" by collision damage from the bow to midships, although it is uncertain if the damage was along one side or on the bottom of the hull.

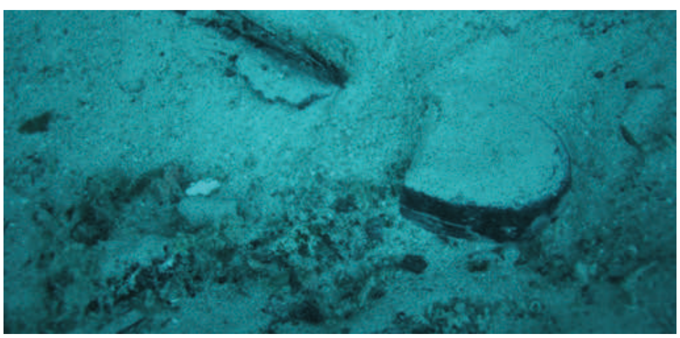
As indicated earlier, the initial (1864) salvage divers were able to open the hatches and "float" out the merchandise stored in the holds. Discussions with Teddy Tucker about his dives on the wreck in the 1950s and 1960s, however, suggest that not all of the cargo was recovered, as he noted he had recovered a crate of rifles and observed a broken crate of bottles beneath a fallen section of hull plating (Tucker 2011).[14] This may suggest that as salvage proceeded in 1864 that hull failure was taking place in the more open and fragile areas of the holds. As McCarthy noted with the *Xantho* wreck site, these areas of the hull ultimately fell apart, collapsing into and outside of the steamer after separating from the rest of the hull at or above the turn of the bilge.

It is interesting to note that in comparison with the bow, there is little structure left intact or visible at the stern. While sedimentation and burial account for part of that, the condition of the stern, and its angled position (it is not in line with the rest of the hull) suggest that its proximity to a coral head resulted in it striking the coral head at the time of sinking and fragmenting. The midships area of *Mary Celestia*, with its boilers and engines intact, as well as the paddlewheels, remained intact and was not salvaged in 1864.

According to Teddy Tucker, when he first dived on the wreck both wheels were attached to the paddlewheel shaft and that the port wheel fell off the shaft and onto its side later (Tucker 2011).

Mr. Tucker also noted that a "British" firm had salvaged some of *Mary Celestia* in the 1950s, largely concentrating on brass and copper "yellow metal" (Tucker 2011). Mr. Tucker's own dives also recovered brass fittings not removed by the earlier salvagers, as previously noted.

While conforming in many ways to "Riley model" described by McCarthy, *Mary Celestia* obviously has specific characteristics as a site that conform to the circumstances of the cultural and natural transformations that took place at this site.

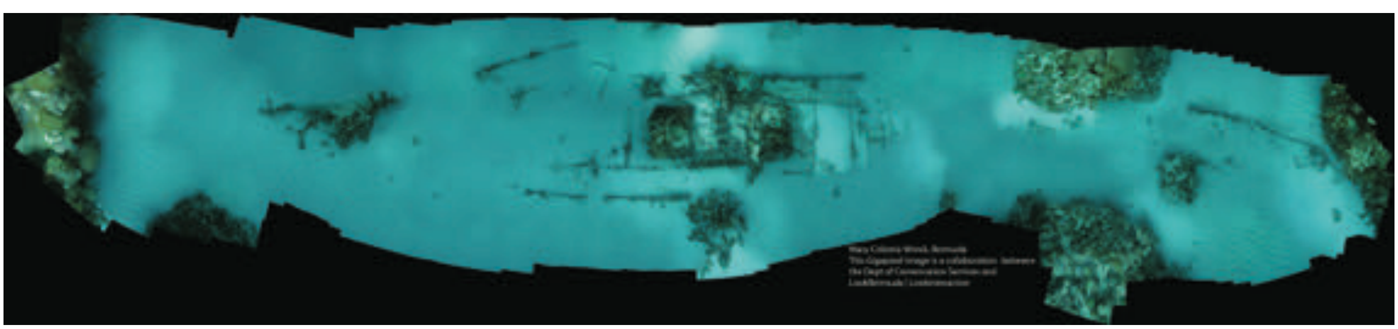


Philippe Rouja

Figure 42: Fragment of a shoe in a disturbed matric of sand and sargassum, indicative of previous exposure, intermixing of bottom sediments and reburial.

NOAA/Tane Casserley

Figure 44: *Mary Celestia*'s engine room, looking forward from the aft boiler past the cranks of the double oscillating engines to the forward boiler.



Bermuda Department of Conservation Services

Figure 43: Mosaic of the *Mary Celestia* wreck site.

[14] The current location of these artifacts is not known.

Architectural Observations

Archaeological observation and documentation of *Mary Celestia* has added to a scarce historical record for the ship's construction. Access to the interior of the bow provided an opportunity to assess and document some of the vessel's construction features. The forecastle of the ship comprises the surviving, intact section of the bow. It measures 29 feet (8.83 m) in length and ends at the aft collision bulkhead, a riveted iron partition that has partially eroded to open the forecastle to the sea.

Mary Celestia's surviving bow structure indicates a well-built vessel with an outer hull of inner and outer strakes fastened with double-riveted overlapping seams and fitted to a frame of ten iron I-bars that are 2 inches (5.08 cm) wide and spaced 3 feet 8 inches (1.15 m) on their centers. Adding further to details not available in the archaeological record, the excavation showed that the keel and keelson are exposed at the after end of the bow, which has broken free of the hull, and are bar-style with iron garboard strakes. An iron bilge keelson and a T-bar bilge stringer riveted to the frames provide structural bracing for the hull. The bilge stringer is located three feet (.91 m) above the bilge keelson.

The iron main deck stringers (deck clamp), attached to the frames by stringer plates, also structurally tie the bow into a reinforced and cohesive structure. Unlike later steamers, *Mary Celestia* does not have diagonal tie-plates at the bow to additionally reinforce it, but abaft of the

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Figure 45: *Mary Celestia*'s bow with the exposed section of keel and keelson and the aft collision bulkhead. Also note the steam winch/windlass.

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Figure 46: Interior of the bow, looking aft. The eroded end of the kingpost (Feature 6) is visible in the foreground. Intact wooden decking is visible to the left with the yellow archaeological scale resting on it. Above it is a horizontal stringer and the frames, with fragments of wooden paneling or sheathing attached to them.

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Figure 47a & b: Interior of the bow looking forward, showing the deck beams (left), the starboard hull with frames and the bilge keelson and bilge stringer (right) and the kingpost (center).

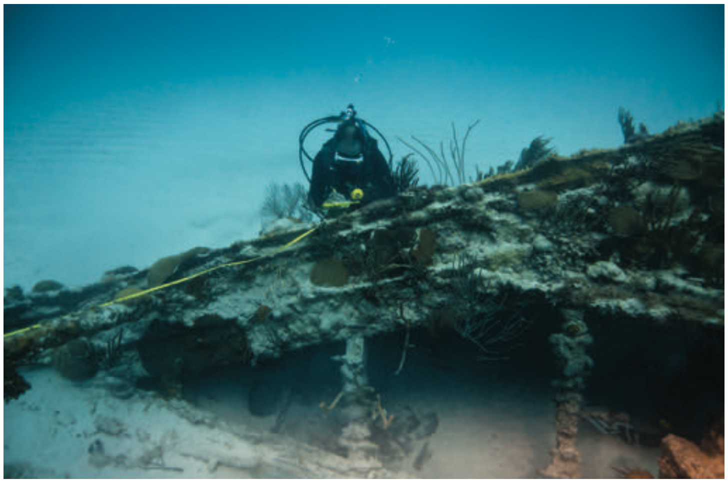
NOAA/Tane Casserley


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Figure 48a & b: Bow with the gunwale stringer plate, deck stringers and decking (at bottom edge of the photo) visible during documentation.

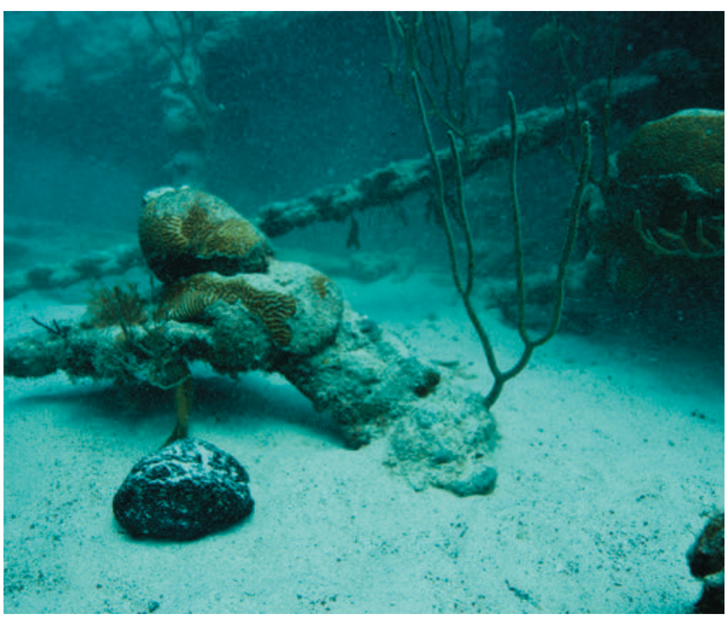
NOAA/Tane Casserley

Figure 50: Buried anchor by bow and steam winch. Note the anchor chain running forward from the winch in the background.


NOAA/Tane Casserley

Figure 49: The steam winch/windlass on the forecastle deck.


The Mariners' Museum

Figure 51: Trotman patent anchor.

windlass, longitudinal tie-plates reinforce the deck, which also has gunwale stringer plates reinforcing it. The archaeologically observed construction characteristics conform to standard quality iron and steel shipbuilding practice in the United Kingdom of this period.

The steam-winch/windlass is a cast and wrought iron structure mounted to the deck 24 feet 9 inches (7.58 m) aft of the stem. It is riveted into place on the deck stringers, rising 28 inches (71.12 cm) above the deck; its warping end, the barrel and the main spur wheels (on the port and starboard sides of the winch) are exposed above the sand.

As previously noted, forward of the winch/windlass and 13 feet 10 inches (4.23 m) aft of the stem is a cast-iron cat-davit measuring 7 feet 6 inches (2.31 m) high and 2 inches (5.08 cm) in diameter; it is mounted to the gunwale angle bar on the starboard side. A section of stud-link chain, concreted into place, stretches aft from the cat-davit and connects to the steam winch.

Buried in the sand, aft of the davit's position and close to the steam winch/windlass is a previously noted anchor with one fluke partially visible; its size suggests it is a bower (one of the two main anchors). It is either the fallen starboard bower or the displaced port bower lying free of the hull.

The anchor is a Trotman patent (1852) bower. The Trotman anchor was a refinement of earlier, hinged anchors that swiveled to dig into the seabed while the upper crown and palm pressed down into the shank, leaving less of an obstruction for the anchor cable to foul on; this anchor was manufactured under license by British firms and found wide use in the merchant marine, although never adopted by the British Admiralty either due to a personal dislike by the Admiralty Board for John Trotman or difficulty in catting and fishing them (Curryer 1999:77-83).

While now the iron strakes and framing are exposed, the forecastle was originally sheathed with wood paneling and was subdivided by at least one and possibly two wooden bulkheads. At the forward end of the bow, a tongue-and-groove planked bulkhead formed the forward wall of a small compartment with shelves that apparently served as the bosun's locker. This compartment is where the artifacts recovered in 2011 were stowed at time of *Mary Celestia*'s sinking. The compartment also accommodated the substantial 7-½ (19.05 cm) by 9-inch (22.86 cm), 4-foot 3-inch (1.31 m) wooden kingpost, which ran from the keelson to the main deck, penetrating it to rise above the deck next to the steam winch. It is broken with an eroded end that now terminates inside the bow below the deck level.

The planking that sheathed the compartment was bolted into the frames; only traces of it remain. The bottom of the compartment, just above the keelson, is fitted with a wooden deck made of up 1½-inch-thick (3.81 cm) planks that rested on deck stringers set into the bilge keel.

NOAA/Tane Casserley

Figure 52: Exposed decking in the forepeak. The iron frames retain traces of the wooden paneling that once sheathed this compartment. A fallen box (left), now empty, lies on the deck; it may have held perfume bottles. Next to it is a stanchion for a table or shelf. The remains of the kingpost are to the right; past them is an exposed deck stringer.

Observations and Analysis of the Material Culture

The material culture recovered from the forepeak of *Mary Celestia* falls into the following categories:

- Bottles, alcoholic
- Bottles, perfume
- Personal Items, shoes
- Personal Items, hairbrush
- Personal Items, buttons
- Containers, wooden boxes
- Containers, metal cans
- Ship's equipment, navigational instruments
- Ship's equipment, rope
- Fuel, coal

In the sections that follow, a detailed description of the various artifacts follows, with historical and comparative archaeological context, and the results of any analysis.

Chip Log Reel

As previously noted, the fragile and broken remains of a chip log reel was recovered from Feature 3. The chip log reel appears to be either a discarded or spare, as when found it was missing its line, drogue "log" and sand-glass; it had been stowed in the forepeak in close association with a small coil of line too thick to have been used on the reel. The reel is a unique archaeological find, especially within the context of coming from a blockade runner. There is a certain delight in the discovery of a "speedometer" within a wreck of a ship built for stealth and speed to evade capture.

The reel was in a position that suggested it had been stowed on a shelf and had fallen as the ship sank and the bow struck. The chip log as found lay at an angle, tangled in loose line and in close association with boxes that appear to have fallen alongside and on top of it. The wood, already in a fragile state, was found to be cracked and broken, leaving the chip log reel in articulated fragments. After excavation, the log was recovered in pieces, although it was possible to keep some of the pieces in the position in which they were found, in situ, for transportation to the laboratory. The upper end of the reel, as exposed, was one end with damage, including a detached handle and evidence of previous exposure. The wear patterns on the damage indicated that it was not recent; it may date to the sinking.


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Figure 53: Chip log reel as excavated.

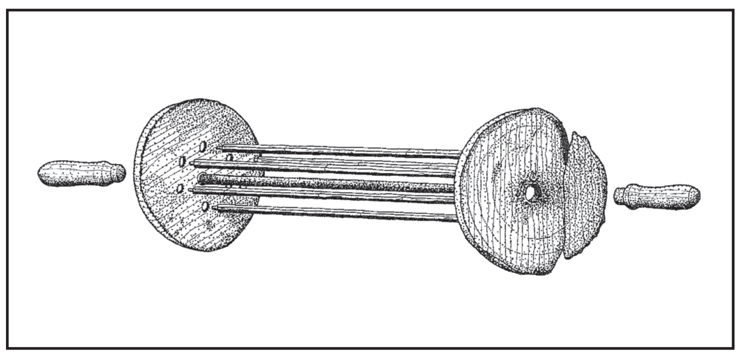
Jack Scott

Figure 54: Chip log reel reconstructed.

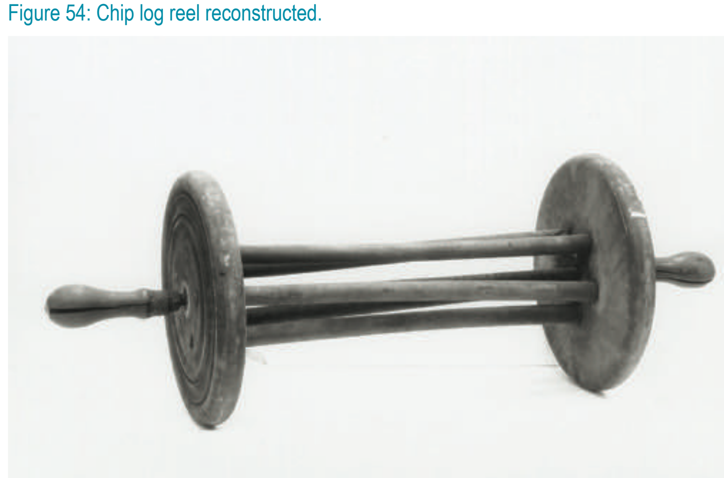
The Mariners' Museum

Figure 55: Chip log reel in the collections of the Mariners' Museum, Newport News, VA.

The handle and the reel end were covered with a thin sand concretion that had been damaged prior to excavation, probably during a recent exposure. Much of this concretion easily separated and fell free of the handle during recovery and transport to the laboratory.

The other (lower) end of the reel, with its handle still mounted, was also partially covered in concretion, and the reel end on this side was also cracked in approximately the same location as its matched end on the other side of the reel. Like the upper end, this section's damage was also worn and suggests an earlier break (Fig. 59). Because both breaks are worn, nearly identical, and are located at what was the "bottom" of the reel where it impacted the deck, this damage likely occurred during sinking when the reel fell into its final, as-excavated position. Other, old damage to the end, including chips and a wear pattern to the end, also suggest that it was an older, unused piece of gear that was stowed in the forepeak (Fig. 57). The edge of the broken piece of the end is eroded, as this section of the reel was apparently exposed above the level of sand for an undetermined period of time and subjected to wear from sand moving in the current; this sand wear is also what apparently broke off the exposed handle.

