OCS Report
MMS 2008-037

Archaeological Excavation of the Mardi Gras Shipwreck (16GM01), Gulf of Mexico Continental Slope

U.S. Department of the Interior
Minerals Management Service
Gulf of Mexico OCS Region

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Prepared under a contract between
Okeanos Gas Gathering Company,
Texas A&M University, Department of Oceanography
and Texas A&M Research Foundation
by
Texas A&M University
Department of Oceanography
and
Department of Oceanography
Center for Maritime Archaeology and Conservation
College Station, Texas

Published by

U.S. Department of the Interior
Minerals Management Service
Gulf of Mexico OCS Region

New Orleans
July 2008

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Report Availability

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Citation

Suggested citation:

Ford, B., A. Borgens, W. Bryant, D. Marshall, P. Hitchcock, C. Arias, and D. Hamilton. 2008. Archaeological excavation of the Mardi Gras Shipwreck (16GM01), Gulf of Mexico continental slope. Prepared by Texas A&M University. U.S. Department of the Interior, Minerals Management Service, Gulf of Mexico OCS Region, New Orleans, LA. OCS Report MMS 2008-037. 313 pp.

About the Cover

The cover art depicts a photomosaic of the weapons box and subsequent artifact drawing by Amy Borgens.

Summary

The Mardi Gras Shipwreck Site (16GM01), located off the coast of Louisiana in approximately 4000 feet (1220 m) of water, is the remains of an approximately 50-ft (15.2-m) vessel that wrecked circa 1815. The site was discovered during a preconstruction survey of the Mardi Gras Pipeline System, owned and operated by Okeanos Gas Gathering Company (OGGC). The Texas A&M Oceanography Department and Center for Maritime Archaeology and Conservation, under contract with OGGC, conducted an archaeological data recovery program at the site between 21 May and 7 June 2007.

The goals of the data recovery were to record the exposed remains of the shipwreck and to recover sufficient artifacts and features to reduce the visibility of the site. The data recovery plan was also designed to identify the age, national affiliation, function, and demise of the vessel, as well as to determine the nationality of the crew and to learn details of life aboard the ship through analysis of the recovered remains and features noted on the seafloor. Analyses of the hull remains and recovered artifacts were additionally used to explore the preservation of shipwrecks in deep water.

The artifacts recovered from the shipwreck originated in Great Britain, France, Mexico, and possibly the United States. While nearly all of these artifacts were made between 1780 and 1820, allowing the wreck to be accurately dated, this wide array of material culture makes it difficult to assign a nationality to the vessel or its crew. Rather, this assemblage exemplifies the international character of the Gulf of Mexico during the early nineteenth century.

The rig of the vessel has been tentatively reconstructed as a schooner, based on the size of the vessel and the recovered boom. The hull remains suggest that the vessel was typical of the schooner type in the early nineteenth century Gulf of Mexico in terms of size (approximately 40–65 tons) and layout. The nature of the cargo is unknown, but given the proximity of the vessel to New Orleans and the possibility that New Orleans was its home port, cotton, tobacco, coffee, and sugar are all viable options (Bauer 1988:128; De Grummond and Morazan 1961:62). The artifact assemblage includes a single box of weapons within what was likely the stern cabin and a 6-pounder cannon; however, it is unknown if the vessel was an armed merchant vessel or a privateer. The first fifteen years of the nineteenth century were a tumultuous time in the Gulf of Mexico and it is likely that many merchant vessels carried similar weapons but privateers were also present and similarly armed. The cause of wrecking is unknown. Foul weather or structural failure are possibilities, but burning or other violence cannot be ruled out because the shipwreck was not fully excavated.

Artifact preservation at the Mardi Gras Shipwreck site indicates that the low-energy environment of the deep Gulf is beneficial to the survival of artifacts. Many fragile artifacts, including sand-glasses, bottles, ceramics, and navigational instruments, survived intact. However, the iron from the site was corroded to an extent similar to pieces recovered from shallower saltwater environments. Similarly, the vessel's hull was deteriorated, apparently by boring mollusks, except where buried or impregnated with iron corrosion products. This condition, similar to the state of the nearby Mica Shipwreck, suggests that deep shipwrecks in the Gulf of Mexico are subject to many of the same destructive factors as shallower shipwrecks.

Beyond these conclusions, the Mardi Gras Shipwreck Project allowed for the refinement of deep-water archaeological excavation methods. This data recovery is one of only a few instances worldwide where an archaeological excavation has been attempted in deep water using

a remotely-operated vehicle. While the project was a success, with the majority of artifacts recovered intact and with proper provenience information, further refinement of these techniques is required. Specifically, better photographic and excavation techniques need to be developed to increase efficiency and accuracy. These advances can only be made through future deep-water excavations. However, until such a time as the methods of deep-water archaeology have been refined to make similar excavations regularly feasible, the significance of each wreck must be weighed against the costs of recovering the data.

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Acknowledgements

The Mardi Gras Shipwreck Project was made possible by the dedication and hard work of numerous people from several different professional fields working together towards a common goal. For this the project's management is truly grateful. First and foremost, Texas A&M University and the Department of Oceanography would like to thank Okeanos Gas Gathering Company for funding the project; especially to Randy Joseck, Thomas Garrett, and Sam Lun for their support and guidance. Likewise, thank you to the Minerals Management Service; specifically to Jack Irion, David Ball, and Chris Horrell for providing assistance both in and out of the field. Several archaeologists had key roles in planning, researching, conducting the fieldwork, and the writing of this report, for which we are truly grateful. Many thanks go to: Donny Hamilton, Ben Ford, Amy Borgens, Laura Landry, Helen DeWolf, Kevin Crisman, Ayse Atauz, Sam Koepnick, Alexis Catsambis, Ashley Gould, and John Hamilton. Also, our gratitude goes to Stuart Burbach and Cesar Arias for their time, assistance, and insight throughout the duration of this project. To the companies who helped plan and execute the fieldwork phase of the project, thank you; specifically to Jeremiah Gilbreath, Mike Horan, and the entire ROV crew at Veolia Environmental Services; the crew of RSV *Toisa Vigilant*; Shawn Bartlett and Terry Lease at Perry Slingsby Systems; Trevor Hughes, Marcus Russell, Shannon Frame and Kari Schaapveld at UTEC Survey; Brett White at Kongsberg Maritime; Robert Church and Dan Warren at C&C Technologies; Thor Sperre and Wenche Haugerud at Sperre AS; and Brett Phanuef and Fredrick Soreide of ProMare. Many thanks to Rick Allen, Lawrence Taylor, Curt Pair and Kim Eslinger at Nautilus Productions for creating an outstanding documentary. To Keith Moorehead of National Geographic Society, we appreciate your taking the time to come out on the cruise. Thanks also to Della Scott-Ireton and the Florida Public Archaeology Network for your assistance in the field and constructing an outstanding webpage. Finally, a very sincere and special thanks to Charlene Miller, Phyllis Bonifazi, Lesa Feldhousen, and Steve Garrett at the Texas A&M Research Foundation.

Mardi Gras Shipwreck Project 2007 Field Crew

1.0 Introduction

By Ben Ford

The Mardi Gras Shipwreck site (16GM01) is located in the Gulf of Mexico off the Louisiana coast in water depths of approximately 1220 meters (m) (4000 ft) (Figure 1.1). This early nineteenth century shipwreck site was discovered during a preconstruction video survey of the Mardi Gras Pipeline System, owned and operated by Okeanos Gas Gathering Company (OGGC). The Texas A&M (TAMU) Oceanography Department and the TAMU Center for Maritime Archaeology and Conservation, under contract with OGGC, conducted an archaeological data recovery program at the site between 21 May and 7 June 2007. This project presented an opportunity to investigate a significant period in Gulf of Mexico history through a unique artifact assemblage.

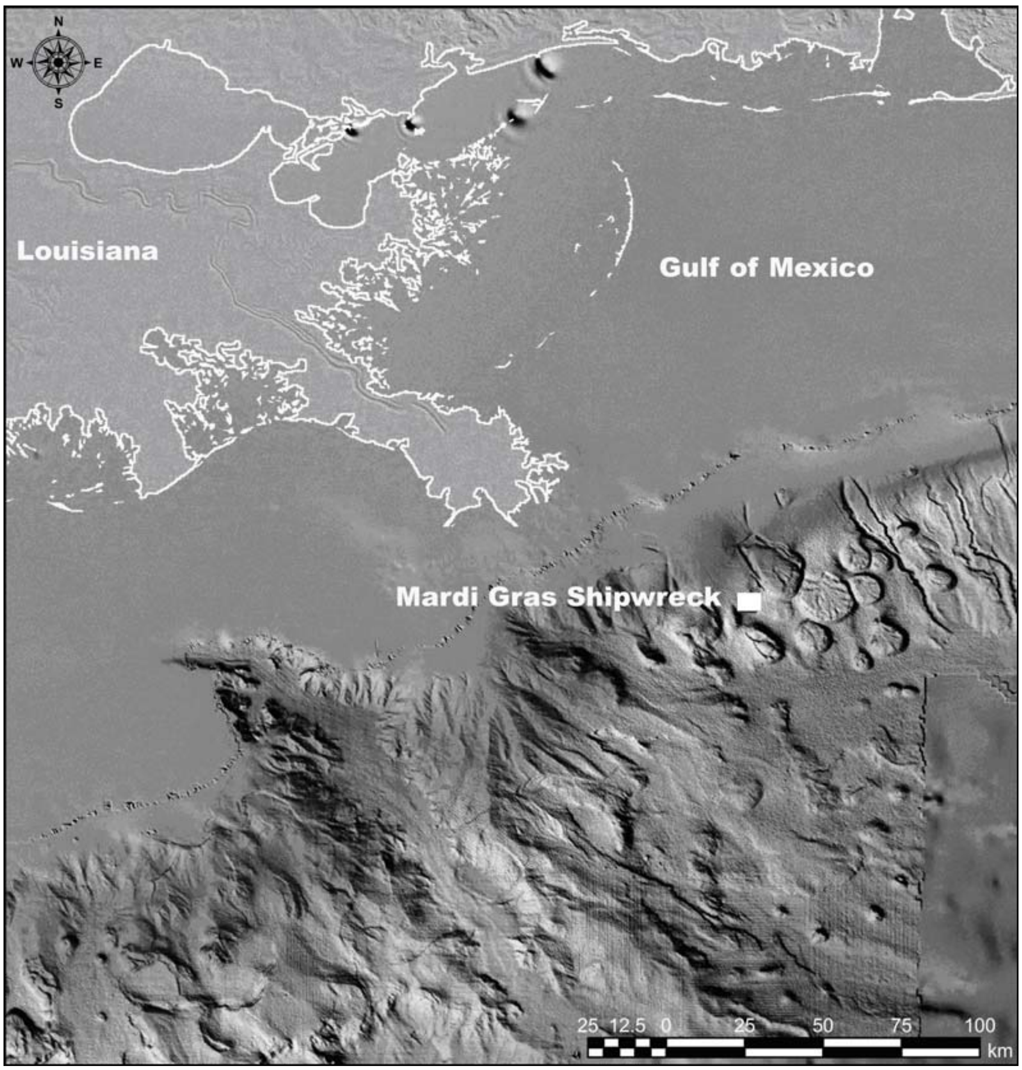

Figure 1.1. Location of the Mardi Gras Shipwreck (16GM01).

The Mardi Gras Shipwreck site was characterized by a scatter of large and small diagnostic artifacts and features within a discrete 20 m (65 ft) long by 5 m (15 ft) wide area of the silty, nearly flat bottom. The hull and artifacts were distributed along a northwest to southeast line, with the probable bow situated to the northwest. These artifacts, which were nearly all in a remarkable state of preservation, included an anchor, a cannon, a ship's stove, ceramic tableware, glass bottles, navigation instruments, and a wooden chest containing an assortment of small arms. The remains of the ship's hull were visible in specific areas, but the majority of the ship was deteriorated or buried in the sediment and beyond the scope of this project. The artifact assemblage and hull remains suggest that the vessel wrecked circa 1808–1820 and was constructed during the preceding decade.

1.1 Authority

The National Historic Preservation Act (16 U.S.C. 470) of 1966 (NHPA), as amended, and other applicable laws, executive orders, and regulations require that the Minerals Management Service (MMS) of the United States Department of the Interior (USDI) consider the effect of its actions, including the permitting of oil and gas exploration and development, on significant archaeological resources on the Outer Continental Shelf (OCS). As a consequence, MMS regulations require operators to take steps to identify, report, and avoid causing harm to significant archaeological sites. MMS deemed Site 16GM01 to be potentially eligible for inclusion in the National Register of Historic Places under Criterion D of Department of the Interior regulation 36 CFR 60.4. The resulting Phase III Data Recovery Plan was intended to mitigate adverse effects associated with a permitted activity.

1.2 Scope

The Mardi Gras Shipwreck data recovery plan was designed to record the shipwreck and reduce the site's profile through the recovery of specific artifacts. This plan consisted of the following components:

1. Accurate and precise records of the shipwreck site before, during, and after excavation in the form of georectified photomosaics and digital video footage;
2. Site planview map based on photomosaics;
3. Recovery and conservation of sufficient artifacts to reduce the surface visibility of the site;
4. Analysis of recovered artifacts with the goal of identifying the period, nationality, and occupation of the ship;
5. Hull analysis with the goal of identifying the type and period of the vessel;
6. Historic research with the goal of providing an historic context for the wreck and possibly identifying the nature, period, nationality, and identity of the ship; and
7. Analysis of water, sediment, pollen, and wood samples with the goal of describing the site setting and possible origins of the vessel.

1.3 Personnel

Project leadership was provided by Dr. William Bryant (Principal Investigator), Drs. Donny Hamilton and Ayse Atauz (Co-Principal Investigators), Peter Hitchcock (Project Manager). The archaeological staff included Alexis Catsambis, Ben Ford, Laura Landry, and Dr. Della Scott-Ireton, with field conservation conducted by Amy Borgens and John Hamilton. Dr. Helen DeWolf, John Hamilton, Kimberly Rash, and George Schwarz conserved the artifacts at the Conservation Research Laboratory. Photographs were taken by Randal Sasaki and Amy Borgens. Archaeological computing was conducted by Cesar Arias, Ashley Gould, and Samuel Koepnick. Cesar Arias also constructed the final photomosaics. MMS was represented offshore by Dr. Jack Irion, David Ball, and Dr. Chris Horrell. Offshore and remotely operated vehicle (ROV) services were provided by Veolia Environmental Services. UTEC provided offshore positioning and Nautilus Productions prepared the project documentary. Dr. Dawn Marshall conducted the pollen analysis, while Dr. William Bryant performed the water and sediment analysis, and Dr. Regis Miller executed the wood analysis. Ben Ford prepared the report with contributions by Amy Borgens, Dr. William Bryant, Dr. Dawn Marshall, and Peter Hitchcock. Jessi Halligan edited the text. Dr. Kevin Crisman, Laura Landry, and Amy Borgens provided comments on the content and presentation of the report.

1.4 Project History

The target was first identified by the MMS during the review of the Okeanos pipeline application on 14 November 2001. The Agency placed a 125-foot avoidance zone around the reported location but required no further investigation. On 2 September 2002 OGGC conducted a preconstruction video survey of the pipeline route using a remotely operated vehicle (ROV). A detail inspection of the target, labeled D-11, revealed the remains of a historic shipwreck. On 11 August 2004 the MMS diverted a research vessel working in the general vicinity to inspect the site.

The August 2004 survey visually documented the site and collected two diagnostic artifacts for dating and identification purposes. ROV video documentation of the site, collected over several survey transects, was used to produce a site plan for organization and planning purposes. The two recovered artifacts, a creamware *pôt de crème* and a creamware bowl, provided a tentative date of 1780-1820 for the wreck. Creamware was widely produced during the late eighteenth and early nineteenth centuries and is common on many North American sites from this period. The type of undecorated ceramics found on 16GM01 may have remained in circulation for several years after their production (Hume 2001).

After determining that the site was probably eligible for listing on the National Register of Historic Places and after consultation with the Departmental Consulting Archaeologist, the Advisory Council for Historic Preservation and the Louisiana State Historic Preservation Office, OGGC agreed with MMS that the proximity of the pipeline constituted a threat to the site and that the best means of protecting the site was through data recovery to reduce the visibility of the site to sonar from ROV's operating along the pipeline (McColloch, personal communication 2004). The site was disturbed in October 2004 by an unsupervised ROV incursion, following Hurricane Ivan, emphasizing the need for a data recovery operation. The OGGC contracted with TAMU to perform the data recovery. Project planning was interrupted by Hurricane Katrina in August 2005.

The site was surveyed by C&C Technologies during May 2005. This survey utilized an autonomous underwater vehicle (AUV) employing a Kongsberg EM2000 multibeam swath system to collect high-resolution multibeam bathymetry data for the site. The survey was conducted at 4-m (13-ft) line spacing over the shipwreck with the sensor at 10 m (32 ft) off the seafloor (Robert Church Personal Communication). This system produced an extremely high-resolution, accurately-positioned 3-D image of the seafloor in which the weapons chest, stove, cannon, and stern concretion were clearly identifiable.

A team from MMS and C&C Technologies returned to the site in July 2006 with OGGC's assistance. During this investigation, the archaeologists collected detailed video images of the wreck site with a high-resolution camera that captured features and details previously unobserved. Several photomosaic transects were performed. These detailed videos of the site revealed several dozen more exposed artifacts, including a number of potentially diagnostic artifacts such as a nautical telescope and sand-glasses, as well as indications of buried features that were thought to be parts of the ship's hull. Several structural components of the vessel were observed closely. For example, a bulkhead next to the weapons chest and timbers located west of the ship's stove were tentatively identified. The video also documented changes to the site that had occurred from the unsupervised ROV incursion, principally the exposure of hull timbers and artifacts caused by a "prop-washing" effect of the ROV's thrusters.

Based on these previous investigations, TAMU drafted a preliminary site plan and began preparation for the data recovery. The data recovery research design was submitted to MMS in April 2007, and the data recovery fieldwork began in May of that year.

1.5 Report Structure

The following report details the methods, analysis, and results of the Mardi Gras Shipwreck data recovery and concludes with remarks on the identification of Site 16GM01 and future directions for deepwater archaeology in the Gulf of Mexico. Chapter 2 describes the environmental and geophysical setting of the wreck site, including the water and sediment analysis. The methods employed to record and excavate the site, as well as conserve the artifacts and conduct the historical research are detailed in Chapter 3. Chapter 4 places the Mardi Gras Shipwreck in its historical context by describing the maritime history of the Gulf of Mexico with a particular focus on the early nineteenth century. Chapter 5 presents the results of the data recovery, describing the artifacts and hull remains. These results are then synthesized with the historical record in Chapter 6 along with concluding remarks. Throughout the report, measurements are provided in both International System (SI) and English units. In all cases, precedence is given to the units in which the measurement was made or in which the item was originally constructed (e.g. English units are used to describe artifacts) and the conversion is provided parentheses.

2.0 Environmental Setting

By Dr. William Bryant and Ben Ford

2.1 Geophysical Setting

The Mardi Gras Shipwreck lies approximately 64 kilometers (km) (40 miles [mi]) southeast of the Mississippi Delta's South Pass and is positioned in the upper Redfish Valley (see Figure 1.1). The Gulf of Mexico is an Atlantic-type passive continental margin and a subtropical, micro-tidal (<0.5 m tidal range), small semi-enclosed ocean basin that extends approximately 1368 km (850 mi) east to west and 1126 km (700 mi) north to south (Figure 2.1). The basin was formed by rifting during the Late Triassic to Early Jurassic followed by spreading during the Late Jurassic to Early Cretaceous. The dominant source of sediments in the Gulf is the Mississippi River, one of the world's largest rivers (Coleman et al. 1986).

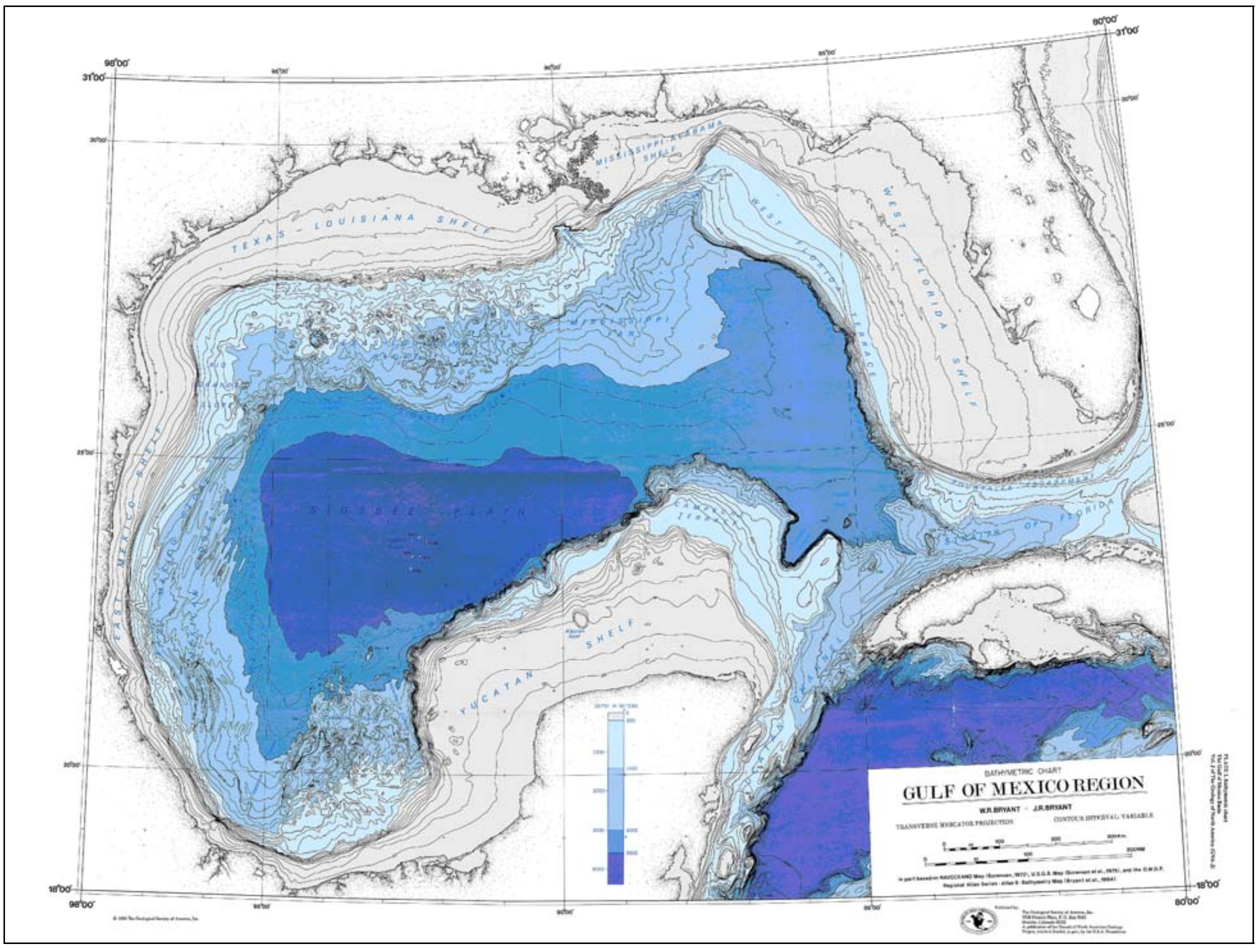

Figure 2.1. Bathymetry map of the Gulf of Mexico (source: Bryant 1986).

During the Late Triassic and Early Jurassic, rifting occurred between the North American plate and the African/South American and Eurasian plates. As the North American plate drifted away from the Africa/South American and Eurasian plates, the Gulf of Mexico basin was born in the stretched zone. Seawater flowed intermittently into the basin, depositing salt more than 1.8 miles (2.8 km) thick during the Late Middle Jurassic (Martin and Bouma 1978).

In the Late Jurassic, carbonate deposition dominated Gulf geomorphology. During the Middle Cretaceous, slow subsidence of the carbonate shelves, combined with little clastic input, resulted in a reef system (Stuart City/Lower Cretaceous reef trend) that extended from southern Texas eastward to southern Louisiana to the shelf edge of Florida and to the eastern Campeche Escarpment. In the Late Cretaceous-Paleocene, due to a Laramide orogeny in the interior continent, detrital sediments started to flux into the northern and western Gulf of Mexico (Coleman et al. 1986). The Gulf of Mexico was inactive during the late Eocene. In the Oligocene, the southern Rockies underwent intensive volcanism, and in the early Miocene, normal faulting molded the relief we see today. During the middle Miocene and Pliocene, the western U.S. underwent a series of broad uplifts (Winker 1982). In sum, throughout the Cenozoic, the total thickness of sediment deposition was estimated to be over 9.3 miles (14.8 km) in the northwestern Gulf of Mexico (Martin and Bouma 1978). In the southern and eastern part of the Gulf of Mexico, carbonate deposition has remained active since the Late Jurassic-Early Cretaceous, with only small amounts of detrital sediments being deposited in the Quaternary (Coleman et al. 1986).

The salt diapers in the region around the Mardi Gras site are typical of the salt structures that comprise the whole of the continental slope and rise offshore of Texas and Louisiana. The halokinesis of allochthonous salt governs the nature of that area and is the result of the migration of Jurassic salt originally laid down during the separation of North American from the South American and African continents during the Jurassic period (Salvador 1991a).

At the northern end of the Florida Escarpment is the north-northeast to south-southwest aligned De Soto Canyon, which separates the carbonate-dominated Florida Platform from the terrigenous-dominated environment to the west. West of the De Soto Canyon, many canyons running in a north-northwest to south-southeast direction formed during the late Wisconsin sea-level lowstand. These canyons include Dorsey and Sounder Canyons. Except for a canyon due west of the De Soto Canyon that cuts through the shelf break, all other canyons seem to originate at a water depth of 1300 feet or deeper and extend more than 25 miles basinward. To the west of these canyons are a series of pancake-shaped, 3 to 9 mile-wide salt domes, which become more scattered and smaller in size in a basinward direction. The first sub-salt well drilled in the Gulf of Mexico was by Exxon Corporation on one of the pancake domes called the Mickey Salt Sheet, for the obvious reasons. The name was later changed to Mica to avoid conflicts with the Walt Disney Corporation (Salvador 1991a).

The Mardi Gras Shipwreck is located 120 miles from the edge of the major salt sheet. During the last sea level lowstand, in the late Pleistocene, the majority of sediments draining into the Gulf of Mexico did so via the largest submarine canyon in the Gulf of Mexico, the Mississippi Canyon. The canyon is located 70 miles west of the Mardi Gras Site. The canyon has a width of about 20 miles. Approximately 75 miles east of the canyon, the present Mississippi Fan Delta, approximately 1000 years old, appears. The canyon/fan complex extends for more than 310 miles past the shelf edge onto the Sigsbee Abyssal Plain and occupies an area of about 56,000 square miles.

The Mississippi Fan (see Figure 2.1) is a large deep-sea fan consisting of a broad arcuate accumulation of predominantly Pliocene and Pleistocene sediments. The Mississippi Fan is flanked on the east by the West Florida carbonate platform and on the north and west by the Texas Louisiana Continental Slope. The deeper parts of the fan merge with the Florida Plain to the southeast and with the Sigsbee Plain to the southwest. Significant contributions to the fan have come from sources other than the Mississippi Embayment; particular sedimentation patterns in the Gulf of Mexico are mainly influenced by geomorphology, halokinesis, faulting, sea level changes, and sediment input. The last major sea level lowstand in the area, the Wisconsinan, occurred about 18,000 yr ago; during that time sea level dropped about 200 to 390 m (Bloom 1983). At that time, the present Mardi Gras site was less than 20 miles south of the Mississippi-Alabama continental shelf.

During the early Holocene (14,000 to 11,000 yr BP), sea level rose rapidly. The rapid melting of the ice sheet created large discharges that carried large amounts of sediments that were deposited on the outer shelf and upper slope in a short time. The rapid deposition and burial produced overpressured sediments on steep slopes that caused instability, mass movements, and sediment gravity flows (Prior and Coleman 1980; van den Bold et al. 1987). The Mississippi River during the last lowstand in sea level, late Wisconsinan, carried more than 13 times its current sediment load (80 X 10^{11} kg·yr^{-1} compared with 6 X 10^{11} kg·yr^{-1}; Perlmutter 1985). When sea level was low, sediments migrated seaward, which caused rapid build-out in front of the prograding delta lobes (Coleman et al. 1986). During the Holocene, sea level rise and a concurrent lessening of terrigenous sediment input deposited sediments at a much slower rate (<10 cm·kyr^{-1}) (van den Bold et al. 1987).

During sea level highstands, the majority of the coarse-grained sediments are trapped within the shelf province, and hemipelagic sediment settling becomes dominant in the deep water (Bryant et al. 1995). Sea-level highstand deposits tend to be parallel-laminated but are highly bioturbated and comparatively thin compared to sea-level lowstand deposits.

2.2 Sedimentology

Two sediment samples were collected with push cores (1 m x 7 cm diameter [3.28 ft x 2.75 in]) for the purpose of determining sediment type and basic properties. One sediment core was retrieved from the shipwreck site, and another was taken 500 feet (130.8 m) from the site. The cores were cut in half lengthwise, and photographed before and after oxidation. The fine fraction sediment of less than 0.063 mm (silt and clay) was separated from the coarse fraction. The fine fraction of Core 2, which was taken 500 feet (130.8 m) from the shipwreck site, was examined with the aid of a petrography microscope with magnification of 40X to 250X.

Figure 2.2 illustrates the half sections of the examined cores. Core 2 consists of silty clays that contain a coarse fraction almost entirely composed of foraminifera tests and a few worm tubes (Figure 2.3). The sediments in Core 2 have a bulk density of 1.2 to 1.3 grams per cubic centimeter and shear strength of 1 to 2 kilopascals. The total coarse fraction of Core 2, which makes up less than 1 percent of the total core mass, is illustrated in Figure 2.4. Figure 2.5 is a picture of the fine fraction of Core 2 obtained with the aid of a petrographic microscope that shows quartz particles and coarse aggregated clays.

In contrast to Core 2, Core 1 had a very large coarse fraction (the fraction larger than 0.062 mm) (Figures 2.6–2.8). The coarse fraction of Core 1 (Figure 2.6) contained shells, shell fragments, particles of wood, possibly some bone fragments, fecal pellets, and various forms of concretions. Figure 2.7 is a close-up of a concretion, worm tube, or a fluid expulsion found in Core 1. A hole in the center of the concretion goes from one end of the concretion to the other. Two of these structures were found in Core 2.

Figure 2.7 shows the oxidization of Core 1. The oxidization is the result of the high organic content sediments of Core 1 being exposed to the oxygen in the atmosphere. The sediments in the lower portions of Core 1 could be called sapropels. Sapropels are defined as a mud, slime, or ooze deposited in more or less open water. Sapropels may vary widely in composition, depending upon relative contributions from decomposing substances derived from plants and animals. Hydrogen sulfide, produced during the initial biochemical degradation of these substances, promotes preservation of the most resistant parts of the organisms. Most marine sapropelic deposits contain no appreciable contribution from humic substances of terrestrial origin. Sapropels usually contain 8 to 10 percent total organic carbon.

It may be a stretch of the imagination to call portions of Core 1 sapropels, but they do behave and appear like sapropels. The interesting aspect of all this is that the majority of organic material present is directly from the ship and the organisms that find the hard grounds created by the shipwreck a proper habitat.

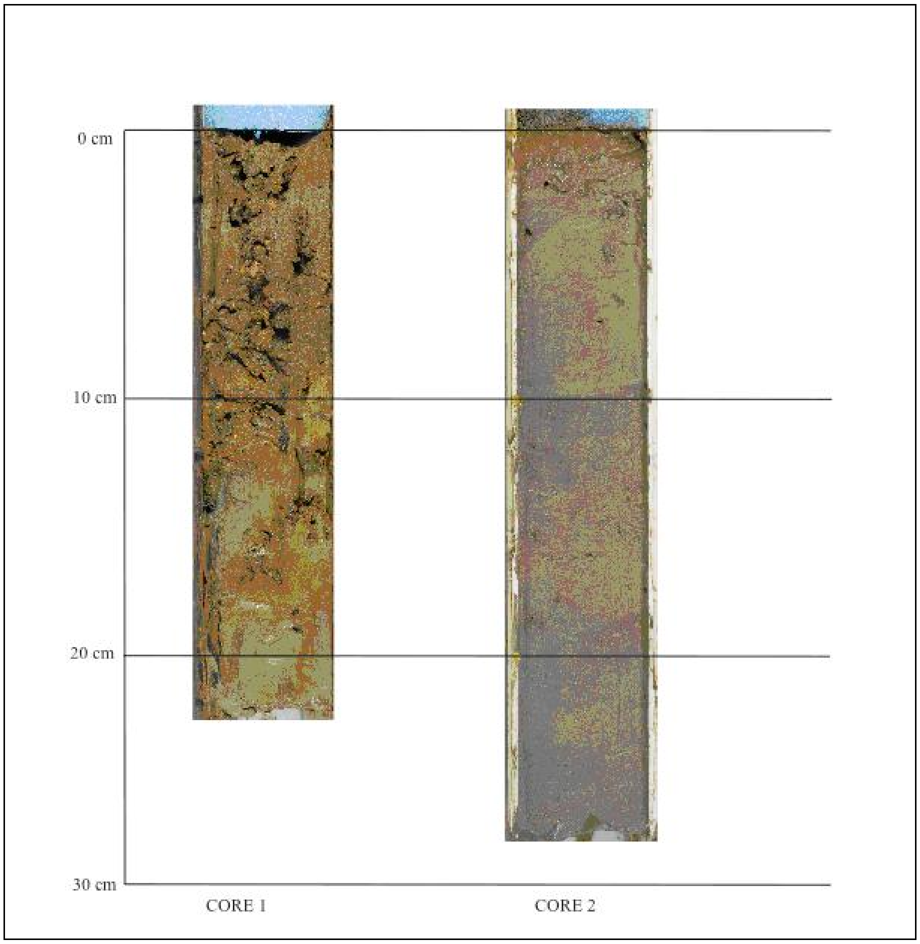

Figure 2.2. Split core 1 and core 2.

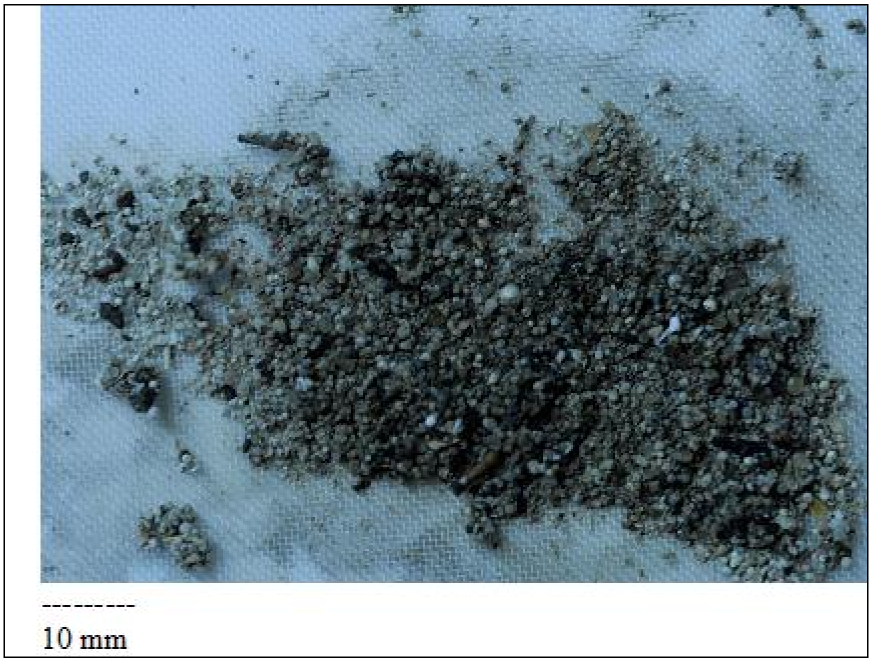

Figure 2.3. Total coarse fraction of core 2.

Figure 2.4. Enlarged view of the coarse fraction of core 2.

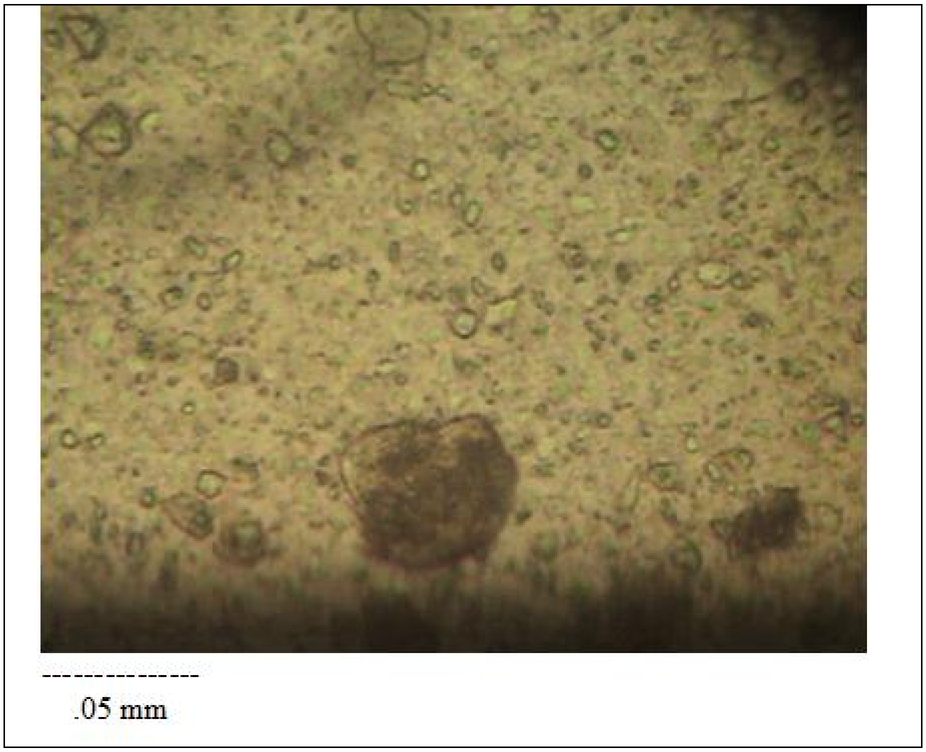

Figure 2.5. The fine fraction (less than 0.063mm) of core 2, illustrating the silt-sized quartz in the core.

Figure 2.6. Total coarse fraction of core 1. The large object with a hole in its top is a concretion or a fluid expulsion feature.

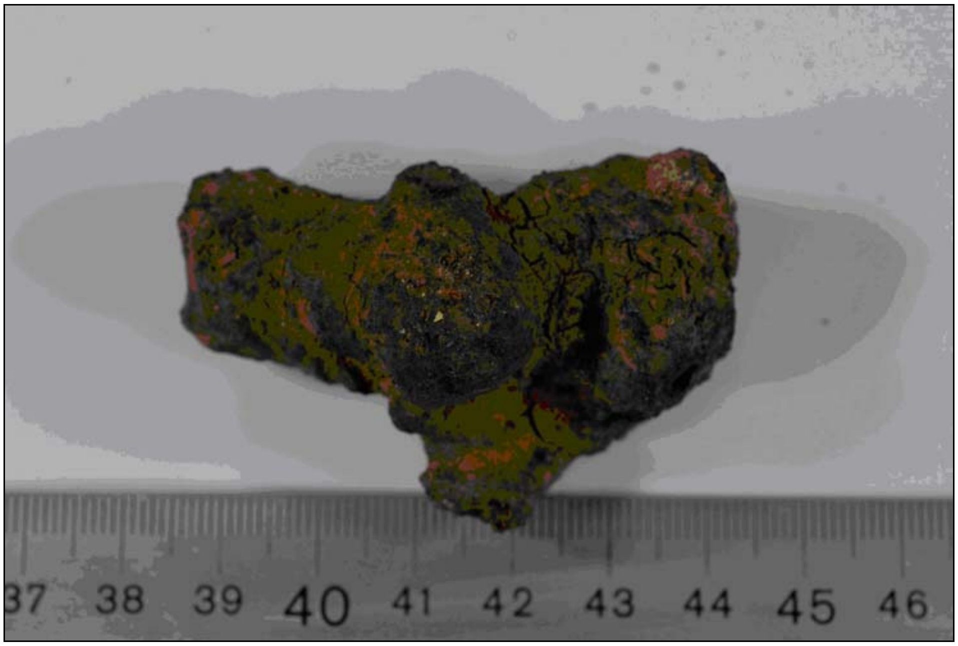

Figure 2.7. The concretion or fluid expulsion feature found in core 1.

Figure 2.8. Enlarged view of the total coarse fraction of core 1.

Figure 2.9. Core 1, illustrating the oxidized portion of the core.

2.3 Hydrological Setting

The Loop Current, which enters the Gulf of Mexico through the Yucatan Channel and exits through the Florida Straits, is the dominant surface current in the Gulf (Figure 2.10). This current transports warm Caribbean water into the Gulf as a result of the circulation caused by the Yucatan and Florida Currents (Hoffman and Worley 1986). The clockwise motion of the Loop Current has an eddy effect that results in counter-clockwise circulation along the Louisiana-Texas shelf during all but the summer months. During June, July, and August, the coastal currents reverse, flowing northward along the lower Texas coast and eastward along the Louisiana and upper Texas coasts (Cochrane and Kelly 1986). Tides, winds, and freshwater inflow also affect surface circulation. For example, the inner side of the shelf is characterized by a coastal flow driven by easterly winds that drives the discharge of the Mississippi and Atchafalaya rivers towards Mexico. In general, shelf currents are coherent with prevailing wind patterns, with maximum wind-induced currents occurring mid-shelf and the wind effect decreasing offshore (Atkinson et al. 1986).

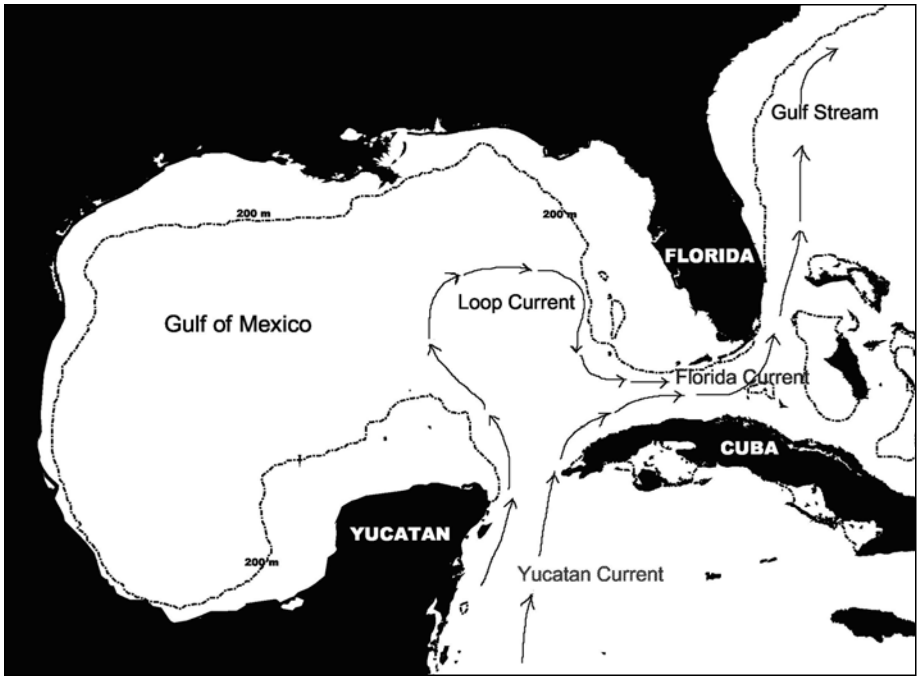

Figure 2.10. Major currents in the Gulf of Mexico region (source: NOAA:2006a).

2.4 Atmospheric Setting

Winds in the Gulf of Mexico are highly variable, but the winter winds generally travel in a westerly direction, while the summer winds often come from the northeast. The summer winds tend to be dominated by an anti-cyclonical pattern over North America, traveling west/northwest, but they can be counteracted by other patterns originating over the Atlantic Ocean. Hurricanes and tropical storms most often enter the Gulf from the southeast after being generated in the equatorial Atlantic Ocean or Caribbean Sea.

Historic navigation routes within the Gulf of Mexico were determined by these current and wind patterns (Lugo-Fernández et al. 2007). There is evidence that Spanish captains recognized the easterly flow along the outer shelf as early as 1519 and used it to speed their voyages from Veracruz to the eastern Gulf (Salvador 1991b:2). The basic routes through the Gulf entered through the Yucatan Channel and followed the prevailing winds and currents westward towards Veracruz and exited by following the northern Gulf coast east into the Straits of Florida and the Bahama Channel. The seasonal variability in winds and currents caused local fluctuations in these routes. For example, Spanish captains leaving Veracruz sailed either northeast or north-northeast depending on the prevailing winds. This course, combined with the season, dictated their prescribed course through the Gulf of Mexico and the latitude at which they turned east. Local variations in current and winds also resulted in varying maximum attainable speeds in different regions of the Gulf, with currents accounting for as much as 50 percent of a ship's speed (Lugo-Fernández et al. 2007).

Storms, both during winter and summer months, are a constant threat in the Gulf of Mexico. As early as 1566, Spanish documents mention *Nortes*, winter storms, and their effects on ships (Garrison et al. 1989a). The most damaging storms, however, tend to occur between June and November, when tropical storms (winds of 34 to 64 knots) and hurricanes (winds greater than 64 knots), regularly pass through the Gulf. Despite the dangers of sailing during hurricane season, many captains and ship owners were willing to weigh the risk against the profits of a successful journey. Other captains were forced to sail during hurricane season due to delays in loading cargo, imprecise understanding of weather patterns, or other impediments that caused the vessel to sail later than planned (Lugo-Fernández et al. 2007; Pearson and Hoffman 1995:14).

3.0 Methodology

By Ben Ford

3.1 Goals

The goals of the archaeological data recovery were to record the Mardi Gras Shipwreck and to reduce wreck visibility to ROVs using sonar along the adjacent pipeline through the removal of artifacts. These activities were conducted primarily within the bounds of the shipwreck as defined by hull remains and artifact distribution; however, the surrounding area was visually inspected and fill was removed from an adjacent location.

The purpose of these activities was to mitigate the adverse effects caused by the installation of the Mardi Gras gas pipeline as well as the unsupervised ROV visit in 2004. The data recovery was designed to address the following research questions:

- What are the identity, age, national affiliation, and function of the vessel?
- What can be learned about shipboard life at the time the vessel was in use?
- Where was the vessel constructed? Was it constructed for a different purpose than its final use?
- Why was the ship armed? Was it defensive or offensive?
- What caused the vessel to be lost? Why was it lost in this particular spot? Does it relate to other losses in the area?
- Does the vessel relate to any specific historical event or person?
- How does the fact that the vessel lies in 1220 m (4000 ft) of water affect artifact preservation?
- How do site formation processes differ in deepwater environments?
- What was the vessel's place within prevailing global economic and geo-political systems at the time of its loss?

To answer these questions, five research strategies were used:

- Historical research, including primary and secondary sources;
- Site mapping and inspection through still and video photography;
- Artifact recovery and excavation;
- Laboratory processing, analysis, and conservation of recovered cultural materials; and
- Analysis of recovered sediment, water, wood, and pollen samples.

This chapter describes the methods used during each of the background research and field activities. The results of the historical research and field investigations are reported in Chapters 4 and 5, respectively. The results of the research and field investigations are evaluated and interpreted in Chapter 6.

3.2 Historical Research and Historic Context

3.2.1 Archaeological Significance and Historic Contexts

The different phases of archaeological investigation (survey, site evaluation, and data recovery) reflect preservation planning standards for the identification, evaluation, registration, and treatment of cultural resources (National Park Service [NPS] 1983). This planning structure pivots around the eligibility of cultural resources for inclusion in the National Register of Historic Places. The National Register is the official federal list of properties studied and found worthy of preservation. The results of a field survey and site evaluation are used to make recommendations about the significance and eligibility of any resource.

The standards for determining the significance of cultural resources, a task required of federal agencies, are the guidelines provided by the NPS (36 CFR 60): the National Register Criteria for Evaluation. The following four criteria are given for determining if the “quality of significance in American history, architecture, archaeology, engineering, and culture is present in districts, sites, buildings, structures, and objects that possess integrity of location, design, setting, materials, workmanship, feeling and association” (36 CFR 60):

A. That are associated with events that have made a significant contribution to the broad patterns of our history; or

B. That are associated with the lives of persons significant in our past; or

C. That embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or

D. That have yielded, or may be likely to yield, information important to prehistory or history.

Most archaeological sites listed in the National Register of Historic Places have been determined eligible under criterion A and/or D. For eligibility under these criteria, a number of issues must be addressed, including the kind of data contained in the site, the relative importance of research topics suggested by the data, whether these data are unique or redundant, and the current state of knowledge relating to the research topic(s) (McManamon 1990). A defensible argument must establish that a site “has important legitimate associations and/or information value based upon existing knowledge and interpretations that have been made, evaluated, and accepted” (McManamon 1990:15). MMS deemed Site 16GM01 to be potentially eligible for inclusion in the National Register of Historic Places under Criterion D.

An historical context is fundamental to the significance of cultural resources because it provides the foundation for the determination of significance by placing the site in relation to other resources. An historical context is defined as follows: At minimum, a historical context is a body of information about past events and historic processes organized by theme, place, and time. In a broader sense, an historic context is a unit of organized information about our prehistory and history according to the stages of development occurring at various times and places (NPS 1985).

Historical contexts provide an organizational format that groups information about related historical properties based on a theme, geographic limits, and chronological periods. Each historical context is related to the developmental history of an area, region, or theme (e.g., agriculture, transportation, waterpower), and identifies the significant patterns that particular resource can represent. Historical contexts are developed by:

- Identifying the concepts, time period, and geographic limits for the context;
- Collecting and assessing the existing information within these limits;
- Identifying locational patterns and current conditions of the associated property types;
- Synthesizing the information in a written narrative; and
- Identifying information needs.

"Property types" are groupings of individual sites or properties based on common physical and associative characteristics. They serve to link the concepts presented in the historical contexts with properties illustrating those ideas (NPS 1983:44719).

A summary of an area's history can be developed by a set of historical contexts. This formulation of contexts is a logical first step in the design of any archaeological survey. It is also crucial to the evaluation of individual properties in the absence of a comprehensive survey of a region (NPS 1983:9). The result is an approach that structures information collection and analyses. This approach further ties work tasks to the types and levels of information required to identify and evaluate potentially important cultural resources.

The following research contexts were developed to organize the data relating to the Mardi Gras Shipwreck:

- European maritime commerce, transportation, and warfare in the Gulf of Mexico prior to 1800;
- European maritime commerce, transportation, and warfare in the Gulf of Mexico during the first half of the nineteenth century; and
- Vessel types and development of the Gulf of Mexico.

3.2.2 Historical Research

There is a recursive relationship between the historic contexts and the material culture of an archaeological site. Thus, the formation of the three contexts was influenced by what was known about 16GM01 and the contexts were used to interpret the suite as a whole. Analyses of the artifacts recovered from 16GM01 suggest that the vessel was a British or American craft sunk during the first quarter of the nineteenth century. Consequently, the historical research focused on the primary and secondary records of merchants operating in the region (New Orleans, Mobile, and Pensacola), port records, privateering activities, and hurricanes of the period, in an attempt to determine the identity of the ship, the cause of its sinking, and the nature of maritime trade and commerce in the Gulf of Mexico during the early nineteenth century. Primary documents, including Ship Registers and Enrollments of New Orleans, Louisiana (WPA 1942) and *Lloyd's Register*, and period newspapers, including the *Orleans Gazette, Alabama Watchman*, *Natchez Gazette, Cahawba Press and Alabama Intelligencer*, *Mississippi Republic, Alabama Courier, Huntsville Gazette, Louisiana Herald, Louisiana Planter, Louisiana Rambler, Louisiana Advertiser, Orleans Gazette and Commercial Advertiser, The Louisiana State Gazette, Louisianan, and Mississippi Messenger* were consulted. Available newspaper editions were investigated for the period 1808–1825. Not all newspapers ran or were available for that entire period. Table 3.1 summarizes the newspapers examined. Secondary United States and Gulf of Mexico maritime history books were also consulted, as were the *Louisiana Historical Quarterly* and previously published cultural resource management reports (Coastal Environments, Inc. 1977; Enright et al. 2006; Garrison et al. 1989a; Pearson et al. 2003).

Table 3.1

Newspapers Consulted

Newspaper	State	Available Start Date	Available End Date
Alabama Watchman	Alabama	8 August 1820	15 December 1820
Cahawba Press and Alabama Intelligencer	Alabama	10 July 1819	30 December 1820
Alabama Courier	Alabama	19 March 1819	15 October 1819
Huntsville Gazette	Alabama	21 December 1816	21 December 1816
Louisiana Herald	Louisiana	20 March 1819	2 December 1820
Louisiana Planter	Louisiana	15 May 1810	15 May 1810
Louisiana Rambler	Louisiana	28 March 1818	11 April 1818
Louisiana Advertiser	Louisiana	19 April 1819	31 December 1825
Louisiana State Gazette	Louisiana	11 November 1825	31 December 1825
Orleans Gazette	Louisiana	28 June 1805	31 December 1819
Orleans Gazette & Commercial Advertiser	Louisiana	11 June 1805	5 January 1816
Louisianian	Louisiana	8 May 1819	27 May 1820
Mississippi Republican	Mississippi	26 April 1813	27 April 1818
Mississippi Messenger	Mississippi	6 September 1805	11 August 1808
Mississippi Herald and Natchez Gazette	Mississippi	27 May 1806	10 June 1807

3.3 Deep Water Archaeology in the Gulf of Mexico

3.3.1 Previous Investigations

The MMS has sponsored several studies to collect information on cultural resources in the Gulf of Mexico region. These studies have been used to help design and guide a remote sensing survey program intended to identify cultural resources on the Gulf of Mexico Outer Continental Shelf. Studies conducted in 1977 (Coastal Environments, Inc.) and 1989 (Garrison et al. 1989a) were directed specifically at collecting information on historic shipwreck resources in the region. In a 2003 study (Pearson et al.), information on reported and known shipwrecks in the Gulf of Mexico region was collected from a variety of sources to expand the information presented in the 1989 study. The MMS has used the results of these efforts to determine where remote-sensing surveys for historic shipwrecks should be required in the Gulf of Mexico. Specifically, this information has been used to identify individual 4.8-km-square (3-mi-square) lease blocks and groups of lease blocks that have a high probability of containing historic shipwrecks and to develop remote-sensing survey strategies for these lease blocks.

All shipwreck information collected during these studies was incorporated into a relational database (Microsoft Access) and a geographic information system (GIS) (ArcView) that serves as a tool for MMS personnel engaged in the continued assessment and monitoring of shipwreck data in the Gulf. Data on a variety of variables relating to the characteristics of vessels and objects were collected for the entries included in the shipwreck database. At present, the database contains over 2,900 records of vessels lost in the Gulf of Mexico; however, a review of this database failed to identify a possible candidate for 16GM01.

In addition to these region-wide resources, the actions of treasure salvers provided information about Gulf of Mexico seafaring. Three shipwrecks disturbed by salvers bear directly on the Mardi Gras site in terms of date and location. The first vessel to be so affected was *El Nuevo Constante*, a Spanish merchant vessel driven into the shallows off what is now Cameron Parish, Louisiana in 1766. Discovered in 1979 when a local shrimper recovered copper ingots in his nets, the finders began mechanically dredging the site with a clamshell bucket after divers located gold and silver ingots. Eventually fearing prosecution for their activities in State waters, the salvers informed Louisiana authorities of their find. The State contracted an archaeological excavation of the ship in 1980 (Pearson and Hoffman 1995). Ironically, the vessel was not a treasure ship, as its finders assumed, but a common merchant vessel laden with a wide range of export items from Mexico.

Another eighteenth-century vessel discovered by fishers in the Gulf of Mexico did not fare nearly as well as *El Nuevo Constante* in terms of the preservation of archaeological data. The wreck of *El Cazador* was found in Federal waters offshore of Grand Isle, Louisiana, in approximately 100 m (300 ft) of water in 1993. A Spanish naval vessel, it had been lost in 1784 carrying some 450,000 pesos of silver *reales* to New Orleans. The wreck remains were dredged off the seafloor with no regard for archaeological context and deposited on the deck of a barge. For a brief period, the salvors maintained a roadside attraction known as the "El Cazador Museum" in Grand Bay, Alabama, south of Mobile. The current disposition of the "museum" and the fate of the artifacts it contained is unknown, but the organization's web site is now a dead link (www.elcazador.com) and the remaining coins recently were purchased by the Franklin Mint and were sold on QVC television beginning 17 April 2007. Sadly, had this wreck been discovered after passage of the Reagan National Defense Authorization Act of 2005 (Public Law 108-375) it likely would have been afforded sovereign immunity from commercial salvage.

The third salvaged vessel is, in many ways, nearly identical in its artifact assemblage to 16GM01 (Sinclair 2002). Dubbed the Piña Colada Wreck by its discoverers, the site was found in 4,999 m (16,400 ft) of water in the Atlantic off the east coast of Florida while searching for the Liberty Bell 7 space capsule. Some artifacts were removed from the site, including a number of utilitarian ceramics that appear to be undecorated creamware, an hourglass, two flintlock pistols, two octants, a wooden telescope, a leather boot, 1300 silver coins, and a gold box. The site was provided with a firm *terminus post quem* of 1810 from a newspaper fragment that was wrapped around coins found inside the gold box. The artifacts from the Piña Colada Wreck are in private possession. Their present condition is unknown, but it is uncertain if the collection will ever be published or made available for study.

Scientific investigations carried out on underwater archaeological sites are exceedingly rare in the Gulf of Mexico outside of state waters. Only two such investigations have been undertaken, both under the auspices of the MMS. The first investigation, completed in 1989, was concerned with what initially was presumed to be a shipwreck from the presence of a large ballast pile and six iron cannon (Garrison et al. 1989b). The researchers ultimately concluded, however, that the site consisted of nothing more than a ballast dump.

A second investigation conducted for MMS had more relevance for 16GM01. Located just 14.4 km (9 mi) to the north of the Mardi Gras Shipwreck in 747 m (2,650 ft) of water, a shipwreck of the same approximate size and age as 16GM01 was discovered after a gas pipeline inadvertently was laid across it. Dubbed the "Mica Wreck" after the name of the pipeline, a site investigation was funded by ExxonMobil to mitigate damages to the site (Atauz et al. 2006). The wreck was found to consist of a well-preserved, copper-sheathed lower hull, which was strangely devoid of artifacts. The wreck dated to the first half of the nineteenth century, based upon the purity of the copper sheathing, which later in the century was alloyed with other metals. Failing to find or recover any datable artifact assemblage, the researchers hesitated to speculate on a more precise date. Wood samples recovered from the site (which were limited to sacrificial exterior planking) suggested that the ship had been built, or at least refitted, in the northeastern United States. The recent recovery of a 2-m (6-ft) section of the Mica Wreck sternpost with a brass gudgeon attached provided little additional information because the gudgeon was unmarked and generic for the period.

3.3.2 Field Equipment

As demonstrated by the above discussion, deep-water archaeology is not well-established in the Gulf of Mexico. As a result, one of the major challenges of the Mardi Gras Shipwreck data recovery was the excavation and recovery of delicate artifacts beyond the limits of direct human involvement. In order to fulfill the goals of the plan, a range of specialized equipment was tailored for performing tasks under these conditions. The equipment used was a combination of off-the-shelf vehicles with tooling adapted from that used in the offshore oil and gas industry and specialized tooling specifically engineered for the needs of this project.

The fieldwork was staged from *Toisa Vigilant*, a subsea support and platform supply vessel managed by Sealion. *Toisa Vigilant* measures 80.5 m (264 ft) in length with an 18-m (59-ft) beam. The vessel was stabilized with two passive roll reduction stabilization tanks, and dynamic position was maintained by four 610 kilowatt thrusters, two forward and two aft, linked to a Kongsberg Simrad SDP21 system. In addition to the ROV winch, *Vigilant* is outfitted with a fixed-boom crane that was used to bring the lifting baskets onto the vessel.

Veolia Environmental was contracted to provide a Perry Triton XLS-17 ROV for the project (Figure 3.1). This ROV was a work-class, 150 horsepower (hp) system with a payload capacity of 550 pounds (reserve). The XLS-17 featured a heavy lift tether-management system (TMS) and was rated to 2,987 m (9,800 ft). It was fitted with one Shilling seven-function T4 and one five-function Rig Master manipulator. The system was completely fiber optic and capable of supporting up to eight cameras. The ROV was deployed with sector-scanning sonar, high-resolution video cameras, and digital still cameras. TAMU worked closely with Veolia representatives to design and incorporate specific tooling necessary to complete the archaeological objectives.

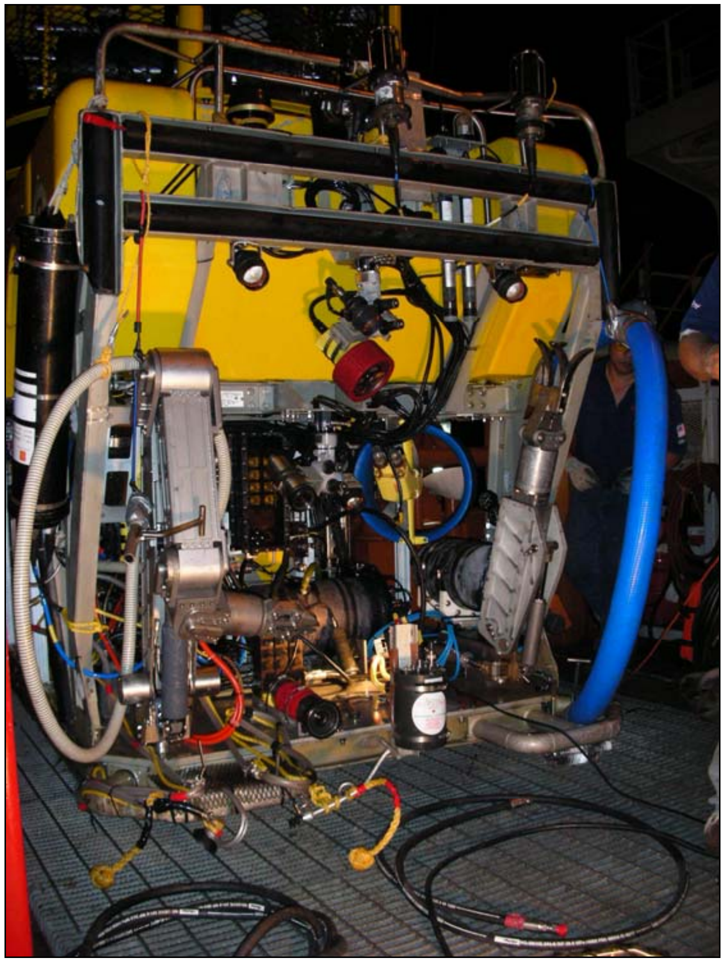

Figure 3.1. Triton XLS-17 ROV. Note the five-function manipulator on the right and the seven-function manipulator on the left, the suction dredge on the extreme right and the suction pickers in the left foreground.

Special tools used on the Mardi Gras Shipwreck excavation included an excavation dredge and screening system, suction pickers, scoops, a rake, and a pneumatic chainsaw. All tools were fitted with "T" handles so that they could be gripped and maneuvered by either manipulator. The dredge and screening system (Figure 3.2) consisted of a Tritec Excalibur hydraulic pump (variable 17 to 30 gallon per minute flow rate) fitted with flexible tubing. The pump was configured so that the artifacts dropped out of the system and into the screen prior to reaching the impellers. The pump had a variable switch that allowed the ROV operator to control the amount of suction and reverse the pump to blow sediment. The screen was constructed of ¼-inch (0.6 cm) #9 stainless steel mesh and fitted to the ROV as a backpack. With this system, artifacts could only be removed by opening the backpack at the surface. As a result, an attempt was made to only dredge in one area at a time with the backpack emptied between areas.

Figure 3.2. Excavation dredge pump and screening system.

The primary tools for artifact recovery were suction pickers, commonly called “sticky feet,” of various sizes. The suction pickers consisted of thin aluminum pipe fitted with a soft rubber cup. The picker was attached to a pump that provided the suction necessary to hold the artifact to the rubber cup. These tools were capable of collecting relatively large artifacts (including one of the stoneware jugs) and were the most precise collection tool, recovering only the selected artifact and not disturbing the bottom beyond the depression left by the artifact. The “bellows”-type suction pickers worked better than those with a simple rubber cup because the bellows allowed the picker to form a seal without pressing hard against the artifact. However, all of the pickers only worked on clean and relatively flat surfaces, limiting their use for certain artifacts. In instances where the suction pickers were inappropriate, a collection of scoops were employed. The majority of the scoops were constructed of $^{1}/_{8}$-inch (0.3-cm) steel plate and ranged from approximately 8 X 12 inches (20.3 X 30.5 cm) to 12 X 24 inches (30.5 X 61 cm) inside dimensions. The scoops were useful for picking up a wide variety of artifacts but disturbed the bottom sediments in the process and risked impacting yet-uncovered artifacts below the selected artifact. In order to partially remedy this situation, expedient tools were constructed by the Veolia Environmental staff. Several of these tools were built, but they all consisted of approximately five welding rods welded to a piece of $^{1}/_{8}$-inch (0.3-cm) steel plate. In general, these tools were only useful for the recovery of a single artifact, after which the tines were too bent to be effective. Finally, a pneumatic chainsaw was employed in an attempt to recover the weapons chest.

Regardless of collection method, most artifacts were transferred on the seafloor to specially modified milk crates in preparation for lifting (Figure 3.3). The milk crates were wired into pairs and fitted with towels to protect the artifacts. A single towel was wired or cable-tied across both crates to form a hammock inside the crate. A second towel was then stretched across the top of the crates. A slit was cut in each end of the top towel, and the ends of the towel were folded over to cover the slit. This towel prevented the artifact from surging out of the crate when lifted to the surface while allowing easy access by the ROV. Each crate was assigned a unique number, which was written on a livestock tag firmly wired to the crate. Two pairs of crates were attached to a piece of metal decking with a central handle (Figure 3.4). This four-crate arrangement could be lifted directly by the ROV and was employed for sensitive artifacts or when the ROV was scheduled to return to the surface after only a short dive. The majority of the artifacts, however, were lifted in a specially designed basket (Figure 3.5). This lifting basket measured 4 X 8 ft (1.2 X 2.4 m) at the base and was constructed of ¼-inch (0.64cm) steel plating with a 4-in (10.2-cm) I-beam frame.

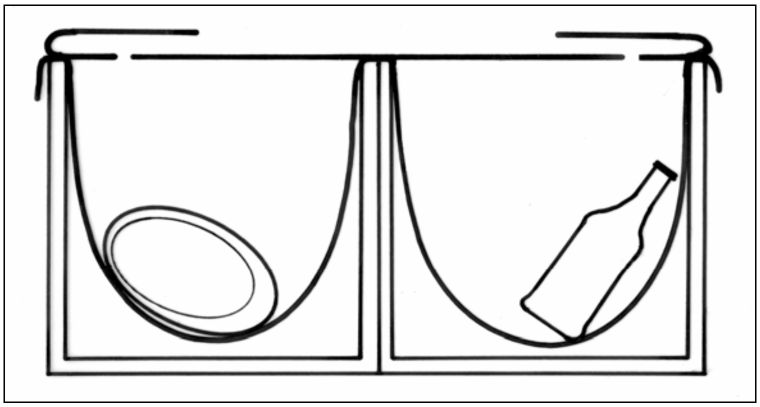

Figure 3.3. Schematic of modified milk crates (illustration by B. Ford).

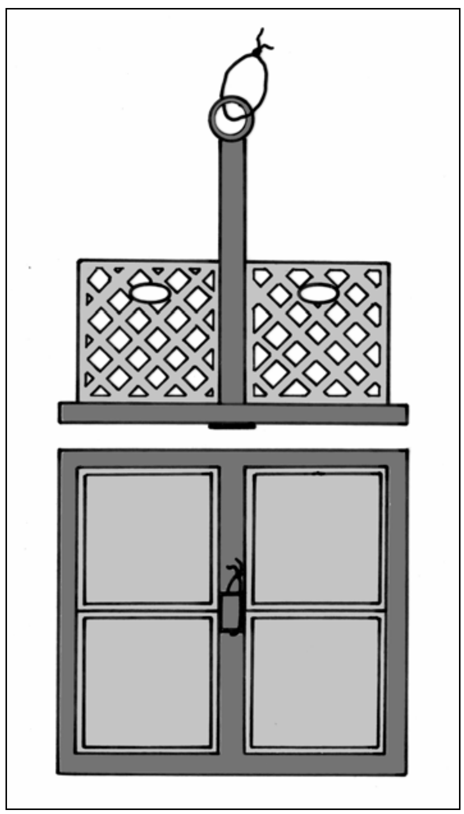

Figure 3.4. Schematic of two pairs of crates attached to a piece of metal decking with a central handle (illustration by B. Ford).

Figure 3.5. Lifting basket.

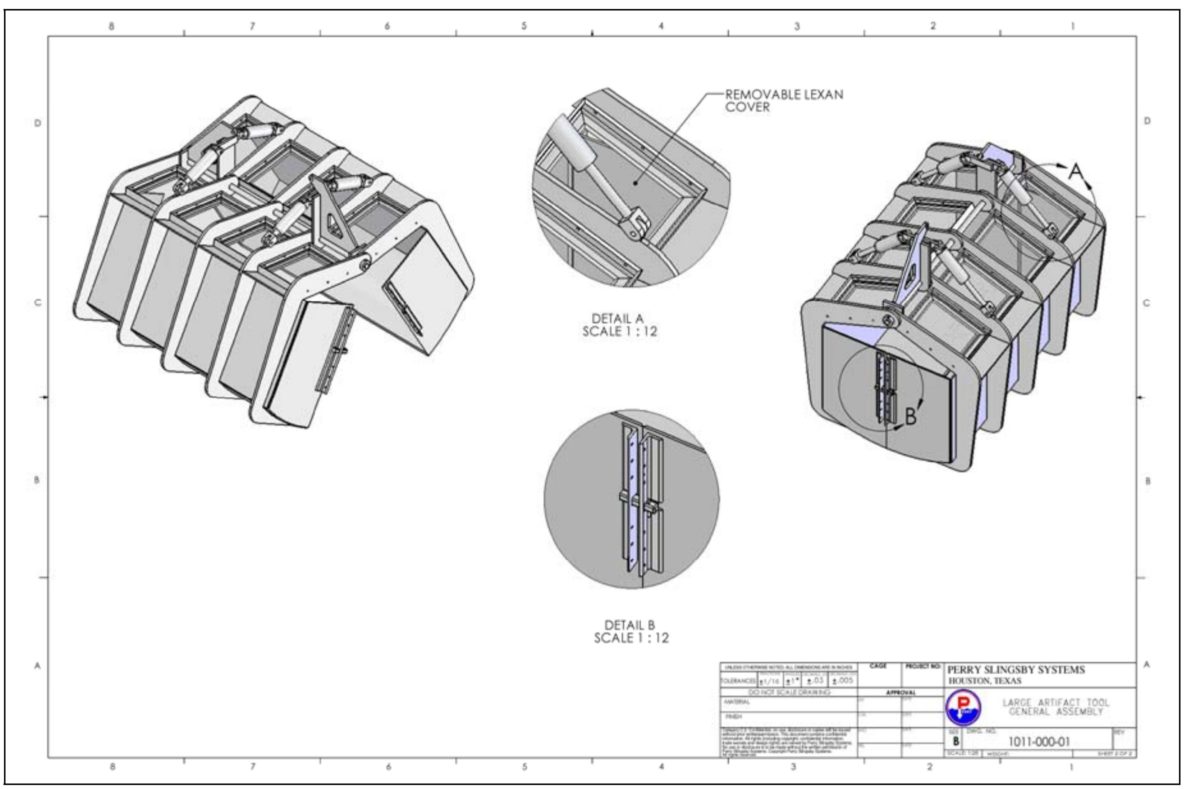

Figure 3.6. Large Artifact Retrieval Tool (LART).

Large Artifact Retrieval Tools (LARTs) were constructed for the recovery of large artifacts and features (Figure 3.6). These tools were used to recover the stern concretion and to backfill the site. They were specifically designed for the Mardi Gras Shipwreck Project by Perry Slingsby Engineering in Houston and were manufactured under the direction of Veolia Environmental Marine Services. The closed LARTs measured 8 X 5 X 7 ft (2.4 X 1.5 X 2.1 m) and the blades could be fully extended to 6 ft (1.8 m). The two halves of the LART could be closed at a controlled rate by means of hydraulic rams; once closed, the LART served as a shipping container for the artifact. Similar equipment for deep-water artifact recovery was proposed by Willard Bascom in 1971, but the current LART provided for a more controlled and precise recovery than Bascom's design.

All artifacts were tracked using *Site Recorder 4*® and a custom Microsoft *Access* relational database. *Site Recorder*®, developed by 3H Consulting, Ltd., was selected as the main software system for recording, registering, and cataloguing artifacts from fieldwork through the conservation process. The software purports to be a fully-integrated GIS designed for use in maritime archaeology. Ideally, *Site Recorder*® can manage thousands of artifacts, drawings, photographs, video clips, documents, and geophysical data files that can be linked together for analysis and interpretation. However, due to initial difficulties establishing geodesy within *Site Recorder*® caused by the program's lack of support for the NAD27 projection and datum and the program's inability to efficiently display the large image files necessary for a high-resolution photomosaic it was deemed necessary to develop the Microsoft *Access*® database. Both *Site Recorder*® and *Access*® were operated in parallel to create duplicate and redundant records.

Unlike archaeological projects on land, every task performed on the seabed during the Mardi Gras Shipwreck Data Recovery Project was documented on video. For the success of the project, it was important to document the artifacts on the seabed with as much resolution as possible. Once removed from the seabed, the only information allowing the archaeologist to match the artifact to its number (along with the lifting basket information) was the visual file. This file took the place of the bag log that generally follows artifacts on terrestrial excavations. For this reason, visual documentation was crucial and was provided by high-resolution digital still cameras with high-intensity lights coupled to an advanced VideoSoft digital video recording system. An Imenco SDS7200 7.3 mega-pixel digital still camera was used for creating photomosaics of the site and for shooting detailed photography of artifacts before they were removed from the seafloor. This camera was mounted on the Triton XLS-17 for the duration of the project. In addition, the project employed a Tritech Typhoon VMS Laser/Camera system. This system included five lasers that surround the lens of the camera, all of which are clearly visible on a monitor. Software provided with the system allowed any object in the field of view to be measured within millimeters. These scales were useful for data processing and for understanding the size and relative position of artifacts within the site. It was found, however, that the scales were accurate only when they could be projected within the same plane and directly onto the artifact, which limited their usefulness for measuring many of the artifacts. Also available for photography of artifacts once onboard the research vessel was a Nikon D200 Professional with software package *Camera Control Pro*®.

In addition to photographic recording, UTEC Survey Inc. was contracted to provide survey support, including acoustic positioning and geo-referenced video support. Basic positioning of the ROV was provided through a Kongberg Ultra short baseline (USBL) system, which is typically accurate to 0.5 percent of water depth. This system was used to track the approximate position of the ROV and its tether management system. Actually positioning on the seafloor was provided by a long baseline (LBL) system of five transponders. Unfortunately, one of the transponders did not function properly, limiting the usable transponders to four. After initial difficulties in obtaining accurate position data, this system provided 30 cm accuracy. In addition, UTEC geo-referenced all video within *VideoSoft®* image capture software.

3.3.3 Field Methods

Field operations on the Mardi Gras Shipwreck site were conducted between 21 May and 7 June 2007 and required the combined efforts of archaeologists, federal managers, ROV pilots, ship's crew, deck and hoist crew, and conservators. The project operated on a 24-hour schedule with the archaeologists divided into three two-person shifts while the remainder of the staff operated on 12-hour or as-needed shifts. Project management and continuity was provided by Peter Hitchcock and Dr. Donny Hamilton, who also worked 12-hour shifts. Each archaeological shift team included one archaeologist in the ROV container and another on the bridge. The ROV container archaeologist provided direct advice to the ROV pilots and guided operations. The bridge archaeologist monitored the excavation and recovery progress through a video feed from the ROV camera. This archaeologist had access to the combined expertise of the archaeology staff and was able to liaise with the positioning and survey staff as well as the archaeologist operating the still cameras and the site/artifact recording software. Communications between the ROV container and the bridge were maintained at all times through the ship's radio.

Prior to reaching the site, the archaeology staff, including MMS personnel, finalized and agreed upon a standard operating procedure for artifact recording and recovery. This plan was then vetted with the Veolia Environmental ROV and technical staff to verify its feasibility. Final set up of the conservation laboratory, computers, and video links was also completed during the transit to the site.

After arriving on site and establishing a station with the ship's dynamic positioning (DP) system, a series of thrusters that allow the vessel to remain essentially motionless, the UTEC staff deployed the positioning system. With the help of the ROV, five transponders were deployed around the wreck allowing the survey staff to track both the ROV and the relative position of the vessel. With accurate positioning achieved, site recording and artifact recovery could begin.

3.3.3.1 Site Survey and Mapping

The initial archaeological task was a pre-disturbance survey of the site. This task was accomplished through the creation of a high-resolution photomosaic. The ROV was flown at an altitude of approximately 4 m (13 ft), providing a swath coverage of 4.5 m (14.7 ft) with the Imenco still camera. In order to achieve coverage with a 60 percent overlap, transect lines were spaced approximately 3 m (10 ft) apart. A coarse mosaic was created shortly after the images were collected using the photo-merge function in Adobe® *Photoshop®*. Because the photo-merge function has the capability of stitching the images at the pixel level, it helped to reduce camera distortion and parallax. The coarse mosaic was next georeferenced using ground control points taken from previously collected data in order to place it in real space. This mosaic served as the base map during the excavation. Additional mosaics of specific site areas were developed throughout the excavation, ending with a mosaic of the backfilled areas. Both total site and specific area mosaics were collected. The specific area mosaics covered designated zones during excavation and recorded changes to the site without the extra expenditure of time to photograph unaffected areas.

After the completion of the fieldwork, a high-resolution mosaic was constructed using approximately 2500 seven-megapixel images. These images were sorted into groups by mosaic survey line (each pass of the ROV over the site) and then automatically corrected for parallax using *ER-Mapper*® software. The corrected images were then stitched into lines and modified so that the color, saturation, brightness, and contrast of each image were balanced for that line. The next step was to establish a georeferenced framework to which the mosaic lines could be attached. This task was accomplished by importing the UTEC field survey points for major artifacts (e.g. stove, concretion, cannon, compass) into ESRI *ArcGIS*®. These locations were then verified by overlaying the sector-scanning sonar images and C&C Technologies multibeam sonar data over them to verify correspondence. Next the ROV flight paths were imported into ESRI *ArcGIS*® for the purpose of checking site geometry in relation to the surveyed artifacts. This process also served to filter out any anomalies or noise caused by individual points far outside the site boundaries. A polygon of each large artifact (cannon, stove, gun box) was then created based on the sonar, multi-beam, and archaeological data, and these polygons were imported into *ER-Mapper*® to define the geographical boundaries of the mosaiced artifacts. The positions were again checked by importing the ROV flight paths into *ER-Mapper*® and checking the artifact position against the ROV position when each picture in the artifact mosaic was taken. The imported artifact frames were then used to position the mosaic lines within *ER-Mapper*®. Thus, the mosaic lines that had initially been created in *ER-Mapper*® without a coordinate system were assigned geographic positions and orientations. This process was repeated until a full mosaic of the site was created. The mosaic was then saved at full resolution as a .tiff file. The final step in the mosaic process involved bringing the .tiff into *Photoshop*® CS2 and balancing the colors between individual lines in order to make the image more aesthetically pleasing and easier to interpret.

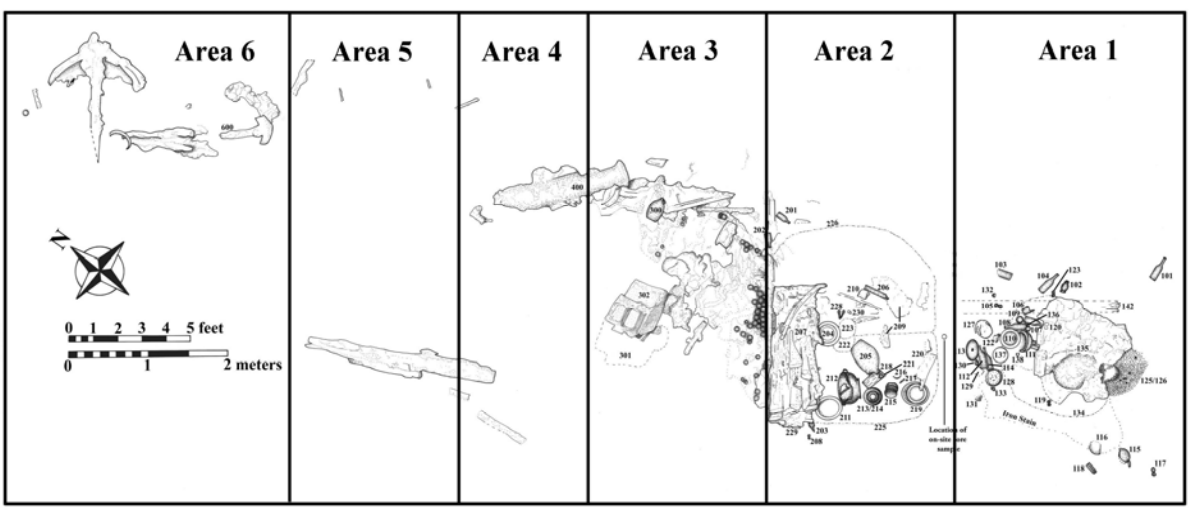

Figure 3.7. Site plan with sections delineated (illustration by B. Ford).

These large mosaics were time-consuming to create and required an enormous amount of computer processing power to manipulate. As a result, the coarse mosaic was loaded into *Site Recorder*® and used as a base map. Based on this mosaic and natural divisions in the hull structure and artifact distribution, the site was divided into six sections, numbered 1–6 from stern to stem (Figure 3.7). The divisions helped structure the excavation and artifact recovery and were used to assign artifact numbers. Each artifact was assigned a three digit unique identifier. The first digit of this key was the section from which the artifact was recovered, while the second two digits were assigned sequentially. If an artifact, such as a concretion, resulted in more than one artifact, these artifacts were given lot numbers assigned sequentially and separated from the primary number by a hyphen. These numbers, in addition to the material and functional class of each artifact and a photograph, were entered into both *Site Recorder*® and the *Access*® database. The *Access*® database also included location data for each artifact.

3.3.3.2 Artifact Recovery

With the ability to identify, record, and track artifacts established, archaeological recovery began. Initially, exposed small/fragile artifacts were recovered through the use of the suction picker and various scoops. The extraction of these items exposed portions of underlying artifact materials. Careful manipulation of the suction dredge removed extraneous sediment from the newly exposed objects so that these items could more easily be recorded and excavated from the site with the ROV tools. An effort was made to remove all exposed, portable objects from the focus area; when this objective was reached artifact recovery was redirected to a new location. The removal of each artifact was a unique challenge, specific to the properties and fragility of the item. The best possible method was employed for each specific object, though the general procedure was as follows.

- The target artifact was selected through an agreement between the archaeologists in both the ROV container and the bridge.
- The ROV with specific numbered crate containers were piloted to the vicinity of the artifact under the direction of the ROV-based archaeologist. The ROV was positioned and landed. Stirred up suspended sediment was allowed to disperse before proceeding.
- A specific number was assigned to the object.
- The target artifact was photographed *in situ* with the Typhoon Camera both with and without the laser measuring system.
- The artifact was extracted using the tool best suited for the object in order to minimize impact to the artifact and disturbance to the adjacent area and to afford an efficient recovery.
- The object was deposited in a numbered crate, insuring it was covered by the protective towel. The number of the crate was recorded by archaeologists in the ROV container and bridge and added to the digital record.

Each crate was assigned one individual artifact and, once a pair of crates was filled, they were piloted to an area near the lifting basket. The process was repeated until a sufficient number of crates were ready to be lifted to the surface. The crates were then carefully stacked inside the lifting basket and the basket lid closed and pinned shut. The basket remained on the seafloor until a window of sufficiently calm weather was available to safely bring the artifacts aboard the vessel. The decision to raise the basket was made by the archaeologists and Veolia ES support staff. In order to raise the large artifact basket, the ROV attached the main winch wire to the basket for the lift, and then followed the basket during the lift to monitor its progress. Once the basket ascended to 200 ft (61 m) below the research vessel, the ROV attached the crane's line to the basket and removed the main winch wire, allowing the basket to be brought up and over the side of the hull.

The artifact crates were then carefully removed from the basket and kept wet while the conservation staff checked the artifacts and crates against the artifact log. Once the identity and provenience of each artifact was verified, it was removed from the crate and tagged with the unique number assigned to it prior to recovery. The tags were made of plastic sign material and attached with monofilament line. Artifacts were then deposited in large galvanized steel tanks for temporary storage. During daylight hours following the artifact recovery, the conservation staff recorded each artifact with a sketch, measurements, brief description, and photograph. All of this information, including the photograph, was printed on a conservation record card that followed the artifact throughout the cruise and into the conservation laboratory. The artifacts were then wrapped in wet towels and plastic wrap before being placed in plastic (Sterilite® and Tupperware®) bins and returned to the galvanized steel tank for storage during the remainder of the cruise. The plastic wrap was perforated to allow free movement of water past the artifact and, along with the towels, served to keep the artifact wet. The plastic bins helped protect the artifacts from damage and also held water. All water used in this process was seawater from the vessel's deck faucet.

While the above process worked well for small and medium sized artifacts, it was not appropriate for large artifacts, specifically the cannon, stove, stern (southeast) concretion, and weapons chest. Each of these artifacts was approached differently. While these artifacts account for many of the large artifacts on the site, it should be noted that an anchor, concretion along the starboard (east) side of the wreck, and exposed hull remains were left *in situ*.

The cannon was removed directly from the bottom in a single lift. The excavation dredge was reversed to blow the sediment from underneath the cannon. This process took advantage of the cannon's situation to create two passages beneath the gun. Lifting straps were passed through these holes and attached to the ship's winch. The winch cable was then slowly taken in until the cannon separated from the wreck and could be brought to the surface. The ROV tracked the cannon on its ascent, monitoring it for any signs of deterioration and to switch the cannon from the winch to crane cable at an appropriate depth. Once on deck, the cannon was placed on two shipping pallets padded with blankets. The gun was then documented and wrapped with wet blankets and plastic sheeting before being enclosed in a LART. The LART served as a shipping container, providing good protection and an easy lift point. The cannon was wetted several times per day prior to shipping.

The stove was more difficult to recover than the cannon due to its advanced state of deterioration. While the cast iron cannon was relatively solid, the thin cast iron plates of the stove contained very little sound metal. In an effort to recover the stove intact, it was placed in a cargo net using one of the pieces of lead sheathing found with the stove as a stretcher to support the stove's weight. Portions of the stove were lost on the seafloor as it was transported to the cargo net. Once gathered in the net, the stove and recovered pieces were deposited inside the lifting basket. Unfortunately, the stove did not sit properly in the basket and was forced to ride at an angle, not resting solidly on a flat surface. As a result of this handling, its poor state of preservation, and pressure from the sediments trapped inside, the stove arrived at the surface in several pieces. The majority of these breaks were along fabrication joints and the pieces have been successfully reconstructed and cast by the Conservation Research Laboratory. The fragments were tagged and individually wrapped for reassembly at the conservation laboratory.

The stern concretion was recovered with a LART. After clearing the small artifacts from the vicinity, it was decided that the LART was an appropriate method to collect the concretion because of its size and irregular shape. The shape of the concretion did not lend itself to strapping like the cannon and its size precluded direct manipulation by the ROV similar to the stove. The LART was deployed to the seafloor, where the ROV positioned it over the artifact and established the hydraulic connection with the rams. The LART was lowered into the sediment in an open position, using its weight to reach a sufficient depth to safely enclose the concretion. The LART was then slowly closed. Next the LART was raised in a similar manner to the lifting basket and deposited on the vessel's deck. The inside top of the LART was lined with plastic sheeting, and the concretion and trapped sediments were wetted several times a day. The artifacts remained in the LART until they were removed at the Conservation Research Laboratory (CRL) in College Station, Texas.

The final large artifact for which removal was attempted was the weapons chest. The weapons chest had the greatest relief on the site and had the potential to contain a significant amount of information about the shipwreck. As a result, an intensive effort was made to recover the chest. The area surrounding the chest was initially excavated in an attempt to free the chest from the wreck. However, it was found to be extremely friable and firmly attached to the hull remains, possibly as a result of iron corrosion. It was therefore decided that a direct lift similar to that employed with the cannon would likely damage the chest and the use of a LART would cause an unknown but extensive amount of harm to the hull. After consultation with the MMS and Veolia Environmental staffs, it was decided to cut the hull timbers adjacent to the chest in order to free it. Over the next several hours, several frames and planks were cut on the aft (southeast) side of the chest. However, it was difficult to saw the forward side of the chest due to the starboard concretion. Again, after consultation, it was decided to leave the chest in place.

The weapons chest and other artifacts and features that were left in place were extensively photo-documented with both video and still photography. The video camera was used to record the artifacts and features at various angles to capture their details and settings in an easily-reconstructed format. The video camera was also used while the ROV hovered so that archaeologists could carefully study the cultural remains. The Tritech Typhoon VMS Laser/Camera system was also used to photograph the artifacts and features left *in situ*. In several instances, the dredge pump was reversed to remove loose sediment from the artifacts without disturbing them. These photographs complete the cultural resource inventory of the wreck.

3.3.3.3 Sample Collection

In addition to the artifacts and photographs collected at the site, several samples were also gathered, including sediment, water, wood, and pollen. Two sediment samples were collected with push cores (1 m x 7 cm diameter [3.28 ft x 2.75 in]) for the purpose of determining sediment type and basic properties. One sample was collected outside the site boundaries as a control, while the other was taken from within the hull between the artifact clusters of Area 1 and Area 2 (see figure 3.7). The ROV also triggered two Mason bottle water-sampling devices mounted on the artifact basket to determine water chemistry. One sample was collected in the water column adjacent to the site and another directly above the shipwreck. All water and sediment analyses were conducted at TAMU, Department of Oceanography. These samples and data were processed to determine site formation processes and conservation condition of the artifacts and also for acquiring a better understanding of the physical and chemical properties of archaeological shipwreck sites in the Gulf of Mexico.

Wood samples were collected from the spar, frames, and planking recovered with the stern concretion. These samples were representative of the major identifiable hull components. Preliminary wood analysis for speciation was completed at TAMU, Department of Forest Sciences. The focus of this analysis was to determine likely locations where the vessel was constructed. Samples were also submitted to the Tree Ring Laboratory at Cornell University for dendro-chronological analysis.

Pollen samples were taken from the collected sediment samples as well as from the interiors of the intact bottles and sand-glasses. The Palynology Laboratory at TAMU, under the direction of Dr. Vaughn Bryant, carried out the pollen analysis. This laboratory is familiar with botanical remains from underwater sites and deep shipwrecks, as well as with Texas and American Southwest botanical species and pollen. The Mardi Gras Shipwreck site has a great advantage in terms of its physical location some 64 km (40 mi) offshore for conducting pollen analysis. This distance limits the amount of contamination from botanical elements transported to the underwater site by rivers, currents, and winds. Pollen present on the site is therefore likely to be directly associated with the shipwreck and possibly its cargo.

The final activity on site was to backfill the depressions made by excavation and artifact removal. The LART was used as a large hopper to transport sediments from offsite. All fill was collected from approximately 250 m away, well beyond the bounds of the shipwreck and its debris field, and gently deposited across the site. Backfilling required three LART loads and substantially reduced the visibility of the site to sector-scanning sonar (Figure 3.8).

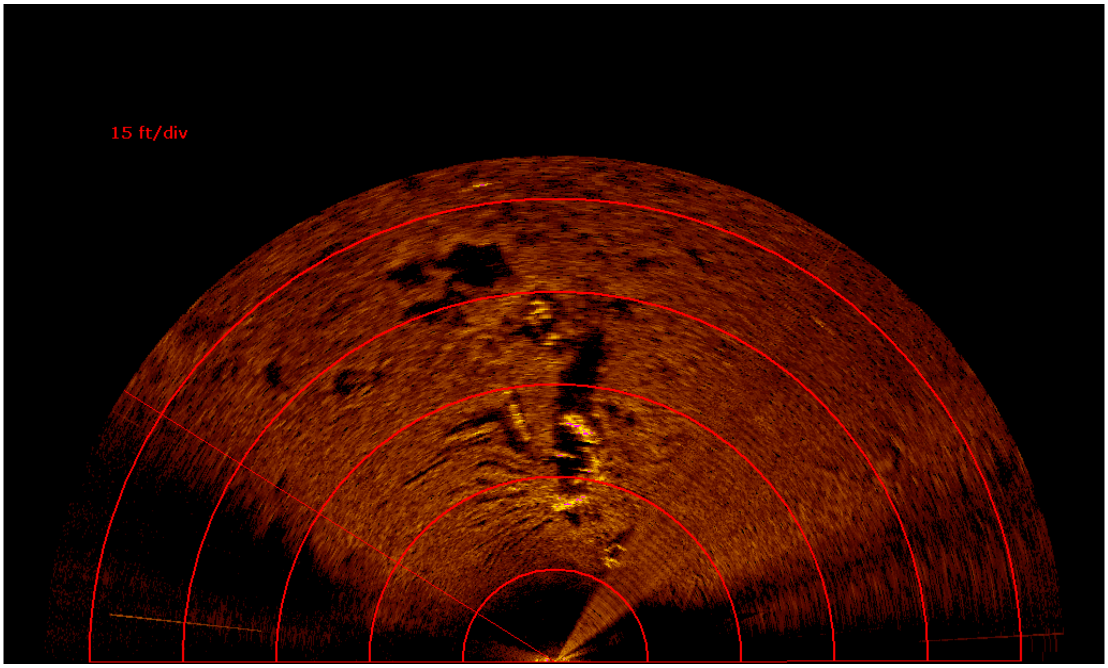

Figure 3.8. Sector-scanning sonar image of the Mardi Gras Shipwreck site after backfilling (each concentric ring is a 15-ft (4.6-m) division).

Raised artifacts were repackaged in wet towels, foam padding, and plastic wrap prior to arriving at the dock in Port Fuchon. This packaging served to protect the artifacts and ensure that they remained damp during transportation. With the exception of the stern concretion and cannon, which were contained in LARTs, all of the artifacts were then placed in plastic (Sterilite® and Tupperware®) boxes and firmly packed to reduce movement. The plastic boxes were subsequently placed in galvanized steel tanks and loaded into a shipping container. The container was transported by flat-bed truck to the Conservation Research Laboratory (CRL) within 24 hours of docking the vessel. Once at the CRL the artifacts were removed from the container and placed in wet storage to await conservation.

3.4 Artifact Conservation

The Conservation Research Laboratory (CRL), under the direction of Dr. Donny Hamilton, conducted all conservation of recovered material. This is an ongoing process that will not be completed until approximately 2009; the methods discussed here reflect only the work completed to date. Arrangements have been made between TAMU, the CRL, and the Louisiana Division of Archaeology for the delivery of completed artifacts.

The CRL has been in operation for over 25 years, operates year-round and has conserved hundreds of thousands of artifacts of all materials and composite classes. All work conducted at the CRL follows the philosophy:

> "Regardless of an artifact's condition or value, its aesthetic, historic, archaeological, and physical integrity should be preserved. After conservation, an object should retain as many diagnostic attributes as possible. The preservation of the diagnostic attributes of the object being conserved is of utmost importance in selecting a conservation treatment." (Hamilton 1999)

What follows are basic steps for artifact conservation followed by the CRL. In general, pottery, such as the creamware and stoneware from the Mardi Gras Shipwreck site, survives well in marine environments and requires only minimal treatment after recovery (Pearson 1987). Earthenware excavated from marine sites becomes saturated with soluble salts, and/or the surfaces often become covered with insoluble salts, such as calcium carbonate and calcium sulfate. Soluble salts (chlorides, phosphates, and nitrates) are potentially most dangerous to the integrity of pottery, and they must be removed in order for the object to be stable. The soluble salts are hygroscopic, and as the relative humidity rises and falls, the salts repeatedly dissolve and crystallize. These salts eventually reach the surface of the ceramic, where extensive crystallization takes place causing exfoliation of the surface of the ceramic. Eventually, the vessel will break as a result of internal stresses. At times, masses of needle-like crystals may cover the surface, hiding all details.

Iron stains on the Mardi Gras Shipwreck ceramics were removed with a 2 percent hydrogen peroxide solution applied locally with swabs and the artifacts were mechanically cleaned. Soluble salts were then removed by repeated rinsing in tap water followed by several rinses of deionized (DI) water. The rinses continued until a stable, low chloride level was achieved. Chloride levels were checked with weekly mercuric nitrate tests. Insoluble salts, conversely, were removed by hand, using wet-scraping with a scalpel or dental tool. Physical cleaning was conducted as necessary using a soft brush. Following the final deionized water bath, the ceramics were submerged in successive baths of 75% DI water/25% ethanol, 50% DI water/50% ethanol, 25% DI water/75% ethanol, 100% ethanol, 75% ethanol/25% acetone, 50% ethanol/50% acetone, 25% ethanol/75% acetone, 100% acetone. The purpose of this treatment was to slowly dehydrate the artifact. The final acetone bath was conducted under a slight vacuum. The ceramics were then consolidated with a dilute solution of polyvinyl acetate (PVA) V15 in acetone under the same vacuum. The artifacts were kept in the PVA solution until bubbling ceased before being removed and allowed to dry. Any repairs necessary were made with a Paraloid B-72 glue. Excess glue was wiped away with a solvent-wetted rag.

Glass, similar to pottery, requires very little conservation but often benefits from consolidation that forms an optical bridge between the devitrified layers of the glass. For this reason, glass is often treated with silicone oil at the CRL. All glass artifacts were initially mechanically cleaned and rinsed with tap and deionized water until stable and low levels of chlorides were achieved. The glass was then dehydrated in successive baths similar to the ceramics before being immersed in a solution of PR10 polymer and methoxysilane/methanol (MTM) crosslinker under a slight vacuum. The glass was then cleaned to remove the excess polymer solution before being placed in a closed container and exposed to dibutyltin-diacetate (DBTDA) vapors, which catalyze the reaction. Following this treatment, the artifact was mechanically cleaned to remove any extraneous polymer or materials. Any mending necessary was completed with Cyanoacrolite (super glue), as traditional conservation adhesives do not adhere to silicone oil-treated artifacts, and this glue can be separated at the glue interface, making it reversible.

Ferrous archaeological materials from marine sites are among the most difficult to conserve because, from the moment of manufacture, the various metals and their alloys, except for gold, react with their environment and begin a corrosion process that converts them to more stable compounds. Corrosion of iron can occur electrochemically or anaerobically. In electrochemical corrosion, a galvanic cell is created when two different metals, or different areas on the same metal, are coupled by means of an electrical or ion-conducting electrolyte. The result is an electrochemical reaction. In essence, electrochemical corrosion is reserved for those processes where a current flows between anodic and cathodic areas situated at different parts of a metallic surface or between two different metals of the same or different material. The electrochemical oxidation of iron results in the formation of ferrous ions as the initial product. The large mass of different metals associated with a sunken ship in salt water may consist of thousands of independent galvanic cells, each formed between two metals that have different electrode potentials. Furthermore, any metallic surface is almost certain to contain inclusions of more noble metals; it is very rare that a metal is 100 percent 'pure.' For this reason, a metal need not be in contact with a more noble metal to corrode in sea water.

Depending on the environment, the corrosion products can take on a variety of states of division and hydration, as well as a variety of physical forms. It is common to find corroded iron from marine sites with an outer layer of hydrated ferric hydroxide (common rust), which has restricted the supply of oxygen to the ferrous hydroxide briefly formed at the surface of the metal. Laminated corrosion layers consisting of an inner layer of black magnetite, a thin layer of hydrated magnetite, and an outer layer of hydrated ferric hydroxide are formed.

As metals corrode in salt water, there are localized changes in the pH, which upset the equilibrium between the dissolved calcium carbonate and dissolved carbon dioxide in the sea water (Leigh 1973:205). This results in insoluble precipitates of calcium carbonate and magnesium hydroxide. These precipitates intermix with sand, marine life, and corrosion products (especially ferrous hydroxide, ferrous sulfide, and magnetite) to form a hard dense layer of encrustation or concretion around the metal. This form of encrustation is most evident at the Mardi Gras Shipwreck in the stern concretion. The encrustation accumulates on the original metal surface to form a perfect mold around the object; furthermore, it will actually separate two metal pieces that were initially touching each other. Such encrustation effectively separates the metals from each other and destroys the electrochemical cell by cutting off the current flow and/or oxygen supply**.** It is rare, in fact, to find any two metal objects recovered from a shipwreck in direct contact with each other.

Despite the fact that the corrosion processes are impeded by the anaerobic environment that accompanies the formation of encrustation, metal deterioration can continue due to the presence of sulfate-reducing bacteria. These bacteria play a large part in the corrosion of metals, especially iron in salt water. They also adversely affect metals in fresh water, as well as metals buried in the soil under anaerobic conditions (Evans 1963:224; Pearson 1972:35; Leigh 1973:205). For instance, sulfate-reducing bacterial activity accounts for most of the rapid corrosion of buried iron and steel pipelines in waterlogged clay soils in England (Farrer et al. 1953:80). As much as 60 percent of the corrosion of iron in salt water can be attributed to bacterial action (Pearson 1972a:35).

The basic conservation process applied to the iron artifacts recovered from the Mardi Gras Shipwreck began with mechanical cleaning followed by electrolytic reduction. Electrolytic reduction helps to clean the artifact through the evolution of hydrogen bubbles from the metal surface. These bubbles flake off and remove iron corrosion products, leaving the sound metal. Electrolytic reduction also removes chlorides and, in some cases, can reduce the corrosion state to a more stable metal. Electrolytic reduction was continued until the artifacts were clean and a low chloride level was obtained. Chloride levels were checked using a mercuric nitrate test. Additional mechanical cleaning was conducted as necessary. Following the cleaning, the iron artifacts were boiled for three days in deionized water, and the chloride levels were checked daily. While still hot from the boiling rinse, the artifacts were next given three coats of tannic acid. Tannic acid forms a rind on iron and helps prevent further corrosion while giving the artifact a pleasing purple-black color. The artifacts were then sealed with microcrystalline wax. The artifacts were submerged in a bath of wax heated to 325^{o} F (163^{o} C), and then the bath was allowed to cool to 180^{o} F (82^{o} C) before the artifacts were removed. This bath had the additional benefit of driving any excess moisture out of the artifacts. Large artifacts, such as the cannon, were treated with Krylon 1301 after they were treated with tannic acid. Krylon provides a moisture barrier similar to wax but is more efficient to apply to large artifacts.

Delicate iron artifacts, such as the stove, were treated with sodium sulfite (North and Pearson 1975). The artifacts were immersed in a 0.5 molar solution of sodium sulfite dissolved in deionized water. The artifacts and solution were sealed and heated to 140^{0} F (60^{0} C) for several days. This treatment was repeated five times. The artifacts were then mechanically cleaned and treated with tannic acid and microcrystalline wax as described above. In the case of the stove, detailed casts were made after mechanical cleaning but prior to any chemical treatment. The mold was made using RTV110, which is a silicone adhesive sealant that provides very good detail. The silicone was backed with fiberglass for strength and casts were made with epoxy resin.

The interiors of concretions were also cast. In many cases, iron artifacts deteriorate to the point that there is no sound metal remaining, but their former surface is often preserved in the surrounding concretion. Following several water baths to remove chlorides, the concretion was x-rayed to determine the nature and arrangements of the voids. These voids were then cleaned with air-scribes and dental tools. The concretion was then cast with a two-part Hysol epoxy resin in order to create a reproduction of the corroded artifact. Delicate artifacts, such as the coins, were also cast prior to conservation in order to preserve their information in case they were damaged during conservation.

The term 'cupreous' is used to designate all metals that consist of copper or alloys that are predominantly copper, such as bronze (an alloy of copper and tin) and brass (an alloy of copper, zinc, and often lead). The cupreous metals are relatively noble metals that frequently survive adverse conditions, including long submersions in salt water that will often completely oxidize iron. Cupreous metals react with the environment to form similar alteration products, such as cuprous chloride (CuCl), cupric chloride (CuCl2), cuprous oxide (Cu2O), and the aesthetically pleasing green-and-blue-colored cupric carbonates, malachite [Cu2(OH)2CO3], and azurite [Cu3(OH)2(CO3)2] (Gettens 1964:550-557). In a marine environment, the two most commonly encountered copper corrosion products are cuprous chloride and cuprous sulfide. The mineral alterations in copper alloys, however, can be more complex than those of pure copper.

Cupreous artifacts were treated similarly to iron artifacts, undergoing electrolytic reduction followed by three boiling rinses. They were then polished with bicarbonate paste and fiberglass to improve their surface appearance. Next, they were immersed in a 2 percent solution of benzotriozole (BTA) to inhibit future corrosion before being sprayed with several coats of Krylon 1301.

In all wood, bacterial action causes a degradation of cell wall components after long periods in marine environments. In general, water-soluble substances, such as starch and sugar, are the first to be leached from waterlogged wood, along with mineral salts, coloring agents, tanning matters, and other bonding materials. In time, through hydrolysis, cellulose in the cell walls disintegrates, leaving only a lignin network to support the wood. Even the lignin will break down over a long period of time. As a result of the disintegration of cellulose and lignin, spaces between the cells and molecules increase, and the wood becomes more porous and permeable to water. All of the deteriorated elements of the wood, including all cell cavities and intermolecular spaces, are filled with water. The remaining lignin structure of wood cells and the absorbed water preserves the shape of the wood. The loss of the finer cellulose tissue does not cause much alteration in the gross volume of wood, but the porosity is increased, and the wood absorbs water like a sponge. A waterlogged wooden object will retain its shape as long as it is kept wet. If the wood is exposed to air, the excess water evaporates, and the resulting surface tension forces of the evaporating water cause the weakened cell walls to collapse, creating considerable shrinkage and distortion.

The majority of the wooden artifacts from the Mardi Gras Shipwreck, including recovered portions of the gun carriage, were treated using the silicone oil treatment. The artifacts were initially mechanically cleaned and rinsed with tap and deionized water until stable and low levels of chlorides were achieved. The wood was then dehydrated in successive baths similar to those of the ceramics before being immersed in a solution of SFD-1 polymer and MTM crosslinker. The wood was then cleaned to remove the excess polymer solution before being placed in a closed container and exposed to DBTDA vapors. Following this treatment, the artifacts were mechanically cleaned to remove any extraneous polymer or materials. Large pieces of wood, including the spar recovered from the LART, were treated with polyethylene glycol (PEG). In this method, the artifact was placed in a container with a dilute solution of PEG. The solution was warmed and the concentration of PEG increased until it reached 70–100 percent. Following treatment the artifact was cleaned of excess PEG and allowed to slowly dry.

The conservation of artifacts from the Mardi Gras Shipwreck is ongoing and will not be completed until approximately 2009. As a result, additions will be made to the basic methodology described here. All artifacts will be delivered to their final repository with a detailed conservation record. Conservation has not yet begun on several of the composite artifacts. Due to the composite nature of certain artifacts, the conservation treatment will be uniquely designed for that object; its condition will determine the process. All composite artifacts will be x-rayed and digitally photographed, and a strategy will be determined before any treatment is even considered.

Artifact analysis took place throughout the conservation process and was based on ongoing discussions between the conservators and the archaeologists. Historic cultural materials were cataloged according to material (e.g., ceramic, glass, iron, copper alloy) and functional (e.g., plate, bowl, bottle) categories. Temporally sensitive historic artifacts, such as ceramics, were also identified in terms of type (e.g., creamware, stoneware) when possible. In addition, ceramic sherds and bottle glass were examined for distinguishing attributes that provide more precise date ranges of manufacture and use. These included maker's marks, decorative patterns, and embossed or raised lettering. Dating of historic archaeological resources was performed using published indices such as Deagan (1987), Hume (1991), Jones and Sullivan 1989, Miller (1980, 1991), Miller and Hurry (1983), and South (1977), and artifacts recovered from Gulf Coast sites of the similar period (e.g. Bense 1988, 1999; Johnson 1999; Waselkov and Sylvia 1995; Waselkov and Gums 2000; and Yakubik and Franks 1997). The goal of the artifact analysis was to determine the origins, economic status, spatial arrangement, and possibly destination of the ship and its crew.

3.5 Analysis of Vessel Components

The exposed portions of the hull were systematically photographed while in the field and a small portion of the hull was recovered attached to the stern concretion. Based on this evidence, a necessarily tentative identification of the ship type could be postulated. The size of the structural elements, location of ship features, and distribution of artifacts suggested the size and construction of the vessel. There was less evidence of the vessel rigging and spars, but indirect evidence, such as the location of the stove and a single deadeye, were suggestive. Based on this evidence, the vessel could not be reconstructed, but ships of a similar model were suggested based on information gleaned from research in contemporary newspapers and a comparison with secondary sources (e.g. Chapelle 1935; Gardiner 1995; Lavery 1987 MacGregor 1984a, 1984b, 1988).

3.6 Curation of Artifacts and Records

The conservation of artifacts from 16GM01 will require an estimated three years-treatment time. As artifacts are completed, TAMU will arrange for their transportation to the curation facility under the direction of the MMS, Gulf of Mexico Region. Conserved material and project documentation will be curated at the Louisiana Department of Culture, Recreation, and Tourism, Division of Archaeology, a federally-recognized curational facility. All items sent to the repository will adhere to their guidelines (Louisiana Division of Archaeology 2007).

Selected artifacts will then be distributed to the Louisiana State Museum for display at a facility yet to be designated.

An important component of the project is the education outreach program. Three elements were proposed to accomplish this task: video documentary, development and maintenance of a project web page, and publication of a small booklet to present the results of the project. These products are separate from this report and will be completed on a schedule negotiated between TAMU, OGGC, and MMS. The video documentation was conducted during the archaeological fieldwork. The final documentary video of the project will be available for education purposes and may be incorporated with ship artifacts as part of a permanent display at the Louisiana State Museum. A web page for the project, developed and maintained by the Florida Public Archaeology Network in conjunction with MMS (www.flpublicarchaeology.org/mardigras/), was updated regularly during the field activities and updates are now available through the CMAC website (nautarch.tamu.edu/mardigras/). The results of the archaeological data recovery will also be posted on the internet at appropriate times. Subsequent to the fieldwork and presentation of the final report, the web-page will continue to be accessible to researchers, students, and other interested parties. The final report will be made available as a downloadable .pdf file. A small booklet or pamphlet will be published summarizing the accomplishments of the project that may be used in conjunction with interpretive exhibits.

4.0 Historical Context

By Amy Borgens with contributions by Ben Ford

Much as it is today, the Gulf of Mexico was far from isolated from international events throughout the eighteenth and nineteenth centuries. It was one of the last theaters for major European territorial exchanges in the New World. The American and French Revolutions would ignite ideals of self-determination, leading Gulf and Latin American territories to permanently reject European sovereignties. Its international character created diversity in commerce but also inspired maritime conflicts and privateering influenced by the constant changes in alliances and political tenor.

4.1 Early European Exploration

The competition for territorial dominance in the Gulf was, in part, an extension of an age-old rivalry between Spain and France. Expeditions to Hispaniola and the Antilles by Christopher Columbus at the end of fifteenth century would signify the first Spanish exploration of the New World. Columbus would not explore the mainland until landing on the Central American coast in 1502.

The European presence in the Gulf of Mexico was first realized by the Spanish explorations of Juan Ponce de León, Alonso Álvarez de Piñeda, and Alvar Nuñez Cabeza de Vaca in the early sixteenth century. Ponce de León "discovered" Florida in 1513, formally introducing the Spanish presence in the northern Gulf of Mexico (Chipman 1992:23). Piñeda was commissioned by Francisco de Garay, the governor of Jamaica, to explore between Mexico and Florida for a supposed water route to Asia. This expedition, which left Jamaica in 1519, touched at Veracruz and was the first to chart the Texas coast. Cabeza de Vaca was second in command of an expedition led in 1527 by Pánfilo de Narváez to create a settlement in Mexico. In 1528, Cabeza de Vaca reached northwest Florida, led an expedition into the interior and established a camp where they resided for three months. After departing Florida, Cabeza de Vaca's vessels were separated from the expedition during a storm and swept ashore, likely at San Luis Island or Follet's Island, just west of Galveston (Favata and Fernández, 1993; Campbell 2003:28; Weddle 1992:99).

Cabeza de Vaca's account of his voyage was used, in turn, as the basis for subsequent explorations of the Gulf region by the likes of Hernando de Soto, in 1539, and Luis de Moscoso Alvarado in 1542. Following De Soto's death in May 1542, Luis de Moscoso Alvardo continued exploration of the Louisiana and Texas coast (Chipman 1992:39–40). In 1559, Don Tristán de Luna y Arellano established the first settlement at Pensacola, although environmental catastrophe and Indian attack would lead to its abandonment in 1561. By that time, Spain was facing increasing difficulties in maintaining its few colonies in Florida. The relatively poor economic prospects for these colonies and increasing competition from other colonial powers quelled the Spanish crown's interest in further colonization efforts. By the late seventeenth century, the threat of French exploration in Spanish territory was exemplified by the establishment of Fort Saint Louis by René Robert Cavelier, Sieur de La Salle at Matagorda Bay in 1685. La Salle, in 1653, had navigated the length of the Mississippi River and his misplaced settlement at Matagorda Bay was part of a plan to create the colony of Louisiana at the mouth of the

Mississippi (Parry 1959:131). This event provided the Spanish government with an impetus to establish permanent settlements in the area (Weddle 1992:105).

In response to the French incursion into Spanish territory, Spain initiated an exhaustive exploration of the Texas coast. Over the next three years, five expeditions by sea and six by land would be conducted in the search for La Salle's settlement (Weddle 1992:101). Remnants of La Salle's vessel *la Belle* would finally be discovered on 3 April 1687, by captains Martín de Rivas and Pedro de Iriarte, commanding two piraguas. The Spanish captains departed on 10 April though they had not located La Salle's settlement (Weddle 1992:103). Despite additional searches of the bay by Martín de Rivas and Andrés de Pez in 1688, La Salle's camp would continue to go undiscovered until the Alonso de León expedition of 1689 (Dunn 1916:367–369).

French exploration of the Americas in the late seventeenth century was encouraged by the policies of Jean-Baptiste Colbert, the French Minister of Finance (1665–1683). After his death in 1683, there was a period of stagnation, but exploration and colonization of the Gulf Coast was revitalized in the early eighteenth century with the establishment of two major settlements in French Louisiana (Parry 1959:131). In 1702, Mobile was founded and a permanent settlement was created at New Orleans in 1718, although the colony was ceded to Spain in 1763.

4.2 European and American Trade Routes

As the preceding discussion illustrates, prior to the late seventeenth century, Europeans viewed the Gulf of Mexico primarily as an exploitation thoroughfare and gave little attention to the lands that bordered these waters. Materials extracted from the interior were funneled onto ships at a few nodes, and from these nodes the ships sailed out into the deep water of the Gulf in order to avoid the treacherous and poorly understood coastline (Figure 4.1). During the sixteenth century, Spain formalized trade routes in the Gulf based on these principles by establishing treasure fleets or flota. These guarded fleets of large vessels benefited from Spanish bureaucracy, developments in ship construction allowing larger and better-armed vessels, and the exploration of Ponce de Leon through the Straits of Florida (1519) (Garrison et al. 1989a; Lugo-Fernández et al. 2007; Mendelssohn 1976). Most of this early navigation in the Gulf followed the Loop Current and prevailing winds, although the exact causes and seasonality of these winds were not always comprehended (Lugo-Fernández et al. 2007; Salvador 1991b:2). Outbound voyages from Veracruz generally departed between February and August, with the majority sailing in June, by sailing either northeast or north-northeast depending on the prevailing winds until they reached between 25° and 26° north latitude and turning to the east. From there, the fleets sailed across much of the Gulf of Mexico, keeping to deep water and then turning southeast to reach Havana. At Havana, the fleets reassembled before sailing through the Straits of Florida and then onto the Azores and Spain. Ships entering the Gulf during the Spanish Period generally came in through the Yucatan Channel and sailed directly to Veracruz. Descriptions of these routes from a latter period are presented by Hutchins (1784) for the Louisiana coast and Romans (1775) for the Yucatan Channel (Garrison et al 1989b). In all of these routes, seasonal variability in winds and currents resulting from local fluctuations caused the actual route taken to vary throughout the year and from year to year. As a result, the Spanish routes through the Gulf appear to wander. The effects of these local variations can not be over-estimated as current and winds greatly affected the maximum attainable speeds in different regions of the Gulf, with currents accounting for as much as 50 percent of a ship's speed (Lugo-Fernández et al. 2007; Salvador 1991b:2).