The two end pieces are disc-shaped, solid pieces of wood, each as noted broken into two pieces. The exterior face of each end is decorated with three concentric grooves. The ends are each 11½ inches (29.21 cm) in diameter, and 1 5/8 inches (4.12 cm) thick at the edge. The ends are centrally pierced for an iron "axle" or pipe, to which the handles were attached. The handles were mounted to freely spin on the axle as the log line ran out. The turned wood handles are 5¾ inches (14.60 cm) long with a 1¾ inch (4.44 cm) maximum diameter. Their distal ends are also decorated with concentric rings. A hole on the proximal end of each handle attached it to the axle and is 5/8 inches (1.58 cm) in diameter and 3½ inches (8.89 cm) deep. The "lower" end, with its handle still attached, was recovered with two fragments of the wooden spindles and a stub of the iron axle still fitted into it (Figure 59).

The two ends were joined by the iron axle and six octagonal-sided wooden spindles. The iron axle is heavily concreted and may be a hollow pipe. It is 5/8 inches (1.58 cm) in diameter, and when excavated was broken into three sections. A 4½ inch (11.43 cm) section of it remains fixed to the handle and "lower" end, and the two other sections, 1 foot 7 inches (48.26 cm) in length, suggests a total length for the axle, which penetrated the ends, of 23½ inches (59.69 cm). With concretion accounted for, a probable original length of the reel of 23 inches (58.42 cm) is likely. This would match the wooden spindles, which fitted into the ends with one-inch diameter wooden dowels, are 1 foot 11 inches (58.42 cm) in length. The wood of the spindles is a lighter wood, heavily saturated and extremely fragile. Some of the spindles were fractured from the sinking damage; others separated on the slightest touch when recovered and much of one spindle had disintegrated and could not be recovered. Small portions of two spindles, a 5½-inch (13.97 cm) and a 1 ¼-inch (3.17 cm) stub, remained affixed to the "lower" end piece.

The log chip reel was transported to the laboratory in one container, and was disassembled, documented and returned to a fresh water bath to await conservation.

Archaeological finds of navigational instruments from nautical contexts are not ubiquitous but are well-doc-

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Figure 56: The end of the reel with the handle placed in its original position.

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Figure 57: The other (lower) end of the log chip reel with its damaged edge.

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Figure 58: Wear and chips on the lower end of the reel.

NOAA/Tane Casserley

Figure 59: Different laboratory views of the "lower" end with its fragments of spindles and the axle.

umented from a series of sites, with more "common" discoveries being lead-lines, telescopes, compass parts, dividers, navigational rulers, pencils, astrolabes, octants and sextants and, most recently, wooden cross staffs. Among the more notable and common finds include instruments from *Lomellina* (1516), *Mary Rose* (1545), *San Juan* (1565), *Vasa* (1628), *Batavia* (1629), *Swan* (1653), *Kronan* (1676), *La Belle* (1686), *Dartmouth* (1690), the *Jutholmen* wreck (1700), *Stirling Castle* (1703), *t'Vliegend Hart* (1735), *Hollandia* (1743), *Salvador* (1812), and the Hoff Store site (1851) (Cowan 1981, Pastron and Hattori 1990, Nasti 2006, Swanick 2005, Mörzer Bruyns and Van Der Horst 2006, Smith 2010). In all, as of 2005 some 27 shipwreck sites worldwide were known to have yielded 230 navigational instruments spanning the period between 1500 and 1700 (Swanick 2005:120, 174). Swanick's 2005 review of the archaeology of navigational instruments noted:

> *Log lines rarely survive for any length of time in the archaeological record unless they have been stored in an enclosed container and completely covered by overburden during the intervening centuries. Since the English log line is made of rope and wood, the only surviving examples are most likely found in historical collections. The Dutch log, which is made of metal, would be more likely to survive in an archaeological site. In fact, it is likely that two have been recovered from the VOC wreck* Kennemerland *(1664) (Swanick 2005: 102).*

Swanick notes that two brass boxes described as tobacco containers from the Kennemerland site may have contained Dutch chip logs, but the instruments themselves appear to be lost. The wooden chip log from *Mary Celestia* therefore appears to be for now the only archaeologically recovered example of this type of navigational instrument. It is a near-identical match for a "mid-nineteenth century" chip log reel that is otherwise unattributed (catalog number 37.2269) in the collections of The Mariners' Museum in Newport News, Virginia (Figure 55).

Historical Context

The chip log is an early and undated development that predated the mid-nineteenth century invention of the propeller-driven taffrail or patent log, which reportedly came into wide-spread use around 1875 (Gilman et al. 1905:402). Based on the simple principle of measuring speed by trailing at first a log tied to a line, and later a more refined drogue behind a ship, the chip log was developed sometime around the early seventeenth century, although some sources date it to the end of the sixteenth century (Waters 1958:122), noting William Bourne's mention of it in his *Regiment for the Sea*.

The chip log consisted of four basic elements, the log-chip, log-line, time-glass and reel. The log-chip was a weighted and balanced piece of board shaped like a drogue and attached to the log-line. A detailed description of a log-line from 1905 noted:

> *The log-line consists of a small rope (untarred hemp, usually) about one-quarter of an inch in diameter and 150 fathoms long, and is wound upon a reel fitted to turn easily upon its axis, which protrudes beyond the reel to form handles by which it is held . . . The log-line is marked as follows: For a certain distance from the chip, usually about 20 fathoms, there are no marks; this is called the stray-line and must be long enough to let the chip get well clear of the eddies at the stern of the ship. The end of the stray-line is marked with a white rag. From that measure off the length of one knot (about 47 feet 3 inches for a 28-second glass) and mark it with a piece of cord worked into the lay of the rope and having one knot tied in its end; the second knot is marked with a similar piece of cord (usually hard-twisted fish-line) having two knots in it, and so on (Gilman et al. 1905:401).*

The markings on the line were proportional to the nautical mile and to the time interval used to measure it. The time-glass was an hourglass-shaped timekeeper filled with black sand and measured to register 28 seconds.

The use of the chip log was described in detail in 1905; although this is an early twentieth century account, the equipment and procedure would have been very similar, if not identical, decades or even a century earlier:

> *To heave the log requires at least two persons, preferably three or more if the ship is going over four knots. One man holds the reel and another the glass; after throwing the log-chip over the stern he waits for the white rag at the end of the stray-line to pass over the ship's rail . . . When the white rag crosses the rail he turns the glass quickly or directs another man to do so – if there is a third – and when the sand is out the person holding the glass calls "up!" The line is grasped and held and the number of knots and tenths which have run out is noted . . . When the line is properly marked, the glass in good order, and the heaving of the log carefully done, the result should not be in error more than two-tenths of a knot and should average less. But it must be remembered that this method only determines the speed at a particular moment, and this may not be the average speed during the interval for which the speed is desired (Gilman et al. 1905:401).*

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Figure 60: The forepeak during excavation, with a piece of coal in the top left corner. This piece of coal was not recovered and remains on site.

This system and equipment were the origin of the term "knot" for the speed of a ship in nautical miles. The chip log was capable of measuring speeds of up to 15 knots; the development of fast sailing ships and steamers were one of the factors leading to the invention of the taffrail log in the nineteenth century, which employed a torpedo-shaped measuring screw dragged behind the ship and transferring its revolutions through its attaching cord to an index on the taffrail of the ship, which showed the speed.

Coal

There is a considerable amount of coal scattered on and collected in the wreckage of the *Mary Celestia* site. None of it appears to be in situ, that is, within its original context inside a coal bunker, but rather scattered as a result of the cultural and natural processes that have affected the site. Two large pieces of coal were excavated from within the bow area.

One piece of coal was recovered from inside the forepeak and part of Feature 8. The retained sample (MC1864-2011-0020) is 4 ½ by 5 ½ by 4 ½ inches (11.43 by 64.77 by 11.43 cm) roughly rectangular block of coal which weighs 1239.2 grams.

Historical Context

Prior to the Civil War, the need for commercial coal for steamships was a slowly growing demand in Bermuda as steam began to replace sailing ships. In addition to private depots, the Royal Navy stockpiled coal for the use of its ships at the Dockyard. The busy pace of Civil War sailings and the need for coal for the blockade-running steamers led to large shipments to Bermuda of coal for commercial use beginning in 1862. A blockade-running steamer required about 200 tons of coal for the 647-mile run between Bermuda and Wilmington, North Carolina, the preferred port of the blockade runners steaming from Bermuda (McNeil 2003:46).

Coal shipments reportedly arrived from Cardiff, Wales, Nova Scotia and Pennsylvania (Deichmann 2003:31). From these shipments, agents for the Confederate government as well as private firms trading with the South stockpiled large amounts of coal in Bermuda for the blockade runners (Wiche 2008:132). This activity was reported by the U.S. Consul in Bermuda, Charles Maxwell Allen, who commented in November 1864:

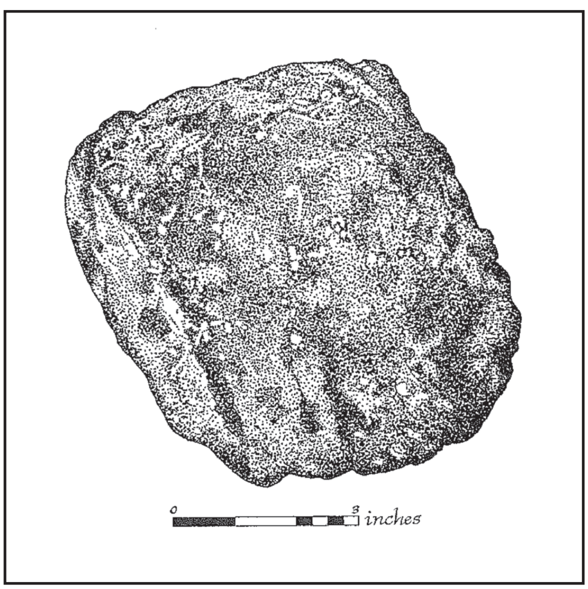
> *Although it has been currently reported and generally believed that most of the blockade-running steamers were to leave these islands not to return here, it appears from the large quantities of coal being received here that such is not the fact, as there is now landed and afloat in the harbor of St. George's more than at any previous time (Dispatch of November 16, 1864, as cited in Wiche 2008:160).*

Nearly two weeks later, Allen reported that "from the best information I can obtain I think there is at present time nearly or quite forty thousand tons of steam coal in the hands of Southern agents here" (Dispatch of November 28, 1864 as cited in Wiche 2008:161).

Wine Bottle Crate

Feature 2, the wine crate, lay on what was its side, showing it fell in that position when the ship sank. It yielded four corked bottles of wine (MC1864-2011-005 through 008). Additionally, excavation revealed one loose bottle of wine (MC1864-2011-013) forward of but in proximity to the crate. The position of the bottle suggested it had been removed from the crate when the sand was much lower and had been shifted forward, possibly by the surge inside the bow, where it was reburied and lost. The morphology of the crate suggests it was at one time completely packed, and was likely so at the time of the ship's loss. The surviving portions of the crate were eight panels (one side, two ends, and four planks that comprised the top and bottom). Made of ½-inch-thick (1.27 cm) softwood, the crate was fastened with small iron nails. The crate was 11 7/8 inches (30.16 cm) long by 8 7/8 inches (22.54 cm) wide. The "top," once a side, was fragmented; the damage appeared to be largely modern and suggests that after an initial exposure the crate was opened by parties unknown who removed some of the bottles.

The surviving side of the crate, which served as its de facto bottom for 147 years, is marked with the impressions of the bottle bottoms and necks that were



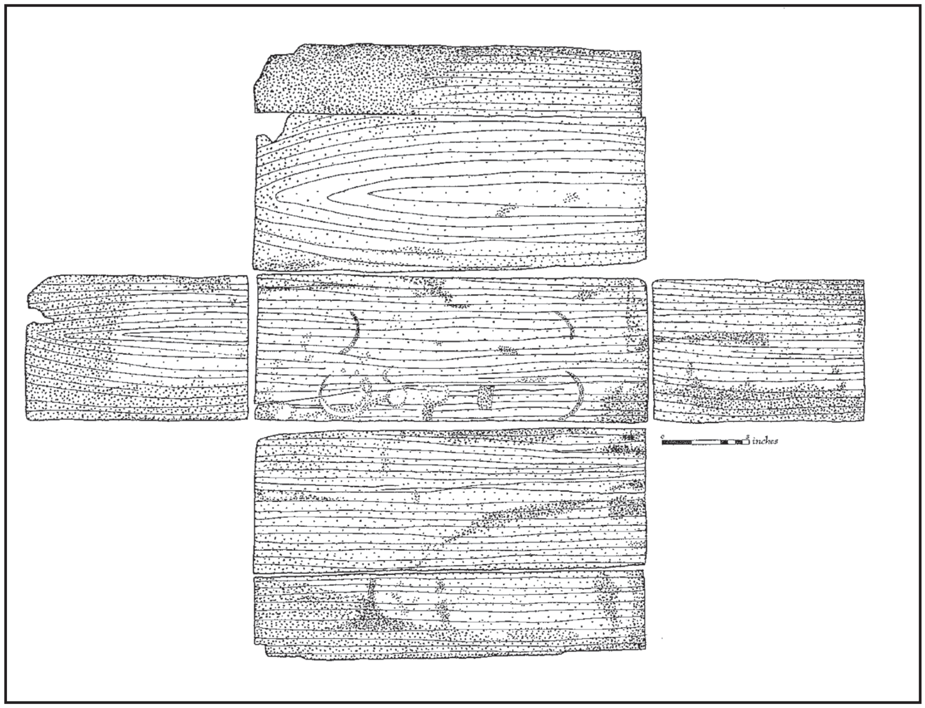
Jack Scott

Figure 61: Coal (MC1864-2011-0020).

NOAA/Tane Casserley

Figure 62: Wine bottles as found inside the wine crate (Feature 2). Back (left side) neck up is (MC-1864-2011-005), back (right side), base up is (MC-1864-2011-007), front (left side) neck up is (MC-1864-2011-006), front (right side) neck up is (MC-1864-2011-008).

NOAA/Tane Casserley



Jack Scott

Figure 63a, b, & c: Views of the wine crate unpacked and disassembled in the laboratory and as documented.

NOAA/Tane Casserley

Figure 64a & b: Side of the Feature 2 wine crate (MC-1864-2011-004) with bottle impression marks. The four bottles of wine recovered from the crate during excavation came from the right side.

NOAA/Wayne Lusardi

Figure 65: Bottles reportedly from the Mary Celestia site on display at the Globe Hotel, St. George's. Courtesy of Bermuda Heritage.

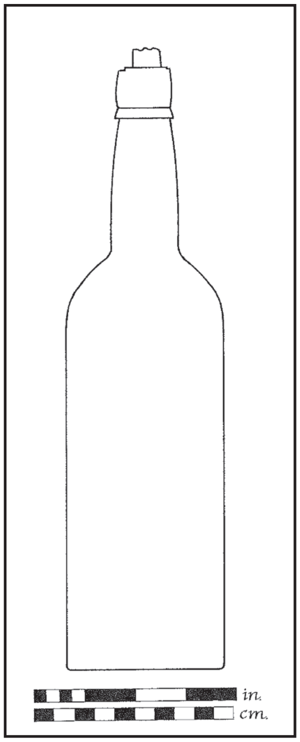
placed within it. One immediately noticeable feature is that the wood bears the impressions for 12 tightly packed bottles.

As noted, only four bottles were found inside the crate when excavated, with three loose bottles found in proximity, one during excavation (MC-1864-2011-013), the others recovered from the crate area by Rouja in 2009 and January 2011 as isolated but adjacent artifacts three-quarters buried in the sand (Fig. 33). The two bottles recovered by Rouja prior to the June 2011 excavation were catalogued by the government and stored in the safe at the Department of Conservation Services. Three additional wine bottles have been identified that are said to have been found by divers in exactly this area over the last several decades and as these details become available they will be added to this report.

It is hypothesized that the loose bottles were removed from the crate either at the time of the January 2011 exposure or earlier. This is based on 1) the fact that the wood bears the marks for a complete shipment of wine (12 bottles) that has rested inside it for a sufficient amount of time to mark the wood as it became water-saturated and softer; 2) the similarity of all of the recovered bottles in terms of style, size and content; 3) the interior of the crate when excavated in June 2011 was filled with clean sand in its forward end, with a darker silt and sand fill at the back end where the four bottles remained in situ; this same sediment was found in the bottom of the crate for a depth of approximately 2 inches (5.08 cm). The sediment also yielded traces of organic packing material; the "top" of the crate was dislodged and fragmented, and a large portion of it was missing when excavated in June 2011. Other bottles have also been recovered from the wreck, exact location unknown, and these are currently displayed at the Globe Hotel (Fig. 67). While the context of these bottles cannot be positively ascertained, nor if when found they were corked and sealed, they raise the possibility of other crates stored in the forepeak that were previously exposed and recovered without documentation. They may also come from another area of the site.