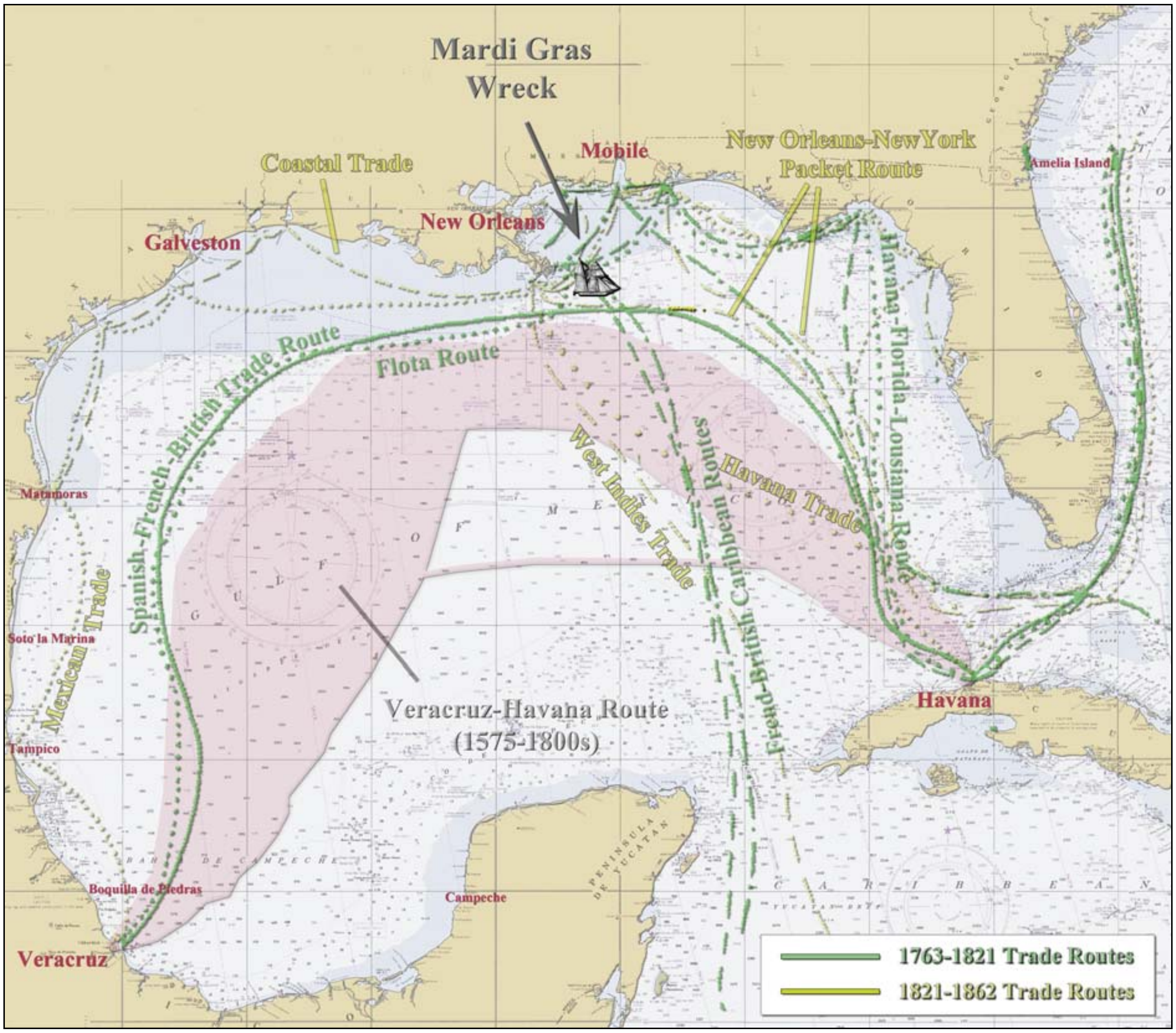

Figure 4.1. Trade routes in the Gulf of Mexico, sixteenth-nineteenth centuries (illustration by A. Borgens, after Garrison et al. 1989a:Figure 11-4 and Lugo-Fernández et al 2007:Figure 1B).

With the coming of the French to the Gulf of Mexico during the late seventeenth and early eighteenth centuries, exemplified by the founding of the La Salle Colony (1685), Biloxi (1699), Mobile (Dauphin Island, 1699), and New Orleans (1718), new trade routes developed. The French maintained active routes between their Gulf settlements and the Windward Islands and controlled commerce on the Mississippi River. These routes, which involved coastal trade as well as routes through the center of the Gulf, permitted communication between New France, France, and her southern colonies. During this period, New Orleans was the dominant port along the northern Gulf of Mexico, with Pensacola as a distant second (Bauer 1988:127). Pensacola was well-positioned but the bar across its harbor remained a problem well into the nineteenth century (Orleans Gazette 18 June 1819). Much like the Spanish, the French saw little reason to modify their trade routes while the Gulf of Mexico remained in equilibrium; as a result, these routes were constant from circa 1699–1763 (Garrison et al. 1989a). Throughout much of the eighteenth century, the French and Spanish operated in separate spheres within the Gulf, only interacting through warfare, privateers, and, occasionally, the adjacent ports of Mobile and Pensacola (Surrey 1916). The routes to and from Veracruz also continued into the 1800s, although Spain lost is monopoly due to incursions by the British and French. Despite the eventual decline of the Veracruz route, Havana remained an important port for trade and traffic within the Gulf of Mexico until the Cuban Revolution.

As discussed below, the late eighteenth and early nineteenth centuries were a tumultuous time in the Gulf of Mexico, with increased pressure from British, and, later, American interests. However, it was also a time of greatly-expanded trade (Coastal Environments 1977:Figure 3; Pearson et al. 2003:4-61). The increased importance of New Orleans as a transshipment point for interior materials bound for both foreign and domestic ports and the development of new ports such as Lake Charles (1803), Grand Terre (ca. 1810), Galveston (1816), and Key West (1822) helped to drive this expansion. As a result of these new ports and the general settlement of the coastline, coastal trade boomed during the early nineteenth century with many small vessels transporting goods between minor ports, landings, and major ports. This trend in the Gulf of Mexico was part of a nationwide increase. Between 1790 and 1810, U.S. coastal trade quadrupled to reach 405,000 tons and constitute 25–30 percent of U.S. merchant marine tonnage (Bauer 1988:105). However, in the Gulf of Mexico the major ports still controlled long-distance trade, a pattern that culminated with the establishment of a packet line between New York and New Orleans in 1837 and New York and Galveston in the 1850s (Bauer 1988:127–128). As the U.S. came to dominate the Gulf of Mexico, trade routes along the rivers and connecting the Gulf Coast with the East Coast through the Straits of Florida became more important. This trade eventually developed into a triangle with the Gulf of Mexico, Europe, and the U.S. East Coast at its vertices (Garrison et al. 1989a). Trade also became more evenly distributed between ports as the nineteenth century progressed. While New Orleans remained the dominant cotton port, handling half the cotton grown in the country in 1858, Mobile was also very important, particularly after the Americans took over the region between the Pearl and Perdido rivers. The Texas ports, despite being hampered by shallow harbors, also became more important as settlement spread west following independence from Mexico (Bauer 1988:127; Francaviglia 1998). As discussed further below, Central and South American ports were also important during this time, receiving a substantial amount of coastal trade from U.S. ports.

While the advent of steamships, first attempted at New Orleans circa 1811 but not of substantial importance until the 1830s (Bauer 1988:70; Garrison et al. 1989a), did not cause drastic changes in Gulf of Mexico trade routes, the development of railroads, commerce raiding during the Civil War, and the opening of the Panama Canal did (Garrison et al. 1989a:11-23). The railroads replaced rivers as the major routes from the interior to ports, causing a shift from ports that had natural benefits to those with political clout. Additionally, the opening of the Panama Canal in 1914 shifted the emphasis from eastern Gulf ports to those in the western Gulf with better access to West Coast and Asian markets through the canal (Garrison et al. 1989a:11-23).

Reference to Figure 4.1 shows the position of the Mardi Gras Shipwreck at the nexus of many of these trade routes. The position of the wreck makes it difficult to use its location as an indicator of its origin or destination, as only coastal trade and in-bound traffic to Mobile or eastern ports can be eliminated. However, this location does suggest that the wreck may be indicative of the types of vessels plying the Gulf of Mexico during the early nineteenth century.

To that end, it is necessary to understand the political and technological conditions in the Gulf of Mexico at the end of the eighteenth and beginning of the nineteenth centuries.

4.3 European Territorial Transitions Towards the End of the Eighteenth Century

4.3.1 British and Spanish Growth in the Gulf

In 1754, the dispute between British and Canadian colonists over the creation of a fort at the juncture of the Allegheny and Monongahela Rivers culminated in the French and Indian Wars. The British military succeeded in dominating the North American campaigns and in capturing all of France's Caribbean possessions except Saint Dominique. Faced with the British occupation of Spanish Havana and their blockade of the Gulf, France chose to cede Louisiana west of the Mississippi and New Orleans to her close ally Spain (De Grummond 1983:12). The resulting treaty of Fontainebleau was signed on 3 November 1762. The subsequent Treaty of Paris, signed on 10 February 1763, virtually eliminated France from North America. The British gained almost all of Canada, the Louisiana territory east of the Mississippi River (excluding New Orleans), and the right to navigate the river (De Grummond 1983:12). England returned the Caribbean islands of Saint Martin, Saint Barthélemy, Guadaloupe, Martinique, and its dependencies to France. Spain, eager to repossess Havana, forfeited Florida to England, thus giving the British control of the Mississippi north of Bayou Manchac and control of the Gulf from the isle of New Orleans east to the Atlantic Ocean (De Grummond 1983:12).

Britain quickly established forts in the Louisiana territory at Manchac and Baton Rouge. British territorial acquisitions in North America would be brief, however, as its colonies revolted in 1776, declaring independence. The expulsion of British sovereignty in southern North America was effected with assistance from the Spanish, who were at war with France in May 1779. Spaniards in the Gulf decided to systematically remove France and her (British) allies from the territory. Bernardo de Gálvez, the Spanish Governor of Louisiana, mounted two successful expeditions to capture Manchac and Baton Rouge from the British in September of 1779 (De Grummond 1983:20). After obtaining reinforcements from Havana, Galvez would continue onward to take Mobile in 1780 and Pensacola in 1781 (De Grummond 1983:20). As part of the Treaty of Paris that formally recognized the American Independence on 3 September 1783, Britain awarded Florida to Spain (Owsley 1981:8). This acquisition gave Spain the complete control of the coast from the Yucatan to the Atlantic Ocean.

4.3.2 Renewed Threat of French Dominance

The French losses on the North American continent were tempered by the wealth accrued from its Caribbean possessions. The island of Saint Dominique, the approximate size of Maryland, was the most profitable plantation colony in the New World, producing 40 percent of Europe's sugar (30 percent of the world's sugar exports) and 60 percent of its coffee (Dubois and Garrigus 2006:8; Rothman 2005:75). By the late eighteenth century, the value of exports from Saint Dominique exceeded those of the United States and accounted for almost one-third of France's overseas trade (Scheina 2003:1). Slaves were regularly imported into Saint Dominique for the cultivation of these products and one-third to one-half would die within a few years of their arrival at the island (Dubois and Garrigus 2006:8). A slave revolt at Saint Dominique in 1791 would have repercussions in the United States, as the fear of similar circumstances prompted the United States Congress to pass a law in 1794 that made it illegal for U.S. citizens to participate in the slave trade (Deyle 2005:19). Ironically, the unfolding events at Saint Dominique would increase the slave trade into the Louisiana territory and directly impact the commercial growth of New Orleans.

As the slave rebellion gained momentum at Saint Dominique, French privateering in the Caribbean and the Gulf of Mexico also increased. In 1793, the French envoy to the U.S. at Guadaloupe invited Americans to acquire privateer commissions and join the French armed service. Though this action was seen as a violation of American neutrality, American vessels equipped themselves in secret and departed for Guadaloupe (Faye 1940a:431). For French mariners, service on a French privateer evoked a sense of national patriotism as these corsairs were perceived to "wage war as loyally as the ships of his imperial majesty" (Aury 1808).

Following the British declaration of war against Spain in 1796, France proclaimed British maritime commerce contraband, as well as the transport of British goods upon American ships (Gathii 2006: 724; Faye 1940a:430). French and British navies alike, desperate for supplies and deserters, seized American vessels and impressed their crews. In 1798, the United States retaliated first against the French by entering into an undeclared naval conflict, the Quasi-War, in the Caribbean (Smith 2004: 3). Privateering in the region was thriving, likely encouraged by the French focus on American vessels as enemy prizes. At least 150 French colonial privateers were operating in the eastern Caribbean, attacking primarily British and American commerce; at the same time, 33 privateers were sailing out of Santiago de Cuba and Baracoa, Cuba (Faye 1940a:433). As a means of suppressing French privateering efforts (world-wide), the U.S. Congress authorized the capture of French military vessels and the seizure of French cargo (Gathii 2006:724). By 1799, the year Napoleon Bonaparte would come to power in a *coup d'état*, French vice-admiralty and prize courts had been established in 'neutral' Spanish territories at New Orleans and in the Cuban port of Baracoa (Faye 1940a:431–432). New Orleans was frequently used by the privateers for selling and disposing of stolen vessels and cargoes, as privateers they could freely dispose of these prizes unlike Spanish ports, where they had to acquire permission from the presiding provinces (Faye 1940a:431)

The Convention of Mortefontaine was signed on 3 October 1800, formally ending the Quasi-War with France. The United States, however, was not compensated for an estimated $12 million in commercial losses; over 2000 American ships had been captured by French military vessels and privateers. As news of the treaty spread, tension in the Caribbean relaxed and attacks upon American shipping declined (Toll 2006:143; Gathii 2006:726).

In 1800, a secret agreement between Spain and France, known as the Treaty of San Ildefonso, would grant the Louisiana territory to France on the condition that the son-in-law of Charles IV, Louis Francis Philibert of Bourbon, was provided a kingdom in Italy. Napoleon sought to gain Louisiana as part of a broader plan to revitalize France's American Empire through the restoration of the sugar plantation economy at Saint Dominique. He intended to stop the ongoing illegal sale of provisions to Saint Dominique by U.S. merchants, providing this support through a French-owned Louisiana instead (Dubois and Garrigus 2006:33).

As France was on the brink of repossessing Louisiana, it was beginning to lose its Caribbean possessions. A coalition of African and Island-born plantation workers, inspired in part by revolutions in France and North America, revolted again at Saint Dominique in late 1801 (Dubois and Garrigus 2006:8). Twelve thousand of Napoleon's French troops would disembark for Samana's Bay on 29 January 1802 to quash the revolt led by Toussaint L'Ouverture (Toussaint would later switch sides and assist the French against British forces). The liberation of Haiti in 1803 would be assisted through the intervention of the British military. France and Britain were again at war following the dissolution of the Peace of Amiens established on 1 October 1801. After months of struggle, the British Navy ultimately captured the French held ports of Libérté, Port-de Paux, Port-au-Prince, and Aux Cayes in October and November 1803. The fleeing French squadron surrendered to the British Navy at the end of November (Scheina 2003:16). Over 350,000 died during the slave rebellion in Haiti (1791–1803), including 200,000 blacks and *affranchias* (mixed blood), 75,000 French soldiers, 45,000 British soldiers, and 25,000 white colonists. This is more than five times the combined total losses from the American Revolution (Scheina 2003:xiii).

In 1803, Spain formally transferred the territory of Louisiana to France. The promise of a French Western 'empire' was brief, however, as Napoleon sold Louisiana to the United States on 30 April 1803 for $15 million. Dubois and Garrigus (2006:8) assert that the French difficulties in Haiti caused Napoleon to sell Louisiana to the U.S. De Grummond (1983:33) instead suggests it was because Napoleon believed he could not defend Louisiana in the face of a British attack. The slave rebellion in Haiti is considered the beginning of the wars for independence in Latin America (Scheina 2003:18).

The plantation and slave economies in areas such as New Orleans and Cuba expanded dramatically at this time, exporting sugar that was no longer provided by Haiti (Dubois and Garrigus 2006: 8). The city of New Orleans would figure prominently in the region's newfound cultivation of sugar, as it replaced the primary agricultural export, indigo, which had been ravished by caterpillars (Rothman 2005:74; De Grummond 1983:28). Prior to the introduction of sugar processing, Lower Louisiana's principal exports at the end of the eighteenth century were indigo, tobacco, lumber, and fur. In the 1790s, the production of sugar along the Mississippi initiated an era of commercial reorientation and expansion, and created an industry that would rely heavily upon the importation of slaves (Rothman 2005:74). The economic impact of the sugar industry on New Orleans caused an increase in both the slave population and U.S immigration, spurred by the wealth and commercial prospects of the port. The slave population grew faster than that of the white population, and the free people of color doubled (Rothman 2005:78; De Grummond and Morazan 1961:11). New Orleans would become one of the principal slave markets in the U.S. Between 1790 and 1810 alone, almost 18,000 slaves were introduced into Lower Louisiana from Africa, the Caribbean, and the United States (Rothman 2005: 83).

4.4 U.S. Expansionism and the Growth of Piracy (1803–1820)

4.4.1 The Emergence of Piracy in the Gulf of Mexico

Mercantile shipping of New Orleans and the Louisiana Territory following the Louisiana Purchase was undefined. Though a recognized U.S. territory, Spanish tariffs still levied duties against exports and imports into the region. Ships hailing from New Orleans did not have papers or a flag to sail under. A petition by fifty-five New Orleans merchants pre-empted a congressional act in 1804 that would formally extend U.S. "rights and privileges" to the new territory and would additionally create two definable regions; the Orleans territory and the Louisiana Territory (De Grummond 1983:38). On 24 February 1804, special legislation for the organization of the customs service was provided, thus enabling seaborne commercial activity for the new U.S. port (Works Progress Administration [WPA] 1942: iv). A byproduct of the congressional act was the prohibition of slave importation into Louisiana from localities outside of the United States. The slave trade between Cuba and New Orleans was essential to the region, and the restriction on this trade was interpreted as a government attempt to maintain the slave trade monopoly enjoyed by South Carolina. South Carolina had recently reopened the U.S. trade with Africa, reversing the prohibition enacted in 1794 (Deyle 2005:19). The cultivation of cotton and sugar, the key agricultural products of the Lower Louisiana Territory, would potentially be harmed by the restriction on the trade.

The establishment of the privateering/smuggling enterprise at Barataria came at a convenient time for New Orleans planters and consumers, as it was on the eve of U.S. legislation that would restrict the ability to import slaves and foreign products into the port. Jean Lafitte established himself at Barataria in 1805 with the assistance of the prominent New Orleans businessman Joseph Sauvinet (De Grummond and Morazan 1961:7). The demand for stolen slaves was immense (Lafitte's privateers did not directly deal in the Cuban slave trade, but stole the cargos from slavers). Slaves purchased legally within the United States cost $600–700 (some were as much as $1000); those traded through Lafitte's privateering enterprise cost $150–200 (De Grummond 1983:41, 168). Congress prohibited the importation of slaves into the United States (at large) in 1807, again inadvertently increasing the demand for this valuable commodity through illegal sources.

In addition to the domestic restriction of the slave trade, foreign legislation also impacted Gulf of Mexico commerce. Foreign policies established by Napoleon in 1806 (Continental System) and by England in 1807 (Orders of the Council) increased the difficulty of U.S. maritime commerce abroad. In response, President Jefferson signed the Embargo Act into law on 22 December 1807. It both prohibited U.S. ships from conducting trade with any foreign port and closed American ports to British ships (Toll 2006:309). Continued U.S. embargos against British and French goods (Embargo Act 2 and 3, Macon's Bill No. 1) likely added to the demand for these products. Foreign merchandise, especially English goods, became valuable, difficult to obtain merchandise that could be acquired from Barataria. Such was the demand for Baratarian wares that traders gave and received orders for them on the streets of New Orleans with little secrecy (De Grummond and Morazan 1961:16).

The dissolution of the powerful Spanish-French alliance and the resulting war would dramatically impact privateering in the Caribbean and inadvertently divert these activities towards the Gulf of Mexico. War between France and Spain in 1808 closed Spanish colonial ports to French vessels, though piratical activities already had begun to subside in the region. Only a few privateers were still in operation out of Guadaloupe in 1806–1807, and only three were out of Martinique in 1809 (Faye 1940a:433). Many of these pirates moved to the more open territory of the Gulf.

As the Napoleonic War endured, France would lose more of its Caribbean territories. The French losses in the Antilles and at Haiti would create an unforeseen difficulty for French privateers in the Gulf of Mexico. As the British expelled the French, the French corsairs, stripped of their ability to operate in the Caribbean, would seek refuge in Louisiana (Aury 1812). The contraband normally deposited in these locations would be diverted to Grand Terre (De Grummond and Morazan 1961:8). By 1807, Lafitte's new enterprise was thriving, with warehouses established in New Orleans, Donaldsonville, and Barataria. By late 1809, the British

Navy had captured all the French Antilles except Guadaloupe and Saint Martin and largely expelled the French privateers from the Caribbean. Concurrently, an estimated 3000–5000 men were employed by Lafitte's Barataria operation (Faye 1940a:434; De Grummond 1961:8, 11). The last of the French Islands, Guadaloupe, would fall to the British in February 1810, though French letters of marque could still be obtained at Saint Barthélemy and Saint Martin (De Grummond 1961:4, 53). A new source of privateer letters for Baratarian mariners emerged at the close of 1811 in Cartagena, the most strongly fortified city in the New World (De Grummond and Morazan 1961:12).

4.4.2 Breaking the Spanish Stronghold: U.S. Control of the Northern Gulf Territories

During the same period U.S. interests were growing in the region. The Spanish government, eager to reestablish itself in East Florida, invited U.S. citizens to colonize the territory beginning circa 1790. Many British settlers had evacuated in 1784, leaving the area seriously under-populated (Owsley and Smith 1997:66-67). At this time, Spain would also increase the U.S. commercial potential in the region. In 1795, the United States was extended the right to freely navigate the Mississippi and to trade in New Orleans for a tenure of three years. Spain and the United States also negotiated the boundary at the 31st parallel. A U.S. fort was quickly established at Ward's Bluff near the headwaters of the Mobile River, where the Alabama and Tombigbee Rivers converge. Navigation of the river was still governed by Spain and a 12 percent duty was levied against goods exported on the Mobile River (Owsley and Smith 1997:61).

In mid- and late-1810, U.S. settlers in Baton Rouge, perhaps encouraged by the Hidalgo Revolution in Mexico, seized the city, declared it independent, and shortly thereafter requested admission to the U.S. In December, President Madison annexed the Baton Rouge District under the [false] premise that it had been part of the Louisiana Purchase (Owsley and Smith 1997: 63, 68-69). Possibly envisioning and perhaps trying to avoid a conflict with the United States, Spanish Governor Vincente Folch offered to convey Mobile and West Florida to the U.S., only to later rescind his offer (Owsley and Smith 1997:64).

Many American settlers had migrated into East Florida, so many, in fact, that Spain closed Florida to U.S. immigration in 1804. The majority of the populace was from the United States, and they were discontent with the high duties on imports and exports into the region (Owsley and Smith 1997:66-67). As U.S. hostilities with Britain increased, there was also concern that England might take possession of Spanish Florida as a base for harassing U.S. commerce and for launching military attacks (Schoultz 1998:2). Madison appointed General George Mathews to secretly negotiate the surrender of the Floridas, though after Folch refused to negotiate, the Americans launched an offensive. Madison removed Mathews from his appointment, though he did not interfere with his creation of an armed "Republic of Florida." Mathews appointed General John G. Macintosh as commander of the expedition of five gunboats that anchored off Fernandina in March of 1812. After the surrender of the Spanish garrison, Macintosh and two hundred men advanced towards Saint Augustine and commenced a siege of the city that was nearly a year long. In April, Mathews appealed to the government to annex East Florida. Mathew's actions were later repudiated by the president, who insisted that Mathews had not been authorized to seize East Florida unless it had been voluntarily offered by the Spanish or had been threatened by invasion. Mathew's appointment was revoked, and the U.S. eventually withdrew its troops (Owsley and Smith 1997:71-80)

The New Orleans 'Association', an organization composed mainly of merchants and influential businessman, was determined to secure Florida for the United States and attempted to organize two filibuster expeditions in 1816-1817. The Associates offered to supply men and arms for an attack on Florida commanded by José Bernardo Gutiérrez de Lara. It was anticipated that Gutiérrez would seize Florida and then sell it to the United States for two to three million dollars. Gutiérrez wanted assurance that the U.S. would recognize the capture as lawful and would provide compensation for the territory. The Associates could not give this assurance and Gutiérrez withdrew from the operation (Warren 1938a:807).

A second plan to attack Florida involved persuading Francisco Xavier Mina to conduct a dual expedition against New Spain. In early 1817, Mina was amassing ships, arms, and men for an attack on the Mexican mainland. Louis Michael Aury, a privateer from Guadaloupe, was developing his operation at Galveston Island, and the Associates hoped it would be the basis for launching an expedition against Florida at Pensacola as well as Mexico (Warren 1938a:808). As Mina and Aury were making preparations, Job Northrup, on Aury's flagship *Independencia* (one 6-pounder) anchored off the Florida coast and captured a Spanish lieutenant sent to the ship to receive dispatches (Warren 1938b:810; Faye 1939:1059). Northrop warned José Masot, the commandant of Pensacola, of the planned impending attack and requested a $50,000 ransom to suspend hostilities for twelve months (Warren 1938b:811). Northrop returned to Galveston empty-handed (except for the capture of the Pensacola pilot boat) as Masot opted instead to reinforce Pensacola for an attack. He was promised four brigantines with 10,000 pesos and 200 muskets to be sent from Cienfuegos as aid (Warren 1938b:812; Faye 1939:1059). Notwithstanding, the planned attack never came to fruition. Mina met with the Associates, but was not persuaded to launch a dual expedition. Like Gutiérrez, Mina did not approve of the scheme to sell the territory to the U.S., and, thus, he maintained his original planned expedition to the Mexican coast (Faye 1940b:764).

Yet another attempt to liberate Florida from Spain would be organized by Englishman Sir Gregor MacGregor in June of 1817. With a small force of men enlisted primarily from Baltimore, Charleston, and Savannah, MacGregor occupied Amelia Island and announced he was going to conquer Florida from Spain. He was able to successfully attack and defeat the Spanish garrison at Fernandina, but did not have enough men and supplies to continue his Florida expedition (Wilgus 1925:207).

Spanish Florida, despite repeated attempts to take the territory by force, would be won not by the sword but through diplomatic means. The Adams-Onís treaty of 1819 ceded Florida to the United States in exchange for $5 million and renunciation of American claims to Texas. It also firmly established the Sabine as the territorial border between the United States and eastern New Spain (Schoultz 1998:16).

4.4.3 The Expulsion of the British at New Orleans

The abdication of Napoleon in 1814 would allow England to focus the strength of its military resources on the United States. The United States government had declared war against Britain on 18 June 1812 and, on the same day, authorized the president to issue letters of marque and general reprisal to private armed vessels. Six privateers would be commissioned from New

Orleans, though Louisiana would not be the center of military activity for another two years (De Grummond 1961:17).

Louisiana, which had been granted statehood on 30 April 1812, was ill-prepared for a British attack. The U.S. government had failed to arm the state militia, and it had ceased construction on a much-needed shallow-draft frigate at the navy yard at Madisonville on the Tchefuncta River (Casey 1987:3). Major General Andrew Jackson arrived at New Orleans in November 1814, recognized it was critically unprepared, and began fortifying the city for the impending attack (Toll 2006:445).

The British were organizing a naval expedition at Negril Bay, Jamaica in late November 1814 (Owsley 1981:138-139). This last major amphibious assault of the war was commanded by Sir Edward Pakenham, commanding the army, and British naval officer Admiral Sir Alexander Cochrane (Toll 2006: 445). The amassed fleet consisted of 70-80 ships of sail, of which 50 were warships carrying 1000 guns. The remaining vessels were merchant ships, chartered to carry the rich booty stored at New Orleans to England (De Grummond 1961:29).

As the fleet was making preparations, Cochrane was trying to remedy the shortage of shallow-draft vessels essential for moving British forces into Lake Pontchartrain, the intended focus of the attack. As his orders to send flatboats had not been obeyed, Cochrane improvised by appointing Captain Robert Spence to purchase or charter additional small schooners in Pensacola. Spence was only partially successful in his mission, as the fleet was still short on shallow-draft vessels. The British expedition arrived on Chandler (Chandeleur) Island and commenced scouting the area. On 13 December 1814 the British Navy engaged a small American flotilla of five gunboats (and a tender) which had been expedited to Lake Borgne to route the approaching fleet. Forty-five British barges (1200 men total), each mounting a single 12-pounder to 24-pounder gun, attacked and captured the five heavily armed American boats (183 men) (Smith 2004:57; Owsley 1981:137–139).

British regiments advanced to a plantation on the eastern side of the Mississippi, eight miles downriver of New Orleans and established their positions with their combined total of 6,000 men. The American army led by Major General Andrew Jackson was composed of regular troops, free blacks, southern volunteers, and Baratarians numbering 3,500 with an additional 1000 in reserve (Toll 2006:446).

On 8 January 1815, the British regiments advanced on Jackson’s line, two miles upstream from the British encampment, into a volley of artillery and musket fire. British causalities were 291 dead, 1262 wounded and 484 captured. In contrast, the Americans suffered 6 killed and 2 wounded (Toll 2006:447). General John Lambert, who succeeded Pakenham after his death in battle, rejected Cochrane’s proposal for a second assault and retreated. The decisive British loss at New Orleans occurred two weeks after the Treaty of Ghent established peace between the U.S. and Britain (Owsley 1981:192).

4.5 The Wars for Latin American Independence (1810–1822)

As Britain and France confronted the end of their expansionist ideals in the western hemisphere, so too would Spain. Having briefly controlled the entire Gulf from the Yucatan to the Atlantic Ocean, internal insurrections in Latin American and the U.S. expansion into the Florida territories would reverse over three hundred years of Spanish dominance. By the turn of the century, Spanish territories in Latin America would begin to extricate themselves from imperial authority. Revolutionary governments would commission privateers to attack Spanish shipping in the Gulf as a means to weaken Ferdinand's power through commercial tactics (Warren 1938b:814). The United States government was keenly aware that both the U.S. and Latin America desired to eradicate Europe from the Western Hemisphere. In reviewing the multitude of insurgencies in Latin America, President Madison regarded the revolutionaries with what he called a spirit of "enlarged philanthropy," meaning he would permit U.S merchants to sell them arms (Schoultz 1998:1).

The first key philosophical break with Spain on the mainland occurred in 1797, when Francisco de Miranda and two South American dissidents appealed to the British and American governments to assist in the liberation of South America. Miranda envisioned a defensive alliance between the United States, Britain, and the South American provinces. Though Britain intimated it would offer a 10,000-man expedition, the United States withdrew, not wishing to become involved in a war (Scheina 2003:21).

True revolution and military challenge to the Spanish 'Royalist' forces would be effected by the Hidalgo revolt in 1810. Father Miguel Hidalgo y Costillo conspired with militia captains Ignacio Allended, Juan Aldema, and Mariano Abasola to replace the viceregal government with a creole *junta* that would rule in the name of Ferdinand VII (Depalo 1997:14). After capturing principal locations in the region of Bajío (Mexico), 80,000 rebel troops commanded by Father Miguel Hidalgo y Costillo would be defeated by the Spanish (through the accident of a grass fire) near Guadalajara in January 1811 (Chipman 1992:220-221). As part of the revolutionary movement, Juan Bautista de las Casas organized raids against San Antonio, Nacogdoches, and La Bahia and arrested the Spanish governor and lieutenant governor of the province. Four hundred Spanish troops surrounded the governor's mansion and arrested de las Casas; both Bautista de las Casas and Hidalgo were executed (Faulk 1964:134–135).This first phase of the war, fought primarily in Central Mexico and northward into Sinaloa and Texas, ended disastrously for the insurgent forces. (Scheina 2003:75).

The failed Hidalgo revolution was almost immediately followed by military expeditions in southern Mexico led by José María Morelos y Pavón, a successful commander under Hidalgo. After several successful campaigns and the capture of Acapulco, Morelos was defeated by the Spanish at Valladolid in December of 1813 (Scheina 2003:79). Morelos was eventually captured by Spanish General Iturbide as he was escorting the Congress through enemy territory. Morelos was executed by firing squad near Mexico City on 22 December 1815 (Depalo 1997:17).

Concurrent with Morelos' campaigns were those organized by José Bernardo Gutiérrez de Lara in 1812. Gutiérrez had originally been commissioned by Hidalgo to solicit U.S. aid for the patriot cause. After failing to be officially received at Washington, Gutiérrez returned to Natchitoches where he met Lt. Augustus W. Magee, a U.S. officer patrolling the 'neutral territory' with a small contingency of soldiers. In June 1812, Magee resigned his military commission and joined Gutiérrez. With 300 men, Gutiérrez and Magee successfully captured Nacogdoches and La Bahia, but were forced by the Royalist army under General Salcedo to retreat to San Antonio. Magee died and was replaced by Samuel Kemper as commander of the military expedition (under Gutiérrez leadership). At the Battle of Salado Creek, in April 1813, the Royalists were defeated. Gutiérrez massacred 17 Spanish officers, an act that alienated U.S. supporters and caused many, including Kemper, to desert. José Álvarez Toledo replaced Kemper as commander of the army, but the Royalist troops under Joaquín Arredonde soon defeated the revolutionaries at the Battle of Medina, forcing many to escape into Louisiana

(Faulk 1964:135; Wilgus 1925:197–200). The death of Morelos ended the second phase of the revolutionary war in Mexico, in which the rebels had first won then lost practically all of southern Mexico (Scheina 2003:80).

Vincente Guerrero, a lieutenant in Morelos' army, would continue military expeditions against the Spanish. Insurgent leaders Guerrero and Guadaloupe Victoria commanded 1000 men at Oaxaca and 2000 men between Puebla and Veracruz, respectively. The Royalist army had 80,000 armed soldiers. These revolutionaries vexed Royalist troops but did not pose a real threat (Scheina 2003:80).

4.5.1 Filibusters in Texas and the Mexican Republic of Galveston

Between 1815 and 1817, internal campaigns to liberate Mexico from Spain would continue with encouragement and financial assistance from the United States. The city of New Orleans would be instrumental in supplying provisions and munitions to insurgents and to the privateer navies assisting in these rebellions. The New Orleans Association, mentioned above, offered assistance to these groups and arranged for the sales of arms and supplies (see chapter 5).

Louis Michel Aury and Francisco Xavier Mina organized another filibuster expedition centered at Galveston Island in 1817. Louis Aury had established a privateering base at Galveston Island in late 1816 under the authority of José Manuel de Herrera, the official minister (of the Mexican *junta*) to the United States. Herrera declared Galveston a port under the now-defunct Mexican Congress and named Aury as its governor. Aury capitalized on his newfound "legitimacy" by plundering vessels of varying nationalities, though U.S. vessels were forbidden as prizes (Chipman 1992:238; Wilgus 1925:203-204; Owsley and Smith 1997:136–137).

In preparation for Aury and Mina's filibustering expedition, vessels left New Orleans for Galveston almost daily with men and supplies by October 1816 (Davis 2005:309). In April of 1817, Aury's fleet transported Francisco Xavier Mina and Henry Perry to Nuevo Santander; Mina marched inland to Soto la Marina, and Perry marched along the coast to La Bahía (Chipman 1992:238; Wilgus 1925:206). Mina's force was overtaken by Joaquín de Arredondo's army, and Perry's contingent was defeated by Texas Governor Antonio Martínez. Perry committed suicide to prevent his own capture (Chipman 1992:238–239). After landing the expedition, Aury tentatively reorganized his headquarters at Matagorda Bay but departed for Galveston after learning of Mina's capture. Mina was executed in October 1817.

In Aury's absence, Lafitte usurped leadership of Galveston and installed a new government, which was sworn in by Luis Iturribarría, a deputy to Herrera. He exploited his leadership of Galveston both by assisting filibustering factions out of New Orleans and by spying on these factions for Spain. The payments Lafitte received from Spain were used to finance his privateering ventures and to improve Galveston's ramshackle community (Wilgus 1925:206).

4.5.2 Cartagena and New Granada

Though the independence of Cartagena/New Granada/Columbia is a larger segment of the struggles in South America, its importance to the Gulf of Mexico cannot be understated. Privateers Louis Aury and Renato Beluche both served as commanders of its privateer fleet/navy and the commercial link between these privateers, Galveston, and New Orleans was great. The Cartagenan privateers would carry troops, arms, and munitions to ports such as Santa Marte and deposit stolen merchandise at Grand Terre. Beluche would repair and outfit privateers at New Orleans for the Cartagenan navy (De Grummond 1983:71, 74)

Cartagena declared its independence on 11 November 1811 (De Grummond 1983:68; Scheina 2003:26), the first city and province in New Granada to do so. It was immediately besieged by a Royalist army (Scheina 2003:26-27). Spain cut off the source of supplies to Cartagena from the interior and in retaliation Cartagena sent a vessel with blank privateer commissions to Grande Terre and invited the Baratarians to attack Spanish shipping (De Grummond and Morazan 1961:12).

Simon Bolívar and a small group of revolutionaries traveled to Cartagena in 1812 and successfully drove the Royalist forces into Venezuela. Bolívar was awarded citizenship and the rank of brigadier by the Cartagenan *junta*. Bolívar was able to convince the *junta* to allow his attack of Venezuela. Bolívar moved across more than 800 miles of Venezuela, attacking Royalist forces and forcing a capitulation on 6 August 1813 (Scheina 2003:29).

Following his successes in Venezuela, Bolívar returned to Cartagena and discovered it was ruled by two Federalist factions. The port of Cartagena which had been liberated in 1811 was, in 1815, under the control of Manuel de Castillo and the Cartagenan army (Faye 1941:616–617). Castillo refused to let Bolívar enter the port and he would not provide assistance against the approaching Royalist forces. To avoid a civil war between Cartagenan factions, Bolívar resigned and withdrew to Jamaica on 11 May 1815 (Scheina 2003:30). Aury, commanding the Cartagenan navy, attempted to preserve independence by resisting the encroaching Spanish military.

Spain had disembarked a large expedition to Latin America, including a Spanish army of 10,640 men, 42 transports, and 18 warships. The Royalist forces arrived off Puerto Santo on 15 April 1815. A combined force of 5000 European soldiers and 3000 Royalists under General Morales were dispatched to Cartagena in 56 ships. By 5 December, Lieutenant General Pablo Morillo, the Spanish naval commander, blockaded the port of Cartagena with Morales troops enforcing the interior (Scheina 2003:31). Aury, in the face of such overwhelming odds and lacking gunpowder, was forced to withdraw. His fleet transported and escorted over 2,000 Cartagenan refugees through the blockade, though most would perish in the effort (Faye 1941:620). After a 108-day siege, Cartagena surrendered to the Spanish Royalists on 6 December 1815 (Scheina 2003: 31).

Simon Bolívar, who had relocated to Haiti after the Royalists took Jamaica in 1816, continued to mount expeditions to re-liberate Venezuela but did not secure complete independence until November 1823, when the defeated Royalist army withdrew to Cuba (Scheina 2003:38). In December of 1819, after the rebel victory at Boyacá, Bolívar secured the liberation of New Granada and imposed the creation of the Republic of Gran Colombia that was comprised of Columbia, Venezuela, and Ecuador (Scheina 2003:36).

4.6 Mexican Independence and the End of Piracy in the Gulf

After more than a decade of continuous warfare, the independence of Mexico was resolved diplomatically. Political changes in Spain would decisively culminate in events causing Royalist military leaders to unite with revolutionary forces in Mexico. In Spain, on 1 January 1820, Colonel Rafeal Riego led a revolt that restored the Constitution of 1812. Legislation passed in Spain remanded provincial active militia men on duty to civil jurisdiction, except in regards to those of a direct military nature. Months later, this was extended to deprive the army of its military *fueros* (laws), thus threatening the social status and judicial immunities acquired through lengthy and dangerous military service. Growing numbers of Royalist officers came to embrace self-determination over continued Spanish rule (Depalo 1997:19)

Augustín de Iturbide believed the unification of the insurgents with the seven regular and seventeen provincial regiments could succeed against the eleven peninsular expeditionary regiments (Depalo 1997:20). In late November Iturbide was communicating with insurgent commander Guerrero regarding a plan for independence. Iturbide and Guerrero issued the Plan of Iguala on 24 February 1821, which proposed creating an independent kingdom of Mexico with Ferdinand VII or another suitable prince as its constitutional monarch. The Catholic Church and the upper-class would retain their privileges. The formerly-hostile forces would be combined into the Army of the Three Guarantees with Iturbide as the commander. The Viceroy at Mexico City denounced Iturbide and rejected the plan. The Army of the Three Guarantees systemically captured important Royalist strongholds in Mexico through peaceful surrender. On 24 August 1821, Iturbide and Juan O'Donojú, the newly appointed Captain General of New Spain, signed the Treaty of Córdaba. In September, the 16,000 man Army of the Three Guarantees marched on Mexico City (Scheina 2003:81–81). Agustín Cosme Damián de Iturbide y Arámburu proclaimed himself emperor in 1822, but he would be deposed by Republican forces and shot in 1823. In 1824, Mexico was reformed as a republic with Guadalupe Victoria as its first president.

The bloody liberation of Latin America (1810–1824) would take its toll on the populace. The population of Ecuador, Venezuela, and Mexico were decreased by 25 percent (as compared to the 13 percent decrease during the U.S. Civil War) (Scheina 2003:xiv). The U.S. did not initially recognize Mexican independence, believing it would jeopardize Spanish ratification of the Adams-de Onís treaty, which ceded East Florida to the United States and accepted U.S. claims to West Florida. The U.S. Senate ratified the treaty in 1819. Spain, however, did not agree until February 1821. The recognition process would not begin until mid 1822 (Schoultz 1998:9).

The perceived tranquility in the Gulf would be short-lived. In 1829, Spain launched an expedition to retake Mexico. A squadron of fourteen Spanish vessels, including frigates and ships-of-the-line, anchored off Tamaulipas on 25 July 1829. In August, Antonio López de Santa Anna, the governor of Veracruz, impressed three U.S. merchant vessels to transport 800 troops to Tecolutal to engage Spanish expeditionary troops at Pueblo Viejo. On 7 September, 2000 troops led by Gen Manuel Mier y Terán joined Santa Anna's force for an attack on over 2000 Spanish troops near Tampico. The Spanish surrendered on 10 September 1829 and departed for Cuba (Grajales 1969:308; Scheina 2003:83). Political unrest continued for the new Spanish government, as Vice-President Anastasio Bustamante used the assembled army at Jalapa to overthrow President Guerrero in December (Scheina 2003:83).

4.6.1 Demise of Piracy in the Gulf of Mexico

Privateering in the Gulf of Mexico was encouraged, outfitted, and ultimately (sometimes indirectly) financed by opposing military and diplomatic factions at work in Europe, North America and Latin America. As Gulf territories were liberated and boundary disputes rectified, the need for mercenary naval forces diminished. As a result, the first substantial U.S. Navy attack on privateering activities occurred in 1814 against Barataria. This action was led by

Commodore Patterson of the. Naval Station at New Orleans (Warren 1938a:205, Davis 2005:191–192). While pirates remained active at Barataria as late as 1819, U.S. policing of the coast and of the organization at Galveston was ever-present by the end of the decade (Orleans Gazette 6 August 1819).

The United States government would finally direct its energy toward the privateers in the second decade of the nineteenth century, an action humorously recognized in Britain as being long overdue (The Edinburgh Advertiser 1821:299). After misfortune in Matagorda Bay and the loss of his Galveston headquarters to Lafitte, Aury arrived at Amelia Island in September of 1817, just weeks after the departure of George MacGregor. A week later, a dozen ships were in the harbor as part of Aury's preparations to establish a privateer base. In December, just months after Louis Aury had established himself on Amelia Island; the U.S. navy mounted an attack, forcing Aury to withdraw to Charleston (Davis 2005:350).

As part of the Adams-Onís Treaty (1819), Congress passed new legislation to protect commerce and punish piracy (Davis 2005: 402). The United States sent squadrons, including Commodore Porter, in pursuit of the pirates. Porter was policing the region with four British cruisers and, by 1822, was accredited with having nearly destroyed all the pirates in the West Indies (Kendall 1925:367). Commodore Patterson was working with a substantially larger fleet and finding success in capturing and legally condemning Gulf privateers.

Pierre and Jean Lafitte, no longer able to broker deals with the Spanish government, found themselves isolated at Galveston and under the constant scrutiny of the U.S. schooner *Lynx*. As a gesture of good will, and as a means to personify himself as something other than a pirate, Lafitte hanged a member of his outfit for burglarizing the home of James Lyon in lower Saint Landry Parish (Davis 2005:413–414). Congress had just passed a bill authorizing harsh punishment for pirates and Lafitte was demonstrating his willingness to comply. The ruse was unsuccessful and Jean Lafitte finally presented an offer to Lieutenant Daniel Patterson of the New Orleans Naval Station, wherein the Lafitte brothers would abandon Galveston Island in exchange for safe passage outside American jurisdiction. The Lafitte brothers departed Galveston in May 1821, largely destroying the remaining camp (Davis 2005:419–422, 432). By 1825, the "day of the buccaneer" was over (Kendall 1925:367).

4.7 Shipbuilding and Vessel Types in the Gulf of Mexico

4.7.1 U.S. Commercial Traffic at New Orleans

The Ship Registers and Enrollments of New Orleans documented U.S. vessels engaged in coastal commerce (enrollments) and vessels conducting foreign seafaring trade (registers). These documents provided a ship's dimensions, a basic description, construction date and location, hailing port, the owner, and captain. It was a means of recording a vessel's tonnage, which was the basis for the tabulation of customs duties.

The first tonnage law in the United States was passed in 1789, fifteen years after it had been established in Britain (Lyman 1945:226). The U.S. law required all vessels over 20 tons built in the U.S. or imported prior to 16 May 1789 to be enrolled before engaging in trade between customs districts. In addition to giving economic preference to domestic built and owned vessels in an effort to promote the development of a U.S. merchant marine (Bauer 1988:104), this legislation provided a useful document for studying the ships of the Gulf of

Mexico. The determination of length was based on the "Builder's Old Measurement" (B.O.M.) and was measured along the rabbet of the keel (Kemp 1976:117). Three-fifths of the beam was deducted from the length while the breadth was recorded from the 'broadest part above the main wales". For vessels with multiple decks, the depth was taken as one-half beam. Due to the prevalence of shallow-draft vessels in the U.S., Congress specified that the depth of single-decked vessels would be calculated from the top of the ceiling planking to the underside of the deck planks. The tonnage law used to deduce vessel dimension continued to be used without modification until 1864 (Lyman 1945:226). Registers and enrollments were issued to owners or masters after proper measurement and proof of date and place of construction were provided. U.S.-manufactured vessels of five tons or greater were entitled to the rights and privileges of American-documented vessels (U.S. National Archives and Records Administration 2001).

The first volume of the New Orleans Register and Enrollments commences with the origination of this documentation in New Orleans, on 24 February 1804 and continues through 1820 (Works Progress Administration [WPA] 1941:iv). Nine hundred and twenty-three vessels are contained within the volume: 319 vessels are enrolled and 604 are registered (or both). A majority of the enrollments for the period are missing between 1804 and 1815. Ships and boats of all sizes embarked for New Orleans from various Atlantic and Gulf ports.

There are generalities that can be deduced by reviewing statistics for the registered vessels that were engaged in commerce at New Orleans. The largest proportions of vessels conducting foreign trade and registering at New Orleans were schooners. Schooners accounted for 43 percent of the vessels, followed in quantity by brigs (24 percent), ships (23 percent), and sloops (6 percent) (Table 4.1). Though enrollment information for the period is incomplete, the existing data suggests the largest proportion of coastal trade (enrollment) was conducted by keel boats (29 percent), boats (22 percent), barges (22 percent), and steamboats (18 percent). These vessels account for a combined 92 percent of the coastal traffic; only 21 schooners (7 percent) and three sloops (1 percent) are enrolled solely for the purpose of this trade. Other vessels disembarking from New Orleans include feluccas, barks, ketches, a lugger, and a snow. The variety of vessels at the Port of New Orleans is illustrated in an 1820 engraving (Figure 4.2).

Table 4.1

Vessels at New Orleans, 1804–1820

Registered (604)		**Enrolled (319)**	
Barge	2	Barge	70
Bark	2	Batteau	1
Brig	146	Boat	71
Felucca	7	Flat boat	2
Galliot	1	Keel boat	93
Lugger	1	Schooner	21
Ketch	2	Sloop	3
Pettiauger	1	Steamboat	58
Schooner	260		
Ship	140		
Sloop	37		
Snow	1		
Steamboat	4		

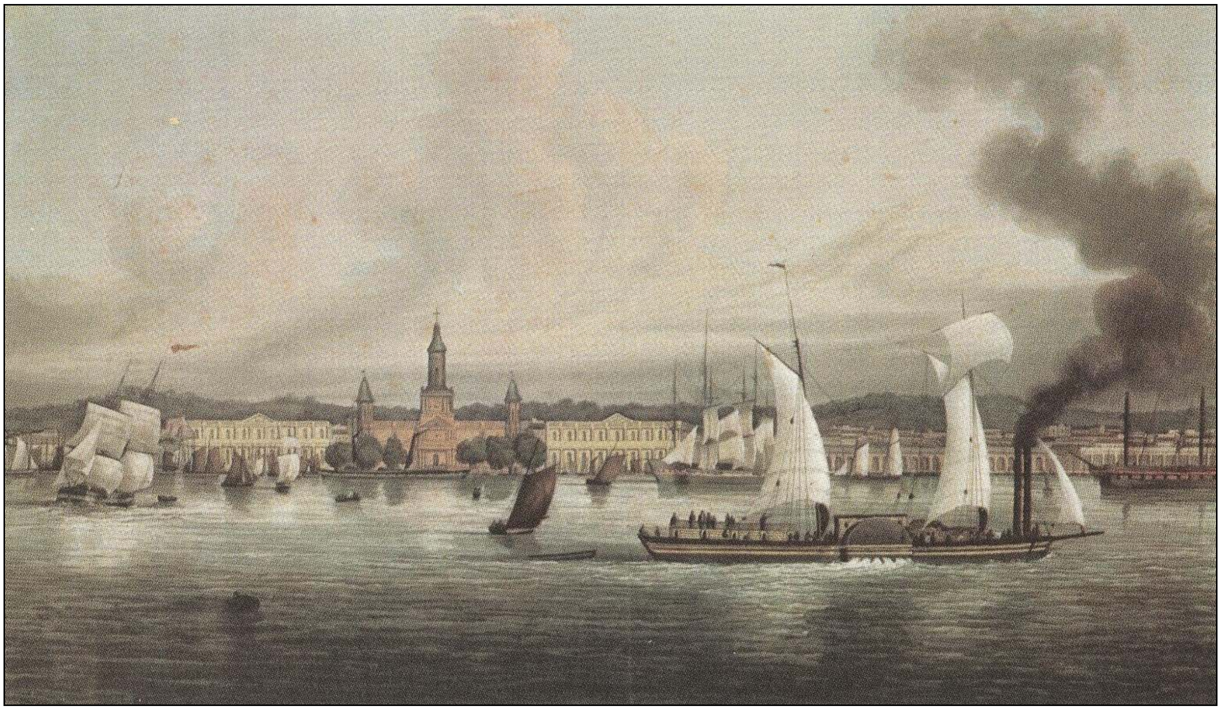

Figure 4.2. Nouvelle Orléans, ca. 1820 (source: Himely and Hocquart after Ambroise Louis Garnerai , ca. 1834, courtesy of The Historic New Orleans Collection, accession number 1940.4).

The ship was the largest sailing vessel type used in the transportation of cargo to New Orleans. The bulk of the commercial traffic emanating from the port was smaller vessels, such as schooners, and as the nineteenth century progressed, fewer ships would be constructed to conduct trade. The geomorphology of the Gulf coast, with its predominately shallow ports and shifting sandbars, was less inviting to larger vessels and may have encouraged the use of schooners and sloops. The peak years for the construction of ships occurred between 1806 and 1810, after which it declined, though the use of the port continued to increase (Figure 4.3).

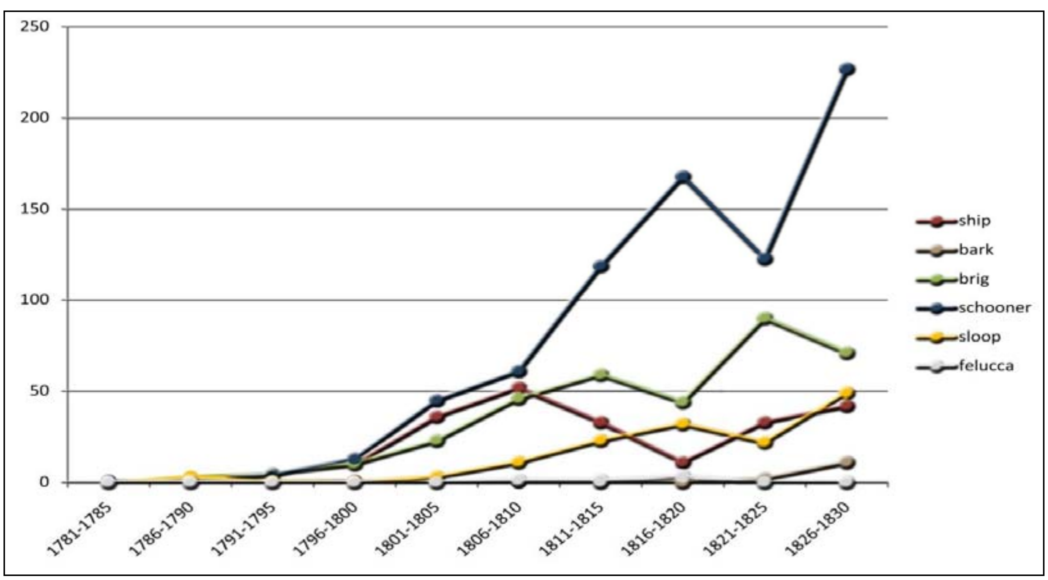

Figure 4.3. Summary of tabular data in New Orleans Registers and Enrollments vol. 1-5 (1804–1850).

Ships ranged in size from 147–414 tons, with the exception of one large vessel, the 127-ft *Horatio* (609 tons) (WPA 1941:no. 425; this vessel was not used to access averages). The average size of a registered ship was 91.15 X 25.82 X 12.95 ft with a displacement of 272 tons (Table 4.2). This is slightly larger than the average for ships hailing from Gulf area ports based on the registration data. A majority of the vessels were described as having two decks, three masts, a square stern, and bow ornamentation, including a fiddlehead, a billethead, male or female figureheads, and, occasionally, an unusual item such as an alligator head (WPA 1941:no. 62). Vessels with a single or flush deck do sometimes occur in the registers along with more obsolete hull features such as quarter galleries. Nine ships with this feature were built between 1794 and 1805; two were built in 1810 and 1814 (WPA 1941: nos. 655, 176, 69, 799, 33, 131, 362, 373, 344, 414, and 425).

The brig was slightly smaller than the ship and was frequently characterized as having one deck, two masts, and a square stern. Like the ship, the brig had bow ornamentation that included billetheads, fiddleheads, and figureheads (WPA 1941: no 720 and 628). The average dimension for a brig registered at New Orleans was 76.29 X 22.81 X 10.87 ft and 173 tons (Table 4.2). Brigs were predominately constructed in the northeastern United States (66 percent) and were the most numerous of the vessel types produced in their shipyards. Only 21 brigs were produced by shipbuilders in the southern United States, and only one was built in the Gulf (Table 4.2). Unlike the ship, however, the production of the brig was relatively constant throughout the period. The peak in brig construction occurred in 1810, and twelve were launched between 1816 and 1820 (see Figure 4.3).

The predominate vessel for New Orleans maritime commerce was the schooner. Not only was the schooner the most numerous type of vessel registered at New Orleans (260: 43 percent), but it was also the most frequently produced watercraft launched from Gulf shipyards. Seventy schooners were built by Gulf shipwrights; 17 of these were from New Orleans. Of the 350 vessels claiming New Orleans as their home port, over half were schooners (179, Table 4.2).

Schooners registered at New Orleans were on average 59.55 X 17.71 X 6.74 ft and 69 tons, (Table 4.2), though the range in size was from 8 tons to over 200. The schooners constructed in the northeastern and southern states were above average in size, averaging between 80 and 90 tons and 65 ft in length. Vessels constructed in the Gulf were diminutive compared to those on the east coast; the average size was 48.74 X 14.34 X 4.84 ft and 32 tons. Many of these vessels were alternately registered and enrolled, therefore able to conduct both coastal and foreign trade. The small size of these vessels may be indicative of their versatility of use in Gulf trade.

Schooners constructed on the Gulf Coast and enrolled in coastal trade were similarly small and were approximately the same dimensions as the registered schooners and enrolled sloops. The average dimension of the coastal schooner was 53.26 X 14.82 X 4.69ft and 32 tons. Enrolled schooners generally varied from 20.21–52.77 tons, with the exception of one schooner that displaced 63 tons. According to Goldberg (1976:77), colonial coastal vessels were constructed to displace between 20–40 tons and seagoing vessels were larger than 50 tons. Although coastal craft built in Gulf shipbuilding communities somewhat conform to this observation, seagoing, registered schooners could range in size from eight to over 200 tons.

Table 4.2 Average Vessel Dimensions, 1804-1820

Registered Vessels (general)					Vessels Hailing from Gulf Ports (350)				
Type	**Tonnage**	**Length**	**Breadth**	**Depth**	**Type**	**Tonnage**	**Length**	**Breadth**	**Depth**
Felucca	23	44.00	12.11	4.1	Felucca (6)	26	44.81	12.75	4.40
Sloop	57	54.39	18.07	6.45	Sloop (23)	45	51.44	16.72	6.05
Schooner	69	59.55	17.71	6.74	Schooner (179)	56	56.17	17.63	6.65
Brig	174	76.29	22.81	10.87	Brig (79)	165	74.06	22.45	10.65
Ship	273	91.15	25.82	12.95	Ship (62)	257	88.65	17.30	12.78
Vessels Built in Gulf Ports (84)					**Vessels Built in New Orleans (19)**				
Felucca (3)	10	36.78	8.94	3.39	Felucca (1)	10	36.78	8.94	3.39
Sloop (6)	29	45.14	14.46	5.18	Sloop (0)	0	0.00	0.00	0.00
Schooner (70)	33	48.74	14.34	4.84	Schooner (17)	50	55.91	16.22	5.46
Brig (1)	150	83.5	20.67	9.67	Brig (1)	150	83.50	20.67	9.67
Ship (0)	0	0.00	0.00	0.00	Ship (0)	0	0.00	0.00	0.00
Vessels Built in Southern Ports (113)					**Vessels Built in Philadelphia (14)**				
Felucca (0)	0	0.00	0.00	0.00	Felucca (0)	0	0.00	0.00	0.00
Sloop (5)	54	54.43	16.88	6.36	Sloop (0)	0	0.00	0.00	0.00
Schooner (66)	82	64.57	19.13	7.24	Schooner (2)	41	52.89	16.87	5.41
Brig (21)	178	78.59	23.24	10.90	Brig 8)	201	80.20	24.18	11.25
Ship (19)	259	88.82	25.66	12.61	Ship (4)	231	86.26	25.51	13.23
Vessels Built in Northeastern Ports (301)					**Vessels Built in New York (13)**				
Felucca (1)	7.86	28.33	9.42	3.50	Felucca (1)	7.86	28.33	9.42	3.50
Sloop (22)	67.89	57.79	19.81	6.84	Sloop (1)	67.00	58.33	20.83	6.67
Schooner (87)	96.19	65.85	19.89	8.07	Schooner (1)	67.55	58.33	18.00	7.58
Brig (97)	182.39	78.28	23.27	11.06	Brig (5)	156.97	77.27	22.37	10.12
Ship (87)	281.72	92.41	26.03	13.08	Ship (5)	328.52	27.70	27.70	13.70

The small schooner was generally less ornamented than the larger brig and ship. Schooners are predominately characterized as having one deck, two masts and a square stern, though a two-decked example (65-ft *Hannah*, 1801) and those with quarter galleries (44-ft *Caroline*, 49-ft *John*) were sometimes registered at the port (WPA 1941:nos. 383, 125, and 477). Periodically these vessels were adorned with a billethead, figurehead, or scrollhead, but this practice was uncommon.