Alcoholic beverage bottles (N=5)

The basic profile of all of the alcoholic beverage bottles were consistent, with cylindrical bodies, rounded shoulders, tapered or slightly bulbous necks, and applied collars; however, there were slight variations in height and volume. Four of the bottles recovered from Feature 2, 005, 006, 007 and 008, exhibit characteristics of one-piece mold manufacture. In this method of manufacture the base and body of the bottle are shaped in an open mold while the shoulders and neck are free blown (Jones et al. 1985:26). Once removed from the mold the bottle is held in place by a pontil rod while the lip is completed (Dumbrell 1983:87), leaving a pontil scar. This method of production fell out of favor during the second half of the nineteenth century

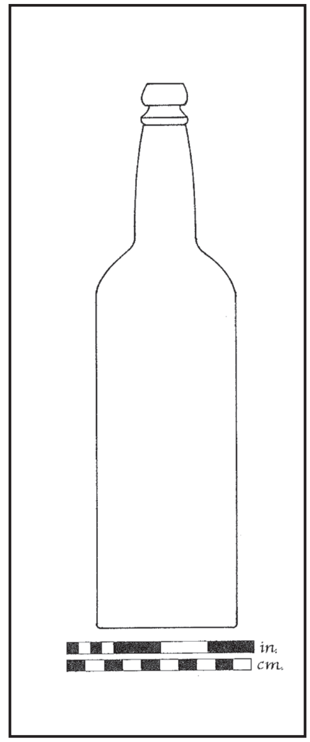


Jack Scott

Figure 66: Bottle MC1864 2011-005.

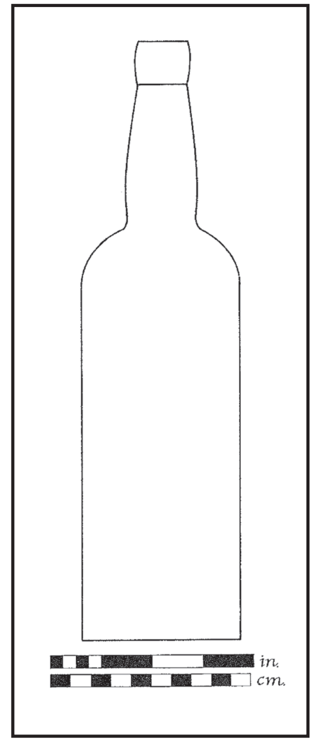

NOAA/Tane Casserley

Figure 67: Detail of the chipped lip and cork of bottle MC1864 2011-005.



Jack Scott

Figure 68: Bottle MC 1864 2011-006.



Jack Scott

Figure 69: Bottle MC 1864 2011-007.

(Jones et al. 1985:26). The fifth bottle excavated from Feature 2, 013, was manufactured in a three-piece mold. This method of manufacture is discussed in detail below in association with the 013 analysis.

The bottles excavated in June 2011 were all recovered with their liquid contents intact. For ease of description, neck finishes and basal profiles will be based on Fike's (1987) classifications.

The bottles recovered in association with Feature 2 are made of black glass, a term that refers to nearly opaque, dark olive-green or olive-amber glass (Fike 1987:17). Although some mineral water bottles have been found made of black glass, they more typically contained some form of alcoholic beverage such as stout, ale or wine. Black glass was popularly used prior to c. 1870 (Fike 1987:13).

Black glass bottles with this type of morphology were recovered during archaeological investigations in San Francisco, California of the Gold Rush Hoff Store site and the storeship *General Harrison* in 2001 (Pastron and Hattori 1990, Delgado et al. 2007). The Hoff Store and the *General Harrison* sites are specifically dated to the destruction of the ship by fire on May 4, 1851. Two of the black glass bottles recovered with their contents intact from this site had their contents analyzed. The laboratory results for both pointed to some form of malted beverage (Delgado et al. 2007:179).

Another source has identified a black glass bottle with the same morphology of those in this collection as an early wine bottle. This identification was based on an embossed seal found at shoulder level on the bottle that reads "BININGERS." Based on information found on paper labels, Biningers was a tea and wine merchant located in New York City as of 1778 (McKearin and McKearin 1971:428).

The term "Alcoholic Beverage Bottles" is perhaps as specific an identification as can be made in reference to empty black glass bottles with the morphology seen in this collection. Bottles recovered with their original contents, however, can be analyzed using the percentage of ethyl alcohol in the liquid. According to Staski (1984:40), ethyl alcohol percentages in beer will be 4.5 percent, wine averages 12 percent, fortified wines such as sherry should be approximately 20 percent and hard liquor ranges between 35-80 percent with an average of 40-45 percent.

005

This bottle had a partially extruded cork (1/2 inch/1.27 cm) and the lip was chipped, suggesting this was a recycled bottle that had been filled and then recorked. This bottle measures 12 inches (30.48 cm) in height with an 8¼-inch (20.95 cm) body, a 3-inch (7.62 cm) neck and a ¾-inch (1.90 cm) lip. It has a basal diameter of 3¼ inches (8.25 cm) with a 1 1/8-inch (2.85 cm) pontil. The finish is a Fike 2.2 double oil or mineral and it has a 3.20 round basal profile.

The bottle as excavated had liquid contents and weighed 1502.3 grams with its contents. There was sediment observed inside the bottle and there was an air bubble at the top. The displacement of the cork and the air bubble occurred during raising the bottle to the surface as a result of ambient pressure changes, but the cork did not become completely dislodged. It was left in its displaced condition without any attempt to re-seat it.

006

This bottle measures 11 5/8 inches (29.52 cm) in height with an 8-inch (20.32 cm) body, a 2 7/8-inch (7.30 cm) neck and a 7/8-inch (2.22 cm) lip. It has a basal diameter of 3 inches (7.62 cm) and a 1 1/8-inch (2.85 cm) pontil. The finish is a variance of Fike 2.21 grooved ring with the lower ring slightly angled instead of the typical rounded profile. The basal profile is 3.20 round.

The cork and lip of this bottle is covered with concretion. The bottle was excavated and recovered with liquid contents intact. It weighs 1430.1 grams with its contents. There is an approximately 4-inch air bubble at the top of the bottle.

007

This bottle measures 11 7/8-inches (30.16 cm) in height, with a body height of 8 ¼ inches (20.95 cm), a neck height of 2 ¾ inches (6.98 cm), and a 7/8-inch (2.22 cm) lip. It has a basal diameter of 3 1/8 inches (7.93 cm). The lip is 1 1/16 inches (2.69 cm) in diameter and is sealed with a 1 7/8-inch (4.76 cm) cork. The finish is a Fike 2.2 double oil or mineral and it has a 3.20 round basal profile.

This bottle was excavated and recovered with its liquid contents intact. It weighs 1478.4 grams with its contents. The cork is seated in the bottle but it appears to be incomplete and broken off at the lip. It has a 1 1/8-inch (2.85 cm) pontil.

008

The bottle is 11 ½ inches (29.21 cm) in height, with the body measuring 8 inches (20.32 cm), the neck 2 5/8 inches (6.66 cm) and the lip measures 1 inch (2.54 cm). The base is 3 1/8 inches in diameter and the neck is 1 1/8 inches (7.93 cm) in diameter. It has a 1 1/8-inch (2.85 cm) pontil. With its contents it weighs 1187.4 grams. It is sealed with a ¾-inch-diameter (1.90 cm) cork that matches the bore diameter. The finish is a Fike 2.2 double oil or mineral and it has a 3.20 round basal profile.

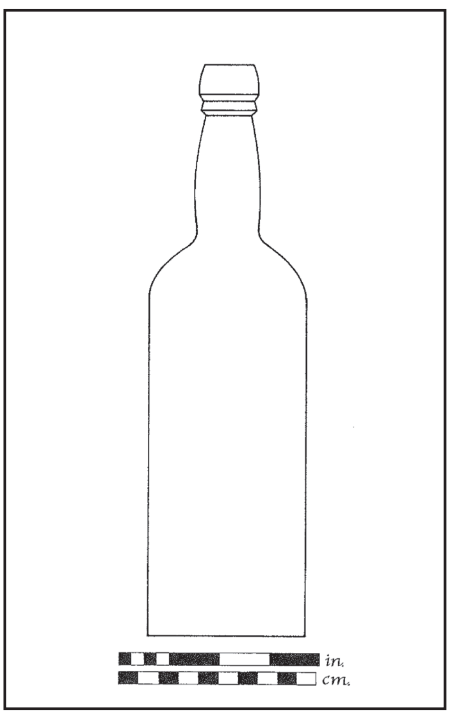
The bottle was excavated and recovered with its liquid contents intact, although the cork was partially broken, suggesting it had extruded at some stage and the extruded portion had broken off. The bottle has a 7-inch (17.78 cm) air bubble, that is, it is less than half full. The liquid on recovery was clear at the top of the bottle and darker at the bottom, suggesting contamination by seawater. There was a slight bubbling of contents on recovery due to the change in ambient pressure.

013

This bottle was recovered from a stratum of clean but denser sand forward of the wine crate and at a level above it. The bottle was found up against the bulkhead, tipped with its neck down and base angled up. It has the appearance of having been removed from its original context and subsequently washed by surge deeper into the forepeak. Like the other bottles, it was corked and retained its liquid contents. The cork was slightly displaced. Unlike the other bottles, this artifact is embossed, "Patent" on the shoulder and "P&R Bristol" on the base.

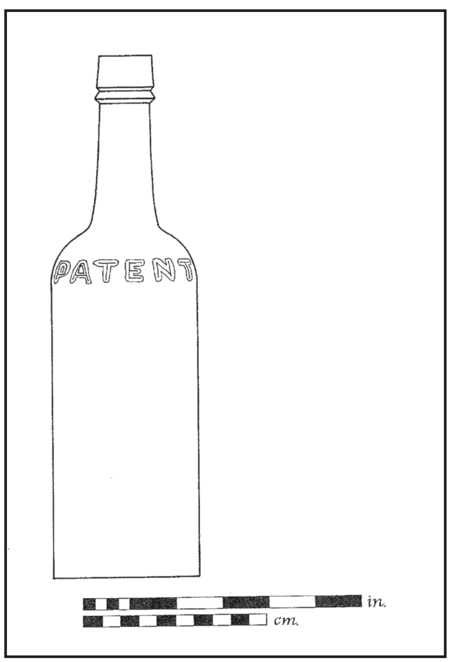
The bottle is 11 3/8 inches (28.89 cm) in height, with the body measuring 7 5/8 inches (19.36 cm), the neck 2 ¾ inches (6.98 cm) and the lip 1 inch (2.54 cm). The base is 3 1/8 inches (7.93 cm) in diameter and the neck is 1 1/8 inches (2.85 cm) in diameter. With its contents it weighs 1495.0 grams. It is sealed with a ¾-inch-diameter (1.90 cm) cork which matches the bore diameter. The finish is a Fike 2.2 double oil or mineral and it has a 3.20 round basal profile. There is a seam around the shoulder and two seams running up the neck. This black glass bottle is an excellent example of the three-piece or "Ricketts" type mold, which "consisted of a cylindrical one-piece mold part that formed the body of the bottle and two open-and-shut mold parts that formed the shoulder and sometimes the neck of the bottle (Jones 1986: 86). Introduced in 1821 by Henry Ricketts of Bristol, England, this type of bottle is well known archaeologically.

The embossing indicates that the bottle was manufactured not only using the Ricketts patent but by his successor firm following his retirement in 1852. From 1854 to 1857 the firm was known as Powell Ricketts & Filer and from 1858 to 1923 it was known as Powell & Ricketts (Jones 1986: 99). The marking on this base indicate it is a Powell & Ricketts bottle, manufactured after 1858. It was



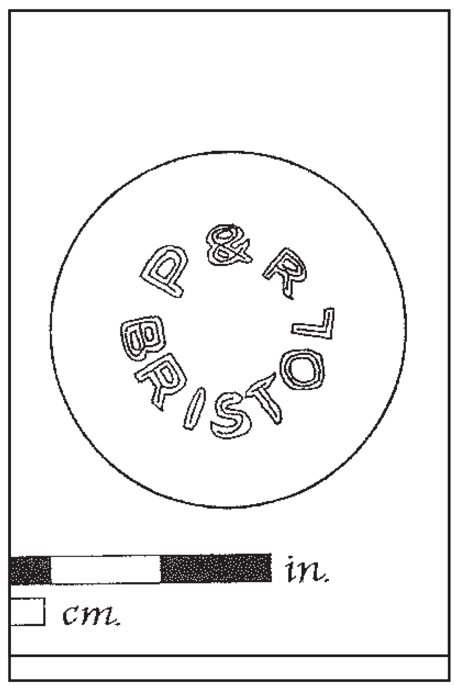
Jack Scott

Figure 70: Bottle MC 1864 2011-008.



Jack Scott

Figure 71: Bottle MC 1864 2011-013, with its "Patent" embossing on the shoulder and neck and lip and string rim details.



Jack Scott

Figure 72: Embossed "P & R BRISTOL" on the base of MC1864-2011-0013.

a relatively new bottle when lost in the sinking of *Mary Celestia* in 1864.

Analysis of the Contents

"Black glass" bottles are generally classified as "alcoholic beverage bottles" archaeologically because the contents can vary. As McDougall (1990) notes, "In short, the specific contents of the majority of black glass bottles cannot be stated for certain at the time of their deposition, but wine, porter, ale, brandy, distilled spirits, or liqueurs are the most likely prospects" (59). The Government of Bermuda determined that analysis of the contents of bottles will be undertaken by Professor Pierre-Louis Teissedre, Professor of Oenology at the University of Bordeaux's Institute of Wine and Vine. That analysis was not complete at the time of this report's writing.

Cologne

As previously noted, one bottle, corked with liquid contents and embossed MURRAY & LANMAN No. 69 WATER ST NEW-YORK (MC-1864-2011-014), was recovered with Feature 3. This type of bottle has been recovered from a number of nineteenth and early twentieth archaeological sites, and with this specific embossing its dates of manufacture can be dated to 1835-1871. "Murray and Lanman's Florida Water appears to have been the best known of the brand-name Florida waters. Bottles for this brand are found more often than any other on archaeological sites in Canada and the United States" (Sullivan 1994:88). It is also well known to bottle collectors (Fike 1987:244).

Notes on the Bottle

An individual example of this type of bottle was recovered, corked and sealed with liquid contents. After recovery, when weighed in the laboratory, it weighed 493.3 grams. The liquid at the time of recovery was observed to be a yellow/green with a dark residue on the sides of the bottle. The cylindrical bottle is tall, with a long, narrow neck that tapers to an oil finish lip. Two seams run from the base to the top; the lip is applied. The bottle is 9 inches (22.86 cm) tall, with a diameter of 2 ¼ inches (5.71 cm) at the base and a ¾-inch (1.90 cm) diameter at the lip. The body is 4 7/8 inches (12.38 cm) high and the neck is 3 inches (7.62 cm) high, with the remaining height formed by the lip. The finish is a Fike 2.11 Ring or Oil. The base has a rounded heel but does not have a pontil. It has a Fike 3.20 Round basal profile. The side of the body of the bottle is vertically embossed as noted above.

This bottle was manufactured using a two-piece mold with separate base. The two-piece mold with separate base manufacturing method dates to c. 1850. It was the most commonly used mold during the late nineteenth and early-twentieth century, supplanting all other forms of bottle manufacture until it was replaced by the automatic method c. 1920 (Jones et al. 1985:28). This mold has two halves that are hinged at the side with a separate piece that forms the base. The finish is the only part of the bottle produced by hand (Jones et al. 1985:28).

Historical Context

Florida Water is a specific eau de cologne of American origin, and dates to February 1808 when Robert J. Murray of New York opened a drugstore at 313 Pearl Street in Manhattan. In 1817 he was joined by his brother Lindley Murray, and as of 1820 they had relocated to the corner of Fulton and Pearl at 263 Pearl. Robert Murray retired in 1829. In 1835 Lindley Murray was joined by a partner, David T. Lanman, and as "Murray & Lanman" they operated at No. 69 Water Street (except for a year-long move after a December 1835 fire destroyed their street and building). Relocated to No. 69 Water, the firm remained there until 1871. In 1849, two years after Lindley Murray died, the company's name was changed to "David T. Lanman & Co." In 1853, a new partner, George Kemp, joined and the firm operated as "D.L. Lanman &

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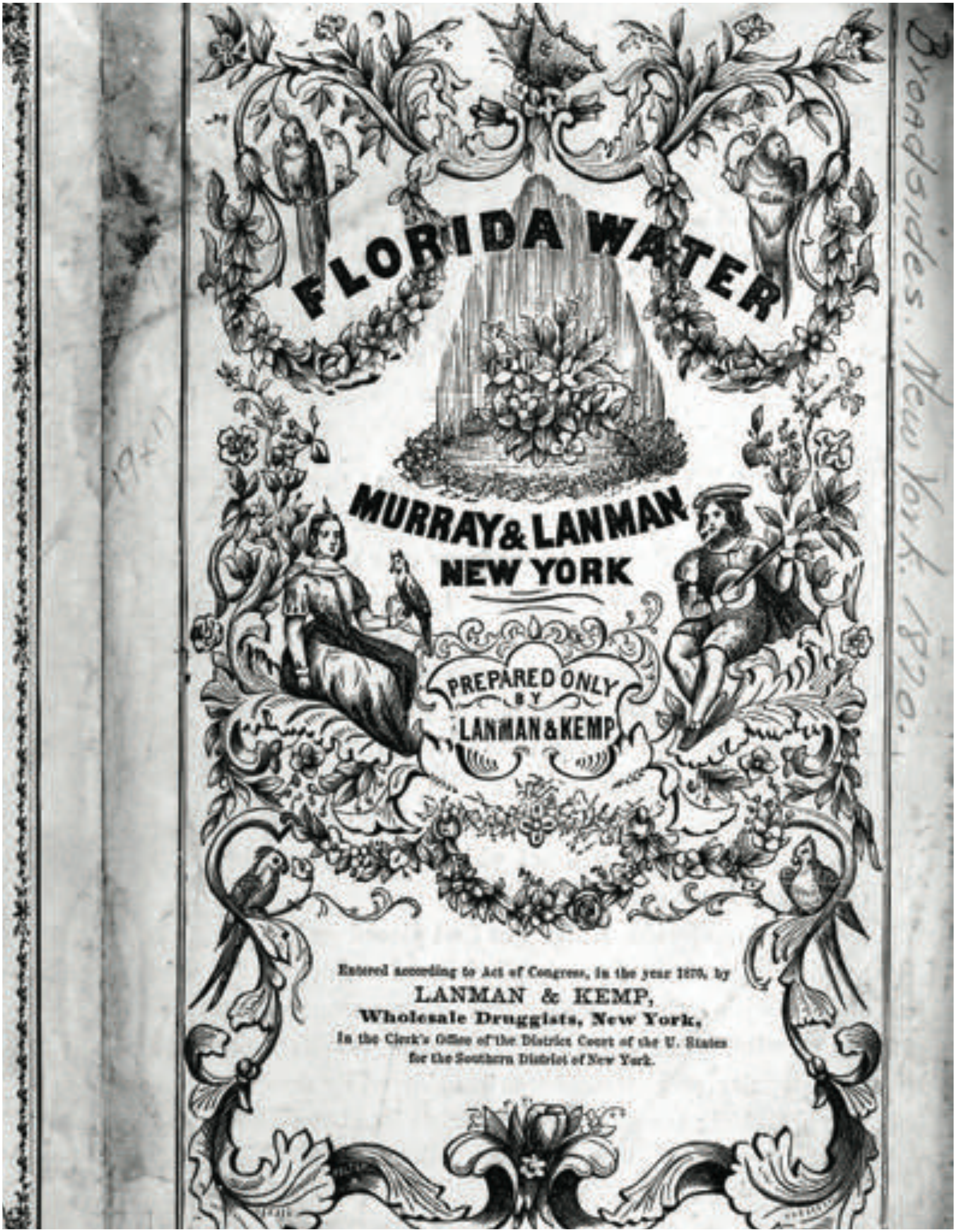
Figure 73: Wayne Lusardi in the laboratory, documenting MC-1864-2011-014, the Florida Water Bottle, and the bottle as documented.



Rubenstein Rare Book and Manuscript Library, Duke University

Figure 74: Murray & Lanman Florida Water advertisement.

NOAA/Tane Caserley

Figure 75: Two views of the empty wooden box, possibly a perfume crate, found inside the forepeak in this position and condition.

Kemp" from 1858 until 1861 until it shifted to the simpler name of "Lanman & Kemp."

In 1871, Lanman and Kemp moved to No. 68 Williams Street. While the name would change again in the twentieth century, Lanman & Kemp continued to sell their most popular product, Florida Water, under the firm's original (and well known) brand name of Murray & Lanman. After a century and a half in Manhattan, the firm relocated to New Jersey in 1957, where it remains in business to this day (Murray & Lanman 2011). It continues to manufacture and sell Florida Water in glass bottles of nearly identical size and shape as found inside the forepeak of *Mary Celestia*, but with a different embossed label. While best known today for its Florida Water, in the nineteenth century the firm was a pharmaceutical wholesaler that marketed its own patent medicines as well as the products of others, and also imported drugs, including opiates, from around the world. Its international business relationships were global, including purchasing drugs and medicinal products, spices, gums and incense from Southeast Asia, South America and Turkey, and extensive business relationships in England, especially with major financial backers in English banking houses.

The firm expanded throughout the eastern United States and began shipping its product to the Caribbean, Mediterranean, South America and Central America, and to the Pacific coast in the 1850s, with an exclusive agent, S.C. Shaw, in San Francisco as of 1860. The Latin American market was supplied by a laboratory and agency opened in Havana, with the product marketed as "Agua de Florida."

Florida Water was advertised in the nineteenth century for a variety of uses:

> *We have the choicest fragrance of flowers, fresh and invigorating as from a bouquet newly culled. The hot and feverish head, bathed with it, becomes cool and easy. The temples laved with it, relieves the racking nervous headache. Poured into the water of the bath, the weary body and overtaxed brain emerges fresh and vigorous. Inhaled from the handkerchief, it imparts the most exquisite enjoyment, and sprinkled in the sick-room it soothes and relieves the restless invalid (New York Historical Society, 1880).*

Florida Water as an eau de cologne was a "citrine bouquet in which the orange flower predominates," usually achieved by "combining such citrus scents as bergamot, neroli, orange flower and lemon" (Sullivan 1994:79).

The formula of Murray & Lanman's Florida Water was a trade secret. A nineteenth century account, however, provides an approximation:

The exact formula by which the M. & L. Florida is made is not likely soon to become known. However, the following is said to furnish an approximate article:

Oil of lavender.................................4 oz.
" bergamot..................................4 "
" cinnamon..................................2 dr.
" neroli.......................................2 "
" cloves.......................................1 "
Pure grain musk..............................4 gr.
Cologne spirit, 95 per cent..................1 gal.
(The Druggist 1883:158)

Perfume

A single one-ounce bottle of perfume (MC 1864-2011-003) was also recovered. Embossed PIESSE & LUBIN LONDON, it was the product of that firm, which sold its products from its shop at No. 2 Bond Street. Anecdotal accounts of other perfume bottles being recovered from the wreck suggest that originally the sole bottle may have been part of crate or box of perfume. The bottle was recovered lying loose next to an empty box lying on its side, without a top, on what had been the deck of the compartment. The box was surrounded by and filled with loose, clean sand, not the undisturbed black sediment-stained sand found in half of the wine crate, which suggests that during more recent sand-removing events the box had been exposed and opened, and its contents, perhaps the perfume bottles, were then removed.

Notes on the Bottle

An individual example of this type of bottle was recovered, and was sealed with liquid contents. After recovery, when weighed in the laboratory, it weighed 136.1 grams. The liquid at the time of recovery was observed to have a yellow tint and some sediment was observed inside the bottle. The rectangular bottle has a short narrow neck with a prescription lip. The bottle is sealed with a glass stopper. The stopper is of the "disc" style, which consists of a vertically oriented, flat, circular finial with a ground tapered shank (Jones et al. 1985:155). Subsequent to the excavation, Rouja recovered two additional, identical perfume bottles that had been removed from the wreck by visiting divers in prior years.

The excavated bottle was manufactured using a two-piece mold with separate base. The two-piece mold with separate base manufacturing method dates to c. 1850. It was the most commonly used mold during the late nineteenth and early-twentieth century supplanting all other forms of bottle manufacture until it was replaced by the automatic method c. 1920 (Jones et al. 1985:28). This mold has two halves that are hinged at the side with a separate piece that forms the base. The finish is the only part of the bottle produced by hand (Jones et al. 1985:28).

The bottle is 3 3/4 inches (9.52 cm)

tall, with the main body being 2 ¼ inches (5.71 cm) in height, a length of 1 5/8 inches (4.12 cm) and a width of 7/8 inches (2.22 cm). With the stopper, the bottle is 4 ¼ inches (10.79 cm) in height. The neck is 1 ½ inches (3.81 cm) in height, with a one-inch-diameter (2.54 cm) lip. The top of the stopper measures ¾ by 3/8 inches (1.90 by .95 cm). The front of the body of the bottle is horizontally embossed as noted above, with a small circular impression embossed below "London." This impression may be an Imperial crown.

Archaeological documentation of this type of bottle includes an intact, empty (without stopper) example excavated from a nineteenth century rubbish pit at the former Arrowtown Emporium site in 38 Buckingham Street in Arrowtown, Otago, New Zealand. (Brooks et al. 2010: 14)

Historical Discussion (David Pybus)

One of the names on the perfume bottle found at the site, Lubin, is a very famous name in French perfumery. Now based at 21 Rue Des Canettes in Paris, Lubin has been court perfumer to the Russian, French and British aristocracy. Lubin as a name is also a town in southwestern Poland, and it may well be that some two hundred years ago people hailing from that area took its name.

Pierre Francois Lubin created his perfume house in 1768 at Rue St. Anne in Paris, just after the French Revolution. He initially created perfumed ribbons, ball masks and fragrant rice powders for his growing list of customers, but then his Eau Vivifiante, soon to be famed as "Eau De Lubin," won approval at the Imperial Court, and he was soon supplying Empress Josephine and Pauline Bonaparte, among others. When the Bourbon monarchy was restored, Pierre focused on Queen Marie Emélie as his prize client. In 1830 he added the American eagle to the list of coats of arms he supplied, since it was then that Pierre Lubin began to conquer the New World from the Francophile capital of New Orleans, Louisiana. The present company lists among its perfumes Gin Fizz, Nuit de Longchamps, L de Lubin, Eau Neuve, Figaro, Le Vetiver, Inédite, Bluff, Itasca and Idole.

"Lubin" and "Piesse and Lubin" are, however, two very different companies. Speaking with the present owner, Gilles Thevenin, it would seem that a business man with the name of Lubin, unrelated to Pierre, teamed up with a British chemist, also of some fame in the world of perfumery, in an effort to cash in on the twin great names of fragrance, one genuine (Piesse), the other a kind of shadow company trading on the fame and acknowledged quality of the real Lubin. Their shop was in New Bond Street, London, and was closed around 1925. An advertisement taken out in the Illustrated London News in 1897 had them at 2, New Bond Street, selling "synthetic scents." (Figure 79)

In " The Art Of Perfumery, And Method Of Obtaining The Odours Of Plants" printed in 1857 by George William Septimus Piesse (published by Lindsay and Blakiston of Philadelphia, hence the U.S. spelling), our second name appears, and has the following to say with regard to the making of perfumes just seven years before the foundering of *Mary Celestia*:

Although very fine Eau de Cologne is often made by merely mixing the ingredients as indicated in the recipe as above, yet it is better, first, to mix all the citrine ottos with spirit, and then to distil the mixture, afterwards adding to the distillate the rosemary and nerolies, such process being the one adopted by the most popular house at Cologne.

A great many forms for the manufacture of Eau de Cologne have been published, the authors of some of the recipes evidently having no knowledge, in a practical sense, of what they were putting by theory on paper; other venturers, to show their lore, have searched out all the aromatics of Lindley's Botany, and would persuade us to use absinthe, hyssop, anise, juniper, marjoram, caraway, fennel, cumin, cardamom, cinnamon, nutmeg, serpolet, angelica, cloves, lavender, camphor, balm, peppermint, galanga, lemon thyme, &c. &c. &c.

All these, however, are but hum—! Where it is a mere matter of profit, and the formula that we have given is too expensive to produce the article required, it is better to dilute the said Cologne with a weak spirit, or with rose-water, rather than otherwise alter its form; because, although weak, the true aroma of the original article is retained.

The recipe of the second quality of Eau de Cologne is given, to show that a very decent article can be produced with English spirit.

Flowers of Erin
Extract of white rose
(see White Rose)............................1 pint
" vanilla……………………………………1 oz.
Royal Hunt Bouquet
Esprit de rose triple,………………1 pint.
" neroli…………………………………}
" acacia…………………………………}
"fleur d'orange…………} of each 1/4"
" musk...}
" orris,..}
" tonquin,..1/2"
Otto of citron ....2 drachms.
Bouquet de Flora; otherwise,
Extract of Flowers.
Esprit de rose………………………..}
" tubereuse…from pomade, of each, 1 pint.
" violette..……………………………}
Extract of benzoin…………......1-1/2 oz.
Otto of bergamot...................................2"
" lemon..} 1/2"
"orange...} of each
The Guards' Bouquet
Esprit de rose,……………………2 pints.
" neroli………………………………1/2 pint.
Extract of vanilla..……………………2 oz.
"fleur d'orange…………} of each 1/4"
" orris...2"
" musk,..1/4pint.
Otto of cloves,..........................1/2 drachm.
Fleur d'Italie; or Italian Nosegay
Esprit de rose, from pomade,………2 pints.
" rose triple,……………………………1 pint.
" jasmine……………………………..}
" violette…………} from pomade, each, 1"
Extract of cassie,...............................1/2"
" musk,...}
" ambergris................................} of each
Jockey Club Bouquet (English formula.)
Extract of orris root,………………2 pints.
Esprit de rose, triple,…………………1 pint.
" rose de pomade,………………………1 pint.
Extract of cassie,......................................}
" tubereuse,..........} depomade, of each 1/2"
" ambergris..1/2"
Otto of bergamot,............................1/2 oz.
Eau de Cologne (First Quality)
Spirit (from grape),
60 over proof,............................6 gallons.
Otto of neroli, Petale,…………………3 oz.
" "Bigarade,…………………………1"

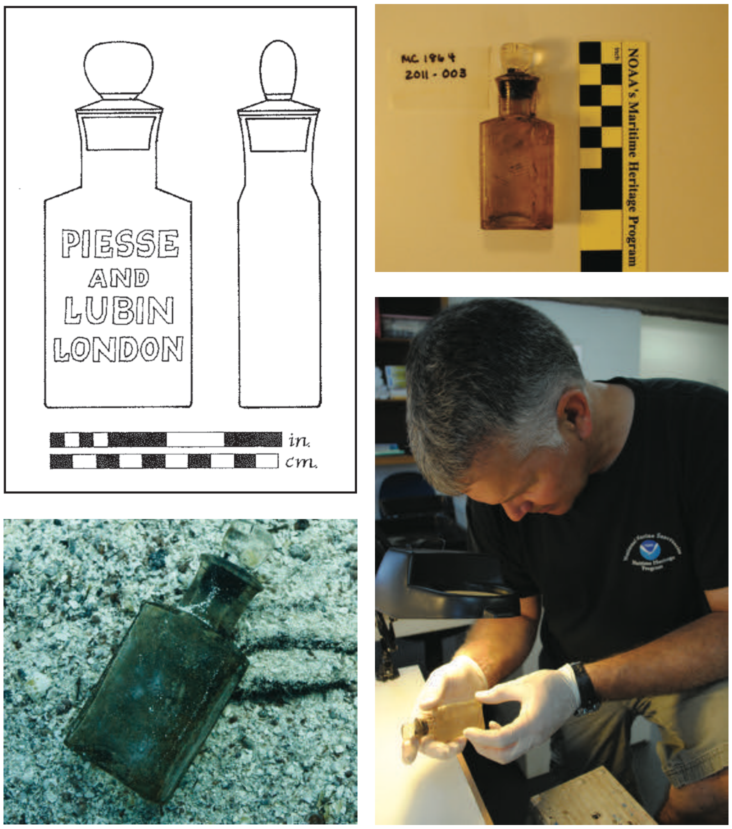


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Figure 76: MC-1864-2011-003, The Piesse & Lubin Perfume Bottle.

Fotolibra

Figure 77: 1865 advertisement for Piesse & Lubin.

" rosemary,..2"
" orange-peel,...5"
" citron-peel,...5"
" bergamot-peel,....................................2"

Septimus Piesse goes further:

Independently of the materials employed being different to the original English recipe, it must be remembered that all the French perfumes are made of brandy, i.e. grape spirit; whereas the English perfumes are made with corn spirit, which alone modifies their odor. Though good for some mixtures, yet for others the grape spirit is very objectionable, on account of the predominance of its own aroma.

We have spoken of the difference in the odor between the English and French spirit; the marked distinction of British and Parisian perfumes made according to the same recipes is entirely due to the different spirits employed. Owing to the strong "bouquet," as the French say, of their spirit in comparison with ours, the continental perfumers claim a superiority in the quality of their perfumes. Now, although we candidly admit that some odors are better when prepared with grape spirit than with that from corn spirit, yet there are others which are undoubtedly the best when prepared with spirit derived from the latter source. Musk, ambergris, civet, violet, tubereuse, and jasmine, if we require to retain their true aroma when in solution in alcohol, must be made with the British spirit.

All the citrine odors, verveine, vulnerary waters, Eau de Cologne, Eau de Portugal, Eau d'Arquebuzade, and lavender, can alone be brought to perfection by using the French spirit in their manufacture. If extract of jasmine, or extract of violet, &c., be made with the French or brandy spirit, the true characteristic odor of the flower is lost to the olfactory nerve—so completely does the œanthic ether of the grape spirit hide the flowery aroma of the otto of violet in solution with it. This solves the paradox that English extract of violet and its compounds, "spring flowers," &c., is at all times in demand on the Continent, although the very flowers with which we make it are grown there.

On the contrary, if an English perfumer attempts to make Eau de Portugal, &c., to bear any comparison as a fine odour to that made by Lubin, of Paris, without using grape spirit, his attempts will prove a failure. True, he makes Eau de Portugal even with English corn spirit, but judges of the article—and they alone can stamp its merit—discover instantly the same difference as the connoisseur finds out between "Patent British" and foreign brandy.