Five schooners at New Orleans were three-masted vessels. This characteristic is a normal feature for ships and occasionally occurred on large vessels such as the lugger and bark. In 1816, John C. Chambers constructed a three-masted schooner for Pierre Lafitte (WPA 1941:no. 317). The other four three-masted schooners were built between 1800 and 1808 in Ohio, Maine, West Virginia, and Pennsylvania (WPA 1941:nos 423, 383, 508, 688). Two of these schooners hailed from Massachusetts, and three were from Gulf ports. The vessel constructed for Pierre Lafitte in 1816 is surprisingly small for the number of masts, with dimensions of 43.42 X 13.42 X 4.35ft and a 21.25 ton displacement. The small size, low tonnage, and amount of canvas would have made this a quick sailor and a vessel well-suited for privateering.

The increase in schooner construction for vessels registered at New Orleans began between 1796 and 1800 (see Figure 4.3). Thirteen schooners were built during that five-year period. Between 1781 and 1795, only 6 schooners were built. Schooners were the dominant vessel type constructed during the study period and accounted for 52 percent of the vessels built between 1801 and 1830. The production of schooners continued to increase exponentially throughout the period during the time the construction of ships was in decline.

A shipbuilding contract from New Orleans in 1769 may elucidate the construction of topsail schooner-type vessels used in the Gulf of Mexico. The vessel was contracted by Mr. Toutant Beauregard, a merchant and ship owner from New Orleans, with the shipbuilder Jean Verret. The finished two-masted vessel was to measure 60 ft in keel length; 23'10" great beams (maximum breadth); 73 ft end to end with a between deck 3'10" high bridge over keel; a hold of floor timber 9 ft under beam; a rudder with a back cut of 15 inches; and a measurement of 6'6" draught. The main masts were to be positioned 5 ft apart with an elevation of 15 in according to the sheer aft. The shipwright was to make a room 6 ft high of flat floor timber. The shipwright was to “furnish one negro” for all the joiners work and that this gentleman was to be supplied with moulds and proportions for the masts, yards, cutwater driver boom, drops, topsail booms and etc. At the signing of the contract, Mr. Beauregard had submitted the first payment for the vessel, in the sum of six hundred and sixty livres thirteen sols (Approximately $120 U.S. dollars) (Porteous 1928: 593–594).

Several Gulf-area shipwrights are mentioned in the enrollments, which was an uncommon practice. The largest number of vessels, three schooners, is attributed to shipwright Juan Mariana Aranburn of Bay Saint Louis, Mississippi. Aranburn constructed three schooners between 20 and 37 tons. His schooners were an average size of 47.9 X 16.5 X 6.69 ft. Peter Burton, Michael Francois Rouvant, and John C. Chambers were three of the shipbuilders operating in New Orleans (WPA 1941: nos. 317, 528, 595).

In addition, the survey of a damaged schooner at New Orleans, *Charlotte*, offers some description of schooner construction. The schooner had sustained damage to the frame during the loading of wood at Cayviete and was found to have extensive leaks. During the investigation of this damage, it was also discovered that the foremast was rotted at the coupling, and there was rotting of the main mast, halyards' cleats, and the hoops of the driver boom. It was also determined that the mainsail, fore-staysail, cross-pack sail and fore-topsail needed replacing as well as half the deck timbers. In order to strengthen the vessel it was suggested to add two breast hooks to the forepart of the vessel; to change four timbers on the starboard deck fore and aft; to change six timbers larboard on the deck; to repair the starboard and larboard hand-rail at the joining of one piece only of about two inches by six inches long (to make the fore part of the main mast level); to recover the deck; to nail the planks again; and to change the larboard pump and renovate the starboard pump and two pump-breakers. The vessel was to be condemned if the repairs were not made to the schooner (Porteous 1930:230-232).

Sloops were one of the smallest vessel types enrolled for foreign trade. Sloops were, on the average, smaller than schooners and had one single mast. On the East Coast, the difference in scale between the schooner and sloop was approximately 12–13 ft in length, 1–3 ft in breadth and 1 ft in depth; the difference in displacement was 30 tons. Schooners and sloops constructed in Gulf ports were, on average, almost identical in size, varying only by a few feet for any dimension. The average sloop was just four tons lighter.

The largest percentage of vessels registered at New Orleans was built in the Northeastern United States (50 percent of all the vessels, 62 percent of the total ships, 66 percent of brigs, 33 percent of schooners). The northeastern U.S. is defined, according to the U.S. Census Bureau, as Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, and Pennsylvania. Vessels constructed in the northeastern states were larger than those produced in the southern states, which were, in turn, larger than those produced in the Gulf territories. This trend in shipbuilding carried through all vessel types. Vessels launched from southern shipyards were only slightly smaller in scale, though the schooner, brig, and sloop were all approximately 10 tons lighter than their northeastern counterparts; the average ship was lighter by 23 tons. Shipbuilders in the Gulf did not produce any ships, and only one brig of 149 tons displacement was launched. New Orleans, Bayou Saint John, Bonfouca, and Tchefuncta produced the largest number of vessels in the Gulf (Table 4.3); the locations of these and other Gulf shipbuilding communities are illustrated in Figure 4.4.

4.7.2 International Vessels

An annotated database study maintained by the author (Borgens, Gulf of Mexico Ship Database) is focused on maritime commerce in the Gulf of Mexico for the first half of the nineteenth century. It is drawn from archival research and primary and secondary source material (over 200 references) and is independent of the New Orleans Registers and Enrollment. This resource was used to supplement vessel information derived from other sources. For this study, vessels engaged in maritime activity between 1800 and 1830 were reviewed, as the construction date for many vessels is unknown. Those operating in the 1830s could have been in use in the preceding decades. The database includes 567 vessels whose period of use is between 1800 and 1830. The database study is somewhat *Amerocentric* in that its focus is mainly on the interaction of international vessels with the Gulf territories primarily west of, and including Louisiana. The database study is ongoing and the current findings are merely a general representation of maritime activity in the Gulf.

A vessel's nationality was not inalterable, especially in the Gulf of Mexico. Foreign allegiances and ownership changed; vessels were sold and captured. The national affiliation of the ships and vessels in the study were assigned based on the most recent appearance in the historical record. The immense privateering activities in the Gulf can create some confusion in territorial affiliations. Vessels listed in Table 4.4 as hailing from Galveston Island during its brief tenure as a Mexican Republic were also interchangeably referred to as Mexican, Cartagenan and Columbian vessels, though the latter examples could also be independent of the Galveston operation. Vessels from Guadaloupe were frequently privateers carrying French letters of marque and could therefore be classified as French vessels. Notwithstanding, a majority of the vessels operating in the Gulf of Mexico were from the United States, Britain, or Spain. Collectively the vessels from Cartagena, Mexico (at Galveston), Grenada, and Columbia, the source of privateer commissions, outnumber Spanish vessels in the region. This calculation is biased by the source material which cannot account for all the Spanish merchant ships conducting trade with the Spanish provinces.

Table 4.3

State and Municipal Shipbuilding Quantities

Vessel Quantities by State		Vessel Quantities by City	
Massachusetts	88	New Orleans, LA	23
Louisiana	65	Philadelphia, PA	14
Maine	61	Pittsburgh, PA	14
Connecticut	57	Baltimore, MD	13
Maryland	40	Dorchester (County), MD	13
Virginia	31	Marietta, OH	13
Pennsylvania	30	New York, NY	12
New York	28	Bayou St. John, LA	11
North Carolina	21	Mathews (County), VA	10
Ohio	20	Saybrook, CN	10
New Jersey	19	Bonfouca, LA	8
Mississippi	15	Kennebunk, ME	8
Kentucky	11	Newburyport, MA	8
Rhode Island	10	Tchefuncta, LA	8
New Hampshire	9	Bay St. Louis, MS	7
Alabama	4	Pascagoula, MS	7
South Carolina	4	Hallowell, ME	7
Delaware	2	Barnstable, MA	6
Tennessee	2	Bath, ME	6
West Virginia	2	Norfolk, VA	6

A variety of vessels plied the Gulf waters, from small pilot boats to ships-of-the-line. Schooners were the most frequently utilized watercraft, accounting for 30 percent of the maritime traffic, followed by brigs, frigates, and ships (12 percent, 9 percent, and 6 percent, respectively). Four hundred and twenty-six vessels were identifiable by vessel type; 188 of these (44 percent) were armed, suggesting they were either military vessels, privateers, or were defensively outfitted. At least 64 vessels (15 percent) were constructed specifically for naval combat, such as gunboats, corvettes, frigates, and ships-of-war.

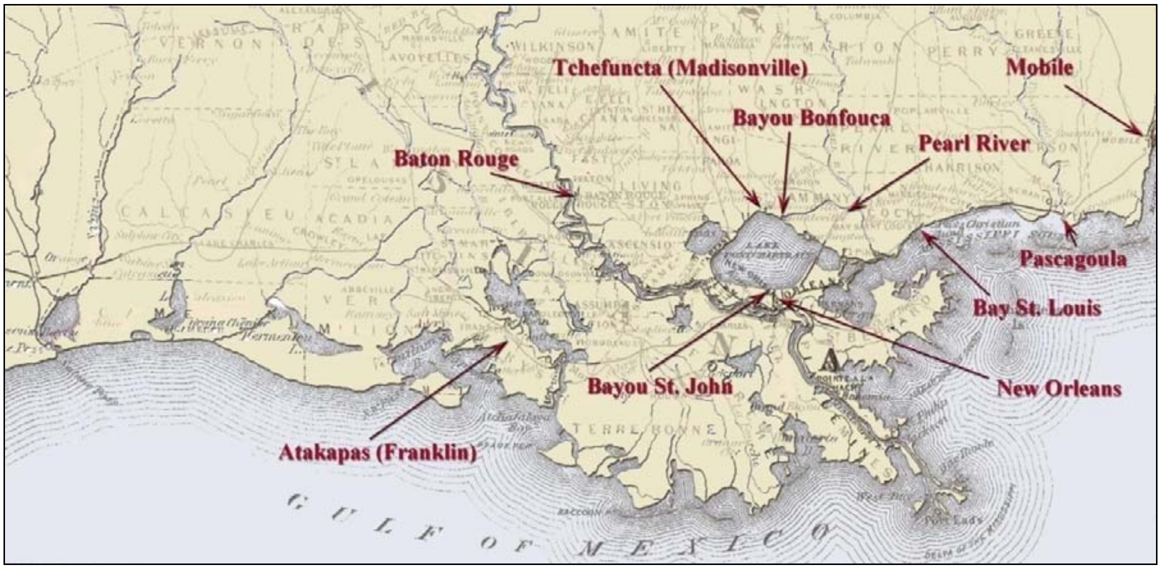

Figure 4.4. Shipbuilding locations in the Gulf of Mexico (illustration by A. Borgens, after Anonymous 1877).

A fluid commerce was ongoing in the Gulf of Mexico; a variety of merchandise was transported across its waters. Major exports from New Orleans included cotton, tobacco, coffee, and sugar. Other items transported from the port were sundry products such as flour, pork, and butter, candles, corn, bearskins, ostrich feathers, rooster feathers, hats, vests, shoes, knives, munitions (Bauer 1988:128; De Grummond 1961:62; *Mississippi Messenger* 11 February 1808). These items were sometimes shipped in large quantities such as the cargo of *Two Friends,* on 16 November 1810, that cleared for Cuba carrying 10 barrels of flour, 10 barrels of beans, 20 barrels of pork, 20 barrels of beef, 150 barrels of pilot biscuit, 2 barrels of red wine, 20 barrels of whiskey, and 3 barrels of chewing tobacco (Faye 1940b:824).

The vessel *Cleopatra* was captured by a privateer *en route* to the Gulf from Spain in 1815 and was recaptured by a U.S. vessel. Cargo from the vessel included 1,953 barrels of flour, 1,830 pipes of red wine, one ullage (partially filled cask) of red wine, 6.5 more casks of red wine, 6 barrels of white wine sugar, 45 boxes of vermicelli, 15 cases of hats, 13 boxes of glass, 22 barrels of peas, oil, silks, laces, veils, perfumery, and tooth powder (De Grummond 1961:133–134). Other products shipped to Mexico included aguardiente (alcoholic beverage made from sugar cane), iron, wine, oils, and almonds (Bidwell 1960: 495).

One of the principal exports from Mexico and Latin America was specie, due in part to rich silver resources. After a twenty-year stagnation in silver mining, the industry experienced a boom in the last decades of the eighteenth century (Ponzio 2006:2, 4). Silver was extracted by private firms and sent to coinage houses. Silver production was 13 million pesos from 1750–1775, 18 million by the end of the 1770s, and over 20 million by the mid-1790s (Ponzio 2006:5).

In the late eighteenth century, Spain financed its colonial state by shipping silver from New Spain to Cuba where it was redistributed to Santo Domingo, Puerto Rico, Florida and Louisiana (Irigion 2003:10). A majority of the Treasury in Cuba (75 percent) was *situado* from New Spain. During the war with England from 1779–1783, this amounted to at least 37 million pesos (Irigion 2003:9–10). By 1821, 80 percent of Peruvian exports were silver (in millions of silver bars and coins). In the 1820s, Mexico traded silver to the United States in exchange for primary imports such as manufactured cloth, raw cotton, and wheat flour coming through New Orleans (Salvucci 2006).

Table 4.4

Summary of Foreign Vessels Operating in the Gulf of Mexico, 1800–1830

	launch	pilot boat	tender	felucca	ketch	polacre	sloop	sloop-of-war	gunboat	schooner	schooner-of-war	cutter	packetboat	bark
Africa										1				
Argentina														
Belgium														
Cartagena									1	16				
Columbia										5				
Cuba										1				
England							3		1	5			10	
France													1	
Grenada														
Guadalupe		1		2						4				
Mexico (Galveston)		1		3	1	2	2			12	1			
Mexico (Independent)		1				1	3		2	22				1
Peru														
Portugal						1								
Scotland														
Spain	1	1		1		1		1		15				
United States		1	1	1	1		3			44	1	2	1	
Uruguay														
Venezuela		1								2				
totals	1	6	1	7	2	5	11	1	4	127	2	2	12	1

	brig	herma. brig	brigantine	brig-of- war	corvette	galleon	frigate	corsair	ship	ship-of-war	ship-of-the-line	steamer	unknown
Africa													
Argentina	1				1								
Belgium									1				
Cartagena	1	1					2	2					4
Columbia	2				2								3
Cuba									1				
England	7		4	1	4		11		8	1	1		30
France	1						2		2				2
Grenada													1
Guadalupe								1					5
Mexico (Galveston)	4	1					5						5
Mexico (Independent)	4		2	1	1		3		1				
Peru			1				1						1
Portugal	1												
Scotland									1				
Spain	11	1	4	3	1	1	10		6				8
United States	21	2			2		4		7			2	23
Uruguay	1												
Venezuela		2											1
totals	54	7	11	5	11	1	38	3	27	1	1	2	83

Mexican silver coinage was shipped in large quantities, creating irresistible targets for privateers. The Spanish brig *Nueva Dolores* was captured off the Balize by three privateers on 29 May 1813. The cargo of 20,000 silver coins was stolen (Faye 1939:1070). An unnamed *prize* of William Mitchell arrived at Galveston in 1816 with a cargo of $170,000 in specie and approximately 800 seroons of indigo (Davis 2005: 255). Two million pesos were part of the cargo on the English sloop-of-war *Tay* that was bound from Campeche to Jamaica in 1816. The vessel wrecked on the Alacrán Reef on 11 November 1816, though all 135 crew were saved

(Marx 1981:63; Gilly 1850, 330). The Columbian vessel *Independiente* was transporting 57,849 pesos and 6 *reales* when the vessel was engaged by the Spanish corvette *Ceres* in 1823. *Independiente* was damaged and withdrew from the fighting (De Grummond 1961:209).

After silver, the most important Mexican export for over 300 years, up until 1850, was the dye cochineal (Marichal 2001:2). Other goods exported from Mexico were grain, indigo, sugar, dyewood, and salt (Faye 1939:1023; Davis 2005:446). Goods exported from northeastern ports in Mexico in the mid 1820s, in addition to specie, included mules, hides, and wool (United States Consulate 1906).

The major exports from Cuba were sugar and coffee (Rothman 2005: 91). Cargos shipped from Cuba to the United States could contain merchandise such as tortoiseshell, mahogany, logwood, coffee wax, molasses, paper, and dry goods (Davis 2005:139; De Grummond 1961: 59, 64; *The Edinburgh Advertiser* 11 November 1822).

4.7.3 Naval Vessels

Spain and the United States maintained small standing fleets in the Gulf of Mexico. The naval vessels regularly policing the Gulf coast were well-suited for the region and were primarily comprised of schooners and gunboats. Expeditionary forces sent by Spain, France, and Britain included large rated vessels, though these vessels were ill-adapted to navigate the shallow ports and entrance bars characteristic of the coast. The British naval attack on New Orleans at Lake Borgne, for example, was executed not by large purpose-built warships, but by 42 oared longboats, each mounted with a single cannon (Owsley 1981:139). It is conjectured that the British loss at New Orleans was due, in part, to Vice-Admiral Alexander Cochrane's inability to secure enough shallow-draft vessels for the expedition, thwarting his plan to attack from the north of the city through Lake Pontchartrain (Owsley 1981:191).

The regular U.S. naval presence in the Gulf largely consisted of vessels operating out of the New Orleans Naval Station. This squadron was initially composed of fifteen gunboats that were divided into four divisions: Balize, Barataria, River, and Lake. These vessels' areas of responsibility were the Gulf of Mexico and the Mississippi River. The gunboats were given numeric designations, though some additionally were named such as gunboat No. 166, *Alligator*. These small boats may have been similar to New Orleans Naval Station gunboat No. 21 that was sloop rigged with two 24-pounders (Smith 2000:14–15).

Shortly after the outbreak of war with Britain, a series of storms and a hurricane grounded a naval brig and sent four gunboats ashore. The New Orleans Naval Station never did fully recover from these losses (Smith 2000:21). Captain John Shaw redistributed the remaining gunboat fleet to defend the Gulf territories by sending three gunboats to Mobile Bay, two to the Rigolets (passage from New Orleans to the east), and five to the Balize (Smith 2000:20). In late 1813, Commodore Daniel Patterson replaced Shaw and inherited an operational squadron of only five gunboats in addition to the cutter/sloop *Louisiana*, the 14-gun schooner *Carolina* (*Caroline*), and the tender/dispatch boat/schooner *Seahorse* (*Sea Horse*) (De Grummond 1961:90–91; Smith 2000: 23). *Louisiana*, *Carolina*, the gunboats and *Seahorse* attacked the privateer encampment at Barataria in 1814. Patterson supplemented his small force with captured prizes (De Grummond 1961:90–91; Davis 2005:77,124). By the time of the British assault on Lake Borgne, the Naval Station had *Carolina*, *Seahorse*, gunboats nos. 5, 23, 65, 156 (*Commodore*) 162, 163, and 166 (*Alligator*) an armed launch, three armed barges, *Firebrand* (captured at Barataria), and the prize schooner *Peter* from New Orleans (Smith 2000:24–25). Historic documentation suggests the U.S. Navy vessels at New Orleans were armed with 12-pounder and 24-pounder cannon and carronades (Table 4.5).

Table 4.5

Armament of U.S. Naval Vessels

ID	Vessel Name	Nationality	Vessel Type	Armament	Tonnage
1398	*Louisiana*	U.S.	Cutter, ship-Sloop	Four 24-pounders, eight 12-pounders, and four 6-pounders (De Grummond and Morazan 1961:90–91)	100
1374	*Bulldog (Bull Dog)*	U.S.	Felucca	Two 12-pounder cannon (Davis 2005:403)	
1397	*Lynx*	U.S.	Schooner	One long 12-pounder, six 12-pounder carronades (Kendall 1925:349)	
1325	*Caroline (Carolina)*	U.S.	Schooner	Twelve 12-pounder carronades and three long nines (De Grummond and Morazan 1961:90).	84

Five gunboats (one of which was *Commodore)* and the tender *Alligator* were attacked and captured by the British at the Battle of Borgne on 14 December 1814 (Owsley 1981:129). The vessel *Caroline* was later destroyed during the British offensive at the Battle of New Orleans in December 1814. With the capture of the gunboats and the destruction of *Caroline* more U.S. vessels were dispatched to New Orleans. *Tickler* and the felucca *Bulldog* were sent in pursuit of Job Northrop's privateer *Independence* in late 1816 (Davis 2005:314). By 1818, the vessel *Prometheus* was at the New Orleans Naval Station and was described as too decayed to repair. *Bulldog* and *Louisiana* were still stationed off Barataria in 1819, in addition to the schooner *Lynx*, and the vessels *Hornet* and *Surprise.* One additional cutter, *Alabama*, was operating in concert with *Louisiana* in 1819, capturing privateer vessels off the coast (Davis 2005:314, 304,404).

Beginning in 1821, the U.S. government assigned a squadron, consisting of schooners, gunboats, and other vessels, to attack piratical vessels in the Gulf, Gulf Stream, and West Indies (*The Edinburgh Advertiser* 9 November 1821). The U.S. sloop-of-war *Peacock* and schooner *Alligator* were engaged in this service off Matazanas, Cuba in 1822. *Peacock* captured the American privateer *Stalling* and Captain Allen, of *Alligator,* was killed when his ship’s boat approached a 5-gun, 80-ton pirate schooner near Matazanas during October 1823. The pirates abandoned their vessel, taking to the ship’s boats; five sailing vessels were saved from capture (*The Times* 9 January 1823).

Four schooners registered at New Orleans between 1815 and 1819 were former U.S. gunboats (Table 4.6). The dimensions for these vessels are very similar, suggesting standardized naval construction (WPA 1942:62, 67, 104, 106). These vessels may be indicative of the U.S. gunboats operating in the Gulf of Mexico in the early nineteenth century.

At the turn of the century, Spanish colonial governments maintained coast guard squadrons, *guardacostas,* with headquarters at the Mississippi Balize, Veracruz, and Havana. These local squadrons were likely similar to that stationed at the Balize, which was comprised of *galeras* (galleys and gunboats) and the slow-sailing schooner *Catalina*. Veracruz and Havana supplemented their mosquito fleets with colonial schooners and brigs. These coastal patrols were a branch of the army and were primarily directed against smugglers (Faye 1940a:429).

Table 4.6

Former U.S. Gunboats Registered at New Orleans

No.	Name	Type	Home Port	Tonnage	Length	Breadth	Depth
408	*Hero*	Schooner	New Orleans, LA	35	51.75	16.58	4.83
434	*Imperial*	Schooner	Bayou St. John, LA	38	56.83	16.25	4.75
687	*Pegasus*	Schooner	New Orleans, LA	36	51.67	16.50	5.00
707	*Polar Star*	Schooner	New Orleans, LA	38	56.00	16.33	4.83

Until 1805, vessels from Spain's peninsular fleet could easily be dispatched as needed to cruise in American waters (Faye 1940a:429). During the Napoleonic Wars, however, Spain lacked maritime resources, as the navy had become bankrupt having fought first one side, then the other. In 1814, with the defeat of Napoleon, Spain focused on quelling the insurgencies in Latin American (Scheina 1987:1). In December 1814, a large naval fleet, consisting of 42 transports and 18 warships disembarked to South America. Part of this fleet was redirected to engage the privateer fleet at Cartagena in July 1815 (Scheina 2003:30–31).

After Mexico successfully secured its independence in 1821, it inherited many vessels of the Spanish Navy, including one ship-of-the-line. Fear of Spanish reprisals induced the Mexican government to purchase six gunboats and two sloops-of-war in the United States (Ward 1828:307). These vessels comprised the Mexican Navy in 1823. The size of the navy was gradually increased so that, by January of 1827, the fleet consisted of one ship-of-the-line (*Congreso Mexicano*), two frigates (*Libertad* and *Tepeyac*), four brigs-of-war (*Guerrero, Victoria, Bravo, Constante*), a corvette (*Morelos*), a schooner (*Hermon*), four gun boats, four large launches, and two pilot boats (Ward 1828:307–308). In 1827, the British *Chargé d' affairs* in Mexico remarked that, in time, the Mexican government would recognize that a few 'light' vessels would be all that they required (Ward 1828:309).

British warships were frequently employed in the Gulf of Mexico to protect mercantile shipping. The expedition to capture New Orleans in 1814 demonstrates the types of naval craft utilized by the British in the region. The vessels of the British fleet rendezvoused at Jamaica in November 1814, prior to disembarking for the Louisiana coast. The fleet consisted of the 80-gun ship *Tonnant*, the 74-gun ships *Royal Oak*, *Plantagent*, and *Vengeur*, the 18-gun brig-sloop *Sophie*, and the 38-gun frigate *Seahorse* (Smith 2004:32, 57, 59, 67). The large ships could not ascend the bay, so the ship's longboats disembarked to engage the U.S. gunboats, rowing for a total of 36 hours before reaching their targets. The 42 longboats carried 1,200 sailors, and each mounted a carronade in the bow, a typical feature of a nineteenth-century ship's boat (Owsley 1981:137–139; Cow 1984:72 [1841]). After the loss of the Battle of New Orleans, the British vessels withdrew to attack Fort Bowyer. Other British naval vessels countering American efforts in Alabama and Apalachicola in January 1815 included *Etna*, a bomb (mortar) vessel, the ships *Grinder, Mars, Florida*, and the sloop *Erebus* (Owsley 1981:171, 173, and 176).

In the 1820s, the British government sent additional gunships to Cuba as a means of dispelling coast-wise piracy and smuggling. The vessels *Seringapatam* of 46 guns, *C.B. Redwing* of 18 guns and the schooner *Grecian* arrived at Havana in late November of 1822 and were given the authority to act jointly with the government of Cuba. The boats of *Tyne*, 26 guns, and the schooner *Speedwell* had already succeeded in capturing four pirate vessels at the port of El Callao. Concurrently, the British ship *Hyperion* was cruising in the Gulf of Mexico seeking privateers (*The Times*, 9 January 1823).

4.7.4 Privateers and Slavers

In the first two decades of the nineteenth century, more than 200 known privateers were seeking prizes in the Gulf of Mexico and Caribbean (Faye 1940a:433; De Grummond 1961:155). Both small and large schooners were typical privateer craft in the Atlantic Ocean, Gulf of Mexico, and the Caribbean Sea. Privateer vessels sailing from the Atlantic Seaboard also included small square-rigged vessels (Faye 1940c:238).

At least 165 vessels from the database for this period were privateers operating in the Gulf of Mexico and the Caribbean. Vessel type was not identified for fifty of these watercraft. The largest number of privateer vessels were schooners (61 of the 115 whose types were known), followed by brigs (15), feluccas (9), hermaphrodite brigs (6), frigates (6), pilotboats (5), corvettes (4), ships (3), and sloops (2). Seventy-seven total vessels were either a schooner or smaller craft. Privateer vessels can be difficult to track in the historical record because different vessels could frequently have the same name. A privateer commission was assigned to a specific vessel. If a ship sank, for example, another vessel would be given the same name in order to commute the letter of marque.

Speed was of considerable importance to the privateer, and the fastest-sailing vessels were sought after. The quickest of the schooners were those built as pilotboats (*paileboate*). These swift-sailing schooners were originally crafted in New England to meet incoming merchants with pilots to bring them into port. The vessels were small, with a well-designed hull that was quick without needing assistance from added topsails. Pilotboats had two simple spars and were devoid of a topsail (Faye 1940c:121). Figure 4.5 illustrates a typical New York pilot of the mid-nineteenth century.

Feluccas were smaller than the pilotboats, were of a more shallow draft, and could have one or two masts. The rigging was either lateen sail (Caribbean) or lug sails (North Caribbean and the Gulf of Mexico). The vessel did not have a deck except for a small extent at the bow and stern. The term pirogue was sometimes used interchangeably to refer to this type of vessel. The pirogues at Barataria were undecked, or decked only at the bow and stern, and had two masts that could be unstepped. These small ‘smuggling barges’ were favored by privateers and were used for transporting goods brought to Barataria (Faye 1940c:122–123).

The variety of vessels employed by privateers can be illustrated by the vessels stationed at Barataria. At 10:00am on 17 September 1814, Master Commandant Daniel Patterson conducted a U.S. Navy raid on the Baratarian privateer base. Patterson and the New Orleans fleet not only encountered schooners and prizes, but a large number of fleeing pirogues. U.S. Gunboat Number 162 opened fire against 20 pirogues anchored behind a sandbar at Grande Terre. By noon, Patterson possessed a felucca, six schooners, a brig, a prize, and two armed schooners (Wilgus 1925:201; Warren 1938a: 205; De Grummond 1961:153; Davis 2005:77, 190). Twenty-seven vessels were in the bay and Patterson decided most were not worth keeping; he burned several, including two schooners and a brig (Davis 2005:191). Among the captured vessels were the schooners *Dorada*, purchased for the U.S. Navy, *General Bolivar* (renamed *General Jackson*), *Misere*, the 90-ton *Harlequin*, the 90-ton *Surprise*, the 50-ton *Petite Milan*, the felucca *Fly*, the 75-ton *Comet*, the 15-ton felucca *Moon of November*, and *Amiable Maria* (Warren 1938a: 205; Davis 2005:192).

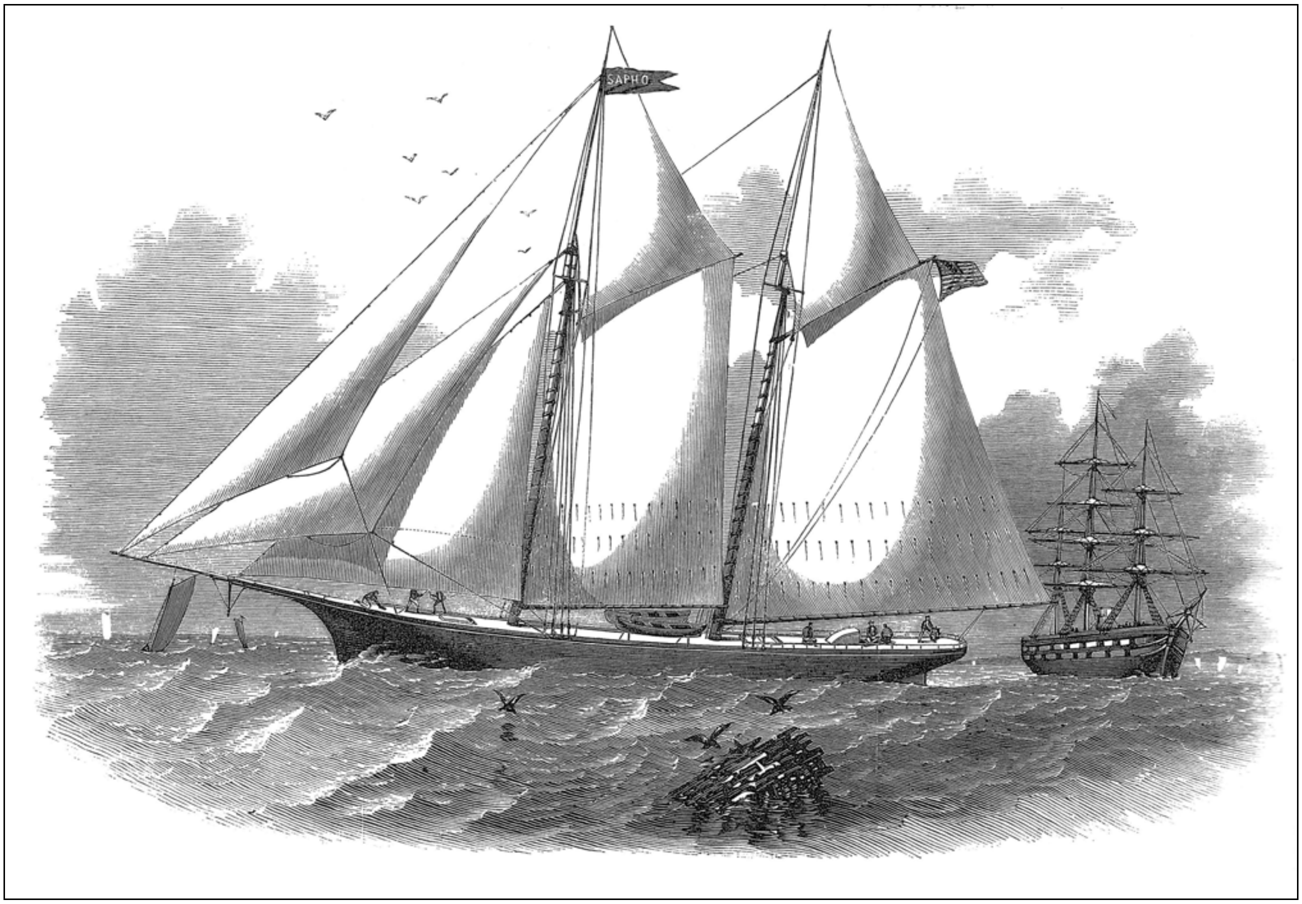

Figure 4.5. Typical mid-nineteenth-century New York pilotboat (source: Harter 2003:78).

Owners outfitting vessels for the Gulf balanced the driving power provided by square sails and the maneuverability of the fore and aft rig. Privateer vessels gained versatility by combining rigging types, the most common of which were the topsail schooner, the foretopsail schooner and the hermaphrodite brig (Faye 1940c:120). The U.S. Government forbade the outfitting of privateer vessels in U.S. ports, though this action did not deter these activities. Gulf privateer vessels were purchased and fitted out at U.S. ports such as Baltimore, New York, and New Orleans (Davis 2005: 97, 242; Warren 1938c:7–8; Faye 1940a: 436–437; Faye 1939:1032–1033). Other locations used to illegally prepare these vessels for privateering included a location on the North Carolina coast, Terrebonne Bay in Louisiana, and Aux Cayes on Saint Dominique (Faye 1941:614; Davis 2005:26–27; Faye 1939:1026).

Privateers mounted a variety of artillery types. According to Faye, small schooners and feluccas armed the crew with muskets rather than carrying small cannons. Few privateer schooners or brigs were big enough to be outfitted with guns larger than an 18-pounder cannon.

Flat-bottomed gunboats could not safely mount more than a 24-pounder at the bow and at the stern (Faye 1940c:123). In 1804, it was observed that small privateer schooners were, for the most part, armed with one or two cannon (Faye 1940a:433)

Table 4.7

Privateer Armament

ID	Vessel Name	Nationality	Vessel Type	Armament	Tonnage
908	*Petite-Milan*	Cartagena	Corsair	9-pounder and a pivot (Davis 2005:236)	50
1515	*Boyacá*	Columbia	Corvette	Twenty 32-pound carronades, two short 32-pounder gunnades (De Grummond and Morazan 1961:227)	
119	*Bolívar*	Columbia	Corvette	Twenty-three 32-pound carronades, one long 12-pounder; 25-gun; twenty-two 32-pounders and three 12-pounders (De Grummond and Morazan 1961:227, 207, 203).	
1495	*Sally*		Felucca	One brass 8-pounder (Faye 1940a:441)	
467	*General Arismande*	Venezuela	Hermaphrodite brig, topsail schooner	One 18-pounder and six 12-pounder carronades (Faye 1939:1040)	
1342	*Firebrand (Dorada)*	U.S., Cartagena	Hermaphrodite brig, schooner	Five cannon in 1814; one 6-pounder and six 12-pounders; four 12 pounders in 1818 (Davis 2005:139, 310,403)	
1480	*Incroyable*	Mexico	Pilot boat	One 9-pounder swivel (Faye 1939:1063)	
1354	*Nuestra Señora de la Popa (La Popa)*	Cartagena	Privateer, hermaphrodite brig	One 16-pounder, one 12-pounder, twelve 6-pounder carronades (Faye 1939:1042)	
780	*Misère,*	Guadaloupe	Schooner	4-pounder swivel (Faye 1939:1017).	40
1483	*Independence, Independencia*	Mexico	Schooner	One 6-pounder (Warren 1938b:810)	
1518	*Antonia Manuela*	Columbia	Schooner	One 8-pounder (De Grummond and Morazan 1961: 208)	
1390	*Two Friends*	Mexico (Galveston)	Schooner	Ten cannon (Davis 2005:369), two guns (Faye 1939:1088)	
698	*Sarpis*	Cartagena	Schooner	Two 6-pounders (Faye 1939:1026)	
974	*Relanifrago, Relámpago (Éclair, éclair)*	Mexico	Schooner	Long brass gun, 18-pounder and an iron 9-pounder (Faye 1940c:118)	
1366	*Rose*		Schooner	Four 9-pounders (Faye 1939:1038)	

Table 4.7 (continued)

Privateer Armament

ID	Vessel Name	Nationality	Vessel Type	Armament	Tonnage
562	*Hotspur*	Mexico (Galveston)	Schooner	One long brass 18-pounder, three long 9-pounders (Davis 2005:319)	
1474	*Guerriere*	Cartagenan	Schooner	Two long 9-pounder, increased to include 4 more guns in 1819 (Faye 1938:1033).	
1517	*Leona*	Columbia	Schooner	One 18-pounder, four 4-pounders (De Grummond and Morazan 1961:208)	
1361	*Constitucion, Constitution*	Cartagenan	Schooner	One long-tom brass 18-pounder and four iron 8-pounders (Faye 1939:1049)	
315	*La Diligent*	Guadaloupe	Schooner	Twelve 14-pounder cannon (Davis 2005:98)	136
1410	*General Santander*	Columbia	Schooner	18-pounder, brass 4-pounder swivel (Davis 2005:406)	40
118	*General Jackson, (La Caridad, General Bolívar)*	U.S., Cartagena,	Schooner	One long brass 18-pounder, one long brass 6-pounder, two 12-pounders (Cusachs 1919:425)	
515	*Félix (Jupiter, Piñérez)*	Cartagena	Schooner, pilot boat	One brass 9-pounder, increased to two guns (Faye 1939:1078)	83

Twenty-three privateer vessels listed in the Gulf Ship Database have detailed descriptions of their armament (Table 4.7). Nine vessels, all schooners, were armed with two or fewer guns. A majority of the 23 privateers mounted four or more cannon, some with as many as 23 guns, inclusive of carronades. The Columbian corsairs *Bolívar* and *Boyacá* each mounted more than twenty 32-pounder carronades apiece (De Grummond 1961:227). Smaller vessels such as schooners, feluccas, and pilotboats were armed with between one and six cannons varying in size from 4-pounders to 18-pounders. Two large schooners, one of 136 tons, were armed with over ten cannon each. The armament on the privateers included long guns, swivel guns, and bronze ("brass") cannon. "Brass" guns could better withstand the shock of recoil and therefore had greater range and accuracy than an iron gun equal of caliber and greater weight (Faye 1940c:124).

Slave trading was a lucrative business in the Gulf in the eighteenth and nineteenth centuries. Though privateers did not directly import the slaves themselves, they captured slavers and sold the cargo illegally at Barataria and through Galveston. Several New Orleans vessels (Table 4.8) were former slavers captured and condemned by the U.S. government. Vessels engaged in the importation of slaves included sloops, schooners, brigs, and ships.

Slavers tended to tightly-pack their human cargo, since slaves sold for a substantial sum. A Spanish brig *en route* to Pensacola was captured, and its cargo of 140 African slaves was sold at Grande Terre. Many of the slaves were recovered and returned to the Spanish owner's agent in New Orleans (Faye 1940a:441). The Portuguese brig *Mosquito* was similarly captured by the privateer *Guillaume* and taken to the Balize in 1810. She was carrying a cargo of slaves from Brazil to Havana. While *en route*, the brig was apprehended by the U.S. Navy, and the slave cargo was sold privately for $18,000 (Faye 1940a:436).

The vessel *William* arrived in Barataria from Guadeloupe in May 1810 with a cargo of 208 slaves who were unloaded at Grand Terre; an additional 105 were transported to Bayou Lafourche and sold for $17,000 to Eugene Fortier (Davis 2005:59). Louis Aury and his vessel were captured in the Mississippi following this transaction. He was arrested but eventually acquitted on the charges of piracy. *William* was seized and sold (Davis 2005:59–60). This is likely the vessel *William* (Table G no. 905) that was first registered at New Orleans on 17 May 1804 under owner William G. Garland. The brig at this time was captained by Peter N. Paillet who would also be associated with the brig *Alexandrine* and the ship *Three Sisters*, both of which were condemned for slave importation (Table G: nos. 23 and 843). Two of the first prizes to arrive at Galveston in 1817 after Lafitte assumed control were *Petronille* (*Petronilla*) and *L'Enrequita*. *Petronille* and *L'Enrequita* were carrying 174 and 113 slaves, respectively (Davis 2005:326).

Table 4.8

Vessels Condemned for the Importation of Slaves

ID	Vessel Name	Vessel Type	Build Date	Tonnage	Length	Breadth	Depth	Features
23	*Alexandrine*	Brig		101	70.16	20.67	8	One deck, two masts, round stern, billethead
610	*Mississippi*	Schooner		73	68.25	17.67	6.75	One deck, two masts, round stern
838	*Thorn*	Sloop	1809	58	57.33	19.5	6.21	One deck, one mast, square stern
843	*Three Sisters*	Ship	1811	404	104.5	29.75	14.88	Two decks, three masts, round stern
883	*Virginia*	Schooner		44	60.83	16.42	5.92	One deck, two masts, square stern
905	*William*	Brig		127	63.42	21.83	10.92	Two decks, two masts, square stern, man figurehead, round tuck

Maritime commerce in the Gulf of Mexico in the early nineteenth century was international in character and included ships of varying nationalities and types. The predominant watercraft was the schooner, though smaller vessels such as the pilotboat, felucca, pirogue, and sloop were easily adapted for use along the Gulf coast. The volatility of the region made commerce dangerous; merchant vessels were vulnerable to piratical activities that characterized the region and for this reason were often armed. There was a large foreign naval presence in the Gulf as the European wars spread to the Americas often and countries sought to protect their commercial vessels. Eventually the crew size of a privateer would diminish in size, as the personnel were shifted to the prize vessels. By the end of a voyage, the crew of a privateer could easily resemble the size of a merchant crew.

4.8 Crew Sizes in the Gulf of Mexico

This is an incomplete study focused on select consular records from Matamoras, the nearest Mexican port to the U.S. Gulf territories, and Galveston. The Matamoras Consulate records for the years 1826, 1827, 1830, and 1833 were selected for review (United States Consulate at Matamoras 1906). The Consulate records at Matamoras in 1833 were the first of the available records, from that location, to separate crew as American or foreign. The consulate records from Galveston that were investigated date to 1838 and 1839 (United States Consulate 1958a and 1958b). These were the earliest records from this archive available for review. U.S. Consulate Records dealt with U.S. vessels at what were, at the time, considered foreign ports.

Between 1826 and 1827 twenty U.S. vessels, 19 schooners and one brig, arrived at Matamoras, Mexico. The single brig was 150 tons burden with a crew of nine. Schooners carried a crew of between four and eight men; the average crew size was 5.4. Table 4.9 summarizes the specific crew sizes for schooners, subdivided by tonnage range.

Table 4.9

Schooner Crew Sizes on U.S. Merchant Vessels in the Gulf of Mexico

	30–50 tons			**51–80 tons**			**81–100 tons**			**101–150 tons**			**151–200 tons**		
	sample size	**crew size**	**aver.**	**sample size**	**crew size**	**aver.**	**sample size**	**crew size**	**aver.**	**sample size**	**crew size**	**aver.**	**sample size**	**crew size**	**aver.**
Matamoras 1826–27	10	4 to 6	4.8	2	5	5	4	4 to 8	6.3	3	5 to 8	6.7			
Matamoras 1830	2	6 to 7	6.5	6	5 to 8	6.7	4	4 to 8	5.8	4	5 to 7	5.5			
Matamoras 1833	6	5 to 6	5.6	11	3 to 8	6.3	2	4 to 6	5						
Galveston 1838–39	7	2 to 5	3.3	13	2 to 6	4.5	21	4 to 8	5.8	9	4 to 7	5	2	5	5
average	25		5.1	32		5.6	31		5.7	16		5.7	2		5

In 1830, 26 different U.S. vessels arrived at Matamoras: five brigs, 17 schooners, and four sloops. The number of crew of a brig was between five and eight men (6.6 average); the schooner had four to eight crew (6.2 men average), and the sloop three to seven men (4.75 average).

Nineteen different U.S. schooners, two brigs, and a sloop disembarked at Matamoras in 1830. The average overall crew for a schooner was 5.9 men. The brigs of 59 and 97 tons burden carried crew of four to seven men respectively; the sole sloop of 49 tons had a crew of five. There were a total of 129 men assigned to the U.S. vessels at Matamoras in 1830; 17 of this crew were considered foreigners (13 percent). Eleven of the 19 schooners (58 percent) had foreign crew members.

Galveston was capable of handling larger vessels than Matamoras, which is discernible in the proportion of larger to small ton schooners at this port. Between November of 1838 and June of 1839, approximately 58 sailing vessels arrived at port including eight brigs, 45 schooners, and two sloops. The crews of the brigs, ranging in size from 93 to 186 tons, were between six and nine men. Schooners carried between four and seven men with an overall average of 5.1. Nineteen of the 58 schooners (33 percent) had at least one foreign crew member. The total crew for all 45 schooners was 264 men, of which 23 were described as foreigners (9 percent). The two sloops of five tons had a crew of two to three men.

Eleven of the 19 schooners that arrived at Matamoras between 1826 and 1827 could definitively be linked to vessels in the New Orleans Enrollments and Registers (WPA 1942) by both master and tonnage. The vessels within the 30 to 50 ton range, nine vessels, measured between 44 and 68 feet (13.4–20.7 m) in length. The remaining two vessels were 53 and 55 tons, measuring 63 feet 2 inches (19.3 m) and 58 feet (17.7 m), respectively. Both these latter vessels had crews of five men. Four of the vessels were between 60 and 68 feet (18.3–20.7 m), these vessels had crews of five to six men. The smaller schooners, varying from 44 to 51 feet (13.4–15.5 m) in length, had crews of four to five men. Though smaller vessels appear to have smaller crews and larger schooners, larger crews, this relationship was not always proportional.

The records demonstrate that merchant schooners most of the time carried between four and six crew members. Overall the average crew size was about five men regardless of tonnage. It also appears that vessels conducting trade with ports of predominately non-English speaking inhabitants had a larger ratio of foreign crews per vessel to that port.

Comparable sized privateer schooners, often armed with one to two guns, often had larger variable crew sizes than the merchant vessels. This was to facilitate the capture and transport of prize vessels. After capturing a series of prizes, the vessel's own crew would be depleted and eventually reduced to a 'normal' size. Several privateers from Cartagena and Venezuela were observed and described by Beverly Chew in 1817 while anchored at New Orleans (Chew 1817). Four vessels were armed with only one to two guns but carried crews of 18 to 50 men. One of these vessels was the schooner *Calibra* armed with one swivel gun and a crew of 30. Another of the small armed craft was the two-gun felucca *Esperanza* that was armed with two guns and a crew of 18. One vessel of three guns, the 90-ft (27.4-m) schooner *Eugene* (230 tons), had a crew of 60 men; though the five-gun *Victory* and six-gun, 55-ft (16.8-m) schooner *Diana* (61 tons) had smaller crews of 50 and 40 men (WPA 1941:33, 42).

4.9 Gulf of Mexico Hurricane Patterns

Bascom argues that, of all the wooden ships ever built, approximately 50 percent wrecked, and, of the half that wrecked, 80 percent did so by running aground or having "some other shallow-water mishap" (Bascom 1976:84). The remaining ten percent of ships, including the Mardi Gras Shipwreck, require some other explanation for their demise. The above discussion of political unrest and piracy in the Gulf of Mexico certainly indicates that human violence may have been a cause for the wrecking of the Mardi Gras Shipwreck. However, the wreck remains did not contain any direct evidence of loss through attack. Another possible exterior force that may have caused the Mardi Gras ship to wreck was a hurricane. Much of the historic shipping season occurred during the hurricane season of June through November, when tropical storms (winds of 34 to 64 knots) and hurricanes (winds greater than 64 knots) regularly pass through the Gulf. While the occurrence of hurricanes and tropical storms is statistically low, only 7.5 storms and one hurricane per year, a correlation between hurricanes and shipwrecks in the Gulf of Mexico has been noted (Garrison 1989a, 1989b; Lugo-Fernández et al. 2007). However, it is difficult to correlate single shipwrecks with specific storms, due to the low resolution of the archaeological record and the lack of good hurricane path data prior to the late nineteenth century (Garrison 1989a; NOAA 2006b). Despite this difficulty, a summary of known Gulf of Mexico hurricanes between 1794 and 1831 (Table 4.10) does suggest the frequency and power of these storms.

Table 4.10

Summary of Eastern Gulf of Mexico Hurricanes, 1794–1831

Date	Landfall	Description	Source
1–8 October 1794	Western Florida	Hurricane	Sandrik and Landsea 2003
1811	New Orleans	Hurricane	Roth 2003
19 August 1812	New Orleans	Worst hurricane in several years. Resulted in significant damage to naval and commercial vessels. At least 53 vessels damaged	Dudley and Crawford 1985; Roth 2003
19 August 1813	Louisiana	Hurricane	Roth 2003
7 August 1817	Apalachicola Bay	Tropical Storm	Sandrik and Landsea 2003
25–28 July 1819	Bay St. Louis	Hurricane. 70 ships, including schooner *Thomas Shields*, schooner *Hooke*, Sloop *James*, schooner *Henrietta* and US Navy schooner *Firebrand*, destroyed.	Roth 2003; *Orleans Gazette* 29 August 1819
September 1819	Between New Orleans and Apalachicola	Tropical Storm	Barnes 1998
15 September 1821	Bay St. Louis	Hurricane	Ludlum 1963; Roth 2003
8 July 1822	Mississippi	Tropical Storm	Ludlum 1963
2 July 1825	Apalachicola Bay	Tropical Storm	Sandrik and Landsea 2003
16–17 August 1831	Baton Rouge	Very destructive hurricane	Roth 2003
28–29 August 1831	Southwest Louisiana	Tropical Storm	Roth 2003

5.0 Results

By Ben Ford with contributions by Amy Borgens and Dr. Dawn Marshall

5.1 Site Layout

The Mardi Gras Shipwreck consisted of a northwest-southeast oriented linear artifact distribution measuring 48.5 X 14.3 ft (14.8 X 4.4 m) (Figure 5.1). The principal features of the site included an iron anchor, a cannon, a cast-iron stove, a box of assorted weapons, a dense cluster of artifacts, and a bulbous concretion. All of the artifacts and site components are described below, but the general site layout is as follows. The northernmost identifiable artifact, the anchor, was not recovered and remains partially buried on the seafloor. Immediately southeast of the anchor were several badly-concreted artifacts that include a ring, a "T" shaped piece of iron, and at least two long and thin artifacts. These artifacts may be a wood anchor stock and the crown of a second anchor. South of these artifacts was a second linear iron-stained artifact that forms the southwestern boundary of the artifact scatter. This artifact and the scatter of smaller items in its vicinity were not recovered and are of unknown function. East of this artifact was the cannon lying along a southeast-northwest orientation and partially attached to a large triangular concretion. This concretion, measuring approximately 14.7 X 4.6 ft (3.5 X 1.4 m), also contained several unidentified and badly-concreted iron artifacts, a substantial number of iron cannonballs, a stoneware jug, and possible hull structure. The ship's stove and associated lead sheeting were situated along the western edge of this large concretion, and a bulkhead formed its southeastern margin. Contiguous with, and partially concreted to, the bulkhead was a chest of assorted weapons, including long-arms, pistols, and swords. Beginning at the southeastern side of the weapons box and extending to the bulbous concretion was a dense scatter of artifacts, including two varieties of glass bottles, creamware serving and table wares, navigational instruments, tools, and other artifacts. This scatter appeared as two distinct distributions on the surface; however, the entire area was not excavated, and it is possible that the two scatters were connected by artifacts buried in the sediment. While a few artifacts, including a sand-glass and a bottle, were situated southeast of the bulbous concretion, this concretion and its associated concentration of lead shot and gun flints demarcated the southern margin of the site.

Based on the location of the anchor, the hull remains recovered with the bulbous concretion, and other associations described below, the anchor end of the site is likely the bow, the bulbous concretion (hereafter stern concretion) the stern, and the vicinity of the cannon starboard. Descriptions in the text that follows will employ both this likely orientation and the cardinal directions. The port side of the vessel was not identified, and, as a result, the centerline of the vessel is still uncertain.

5.2 Artifacts

The Mardi Gras Shipwreck site contained a wide variety of material culture representing the products of several nations, including Great Britain, France, Mexico/Spain, and possibly the United States (Table 5.1). These artifacts are distinct from those recovered from many shipwreck sites and nearly all terrestrial sites in that they are largely intact. This condition allowed for better identification and a more complete analysis of the wreck assemblage. The artifacts were analyzed to determine their date of production, function, and nation of origin. All

Figure 5.1. Site plan (larger version in Appendix D; illustration by B. Ford).

Table 5.1

Diagnostic Artifacts Recovered from the Mardi Gras Shipwreck

Artifact No.	Description	Date	Nationality	Notes	Sources
01	Bowl	1790-1820	British	Light color, distinctive shape	Hume 1991
02	Pôt de crème	1790-1820	British	Light color, distinctive shape	
101	Bottle	Early 19th c.	French	Wine bottle	Jones 1986; Jones and Smith 1985; Waselkov and Gums 2000
103	Bottle	Early 19th c.	French	Wine bottle	
104	Bottle	Early 19th c.	French	Wine bottle	
108	Bottle	Early 19th c.	French	Wine bottle	
109	Bottle	Early 19th c.	French	Wine bottle	
112	Bottle	Early 19th c.	French	Wine bottle	
114	Bottle	Early 19th c.	French	Wine bottle	
203	Bottle	Early 19th c.	French	Wine bottle	
227	Bottle	Early 19th c.	French	Wine bottle	
122	Bottle	Early 19th c.	French	Wine bottle	
202	Bottle	Late 18th c.	British	Beer bottle	Brown 1971; Hume 1991; Jones 1986; Jones and Smith 1985,
201	Bottle	Post 1810	British	Beer bottle	
118	Bottle	Post 1806	British	LONDON mustard bottle	Jones 1983, 1991
132	Inkpot	Early 19th c.	British		Jones and Smith 1985; Wakefield 1982
219-1	Plate	1790–1820	British	Light color, undecorated	Hume 1991; Miller 1980, 1991
219-2	Plate	1790–1820	British	Light color, undecorated	
110-2	Plate	1790–1820	British	Light color, undecorated	
204	Charger	1790–1820	British	Light color, undecorated	Goss 2000; Hume 1991; Miller and Stone 1970; Standage 2005
213	Tea Bowl	1775–1820	British	Chinese influenced shape	
215	Tea Bowl	1775–1820	British	Chinese influenced shape	
214	Saucer	1775–1822	British	Light color, undecorated	
111	Bowl	1790–1820	British	Light color, undecorated	
113/212	Tureen and lid	1775–1820	British	Light color	Queensland Museum 2007
116	Pitcher	circa 1800	British	Light color, distinctive shape	Gray 2007; Holdaway 2007; Walford 2007
115	Teapot	1790–1812	British	Light color, distinctive shape	Holdaway 2007; Towner 1978
211	Platter	1790–1805	British	Light color, distinctive shape	Barker 2007; Hume 1991; Towner 1978
219-3	Platter	1790–1805	British	Light color, distinctive shape	
130	Shaker	1780–1820	British	Creamware	Coysh and Henrywood 1982; Hornsby 1983
205	Jug	Pre-1786	Unknown	Stoneware	Greer 1981; Ketchum 1991; Osgood 1971
300	Jug	circa 1800	American?	Stoneware	Greer 1981
102	Bottle	1775–1850	French	Stoneware	Greer 1981
228	Spoons	1760–1820	French	Old English or Hanoverian Type	Davis 2003; Moore 1999
222-7	Coin	1808	Spanish	8 *Reales*	Craig 2000
222-8	Coin	1772–1802	Spanish	2 *Reales*	

Table 5.1 (continued)

Diagnostic Artifacts Recovered from the Mardi Gras Shipwreck

Artifact No.	Description	Date	Nationality	Notes	Sources
230	Buttons	post-1796	British	ORANGE TREBLE GILT	Hughes and Lester 1981; Meredith and Meredith 2000
222-11	Button	1800–1865	British	Weave pattern	Meredith and Meredith 2000; Peacock 1996
222-12	Buttons	1800–1865	British	Weave pattern	
221	Watch	1780–1810	British?		Bailey 1975; Bruton 1967; Clutton 1973
400	Cannon	post 1797	British		Brown 2007
229	Butt Plate	1750–1800	Dutch/German		Lea 2007; Neumann 1967
206	Telescope	post 1802	English	Circa 1810	Clifton 1995
133	Octant fragment	pre 1882	English		

artifact counts and analyses are based on the information available at the time of writing (January 2008). Conservation of the artifacts is ongoing and may revise future interpretations. For ease of discussion, the artifacts are divided into five main categories according to material type: glass, ceramics, metal, organic (including rigging elements), and composite with weapons and instruments treated as special subsets of composite artifacts.

Several of the artifacts were damaged or destroyed by the unsupervised ROV operations of October 2004, following Hurricane Ivan. The handle of a stoneware jug (artifact no. 205) was broken, as were several of the bottles (artifact nos. 106 and 122), accounting for much of the broken glass on the site. The glass of one of the compass covers was broken (artifact no. 128) and the creamware tureen was inverted and damaged (artifact no. 212). An octant (artifact no. 03) was also damaged and removed from the site.

5.2.1 Glass

The glass assemblage consists of 14 complete or nearly-complete bottles, one pane, and one inkpot, as well as 29 bottle fragments, including two finishes (top portion of neck) all recovered from aft (southeast) of the weapons box and bulkhead. The bottle assemblage consists of 13 bottles intended to contain fluids and a single condiment bottle. The fluid bottles are divided into three distinct morphological groups: “wine” bottles (n=11, including two nearly-complete broken examples), one “beer” bottle, and one “beer” bottle with a distinct shape and light blue patina (Table 5.2).