Perhaps it may not be out of place here to observe that what is sold in this country as British brandy is in truth grape spirit, that is, foreign brandy very largely diluted with English spirit! By this scheme, a real semblance to the foreign brandy flavour is maintained; the difference in duty upon English and foreign spirit enables the makers of the "capsuled" article to undersell those who vend the unsophisticated Cognac.

Some chemists, not being very deep in the "tricks of trade," have thought that some flavouring, or that œanthic ether, was used to impart to British spirit the Cognac aroma. An article is even in the market called "Essence of Cognac," but which is nothing more than very badly made butyric ether.

On the Continent a great deal of spirit is procured by the fermentation of the molasses from beet-root; this, of course, finds its way into the market, and is often mixed with the grape spir-

it; so, also, in England we have spirit from potatoes, which is mixed in the corn spirit. These adulterations, if we may so term it, modify the relative odors of the primitive alcohols.

Piesse was a businessman, and in times when there was no copyright protection it would naturally be foolish to give away complete formulas in a book for competitors to simply copy. In the Parisian perfumer Eugene Rimmel's book some ten years after Piesse's masterpiece, he noted that there were more than 60 perfume houses in London alone, the well-known ones being Yardley and Crown Perfumery. In particular, there are still two mysteries in the world of perfumery regarding George William Septimus Piesse:

1) Did he know of and use ylang ylang in some of his formulations?

2) What was the basis of his opoponax perfume?

Eugene Rimmel, a great competitor of Piesse, publicized ylang ylang (flower of flowers) at the 1867 Paris Universal Exhibition and formulated with it later. However, his book of 1865 makes no mention of it as an essential oil used in perfumery. In Paris, Rimmel exhibited the flower preserved in glycerin, while others exhibited the distilled essence of ylang ylang and cananga. He named it from its local moniker, "ihlang-ihlang." Ylang ylang was however, first distilled in Manila for the perfume industry and was already known to British perfumers. The British Islands in the Indian Ocean, such as Reunion and Mauritius, also had copious amounts of the flower. It was, with coconut or palm oil, the base of the Victorian "Macassar hair oil," which was a modern precursor to brilliantines, such as Brylcreeme©, used for softening and grooming men's hair.

So named because its provenance originally was thought to be Macasar in then Dutch Indonesia and because this oily substance transferred to the backs of Victorian furniture, antimacassars, or small crocheted mats, were placed judiciously around Victorian parlors. It would be of great interest to the perfume world if the sample found was analyzed to have ylang ylang in the formula. This may particularly be the case for Frangipani.

Piesse also makes mention in his later works of the plumeria flower – the common name for which is Frangipani, a species called champa in India. Nag champa is an Indian scent that is famously used as an incense. Nowadays it is especially associated, alongside musk and patchouli, with the hippie counter-culture community. Many champa incenses also include plumeria as an ingredient, harnessing its rich, sweet, heavy scent. Nag champa also traditionally includes a resin extracted from the Ailanthus tree, an Asian native, reminiscent of sandalwood. It has a rich, heavy, earthy aroma. If Celestine contains plumeria, we should be able to detect it.

Looking now at opoponax, we see that on his trademarked musk label he calls the concentrated essence of opoponax "a native plant of Sicily." We have to recall that Piesse in his trade also dealt with other perfumers, and sold bases for their use. Again he would have wanted them to trade directly with him and not go to the source (where it would be considerably cheaper). So there may have been some subterfuge in the naming. But assuming the source is correct, what do we find in Sicily today?

But how does one go to Sicily looking for a native plant called opoponax? Opoponax chironium, also known as sweet myrrh or bisabol myrrh, is an herb that grows 1-3 feet high and produces a large yellow flower. Chiron, in Greek mythology, was a centaur famed for his knowledge of medicines through herbs and other plants. The name opoponax comes from an ancient Greek phrase meaning "plant juice." The plant thrives in warm climates around the Mediterranean and farther afield but also grows in cooler climates.

A resin can be extracted from opoponax by cutting the plant at the base of a stem and sun-drying the juice that flows out. This highly flammable resin can be burned as incense to produce a scent somewhat sweet balsamic and lavandaceous/herbal/grassy. What is interesting to perfume historians is that opoponax has been shown to have various coumarins in its makeup, and it may be that Piesse employed their unusual aroma in some of his formulations.

Coumarin is a fragrant aroma chemical found in many plants, notably in high concentration in tonka beans, which Piesse used in formulations, and also in sweet woodruff, mullein and cassia. The sweet odor is strongly reminiscent of new-mown hay- very appealing to human species. It was not until it was synthesized by W.H. Perkin in 1868 that it grew in use as an essential cornerstone aroma in perfumery. Fougere Royale was created using it in 1882 and since that time coumarin has been fundamental to the fougère perfumery accord together with lavender and bergamot oils. We will be able to detect coumarins in the lost perfume.

In a recent blog one Romanian perfumer attempted to put down the framework for opoponax, although it is not known where he got a sample from, if he did at all. Perhaps it is just conjecture. Anyway, the structure he gave (without percentages) is:

- Opoponax res.
- Vanilla res.
- Fève tonka res.
- Lemon oil
- Bergamot oil
- Mandarin oil
- Patchouli oil
- Civet abs. 10 percent
- Jasmin Egypte abs.
- Rose de Mai abs 10 percent
- Orris conc. 1 percent
- Olibanum res 10 percent

In many respects, which I have outlined, Piesse may have been a perfume pioneer in more ways than one. George William Septimus Piesse was born in 1820 and died in 1882. In 1879 Piesse described himself in the fourth edition of his book (published by Longmans) as an analytical chemist, and author of "Chemical, Physical And Natural Magic" and "The Laboratory of Chemical Wonders" amongst others. The scents of Piesse and Lubin listed by year from their adverts in the *Illustrated London News* were:

- Ambergris, 1873
- Frangipani, 1873
- White Rose, 1873
- Opoponax, 1873
- Hungary Water, 1873
- Orange for Weddings, 1873
- Kiss Me Quick 1873
- The Flower of the Day, 1873

Prior to these dates, and in particular seven years earlier in 1864 when *Mary Celestia* sank, it is likely that our mystery bottle was one of the eight fragrances listed above and dated 1873. It takes time to develop a perfume and to establish its name and following. Over one hundred and fifty years ago, perfume creation and sale did not have the market "effervescence" of today, with designer fragrances and celebrity scents launched by the hundreds every year.

Further in his book George William Septimus Piesse gives the probable core recipes for at least three of his eight marketed fragrances at that time:

Hungary Water
Rectified alcohol,………………1 gallon.
Otto of English rosemary,……………2 oz.
" lemon-peel,…............……………..1 oz.
*" balm (*Melissa*)……..…………...........1 oz.*
" mint,....................................1/2 drachm.
Esprit de rose,..................................1 pint.
Extract of fleur d'orange,......................1"
Essence of White Rose
Esprit de rose from pomatum……..1 quart.
" " triple………….....................................1"
" violette…..............………….............1"
Extracts of jasmine.........................1 pint.
" patchouly...1/2"
Extrait d'Ambre. (Ambergris)
Esprit de rose triple,…..................1/2 pint.
Extract of ambergris,.............................1"
Essence of musk,................................1/4"
Extract of vanilla,.........................2 ounces.

Of the other named perfumes, Frangipani was originally the name of an Italian perfume used to scent gloves in the 16th century and named after its creator, Marquis Frangipani. So the story goes, when the subtropical "frangipani" flower was discovered, its natural perfume reminded people of the scented gloves, and so the flower was called frangipani. However, for Piesse it may have been a formulated mix that also included ylang ylang.

From the Piesse and Lubin brand names alone, three are definite core florals (*White Rose, Frangipanni (possibly ylang ylang) and Flower of the Day* (possibly plumeria); two are colognes (*Orange for Weddings and Hungary Water*); two are of sweet incense-amber variety (*Ambergris and Opoponax*); and in one, *Kiss Me Quick*, the core content cannot be immediately ascertained by the name.

Now there seems to have been another Piesse on the scene around this time – a Charles Piesse, purportedly another perfumer from Paris (or Nice!). He worked on a theory linking aromatic notes with musical notes. In his book "Des odeurs," Charles Piesse claimed, "there is an octave of odours, as there is an octave of notes." Charles set out in musical notation a range of six and a half octaves, every note of which had its own perfume, from patchouli on the lowest C on the piano to civet at its highest F. He proposed that bouquets ought to be grouped like the notes of a chord, and described the chord C–E–G–C as that of the aromas of geranium, acacia, orange-flower and camphor.

An effective bouquet of fragrance, he believed, could be created by choosing the odors that corresponded to a harmonious musical chord. Modern descriptions of perfumes refer to three layers of notes: the head or top note (the initial scent), the heart or middle note (the core of the fragrance), and the soul or base note (the long-lasting aromas that add to the character of the scent and are the last to disappear). By this description, Charles Piesse set the foundation for the method of detailing a fragrance's character by its volatile oils, a practice that is extant in the perfume industry today.

A 1891 book (fifth edition) on *The Art Of Perfumery And The Methods Of Obtaining The Odours Of Plants; The Growth And General Flower Farm System Of Raising Fragrant Herbs; With Instructions . . . Dentifrices*, published by D. Van Nostrand Company, New York, had the joint authorship of G.W. Septimus Piesse and Charles Henry Piesse, so there was a clear relationship between the two– probably father and son. The book's source was stated to be the "Piesse and Lubin" company.

The British Company Piesse and Lubin were sued by the then owner of the original French Lubin, the Prot family. Two of Lubin's present shareholders are descendants of the Prot family, who owned Lubin from 1844 until 1970. They mentioned to me that their ancestors had to deal with a considerable amount of counterfeiting attempts from others. Among these counterfeiting firms were "Piesse & Lubin" from London and "Claudius Lubin" from Lyon in France.

So we have a perfume bottle that is not quite what it seems, as it is unlikely the perfume had the quality of an original Lubin fragrance. It would seem that copycats and counterfeiters were around in the scent business even one hundred and fifty years ago.

Analysis of the Contents (Isabelle Ramsay-Brackstone, Jean-Claude Delville and Lionel Nesbitt)

In April 2013, the non-archaeologically recovered pair of bottles was hand-carried to the laboratories of Drom Fragrances in New Jersey, where they were opened and their contents analyzed by a technical team. Bottle 1 appeared to be "intact" in both appearance and content, with a small air pocket between the glass stopper and the liquid. Bottle 2 had a larger air pocket and therefore appeared to be missing about 15 mL of its contents. The liquid in Bottle 2 was slightly darker than Bottle 1, with traces of black sediment residue in the bottom of the bottle. The liquid in both bottles was distinctly light yellow in color and perfectly clear. The glass stoppers appeared to be cemented and held firmly within the necks of the bottles. A thin dark line showed at the upper edge where the stopper merged with the neck and lip of the glass bottles. The neck was perfectly clean in Bottle 1, while there appeared to be some dried residue on the neck of Bottle 2. Both bottles were recovered from the shipwreck with the same level of liquid inside; it therefore appears that Bottle 2 likely developed a small leak post-recovery and some material evaporated, dried and calcified at the point of the leak. Fortunately, it appears that this "calcification" effectively resealed the bottle, but perhaps not before introducing some exchange of fresh or new air to the bottle. This egress of "fresh air" may have caused some minimal oxidization in specimen two and might account for the black residue inside, as well as the more pungent, or oxidized, smell or tone of the contents.

The thin mineral buildup on both necks may have been the result of submersion over the last 150 years and is most likely either a depositional or weathering product, reflecting the action of calcifying marine microorganisms or glass deterioration, respectively. Glass is not impervious to water. Over time and under pressure, it will allow some penetration of water, leading to glass deterioration. Glass objects of this period, especially if they are in salt water, can develop fine films of hydrated silica on their surface as the networks of glass are slowly broken down.1 The development of such silica films may have in fact contributed to the long-term preservation of the contents as they potentially filled any gaps in the seal between the neck and the ground-glass stopper and certainly more securely held the stopper in place.

Both bottles were easily opened after these mineral deposits were carefully removed from around the glass stopper at their necks. Upon opening each bottle, a small amount (5 mL) of liquid was removed by pipette. This was transferred to a small glass vial and sealed with an inert cap by a lab technician. The glass bottles were then instantly resealed with their original glass stoppers. The vials were labeled Specimen 1 and Specimen 2 and quickly made available for human analysis by olfactory experts, perfumers, and technological analysis by mass spectrometer and gas chromatograph. Olfactory analysis was carried out in the standard fashion: dipping a perfume blotter into each specimen vial until lightly coated with liquid, then waving it or passing it both at a distance and then progressively closer to the nose. The smells were instantly assessed, described and noted. Simultaneously, 1 mL of liquid was taken via pipette from each of the specimen vials and transferred to an Agilent 5975C mass spectrometer via standard dipping stick and analyzed for chemical qualification via an Agilent 6890 dual column flame ionization detector gas chromatograph.

Olfactory Results

Specimen 1 smelled principally of rotten orange, bergamot and grapefruit, with some background notes or impressions of rose and geranium. Specimen 2 had a more pronounced smell than Specimen 1, giving similar rotten citrus impressions, but also containing a strong, lasting and eventually overwhelming note of hydrogen sulfide. Animalic notes of ambergris, civet and castoreum were also perceived. Some floral notes of neroli, orange flower, orris and geranium could be perceived, as well as woodsy notes of bois de rose, sandalwood, vetiver and benzoin. Ambery notes of opoponax, styrax, labdanum resinoid and incense were also recognized. Both specimens had top note impressions of orange oil and petitgrain. The middle notes were perceived to be of natural rose and geranium. An orange flower absolute with traces of civet or ambergris tincture were recognized in the dry down.

Chemical Analysis Results

A comparison of the results for both specimens from the mass spectrometer and gas chromatograph revealed that the chemistry of the fragrances inside were exactly the same. It is important to note that the results make it absolutely clear that there had been no egress of salt water in these bottles, which would have registered on the chromatograph or affected the pH. In short, the researchers did not chemically detect the presence of salt water in the samples. The citrus portion of the fragrance may have broken down or been distilled in a manner that most facilities do not use in contemporary perfumery. There was no presence of myrcene or p-cymene. A large quantity of p-cymene would indicate citrus breakdown. Based upon the terpinenes found, as well as the amount of limonene, it is clear that a combination of lemon and mandarin was used. Limonene was added to balance the difference between the formula and the target. It is very possible that the original sample contained grades of citrus oils that no longer exist. If the sample tested had revealed the presence of linalyl acetate, the researchers could have assumed that bergamot oil may have been the source of citrus in the fragrance; however, that ingredient was not found. The linalool therefore may have originally been derived from bois de rose or, possibly, another natural ingredient derived from rose oil. There is also a substantial amount of phenyl ethyl alcohol, which may have been derived from rose oil. The ethyl ether ingredients are breakdown products of the associated esters: linalyl ethyl ether, terpinyl ethyl ether, geranyl ethyl ether and α-terpinyl ethyl ether.

Table 3: Fragrance Formula for Specimen 1 and Specimen 2.

INGREDIENT	QUANTITY
Benzyl alcohol	3.50
Citronellol	30.00
Geraniol pure	55.00
Geranyl acetate 60	17.50
Geranyl ethyl ether	10.00
Lemon oil	55.00
d-Limonene	60.00
Linalool (synthetic)	142.00
Mandarin oil green extra	15.00
Nerol	25.00
Phenylethyl alcohol	90.00
Terpinen-4-ol	2.00
Terpineol	25.00
Total	**530.00**

Price 1948: 199-200

The hydrocarbon ingredients ethyl myristate, ethyl palmitate, ethyl heptadecanoate, ethyl stearate, ethyl oleate, ethyl linoleate and ethyl linolenate are usually associated with resins and absolutes. It is very possible that they are derived from rose oil. It is also possible that they may have been derived from an osmanthus absolute. Several acids (myristic, palmitic and steric) found in the sample are found in absolutes and resins as well. Ingredients from sulfury or blackcurrant oil were not found, despite the specimens' strong odor when the bottles were opened. However, that does not rule out that these ingredients were not used. It was not possible to determine which absolutes or resins were initially used in this fragrance as many of them contain similar ingredients. (Table 3)

At this time, the qualitative and chemical analysis of the fragrance found in *Mary Celestia* did not allow the researchers to determine the identity of the fragrance with certainty. The earliest reference of the collection of fragrances of Piesse & Lubin dates back to 1873. A review of the limited literature available about Piesse leads to the hypothesis that the fragrance contained in the bottles found was probably an ancestor or precursor to one or many of the fragrances listed as Piesse & Lubin's 1873 advertisement of fragrances. In the literature, it appears that Bouquet Opoponax was the most popular fragrance marketed by Piesse & Lubin at the time that *Mary Celestia* wrecked. According to Octavian Coifan, perfume historian (1000fragrances.blogspot.com), Bouquet Opoponax was launched around 1859 and was outstandingly popular. Piesse was a chemist with an excellent aptitude for marketing. He understood that describing fragrances by their olfactory "impressions," rather than by their actual ingredients, had much more appeal with his customers. According to Coifan, the ingredient description of Bouquet Opoponax (without percentages of each ingredient in the formula) was as follows:

Opoponax resin, vanilla resin, tonka bean resin, lemon oil, bergamot oil, mandarin oil, patchouli oil, civet absolute 10%, Egyptian jasmine absolute, rose de mai absolute, orris concrete 1%, olibanum resin 10%.