The dominant intact wine bottle type (artifact nos. 101, 103, 104, 108, 109, 114, 122, 203, and 227) range in length from 11.38 to 12.4 inches (28.9 cm–31.5 cm), with body diameters between 1.04 to 1.21 inches (2.63 cm–3.07 cm) (Figure 5.2; note, scale in all photographs in cm). Interestingly, there is a loosely-inverse relationship between the bottle length and body diameter, suggesting that the bottles were made from approximately the same amount of glass. The average volume of these bottles is 744 milliliters (ml). This value is within the range of most round bottles of this period (680–760 ml) and indicates that the glassmaker was attempting to create a bottle that contained one-fifth of a gallon (758 ml) (Brown 1971:101). The bottles range in color brown to very dark green or black. Six of these bottles contain their corks, indicating that they were filled at the time of the wreck. It was initially hoped that the contents of the bottles would be intact; however, it was found that the pressure at depth had dislodged the corks. The corks averaged 6.5 cm in length and 2 cm in diameter.

Table 5.2

Summary of Mardi Gras Shipwreck Bottles

Artifact No.	Height (cm)	Body Diameter (cm)	Neck Diameter (cm)	Volume (ml)	Color	Comments
101	29.4	7.75	2.79	800	Brown	Intact
103	29.2	7.8	2.96	700	Black/Brown	Intact
104	29.1	7.67	3.02	800	Brown	Intact
106	n/a	8.65 (estimate)	n/a	n/a	Brown	Broken
107	n/a	8.45 (estimate)	n/a	n/a	Brown	Broken
108	29.6	7.6	2.63	800	Brown	Intact
109	29.5	7.72	2.72	700	Brown	Intact
112	30.08	8.23 (estimate)	2.75	n/a	Brown	Broken
114	28.9	7.67	3.31	800	Black	Intact
118	14.1	4.36	3.1	59	Aqua	Mustard Bottle
122	29.5	7.91	3.07	800	Black	Intact
124-1	31.5	8.04	2.7	n/a	Brown	Broken
134-8	n/a	n/a	n/a	n/a	Brown	Bottle fragments
201	24.4	8.96	3.48	780	Blue	Blue
202	22.3	9.78	3.3	800	Black	Short Fat
203	29	7.6	2.75	700	Brown	Intact
227	26.5	8.02	2.74	600	Green	Intact

Figure 5.2. "French wine" bottles (artifact nos. 122, 203, 227, and 103) (photograph by R. Sasaki).

These bottles appear to have been made using the dip-mold technique, which was employed from circa 1730 through 1870 (Jones and Sullivan 1989:26; Lorraine 1968). This determination was made based on the dimpled "orange-peel" texture of the bottle body as compared to the smooth feel of the shoulders and neck, along with the lack of seams, the elongated longitudinal bubbles, and the slight taper from the shoulders to the base. The dip-mold technique consisted of gathering a specified amount of glass on the end of a blow tube and giving the blob a preliminary shape by turning it against a flat stone or metal surface. The resulting piece of glass, called a *parison*, was then inserted into a single-piece mold and blown to form the vessel below the shoulders. Bottles of this type taper from the shoulders to the base to facilitate removing them from the mold. Once the body was formed, the upper portion of the bottle was shaped by turning and the push-up, or kick, was formed using a shaping stick known as a *mollette*. Kicks are the indentation in the base of the bottle that helped ensure that the vessel sat flat and may have had the added advantage of making the bottle appear to hold more liquid than it actually contained (Jones 1991:88). The creation of the kick affected the shape of the vessel body and may have resulted in the bulged heel evident on these bottles. This base form, in which the bottom of the bottle swells immediately above the bottom, generally dates to before 1820 (Jones 1986:91). With the base formed, the still-hot bottle was then attached to a pontil, or metal rod, to ease handling, and the lip and finish were formed. The finish of these bottles, including the two disassociated neck fragments (artifact nos. 124-2 and 134-8), consists of a single, broad string rim, either flat or "V" shaped. This type of lip was formed by adding a line of glass to the neck of the bottle with very little shaping and was a technique used throughout the eighteenth and nineteenth centuries (Jones 1986). The lip allowed the cork to be secured to the bottle with wire or twine. The finish was completed by breaking the bottle off just above the lip. The Mardi Gras bottles do not show any evidence of fire polishing. Two of the bottles have no neck above the lip, while the remainder have approximately 1 cm of glass above the lip, suggesting that this is the original arrangement. Finally the pontil was snapped off before the bottle was placed in an annealing oven to slowly cool and remove stresses in the glass. The removal of the pontil left a distinctive ridge-like scar inside the kick of many of the Mardi Gras bottles, suggesting that a glass-tipped pontil was used (Jones 1991:93).

The most striking attribute of these bottles is their sloping shoulders, distinguishing them from British bottle forms, which tend to have more pronounced shoulders (Hume 1991:68). Similar bottles, including kick and pontil morphology, were recovered from early nineteenth century contexts at Fort George, Ontario and the Dog River Site, Alabama. All of these examples were identified as French bottles (Jones and Smith 1985:22; Waselkov and Gums 2000:153–154). It is therefore likely that the Mardi Gras bottles once contained French wine (Jones and Smith 1985:14).

The dark green "beer" bottle (artifact no. 202) appears to have been made using a similar dip-mold process but resulted in a very different shape (Figure 5.3). This bottle measures 8.78 inches (22.3 cm) high with a body diameter of 3.95 inches (9.78 cm) and a volume of 800 ml. These dimensions very closely match the measurements of late eighteenth century British beer bottles (Brown 1971:Plate 7; Jones 1986:74, 77; Hume 1991:68). The double-string finish of this bottle also differs from the sloped-shoulder wine bottles. This finish was applied by hand and shows evidence of where the strings overlapped and were not cleaned. The finish has rounded edges and appears to have been fire polished. This type of finish generally dates to the second half of the eighteenth century (Jones 1986:54).

Figure 5.3. "British beer" bottles (photograph by R. Sasaki).

The final liquid bottle has a distinctive shape and finish but is most readily distinguished by its unique patina (artifact no. 201). This is a swirled white and light blue patina that appears to be part of the original composition of the glass (see Figure 5.3). There is some evidence, in the form of brown tinges to the glass in several locations, that the patina is a corrosion product and not intended by the glassmaker; however, more analysis is necessary to determine if the color was intentional, accidental, or the result of corrosion. Regardless, the patina likely resulted from inclusions or contaminants in the glass, possibly cobalt and calcium. This bottle is also unique in terms of its shape and dimensions. The bottle measures 9.61 inches (24.4 cm) high with a body diameter of 3.53 inches (8.96 cm) and a volume of 780 ml. These dimensions are intermediate between the beer and wine bottle types popular among early nineteenth century British bottle makers. However, the short neck of this bottle suggests that it may have once contained beer or ale (Jones 1985:18; 1986:77). While this bottle was made using a similar dip-mould technique, it has a more modern lip finish than the other bottles. The finish consists of a down-tooled lip with a down-tooled string rim immediately below it, both with "V" cross-sections. The uniform and symmetrical shape of this finish suggests that it was made with a finish-forming tool. Finishes of this type have been dated to the second decade of the nineteenth century (Jones 1986:68).

While the majority of the Mardi Gras Shipwreck bottles are classed as French wine bottles, with two additional British beer bottles, this is a very tentative identification. International bottle styles have not been well-defined and there are several confounding circumstances. Prior to the American Revolution, British bottles dominated the American market but French bottles were also present. Following the Revolution, German bottles were widely used and American glassmakers, who had been in operation since 1608, significantly increased their production (Busch 1991:114; Palmer 1993:6, 9). Many of these bottle makers closely followed the British styles making their wares difficult to distinguish. There was also a good deal of movement between glassworks (Palmer 1993:10). The nation of origin for the bottle also does not necessarily indicate its contents. “Wine” and “beer” bottles generally contained the beverages they were named for, and the palynology data presented below supports these identifications, but these bottles could also be used to transport or serve cider, punches, or distilled liquors. Furthermore, as a bulk commodity, it was generally easier to ship alcoholic beverages in large containers and to obtain bottles once the liquid had reached its final destination. The bottles and beverages often arrived at the port separately and beverages were bottled at or near the retail level with very little concern for the actual bottle type (Jones 1986:17, 19). In many cases, poor quality bottles were shipped to the American colonies to be filled upon arrival (Jones 1986:13; Palmer 1993:7). This description is consistent with the Mardi Gras Wreck wine bottles. Their generally uniform shape compared with their various colors, suggesting little control over impurities in the glass, and their sloppily-applied, unpolished finishes suggest that they are low-quality bottles. The tendency to bottle spirits at the retail level also suggests that the bottles were for private consumption and were not part of the wreck cargo. While alcohol was certainly also shipped in the bottle, the small number of bottles evident on the wreck site supports the private consumption hypothesis.

In addition to imported empty bottles, bottlers could also reuse bottles. Especially prior to 1820, there was a significant demand for reused bottles in the United States. Many bottlers would either pay for bottles or offer discounts on products put into bottles supplied by the customer (Busch 1991). Consequently, except for the blue beer bottle with its more modern finish, it is possible that all of the bottles from 16GM01 were reused. However, given the turn of the nineteenth century date of the majority of the bottles, the British varieties were likely imported prior to 1812. In 1812 the Chancellor of the Exchequer raised the duty on glass bottles, causing a decline in the use of glass in favor of stoneware vessels (Hume 1991:68). While this is circumstantial evidence, especially given that bottles were often reused for more than a decade (Adams 2003), it is supported by the other artifacts. Throughout the rest of this report, the bottles will be discussed as “French wine” and “British beer” bottles to avoid cumbersome description, with the caveat that these may not have been their respective contents at the time of wrecking.

The fourteenth bottle is a square-section condiment bottle measuring 5.55 inches (14.1 cm) high and 1.72 inches (4.36 cm) wide with the word “LONDON” embossed on one panel (artifact no. 118; Figure 5.4). The bottle consists of four slightly-concave panels with chamfered corners, a wide circular neck, and an asymmetrical lip. Based on the shape of the bottle and the diagonal mold seam across the base, this bottle was made using a two-piece mold. Similar to the dip mold bottles, the London bottle was formed by blowing a ball of glass within a mold. However, while the dip molds were one piece requiring the bottle to be tapered so that it could be removed, the two-piece mold could be opened and the bottle removed. In the case of the London bottle, the body and neck were formed by the mold, but the lip was formed by folding the neck back on itself in a second step. Two-piece molding was used by bottle makers from circa 1750 through circa 1880 (Jones 1991:27).

Commercial production of dry mustard began in the 1720s, and it became progressively more popular during the eighteenth and nineteenth centuries. By 1800, generic, tall, four-panel bottles with wide mouths were widely used to distribute mustard in approximately two-ounce packages. These bottles were commonly embossed with the type of dry mustard, generally

London or Durham, and occasionally the place of manufacture. The earliest recorded instance of such a bottle labeled "LONDON" comes from a 1775 order placed with a Norwegian glass house. However, it was not until 1806 that a bottle specifically matching the one recovered from the Mardi Gras Shipwreck was offered for sale in the New World (Jones 1983).

Figure 5.4. London mustard bottle (photograph by R. Sasaki).

In addition to the bottles recovered from the wreck, a single cut pane of glass (artifact no. 129) was also brought to the surface. The pane measures 6 X 3.75 inches (15.1 X 9.55 cm) and 0.06 inches (0.15 cm) thick. The pane appears to be a piece of leaded crown glass, which generally predates 1840 (Scharfenberger 2004). While there have been attempts to date flat glass based on its thickness (Roenke 1978), these approaches can only be applied to a statistically valid sample, not a single pane.

The final piece of glassware is a cut leaded-glass inkpot with dried ink still adhering to the inside surface (artifact no. 132; Figure 5.5). The square pot measures 1.8 inches (4.55 cm) on a side and 1.3 inches (3.24 cm) high with a circular, 1.2 inch (3.1 cm) wide mouth. The open mouth of the well would have been covered with a metal lid pierced with a small hole to receive the pen. The writing set also likely included a sand pot, not recovered or noted during the excavation, as sand was dusted over the writing to reduce smudging. Glass cutting is one of the oldest means of glass production and the method is still employed today. However, the technique became more popular in mid-eighteenth century Britain, particularly in Ireland, and fluoresced in the early years of the nineteenth century. Simple styles of cut glass, such as the recovered inkpot, tend to date to the first two decades of the nineteenth century before the more ornate Regency style became popular (Wakefield 1982:19). This general trend is supported by the presence of a similar inkpot with beveled edges in an early nineteenth century advertisement (Jones and Smith 1985:110).

Figure 5.5. Inkpot (photograph by R. Sasaki).

5.2.2 Ceramics

The ceramics assemblage from the Mardi Gras Shipwreck consists of 14 complete vessels, six broken but generally complete items, and three shards. The majority of the wares are creamware, but stoneware is also present. The collection includes three place settings consisting of a plate, tea bowl and saucer, as well as two soup plates, a bowls, tureen and lid, two platters, a pitcher, teapot, caster, two jugs, and a bottle. The majority of the creamware was recovered in association with each other just aft of the weapons box (Figure 5.6).

Figure 5.6. Ceramics in situ. Note the weapons box in the upper left.

The majority (n=14) of the ceramic assemblage consists of undecorated creamware. Creamware is a light-colored refined earthenware that was generally fired to less than 1000^{o} C. Due to its low firing temperature, creamware required a glaze in order to contain liquids. This glaze was almost exclusively lead-based and tended to have a yellow or green cast that, when combined with the base ceramic color, gave creamware its yellowish cream color. Similar wares had been produced in England prior to 1740 but significant improvements to color took place during the 1750s and 1760s, giving rise to what is today recognized as creamware. Josiah Wedgwood was one of the major innovators of this ceramic, developing an early creamware by 1759 and perfecting his strong and light-colored ware between 1762 and 1768 (Hume 1991:124–125; Towner 1978:20). Despite the sale of a creamware tea service to Queen Charlotte in 1765 that led to the ware also being known as "Queen's Ware," creamware was an industrial, mass-produced product intended for consumption by "middling" families. Most of these wares were produced by large pottery firms taking advantage of the latest technology, such as calcined flint, liquid glazes, and plaster molds, to produce durable and attractive wares at a low cost (Barker 2007:33; Draper 1984:47; Massey 2007:18, 25). While creamware was produced in Britain's American colonies as early as 1773, nearly all refined earthenwares recovered from nineteenth-century archaeological sites are of British origin (Miller 1980). A prodigious amount of these wares were exported. Staffordshire, for example exported five-sixths of its product, and British producers sent 1.2 million pieces of refined earthenware to its North American colonies in 1770 and 14 million pieces to the U.S. in 1830 (Barker 2007:35). Much of these wares came from Staffordshire, but there were major factories in Leeds, and the Herculaneum Pottery Works in Liverpool was well-situated to export to the U.S. (Draper 1984).

Creamware was the major British pottery during the 1770s, but its popularity was curtailed beginning in 1780 by the introduction of pearlware. Pearlware was a slightly-modified creamware paste with a blue-tinted glaze (Hume 1991; Towner 1978:21). The blue-tinged glaze served a similar purpose to the bluing agent in some detergents, making the ceramic appear colder and whiter, better approximating Chinese export porcelain. While creamware continued to be produced well into the nineteenth century, pearlware was the most common ceramic ware of the early 1800s until its use began to decline circa 1820 (Hume 1991:129–130).

The industrial production of refined earthenwares during this period greatly benefited from the use of molds to make most flatwares (e.g. plates) and some hollowwares (e.g. teapots). Molds came into wide-spread use during the second half of the eighteenth century with the introduction of plaster of Paris. Plaster of Paris was an ideal mold material because it allowed for good detail, was highly absorbent, allowing the clay to set up quickly, and it was inexpensive. Most flatwares were made by pressing a thin piece of clay into the mold, using the mold surface to shape the front of the piece. The back of the piece and the foot ring were then formed by hand using a shaping tool. Hollowwares were often formed using a wheel prior to the American Civil War, but the two halves of the vessel could also be formed using a mold before being joined with slips (liquefied clay) or thin pieces of clay (Goodby 2007:77, 79; Miller 1991). Regardless of the shaping process, the pieces were then allowed to dry to a leather-hard condition before being fired in a kiln. The ceramics were separated from each other in the kiln by the use of cock-spurs, wasters, and other items. Cock-spur marks have been noted on the Mardi Gras Shipwreck ceramics. This first firing transformed the clay into ceramic. The pieces were then slowly cooled, decorated, glazed and fired again (at a lower temperature) to vitrify and set the glazes.

Figure 5.7. Creamware plate (photograph by R. Sasaki).

The 14 pieces of undecorated creamware recovered from the Mardi Gras Shipwreck consist of three plates (artifact nos. 110-2, 219-1, and 219-2), three tea bowls (artifact nos. 213, 215-1, and 215-2, which includes two broken bowls), three saucers (artifact no. 214-1, 214-2, and 214-3, two of which are broken), two soup plates (artifact nos. 110-1 and 204), one bowl (artifact no. 111), one broken tureen (artifact no. 212) with lid (artifact no. 113), one pitcher (artifact no. 116), and one teapot (artifact no. 115). These are in addition to a bowl (artifact no. 01) and pôt de crème (artifact no. 02) that were previously recovered from the site in August 2004. The plates measure 9.5 inches (24.2 cm) in diameter and 1 inch (2.5 cm) from foot ring to rim and are completely devoid of any decoration or molding (Figure 5.7). Similarly undecorated are the tea bowls, which measure 2.6 inches (6.5 cm) from foot ring to rim, and has foot ring and rim diameters of 2.2 inches (5.6 cm) and 4.1 inches (10.5 cm), respectively (Figure 5.8). The saucers, which measure 6 inches (15.3 cm) in diameter, are associated with the tea bowls (Figure 5.9). The soup plates are the same diameter as the plates (9.5 inches) but slightly deeper at 1.4 inches (3.5 cm). The bowl has a rim diameter of 12 inches (30.5 cm), a foot ring diameter of 5.5 inches (14.1 cm) and a height from foot ring to rim of 4.2 inches (10.7 cm) (Figure 5.10). The creamware tureen has a slightly ogee-shaped profile with a flared lip and base and lug handles (Figure 5.11). The oval opening measures 10.6 inches by 8.1 inches (27 X 20.6 cm), which matches the lid. The base of the tureen is 7.4 inches (18.9 cm) in its maximum dimension, while the bowl of the tureen flares to 12 inches (30.5 cm) in the same dimension. The entire tureen is 5.3 inches (13.4 cm) high. The lid is undecorated but has a ladle notch in its long dimension (Figure 5.12).

While all of the preceding pieces were likely press molded, the teapot and pitcher appear to have been turned or at least finished on a wheel, as evidenced by circular marks on their bottoms. The teapot measures 5.5 inches (14.1 cm) high with hard shoulders, leading to a 4-inch (10.2-cm) opening, the lid for which was not noted on the seafloor (Figure 5.13). The strap handle and spout are both undecorated. After the body of the teapot was formed it was allowed to harden slightly, then punched with holes within the area where the spout was to be attached. Finally, the pitcher also has a simple strap handle of the same thickness (0.33 inches [0.85 cm]). The pitcher stands 6.9 inches (17.5 cm) tall, has a base diameter of 4.4 inches (11.3 cm), and an opening diameter of 5.2 inches (13.3 cm), including the spout (Figure 5.14).

Figure 5.8. Creamware teabowl (artifact no. 213) (photograph by R. Sasaki).

Figure 5.9. Creamware saucers (photograph by R. Sasaki).

Figure 5.10. Creamware bowl (photograph by R. Sasaki).

Figure 5.11. Creamware tureen (photograph by R. Sasaki).

Figure 5.12. Creamware tureen lid (photograph by R. Sasaki).

Figure 5.13. Creamware teapot (photograph by R. Sasaki).

Figure 5.14. Creamware pitcher (photograph by R. Sasaki).

All of these ceramics are undecorated, light-colored creamware. In 1775, the Staffordshire potters were granted access to kaolin clays from Cornwall, allowing them to produce lighter-colored creamware, which generally dates from 1775 to 1820 for table and tea wares (Miller 1991). Plain rimmed creamware plates can date earlier than 1783, but the vast majority were produced after 1790 (Hume 1991:126). However, this ware was the cheapest-available refined earthenware of the period. By the early nineteenth century, a wide variety of decorated creamwares were available including sponge-painted, banded (mocha), feather-edged, hand-painted, and transfer-printed. Undecorated creamware sold for approximately two-thirds the cost of a feather-edged creamware and one-eighth the cost of the cheapest transfer-printed varieties (Miller 1980:Figure 2). Creamware also suffered from the growing popularity of pearlware and, after 1812, it was rare to find tea sets made of creamware. After 1820, creamware was almost absent from the table and used only for chamber pots, bed pans, and large kitchen bowls (Miller 1980, 1991).

Further evidence for the approximate date of these ceramics is derived from their forms. For example, hard shoulders leading to a reduced-diameter mouth became popular on teapots circa 1775 (cf. Towner 1978:86–87, 123) and a very similar shape, though significantly more decorated, was produced by Wedgwood in 1805 (Holdaway 2007:65). Similarly, the pitcher shape was popular during the late eighteenth and early nineteenth centuries and can be distinguished from earlier examples that either have a foot ring or much more flare to the base. Examples similar to the pitcher recovered from 16GM01 were produced at Newcastle in 1796 and in Wales circa 1800 (Gray 2007:271; Holdaway 2007:69; Walford 2007:93). A similarly-shaped tureen with a more ornate lid was recovered from HMS *Pandora* that wrecked in 1791

(Queensland Museum 2007). The shape of the tea bowls appears to be less temporally diagnostic as the shape was present from the late seventeenth century through the nineteenth century; however, this shape was particularly popular from circa 1750–1820. Additionally, there is some connection between this shape and coffee, as similar bowls were depicted in a late eighteenth century illustration of an English coffee house (Goss 2000; Miller and Stone 1970; Standage 2005:155).

In addition to the undecorated wares, there are two creamware platters with molded edges (artifact nos. 211 and 219-3; Figure 5.15). While these pieces would also have been classed among the most inexpensive wares available, they appear to be from a different set than the other pieces. Both platters measure 11.8 in by 9.5 inches (30 X 24.2 cm) and are molded in the Royal Pattern. Creamware of this pattern was developed by Wedgwood in 1765 but did not become popular until after 1770, remaining popular for several decades (Hume 1991:125; Towner 1978:60). While the Royal Pattern edge is widely recognized, there were subtle variations through time; however these have not been well-documented and are not effective for dating. Despite that caveat, a platter with a very similar edge treatment was excavated from Haregate Hall, England and dated to 1790–1805 (Barker 2007:39).

The final piece of refined earthenware is the creamware shaker (artifact no. 130) situated in association with the ceramics and bottles, forward (west) of the stern concretion (Figure 5.16). The shaker has an ovoid body with a pronounced base and a perforated head set off by a strong rim. The piece measures 4.4 inches (10.9 cm) tall with diameters of 1.8 inches (4.6 cm), 2.2 inches (5.6 cm), and 1.4 inches (3.6 cm) at the base, widest point, and head, respectively. Shakers were commonly used to hold dry table condiments. Two late eighteenth century examples contained sugar and pepper (Towner 1978:85, 141). Similar pearlware and pewter shakers dating to 1780–1810 were identified during the literature review (Coysh and Henrywood 1982; Horsnby 1983:152–153; Michaelis 1971:Plate XXIX).

Figure 5.15. Royal Pattern creamware (photograph by R. Sasaki).

Figure 5.16. Creamware Shaker (photograph by R. Sasaki).

The final three pieces of ceramic are stoneware. Stoneware was fired at a higher temperature (1200–1400^o Celsius) than refined earthenware, which resulted in the ceramic being vitrified and impermeable to liquids. Consequently, stoneware vessels did not require glaze in order to contain liquids. However, they were often given a salt or alkaline glaze to increase durability and improve appearance. While much stoneware was produced in Germany beginning in the sixteenth century, the British and Americans also produced substantial amounts of this ceramic. American production began prior to the second quarter of the eighteenth century and continued well into the nineteenth century (Hume 1991:100).

Two of the stoneware pieces from the Mardi Gras Shipwreck are large storage jugs. Artifact number 205, recovered from aft (southeast) of the weapons box, measures 15.3 inches (39 cm) high with a maximum body diameter of 11.4 inches (29 cm) (Figure 5.17). The outside diameter of the lip is 2.4 inches (6 cm), the base diameter is 6.3 inches (16 cm), and the lip-attached handle is 0.8 inches (2 cm) thick. The jug has a volume of 1200 ml. The body of the jug is incised with a large, multi-petaled flower that is decorated with cobalt blue glaze under the clear salt glaze that covers the exterior of the vessel. This artifact was damaged by the 2004 ROV visit with a large vertical crack through the body and a portion of the handle broken free (recovered). Artifact number 300 is slightly smaller and slimmer than number 205, measuring 15.6 inches (37 cm) tall and 9.3 inches (23.5 cm) at the widest point, with base and neck diameters of 6.1 inches (15.3 cm) and 2.5 inches (6.46 cm), respectively (Figure 5.18). The jug has a volume of 9250 ml. It was situated along the starboard (northeast) side of the vessel between the stove and cannon. The strap handle, which measures 0.7 inches (1.7 cm) thick, is attached just above the shoulder and immediately below the lip. An alkaline glaze was poorly applied to the exterior, with drip lines near the base. The jug is marked with a "4" near its shoulder, likely indicating that the jug was intended to contain four pottles, equivalent to two pre-1826 beer gallons (1 beer gallon = 4620.1 ml) (Ross 1983:47). Both jugs were wheel-thrown with striations from the cutting wire visible on the base of jug 300.

Figure 5.17. Stoneware jug (photograph by R. Sasaki).

Both jugs appear to date between circa 1780 and 1830. A jug with a very similar body shape, lip shape, and handle attachment to artifact number 300 was recovered from the French Kingstown Harbor Shipwreck (1776) and given a *terminus ante quem* of 1786. This jug was also inscribed with a "4" and was identified as Rhenish (German) (Johnson 1999:14). The shape of artifact number 205 was common circa 1790–1830 and the attachment of the handle to the lip of the jug was popular circa 1809–1830 (Greer 1981:76; Ketchum 1991; Osgood 1971; Webster 1971). While Hume (1991:101) claims that American stoneware was seldom both incised and color-glazed, Greer (1981) includes a number of American-made stoneware jugs that were decorated in this manner. One of these examples, dated to the very-late eighteenth or early nineteenth century and attributed to the Crolius potter family of Manhattan, New York, was remarkably similar in shape and decoration (incised, color-glazed, multi-petaled flower, with large and small leaves) to artifact number 205 (Greer 1981:156).

Figure 5.18. Stoneware jug (artifact no. 300) (photograph by R. Sasaki).

The final stoneware artifact is a 5.9 inch (14.9 cm) tall baluster-shaped bottle (artifact no. 102) that was situated immediately north of the stern concretion (Figure 5.19). This bottle was fitted with a cork when it was recovered, but similar to the glass bottles, none of the original contents remained. Bottles of this type were commonly made in France from the late eighteenth through the mid-nineteenth centuries to contain inks and oils. These containers are common in New Orleans but have also been recovered from Savanna, Georgia and Charleston, South Carolina (Greer 1981:247–248).

Figure 5.19. French stoneware ink or oil bottle (photograph by R. Sasaki).

5.2.3 Metals

The metal artifact assemblage from the Mardi Gras Shipwreck, consisting of cuprous, ferric and pewter items, includes many of the smallest and largest items recorded on the site. Spoons, buttons, coins, the ship's stove, and anchor are included in this assemblage.

Complementing the creamware table setting are three pewter spoons (artifact nos. 139-1 [recovered near the stern concretion], 228-1 and 228-2 [recovered aft of weapons box]). These spoons are likely not the only utensils on the ship's table, but they survived better than the possible forks and knives represented by several bone and wood scales (see Organics below). Two of the spoons are remarkably well-preserved (Figure 5.20), while the third is badly corroded. It is possible that the corroded spoon is made of a different material or differentially corroded due to its proximity to another artifact, but at the current state of conservation it is impossible to make this determination. The intact spoons measure 8.8 inches (22.3 cm) long, with long ovoid bowls measuring 3.1 in by 1.6 inches (7.8 X 4.1 cm). The handles terminate in a tear-drop shape that measures 0.9 inches (2.4 cm) in its longest dimension. The drop on the back of each spoon bowl is decorated with two lobes of the handle extending 0.7 inches (1.8 cm) onto the bowl.

Figure 5.20. Reverse of pewter spoons (artifact no. 228-1 and 228-2) (bar equals 2 cm). Note maker's marks (photograph by R. Sasaki).

Both spoons are stamped on the reverse of the handle. While neither strike is particularly clear, the mark appears to read "FABREGUETTE / JEUNE A BORDX." However the final letter could also be "Y." Translated this inscription reads "Fabreguette the younger from Bordx." The only French pewter smiths of the name Fabreguette was a family that operated beginning in the late eighteenth century on the Rue des Ayres in Bordeaux (Anonymous 1900:309). Consequently, it is possible that the mark refers to one of the sons of this family and "BORDX" is an abbreviation for Bordeaux. This date conforms well to the other artifacts recovered from the shipwreck and the morphology of the spoon.

During conservation it was noted that the lot 228-2 spoon with the crimped handle is marked with an asterisk on the inside of the bowl and initials on the reverse of the handle. The asterisk consists of an X with an additional line running through its center along the long axis of the bowl. The initials on the reverse of the handle are difficult to read due to the damaged handle. However, they appear to read "BDF." The bottom of the B is obscured and the F is tall but only lightly engraved. These initials have not been tied to an individual because the vessel's port of origin has not been definitively identified.

Pewter was present in antiquity as a heavily-leaded metal but by the Renaissance it was primarily made of tin, as much as 90 percent in fine pewter, alloyed with copper and antimony for strength and durability and lead to make the metal easier to cast. Fine French pewter followed the 90 percent tin rule, but lower grades could contain up to 26 percent lead, and *Claire Etoffe* contained a maximum of 40 percent lead (Davis 2003:2; Hornsby 1983:11). The presence of lead in pewter was important because, prior to 1800, all pewter was cast, and the lead aided the flow of metal; however, too much lead made the metal too soft for most functions.

When the American colonies were settled, pewter was very common as tableware, but, by 1700, the industry had begun to suffer from competition with copper wares and, slightly later, was further threatened by inexpensive ceramics. While the expanding U.S. and European populations offset some of this downturn, the U.S. was one of the few regions to experience growth in pewter sales during the eighteenth century (Davis 2003:2; Hornsby 1983:25). Spoons, candlesticks, and mugs were among the items that were not readily replaced by other materials, and utensils and mugs were two of the major products remaining in the pewter industry during the nineteenth century (Hornsby 1983:27; Michaelis 1971). In response to continued competition from ceramics, the pewter industry underwent a major change in the early nineteenth century and began using alloys containing more antimony to form objects shaped from rolled sheets rather than casts. The new metal was called Britannia and was valued for its ornamental quality instead of its utility (Farber 1974:xi–xii). The heavy utilitarian spoons recovered from the Mardi Gras Shipwreck clearly are not Britannia pewter.

Pewter does not regularly occur in terrestrial archaeological sites because it was readily recycled during the historic period and the few pieces that were lost or discarded tend to deteriorate rapidly once buried (Davis 2003:6). Pewter does, however, survive well in collections and in anaerobic environments; many surviving examples are from these contexts. This pattern has biased the American sample, with much of the emphasis placed on British and U.S. examples. While Britain was the leading producer of pewter, exporting more than 300 tons of the metal annually to the U.S. during the 1760s (Farber 1974:ix), France was also a major producer, well outranking the U.S. (Hornsby 1983:20). The French industry is evident in eighteenth century treatises, such as *Art du Portier d' Étain* by M. Salmon (1788).

The spoons recovered from the Mardi Gras Shipwreck Site are of the Hanoverian type. This type is distinguished by its relatively long bowl, rounded handle, and drop shape and was produced between 1760 and 1820 (Davis 2003:176–181). The Hanoverian type of spoon is distinguished from the Old English type by its upturned handle end (Moore 1999). Similar double-lobed drops were also noted on late eighteenth century French spoons (Salmon 1788:Plate xxviii). This form of drop seems to have been developed from the earlier eighteenth century "rat-tail" drop that extended the handle down the center back of the spoon bowl. Ultimately, drops were completely removed.

Also recovered from the area of the weapons box was a single crushed metal (appears to be iron) cylinder or can (artifact no. 226-2) that measures 6 inches (15.2 cm) long and 4 inches (10.2 cm) wide. This item is still undergoing conservation and its function is not yet clear.

Meals eaten from the creamware dishes with the pewter spoons were likely cooked on the small cast-iron ship's stove (artifact no. 302). The stove is rectangular in plan, measuring 19.3 inches by 26.8 inches (49 cm X 68 cm), and stands 17.5inches (44.4 cm) high at the shoulder with a 2-inch (5-cm) flue extending 5.2 inches (13.2 cm) above the shoulder (Figure 5.21). The entire structure rests on four 2.4-inch (6.2-cm) legs that were cast as part of the side plates. The stove is constructed of six separate pieces held together with six tie-rods (not extant). The side plates were cast with lips and tabs that held the other plates in place. The lips ran the entire length of all but the sloping side and likely helped to reinforce the brittle cast iron. The other plates slid between these lips and the tabs. The tie rods ran transversely through both of the upper kettle-box corners, through the center of the kettle box, across the forward face of the roasting box, and likely between the legs.

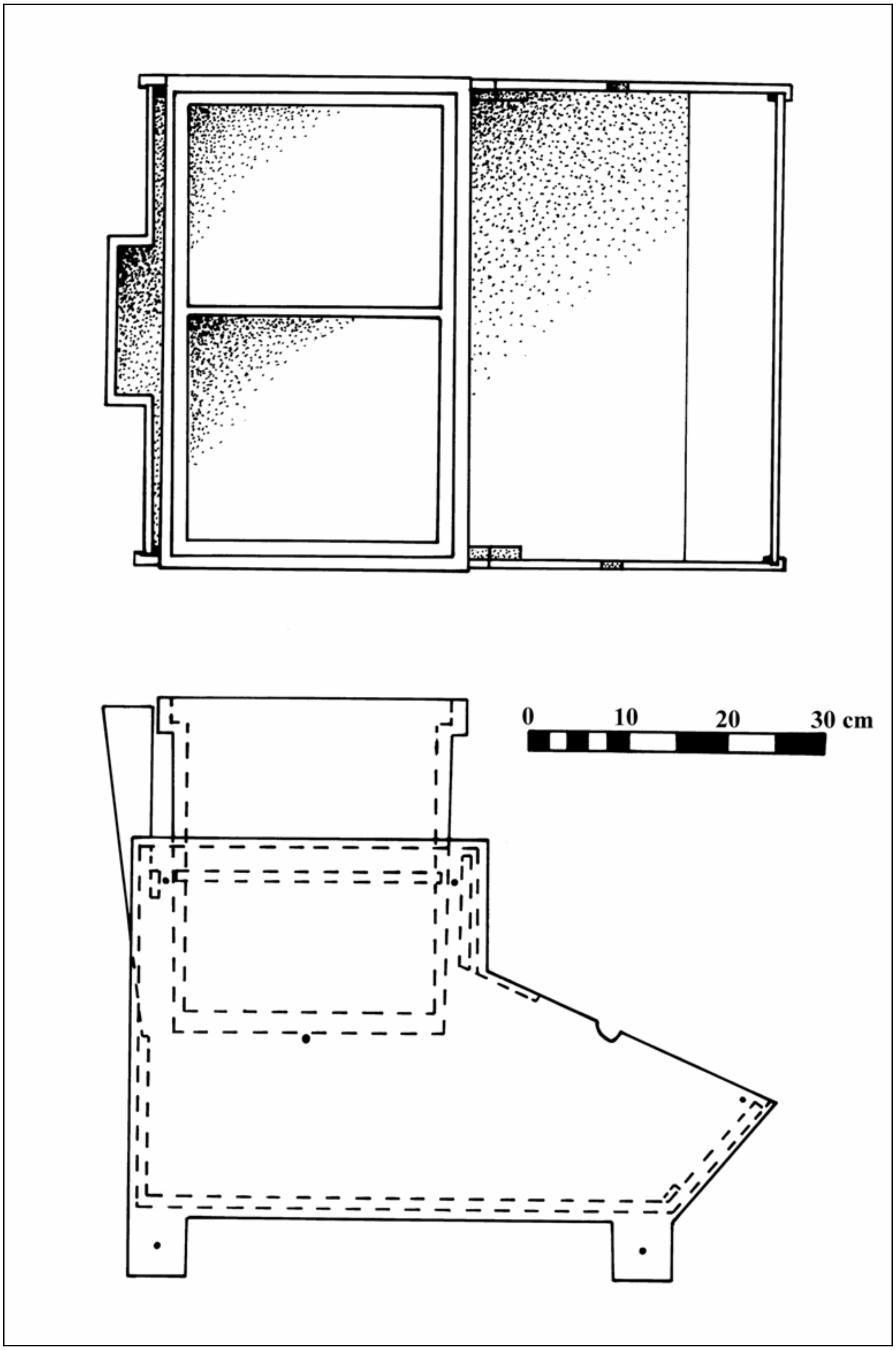

Figure 5.21. Reconstruction of cast iron galley stove (artifact no. 302) (illustration by B. Ford).

The entire stove assembly consists of two side plates with raised lips that held the other plates in place, a back plate with a cast flue, a bottom plate, a small front plate, and the kettle. The kettle consists of two separate, rectangular-plan basins cast as a single piece. The entire kettle measures 19.5 inches by 13 inches (49.4 cm X 33.1 cm) and 13.4 inches (34 cm) high, including a 1.5-inch (3.7-cm) lip. The interior of the kettle is divided by a 0.4-inch (0.9-cm) wall into two unequal basins both 12.6 inches (32 cm) deep. Both basins measure 10.2 inches (26 cm) longitudinally but 8.3 inches (21.1 cm) and 9.7 inches (24.6 cm) transversely at the top. The kettle was cast with thicker walls than the stove itself, 0.6 inches (1.6 cm) as compared to 0.4 inches (1 cm), possibly as means to distribute the fire heat more evenly and prevent scalding. While the kettle was used for cooking liquids or as Dutch ovens, direct access to the fire was provided by the lower forward portion of the stove (ship's stoves typically had the kettles aft (Lavery 1987:197). The forward portion of the stove extends 11.6 inches (29.5 cm) beyond the face of the boiler box with a semi-circular notch near its center on both side plates. These notches were likely intended to receive a spit for roasting small pieces of meat. With the spit removed, a small cauldron could also have been hung over the opening. This opening is also the only access to the interior of the stove, suggesting it is where fuel was added and ashes removed. Charcoal may have been the primary fuel, for the shallow area between the bottom plate and the bottom of the kettle would only have fit small pieces of wood. Charcoal is less dense than water and would have likely floated away from the wreck.

Metal galley stoves can be traced back to the foculi of the Roman Period, but modern iron galley stoves were proposed in 1728 and, by 1757, were in general use, slowly replacing earlier brick hearths. Unfortunately, very little is known about these stoves archaeologically. HMS *Pandora,* HMS *De Braak,* the Kingstown Harbor Wreck, the Rose Hill Wreck, and the Piña Colada Wreck all contained metal stoves of this period, the Piña Colada Wreck's stove appearing to be the most similar to the one recovered from the Mardi Gras Shipwreck; however, none of these stoves have been fully-reported (Shomette 1993; Sinclair 2002; Wilde-Ramsing et al. 1992; David Johnson, personal communication 2007). Similarly, a search of the U.S. patent records did not yield any similar stoves, and the British patent records are not available. The stove does not bear any marks to indicate where it was made or the name of the manufacturer. Small stoves of this type were cast in great numbers for sale through ship chandlery shops. A review of stoves offered for sale in port newspapers may help identify the manufacturer or at least identify the general type.

Despite this lack of information, the Mardi Gras shipwreck stove appears to be of a generic pattern for the period. By the 1780s, most iron stoves consisted of a combination kettle and spit-cooking apparatus within a rectangular footprint. Square, cast-iron kettles also appear to have come into wide-spread use at approximately the same date (Lavery 1987:197, 199; Watson 1968:410). The division of the kettles into uneven sizes was developed even earlier and was common in the American, French, and English navies. The Revolutionary War period privateer *Defence* had similar uneven kettles built into its brick hearth. The specific reasons for this uneven division are unclear but appear to have been based on a division of the food by rank among the French and a functional division for the British (Boudriot 1986:110; Lavery 1987:197; Switzer 1978:41–42).

The kettles of the Mardi Gras Shipwreck stove appear to have rested on the central tie-rod. This supposition is supported by the position of the kettle resting above the stove body on the seafloor as compared with the reconstructed stove. This arrangement allowed for more food to be cooked, while taking up less deck space and maintaining sufficient room beneath the kettles for fuel to be banked. In this position, the kettle also appears to form the front of the flue, creating more efficient draft by directing hot air past the rear of the kettles. Removing the central tie-rod would have allowed the kettles to be lowered into the stove, where the kettle lip would have rested on the stove plates. This arrangement may have been beneficial when the stove was not in use or if the contents were being warmed over a small fire. The forward portion of the stove was likely fitted with a spit and a lid. The spit can be inferred from the two notches in the top edge of each side plate. The slope of the side plates and the shape of the notches would have allowed the spit to rest securely. Roasting spits were common on Brodie-patented stoves of the same period (Watson 1968). The presence of a lid for the lower portion of the stove is deduced from the lip extending part-way along the sloping surface of the side plates. This lip may have been to reinforce the sides but does not extend the full length of the sloped edges, implying a different use. A metal lid could have rested on these lips and on the tie rod across the roasting box. Such a lid would have been useful to retain heat and direct it to the kettles when the spit was not in use. The length of the lips would have allowed the lid to be slid partially open, acting as a damper to control the heat of the fire.

Associated with the stove are two sheets of lead, likely used to protect the deck and hull from sparks and heat. One of the pieces has an impression that matched the stove leg, suggesting that the stove rested atop the lead and that the lead was used instead of brick to shield the deck. While copper sheathing was more common for this purpose, other metals, such as tin, were used (Boudriot 1986:109). The stove likely also included two lids to cover the kettles and a chimney for the flue (Lavery 1987:197), neither of which was observed or recovered from the shipwreck.

The other major piece of ship's equipment noted on the site is the anchor situated near what is likely the bow of the ship. The anchor was not recovered, due to its poor state of preservation; instead it was recorded on the seafloor. The anchor measures 4 ft (1.22 m) between bills and 5.3 ft (1.62 m) from its crown to where the shank is buried in the sediment. The only identifiable features of the anchor, the angle of the crown and the ratio of the flukes to the arms, are very similar to the anchors illustrated in Lavery (1987:31, 32, 34), suggesting that the anchor was forged prior to circa 1815 (Lavery 1987:30). The stock of the anchor, which was originally perpendicular to the arms, may be lying just east of the shank. The possible stock consists of two pieces of what appears to be iron-stained wood measuring 2.9 ft (88.4 cm) long and 12 inches (30.5 cm) wide at their widest point. A large (12-inch [30.5-cm]) iron ring is lying on the west end of the possible stock. Immediately east of the possible stock is a piece of iron that may be the crown of a second anchor with only short portions of the arms and shank surviving. This artifact measures 1.2 ft (36.6 cm) from "arm" to "arm" and 2.2 ft (67.1 cm) from "crown" to "shank." Several other artifacts that were not recovered are situated in this area. These appear to be partially buried pieces of iron bar.

Moving from the largest to among the smallest artifacts recorded at 16GM01, two Spanish coins were recovered from immediately aft of the weapons box, both minted in Mexico. The milled eight-*reales* piece (artifact no. 222-7) was struck with the royal coat of arms surrounded by "•HISPAN • ET • IND • REX • M • 8R • T•H•" on its obverse (Figure 5.22). The first four words can be translated as "King of Spain and the Indies." The "M" beneath an "o" refers to Mexico City, the mint where the coin was produced. "8R" indicates the denomination of the coin, eight *reales*, which is equivalent to approximately 27.0642 grams of silver (Craig 2000; Menzel 2004). Finally, the "TH" refers to the assayers Tomás Butrón Miranda and

Henrique B. Azorín, who were in office 1803–1810. The coat of arms includes two rampant lions, two keeps, the Pillars of Hercules, and a crown. The reverse of the coin was struck with the bust of Charles IV (reigned 1788–1808) with the partially illegible inscription "CAROLUS IIII 1808," indicating to the mint date and the ruling monarch (Craig 2000) (Figure 5.23).

Figure 5.22. Eight *reales* coin obverse (photograph by R. Sasaki).

Figure 5.23. Eight *reales* coin reverse (photograph by R. Sasaki).

The other coin (artifact no. 222-8) is a two-reale (approximately 6.766 grams of silver) piece with only the obverse side legible. The reverse is concreted to a wood fragment and may be revealed during conservation. The mark is similar to that of the eight-reale piece but the inscription read “HISPAN • ET • IND • REX • M • 2R • F•M•” (Figure 5.24). The assayers of this coin were either Francisco A. de la Peña and Manuel de Rivera (1772–1777) or Francisco A. de la Peña and Mariano Rodríguez (1783–1802) (Craig 2000). Without the reverse side of the coin, it is impossible to be certain of its production date. While it is tempting to attribute the coinage carried by the officers and crew to their nationality, Spanish coins were one of the major forms of portable wealth in the Gulf of Mexico region during the early nineteenth century. Spain still controlled much of the known silver in the area, and its standardized coin denominations lent themselves to international exchange. Spanish silver coins have been recovered from late eighteenth/early nineteenth century wrecks as widely separated as the early nineteenth century Piña Colada Wreck off the Atlantic coast of Florida and the 1761 wreck of *Auguste* near the mouth of the St. Lawrence River (Ascroft and Rochette 1992; Sinclair 2002).

Figure 5.24. Two *reales* coin obverse (photograph by R. Sasaki).

In addition to the coins, nine metal buttons (artifact nos. 222-2, 222-11, 222-12, 223-6, 225-9, 225-9.1, 225-9.2, 230-1 and 230-2; Figure 5.25) and one wood button (artifact no. 222-6, discussed here for consistency) were recovered from immediately aft of (southeast) of the weapons box, in close proximity to the coins (lot 222). The majority of these buttons appear to be copper alloy coat, breeches, sleeve, waistcoat, and vest buttons, likely imported from Britain. While there were American button manufacturers during the eighteenth century, they controlled a small portion of the market prior to 1810 (Fink and Ditzler 1993:25; Peacock 1996:5–7). These buttons are also indicative of male clothing, as women’s fashions of the early nineteenth century seldom had buttons (Meredith and Meredith 2000:10).

Four of the buttons appeared to be undecorated copper alloy disks, one with an intact shank (artifact no. 225-9.2), one with a broken but associated shank (artifact no. 222-2) and two with missing shanks (artifact nos. 223-6 and 225-9.1). The button with intact shank measures 1 inch (2.5 cm) in diameter with a 0.25-inch (0.66-cm) shank. The button with associated shank measures 1.04 inches (2.66 cm) in diameter with a 0.3-inch (0.75-cm) shank. The buttons with missing shanks measure 0.9 inch (2.3 cm) and 1 inch (2.5 cm) in diameter. Additionally, one of the buttons without a shank (artifact no. 225-9.1), appears to have the remains of a cone shank. Cone shanks date to the late eighteenth and early nineteenth centuries (Hughes and Lester 1981:221). All of these buttons were likely attached to waistcoats, sleeves, breeches, or vests based on their size and lack of decoration (Ferris 1986; Hinks 1988; Hughes and Lester 1981).

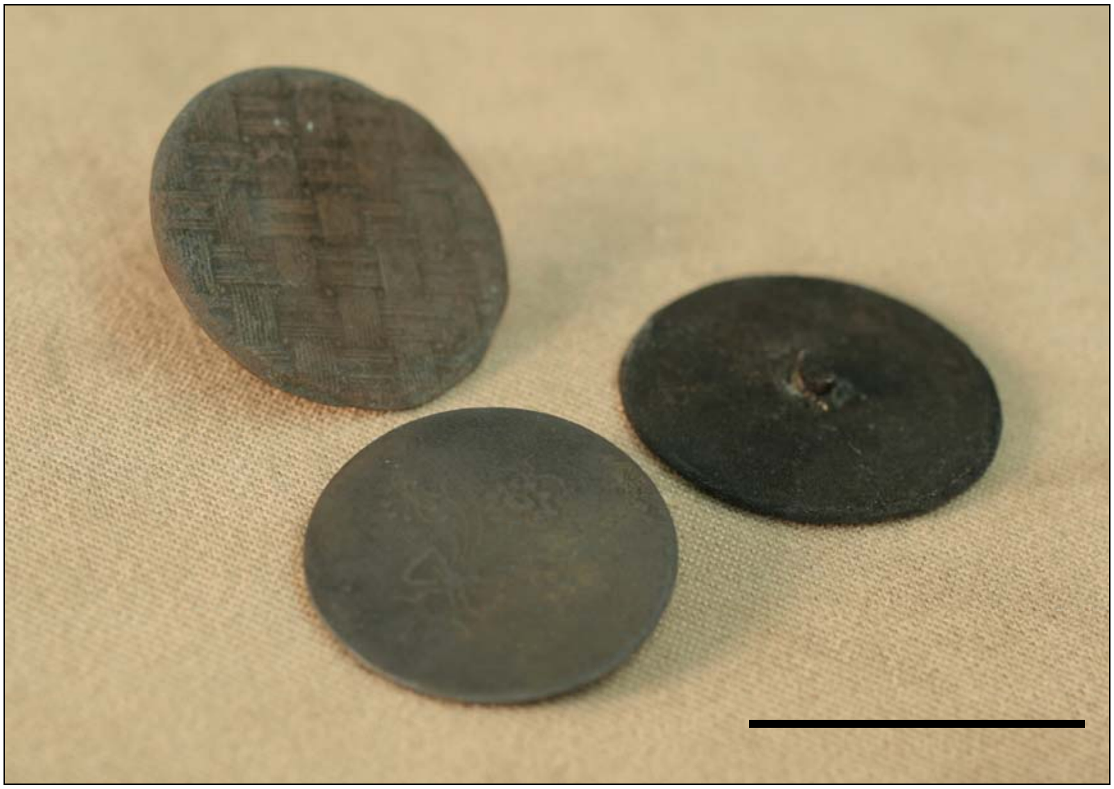

Figure 5.25. Assorted buttons (artifact no. 225-9 (center), 225-9.1 (left), and 225-9.2 (right)) (bar equals 2 cm; photograph by R. Sasaki).

In addition to the plain buttons, there are two buttons with back marks and undecorated faces (artifact no. 230-1 and 230-2). These buttons measure 0.94 inches (2.4 cm) in diameter with broken omega-type shanks. One of the back marks is badly deteriorated, surviving only as a light indentation, but the other clearly reads "ORANGE TREBLE GILT•" encircling the shank. Back marks generally post-date 1790, but examples have been found as early as 1758 (Bingeman and Mack 1997). However, omega shanks were not introduced until circa 1800 and back marks that reference the gilding process did not appear until 1796 (Hughes and Lester 1981:221; Meredith and Meredith 2000:26). In 1796, Parliament passed an act standardizing the amount of gold that had to be used in gilding buttons at 9/16 of an ounce per gross of buttons. Briefly, buttons were gilded by dipping them in a solution containing gold; prior to the act many manufacturers were producing inferior buttons to the detriment of the industry. The 1796 Act placed a premium on quality and led to back marks such as "Treble Gilt," "Rich Orange," "Double Gilt," and "Treble Standard" (Albert and Adams 1951:38; Luscomb 1967:79; Meredith and Meredith 200:25, 26; Peacock 1996:15). Similar to the other undecorated buttons, these buttons were likely attached to waistcoats, sleeves, breeches, or vests, based on their size and lack of decoration (Ferris 1986; Hinks 1988; Hughes and Lester 1981).

Figure 5.26. Reverse of weave pattern button (artifact no. 222-11) (bar equals 2 cm; photograph by R. Sasaki).

There are also two buttons with matching back marks and obverse decorations (artifact nos. 222-11 and 222-12). Both measure 1 inch (2.5 cm) in diameter and have intact 0.2-inch (0.6-cm) wide alpha shanks. The back marks consist of a laurel with a trefoil bead pattern at its base and a crown at the apex and the word "GILT" along the inside of the laurel (Figure 5.26). The crown is similar to crowns associated with Great Britain, suggesting that the buttons are of British origin. This supposition is supported by the dominance of the gilded button market by Birmingham during the first quarter of the nineteenth century (Peacock 1996:15). Unfortunately, a review of available sources on buttons failed to identify the specific maker or type. The back of artifact number 222-11 also has evidence of the casting seam. The obverse of both buttons is decorated with a cast weave pattern (Figure 5.27). The vertical weave is eight strands while the horizontal weave is two sets of three strands separated by a blank area. A dot is cast at the intersection of each warp and weft. During the early nineteenth century, male fashion called for decorated and gilded buttons, commonly referred to as dandies or golden age (Meredith and Meredith 2000:20; Peacock 1996:15). The weave pattern was popular from circa 1800 through the Civil War, but the presence of an alpha shank suggests that these buttons were produced early in that period (alpha shanks date to ca. 1770–1800) (Hughes and Lester 1981:221; Meredith and Meredith 2000:25; Peacock 1996:17). While these buttons are smaller than most gilded coat buttons, their decoration suggests that they were attached to such a garment (Albert and Adams 1951; Hughes and Lester 1981; Peacock 1996).

The final decorated metal button (artifact no. 225-9) is a cast, flat disk measuring 0.9 inches (2.2 cm) in diameter. The reverse of this button is undecorated while the obverse is decorated with a three-flower bouquet bound by a large bow (Figure 5.28). No parallels for this button were identified during the literature review. Floral patterns were common on gilded buttons, but the majority appeared to be natural, rather than bouquet, patterns. The small size of this button suggests that it was attached to a sleeve, waistcoat, or breeches (Hughes and Lester 1981).

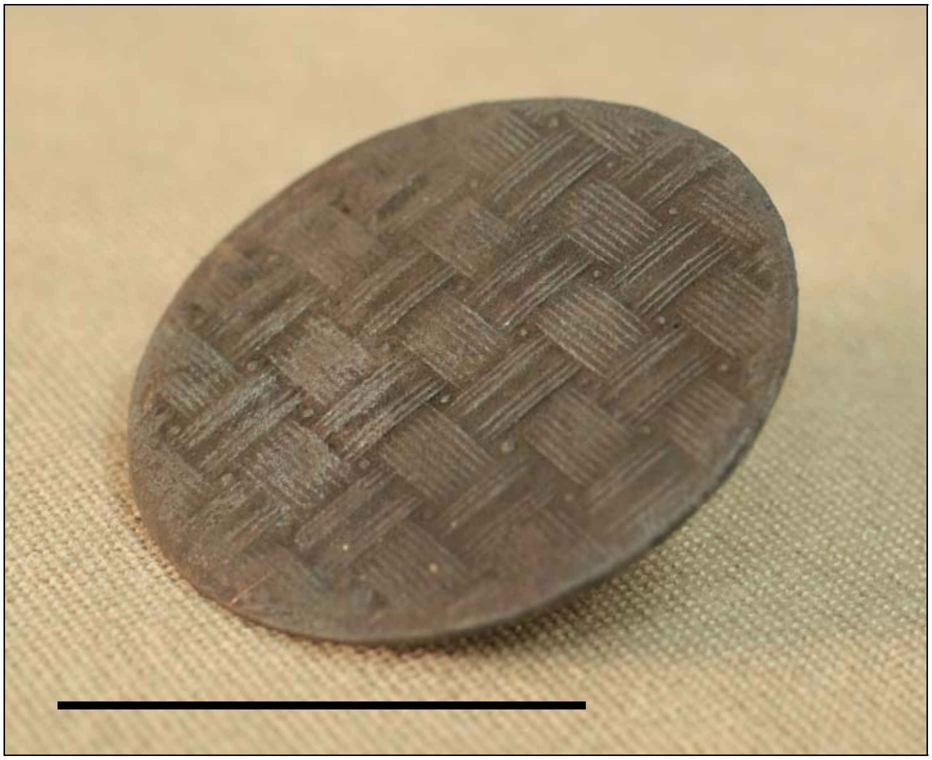

Figure 5.27. Obverse of weave pattern button (artifact no. 222-11) (bar equals 2 cm; photograph by R. Sasaki).

Figure 5.28. Bouquet button (artifact no. 225-9) (bar equals 2 cm; photograph by R. Sasaki).

The final recovered button (artifact no. 222-6) is made of wood (Figure 5.29). This domed button measures 0.7 inches (1.7 cm) in diameter and is 0.3 inches (0.7-cm) thick. It is decorated with 10 incised lines radiating from the center and a line carved around the circumference of its base. Wooden buttons seldom survive and, consequently, are not well documented. However, similar buttons were made of glass during the nineteenth century (Luscomb 1967:87). Wooden buttons of this size were commonly used on light outer garments such as breeches and waistcoats (Hughes and Lester 1981).

Figure 5.29. Wooden button (artifact no. 222-6) (bar equals 2 cm; photograph by R. Sasaki).

In addition to these identifiable artifacts, there are several metal artifacts that could not be assigned a function (photographs of these artifacts are located in Appendix B). A small cupreous rectangle measuring 1.03 X 0.66 inch (2.7 X 1.7 cm) was recovered from west of the stern concretion (artifact no. 139-4). Given the proximity of this artifact to the navigation instrument fragments, it is possibly associated with them. Similarly, a 2.2-inch (5.6-cm) diameter ring with a raised and knurled surface (artifact no. 136) was recovered from within the ceramic and glass concentration near the stern concretion. This artifact may also have been associated with the instruments. A cupreous handle (artifact no. 216), likely from a drawer, was recovered near the southeast corner of the weapons box. This item measures 3.2 inch (8.1 cm) long and 1.5 inch (3.8 cm) wide and ranges in thickness between 0.2 inch (0.5 cm) and 0.35 inch (0.9 cm). An oddly-shaped cupreous tab (artifact no. 223-2) was recovered from immediately east of the weapons box. This artifact measures 0.8 inch (2 cm) in its greatest width with a 0.15-inch (0.4-cm) diameter hole in the center and three 0.1-inch (0.3-cm) holes around the edge. A badly corroded cupreous fragment (artifact no. 223-4) measuring 3 X 0.8 X 0.07 in (7.7 X 2 X 0.2 cm) was also recovered from east of the weapons box. A metal ring (artifact no. 225-3) that measures 0.7 inch (1.9 cm) in diameter and 0.1 inch (0.3 cm) thick and a bent cupreous disk (artifact number 222-5) were recovered from near the center of the east side of the weapons box. The disk has a diameter of 0.9 inch (2.3 cm) and is bent along its center line. A 0.2-inch (0.5-cm) hole is situated near the top edge of one of the halves. Artifact numbers 223-2 223-4, 225-3, and 222-5) may have been associated with navigation equipment or other instruments (the measurement compass, artifact number 225-2, is part of the 225 lot), but their fragmentary nature makes their function difficult to discern.

5.2.4 Organics

The organic artifact category includes wood, leather, bone, seed, and rope artifacts recovered from throughout the site. These items are divided into four categories: personal items, implements, rigging elements, and miscellaneous.