There is no doubt that the techniques and solvents used by Piesse to extract the oils, absolutes, concrete and resins, as well as the natural aging influences over the past 150 years, have altered the original chemical composition of the ingredients of the fragrance. Therefore, while the analysis of the samples performed by Drom may be at the leading edge of perfumery's technological ability, it is impossible to confidently determine the exact original chemical composition of all the ingredients that have come together to make up this fragrance. The results, however, leave the authors with no doubt that the chemistry of these perfume samples closely matches what one would expect to find based on the historic literature on Piesse's formulas and descriptions.

Shoe Last

A find from Feature 5, found mixed among the scattered wooden planks and probable shelving, was a single wooden "last" (MC 1864-2011-017). Lasts are foot-shaped forms on which leather was stretched and formed to make a shoe. They date to late antiquity, perhaps earlier, and remain in use to the modern day. Wood was (and is) a common material; the last recovered from the wreck of *Mary Celestia* is a hardwood last. The last (wet) weighs 918.4 grams; it measures 11 inches (27.94 cm) in length, 3 inches (7.62 cm) in height, and 3 5/8 inches (9.20 cm) at its widest point. There is a small 7/16-inch-diameter (1.11 cm) hole drilled through the last above the heel. While the wood is darkened, it does not appear to have been painted; the coloration is likely from corrosion staining of the wood and its water saturation. The last was also found in association with what was at least four shoes, with one pair MC 1864-2011-018) and two singles (MC 1864-2011-002 and MC 1864-2011-012). The intact bottoms of MC 1864-2011-018 perfectly fit the last, suggesting that they were associated and perhaps packed together, although whatever container they were in had subsequently broken apart and disintegrated.

NOAA/Tane Caserley and Jack Scott

Figure 78: MC 1864-2011-017, the wooden shoe last, oblique view of the bottom.

Historical Context

In an analysis of mass produced footwear, Anderson describes the development of shoe lasts as follows:

As late as 1860 most shoes were formed on "straight" lasts. This meant that the shape of the instep was not considered and no distinction was made between right and left feet. In addition, lasts came only in two width, "slim" and "wide." A piece of leather padding was simply placed over a "slim" last to made [sic] a wide shoe. During the Civil War "crooked" shoes as opposed to "straights" were developed (Anderson 1968: 59).


Library of Congress

Figure 79: A shoemaker working from a last, 1885.

In 1888 the Retail Boot and Shoe Dealers National Association established criteria for last sizes that are still used today (Anderson 1968:59). The last in the *Mary Celestia* collection appears to be a straight last.

A post-Civil War encyclopedia article describes the use of the last in shoe manufacture, noting that:

Till within recent times shoemaking was a pure handicraft; but now machinery effects almost every operation in the art. On the factory system all human feet are treated alike; in the handicraft, the shoemaker deals with the individual foot, and he should produce a boot which for fit, comfort, flexibility, and strength cannot be approached by the product of machinery. The shoemaker, after measuring the feet, cuts out upper leathers according to the size and pattern. These parts are fitted and stitched together by the "boot–closers"; but little of this closing is now done by hand. The sole "stuff" is next cut out and assembled, consisting of a pair of inner soles of soft leather, a pair of outer soles of firmer texture, a pair of welts or bands about one inch broad, of flexible leather, and lifts and top-pieces for the heels. These the "maker" mellows by steeping in water. He attaches the insoles to the bottom of a pair of wooden lasts, which are blocks the form and size of the boots to be made, fastens the leather down with lasting tacks, and, when dried, draws it out *with pincers till it takes the exact form of the last bottom. Then he "rounds the soles," by paring down the edges close to the last, and forms round these edges a small channel or feather cut about one-eighth of an inch in the leather. Next he pierces the insoles all round with a bent awl, which bites into, but not through, the leather, and comes out at the channel or feather. The boots are then "lasted," by placing the uppers on the lasts, drawing their edges tightly round the edge of the insoles, and fastening them in position with lasting tacks. Lasting is a crucial operation, or, unless the upper is drawn smoothly and equally over the last, leaving neither crease nor wrinkle, the form of the boot will be bad. The welt, having one edge pared or chamfered, is put in position round the side, up to the heel or "seat," and the maker proceeds to "inseam," by passing his awl through the holes already made in the insole, catching with it the edge of the upper and the thin edge of the welt, and sewing all three together in one flat seam, with a waxed thread. He then pares off inequalities and "levels the bottoms," by filling up the depressed part in the centre with a piece of tarred felt; and, that done, the boots are ready for the outsoles. After the leather for them has been thoroughly condensed by hammering on the "lap-stone," they are fastened through the insole with steel tacks, their sides are pared, and a narrow channel is cut round their edges; and through this channel they are stitched to the welt, about twelve stitches of strong waxed thread being made to the inch. The soles are now hammered into shape; the heel lifts are put on and attached with wooden pegs, then sewed through the stitches of the insole; and the top-pieces, similar to the outsoles, are put on and nailed down to the lifts. The finishing operations embrace pinning up the edge of the heel, paring, rasping, scraping, smoothing, blacking, and burnishing the edges of soles and heels, scraping, sand-papering, and burnishing the soles, withdrawing the lasts, and cleaning out any pegs which may have pierced through the inner sole. Of course, there are numerous minor operations connected with forwarding and finishing in various materials, such as punching lace-holes, inserting eyelets, applying heel and toe irons, hob-nailing, &c. To make a pair of common stout lacing boots occupies an expert workman from fourteen to eighteen hours (Encyclopaedia Britannica 1875)*

Shoes

The leather soles and fragments of the uppers of four shoes were found in association with Features 1, 3 and 5. MC 1864-2011-002 was found with Feature 1. MC 1864-2011-012 was found with Feature 3; and MC 1864-2011-018 was found with Feature 5, which also included the wooden last (MC 1864-2011-017) that fits the shoe from Feature 5 (MC 1864-2011-018). The shoes and last were presumably packed together, either in a crate, box or some other container that either no longer survives or is recognizable among the fragments of loose wood found within the forepeak. The shoes might also have been lying loose; the sole of one shoe, not recovered, was observed concreted to the deck adjacent to Feature 3 (Fig. 82), and buried in undisturbed silt and sand. This suggests the shoe floated free, came to rest on the deck, and was covered by the filtration of the silt and sand that filled the forepeak after the ship sank. The other shoes were found lying loose and not in tight association, although all were loosely located, as noted, in the confines of features 3 and 5, as was the last. Given the periodic nature of sediment cycling in the forepeak as well as evidence of human disturbance in this area, it is not possible to note whether the shoes constituted a larger shipment or a few pairs belonging to a private individual, such as a member of the crew.

Observations on the Shoes

Shoe MC 1864-2011-002

Two fragments, one primary and smaller piece, were recovered lying loose in Feature 1. The sole measures 11¼ inches (28.57 cm) in length, and is 3½ inches (8.89 cm) at its widest point. The heel is 1¼ inches (3.17 cm) high. During initial assessment of the shoe, it was noted that the entire inner sole, with the heel attached, was stitched along its sides. The fragment of leather from the shoe measures 3½ by 2 inches (8.89 by 5.08 cm).

Shoe MC 1864-2011-012

There were two fragments recovered, which may or may not be from the same shoe. The first is an inner sole fragment 7 1/8 inches (18.09 cm) in length, and is 5/8 inches (1.58 cm) thick. It has eight perforations in a line down the center and stitching around the edge. The second fragment is a heel that is 2¾ inches (6.98 cm) long, 2¼ inches (5.71 cm) wide, 5/8 inches (1.58 cm) in height. The shoe has a stacked leather-stitched heel.

Shoe MC 1864-2011-018

This was the only pair of shoes recovered in the excavation. The shoes were distinguishable as a right and a left shoe; the right shoe was more intact and complete than the left. The right sole measures 11 inches (27.94 cm) in length, 3 5/8 inches (9.20 cm) at its widest point, and 3 1/8 inches (7.93 cm) thick at the heel. The heel is 1 5/8 inches (4.12 cm) in thickness. The left shoe is only 5 5/8 inches (14.28 cm) in its surviving length, 3 5/8 inches (9.20 cm) wide at its widest point, and 3 1/8-inch (7.93 cm) thickness at the heel. The left heel is a wooden-pegged self-covered heel attached to the sole, as is the right heel, which has stitching around its edges, demonstrating that the uppers were sewn on to it.

In 1857, a machine was produced that was capable of sewing the leather upper to the sole of a shoe. Prior to the use of the sewing machine, many mass-produced shoes and boots from the 1810s on were held together with tiny wooden pegs (Anderson 1968:59). Method of manufacture can be discerned by looking at the holes in the shoe sole around the perimeter. Pegged shoes will have round holes with no markings between the holes. Sewn shoes will have smaller holes made by the needle and sometimes markings between holes where the thread was drawn taught (Anderson 1968:62). The soles excavated from the site exhibit characteristics associated with both methods of manufacture.

Historical Context

Shoemakers, also known as "cordwainers," came to America in the Colonial period and established themselves as often itinerant artisans or "craft" makers of sewn shoes in the seventeenth and eighteenth centuries throughout the colonies (Thomson 1989:27). The nineteenth century saw the rise of industrialized and centralized shoe making. The transition from labor-intensive hand-sewn craft shoes began around 1810-1815 as "pegged" shoes were introduced (Thomson 1989:34-35). Sharpened wooden pegs, "nail-like" in their form, were used to join the uppers to the lower parts of shoes. The pegs reduced costs and increased the quantity of shoes being manufactured; one pegger could do the work of three sewers (Thomson 1989:35). The next major step was the invention of the sewing machine. The 1846 patent of Elias Howe led to a series of refinements and widespread adoption in the 1850s, although it was not until the Civil War that a machine capable of sewing uppers to lowers was developed.

The industrialization of shoemaking in the United States began in Massachusetts, and as the industry grew and expanded beyond its origin point, Massachusetts remained dominant. In the first half of the century prior to the Civil War, the shoemaking industry of the United States was centered in New England. In 1840, 49.3 percent of American shoes were made in New England, and 36.8 percent were made in the Mid-Atlantic States, with 8.1 percent in the West (Ohio being the dominant state) and 5.6 percent in the South (Thomson 1989:67). The percentage of New England-manufactured shoes jumped to 55.4 percent in 1850 and 59.7 percent in 1860 with the Mid-Atlantic States maintaining 31.1 and 25 percent of the market in those years (Thomson 1989:67). The South, by comparison, saw its numbers drop to 4.6 percent in 1850 and 5 percent in 1860. In 1860 Massachusetts alone produced 50 percent of America's shoes (Thomson 1989:67). The preeminence of New England and the mid-Atlantic was due not only to the domination of the leather trade but also to control of industrial resources and skilled labor – 64 percent of American machinists and millwrights lived in Massachusetts, New York and Pennsylvania in1850 (Thomson 1989:69).

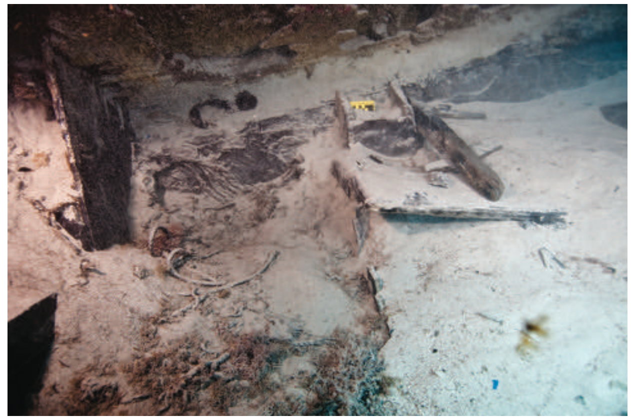
The control and concentration centered in New England and the mid-Atlantic meant that, with the coming of war and the blockade, the South was faced with an immediate shortage of shoes and boots. The problem was acute both for the military and civilians, and led to a variety of attempted solutions throughout the war years that ranged from priority shipments in blockade runners, rationing, and efforts to encourage the creation of southern tanneries and factories for shoes. Despite all of these efforts, "the shortage remained one of the most serious home front problems from Virginia to Texas . . . the problem was universal and serious from the first year of the war through the last" (Massey 1993:81).

Blockade running was one means of dealing with the shortage of shoes and boots; it is said that the Confederacy imported some three quarters of a million pairs from Great Britain during the war. In Foreman's book *A World on Fire: Britain's Crucial Role in the American Civil War*, the role of the British blockade runner is described as follows:

> *It was common knowledge that the South would not be able to survive without its imports. During the past four years, 60 percent of the Confederacy's rifles had come through the blockade, 75 percent of her saltpeter, and 30 percent of her lead, and, particularly after 1862, the blockade runners had become the South's lifeline . . . Despite the U.S. Navy's efforts, the South had managed to export 124,700 bales of cotton in return for meat, shoes, arms medicine, and all the other necessities of war (Foreman 2010:737-738).*

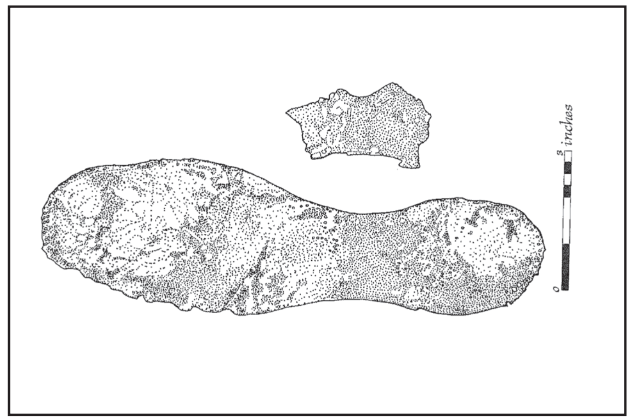
As the war waged on, the success of the Northern Navy's blockades improved. In 1861 roughly nine out of ten blockade runners reached their destinations, but by 1865 the number was only one in two (Foreman 2010:738).

As the blockades grew stronger, the Confederate Army's supplies



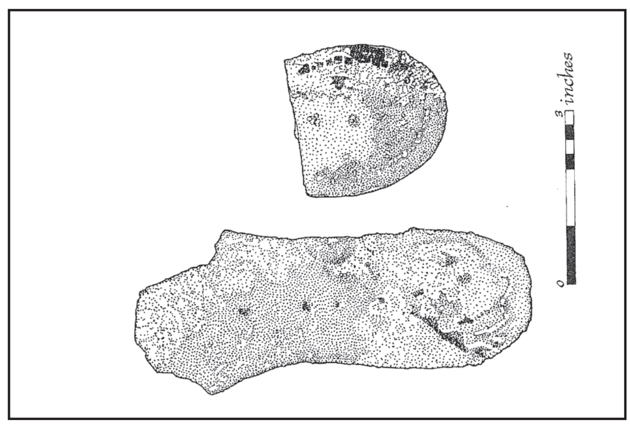
NOAA/Tane Casserley

Figure 80: Deck with the unrecovered shoe sole from Feature 3.



Jack Scott

Figure 81: Sole and leather fragments from shoe MC1864-2011-002.



Jack Scott

Figure 82: Sole and heel fragments from shoe MC 1864 2011-012.

Jack Scott

Figure 83: The pair of shoes MC 1864-2011-018.

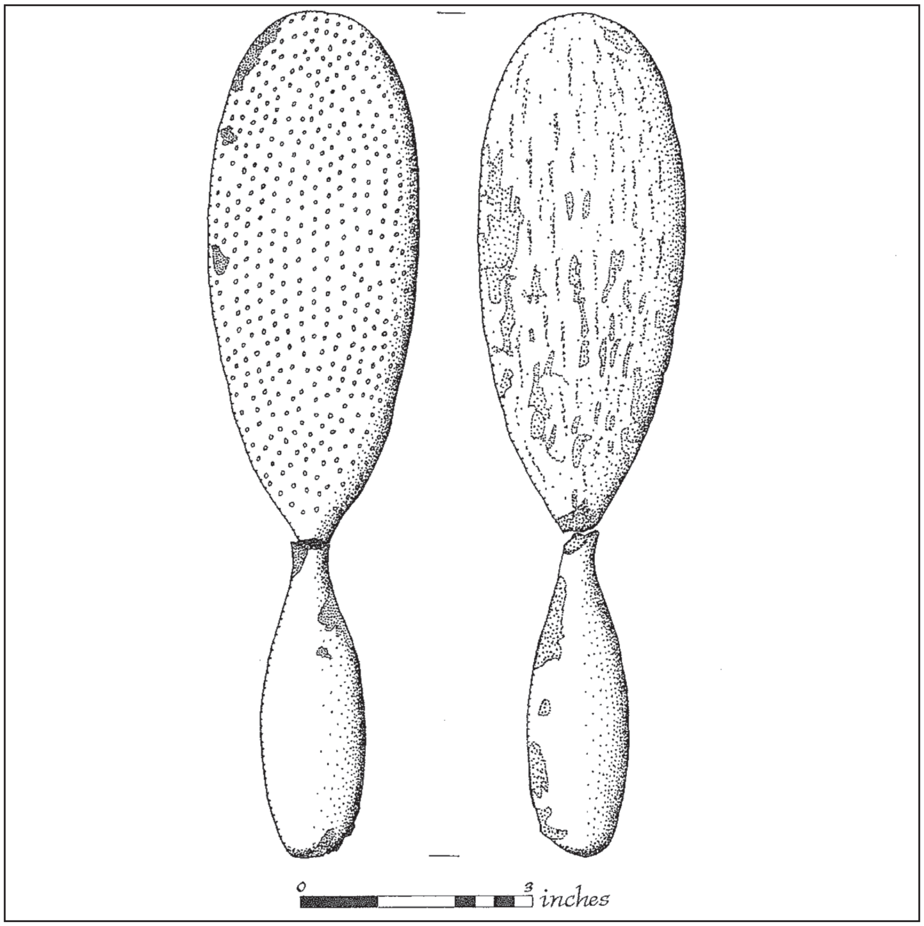


Figure 84: Hairbrush (MC 1864 2011-015).

dwindled. The first shots of the 1863 Battle of Gettysburg occurred when four Confederate infantry brigades went in search of a warehouse full of shoes and found the 1st Cavalry Division of the Union Army instead (Foreman 2010:480). In late October of 1863, Robert E. Lee wrote a letter to his wife saying, "thousands were barefooted, thousands with fragments of shoes, and all without overcoats, blankets or warm clothing" (Foreman 2010:558). Any shoes or shoe-manufacturing equipment carried aboard *Mary Celestia* would have been sorely sought by the South in 1864.

Hairbrush

A single wooden hairbrush with an oval body and an ovoid handle (MC 1864 2011- 015) was recovered lying adjacent to the chip-log in Feature 3. During excavation, the thin and fragile handle was broken off but recovered. It has a veneered back that was applied with five fasteners on the handle and six on the brush. There are 17 rows of bristle holes, but all of the bristles are missing. The brush is 10½ inches (26.67 cm) long, with a maximum width of 2 5/8 inches (6.66 cm) and a ½-inch (1.27 cm) thickness. It weights (wet) 144.3 grams. Based on the style of the brush, it would have been a hand-stitched or "hand-drawn" type.

Historical Context

While combs date to antiquity, the first "modern" manufactured brushes date to the late eighteenth century. An 1839 account describes the manufacture of brushes, which was seemingly unchanged from its invention a few decades previous:

> *In considering such articles as may be reckoned necessary appendages to the toilette, we must not pass over the different kinds of brushes which are in use for the cleansing and preservation of the clothes, the hair and the teeth. Their fabrication is so extremely simple that we need not occupy much space in describing it. The common method is this: when the piece of wood in which the hairs are to be placed is cut to the size and shape required, it is drilled full of small holes, and in each of these holes is placed a bundle of hairs folded together, so that the ends shall all project on one side, while on the other they are secured by means of wire passed through the bent part. With the addition of glue, which is placed in the holes to keep the bundles firm, they are now perfectly secured; but the back of the brush has an unsightly appearance, and it is necessary to cover the rough surface formed by the wire-work and the projecting parts of the hair. For this purpose, in the case of clothes and hair-brushes, a thin coating of some finely polished wood is often veneered upon the back of the brush, or, in other words, a thin plate of fancy wood is laid down in glue, on the surface of the plainer material (Materials for the Toilette 1839: 182)*

The style of the brush suggests it is the product of G.B. Kent and Company. The company was founded by William Kent, a British brush manufacturer, who began his company in 1777. Kent brushes continued to be manufactured by the family until 1900 when the company then known as G.B. Kent and Sons went public (Wodall 1959:3). The public company continues to produce hand -made wooden brushes to this day.

At the time of the *Mary Celestia*'s sinking, George Barton Kent was in charge of the company, having taken over after his father's death in 1854. According to Wodall (1959:12), "It was under G.B. Kent that the name Kent for brushes became a household word and the firm expanded into a business of international reputation exporting to all of the principal countries throughout the world." G.B. Kent himself wrote in an 1872 preface to the Kent catalog that the factory had for several years "turned out more brushes than have been made in any other factory in the United Kingdom" (Wodall 1959:12).

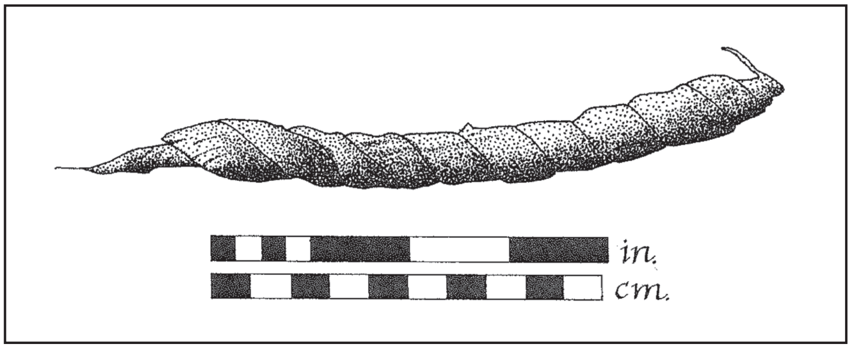
Buttons

Two buttons were discovered in the screening of the excavation dredge "spoil." One is a fragment of a mother-of-pearl button (MC 1864 2011-023) and the other is a copper button (MC 1864 2011-024). The mother-of-pearl fragment has an outer diameter of 3/8 inches (.95 cm) and an inner diameter of 3/16 inches (.47 cm).

The second button is a copper-alloy button with a raised head. It is ¾ inches (1.90 cm) in diameter with a 1/8 inch (.31 cm) height. Its surface has a thin piece on

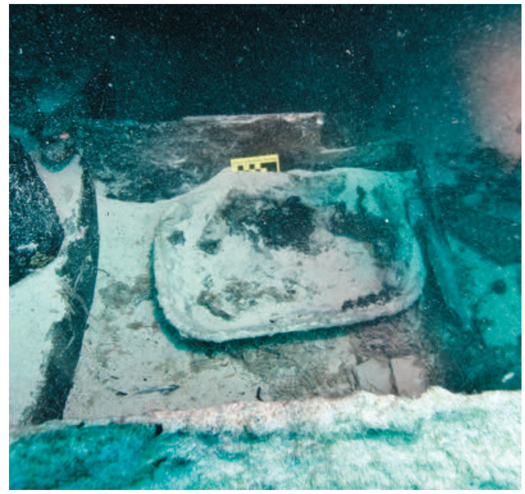
NOAA/Tane Casserley

Figure 85: The coil of rope during excavation of the forepeak.



Jack Scott

Figure 86: Fragment of plain-laid rope MC1864-2011-011.



NOAA/Tane Casserley

Figure 87: Possible tinware basin (Feature 4).

its face that is not attached, and that may be a fragment of paint, paper or fabric. The buttons are likely associated with now-disintegrated clothing once stowed in the forepeak, or they may have been individual button losses within that compartment.

Cordage

The coil of hemp cordage was excavated in badly deteriorated condition adhering to the deck planks at the forward end of the forepeak. The rope was measured at 9/16ths of an inch (1.42 cm), which is an irregular measurement probably caused by waterlogging; we surmise this was originally a coil of ½-inch (1.27 cm) rope. This size was the smallest-diameter rope carried on ships of the period (Brady 1849: 295) and was generally used in running rigging. The rope is made up of three strands in a plain-laid pattern, fitting the period definition of common or plain rope "composed of three strands, of an equal number of yarns twisted together" (Brady 1849:45). The rope lay in a loose coil that indicated that it had been used, recoiled and left in the forepeak. One end of the chip log reel lay on top of the coil; the two items may have been stowed together or the chip log may have fallen onto the rope when the ship sank.

Badly rotted, the cordage began to disintegrate upon exposure once its surrounding matrix of dense, fine-grained silt was fanned away; some of the sediment on fanning was determined to be disintegrated cordage. Removal of all of the line was difficult because of the tight confines of the forepeak, the surrounding (and fragile) joinery and chip log reel, and the loose and mushy consistency of the large mass of cordage. As much of the coil that could be lifted intact was removed, and a number of loose fragments were also recovered and bagged.

Tin Can(s)?

During the excavation of Feature 4, badly corroded fragments of metal were encountered lying intermixed in the sand. These fragments had a thin "skin" of material adhering to the metal that easily detached and floated off the metal surface when exposed. The fragments, in situ, were seemingly disturbed, either through natural or human processes that had relocated sand in the forepeak. Despite the disturbance, all were concentrated in the area of the feature. The fragments were collected, bagged and examined in the laboratory. One fragment measuring 6½ by 4¾ inches (16.51 by 12.06 cm) had an edge turned outward and has a slightly convex surface. There was also a convex spout-like fragment 4¼ inches (10.79 cm) long and 1¼ inches (3.17 cm) wide.

Pending chemical analysis, the fragments appear to be from a large metal can or cans, and the film-like coating appears to be paint. The hypothesis is that these are the remains of cans of paint that were stowed in the boatswain's locker in the forepeak.

Metal Basin

A shallow metal basin, with a curled or thick lip, was documented as Feature 4. It was left inside the wreck as it was concreted to the hull and could not be removed. The appearance of the metal suggested that the basin was heavily corroded and concreted tinware.

The origin and use of this artifact is unknown; given its position in the forepeak and its proximity to the fragments of the possible paint cans, it may have been utilized as a paint receptacle that was stowed in the boatswain's locker.

Final Observations on the Material Culture

None of the material culture encountered in the forepeak of *Mary Celestia* could be directly attributed to the cargo listed on the final manifest, albeit the manifest itself was not particularly detailed, and the shoes encountered may have been some of the "merchandise" listed on it. Some items were related to the ship's gear and equipment, while others appeared to have been contraband intended for private sale by the crew or items for personal use. The increasing efficiency of the blockade is evident as the war progressed: during the period from April to December 1862, 23 blockade runners were captured trying to reach southern ports, while the following year it increased to 42 captured (Wise 1988: 276-283); and the blockade made it more difficult for the Confederate government to obtain the materiel and supplies it needed to wage war. The problem for the South was compounded by blockade runners arriving with now-scarce luxury items that commanded high prices. The war had little effect on the ability of moneyed Southerners to have access to luxury goods throughout 1863; "for a price, any luxury could be brought through the blockade, even if it meant that certain war material was left behind in Nassau or Bermuda" (Wise 1988:121). While some were willing to pay any price, others complained of runners who enriched themselves "bringing in liquors and useless gew-gaws" (Jones 1935: 350).

The Confederate Congress responded on February 6, 1864, with a bill to regulate commerce, that is, the blockade runners; they hoped to accomplish this by controlling exports and, even more important, by banning certain imports. Among those items banned by the act "To Prohibit the Importation of Luxuries, Or Of Articles Not Necessary Or Of Common Use" were "brandy, wines and spirits," as well as "carpets and rugs, carriages and carriage parts, furniture, marble, wallpaper, bricks, coconuts, gems, antiques and coin collections" (Wise 1988: 145, Ekelund et al. 2004). A second bill in early March refined the law to create a "comprehensive program to control blockade-running" (Wise 1988: 146). Despite the law, two problems remained; it was reportedly not well enforced (Massey 1993: 15) and smuggling by ship owners, captains and crews circumvented those occasions when the law was enforced.

The law was officially being enforced when *Mary Celestia* cleared Bermuda on its final voyage in September 1864 with an "official cargo" listed as 125 boxes of bacon and 534 boxes of "merchandise" (*Bermuda Royal Gazette*, September 13, 1864). There were other items on board, however, that were not explicitly noted, if listed at all, including the rifles that Edward "Teddy" Tucker noted on the wreck, or some of the items archaeologically recovered in 2011. These items – the shoes, the perfume, Florida Water cologne, and the wine – were all scarce and highly valued commodities in the blockaded south in the early fall of 1864.

The location of the items excavated in 2011 was an area not ordinarily used for cargo stowage, restricted to the crew, and not easily accessed. A crowded, presumably "dirty" space, the forepeak on many vessels of the period was used as the boatswain's (bosun's) locker, a small compartment used to store tools, spare gear and the supplies used to maintain, repair and service the ship's rigging and cargo gear – and usually the "catch-all" place in which old gear that was not ready for disposal was stored, be it a cracked block, an iron hook, or a loose marlinespike. The tin can fragments, the spare chip log reel, the cordage and anecdotal suggestions of a ship's block coming from this area would support the contention that the forepeak of *Mary Celestia* was the bosun's locker.

The bosun's locker was an ideal place for a crew member to store, cache or hide something that they did not want an inspection or search to find; accessing the small forepeak through a hatch and rustling through a tight, unlit space filled with paint, rope and "dirty" gear was something that would only come with a thorough, detailed search. It follows then, that the artifacts found inside the forepeak were items placed there by a member or members of the crew who wished to hide them from the captain, officers or other crew, or who simply wished to hide them from Confederate customs officials when *Mary Celestia* arrived at the Cape Fear. According to the law:

> *Every collector, naval officer, surveyor, or other officer of the customs, shall have the like power and authority to seize goods, wares and merchandise imported contrary to the intent and meaning of this act, to keep the same in custody until it shall have been ascertained whether the same have been forfeited or not, and to enter any ship or vessel, dwelling house, store, building or other place, for the purpose of searching for and seizing any such goods, wares and merchandise, which he or they now have by law, in relation to goods, wares and merchandise subject to duty ; and if any person or persons shall conceal or buy any goods, wares or merchandise, knowing them to be liable to seizure by this act, such person or persons shall, on conviction thereof, forfeit and pay a sum double the amount or value of the goods, wares and merchandise so concealed or purchased (Confederate States of America 1864).*

There was every reason, therefore, to hide the wine, perfume and cologne in the forepeak bosun's locker of *Mary Celestia*.

The likely origin of the "contraband" goods discovered in the forepeak during the winter storms and recovered in the 2011 excavation being established, the remaining question is: for whom were they intended? Were these items placed there for lucrative resale by a crew member or members once they arrived in the Confederate States? Or were they gifts for family members stuck behind the blockade and subjected to the privations that by 1864 effected Confederate citizens of nearly every social class (Massey 1993)? Or were they a mix of the two?

The wine is one item possibly packaged and shipped for personal use. To bring in wine for resale would have likely involved a cask or barrel. The wine bottles, as noted, were reused and the liquid inside them was probably drawn from a cask or barrel, the bottles re-corked and packed into a used wine crate. A crate was not the preferred method of shipment by sea; shippers preferred barrels and casks for the stowage of wine. When bottles were shipped, it was said, "crates should be packed perpendicularly by each other, and firmly wedged together so that the glass will not talk or sound when the ship rolls. Keep at a distance from salt or wet or the straw will rot and breakage ensue" (Stevens 1858: 63-64).

It is known that blockade runners did carry goods for personal use or as gifts, and it is also specifically known to have happened on board *Mary Celestia*. The surviving correspondence of engineer Charles Francis Middleton is specific; in one letter to his wife in August 1864, Middleton explained that, on departing Wilmington for Bermuda after *Mary Celestia* had made a successful run and landed its cotton cargo, he had left with the ship's agent some personal items for his family:

> *I have sent a trunk full of goods to Bean to ship for you by express, and enclose the key in this and sincerely hope you may receive it safely. I have still aboard a Barrel . . . of Sugar one of Ale and Box of Brandy which I must risk reaching from here for I do consider it a great risk indeed. Also a small Box for Mrs. Dillingham which I will have forwarded to you for her. I will get them off tomorrow or next day (Middleton 1864).*

When *Mary Celestia* was lost, Middleton wrote his wife and reported in his letter that "I saved a good many clothes but lost a great deal otherwise. I had 1 ½ Barrels Sugar, 1 lb. Best Tea, a case of shoes (59 pair), a whole piece of calico and two dresses of same, but thank God I saved myself" (Middleton 1864).

The shoes in the forepeak, albeit just four, may have been two pairs out of the 59 pair that Charles Middleton lost and that never reached his family, but they also could have been bound for yet another crew member's family. That is likely the case as well for the perfume, Florida Water, the wine, and perhaps even the brush. The forepeak, as documented and excavated in 2011, was in part a time capsule, albeit a compromised one. Recurrent storms and the clear hand of parties unknown who had entered the bow, opened boxes, and recovered as yet unseen and undocumented bottles with contents and other artifacts have unfortunately clouded the record, and yet what clearly survives and what emerged from the bow of *Mary Celestia* in June 2011 was a reminder of the human side and the costs of the blockade, and the very human means by which people have always sought to avoid or circumvent the rules. *Mary Celestia* proves this point, and the bow's contents do the same on a smaller scale.