Two of the personal items are a shoe heel (artifact no. 138-2) and a toothbrush head and handle (artifact no. 134-6) recovered from the bottle and dish feature northwest of the concretion (Figures 5.30 and 5.31). The leather heel measures 2.5 inches (6.4 cm) wide (across the foot), 2.3 inches (5.8 cm) long (heel to toe), and 0.4 inches (1.1 cm) thick. The associated footwear appears to have been made using pegged or nailed construction. This method dates from the sixteenth century through circa 1870, but during the nineteenth century was commonly used for boots and cheaper shoes (Stevens and Ordoñez 2005). Aside from the buttons discussed above, the heel is the only remains of clothing recovered from the shipwreck. The bone toothbrush head measures 1.9inches (4.9 cm) long and 0.4 inches (1.1 cm) wide with 31 holes. The back of the brush is inscribed with three lines that correspond with the bristle holes. The associated handle is circular, measuring 0.5 inches (1.3 cm) in diameter and 2.2 inches (5.6 cm) long. Several animal hair bristles were recovered from the holes in the head.

Figure 5.30. Leather footwear heel (artifact no. 138-2) (photograph by A. Borgens).

Additionally, five bone utensil scales were recovered from the wreck site (Figure 5.32). These scales would have been riveted to the tang of a knife or fork to form the handle. All scales are flattened hemispheres in section with the flat surface intended to fit against the tang. The three handles from the artifact lot 134-1, 134-1.1 and 134-1.2 measure: 3.5 X 1 inches (9.8 X 2.5 cm), 2.3 X 0.9 inches (5.9 X 2.2 cm), and 2.1 X 1 inches (5.3 X 2.5 cm). These scales were recovered in association with the bottle and ceramic assemblage northwest of the stern concretion. The 3.5-inch long scale is pierced by two holes and possibly a third. The two holes measure 0.6 inches (1.5 cm) and 0.5 inches (1.4 cm) in diameter with the smaller hole near the pommel. The 5.3-inch long scale is pierced with two holes that are 0.5 inches (1.3 cm) in diameter; these allowed rivets to pass through the scale with the peened end of the rivet holding the scale to the tang. Two other handle scales were recovered from the area immediately southeast of the weapons box. Artifact number 217 measures 3.8 inches long (9.5 cm) and 1.1 inches wide (2.8 cm), and is pierced with two holes measuring 0.4 inches (1.1 cm) and 0.3 inches (0.7 cm) in diameter. Again the smaller hole is near the pommel. Artifact number 225-7 is 3.7 inches long (9.3 cm) and 1 inch wide (2.5 cm) with two holes measuring 0.4 inches (1.2 cm) and 0.3 inches (0.8 cm) in diameter. Similar to the other scales, the smaller hole is near the distal end. Given the similar sizes and close proximity of these scales, it is likely that they came from the same knife or fork. Another handle scale made of wood (artifact no. 222-3) was also recovered from this area. This scale measures 2 inches (5.2 cm) long, 0.8 inches (1.9 cm) wide at the widest and 0.6 inches (1.5 cm) wide at the narrowest. No rivet holes were noted in this piece. Thus, there are a minimum of four distinct utensils represented by these scales.

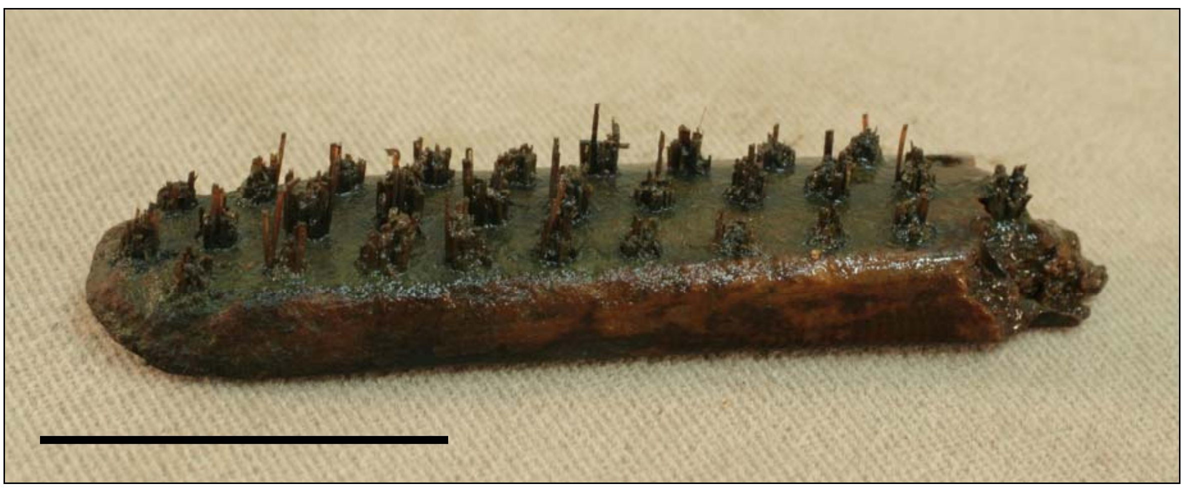

Figure 5.31. Bone toothbrush head with bristles in place (artifact no. 134-6) (bar equals 2 cm; photograph by R. Sasaki).

While forks and knives had similar handles during this period, it is more likely that the scales were attached to knives. Forks had been increasing in popularity since circa 1660 but had not yet been adopted by all populations (Moore 1995). Unfortunately, handle scales of this type are not diagnostic because they can date from the sixteenth century to the present (Moore 1995). Similarly, these scales can be interpreted as being tableware based on their proximity to the creamware and spoons but they could have also served other utilitarian purposes.

In addition to the utensil handles, there were several wooden artifacts recovered from lot 139-2 that appear to be utilitarian. These include a thin piece of wood measuring 3.5 inches (8.9 cm) long, 1 inch (2.6 cm) wide, and 0.1 inches (0.3 cm) thick with constricted shoulders 0.8 inches (2 cm) from the end. A wooden disk of similar thickness and measuring 0.7 inches (1.7

cm) in diameter and a hemispherical wooden rod in three pieces that is 0.6 inches (1.4 cm) wide and 4.5inches (10.5 cm) long were also discovered. These items could potentially be gaming pieces or mess tags similar to those recovered from *Defence*.

Figure 5.32. Selected bone handle scales (photograph by R. Sasaki).

Also from this area are several coffee beans (*Coffea* sp.) (artifact no. 135-5) that were recovered as part of the stern concretion matrix. The specific type of coffee bean has not been determined, but the beans were likely for consumption by the crew, based on the coffee grinder recovered from the site (see composite artifacts below).

Coffee was first introduced to the European public from Arabian countries during the mid-seventeenth century. Initially, it was popular in England, and by the eighteenth century was becoming the caffeinated drink of choice in France. Americans were slower to adopt the beverage, but coffee houses were present in most major eighteenth century towns. It was not until the first half of the nineteenth century that the former colonies fully adopted coffee. The War of 1812 was particularly influential in that regard. The war temporarily denied Americans access to tea, causing a shift to coffee that was supported by the popularity of coffee in France and the popularity of France in the United States. By the end of the war, coffee beans imported from Brazil were closer and cheaper than teas from England and elsewhere (Pendergrast 1999; Standage 2005).

Other organic materials recovered from the wreck include multiple rigging elements, including two parceled pieces of rope and the sheaves from a double block. Parceling is the process of wrapping a rope to prevent it from chafing. Generally, this was done with canvas, but leather was used in this case. One of the parceled ropes (artifact no. 140-2) forms a broken oval measuring 14.6 inches by 10.6 inches (37 X 27 cm) (Figure 5.33). The diameter of the rope and its leather covering is 2.4 inches (6 cm). Prior to being parceled, the main rope of this artifact was wormed with smaller line. The worming line was worked into the grooves of the main line in order to give it a smoother surface. The leather parceling was then stitched along the inside of the loop, suggesting that the wear surface was to the outside. The shape of the oval and impressions in the leather indicate that it was seized in the middle with smaller line, forming two lobes in the oval. A review of primary (Biddlecombe 1979[1848]; Fincham 1982[1854]; Steel 1982[1794]) and secondary (Anderson 1982; Boudriot 1987; Crown Publishers 1978; MacGregor 1984a, 1988) sources failed to reveal any direct parallels. However, similar configurations were used as a strop to join two blocks into a sister block (Biddlecombe 1979:Plate IV), guide lines around a capstan (Crown Publishers 1978:06.02), and as gammoning for the bowsprit (Anderson 1982:87). Unfortunately, none of these uses are consistent with leather parceling laced on the inside, but, of the three options, a strop is the most likely.

Figure 5.33. Wormed and leather-parceled rope (artifact no. 140-2) (upper scale marked in cm; photograph by A. Borgens).

A similar leather wrapping (artifact no. 601) was recovered from the opposite end of the site, south of the anchor. Like artifact number 140-2, this artifact consists of a tube of stitched leather. However, it does not contain any rope and is not in the shape of an oval. It measures approximately 24 inches (61 cm) in length and 1.6 inches (4.1 cm) in diameter. This artifact is likely parceling but it is unclear what line it parceled. As discussed below, the cascabel rope (artifact no. 400-8) of the cannon is also leather parceled.

The supposition that artifact number 140-2 was used as a block strop is supported by the proximity of the parceled loop to the remains of a double block (artifact no. 140-1; Figure 5.34). Both of these artifacts were recovered from the LART matrix. The block sheave pin measures 4 inches (10.3 cm) long and 0.8 inches (2.1 cm) in diameter and appears broken on one end, while both sheaves are 5.7 inches (14.5 cm) in diameter and 0.8 inches (2 cm) thick. The sheaves are remarkably well-preserved as compared to the wood in the remainder of the vessel, suggesting that they were turned out of a hard wood distinct from that used in the hull. The tropical hardwood *lignum vitae* was used extensively for block sheaves during the eighteenth and nineteenth centuries.

Figure 5.34. Double sheave and pin (artifact no. 140-1) recovered in double-block configuration (bar equals 2 cm; photograph by R. Sasaki).

The final rigging element recovered from 16GM01 appears to be a section of a yard, possibly a boom or gaff (artifact no. 142; Figure 5.35). The yard was unearthed when the LART removed the stern concretion and a portion was recovered within the LART. The recovered piece measures 86.6inches (220 cm) long and 5.9 inches (15 cm) in diameter, but the remainder was not measured. Given the diameter of this yard, it is unlikely that it is a mast as masts seldom had a diameter less than 6 inches even at the extreme end of a mast for a small vessel (Steel 1982:50). A diameter of 5.9 inches, however, would not be disproportionate for a yard on a vessel of approximately the size of the Mardi Gras Shipwreck. The orientation of the yard, parallel to the longitudinal axis of the wreck, suggests that it was associated with a fore-and-aft sail. According to Steel's (1982) masting tables, either the boom or gaff for a vessel of Mardi Gras Shipwreck's tonnage (approximately 40–65 tons) would be approximately 6 inches in diameter between the third-quarter and end of the yard. The position of the recovered piece is consistent with this portion of the boom or gaff. While all conclusions regarding the rigging of the vessel are tentative, if the preceding is taken as true and the parceled rope is in fact a strop, it is possible that the strop and/or sheaves came from the vang-pendant or, more likely, the halyard of the spanker sail (Biddlecombe 1979: Plate X).

Figure 5.35. Boom or gaff (artifact no. 142) (photograph by A. Borgens).

Several other organic artifacts were recovered from the wreck site, including several fragments of flat leather (artifact nos. 209, 223-5, 225-11) recovered from east of the weapons box. No construction features, such as stitching, have yet been identified. Consequently, the use of this leather is unknown, but given its proximity to the spyglass, it may have been used to wrap this valuable instrument. Additionally, the only fragment of rope (artifact no. 225-6) not associated with the cannon or leather parceling was recovered from the same vicinity as the leather. This small rope fragment measures 1.5 inches (3.9 cm) long and 0.25 inches (0.7 cm) in diameter and is made of two 0.13-inch (0.3 cm) diameter strings. A total of 46 unidentified fragments of generally worm-eaten wood were also recovered (artifact nos. 125-4, 134-10, 220, 223-8, 225-5, and 225-8). While several of these pieces retained preserved surfaces that may ultimately lead to their identification either as a portion of the hull, a container, or another function they have not yet been identified. Four similarly unidentified leather fragments (artifact nos. 134-5 and 139-3) were also recovered. Finally, an unmodified faunal remain (artifact no. 125-3) measuring 1 X 0.7 X 0.7 inches (2.5 X 1.9 X 1.9 cm) was recovered.

5.2.5 Composites

The three composite artifacts not included in the instrument category include a watch face and bezel (artifact no. 221), a carpenter's plane (artifact no. 218), and a coffee grinder (artifact no. 210). The enameled iron watch face (introduced circa 1720) measures 1.9 inches (4.8 cm) in diameter, suggesting that it is from a pocket watch rather than a wristwatch (Jagger 1988:52) (Figure 5.36). The central hole measures 0.13 inches (0.33 cm) in diameter and is accompanied by a slightly smaller (0.12-inch [0.31-cm]) hole near the numeral "2". The presence of two holes indicates that the watch was key-wound. The chipped enamel around the off-center hole suggests that the owner was often less than careful while inserting the key. The face is hand painted with Arabic numbers. The hour is indicated by large numbers while a smaller outer ring indicates the minutes with ticks for each minute and the appropriate Arabic numeral at ten minute intervals. The associated bezel that joined the face to the case measures 2.1 inches (5.3 cm) in diameter and is 0.12 inches (0.31 cm) thick. Painted enamel dials lasted into the 1850s, but minutes indicated on the outer ring were only popular during the mid eighteenth century before being replaced by a secondary movement known as a regulator dial during the late eighteenth and early nineteenth centuries (Bailey 1975:190; Bruton 1967:Plates 85, 89; Clutton 1973:174, 199; Jagger 1988:52, 58). Arabic numerals for the hours never surpassed Roman numerals during the historic period but were particularly rare prior to 1780 (Jagger 1988:52). Key winding, either through the face or the case, remained prevalent into the 1880s (Jagger 1988:57). A similar face without the minutes was noted on a Swiss watch of the 1789–1802 period (Bruton 1967: Plate 107).

Figure 5.36. Pocket watch face and bezel (photograph by R. Sasaki).

The only tool analyzed thus far from 16GM01 is a carpenter's plane (artifact no. 218) that was situated approximately 2.5 ft (0.76 m) southeast of the weapons box (Figure 5.37) (a chisel (artifact no. 135-15) was recovered from the stern concretion but has not been analyzed). The stock measures 7.4 inches (18.8 cm) long and 2.8 inches (7.1 cm) high. It is lozenge-shaped with flat ends measuring 3 inches (7.6 cm) at the widest point. The wedge is 4.7 inches (12 cm) long, 2.5 inches (6.4 cm) wide, and 0.8 inches (2 cm) thick. No evidence of the iron was recovered. The morphology of the plane is not diagnostic for period, since similar planes were in use as early as the Tudor Period in England. However, the shape does indicate that the plane was used for smoothing (Bealer 1989:169; Mercer 1960:110). While planes are not commonly recovered from shipwreck sites, they were part of the ship carpenter's tool kit (McDermott 2000; McKewan 2002). During the late eighteenth and early nineteenth centuries, ship carpenters carried several types of planes, including smoothing, jack, fore, grooving, and long varieties, but smoothing were the most widely-used planes (Bealer 1989:167; McDermott 2000:223–228). The plane suggests that other tools were also carried for basic ship maintenance and may have been part of a tool kit stored in the cabin.

Figure 5.37. Carpenter's smoothing plane (artifact no. 218) (bar equals 2 cm; photograph by R. Sasaki).

The final composite artifact is a small grinding mill (artifact no. 210), which has tentatively been identified as a coffee mill based on its size and morphology (Figure 5.38). This artifact was recovered from the eastern side of the debris field approximately 2.3 ft (0.7 m) southeast of the weapons box and consists of a wooden box with an affixed copper alloy bowl and iron grinding apparatus. The square box measures 4.1 inches (10.4 cm) on a side and 3.1 inches (7.9-cm) high with a slightly larger top piece that measures 5.9 inches (15 cm) on a side. Two small (0.4 in [1 cm]) projections on one side of the box suggest that a drawer for catching grounds was originally slotted into the lower portion of the box. The copper alloy bowl measures 4 inches (10.3 cm) in diameter and 1.6 inches (4 cm) high. Within the bowl is an iron concretion that is likely the grinding apparatus. The concretion has evidence of a handle and space below the apparatus where the grounds could fall into the box. A hole in the center of the concretion may have been its pivot point and corresponds with a larger hole in the box.

Domestic coffee mills were in existence as early as 1700 but did not proliferate until circa 1800, when small utensils became more prevalent. Eighteenth-century coffee mills were generally made of a turned exotic hardwood, typically *lignum vitae* or mahogany. These mills were often prized as much for appearance as function and were kept on display. Cast iron mills were introduced in 1815 and quickly became common. While the later mills included electric motors, the basic shape of coffee mills did not change until the late twentieth century (Eveleigh 1997; Fearn 1999). The mill recovered from the Mardi Gras Shipwreck may be an intermediate example, employing separate bowl and box construction in a plain and utilitarian form, suggesting that it postdates the period when coffee was an expensive luxury but pre-dates the advent of all-cast iron mills.

Figure 5.38. Coffee mill (artifact no. 210) (bar equals 2 cm; photograph by R. Sasaki).

5.2.6 Arms and Munitions

By Amy Borgens

The Mardi Gras vessel was carrying a quantity of arms and ammunition, much of which still resides on the ocean floor. The artifacts identified on the site include a 6-pounder 'merchant' cannon, a box of mixed arms and edged weapons, multiple iron artillery shot, over 1000 lead shot, and almost 60 gunflints. These artifacts were distributed throughout the site at two primary locations: approximately amidships on the vessel and towards what is tentatively identified as the stern (Figure 5.39).

In the early years of the nineteenth century, an armed vessel was not unusual in the Gulf of Mexico; it was practically a necessity. International warfare diffused into the Gulf as European nations sought to gain possession of Gulf and Caribbean territories. The U.S. conflict with Great Britain and a multitude of Latin American insurrections added to the heightened naval activity in the region. Merchant vessels needed weapons and munitions in order to deter possible attackers, particularly the privateer fleets exploiting the political discord.

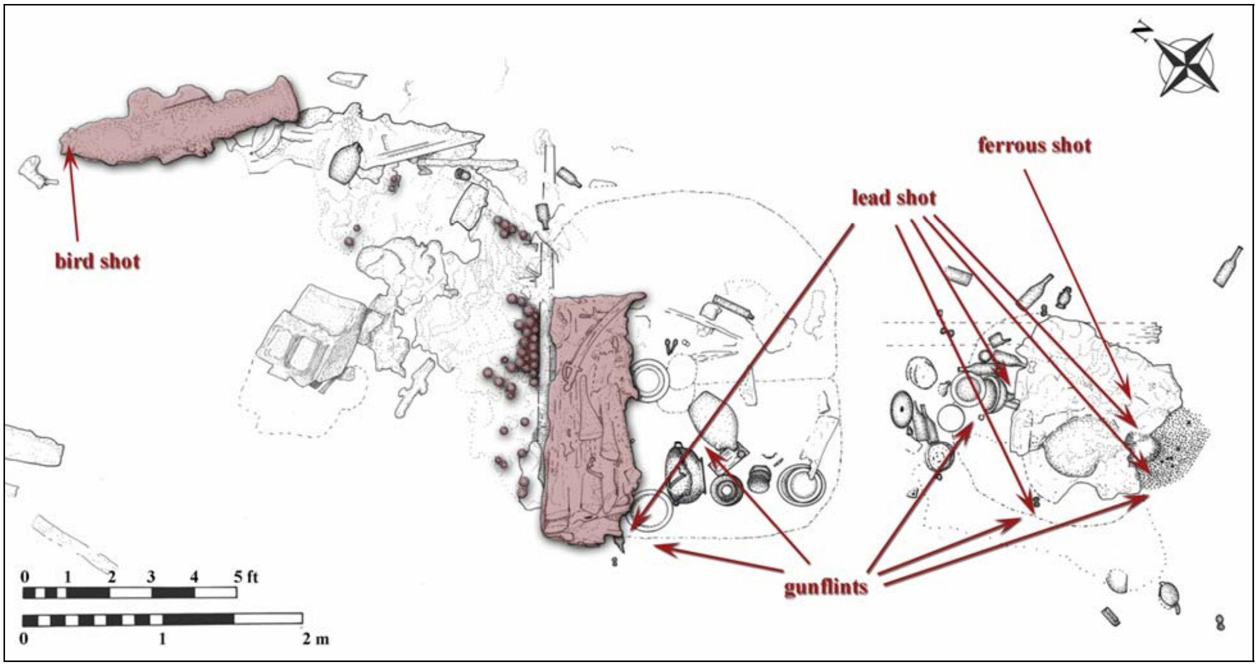

Figure 5.39. Arms distribution at wreck site (illustration by A. Borgens, after B. Ford).

5.2.6.1 Large Artillery and Shot

The volatility of seafaring, especially in the Gulf of Mexico, often necessitated the outfitting of shipboard artillery. The Mardi Gras Shipwreck was not an exception, being armed with at least one cannon. Cannon first came into general use during the Hundred Years' War (1339–1453). It was during this period as well, in the early fifteenth century, that cast iron balls were utilized as projectiles, replacing those of stone (Manucy 1949:63). During the reign of Queen Elizabeth (1558–1603), 6-, 9-, 12-, 18-, 24-, 32-, and 42-pound caliber cannon were developed (Manucy 1949:41). The calibers were adopted by the succeeding Oliver Cromwell government and were used by the English through the eighteenth century. In France, Louis XIV (1643–1715) standardized a set of calibers distinct from those of the English guns: 4-, 8-, 12-, 16-, 24-, 32-, and 48-pounders (Manucy 1949:41). Designs were fairly standardized by the mid eighteenth century resulting in a gun of much cleaner lines than the cannon produced a century earlier. Although as yet there had not been a sharp break with the older traditions, the shape and weight of the cannon in relation to the stresses of firing were becoming increasingly important in their design (Manucy 1949:41).

Along the northeast U.S. coast, colonial trading vessels were frequently armed. Shaped by an environment of conflict and warfare during successive wars with the French and the American Revolution, defensive shipboard artillery was viewed more as a necessity than as a luxury. All but the smallest-sized merchant vessels were designed to carry practical armament (Chapelle 1935:24).

Not unlike the atmosphere of the colonial U.S., commercial shipping routes in the eighteenth and early nineteenth century Gulf of Mexico were vulnerable to foreign and internal conflict. The depredations on shipping within the region were immense as conflicts between the foreign powers encouraged an already-rich environment for privateering. English, French, and Spanish warfare within Gulf coastal territories increased the presence of armed vessels and likewise created a threat to commercial shipping. Though privateers often professed a national or regional affiliation and carried letters of marque, in actuality they were somewhat indiscriminate. For these reasons, the bulk of commercial vessels in the region likely carried armament.

In addition to (and sometimes instead) of large cannon, shipboard artillery could include carronades, swivel guns, gunnades, and in some cases mortars. Prior to the invention of the carronade in 1774, the mortar was the only other large-caliber smoothbore gun used as a ship's heavy artillery besides the cannon (Chapelle 1935:56; Bryce 1984:43). Small mortars were sometimes used on more conventional three-masted ships, but were more frequently the armament on special purpose-made vessels. These small mortar boats, called a bomb vessel or bomb ketch, were not often used by U.S. naval forces of the period (Bryce 1984:43; Chapelle 1939:56).

The carronade was first employed by the British Navy in 1779 and usually ranged in caliber from 6- to 68-pounders (Chapelle 1935:56). Carronades did not have trunnions; instead, they were mounted through a lug underneath the barrel. These types of guns were frequently part of the complement on smaller vessels. A single carronade or pivot-mounted long gun was often the sole large artillery on slavers, used mainly to deter hijacking efforts. Many slavers favored carronades because these pieces did not require a large crew (Chapelle 1935:161).

A gunnade was an adaptation of the carronade, with the substitution of trunnions in order to lower the center of gravity. It was essentially a short merchant gun in a different guise. The term 'insurance' gun is usually reserved for the gunnade but was also applied to the shorter cannons manufactured for the merchant market (Brown 2007).

Swivel guns were placed upon yoke-like swivel mounts instead of being supported by carriages. The swivel mount attached to the weapon at the trunnion and was set into an opening in the gunwale or on a supportive wood stand. This small-caliber weapon was capable of directing fire towards enemy ships, boarding parties, or inward towards the vessel's own deck. The swivel gun fired small iron or lead shot (Bryce 1984:43).

An ongoing study by Amy Borgens compiled from primary and secondary sources regarding maritime vessels in the western Gulf of Mexico between 1800 and 1850 was queried for armed vessels. Of the 1546 vessels currently in the database, 566 were in use between 1800 and 1830. At least 217 of these vessels were documented has having been armed. For 85 vessels, the source material provided general characteristics and numbers of the shipboard artillery (Table 5.3).

Certain vessels (from Table 5.3) such as the frigate, brig-of-war, corvette, and ship were purpose-made warships and carried large numbers of heavy artillery. The revenue cutter was also outfitted with a small complement of arms, though these were frequently made of bronze instead of iron (Chapelle 1935:193–94). The most numerous types of vessels in the Gulf of Mexico, schooners and brigs, were likely privately-outfitted so the size and type of artillery was variable. The smaller schooners did not carry a canon larger than an 18-pounder, though armament could also include swivel guns and carronades. Brigs were equipped with similar weapons, though both the quantity and caliber of the arms were often greater.

Table 5.3

Armament of Gulf of Mexico Vessels, 1800–1830

Type of Vessel*	Number	Number of Guns	Types of Armament
Felucca	5	1–4	8-pounder, 12-pounder
Pilot boat (unspecified)	1	1	9-pounder swivel
Schooner	29	1–18	swivel, 4-lb swivel, 6-pounder, 8-lb carronade, 9-pounder, 12-pounder, 14-pounder, 18-pounder
Sloop-of-war	3	10–20	Unspecified
Brig	19	1–24	swivel, 6-pounder, 12-pounder, 16-pounder,18-pounder, 24-pounder carronade
Cutter-naval	1	16	6-pounders, 12-pounders, 24-pounders
Corvette	5	18–28	pivot gun, 9-pounder, 12-pounder, 32-lb carronade, 32-lb gunnade, 32-pounder, 36-pounder
Frigate	11	36–64	unspecified
Brig-of-war	1	74	unspecified
Ship	3	68–74	unspecified
Steamer	1	4	unspecified

The cannon (Artifact no. 400) recovered from Area 4 of the wreck site is currently undergoing conservation at the CRL (Figure 5.40). The button of the cascabel, became detached from the artifact upon its arrival at the conservation facility while being moved into a storage vat. The removal of extraneous concretions from the cannon revealed the end of the muzzle was plugged with a tampion (artifact no. 400-4). A long, tightly braided rope 24 inches (61.0 cm) in length was inside the bore of the cannon (artifact no. 400-5). The 0.35-inch (0.88-cm) diameter rope is comprised of three strands, each measuring .18 inches (0.45 cm) in diameter. The rope is incomplete and broken at one end. No other artifacts were contained within the bore.

The absence of wadding, shot, and gunpowder demonstrates that the cannon was not primed for firing. Fragmentary bits of fiber, perhaps fabric (artifact no. 400-6) were also concreted to the touchhole. This material may have been related to the plug for the touchhole. A plug was stuffed into the touch-hole after firing to prevent the escape of gas which might burn out the vent. A plug inserted in the touch-hole when the cannon was not in use kept moisture from accumulating in the bore of the gun.

On 13 September 2007 the cannon was temporarily removed from conservation so that additional mechanical cleaning and technical recording could be conducted by John Hamilton and Amy Borgens. At this stage in the conservation process, almost all of the surface concretion had sloughed from the artifact. Therefore, measurements recorded from the cannon in September 2007 will not fundamentally differ from its eventual post-conservation dimensions.

The cannon measures 5.08 ft (154.84 cm) in overall length. The length of the cannon measures from the face of the muzzle to the rear of base ring (the diagnostic length of measurement) is 4.5 ft (137.16 cm) (Figure 5.41). The diameters of the swell of the muzzle and base ring are 7.23 inches (18.35 cm) and 12.64 inches (32.10 cm), respectively. The bore of the cannon measures 3.73 inches (9.47 cm). The diameters of the trunnions are 3.5 inches (9.1 cm) each. Both trunnions are marked with manufacturing designations. The left trunnion is engraved

Figure 5.40. Artifact number 400: (a) at 4000 feet and (b) during conservation.

2012 CLYDE 1797 and the right trunnion 6 P and 8-2-0 (Figure 5.42). These marks indicated the cannon is a 6-pounder, of 8 hundredweights and 2 quarters (952 lbs) that was manufactured in 1797 by the Clyde Company (Brown 2007). The serial number 2012 indicated its position on the list of Clyde castings. Its length of 4.5 ft (1.4 m) demonstrated that this is a typical gun sold for the merchant market, as it is shorter than the 6-ft (1.8-m) length required for the equivalent-caliber government cannon (Brown 2007). Two features of the cannon also allude to its later eighteenth-century manufacture. The band between the vent and reinforce is flat and less elaborate than earlier examples. The breech and the cascabel also appeared to be modeled after a carronade. These latter characteristics were not adopted by British guns until the late 1780s (Brown 2007).

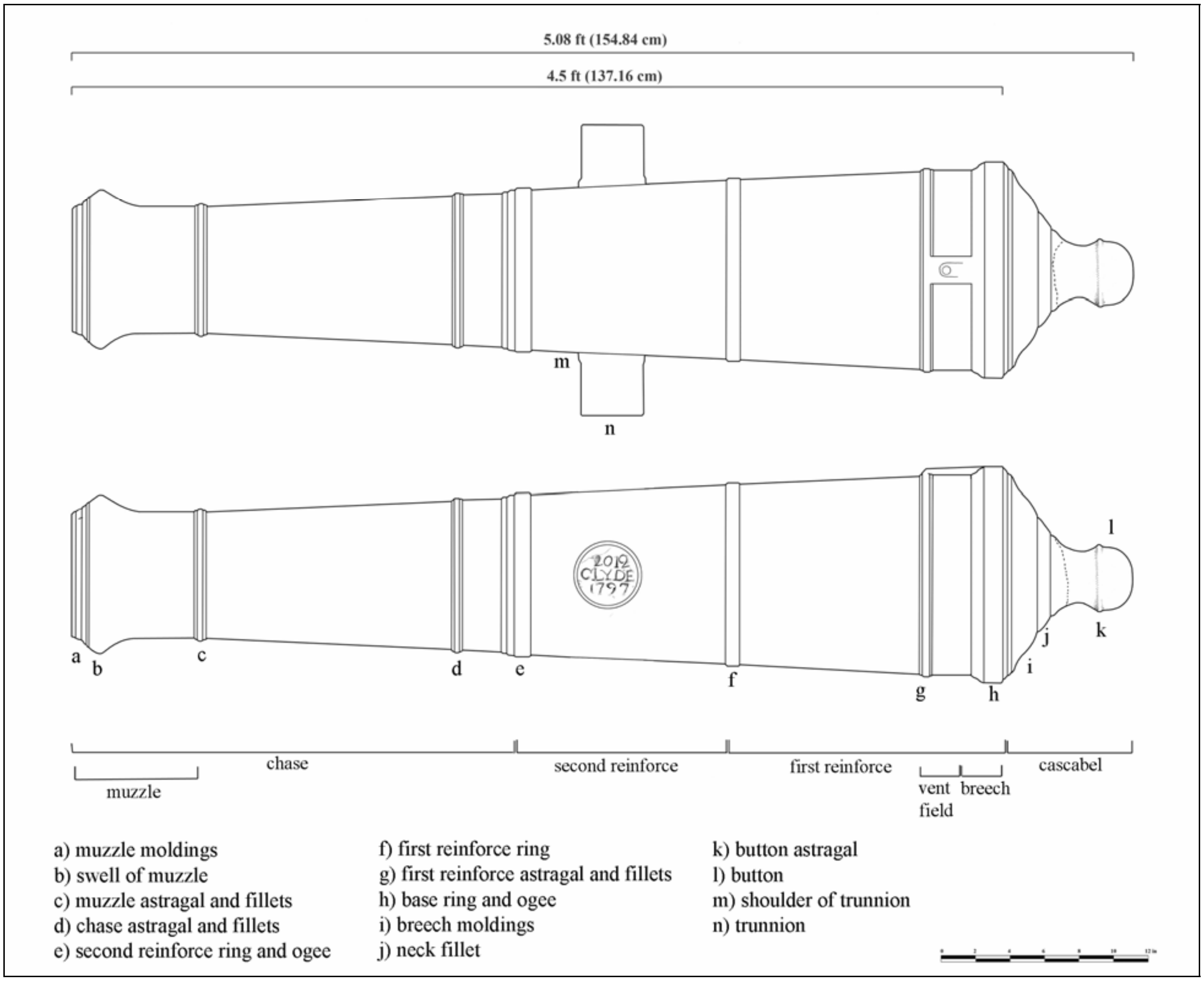

Figure 5.41. Mardi Gras cannon (illustration by A. Borgens; nomenclature from Manucy 1949:89).

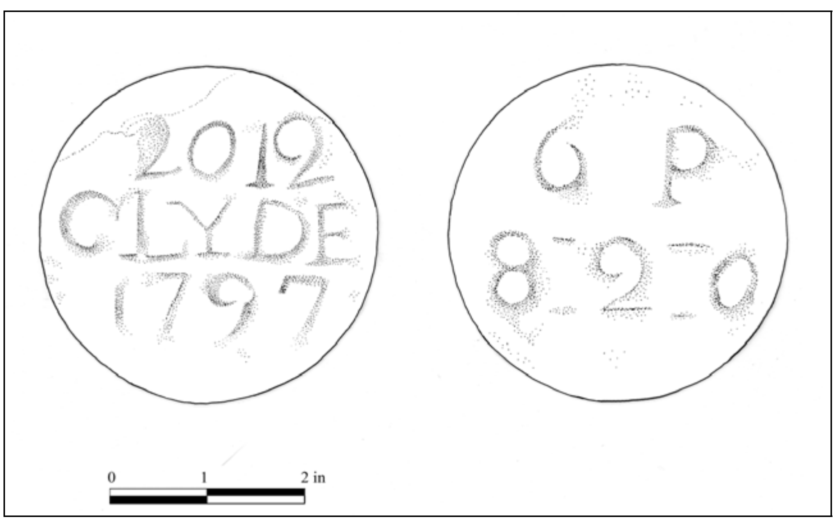

Figure 5.42. Engraved trunnions (illustration by A. Borgens).

Clyde Company, of Glasgow, Scotland, was founded by Thomas Edington in 1786. In 1794 he offered to supply 12- and 18-pounder guns to the British Board of Ordnance. Edington successfully passed the Board's proofs in 1795 for a consignment of 500 tons of iron guns, initiating the company's casting of government arms. Clyde Company manufactured both large- and small-caliber weapons, though specializing in the smaller guns. In addition to producing Board of Ordnance arms, Clyde cast carronades, gunnades, and small-caliber guns for the merchant market. In 1805 Edington left Clyde to form his own ironworks (Brown 2007).

Large extant artillery manufactured by Clyde Company are located at the Barracks, Berwick upon Tweed (1799); the Army Museum in Vienna; Princess Royal Fortress in Australia (a gunnade dated 1804); the wreck of *Pomone* (a 32-pounder carronade, 1803), and two unknown shipwrecks from the Bahamas and New Jersey (gunnades) (Brown 2007). The Clyde weapon at Berwick is a merchant gun dating to approximately 1799. Thomas Edington continued to manufacture this style of merchant gun after establishing his own gun works. An Edington cannon from the Culzean Castle on the Scottish Coast (1813) is similar to those produced during his tenure at the Clyde foundry. The cannon from the Mardi Gras Shipwreck is the earliest example of a Clyde gun Ms. Brown has recorded (Brown 2007).

5.2.6.2 Related Artifact Materials

The tampion (artifact no. 400-5) was used to plug the cannon's muzzle and prevent the accumulation of moisture in the bore. This could be used both when the cannon was stored for a period of disuse or also to prevent seawater from entering an inactive loaded cannon. There is a long tradition of shipboard cannon stoppage. Tampion artifacts have been recovered, *in situ*, from the weapons of vessels such as the Elizabethan Period wreck at Alderney (1592), the vessel believed to be *Queen Anne's Revenge* (1718), *Machault* (1760), and *Monitor* (1862).

Three principal gun carriages types were used to mount muzzle-loading cannon: siege, garrison, and field. Other secondary carriages included those made for carronades or mortars. Garrison carriages were used for land fortifications and shipboard artillery. They were strongly-constructed due to the weight of the guns and also to minimize recoil (Wilkinson-Latham 1973:51). There was little variation in the design of garrison carriages for sea use with the exception that the trucks (wheels) were made of wood instead of iron. This change in material protected the deck and also facilitated repairs, which could be conducted by a ship's carpenter (Bryce 1984:43; Wilkinson-Latham 1973:60). In some examples, the rear trucks could be removed and replaced with chocks. This variation of the carriage, known as the rear chock carriage, reduced the recoil when firing (Wilkinson-Latham 1973:60). Shipboard gun carriages were also equipped with ring bolts and hemp tackle as another means to check recoil in the confined area of the ship's gun deck (Bryce 1984:43). Different types of naval gun carriages are illustrated in Figure 5.43.

Spanish gun carriages of the eighteenth century were more complex than U.S. and English counterparts. The side pieces, cheeks, on Spanish carriages were fashioned from a single piece of timber and required a larger degree of craftsmanship. U.S. and English examples were composed of multiple timbers mortised or jogged together (Manucy 1949:50). The timber used in the construction of the carriage had regional variations. British specification of the mid eighteenth century required dry elm (though some were made of oak), while the U.S. used oak, the French elm, and the Spanish mahogany (Manucy 1949:49).

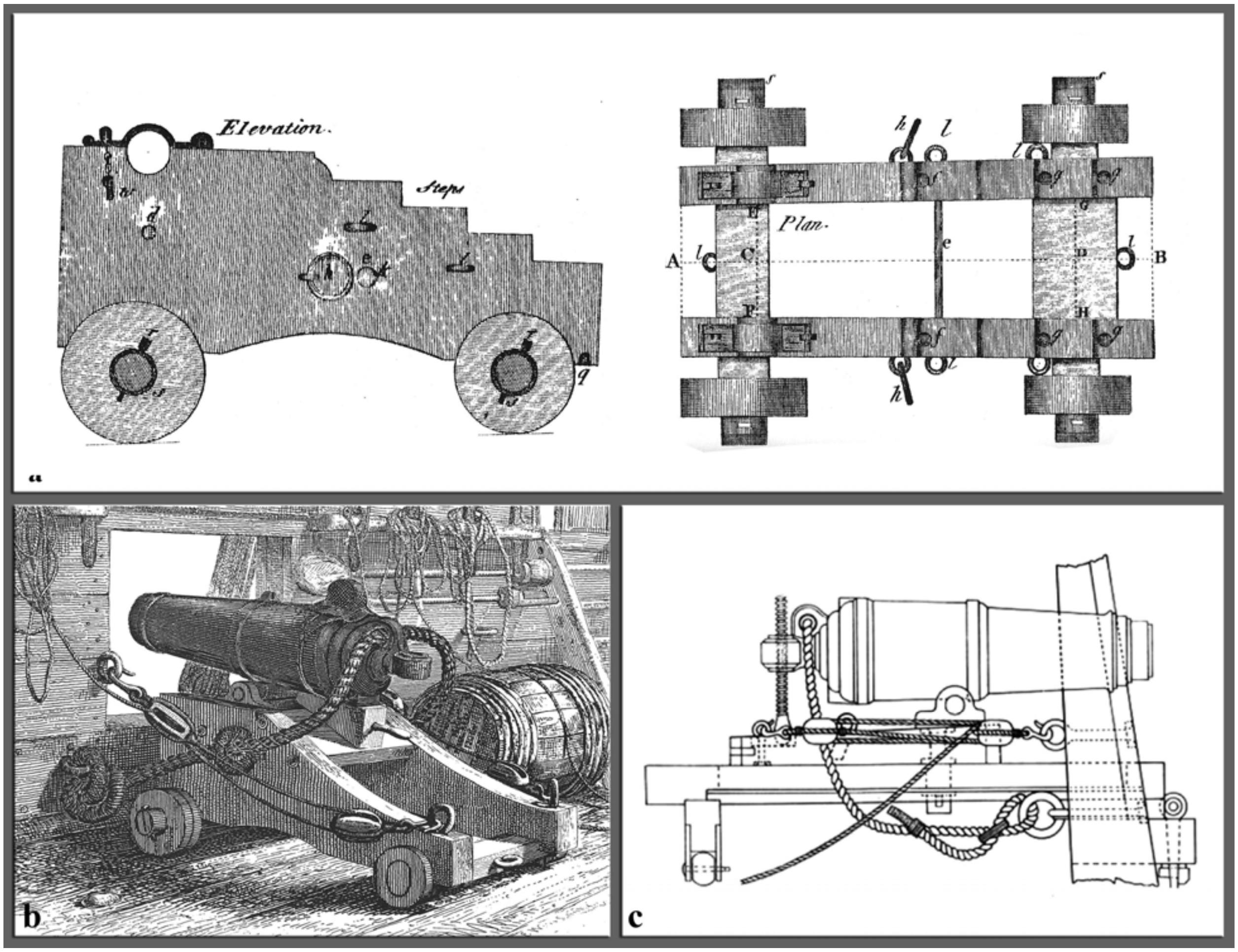

Figure 5.43. Naval Gun Carriages. (a) typical naval carriage (Muller 1995:94 [1780]) (b) early nineteenth-century 12-pounder carronade (Cooke 1989:44) (c) bed and slide mount for a 24-pounder carronade circa 1820 (Clowes 1900:540).

A portion of the Mardi Gras Shipwreck cannon carriage was concreted to the cannon (Figure 5.44). Due to the upside-down deposition of the cannon on the ocean floor, much of the carriage was originally exposed in the water column. It is unlikely that much remains of the fragments on the ocean floor, as the recovered portion shows extensive boring mollusk damage. The fragments were concreted to the cannon at the trunnion and are parts of the carriage cheek and capsquare. The larger fragment, Artifact number 400-1, was heavily-concreted but measures 20.8 in X 11.5 inches (52.7 X 29.1 cm) after cleaning. This concretion contains a capsquare. The smaller carriage piece, no. 400-2, is 11.4 X 6.5 inches (29.0 X 16.36 cm) and was located directly aft of the trunnion channel. It is broken at the juncture between the trunnion channel and carriage cheek. The carriage was constructed of black walnut (*Juglans nigra*). Iron brackets, now missing, reinforced the cheek timbers in the area of the capsquare fasteners. The carriage was inset at the location of each bracket. A small truck of 5.8-inch (14.8-cm) diameter, possibly belonging to this carriage, and a leather-parceled becket for the breeching rope were concreted to the button of the cascabel. A likely reconstruction of the becket is illustrated in Figure 5.45.

The thickness of the waterlogged carriage cheek varies between 3.8 to 3.9 inches (9.72 and 9.88 cm), roughly corresponding to the 3.73 inches (9.47 cm) bore of the cannon. The cheeks are the thickness of the caliber of the gun. A gun carriage was designed to be proportional to the cannon it was supporting (Manucy 1949:49). This was obtained by measuring the distance from trunnion to base ring of the gun, the diameter of the base ring, and the diameter of the second reinforcement ring. The resulting quadrilateral figure was used to fashion a carriage to fit the gun (Manucy 1949:49). The form of the carriage suggested it was a garrison-type carriage commonly used for naval gunnery. A reconstruction of the cannon and carriage illustrate the orientation of the artifacts (see Figure 5.45).

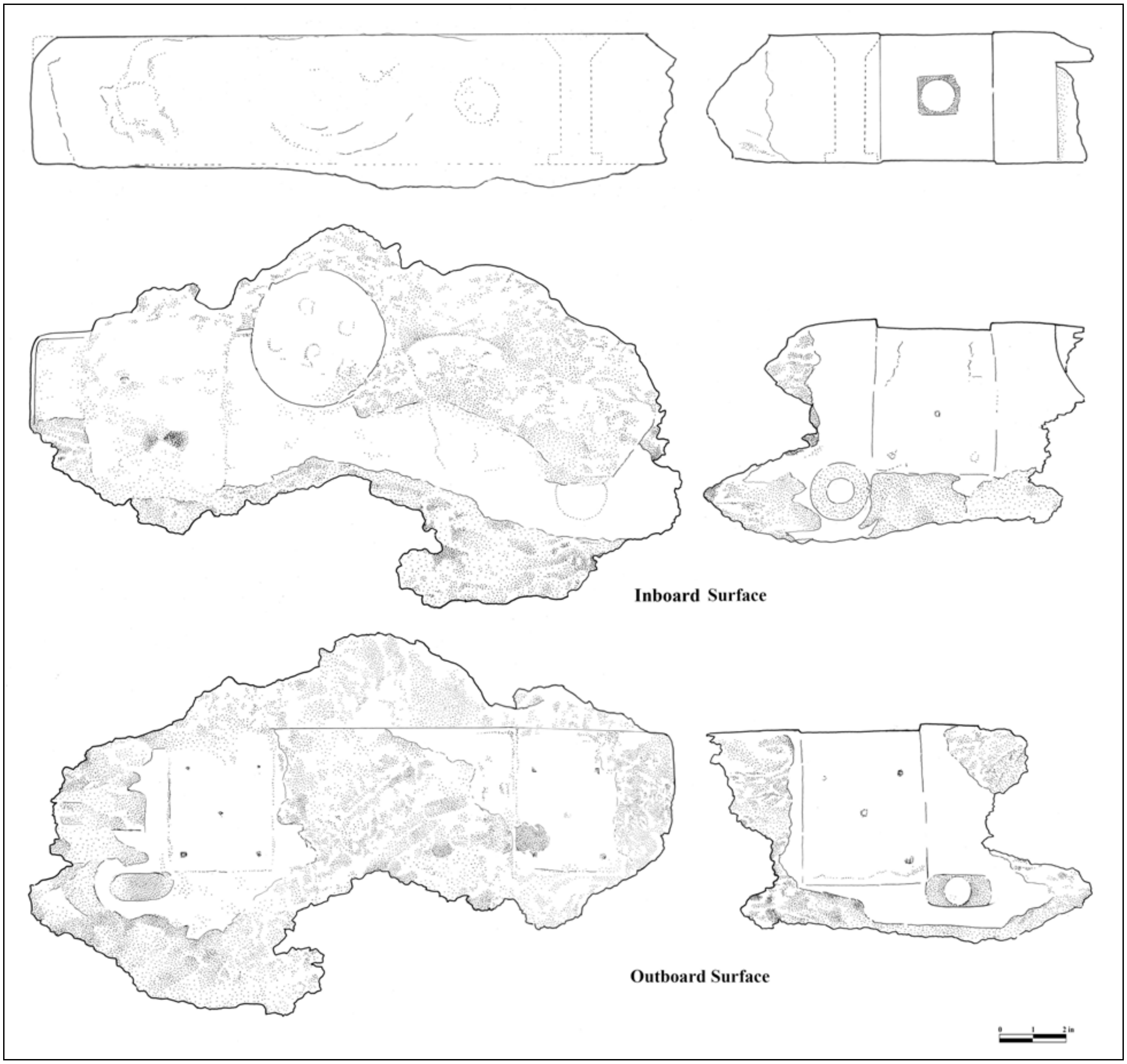

Figure 5.44. Gun carriage artifacts 400-1 and 400-2 (illustration by A. Borgens).

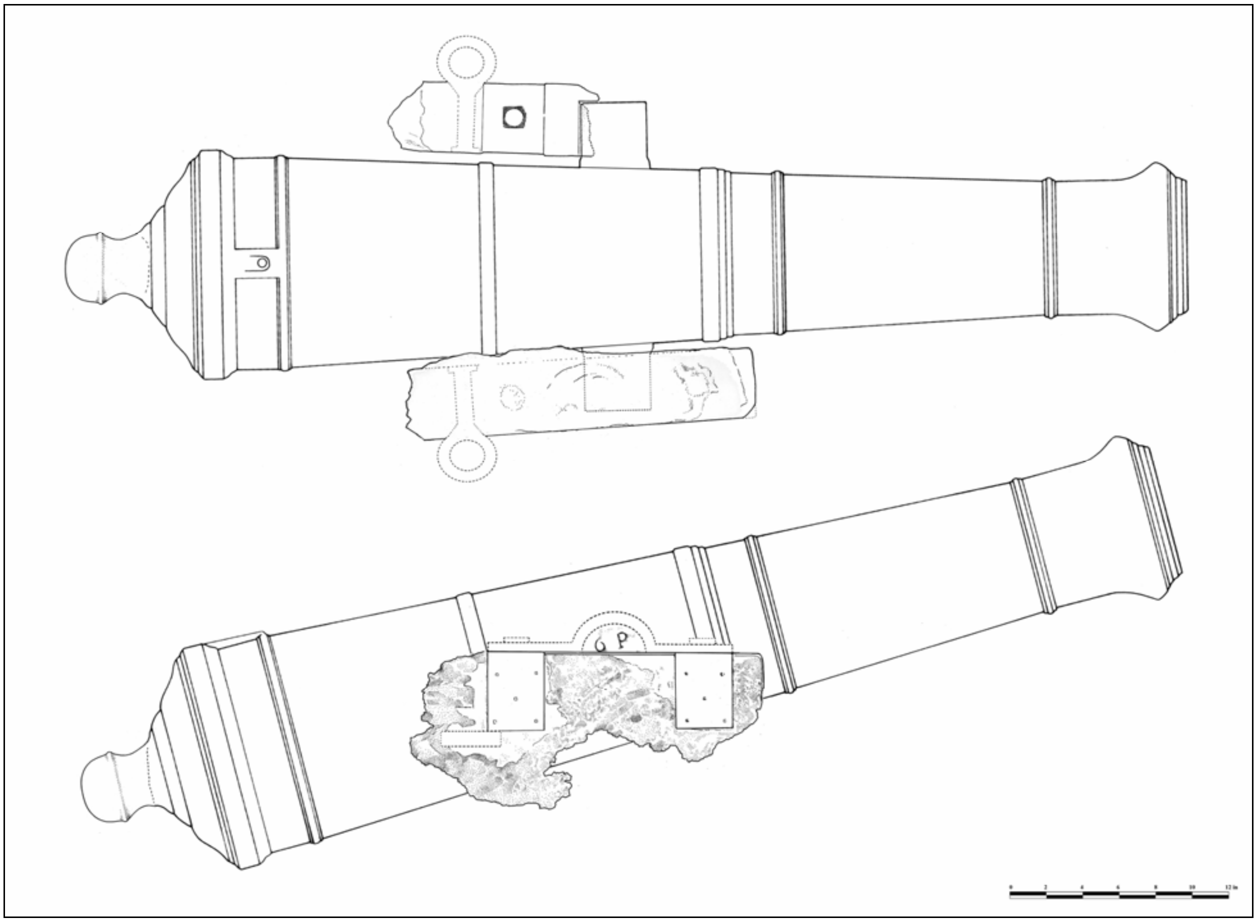

Figure 5.45. Reconstructed cannon and carriage (illustration by A. Borgens).

Three cast iron cannon shot have been retrieved from the stern concretion, and assigned artifact no. 135-2, 135-2.1 and 135-2.2. The largest has a diameter of 3.5 inches (8.9 cm), consistent with those used for 6-pounder cannon. A slightly smaller shot at a diameter of 3.2 inches (8.1 cm) is closer in size to those used for a 5-pounder cannon (Wilkinson-Latham 1973: 26). The smallest of these (artifact no. 135-2.2) has a diameter of 2.8 inches (7.1 cm), indicating it was a 3-pounder. Multiple iron and lead shot are still contained throughout the concretion, including barshot (Figure 5.46). While not fully excavated, the estimated diameters of exposed shot indicate use for different caliber cannon. A second area of assorted cannon shot was located in Area 3, next to the bulkhead, and conjoined to the musket box (Figure 5.47). These shot were not removed from the wreck site. Both small-and large-caliber iron cannon shot were observed within the vicinity of the musket box.

The barshot (two identified, artifact nos. 135-27 and 135-78) was discovered in a portion of the concretion that was separated during the movement of the concretion to the CRL. The barshot has not been completely extracted, so it is not known if these are complete examples. Barshot was made in several different forms and was employed to cut the rigging and demast an adversary vessel. It is possible that fragmentary shot from this concretion was used as langrage (loose objects fired from a cannon as anti-personnel shrapnel).

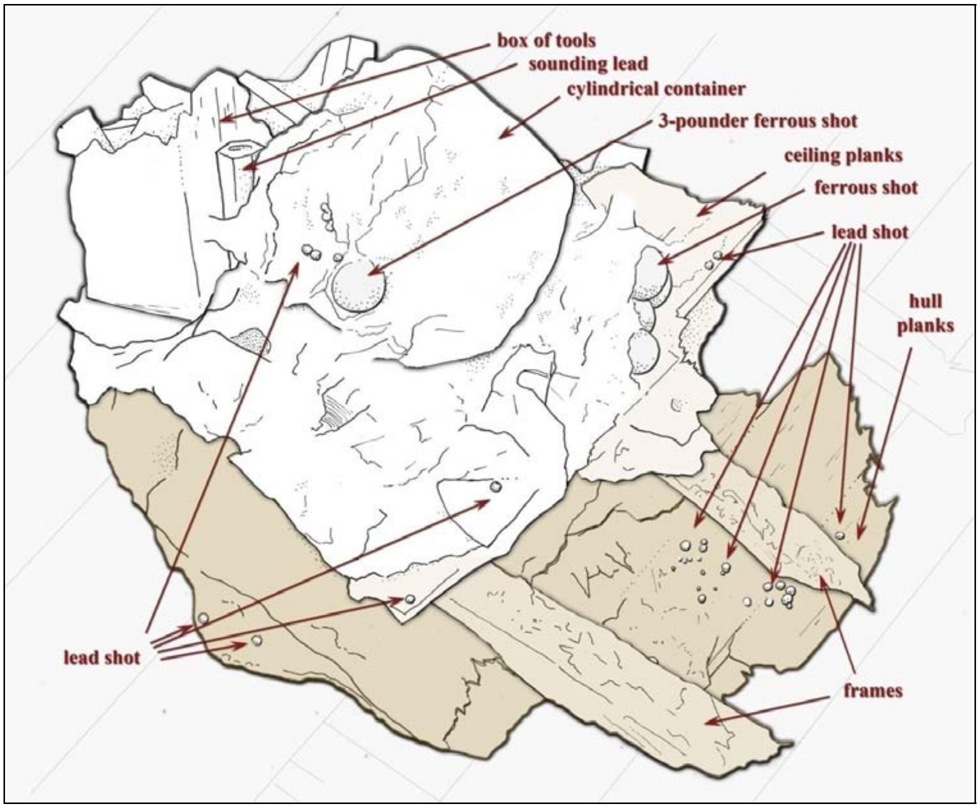

Figure 5.46. Sketch of stern concretion (artifact no. 135) showing the distribution of shot (illustration by A. Borgens).

Figure 5.47. Arrangement of iron shot.

5.2.6.3 Small Arms

One of the most intriguing artifacts from the Mardi Gras Shipwreck, a box of mixed arms and edged weapons, was not recovered from the site. Such weaponry can contain important diagnostic information such as national affiliations, dates, manufacturers, and military designations. However, video imagery and underwater still photography have provided some general information regarding the box contents. The longarms contained within the box are of varying lengths and have furniture manufactured of both ferrous and cupreous metal. This indicates that the longarms represent a variety of weapons that could vary by date, general type (muskets, carbines, etc), and nationality. In addition to the longarms, pistols and edged weapons are also present. This mixed assemblage may be indicative of civilian shipboard arms or a cargo of assorted pieces carried by gunrunners and privateers.

In the Gulf of Mexico, a vessel with a collection of arms was not unusual. The economic damage levied against commercial shipping in the region by privateering and international warfare forced European and U.S. naval intervention throughout the early nineteenth century. The United States and Britain, still malcontent after the American Revolution and War of 1812, often supplied weapons to insurgent Latin American revolutionaries; each trying to achieve supremacy or favor in the Gulf. Guns were an important tool for establishing and maintaining an autonomous principality. Without this precious commodity, a military coup or uprising was largely ineffectual. For example, an early liberation of Cartagena in 1815 by Louis Michael Aury could not be sustained because the insurgents lacked gunpowder, thus rendering the flintlock arms useless. Aury was forced to retreat and transport over 2000 Cartagena refugees to Haiti before the approach of the Spanish fleet (Faye 1941:614-620). It is no surprise that one of the major financial enterprises undertaken in 1823 by the newly independent Mexico was the purchase of weapons and ships from England (Castañeda 1970:304).

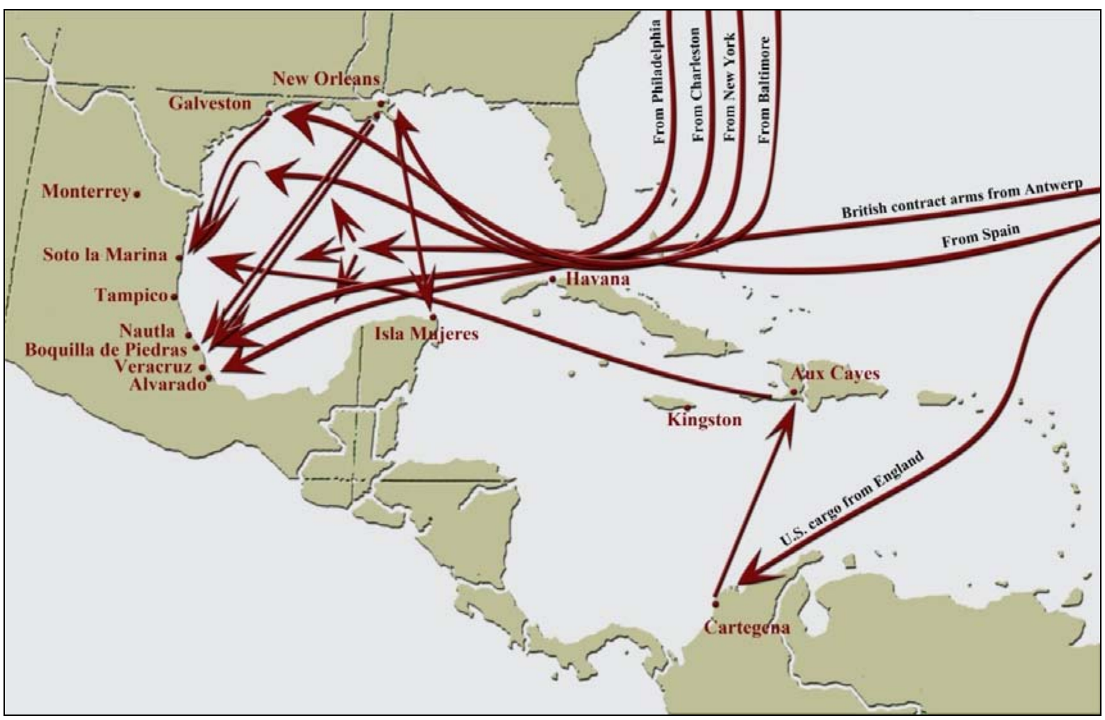

Figure 5.48. Focal points of the weapons trade. Graphic shows directionality and not specific routes (illustration by A. Borgens).

Large quantities of weapons were transported across the Gulf and the Caribbean from Spanish, U.S., English, and German origins (Figure 5.48). Regulations established in 1772 required Spanish colonial regiments in New Spain to carry standardized military arms. According to Title Four of the Regulations, each presidio soldier was to be armed with a broadsword, lance, shield, musket, and pistols. The regulation musket was to have a .66-caliber barrel with a Spanish-style (*miquelet*) lock (Oficina de la Aguila 1965:21 [1834]). According to Faulk, despite the regulation's insistence on weapons with Spanish locks, weapons of French and British manufacture were commonplace (Faulk 1971:56). In 1817, for example, Joaquín de Arredonde allocated 100 new English weapons along with 30,000 shot and 1200 gunflints to the Spanish governor of Coahuila (Martínez 1817).

Spanish attempts to arm its under-equipped solders were futile at best. The new arms mandated in the 1772 Regulations were only just being delivered, on the frigates *Princes* and *Aranzazu*, in March of 1790 (Sánchez 1990:74; Faulk 1971:56). In spite of the insistence on regulation arms, the predominant firearm used by the presidio soldier was the Spanish *escopeta*. There were many variations in barrel length and stock design, but, frequently, this weapon was a smoothbore muzzle-loading musket or carbine with a Catalan stock and a Spanish (miquelet) lock (Brinckerhoff and Faulk 1965:73).

Many of the forces in New Spain were armed with the Model 1757 and 1791 military muskets, including Spanish expeditionary forces, colonial regiments, and militia in Mexico, Louisiana and Florida (Lull and Hefter 1964:79–80; Brinkerhoff and Chamberlain 1972:18). The 1757 musket was a .69-caliber weapon with an overall length of 59 ¼ inches (150.5 cm) that was an almost direct copy of the French Model 1756 military musket. The barrel was octagonal in shape at the breech but tapered to round. The flat lockplate was French in design with a ring jaw screw (Pérez 1999:35; Brinkerhoff and Chamberlain 1972:28–30).

The Spanish conducted trade with Native American tribes who carried superior-quality arms purchased from traders. Prior to 1763 and the defeat of the French in North America, trade guns were French in manufacture, however after 1763, British traders supplied the trade arms (Brinckerhoff and Faulk 1965:90). In 1786, the Spanish traded Spanish arms as an attempt to control the distribution of weapons to the tribes. The supply of munitions, in addition to spare parts for maintenance of the arms, could only be acquired from the Spanish who were determined not to provide these services once the arms were traded. It was believed the unfamiliarity with the miquelet-lock muskets would cause tribes to be less effective with the weapons.

This theory did not work in practice, as the tribes refused the arms. By the 1790s, Spain traded weapons of English manufacture (Russell 1960:37). The Spanish government issued permits to traders such as The Company of Explorers of Upper Missouri (in 1795) and Auguste Choteau for the establishment of trading posts in New Spain (Hanson 1992:8). Surplus Brown Bess carbines and muskets were frequently sold and used by the Spanish. These firearms furnished much of the supply for the Southwest (Hanson 1992:8). It is unlikely the traders of New Spain contracted for English "Northwest guns," which were manufactured for trade in the New World. These weapons were new and, thus, were governed by import restrictions and would have sold best where there was a ready market (Hanson 1992:8).

New Orleans, as well as other important Atlantic ports, was instrumental in providing arms to Latin America and neighboring territories. This U.S. aid, though not publicly acknowledged, was not concealed. In late 1815 and early 1816, a barrage of arms supplies emanated from New Orleans and other sources. General Simon Bolívar organized another expedition to liberate Venezuela in early 1815. A large supply of munitions was expected from England, though Bolívar attacked Cartagena during March 1815, months before its arrival. The English arms were transported on the U.S. vessel *General Gates*, which traveled to England and then sailed under the British registry name of *Dardo*. *Dardo* arrived at Cartagena in July 1815 with a cargo that included 15,000 European muskets, 400 carbines, 400 sabres, 200 pairs of pistols, 20,000 pounds of powder, and 3 printing presses (demonstrating that the pen is indeed mightier than the sword) (Slatta and De Grummond 2003:130; Faye 1941:616–617). By the time of its arrival, Bolívar had already signed a treaty and departed for Jamaica. Luis Brión, refused to sell *Dardo's* weapons to the remaining insurgents, commanded by Aury, as they did not have funds. *Dardo* departed for Haiti on 11 November, where the cargo was transferred to the Royalist arsenal. Two thousand of the muskets were later released, transported on the vessel *Popa*, and sold on the Mexican coast in January 1816 (Faye 1941:616, 621).

Unofficial U.S. military support of insurgent groups was also provided by Commodore Daniel Patterson of the U.S. naval station at New Orleans. In September 1815, José Alvarez de Toledo and several Americans departed New Orleans on Lafitte's privateer *Petite Milan* and took onboard an arms cargo (containing 1,200 muskets) either further downstream or at Barataria. The vessel rendezvoused with the U.S. vessel *Firebrand* and arrived off Boquilla de Piedras on Oct 6, 1815. José Manuel Herrera had $28,000 in specie, though he refused to pay for the cargo when it was delivered, instead offering to produce the funds when he returned to New Orleans (Warren 1938a:208; Davis 2005:262). *Petite Milan* would continue to be used to ship munitions to Mexican revolutionaries until her seizure and auction in January 1816 (Davis 2005:264).

Patterson would again support insurgent activities in December 1815, outfitting the ketch *Surprise* to carry arms, a printing press, a proclamation, and dispatches urging the Mexican Congress to concentrate on the capture of Tampico and Veracruz. This vessel returned to New Orleans on 20 December with $13,000 to be used to fund the revolution (Warren 1938a:208; Davis 2005:263, 280). Patterson not only used *Firebrand* as a dispatch boat for the Mexican Revolutionaries, he also offered to equip the Baratarian schooner *General Bolívar* for service. *Bolívar* was sold to Abner Duncan and it conducted trade with the insurgents under the guise *General Jackson*. Patterson likely had a share in the profits (Warren 1938a:208).

Patterson, in late 1816, created a small international incident by again allowing the U.S. vessel *Firebrand* to escort *General Jackson* to Boquilla de Piedras. The cargo could not be offloaded at Boquilla so the vessels sailed in search of an insurgent port. The two vessels were attacked and captured by the Spanish squadron on 27 August 1816. The demasted *General Jackson* was able to escape, though the vessel was seriously damaged; the captain of *Firebrand* was detained for 24 hours. The incident was seen in the United States as an unauthorized attack on a U.S. vessel (Warren 1938a:211–12).

In August and November (1816) *General Jackson* and *Eugene* (under the guise *Rebecca*) transported more arms and supplies from New Orleans to Boquilla de Piedras. The cargo of *General Jackson* included 1200 muskets and 4 field cannon. *Rebecca* likewise carried 10 cases of muskets/rifles, 36,000 gunflints, 80 kegs of powder, 2 cases of sabres, and a cannon (Davis 2005:303, 309).

In November 1816, Pierre Lafitte had 500 worn and damaged muskets from the Battle of New Orleans repaired in New Orleans in order to ship them to Mexico. Lafitte took the weapons to a local gunsmith, Theon Barbaret, for repair, stating they were for General Humbert. He had difficulty arranging transportation for the weapons (Davis 2005:265); he intended to transport them to Mexico, but Herrera and Toledo were depleted of funds.

In addition to assisting and supplying Mexican insurgents, Pierre and Jean Lafitte were also employed as Spanish spies, providing details of the planned expeditions. In November 1816, Pierre Lafitte informed 'Spanish spymaster,' Antonio de Sedella, of a contract for 29,000 muskets arranged between Toledo and New Orleans merchants Vincent Nolte, Abner Duncan, John B. Gilly and Thomas Hartman for $12 apiece. These weapons were to be transported along with 9000 saddles to the Mexican coast (Davis 2005:276).

More U.S-purchased arms would be transported to Mexican sources from New York and Baltimore. José Manuel de Herrera was attempting to establish an Independent Mexico at Galveston Island that could be used to stage a military expedition against Spain. Aury was appointed governor of the Mexican island. Francisco Xavier Mina, on board *Calypso*, arrived at Galveston in November 1816. *Calypso*, along with arms, munitions, supplies, and $110,000, was provided by Baltimore merchants to assist Mina with the expedition focused on Soto la Marina. More U.S. support for Mina's expedition arrived from New York on board the schooner *Ellen Tooker* in January 1817. *Ellen Tooker*, bound for Nautla, joined Mina's flotilla (Warren 1938c:19). The cargo contained 84 cases of muskets, 52 kegs of musket flints, 20 cases of musket balls, 792 kegs of powder, 25 barrels of pitch, 15 cases of sabres and pistols, 12 cases of cloth, 1800 knapsacks, 1800 canteens, and 25 tons of iron (Faye 1939:1091).

In the months prior to the Treaty of Cordóba, which granted Mexico independence on 24 August 1821, another shipment of arms was transported from New Orleans to the Gulf of Mexico (Sánchez 1990:140). The vessel *Nancy Eleanor* sailed from Charleston to New Orleans in February 1821. *Nancy Eleanor* offloaded her cargo and, after port inspection, picked up additional crewmen and a cargo of provisions and arms. Pierre Lafitte transported the cargo to Isla de Mujeres (off the Yucatan Peninsula) in March, then loaded a cargo of salt and dyewood and returned to Charleston (Davis 2005:447).

In 1822 and 1823, the newly-independent Mexico pursued arms supplies through both U.S. and British sources. Initial contracts were negotiated with Hawks and Hanna in October of 1822 for the purchase of guns, ammunition and clothing in the United States. During the previous month, José Félix Trespalacios sent Juan Almonte to purchase supplies at New Orleans. In March 1823, Almonte communicated his failure to purchase the arms; however, another separate shipment of U.S. manufactured arms was purchased for the Mexican military in 1823. This cargo of naval stores was transported on the American frigate *Fortina* from Philadelphia (Jackson 2003:22; Bidwell 1960:121).

The difficulty of purchasing arms in the United States, caused in part by the rejection of the Mexican currency, may have prompted the Mexican government to pursue loans from England for the purchase of arms and naval vessels. The Mexican Government under Guadalupe Victoria considered loans offered by the London House of Barclay, Herring, Richardson, & Company and B.A. Goldschmidt & Company. The Barclay proposal was accepted on 18 August 1823, extending Mexico a loan of £2,500,000 at the rate of £100,000 a month (Turlington 1930:30–31). A draft of the contract for the purchase of fusils, carbines, pistols, and swords from Barclay, Herring, Richardson & Company was transmitted on 5 December 1823 (Turlington 1930:30–31).

In 1824, Mexico began to acquire the new arms. Of the arms contracted with Barclay, Herring, Richardson, & Co., 7500 muskets and 200 swords were to be shipped from England on 29 July 1824 (de Michelena 1824). On 15 August 1824, the ship *Prince of Wales* departed from Antwerp, Belgium for Alvarado, Mexico, laden with 30 boxes of muskets (Gorostiza 1824). These muskets were comparable to those of the Tower of London and were additionally described as the best that Mexico had yet acquired. A similar shipment of the arms received in Columbia was described as excellent (de Michelena 1824).

It is likely these British-contract arms were surplus military muskets that were in abundant supply following the end of the Napoleonic wars. Faced with the onset of war in 1793, the Board of Ordnance reviewed its weapons stores, and it determined the supply was insufficient for the needs of its military. In order to supplement the shortage of arms, the Board of Ordnance purchased the collection of Windus Pattern muskets from the East India Company. To facilitate arms supplies and maintenance, British contractors were instructed to manufacture the British military muskets to conform to the East India Company design. At least 676,800 of these India Pattern arms were produced by the East India Company and approximately 2,800,000 were manufactured for the British Board of Ordnance (Harding 1997:50). The India Pattern musket was a .76-caliber, smoothbore musket with an overall length of 55 inches (139.7 cm). The flintlock lock had both a swan-neck cock (1771–1812) and ring-neck cock (1813–1818) (Harding 1997:50). By November of 1817, the Board of Ordnance was offering surplus India Pattern arms for sale to the East India Company; however, the East India Company refused to purchase the guns (Oriental and Indian Office Collections 1817). The weapons cargos Mexico acquired from Britain likely contained outdated models that were more affordable to the economically-pressed Mexican government (Pegler 2001). India Pattern arms may have been one of the principal arms types in Latin America in the early nineteenth century.

New Orleans gun merchants likely traded a variety of arms types, including the Spanish military arms used within the region. A surplus of muskets and other weapons may have become available following the U.S. victory at the Battle of New Orleans in January of 1815. Weapons used in the conflict included the British East India Pattern muskets, the British Baker rifle, the U.S. Model 1795 Springfield musket, older model British Brown Bess muskets, Kentucky/Pennsylvania rifles, Harpers Ferry pistols, British Dragoon pistols, old Spanish shotguns, fowling guns, and assorted other arms (Meuse 1965:16–22, De Grummond 1983:120). Personal arms might also have included British, French, American, and German military muskets carried into the region by settlers following the American Revolution.

The wreck of a small vessel off the Texas coast, though later than the Mardi Gras Shipwreck, may be indicative of the large variety of arms, both military and civilian class, available on the open market at New Orleans in the early part of the nineteenth century. The vessel is believed to be the U.S. schooner *Hannah Elizabeth*, which sank in 1835 while *en route* from New Orleans to Matagorda Bay, Texas. She was laden with arms for Texas revolutionary troops (Borgens 2004). The cargo consisted of sabres, bayonets, lead, and cannon shot, in addition to British and Spanish military muskets, some of which predated the voyage by as much as 75 years (Borgens 2004). The vessel carried a variety of longarms representing at least four distinctive types: the British Short Land Pattern (ca. 1769–1794), the British East India Pattern (ca. 1809–1815), the 1757 model Spanish military musket (ca. 1757–1791), and an English trade pistol (ca. 1800).

As the box of mixed arms from the Mardi Gras Shipwreck still resides on the ocean floor, only general features can be discussed. The thickness of the concretion on the weapons makes it difficult, if not impossible, to recognize diagnostic features such as the firearm furniture. The weapons box contains an assortment of longarms, at least seven pistols, and two edged weapons. The variety and types of arms it contains could be diverse, as demonstrated by the regional use of weapons of the time.

Table 5.4

Firearm Measurements

Nationality	Model	Type	Date	Length (in)	Reference
England	Baker	Rifle	1802	46.0	Harding,1997:170
England	Light Infantry	Carbine	1760	57.0	Baily 1997:104.
England	Eliot Light Dragoon	Carbine	1760	43.3	Baily 1997:104.
England	Short Land Pattern	Musket	1769	58.0	Neumann 2001:52.
England	Windus (India) Pattern	Musket	1771–1818	55.0	Harding 1997:50
France	Charleville	Musket	1763	59.5	Fuller 1930:37
France	M 1763	infantry musket	1766	60.5	Ahearn 2005:189
France	M 1773	infantry musket	1773	60.5	Boudriout 1997:121
France	M1781	Carbine	1781	53.0	Boudriout 1997:157
Germany	commercial	Musket	circa 1742	56.8	Ahearn 2005:214
Prussia	M 1780/1787	infantry musket	1780s	57.7	Schmidt 2003:50
Prussia	M 1787	rifled sharpshooter	1787	47.6	Schmidt 2003:50
Prussia	1809	Musket	1809	56.5	Schmidt 2003:50
Spain	1752 (1757)	Fusile	1757	59.3	Brinkerhoff and Chamberlain 1972:28-30
Spain	Model 1792	Musket	1792	60.3	Rubí 1990:161–162.
Spain	Model 1802	Carbine	1802	46.5	Rubí 1990:162–163.
United States		Fowler	circa 1740	60.8	Ahearn 2005:108
United States	George Shroyer	Rifle	circa 1775	58.3	Shumway 1980:408
United States	Springfield Model	Musket	1795	60.0	Fuller 1930:37

The approximate size of the weapons crate, extrapolated from scaled underwater photography, is 5 X 1.6 ft (150 X 50 cm). This container could accommodate longarms less than about 60 inches in length. A majority of the longarms produced in the later part of the eighteenth and early nineteenth century could feasibly have been carried in a box of this size. A sample of arms measurements is included in Table 5.4. Firearms were manufactured in a variety of sizes, though there are some generalities regarding the lengths. Muskets manufactured during this period could range in length from 55 to 60.5 inches (139.7 to 153.7 cm). Carbines, a portable

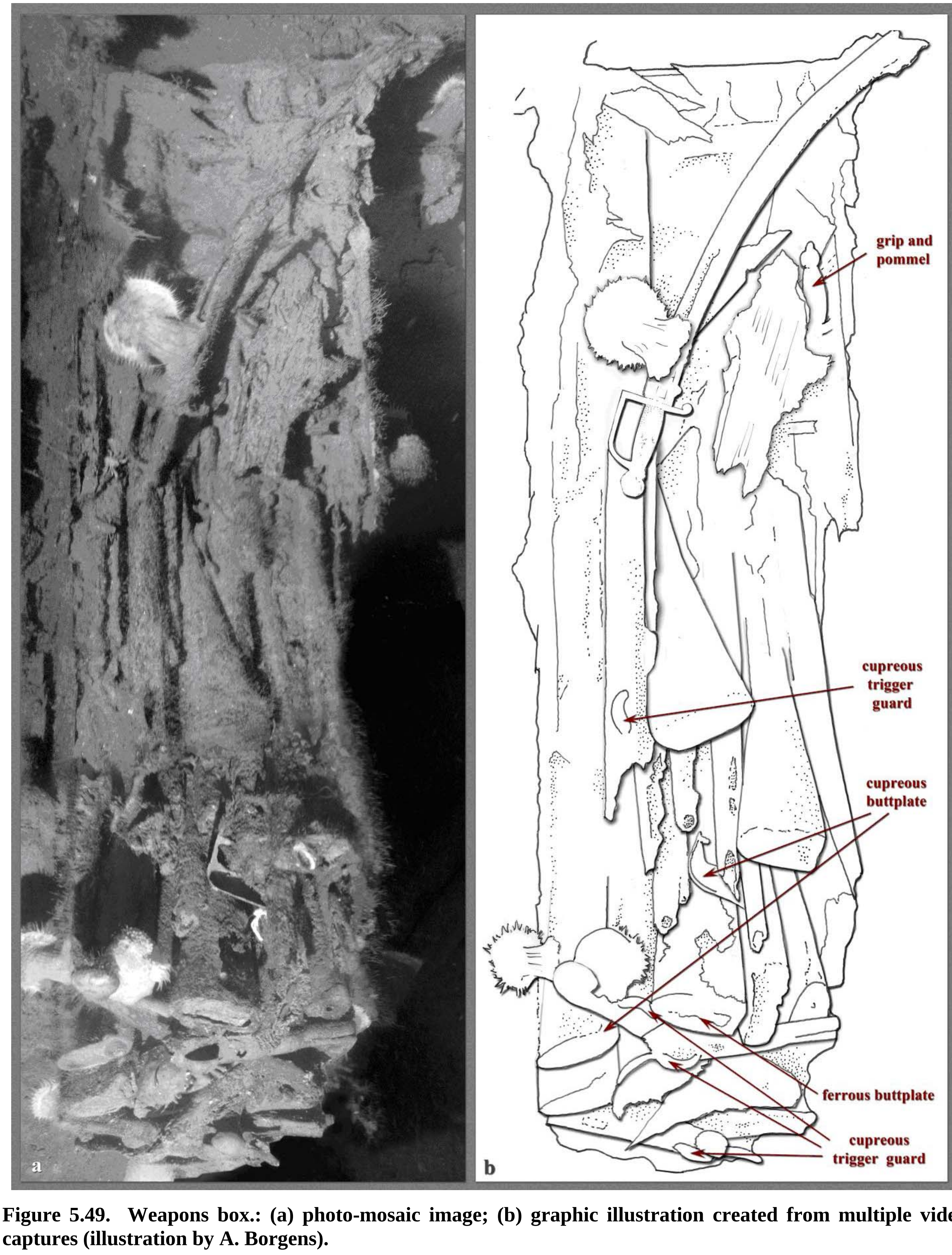

Figure 5.49. Weapons box.: (a) photo-mosaic image; (b) graphic illustration created from multiple video captures (illustration by A. Borgens).

firearm produced for cavalry, were usually a much smaller longarm, measuring between 43 and 53 inches (109 to 135 cm), though larger examples did occur. Rifles were typically smaller weapons, sometimes corresponding in size to the carbine. American non-military rifles were usually longer weapons, with variable lengths.

Figures 5.49 and 5.50 illustrate the orientation of the weapons within the box, demonstrating the various lengths of guns that were packed. Some of these weapons extended the length of the box, although at least one example is much shorter (<47 in [120 cm]), indicating a carbine or rifle. The longarms appear to have been packed end-to-end (Figure 5.49). The assorted arms in the top of the box appear disorganized, possibly due to the nature of its original deposition. A collection of pistols is at the south end and the edged weapons are perhaps intermixed within the box or packed to the east side.

The box does not rest horizontally on the ceiling planking, but abutted it at an angle (Figure 5.50). The juncture between the box and the ship itself is heavily concreted, though it appears to have become lodged into the ceiling planking and rests against a longitudinal support timber. This area of the wreck is heavily damaged, with much of the ceiling broken, compressed, or collapsed. The west side of the container is concreted to a bulkhead, separating this artifact from a large encrustation containing munitions such as iron shot. A large variety of artifacts were on the east side of the box, including ceramics, bottles, and buttons.

An indication of the number of arms contained within the box can be deduced from reviewing bills of lading for arms cargos. For instance, bills for muskets purchased from New Orleans in the 1830s demonstrated that approximately 20 guns were packed within a crate. An assorted cargo of arms transported on the vessel *Tamaulipas* in 1836 were packed by weapon type, including 22 cases of U.S. muskets (20 per crate), 3 cases of carbines (33 per case), one case of 50 pistols and one case of 75 sabres (Hall 1836a). In 1836, Edward Hall shipped two more cases of arms for the Texas cause, this time purchasing 48 English Tower muskets (24 per case) (Hall 1836b). A contract for weapons purchased for the Texas Republic in 1840 included 860 muskets (43 cases), 640 Tyron muskets (32 cases) and 250 Jenk's rifles (13 cases); all of these longarms were packed 20 per case (Hockley 1841).

At least 17 longarms are visible in the photographic images of the weapons box produced during the investigation of the site. Figure 5.50c demonstrates that 6 or 7 arms are stacked atop one another. The size of the box suggests that at least 18 to 21 firearms of various sizes may have been stored within the crate, in addition to at least two edged weapons and seven pistols. Cargos of arms in the region could vary anywhere from 10 to 84 cases (Davis 2005:309; Faye 1939:1091). Although this is a small quantity of arms, possibly indicative of a shipboard supply, a cargo of only two boxes is historically documented (De Grummond 1961:111; Rose 1961:154). It is unknown if multiple cases of arms were originally on this vessel.

One loose buttplate, artifact no. 229 (Figure 5.51), was located directly under the weapons box and recovered from the shipwreck. The cupreous butt plate measures 2.19 inches (5.56 cm) across the butt with a tang length of 5.75 inches (14.64 cm). The length of the butt from the heel to the toe is 4.37 inches (11.10 cm). This artifact is Germanic-Dutch in origin and dated to approximately the last half of the eighteenth century. The buttplate is similar in type to those frequently used on Germanic mercenary arms during the American Revolution. The flattened central facet of the tang indicates the butt plate was manufactured in Potsdam, Germany (Lea 2007). Frederick the Great heavily relied upon the Potsdam arsenal to supply the troops

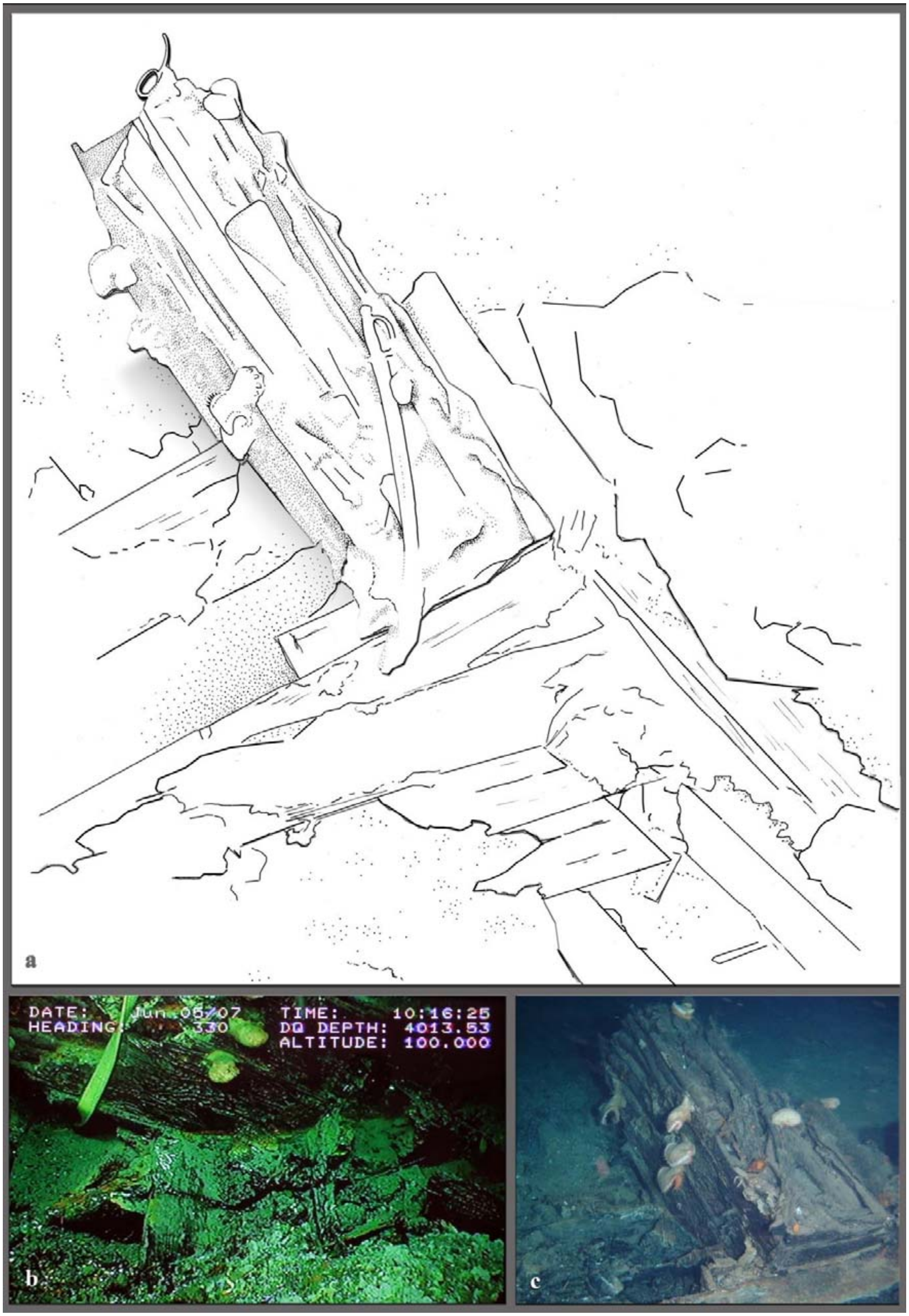

Figure 5.50. Orientation of weapons box: sketched from video (a), depicting lower corner (b), and as recorded in video (c) (illustration by A. Borgens).

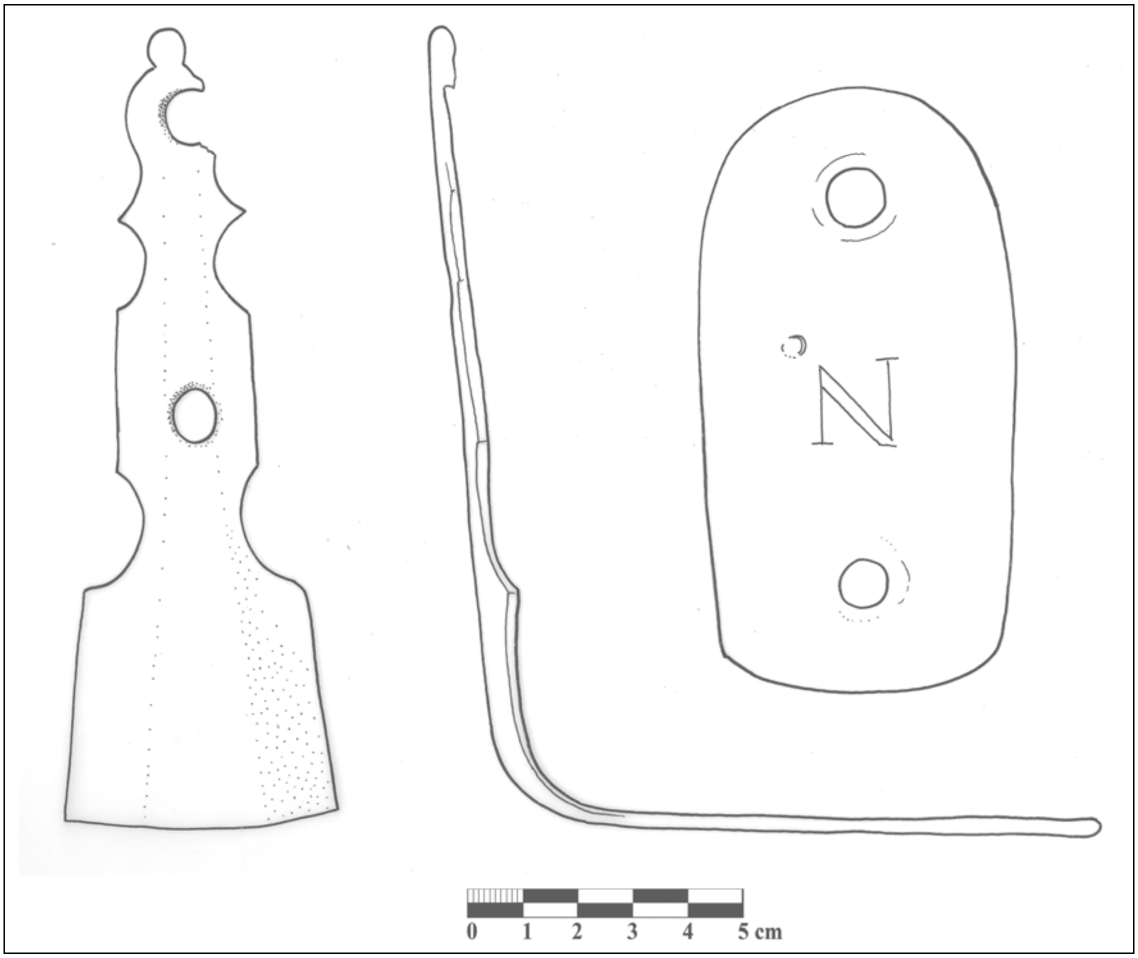

Figure 5.51. Butt plate (artifact no. 229) (illustration by A. Borgens).

furnished to England for fighting in America (Neumann 1967:36). Bill Ahearn (2005:217) contends that Prussian troops were not sent to America; though these weapons may have been supplied to the Brunswick Grenadiers. Mercenaries provided from other locations such as Brunswick and Hesse-Kassel did not have their own manufacturing facilities and therefore carried a mixture of Dutch and Prussian patterns (Neumann 1967:36).

The buttplate is engraved with the letter "N". Dutch buttplates were sometimes marked with letters engraved into the face, the meaning of which is unknown. The "N" mark on artifact number 229 is nearly identical to that of an eighteenth-century Dutch musket in the Colonial Williamsburg Collection and illustrated in Ahearn (2005:Figure 442). An examination of Germanic pedigree muskets used in the American Revolution has demonstrated that these arms are very similar to the 1740 Prussian Infantry musket. The locks for the Prussian Infantry muskets were produced by the Potsdam arsenal while the barrels and furniture were made by the Spandua manufactory in Berlin, where the arms were assembled (Ahearn 2005:217–219). An example of a buttplate similar to artifact no. 229 is found on a German rifled flintlock carbine (ca. 1770), and a Dutch military longarm (ca. 1760) (Figure 5.52).

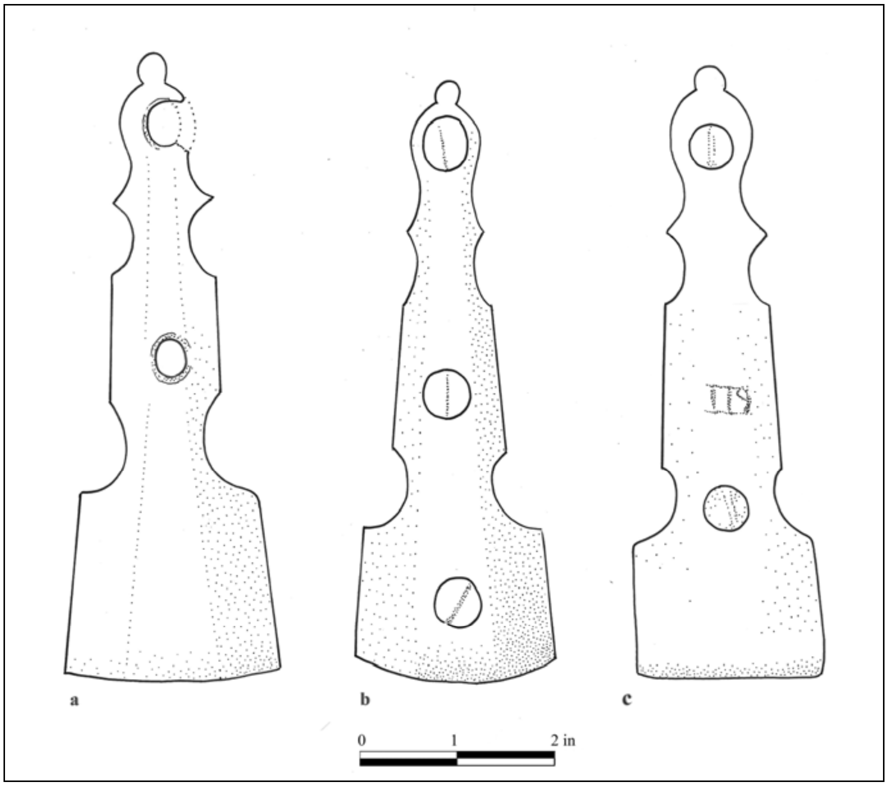

Figure 5.52. Decorative tangs. (a) artifact 229; (b) 1740 Prussian Infantry musket; (c) ca. 1760 Dutch military longarm (scale approximated). (illustration by A. Borgens after Ahearn 2005: Figures 440 and 478).

A second loose buttplate lies atop the other firearms near the pistol assemblage (Figure 5.53). This furniture item is clearly of a different pattern longarm due to the noticeably shorter tang and the method of attachment. Artifact no. 229 was affixed to the stock through a series of screws; two on the tang and two on the butt of the plate. The loose example used a lug attachment on the tang that was pinned through the stock. The shorter tang is reminiscent of the simpler style furniture used on British, U.S., and French arms.

Figure 5.53. Buttplate on weapons box.

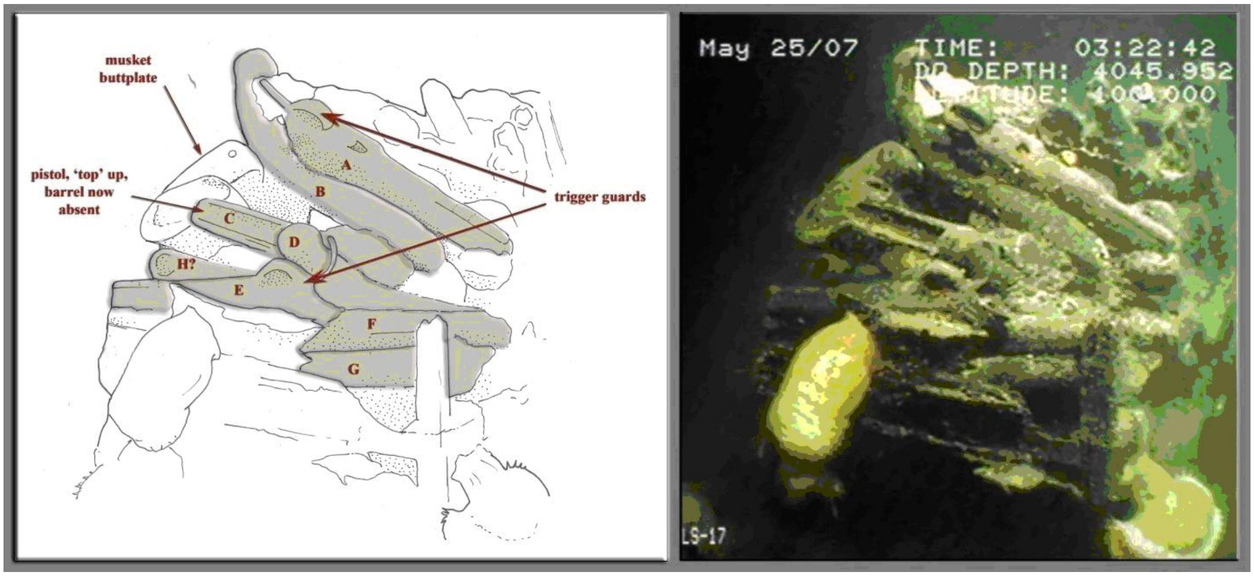

Figure 5.54. Pistol arrangement (illustration by A. Borgens).

At least seven pistols are stowed at the south side of the weapons box (Figure 5.54). The orientation suggested they would have originally been packed one atop the other in the space remaining between the side of the box and the longarms. There are four pistols that are exposed (A, B, D, and E) with some visibility regarding basic features. Two are broken (likely worm-eaten) at the position of the distal edge of the lock plate (A and E). Both these weapons appeared to have cupreous trigger guards and one ramrod pipe (neither appeared to have a tail pipe). The cupreous trigger guard on pistols A and E do not have a lug attachment at the rear tang, indicating they are affixed with a screw. Pistols B and D are complete examples of the pistol artifacts, though the diagnostic characteristics are indiscernible. Pistols constructed for naval use were equipped with belt hooks and wooden ramrods; though the latter feature can also indicate an early manufacture date. The thickness, lack of concretion, and preservation of the ramrods on pistol artifacts A and E suggest that they are of wood.

Two edged weapons are associated with the weapons case. An almost complete example of a sword or sabre, concreted within its scabbard, is situated atop the box. The grip had a uniform surface with the appearance of wood or bone. Underwater photography indicated the pommel is spherical but also damaged or incomplete. The preservation of the stirrup hilt suggests that it is cupreous. The stirrup hilt, so-called due to its similarity to the hardware on a saddle, became increasingly popular during the last quarter of the eighteenth century (Neumann 1991:111). The design originated in Europe and was adopted by U.S. manufacturers (Neumann 1991:123). Its location indicates it was either lying atop the box or shifted to that position as part of the site formation process. A small concretion on the upper left side of the scabbard may also indicate an attachment ring used for suspending the sword. One additional edged weapon is partially visible near the northeast corner of the weapons box. The lightly-concreted artifact appears to have a wire-braided grip and pommel. This feature suggests that the two edged weapons are of different types (Figure 5.55).

Figure 5.56 illustrates several variations of stirrup hilts from edged weapons manufactured during the last quarter of the eighteenth century. Though these examples are not representative of the whole variety of hilts produced at the time, the Mardi Gras artifact seems to bear a strong resemblance to some of the hilt features of the American sabre (ca. 1775 to 1790, Figure 5.56a) and the American hanger (ca. 1790, Figure 5.56d).

Figure 5.55. Edged weapon artifacts. (a) stirrup hilt in situ (b) pommel and grip (c) stirrup hilt reconstruction (illustration by A. Borgens).

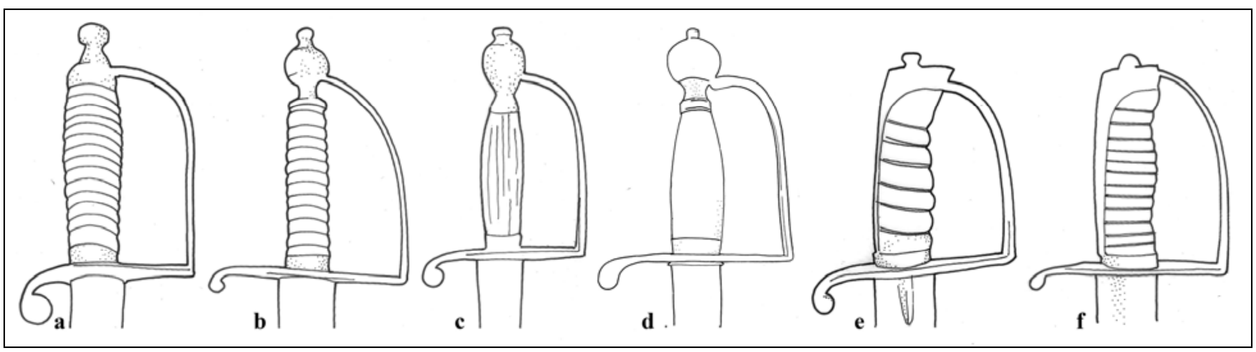

Figure 5.56. Stirrup hilts. (a) American saber or short sword [ca.1775]; (b) American short saber [ca. 1775–1783]; (c) English short saber [ca. 1775–1790]; (d) American hanger [ca.1790]; (e) French Hussar saber [ca 1765–1785]; (f) Dutch short saber [circa 1774]. Illustration by A. Borgens after Bazelon 1987:107, Moore 1967: 144, and Neumann 1991:113 117, 125, 162.

5.2.6.4 Lead Shot

The use of lead balls as projectile shot for gunpowder weapons dates to the fourteenth century when they were fired from a hand-held arm called a *harquebut* (Deane 1858:32–33). The higher-quality performance of the lead ball compared to other mediums such as copper, bronze, pewter, and gemstones was accepted by 1350 (Brown 1980:12). Its appearance in the Americas likely dates to the Age of Exploration, which has been substantiated by the recent discovery of an Incan gun-shot victim in Peru that dates to the 1500s (Schmid 2007). Due to the prolific use of these projectiles in military engagements, these artifacts are the most common relic recovered from most nineteenth-century battlefield sites (Brown et al 1986:64).

Lead shot could be either factory-manufactured or hand-cast in the field from lead stock called pig lead. Mid eighteenth-century shot was produced by pouring melted lead through strainers and letting it drop 150 feet into a tub of cold water. The motion of the melted lead through the air created the cylinder shape. The lead was cooled by the water and then placed into polishing machines (Deane 1858:35). Shot was hand-cast by pouring melted lead into hinged hand-held molds. The molds produced superfluous lead attachments, called sprues, which were clipped off; the remaining burr could be polished in a rolling mill (Harding 1999:7). Hand-held casts produced marked seams and also sometimes resulted in offset lead shot. Lead shots without seams can be indicative of factory-produced shot.

The shot from the Mardi Gras Shipwreck have evidence of being hand-cast, though some do not have discernible evidence of the casting process. The shot have pronounced mold seams, small incised cast lines, and/or casting sprues. In the absence of noticeable casting features, a large portion of the shot have a thickness around the circumference, indicating the mold seam. Only in a few examples do the shot have crudely-cut sprues. A majority of these are flattened or are barely-discernible raised ‘knots’ on the surface. Archaeological examples of unfired musket shot without sprues or seams have been excavated from British military sites in the United States. The rough maritime and overland transportation of the lead balls, packed tightly in crates and barrels, would likely have caused the shot to bang together repeatedly. Over time, this would eliminate evidence of the casting (Sivilich 2005:7)

Almost 1200 lead shot have so far been recovered from the wreck site with large numbers still contained within a concretion, artifact no. 135, which is undergoing conservation. Artifact 135 is a large encrustation from Area 1 that is comprised of multiple objects (see Figure 5.46 and discussion below). A small portion of the artifacts were removed from artifact number 135 and its surrounding matrix (artifact lot 140) during its movement into a pre-conservation storage container at the Conservation Research Laboratory, including 1012 lead shot. A 10 percent sample of the shot from artifact 140-10, 100 lead balls, was recorded. The shot sample from artifact lot no. 140 was not random, but was selective so that all the larger and smaller shot would be documented. The other artifact lots (125.1, 126.2, 134.9, 135-1, 223.7, and 225.10) contained a total of 161 shot. All of these shot were recorded.

Figure 5.57. Lead shot from the Mardi Gras Shipwreck, No. 140-10. Calibers (l to r): 0.35, 0.43, 0.56, 0.63, and 0.68 (photograph by A. Borgens).

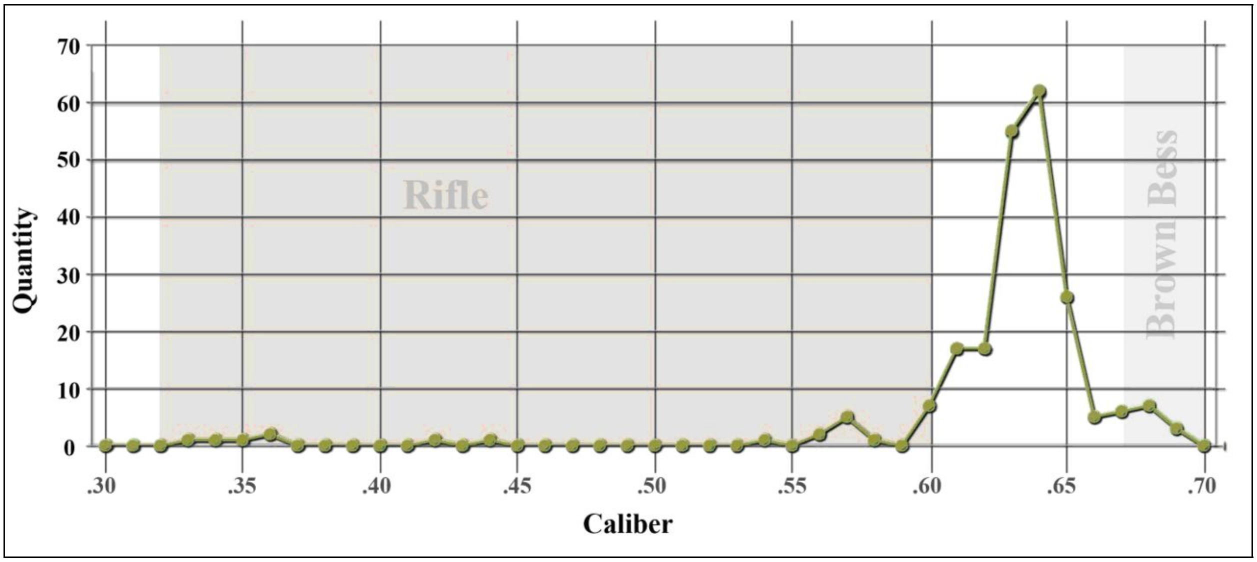

Figure 5.58. Mardi Gras Shipwreck shot calibers.

Collectively, the calibers for 271 shot were calculated. The range of calibers varies between 0.33 and 0.69. The variability of shot sizes can be seen in Figure 5.57. Many shot are very asymmetrical and likely would have been unusable. Such was also the case with shot having pronounced mold seams and casting sprues; these were sometimes intentionally discarded by musketeers and therefore remained unfired (Sivilich 2005:7). All shot calibers were recorded, but for simplification, only lead shot that are roughly symmetrical with individual calibers of less than a 0.03 variance were used to create the tabulation of quantities in Figure 5.58. Of the 271 lead shot measured for this study, 249 shot calibers have a variance of less than 0.03 caliber.

Two hundred and four lead shot, 75 percent, have a caliber of 0.60–0.66. The difference between the caliber of the gun and the size of the ball, windage, was typically 0.05 to 0.10 cm (Neumann 1967:52). The 0.60–0.66-caliber would therefore best conform to the size of shot used in .69-bore muskets. This caliber was commonly used for French, U.S., and select Spanish military muskets of the period (Table 5.5). The optimum size shot for the 0.69-musket bore of these longarms was 0.63-caliber; 129 shot are collectively of 0.63 and 0.64 caliber. Shot with calibers between 0.63 and 0.68 caliber, however, would be equally usable in Prussian/Hessian muskets from the Revolutionary War period. Regulation Spanish miquelet-lock muskets had a bore of 0.66, requiring lead shot in the range of 0.61-caliber. Many of the English longarms common throughout the Gulf region, in particularly the Short Land and India Pattern muskets, had a caliber of 0.75 and used shot of 0.67–0.70-caliber. The musket ball manufactured for these muskets by the British Board of Ordnance was 0.68-inch in diameter (14.5 balls per pound) (Harding 1999:4–5).

Three artifact lots (125-1, 225-10, and 226-1) contain small diameter bird shot. Artifact lots 225.10 and 226.1 contain 458 small lead balls and were located in Area 2 of the site, forward of concretion 135. The bird shot have a diameter of between 0.08 and 0.17 inches (0.21 and 0.42 cm).

Table 5.5

Calibers of Weaponry

Nationality	Model	Type	Date	Caliber (in)	Reference
Dutch		musket	mid-18th century	0.77	Ahearn 2005:206
Dutch		musket	circa 1798–1809	0.73	Hoff 1978:169
Dutch		musket	circa 1775–170	0.74	Neumann 1967:82
Dutch		musket	circa 1775–1780	0.67	Neumann 1967:4
Dutch		military rifle	circa 1775–1790	0.66	Neumann 1967:148
Dutch		officer's musket	circa 1780	0.67	Hoff 1978:173
English	East India Pattern	musket	1795–1815	0.75	Meuse 1965
English	Short Land	musket	176?–1795	0.75	
English	Baker	Rifle		0.62	Meuse 1965
English	Baker	musket	circa 1800	0.75	Meuse 1965
English	Light Dragoon	pistol	1775–1785	0.65	Neumann 1967:210
English		naval pistol	1762	0.61	Neumann 1967:164
English	Light Infantry	carbine	1775–1783	0.65	Neumann 1967:120
English		blunderbuss	1750–160	1.25	Neumann 1967:128
French	Charleville	musket	1756	0.69	
French	M 1763	Infantry musket	1763	0.69	Boudriot 1997:72
French	M 1773	Infantry musket	1773	0.69	Boudriot 1997:121
French	M1781	carbine	1781	0.69	Boudriot 1997:157
French	M1768	artillery carbine	1768	0.72	Neumann 1967:78
German	Jaeger	rifle	1740–1760	0.60	Neumann 1967:136
German		fusil musket	circa 1765–1780	0.73	Neumann 1967:84
German-Dutch		cavalry pistol	1760–1775	0.69	Neumann 1967:194
German-Dutch		carbine	circa 1740–1780	0.76	Neumann 1967:86
Prussian	M 1780/1787	Infantry musket	circa 1780s	0.73	Schmidt 2003:50
Prussian	M 1787	Fusilier musket	1787	0.73	Schmidt 2003:50
Prussian	1809	musket	1809	0.70	Schmidt 2003:50
Prussian	1740	infantry musket	1740	0.75	Ahearn 2005:218
Spain	1752 (1757)	fusil	1757	0.69	Brown 1980: 175
Spain	1752 (1757)	carbine	1757	0.65	Brown 1980: 175
Spain	Infantry	musket-miquelet	circa 1740–1760	0.72	Neumann 1967
United States	Springfield 1795	musket	1795	0.69	Meuse 1965
United States	Pennsylvania	rifle	circa 1770–1780	0.52	Neumann 1967:140
United States	Kentucky /Pennsylvania	rifle		0.36-0.40	Meuse 1965
United States	Harpers Ferry	pistol	1806	0.54	Meuse 1965
United States	Kentucky	pistol	circa 1800	0.52	Pegler 2001:122
United States	Kentucky/ Pennsylvania	rifle	1750–1760	0.54	Brown 1980: 265
United States	Northwest trade gun	fusil	1789	0.66	Brown 1980: 285
United States	Committee of Safety	musket	1775	0.75	Brown 1980: 309
United States		musket	circa 1755–1770	0.72	Neumann 1967:98

A small proportion of shot have small-diameter holes that are not associated with the cast sprue or mold seam (Figure 5.59). This characteristic is only apparent in examples collected from concretion 135. Twenty-three shot are of this condition, comprising two percent of the

1012 lead balls so far collected from the artifact. Some of the holes have centrifugal patterns that are similar to those produced by ramrod worms used to remove lead balls lodged within a barrel (Figure 5.59 a and b). Shot was generally removed in this manner when the gun misfired and there was no other means to extract the ball. The presence of these shot implies that an attempt was made to fire them. This, in itself, may present evidence for the occurrence of violence during the lifetime of the vessel. One additional shot has a small linear pattern on one face (Figure 5.59c). This characteristic could be a tool mark and is similar to the forceps marks on lead balls removed from an injured combatant. Similar artifacts have been recovered from American Revolution battle sites (Sivlilich 2005:15).

Three pieces of lead from the concretion artifact, are flat and folded and appear to examples of lead shot that were modified to hold a gunflint. The two artifacts pictured in Figure 5.60 measures 1.02 X 0.97 inches (2.58 X 2.46 cm) and 1.09 X 0.78 inches (2.78 X 1.99 cm); the third example is damaged and is not illustrated. These both correspond well with the gunflints from the site, whose average width is 1.06 inches (2.69 cm).

All the lead shot excavated from the site were congregated in Areas 1 and 2, either fore, aft, or within the large encrustation (no. 135) and on the south side of the weapons box. The lead balls recovered in Area 2 (no. 223-7), on the south side of the weapons crate, were stored in a box. The container is no longer extant, though its rectangular shape is indicated by the pattern of shot in the sediment. Fragments of the box were recovered during the collection of the lead balls (Figure 5.61). The various circular impressions in the wood suggested multiple calibers may have been contained within the same case.

The variety of longarms used in the region of the Gulf undermines the ability to use the range of calibers as a diagnostic tool as has been done with battle sites from the American Revolution (Sivlilich 2005; Sivlilich 1996). There is, however, a very low quantity of lead shot (.67–.69-caliber; 20 total shot) that would be useable in English muskets.

Figure 5.59. Modified shot, magnified to show marks (photograph by A. Borgens).

Figure 5.60. Modified lead (artifact no. 135-1). Image at right is an enlarged view of the larger flattened lead (photograph by A. Borgens).

Figure 5.61. Shot impressions in wood (artifact no. 223-8)(photograph by A. Borgens).

5.2.6.5 Gunflints

A small collection of gunflints were collected from the wreck site (a sample of these is illustrated in Figure 5.62). These flints were essential for the use of flintlock arms and are a relatively common find at many historic archaeological sites (Kenmotsu 1990:92). Gunflints used in the Americas were predominantly of French and English origins and, as such, were transported by sea. These could be shipped in large and small quantities alike; shipments could contain a cargo of as many as 36,000 gunflints (Davis 2005:309).

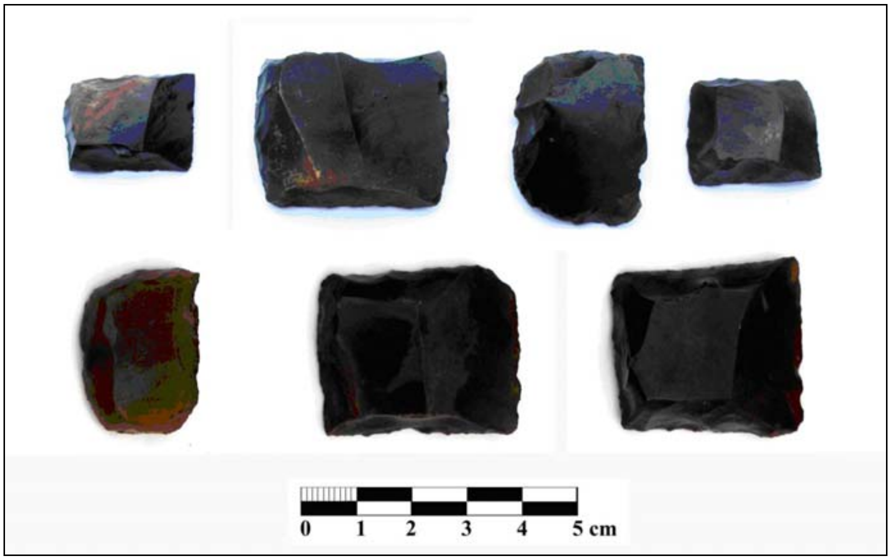

Figure 5.62. Gunflints (artifact no. 134-3) (photograph by A. Borgens).

The identification of gunflints is assisted by the examination of the color of the flint. Gunflints from shipwreck sites, however, usually have heavy ferrous staining caused by the degradation of the wreck. Newly-cut gunflints experience a chemical change that causes a patination of the surface. This process makes the gunflints absorbent to staining, especially those on the seafloor. The external color of a stained gunflint, unless freshly exposed, cannot provide provenience information (Lotbiniere 1984:207).

French yellow-honey or blonde gunflints were the most commonly-used type in England, France, and the American colonies prior to 1800. Over 95 percent of the gunflints found in military camps, including those of the British, were of French origins (Kenmotsu 1990:96). Originally the English quarries produced gunflints by creating somewhat regular shapes out of large flakes removed from flint blocks. This created an unshapely gunflint and was the mode of production until the introduction of the French method into England, possibly at Kent, around 1775 (Lotbiniere 1983:v). After the establishment of the Brandon quarries in about 1790, English gunflints began to dominate archaeological collections in the United States (Kenmotsu 1990:96).

The most sophisticated method of gunflint production, started by France and later utilized by England, France, Austria, and, eventually, Spain, was blade production. A flint nodule was quartered, which produced a striking platform for splitting blades. Using this technique, a single flintknapper could produce 1000 to 1500 gunflints daily (White 1975:65). Historically, an average of 20 rounds could be fired using a single flint (Kenmotsu 1990:103)

Fifty-nine gunflints were recovered from the Mardi Gras Shipwreck. Fifty-seven are English gunflints and two are of the French type. A majority of the gunflints, 45 in all (including the two French examples), are sized for musket locks (using Skertchly's typology). One example is a crudely-flaked bifacial gunflint. The average size of the musket gunflint is 1.3 X 1.1 X 0.3

inches (3.3 X 2.8 X 0.7 cm). One gunflint is similar in size to that for a carbine, measuring 1.2 X 1.1 X 0.23 inches (3 X 2.8 X 0.6 cm). Only six small gunflints, corresponding to Skertchly's (1879:61) second double/rifle flint, are in the collection. The average size of these small gunflints is 0.96 X 0.68 X 0.27 inches (2.4 X 1.7 X 0.7 cm). These are from three artifact lots (222-4, 225-4.1, 223.3), all located in Area 2 of the site, just aft of the weapons box. Three intermediate-sized gunflints, corresponding to the Skertchly horse pistol type, and five large gunflints, the large swan type, comprise the remainder of the gunflint artifacts (Skertchly 1879:47, 56–58).