Recommendations

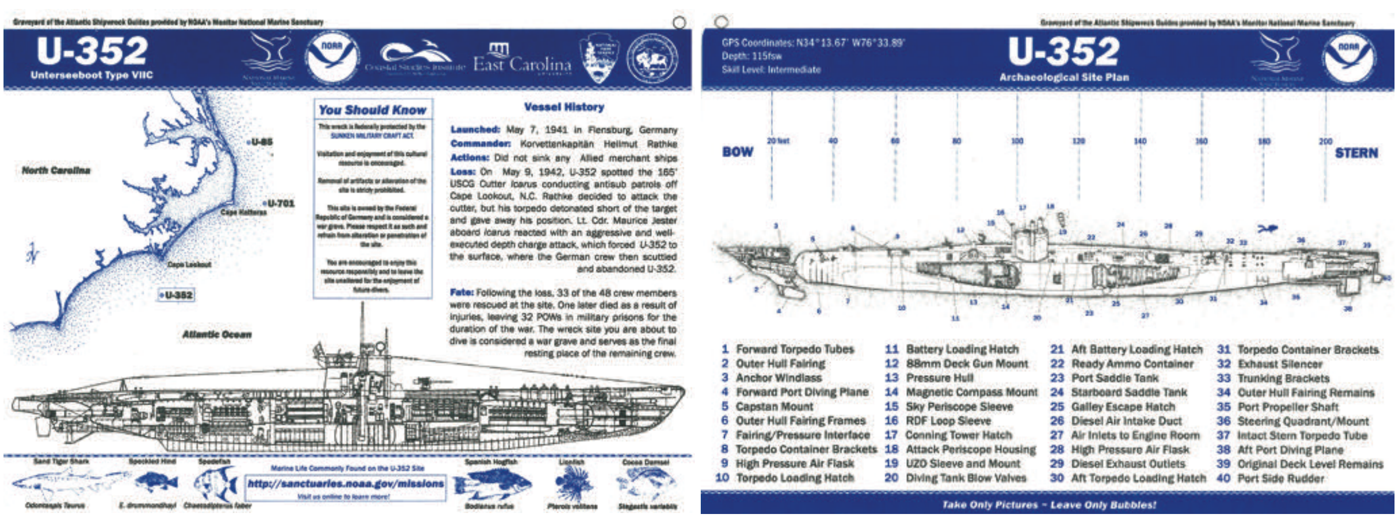
The excavation of the forepeak of *Mary Celestia* was an emergency project that cleared a small area subjected to ongoing erosion and the threat of unlicensed and undocumented recovery. A number of wooden features were briefly uncovered and reburied in situ. Should funds become available, the complete excavation and detailed documentation and recording of the interior of the bow of *Mary Celestia* should be undertaken.

Other areas of the wreck, such as the engineering spaces, and portions of the collapsed hull should also be excavated to document the buried structure of the wreck and to determine if additional artifacts are present on the site; in those cases, they should be recovered, documented, conserved and placed on public display.

Any recoveries should be small-scale. We do not recommend recovery of major portions of the machinery or hull. After a century and a half, *Mary Celestia* has reached a state of near equilibrium disturbed only by extreme weather events and human activities. The site has tremendous draw and appeal as a heritage tourism dive site, and is listed in a number of dive publications as one of the top wreck dives in Bermuda. An interpretive trail with interpretive dive slates would augment the tourist dive experience, and should be considered. ONMS has developed a series of dive slates for visitors at, for example, Thunder Bay National Marine Sanctuary, which provide detailed and accurate wreck illustrations with points of interest. ONMS stands ready to assist Bermuda in the development of a dive slate for *Mary Celestia* similar to the dive slates for wrecks in Thunder Bay, such as the wreck of the bulk freighter *Norman*. Similarly, wreck slates developed in other countries also provide the same interpretive experience, including one relevant example from the United Kingdom for the blockade runner *Iona II*.

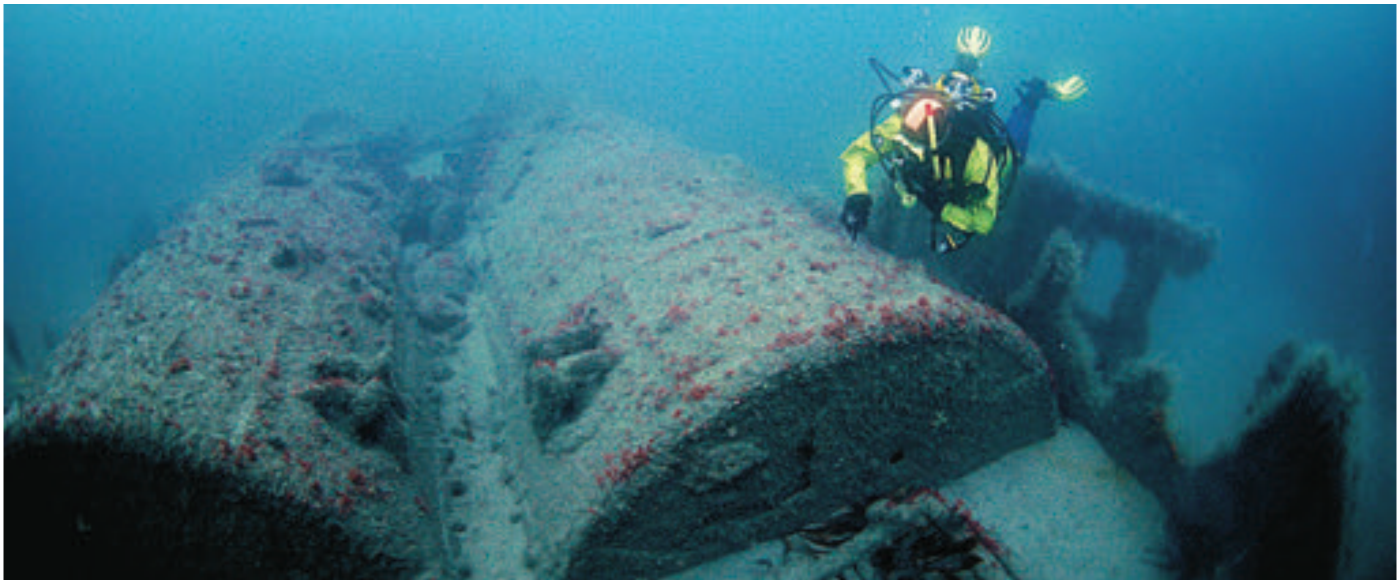
At the same time, the artifacts recovered in 2011 from the forepeak of *Mary Celestia* remain in passive conservation storage at the National Museum of Bermuda. The conservation and analysis of these artifacts was agreed to be the responsibility of the Government of Bermuda. We encourage the completion of that aspect of this project, as well as the public display of the artifacts. The 150th anniversary of the sinking of *Mary Celestia* could be the occasion for an exhibition of the ship featuring the treated artifacts. Such an exhibition might also be suitable for an international, traveling and cooperative venture, especially in those communities in the United States closely linked to *Mary Celestia* and her crew, namely Wilmington, North Carolina and Charleston, South Carolina, as well as Liverpool in the United Kingdom.

In addition to the publication of this report, the project to date also resulted in the publication of a feature article in *Archaeology Magazine*, a number of news stories, and an online photo gallery of images on National Geographic's news website; a feature documentary produced by LookBermuda is nearing completion. This type of outreach should continue and is strongly encouraged.



NOAA's Office of National Marine Sanctuaries

Figure 88: ONMS dive slates for Battle of the Atlantic wrecks off the coast of North Carolina.



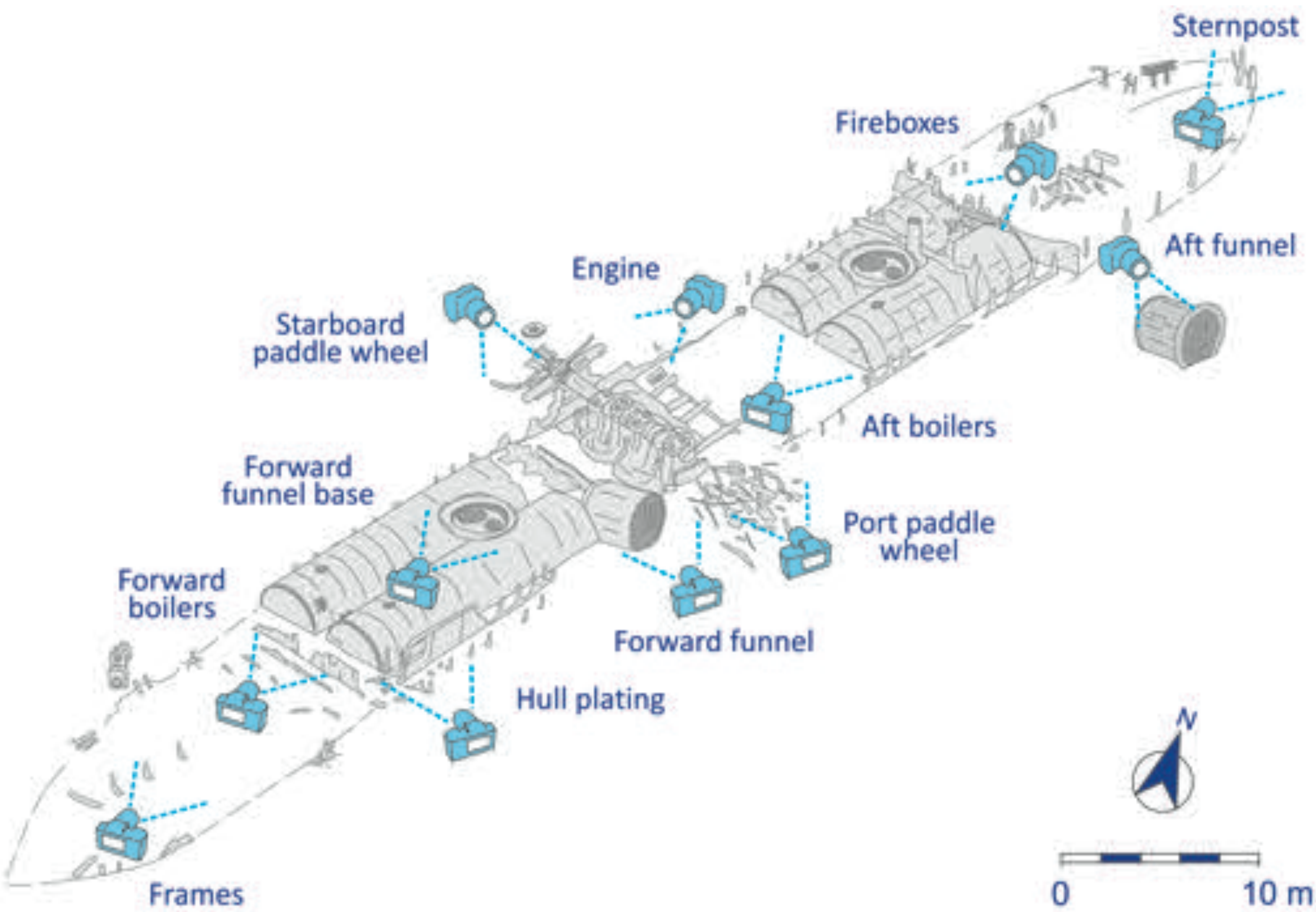


Figure 89: Diver over the *Iona II*'s forward boilers. Photographic monitoring points plan for the *Iona II*. Created by Wessex Archaeology for English Heritage.
James Wright, Appledore Sub Aqua Club, UK and Wessex Archaeology

Acknowledgements

No project, large or small, is the product of an individual or even a small group. In 2011, many people, organizations, institutions and in this case, two governments came together in common cause to rescue history on the verge of being lost, a history that spans a century and a half and unites two nations. This project was financially supported by the Waitt Institute of La Jolla, California. The Waitt Institute has been a gracious supporter of ocean research and conservation and archaeology and, once again, they made a critical and essential difference when a quick decision was needed in response to a pressing need. In particular, we gratefully acknowledge the support of Founder Ted Waitt, Executive Director Dominique Rissolo, PhD, and one of their team members Allie Farmer who assisted in organizing travel and logistics. The Waitt Institute also helped make this project possible by supporting the participation in the field, on the boat and in the water, of co-principal investigator Dr. Rissolo and team member Joe Lepore. Their hard work, thoughtful contributions, and "can-do" spirit exemplified the partnership's best attributes.

The project was initiated and locally managed by Philippe Rouja, PhD, Principle Scientist and Conservator of Wrecks in the Department of Conservation Services and supported by the Bermuda Government Ministry of Public Works. We gratefully acknowledge the support of the Minister, the Honorable Derrick V. Burgess, JP, MP, and the Director of the Department of Conservation Services Andrew Pettit. The department's ship R/V *Calamus* was an ideal platform for the field work and was capably captained by Anson Nash. The hospitality of Philippe's family is also gratefully acknowledged.

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We are also thankful to the Historic Wrecks Authority for their support of the project and their support for shipwreck preservation generally.

Conservation and museum services support, as well as research, was graciously sponsored and provided by the National Museum of Bermuda, Dr. Edward Cecil Harris, MBE, FSA, Director, as well as Curators Elena Strong, Jane Downing, Dr. Piotr Bojakowski and consultant Charlotte Andrews. The National Museum's leadership in the study and protection of Bermuda's underwater cultural heritage is gratefully acknowledged as much as it is renowned nationally and internationally.

The story of *Mary Celestia* and the project was magnificently captured on film and in photographs by LookBer-

Acknowledgements

muda. We gratefully acknowledge these other essential members of the project team, who made outreach and education possible: J-P Rouja and Ben Watson.

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Our long –time friends and colleagues at the Mariners' Museum in Newport News assisted with research and in generously sharing images. We want to thank Anna Gibson Holloway, Claudia Jew and Erin Lopater for their help. At Osprey Publishing, we acknowledge and thank them for the use of Tony Bryan's exceptional cutaway image, and especially thank Claudia Galluzzi. Friend and colleague Andrew "Andy" Hall, an expert in blockade runners, was also a major help, and we thank him for the use of his images of the runner *Will o' the Wisp*.

The National Trust of Bermuda's Globe Hotel, an essential stop to learn the history of Bermuda's Civil War role, was also gracious in providing access to see its displays and in allowing photography of its collection of *Mary Celestia* artifacts.

The review by Michael McCarthy, Elizabeth Semmelhack, and Dr. Edward C. Harris is greatly appreciated. Editor Joy Waldron provided professional editing of this report, with additional editorial review by Letise LaFeir and Cirse Gonzalez of ONMS. Crimson Pavlekovsky of ONMS completed graphic design and layout.

If we have forgotten anyone and omitted any names, we sincerely apologize.

Finally we would like to say that the project team enjoyed working together. The enthusiasm, knowledge and experience of the team combined to make the best of this unique situation and resulted in the rescue of historically important and unique artifacts. These artifacts expand and bring to life the powerful story of this shipwreck and its place in history, a story that will serve to enhance not only the continued preservation of this wreck but advance in general the rationale for historic preservation.

A Note on Weights and Measurements

The following conversions may prove useful:

- 1 pound weight (lb.) = 454 grams
- 1 hundredweight = 112 pounds (lb.)
- 1 kilogram = 2.2 pounds
- 1 ton = 2,240 pounds
- 1 tonne = 2,200 pounds
- 1 inch = 2.54 centimeters
- 1 centimeter = 0.394 inch
- 1 foot= 0.3048 meter
- 1 fathom = 6 feet
- 1 meter = 3.28 feet
- 1 knot = 1 nautical mile in speed
- 1 nautical mile = 1.115 US miles = 1.852 kilometers
- 1 kilometer = 0.54 nautical miles
- 1 statute mile = 1.609 kilometers
- 1 kilometer = 0.62 statute miles
- 1 horsepower = 746 watts
- 1 kilowatt = 1.34 horsepower
- 1 cord (timber) = 128 cu ft.
- 1 ounce = 2.95 centiliters
- 1 dram = 1/8 of a fluid ounce
- 1 gallon = 4.54 liters
- 1 pint = 0.47 liters

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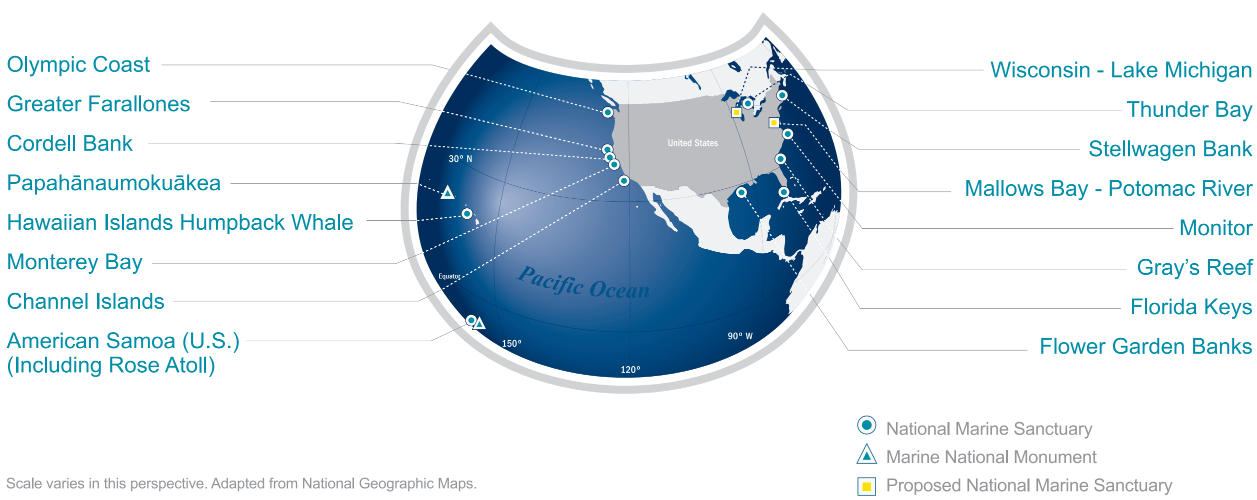

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