5.2.6.6 Arms and Munitions Summary

The Mardi Gras Shipwreck was carrying a collection of longarms, lead shot, cast iron artillery shot, and gunflints and was outfitted with at least one cannon. The artillery shot from the wreck is of multiple sizes, including at least those for a 3-pounder, 5-pounder, and 6-pounder gun. Only one cannon was located on the wreck site, a 6-pounder cannon manufactured for the merchant class. As the cause of the wreck is unknown, it is indeterminable if the vessel was partially salvaged prior to the sinking or if a possible catastrophic event, such as a hurricane, may have dislodged objects from the wreck, scattering the materials over a large area as they sank to the bottom. It is therefore unknown if the vessel carried multiple artillery. The ferrous shot could therefore be indicative of supplies for shipboard guns and/or as cargo items. The collection of the arms material at the aft end of the vessel could be indicative of a shipboard magazine.

The lead shot, as with the other arms materials, was found in multiple areas of the site and in large quantities. There is evidence that part of this artifact collection was originally stored in a box, though historically lead shot was also transported in bags and casks. A majority of the shot was manufactured for use in smaller caliber muskets, like those produced in the U.S., France, and Spain during the eighteenth and nineteenth centuries. There is very little shot (less than 7 percent) in the entire collection that would have been used in the larger-caliber English arms that were ubiquitous in the Gulf in the early part of the nineteenth century.

The cannon is of British manufacture (Scotland), though the recovered lead shot do not support the presence of British muskets on the vessel. The sole example of firearm furniture, a single buttplate, is of Germanic/Dutch origins and was likely manufactured decades before the voyage. The weapons box appears to contain an assortment of arms of different nationalities, types, and manufacture date. Longarms transported for official military use were often packaged by type, indicating the weapons box was filled with personal, likely civilian, shipboard arms or part of a privately-acquired arms shipment. New Orleans, the nearest port in proximity to the wreck, was a focal point for the sale and distribution of a variety of arms types for private use, filibusters, and regional revolutionaries. The arms on the wreck are suggestive of the international character of the region.

The arms assemblage suggests the ship was a non-military civilian vessel or a privately-outfitted gunrunner/privateer-type craft. Both of these would have been commonly armed in the Gulf of Mexico, as the enormity of the privateering activities in the region would have created a necessity for arming and defending a merchant vessel. The cannon, dated 1797, and the quantity of English gunflints on the site both suggest an early nineteenth-century date for the wreck.

5.2.7 Navigational Instruments

By Ben Ford

The majority of navigational instruments recovered from the Mardi Gras Shipwreck (Figure 5.63) appear to have been manufactured in London, which is consistent with London's dominant position in the instrument trade. Instrument-making developed in London during the second half of the sixteenth century as a result of an influx of immigrants from the Low Countries (Clifton 1995). In 1551, there were only three scientific instrument-makers in the British Isles, including one in London; a century and a half later, the number had risen to 151 in the British Isles, the vast majority of which (123) were operating in London. The number had risen to 584 British makers by 1801 (with 297 in London alone), and continued to increase, reaching 837 British instrument manufacturers by 1851 (Clifton 1995:XV). Clearly, London was the center of British production, but it was also the center of all European production. London benefited from a growing popular interest in mathematical, natural philosophical and astronomical interests, financial encouragement from scientific institutions, guidelines set by the Royal Observatory that guaranteed quality, and freedom from restrictive work practices (Stanbury 1991:197). While English instrument production spread to other communities during the eighteenth century, London remained the center, and instruments produced there were used throughout Europe and on expeditions funded by foreign powers (Clifton 1995; Stanbury 1991:197).

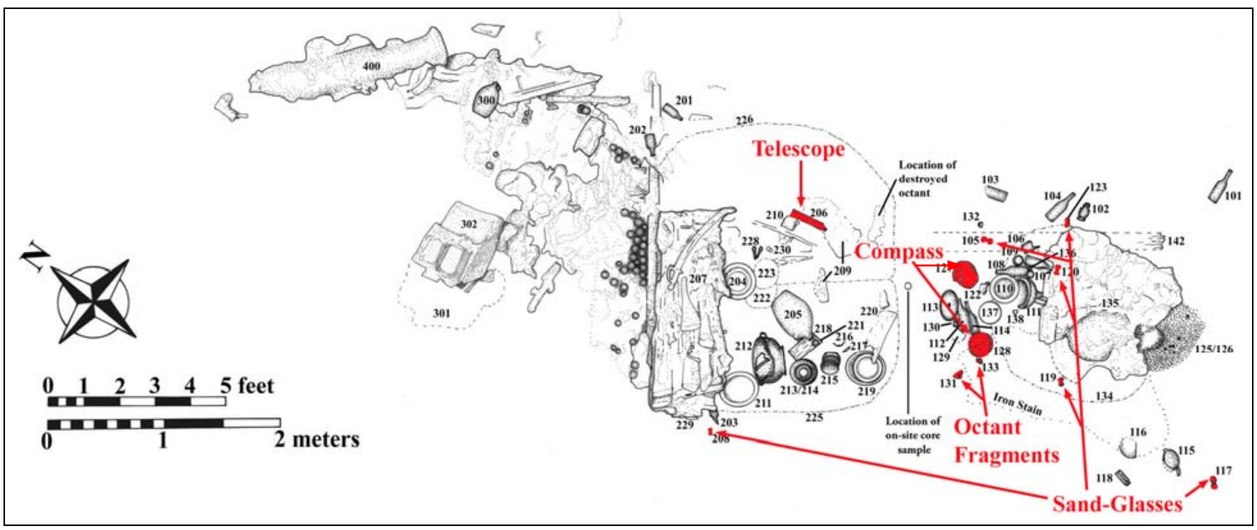

Figure 5.63. Distribution of navigational instruments (illustration by B. Ford).

5.2.7.1 Sand-Glasses

Sand-glass is the "generic name for an instrument that measures equal periods of time by the motion of a freely-flowing powdered solid substance" (Turner 1984:75). This term is used despite the fact that sand was rarely used in sand-glasses. Instead, marble dust, lead dust, tin dust, and pulverized eggshell, among other materials, were commonly used, with the occasional cleaned and sieved river or ocean sand. Common sand does not fall with the required consistency and is, therefore, a poor substance for keeping precise, if not accurate, time (Turner 1984:84). In the case of the sand-glasses recovered from 16GM01, the falling substance is lead dust (see Palynology section below). Regardless of the presence or absence of actual "sand,"

sand-glasses were present in Europe as early as the mid-fourteenth century. However, prior to ca. 1760, they were made by lashing two ampoules together to form the glass. The neck of all of these sand-glasses bulge and are wrapped with fabric and cord. After 1760, an effective technique for blowing a one-piece sand-glass was developed. After the glass had cooled the "sand" was added through an opening in one end. In many cases, such as those from the Mardi Gras Shipwreck, the hole was plugged with a cork and covered with parchment or linen. In later periods, the hole was plugged with glass and the ampoule was ground smooth (Turner 1984:76).

Figure 5.64. Sand-glasses (photograph by R. Sasaki).

Clearly the size of the sand-glass has some bearing on the amount of time it recorded, but, due to variation in the size of the neck aperture and the "sand" material, the amount of sand was the determining variable. During production, sand was either added or removed to achieve the desired period (Turner 1984:112). Consequently, a 3-inch tall sand-glass can have a 30-minute duration while 10.5-inch sand-glass may only measure 2 minutes and 40 seconds (Turner 1984). Several varieties of sand-glasses were often carried aboard ships. Sand-glasses measuring a 4-hour watch, a two hour half- or dog-watch, and the half-hour tricks of a watch were all necessary. Additionally, half-minute, 1-minute, and 4-minute sand-glasses were also needed for taking the log-ship measurement at different speeds (Lavery 1987:29; Murray 1980:136; Taylor and Richey 1962:34–35).

Five sand-glasses (artifact nos. 117, 119, 120, 123, and 208) were recovered from the Mardi Gras Shipwreck (Figure 5.64), while a sixth sand-glass (artifact no. 105) was lost in a seafloor crevasse. These sand-glasses were situated throughout the wreck aft (east) of the weapons box and do not appear to be arranged in any meaningful pattern. The measurements of the recovered sand-glasses are summarized in Table 5.6. The glasses range in height from 5.6–3.7 inches (14.1–9.4 cm) with ampoules ranging from 2.5–1.4 inches (4.1–3.5 cm) in maximum diameter and necks ranging from 0.5–0.3 inches (1.2–0.8 cm) in diameter. Sand-glass number

105 was similar in size to the recovered sand-glasses. There is a general correlation between the height of the sand-glass and the diameter of the ampoules but the necks vary less than the other dimensions suggesting that the maker was attempting to maintain a consistent flow of "sand." The ampoules of each glass also vary slightly in shape and size, which is to be expected in a blown sand-glass.

Table 5.6

Summary of Mardi Gras Shipwreck Sand-Glasses

Artifact No.	Height (cm)	Ampoule 1 Diameter (cm)	Ampoule 2 Diameter (cm)	Neck Diameter (cm)
117	13.66	6.14	6.12	1.05
119	10.62	3.66	3.51	0.95
120	14.1	6.23	6.22	1.14
123	9.66	4.07	4.02	0.84
208	9.38	4.7	4.61	1.17

Beyond the change in manufacturing ca. 1760 it is very difficult to date sand-glasses and they seldom survive in shipwrecks. Similarly, it is impossible to determine the duration of the glass without knowing the precise amount of "sand" that it originally contained. However, a similarly shaped French sand-glass dating to the eighteenth century measured 4.6 inches (11.7 cm) high and had a duration of 28 seconds, suggesting that the Mardi Gras Shipwreck sand-glasses were likely used for ship-log measurements rather than timing watches (Turner 1984:112–113).

Figure 5.65. Measurement compass (photograph by R. Sasaki).

5.2.7.2 Measurement Compass

One measurement compass (artifact no. 225-2) was recovered from the sediment southeast of the gun box (Figure 5.65). This cuprous compass measures 2.5 inches (6.5 cm) in length with a circular pivot measuring 0.5 inches (1.3 cm) in diameter and legs that are 0.2 inches (0.4 cm) wide. Both legs have a recess to receive the tips, which were likely iron and had previously deteriorated (Bruyns and van der Horst 2006). This type of compass is often referred to as a true compass, as opposed to the one-handed variety that is typified by an open-circular head and scissor action. While compasses often survive on shipwrecks, they are not particularly diagnostic. Similar compasses were in use by the beginning of the eighteenth century (Lizé 1984:125; de Maisonneuve 1992:21; de Mello 1979:219; Morris 1984:257).

5.2.7.3 Telescope

While telescopes and enlarging lenses were common in Europe following the Renaissance, it was not until the first quarter of the eighteenth century that effective telescopes were developed for use at sea. These telescopes benefited from the transition from pasteboard to metal and wood tubes and the development of the achromatic lens (Taylor and Richley 1962). Much of the flourishing of marine optics was a result of the productive and inquisitive spirit that typified London artisans of the period.

The telescope (artifact no. 206) recovered from approximately 2 ft (0.61 m) southeast of the southeast corner of the gun box measures 13.8 inches (35 cm) long and has an outside tube diameter of 2.3 inches (5.82 cm) (Figure 5.66). One cuprous fitting on the object-lens tube is missing, but the other measures 2.4 inches (6.1 cm) in diameter. The eye piece is 1.4 inches (3.4 cm) in diameter (Figure 5.67). The object-lens tube is made of wood, while the eye-piece and eye-piece tube are brass. The telescope appears to be a two-draw telescope (two tubes) with all of the ground glass lenses intact. Two pieces of leather (artifact no. 209) were recovered in association with the telescope and may have been used to wrap the instrument.

Through the efforts of the Conservation Research Laboratory, a maker's mark was identified in an X-ray of the brass eye-piece tube (Figure 5.68). The inscription, in block letters, reads

…A…IS & SON LONDON

……………….IGHT

The most likely interpretation of this mark is "T Harris & Son London / Day and Night," indicating the maker and type of telescope. Thomas Harris began producing telescopes, microscopes, globes, and mathematical instruments in 1790 and was joined by his son William in 1802, at which time the firm became known as Harris and Son. Thomas left the business in 1806, but William continued to produce instruments under the same name until his death in 1843. During this time, the firm operated at 20 Duke Street and 30 Hyde Street, both in Blomsbury, London, and was twice given royal appointments in 1819 and 1820. William was also Master of the Spectacle Makers Company of London between 1824 and 1826. Despite suffering at least one financial collapse in 1830, the firm continued on under other owners until at least 1901. Thomas had a second son, also named Thomas, who was an optician and worked with his father and brother during the early nineteenth century but was killed in the 1808 Covent Garden Theatre fire. It is interesting to note that, while both the elder Thomas and William were

Figure 5.66. Telescope (photograph by R. Sasaki).

Figure 5.67. Telescope eyepiece (photograph by R. Sasaki).

members of the Spectacle Makers Guild, the younger Thomas was a member of the Loriners Guild (bit, spur, and bridle makers) (Clifton 1995:124–126). This apparently incongruous guild membership was likely a result of the difficulty of incorporating the relatively new craft of instrument-making into the established guild structure of London (Brown 1979). A search for American instrument makers that also matched the maker's mark resulted in no matches (Bedini 1964).

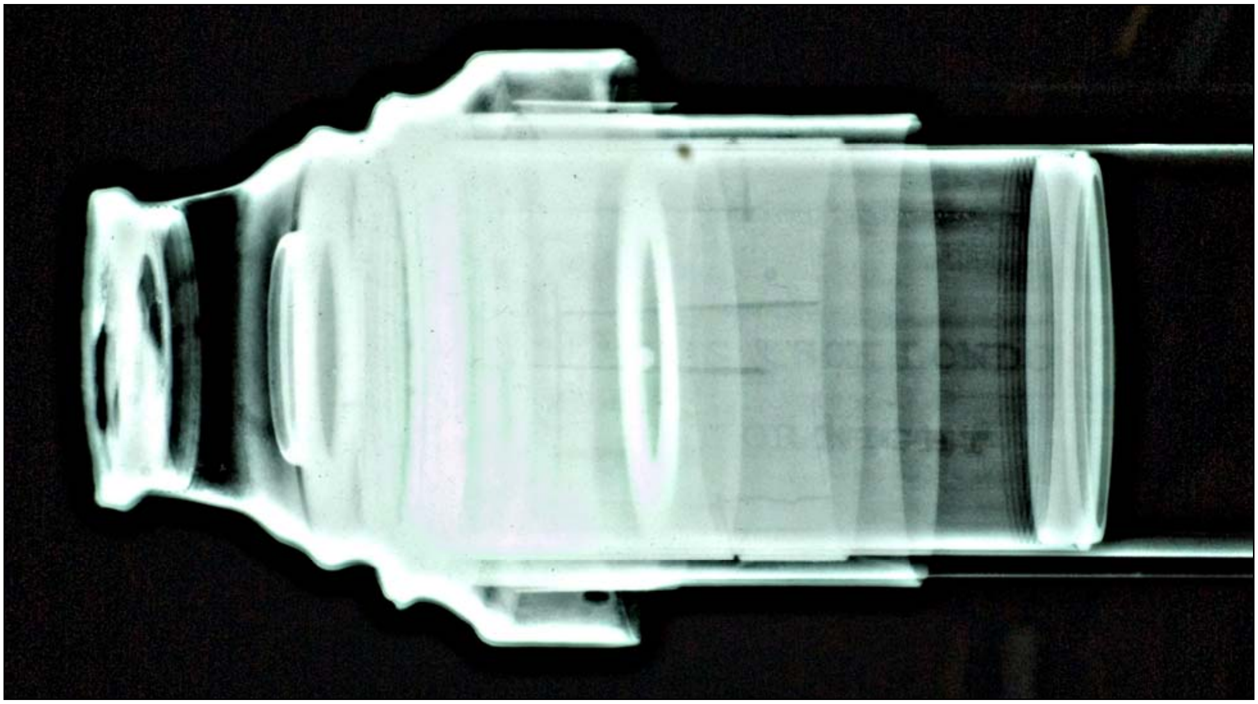

Figure 5.68. Detail of X-ray image depicting inscription on eye-piece tube (photograph by G. Schwarz).

Telescopes are not regularly recovered from shipwreck sites, but a slightly smaller telescope (object-lens tube length of 22 cm) was excavated from the 1790 wreck of the Russian frigate *Nicholas*. In addition to being shorter, this telescope has a simpler eye piece, but similar wood and brass construction (Ericsson 1975:67). Two T. Harris and Son telescopes are known from museum collections, both dating to circa 1810. The telescope from the Museo della Specola in Bologna appears to be nearly identical to the 16GM01 but measures 19.8 inches (51 cm) closed (Museo della Specola 2007). Likewise, the T. Harris and Son telescope in the National Maritime Museum collection appears identical to artifact number 206 but is slightly larger (overall closed length of 20.6 inches [52.5 cm] and object-lens tube diameter of 2.4 inches [6.2 cm]) and the maker's mark is engraved in script rather than block letters (National Maritime Museum 2007).

5.2.7.4 Octant

Two octant fragments (artifact nos. 131 and 133) and numerous disarticulated parts (artifact no. 134-4) were recovered in the vicinity of the stern concretion. A complete octant (artifact no. 03) was removed by the unsupervised 2004 ROV visit.

The term octant is derived from the Latin *octans*, meaning eight parts of a circle, and refers to the instrument's arc of 45^{o}. During the first half of the eighteenth century, there was a flurry of activity around the goal of effective celestial measurement, with many of the solutions employing the principle of a reflecting quadrant, whereby mirrors reflect the path of light to the eye, doubling the angle measured and allowing a smaller instrument to do the work of a quadrant (Ifland 1998:16). Isaac Newton developed a reflecting quadrant in 1699, but it was not published until 1742; consequently, credit for developing the octant is generally awarded to John Hadley, a London mathematician, and Thomas Godfrey, a Philadelphia glazier, both circa 1730. Both men seem to have developed their designs independently; however, Hadley's design was read to the Royal Society in 1731, widely publicized by the Society, and widely distributed by London instrument-makers. Consequently, Hadley's design dominated the octant market (Ifland 1998:15). The usefulness of octants for defining positions at sea and their ease of use on rolling ships led to their quick adoption by all navigators, and by the late eighteenth century the ability to use an octant to determine longitude was established among even petty officers (Stanbury 1991:197). However, the preeminence of octants was short-lived. Beginning with the 1767 edition of the *Nautical Almanac*, lunar distance tables became widely available, allowing for calculations based on the positions of sun and moon. Many of these measurements exceeded the 90^{o} maximum of the octant, leading to the development of the sextant by Vice Admiral John Campbell and instrument maker John Bird. Sextants, based on a 60^{o} arc, could measure up to 120^{o} providing for all but the most extreme distances (Ifland 1998:27–28). While sextants were more accurate than octants, they were also more expensive. Consequently, many navigators carried only an octant or both an octant and a sextant late into the nineteenth century. If both instruments were carried, the sextant was often used only for lunar measurements, while the octant was employed for more routine daily meridian altitudes (Ifland 1998:28; May and Holder 1973:147).

The only functionally-significant difference between octants and sextants is the sweep of their arc, making it difficult to conclusively distinguish the two from fragmentary remains (such as were recovered from 16GM01). Sextants, however, tended to be made of metal, which made them less prone to distortion, increasing their accuracy, but also their cost. Octants, meanwhile, were often, though not exclusively, constructed out of wood. Similarly, sextants almost universally employed a sighting telescope, or at least a sighting tube, rather than pinnula (Ifland 1998; May and Holder 1973:147; Murray 1980; Taylor and Richey 1962:57). The use of wood and the absence of a sighting telescope suggested that the materials recovered from the Mardi Gras Shipwreck are parts of an octant.

Due to the fragmentary nature of the 16GM01 octant remains, a brief description of the principal parts of an octant is appropriate (Figure 5.69). Line of sight was established through a sighting telescope or pinnula, with pinnula more common on cheaper instruments. Reflections of the celestial body being measured were then lined up using the index mirror situated on the index arm and the horizon mirror that was affixed to the octant body. Between the horizon and index mirrors, there were often several hinged shades of colored glass. These shades allowed the amount of light reaching the eye to be adjusted, permitting the same octant to be employed in sighting both the sun and faint stars. Shades of this type are often attributed to Peter Dollond, with an introduction date of 1772; however, similar shades were recovered from the 1761 shipwreck *St. Auguste* (Ascroft and Rochette 1992:29; Ifland 1998:77). Occasionally, separate shades for the horizon mirror were attached for sighting low sun positions with a bright horizon. It was also common for octants to have a second horizon mirror attached to the frame farther from the pivot that would allow for back-sights. Besides the index arm, the only necessary moving parts were a set-screw on the index arm that allowed it to be locked to the scale and an adjusting screw for the horizon mirror. This screw, later known as the tangent screw, allowed the instrument to be zeroed. It also allowed the operator to check for side error by swinging the reflected image past the true object to verify that the two were aligned (May and Holder 1973:148; Murray 1980:101).

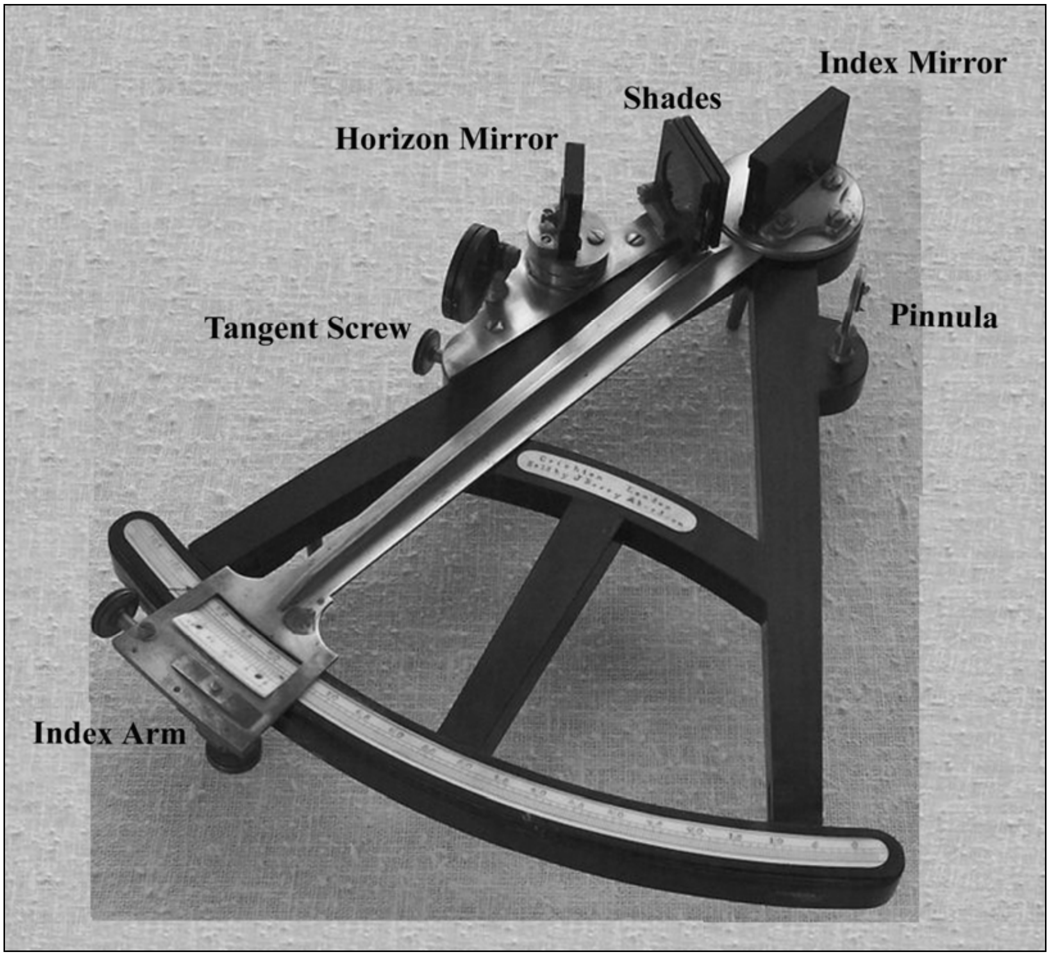

Figure 5.69. Parts of an octant (image by B. Ford after Wikipedia 2007).

The two principal parts of the recovered octant include the index mirror (artifact no. 133) and the base of the horizon mirror (artifact no. 131). The horizon mirror assembly consists of brass dials, screws, and base attached to a wooden fragment (Figure 5.70). The entire artifact measures 3.8 inches (9.7 cm) long, while the mirror assembly measures 3 inches (7.6 cm) long. The mirror support measures 1.1 inches (2.8 cm) in diameter. Attached to the mirror support, but on the back of the octant arm, are two washers and a thumb screw all joined to a brass base. The backing washer for the mirror support measures 0.8 inches (2 cm) in diameter, while the central thumb screw measures 0.6 inches (1.5 cm) in diameter, and the third washer measures 0.75 inches (1.9 cm) in diameter. The thumb screw likely served as the tangent screw, while the third washer may have been a fixture for the internal workings of the screw (Murray 1980:100). The index mirror assembly (artifact no. 133) consists of the index mirror, shades, and attached wooden fragments of the index arm and frame (Figure 5.71). The entire artifact, when laid flat with mirror vertical, measures 3.7 inches (9.4 cm) long and 2.6 inches (6.5 cm) high. The mirror measures 2.2 X 1.3 inches (5.6 X 3.4 cm) and was formed by pressing a drop of mercury between the glass and the backing before crimping the edges of the backing over the glass to form the setting. The remains of three hinged shades with colored glass intact are also attached. The glass disks measure 1.1 inches (2.7 cm) in diameter and are set into brass squares 1.3 inches (3.3 cm) on a side. Likely associated with this artifact are two brass fragments recovered as part of the artifact lot 134-4 (Figure 5.72). These fragments include a shade frame without glass and a rectangular object with a central slit and a hinged end. The rectangular object may have been placed in front of the index mirror as a modified version of a Maskelyne flap, allowing for observations of bright celestial bodies (Ifland 1998:72).

Figure 5.70. Octant horizon mirror assembly (artifact no. 131) (bar equals 2 cm; photograph by R. Sasaki).

Figure 5.71. Octant index mirror assembly (artifact no. 133) (bar equals 2 cm; photograph by R. Sasaki).

Figure 5.72. Artifact lot 134-4, including likely octant fragments (photograph by R. Sasaki).

Dr. Helen DeWolf of the Conservation Research Laboratory disassembled the index mirror assembly and noted the name “B COLE” marked on the underside of the hinged shade base (Figure 5.73). Beside the “E” but much smaller and turned 90^{o} counter-clockwise is a “27.” Between the index arm and the frame was a paper gasket; both pieces of wood are marked “92.” The purpose of these numbers is unclear but they may have been manufacturing numbers indicating pieces of the same instrument (Helen DeWolf, personal communication).

The “B COLE” likely refers to Benjamin Cole of London, either Benjamin the elder (1695–1766) or his son, also named Benjamin (died 1813). The elder Cole began manufacturing mathematical, philosophical, and optical instruments in 1720 and was joined by his son immediately before the death of the father in 1766. The younger Cole operated the firm under the name Cole and Son until 1782, when it was sold to Cole’s apprentice John Troughton. Cole and Son advertised a full range of instruments and were known to have sold globes, octants, and telescopes. Troughton carried a similar line of instruments but also sold dividing engines, the machines used to inscribe angles on the scale of an octant. An additional Benjamin Cole was apprenticed to the younger Benjamin but does not appear to have been a relative. This Cole operated during the 1770s (Clifton 1995:60–61, 282). A search for American instrument makers that also matched the maker’s mark resulted in no matches (Bedini 1964).

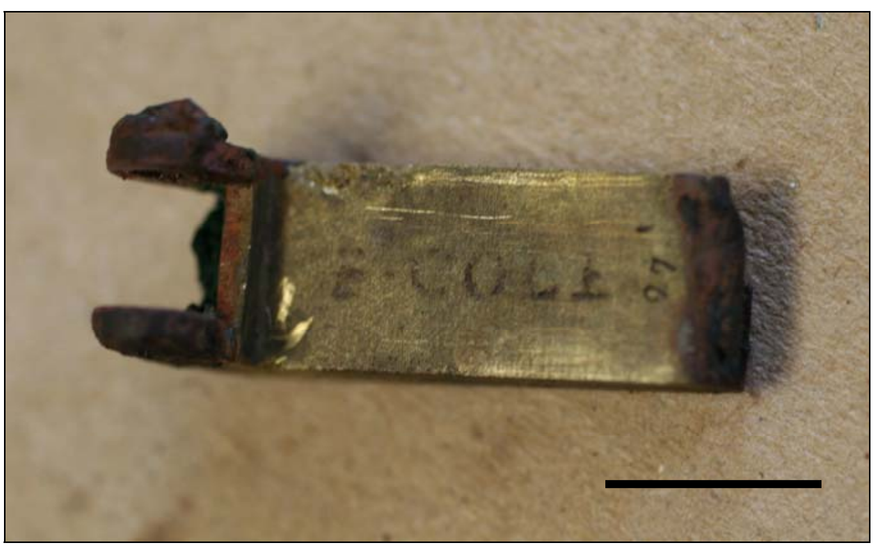

Figure 5.73. Inscription on underside of octant shade base (artifact no. 133) (bar equals 2 cm; photography by R. Sasaki).

While the Cole manufacturing dates are earlier than many other artifacts recovered from the wreck, they are consistent with the morphology of the octant fragments. Similar components, including the index and horizon mirror mounts, were noted on a 1758 octant manufactured by Thomas Hammond and a generic illustration of a mid-eighteenth century octant (Ifland 1998:46, 87). Similarly, the brass sextant recovered from the 1790 wreck of HMS *Sirius* was described as being very similar to mid-century octants and had an index mirror mount and tangent screw arrangement nearly identical to that of the Mardi Gras Shipwreck octant (Stanbury 1991). Other archaeological examples of octants include fragments recovered from the 1761 wreck of *St. Auguste* that had a different tangent screw arrangement, and three nearly-intact examples excavated from an 1812 shipwreck on the coast of Uruaguay that were similar but more complicated with a second mirror for back-sights (Ascroft and Rochette 1992; Nasti 2001).

5.2.7.5 Navigational Compass

While not regularly recovered from archaeological sites, compasses were the primary means of navigation in Europe by circa 1300 (compasses were present in China by 1100). Compasses similar to the ones recovered from 16GM01 were in use by the end of the sixteenth century (Murray 1980). However, the compass described in Falconer's 1780 dictionary most closely approximates the remains found at the Mardi Gras Shipwreck site (Figure 5.74). Typically, the brass compass bowl, also referred to as a box, was secured with pivots to an outer ring or gimbal that was the last vestige of an intermediate box. This ring also had pivots at right angles to those of the bowl that were attached to an outer box of wood. This arrangement allowed the compass bowl to pivot in all directions (Falconer 1970:87 [1780]). The outer box was commonly square so that it fit well in the binnacle and automatically aligned the compass' lubber line when placed into position (Murray 1980:16). Within the bowl were a brass pedestal with a lead base that supported the card and needle. The lead base helped steady the bowl in addition to supporting the pedestal. The tip of the pedestal was often a sewing needle, but later was made of iridium. The pedestal was affixed to the needle with a cap and the needle attached to the card so that the two moved in unison (Falconer 1970:87 [1780]). Prior to the mid eighteenth century, needle shapes varied widely, but, in 1745, Dr. Gowin Knight developed an artificial rectangular bar compass that came to dominate the market through the first quarter of the nineteenth century, after which time it was found that more eccentric needle shapes helped balance the card and counteract the roll of the ship (Falconer 1970:87 [1780]; May and Holder 1973:67, 72). The card itself was often printed on paper and then varnished and attached to a supporting disk. The disks were occasionally made of cardstock, but mica and talc were more popular because they held their shape well and were unaffected by humidity and heat. The card could also be reinforced with a brass ring attached to its edge. The entire bowl assembly was often covered with a rimmed glass to protect the card and to prevent dirt from entering the bowl (Falconer 1970:87 [1780]; Murray 1980:15, 22). A piece of catgut string was also occasionally stretched across the compass fore and aft to limit the effects of parallax when viewing the card (Falconer 1970:25 [1780]).

Most ships carried two compasses fit into a binnacle or bittacle (from the French *habitacle*, meaning a small habitation) positioned directly in front of the helm (rudder, whipstaff, etc.) along the ship's centerline. The binnacle consisted of a small cabinet or box with three compartments (see Figure 5.74). The outer compartments each held a compass, while the center compartment contained a candle or lamp separated from the compasses by panes of glass (Falconer 1970:35–36 [1780]; Lavery 1987:26). The binnacle had the benefits of protecting the compasses and placing a compass in front of the helmsman regardless of which direction he turned, but they also had the negative effect of placing the compasses close enough together that they affected each other. This external influence, combined with iron inclusions in the copper bowl and needles that tracked the roll of the ship, made accurate navigation very difficult (Lavery 1987:26; Murray 1980:31).

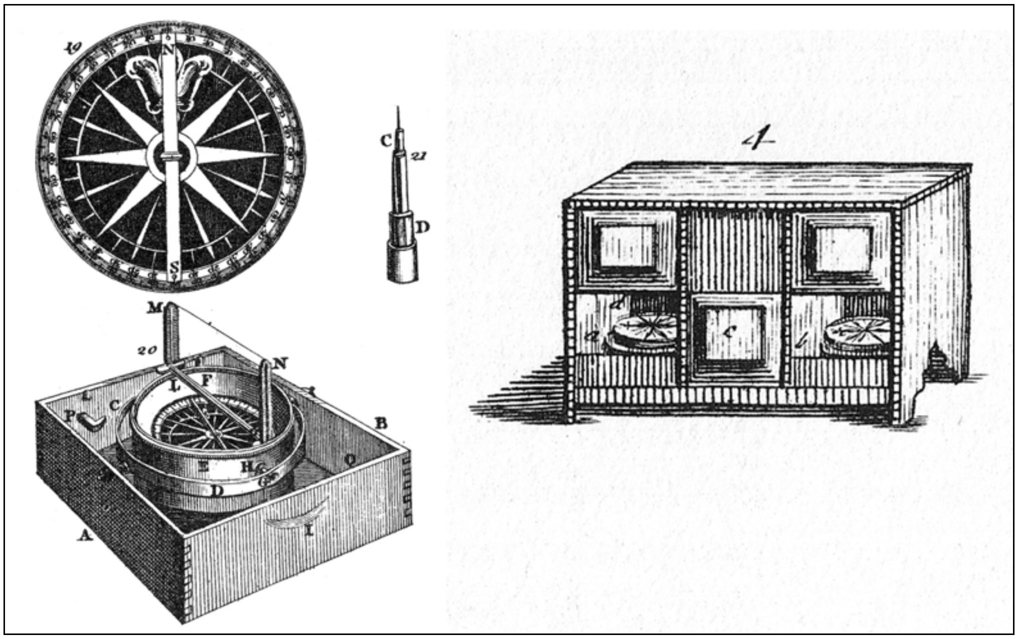

Figure 5.74. Circa 1780 compass and binnacle (source: Falconer 1970:Plates I and II [1780]).

The remains of two compasses (artifact nos. 127 and 128) laying 1.5 ft (46 cm) apart were recovered from approximately 1.5 ft (46 cm) northwest of the stern concretion. Compass no. 127 consists of the brass gimbal attached to the reinforced lip of the compass bowl, several fragments of the brass compass bowl, and the brass pedestal attached to a fragmented lead base (Figure 5.75). The gimbal measures 7.9 inches (20 cm) in diameter, while the compass bowl measures 7.2 inches (18.2 cm) in diameter. The largest fragment of the lead pedestal base is 4.1 inches (10.5 cm) across. The top of the pedestal has a recess to hold a post, often a sewing needle, that supported the card (Falconer 1970:87 [1780]). In addition to several unidentifiable disarticulated parts, one of the gimbal-to-box pivots was also recovered with the compass.

Compass no. 128 includes the gimbal with two intact pivots for attaching it to the box and holes for the inner pivots, pieces of wood that were likely the remains of the outer box, the compass cover with glass fragments still attached, several pieces of glass from the cover, the brass pedestal with lead base, a fragmentary mica card disk, and several fragments of the bowl as well as the two disarticulated inner gimbal pivots (Figure 5.76). The gimbal measures 8.5 inches (21.6 cm) in diameter while the frame of the glass cover is 7.5 inches (19 cm) in diameter. The reinforcing ring of the compass bowl is still inside of the glass cover, and the two are integrally attached, with the inner pivots passing through the ears of the cover to attach to the bowl. The lead pedestal base is 4.2 inches (10.7 cm) in diameter and the pedestal has a recess similar to that of artifact no. 127. The mica card disk measures 5.5 inches (14 cm) in diameter with two pairs of holes on either side of the 1-inch (2.5-cm) central hole that were likely used in securing the needle to the card.

Figure 5.75. Compass number 127 (photograph by R. Sasaki).

Figure 5.76. Compass number 128 (photograph by R. Sasaki).

An additional lipped brass ring measuring 7.4 inches (18.9 cm) in diameter (artifact no. 137) was recovered from between and immediately east of the two compasses (Figure 5.77). This artifact has no holes to mount pivots and is shaped to hold a pane of glass. Therefore, it is likely the cover for compass no. 127, the bowl of which it fits nicely. In addition to being different diameters, which was not uncommon (cf. Ericsson 1975:67), the two bowls are different shapes based on the convexity of the lead pedestal bases.

Figure 5.77. Brass compass cover ring (artifact no. 137) (bar equals 1 cm; photograph by R. Sasaki).

It is very likely that the two compasses were contained in a binnacle based on their positions. This interpretation is supported by the presence of a pane of glass (6 X 3.75 X 0.06 inches [15.1 X 9.55 X 0.15 cm]; see Glass section above) situated between the two compasses. This pane is likely part of the central portion of the binnacle.

The primary means of dating compasses is their maker and the card. The divisions of cards and their decoration changed through time, while the shape of compasses remained largely fixed for several centuries (Murray 1980). Similarly, very little comparative archaeological literature is available. For instance, a few small compass fragments were recovered from the 1747 wreck *Maidstone*, while excavation of the Russian pink *Evstafi* that wrecked in 1780 yielded only a lead compass bowl weight. Conversely, the Russian frigate *Nicholas* (wrecked 1790) included a nearly-complete compass including a lead pedestal base and a securing rim or cover for a slightly smaller compass that was not recovered. This compass, however, had very different gimbal pivots than the Mardi Gras Shipwreck compass, and the mica card had a significantly smaller hole (Ericsson 1975:67). Two compasses were recovered from *Santo António de Tanna* off of Mombasa, Kenya; however, this vessel was a Portugese East Indiaman that was lost in 1697 (Richardson 1991).

5.2.8 Stern Concretion

The stern concretion (artifact no. 135), situated at the extreme southeastern end of the site, was recovered using a LART and transported in the LART to the Conservation Research

Laboratory where it is currently undergoing detailed recording, excavation, and conservation (Figures 5.78 and 5.79). As this process is ongoing, a final inventory and analysis of the concretion can not be provided in this report. However, an initial recording (see Figure 5.46)

Figure 5.78. Stern concretion (artifact no. 135) during conservation. Box in foreground and domed concretion in left background. Drilled planks in left foreground and hull remains in right background (squares in fiberglass grid supporting concretion measure 1 inch on a side; photograph by R. Sasaki).

Figure 5.79. Stern concretion (artifact no. 135) during conservation. Box and cannon shot visible above frames and planning (squares in fiberglass grid supporting concretion measure 1 inch on a side; photograph by R. Sasaki).

and inspection revealed a wide array of artifacts. These artifacts include a domed concretion that appears to be a conglomeration of scrap iron. Adjacent to the domed concretion is a wooden box containing a mixed assemblage of items, including an axe or hatchet head, a chisel, a broom head, and several other possible tools. A lead sounding weight is situated between the box and the domed concretion. East of the box as the stern concretion originally laid, is an assemblage of wood planks with holes drilled through their narrow dimension, some of which contain pegs. Additionally, the concretion contains lead and iron shot, including bar shot, as well as unidentified pieces of iron, wood, leather, bone, and cloth.

5.3 Hull Remains

The data recovery plan allowed very few opportunities to inspect the hull of the Mardi Gras Shipwreck due to the highly degraded nature of exposed hull and the goal of limited bottom disturbance. Only one hull fragment (likely timber along southwest edge of site) was noted above the sediment; the remainder of the hull appeared to have been destroyed by boring mollusks and natural action. A 2–4 inch (5–10-cm) thick black layer containing a heavy load of mollusk tubes and small wood fragments was noted approximately 3 inches (8 cm) below the surface. This mulch layer was likely the remnants of much of the hull. Living examples of various boring mollusk species (all members of the *Teredinidae* family, but many outside of the Teredo genera) have been recovered from depths exceeding that of the Mardi Gras Shipwreck. Temperature, salinity, and the presence of wood, rather than pressure, are the controlling factors in the distribution of boring mollusks (Turner 1966:52, 56). However, given the depth of the wreck, its isolation on the seafloor, and the limited time (96 hours) that free-living larva have to begin boring before they degenerate and die, it is likely that the vessel was infested with cold-breeding mollusks before it sank and that the population lasted until all available wood was destroyed (Lane 1960; Turner 1966:52). Only portions of the hull that were buried or impregnated with iron corrosion products before infestation appear to have survived. This observation is consistent with the nearby Mica Shipwreck, where only timbers in direct contact with the copper sheathing were preserved (Atauz et al. 2006; Jones 2004).

Despite the deteriorated state of the wreck and the limited amount of excavation, the hull was visible in four locations: a longitudinal timber along the south side of the wreck, frames near the cannon, frames and planking southeast of the gun box, and frames and planking recovered with the stern concretion. The aggregate of these areas is approximately 60 ft^2 (5.6 m^2) or 10 percent of the total shipwreck area.

What appeared to be two attached timbers extending 8.7 ft (2.65 m) southeast-northwest (fore-and-aft) are situated along the southern margin of the site (see Figure 5.1). The arrangement is 1 ft (30.5 cm) at its widest, with the large timber measuring approximately 9 inches (22.9 cm) across. This area of the site was not investigated and it is unclear if these timbers are a single broken piece of wood or two distinct pieces. Similarly, the function of these timbers is unclear, and it is uncertain if they are in their original position or are disarticulated.

Immediately south and east (aft) of the cannon muzzle, two timbers were noted beneath the concretion. The two parallel timbers are oriented roughly east-west (athwartship) (Figure 5.80). These timbers have a sided dimension of approximately 8 inches (20.3 cm) and are spaced approximately 6 inches (15.2 cm) apart, suggesting that the timbers are centered every 14 inches (35.6 cm). It was not possible to measure the moulded dimension of these timbers. An

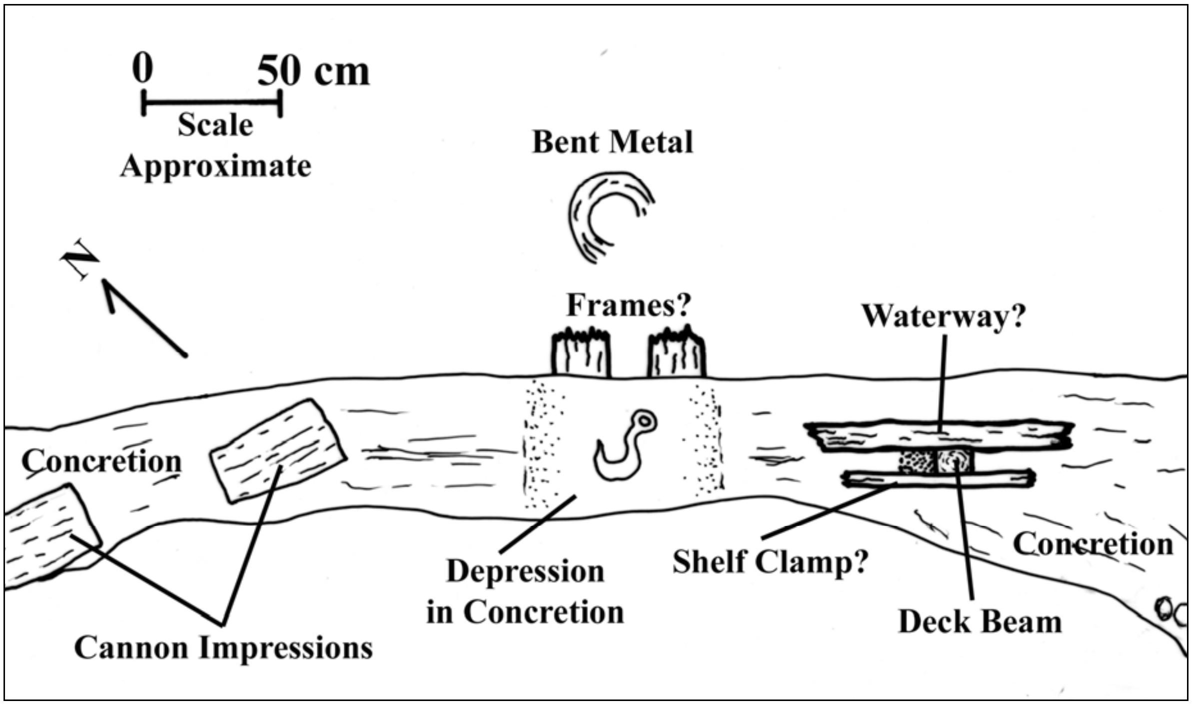

Figure 5.80. Sketch of hull remains situated near cannon (illustration by B. Ford).

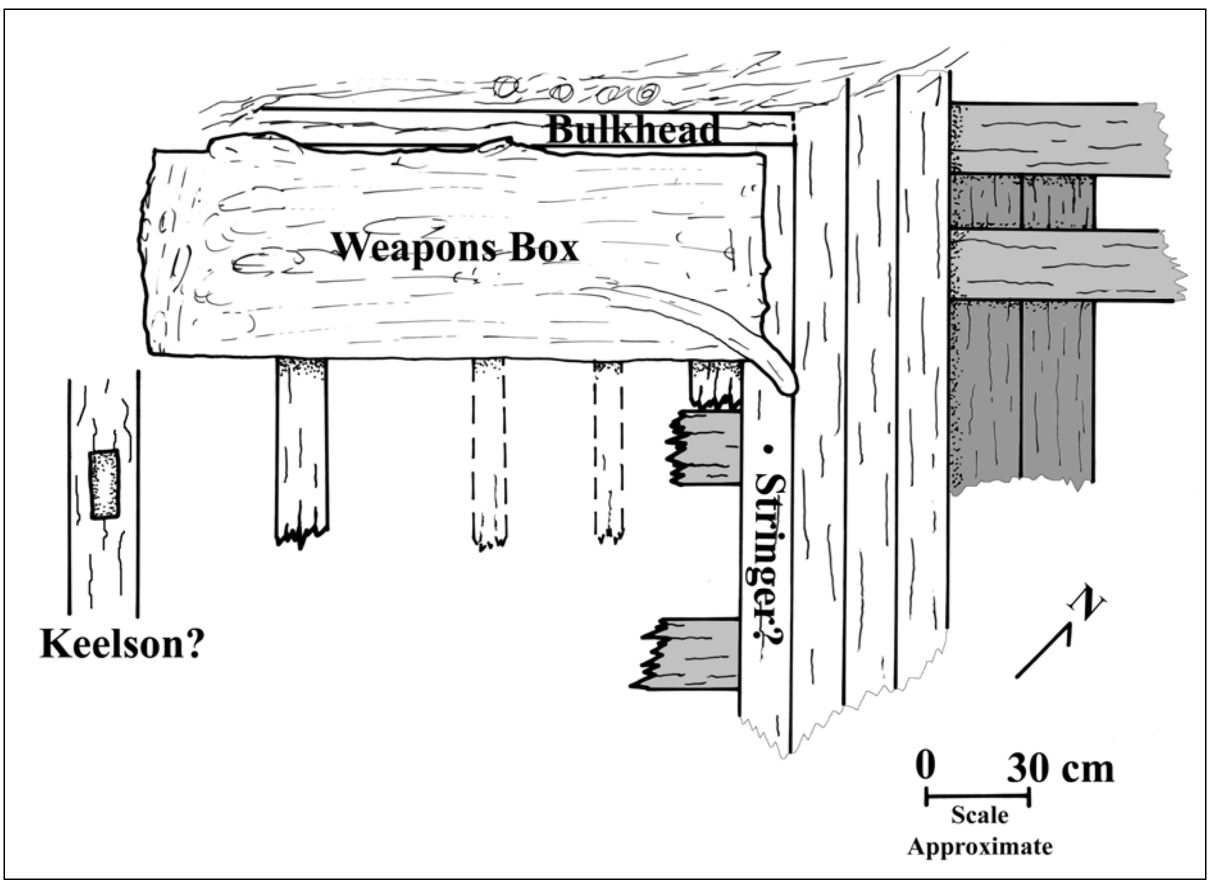

Figure 5.81. Sketch of hull remains situated near weapons box. Ceiling planking shaded light grey, frames shaded medium grey, and hull planking shaded dark grey (illustration by B. Ford).

oddly-rectangular depression with a hook near its center was also noted within the concretion immediately above these timbers and what appeared to be a curved piece of metal is situated slightly farther to the east. Approximately 1.5 ft (45.7 cm) southeast of these timbers, another timber was noted sticking vertically out of the concretion. This timber measures approximately 4.7 X 2.8 inches (12 X 7cm) and may have had a second timber of similar dimensions contiguous to the northwest (forward), although only a roughly rectangular hole remained in the concretion. The timber appeared to be clamped between a 4-inch (10.2-cm) thick southeast-northwest (fore-and-aft) oriented timber to the east and a 2.4-inch (6.1-cm) thick timber to the west. Given the lack of investigation and recording in this portion of the wreck, it is difficult to interpret these timbers. However, one tentative explanation is that the side of the vessel has splayed open so that the timbers near the cannon are frames and the upright timber(s) is a deck beam possibly accompanied by a shelf clamp and waterway.

Additional hull was uncovered while excavating around the gun box. The hull structure in this area was compressed and difficult to interpret. This situation was further exacerbated by the difficulty of interpreting three-dimensional space on a two-dimensional screen lit with artificial light that caused the view to shift drastically as the camera and ROV moved. The sketch presented in Figure 5.81 is the author's best interpretation based on the evidence but may require revision if better data is collected. In this interpretation, four irregularly-spaced frames were noted in this area. While all of the frames are approximately 8 inches (20.3 cm) sided, the northern (forward) three frames are approximately 6 inches (15.2 cm) apart, while the frame to the south (aft) is approximately 12 inches (15.2 cm) from the nearest timber. Immediately east of the weapon box is a 6-inch (15.2-cm) wide and 3-inch (7.6-cm) thick longitudinal plank. This plank is bolted to one of the frames with a round-headed iron fastener and appeared thicker than the other ceiling planking suggesting that it is a stringer. Three ceiling planks are also present immediately to the east of the stringer, all of which measure approximately 6 inches (15.2 cm) wide and 1 inch (2.5 cm) thick. Beyond the ceiling planking, two strakes of hull planking were visible. The thickness of these planks was not able to be measured, but they are 8 inches (20.3 cm) wide. The frames and planking in this area appeared to be at a different vertical angle from those west of the stringer. While it was difficult to judge angles due to the use of artificial light, several observers noted that the hull east of the stringer seemed to be rising, suggesting that the stringer may have been at the bilge. This area was significantly altered with a chainsaw in the aborted attempt to recover the weapons box. Beneath the weapons box, an additional ceiling plank was noted, as were the ghosts of possibly thinner longitudinal timbers that disintegrated during dredging. Farther west, beneath the western edge of the weapons box, a substantial timber was noted. This timber, oriented southeast-northwest (fore-and-aft), measures approximately 8 inches (20.3 cm) sided and 5 inches (12.7 cm) molded with a notch carved into its upper surface. This timber may be the keelson but the notch is unexplained. It is unlikely that the notch served as a mast step, but it could have been for a deck beam stanchion.

As noted in the Arms and Munitions section, the weapons box appears to have broken through the ceiling planking in this area, leading, in part, to its angle on the seafloor. A concretion obscured the interface between the weapons box and the hull, however it appears that the corner of the box truncates a frame visible farther to the northeast. The truncated frame could be explained by a framing pattern with unattached floors and futtocks similar to that noted on *Boscawen* (1759) and *Ticonderoga* (1814) (Steffy 1994:173; Kevin Crisman, personal communication). During this period, it was not uncommon for vessels to have either longitudinal or transverse gaps between floors and futtocks. The lower corner of the weapons box may be lodged between the end of a floor (not visible) and the beginning of the futtock visible beyond the ceiling planking.

The final hull portion consists of two frames (artifact no. 135-13) and several planks recovered in association with the stern concretion. These timbers were recorded at the Conservation Research Laboratory before conservation began (see Figure 5.46). One of the timbers measures 3.5 inches (8.9 cm) sided and 4.5 inches (11.4 cm) moulded while the other frame, set at an acute angle to the first, measures 6 inches (15.2 cm) sided and 4.5 inches (11.4 cm) moulded. The two visible frames are not square to each other suggesting that they may be cant frames situated at the stern of the vessel. The single ceiling plank measures 1.25 inches (3.2 cm) thick but is partially covered by the concretion obscuring its width. The attached hull planking is 10 inches (25.4 cm) wide and 1.5 inches (3.8 cm) thick. In addition to the hull planking, there is sacrificial firring attached to the hull that measures 1.25 inches (3.2 cm) thick. This wood, generally pine (*Pinus* sp.), was attached to the hull to forestall boring mollusks from reaching the hull. The firring was periodically torn off and replaced at less cost than re-planking the hull.

When compared to other known merchant vessels of the late eighteenth and early nineteenth centuries (Table 5.7), the frames of the Mardi Gras Shipwreck are light but within the range of other similarly-sized vessels. The wreck was not compared to river and coastal vessels, such as the Brown’s Ferry vessel or Malcolm boat, or military vessels, such as Deadman’s or the Phinney Site, because these vessels were more likely to be lighter- or heavier-built, respectively (Amer and Hocker 1995; Bense 1988; Hunter 2004). Both the hull and ceiling planking of the Mardi Gras Shipwreck are less than the 2 inches (5.1 cm), which was standard for much of the period (Vanhorn 2004). The possible keelson is also smaller than any other recorded keelson (Vanhorn 2004). This pattern may reflect the slightly smaller-than-average vessels being built in the Gulf of Mexico during this period (see Chapter 4) or the trend towards smaller scantlings during the late eighteenth century (Chapelle 1935:227), but given our limited knowledge about shipbuilding in the Gulf during the early nineteenth century, it is impossible to be conclusive. However, the presence of single frames, rather than double frames, does support the early-nineteenth-century date suggested by the artifacts (Chapelle 1935:227). Thus, it is likely that the vessel was constructed within a decade of its sinking, conforming to the average life-span of a vessel of this period (Bauer 1988).

5.4 Palynology

By Dr. Dawn Marshall

5.4.1 Introduction

The deposition of pollen grains in an oceanic environment is dependent on many factors. Within the context of the Gulf of Mexico (GOM), numerous studies and simulation models exist that postulate trajectories of particle movement due to Loop Current Rings or Loop Current Eddies and the separation of these rings from the Gulf and Caribbean Currents respectively.

Vessel	Date	Rig	Tonnage	Length (ft)	Beam (ft)	Hold (ft)	Frame Centers (in)	Floor Moulded (in)	Floor Sided (in)	Futtock Moulded (in)	Futtock Sided (in)	Hull Planking Width (in)	Ceiling Planking Width (in)	Notes	Reference
Clydesdale Plantation	1780–1820	Sloop	20–25	43.25	15.5	6.25		5				10		Keelson bolted through every 3rd or 4th frame	Amer and Hocker 1995; Hocker 1992
Mardi Gras	ca. 1810						14	4.5	3.5–8	4.5	3.5–8	9	6		
Browns Bay	pre-1820			54			18	3	4	3.5	2.6			Great Lakes	Amer 1986
Otter Creek	1800		100	58	16	9	1.25–3.25	12.5	8				9.5		Vanhorn 2004
Readers Point	1775	Sloop	100	60	18		22	10	9.5	7	7.25	18	14		Cook 1997
Rose Hill		Sloop	103	67	22		22	10.5	11	10.5	11	12	10		Vanhorn 2004
Nancy	1789	Schooner	100–120	68	22	7.5	25	8.25	8.5	8	8	8			Vanhorn 2004
Terence Bay	1750	Schooner	100–120	70			10	5.5	7.5	5.5	7.5			Closely spaced frames.	Vanhorn 2004
Defence	1778	Brig	170	72	22			12.5		8	4.75	10		Privateer	Vanhorn 2004; Wyman 1984
Bermuda Collier	1770–1796		170–210	72	24	11.5		12	12	7	10	12			Vanhorn 2004
Betsy	1781		180	73	23.6	9.5	28.25			8	9.5	8			Vanhorn 2004
Burroughs Site	mid-18th c		231–269	96	7.5	3.5	14	9						Frame measurements from site plan	Rodgers and Corbin 2002
Ronson	mid-18th c	Ship		100			15	8.5	8.5	8.5	8.5	10	8		Rosloff 1986; Vanhorn 2004

Table 5.7 Summary of Eighteenth and Early-Nineteenth Century Scantlings from Archaeological Evidence

To determine possible origins of pollen grains deposited in the area of the Mardi Gras Shipwreck *not* associated with the archaeological site itself, other factors, such water deposition from currents, eddies and deltaic deposits, wind, geological and modern contamination, were also considered.

Pollen samples were collected from 11 bottles, 5 sand-glasses, sediment surrounding the stern encrustation of archaeological artifacts, an encrustation found inside a bottle, a rope, and 2 cores. Basic palynological processing procedures were employed and adapted as needed to accommodate different depositional contexts.

Pollen preservation was mixed in most samples. Pollen grains that are not well-preserved could indicate contamination from surrounding sediments. Fresh, modern grains are also present. These could have been introduced during the sampling procedure, or could demonstrate that there is good preservation at the site as a result of a sealed container. If the pollen was well-preserved but could not be identified, then the pollen was counted and placed in the unknown category. However, if the pollen grain could not be identified due to degradation it was counted and placed in the indeterminable category.

The results indicated that most of the pollen grains from the core samples are a mix of Holocene- and Pleistocene-age pollen, with the oldest sediments at the bottom of the cores. Nevertheless, the pollen found from the core samples indicated that some mixing occurred either before, during, or after the cores were collected. Pollen types found in the sand-glasses were not present in the other samples and could be an artifact of initial filling of the glasses.

5.4.2 Depositional Environment

Although there are many studies that have explored the dynamics of regions that lie above and below the depth of the Mardi Gras Shipwreck, relatively few have examined grain movement in the transitional depth at which the shipwreck was found. Although sporadic, strong mid-depth currents have been reported by SAIC, NOAA, and Texas A&M (Nowlin et al. 2001), recent simulation studies indicated that movement of particles vertically in this region is most affected by ring separation in the upper depths. The understanding of separation process of rings from the Loop Current is based on Vukovich et al (1979), Vukovich and Crissman (1986), Fratantoni et al. (1998), Welsh and Inoue (2002), and Oye et al. (2005).

Lateral movement of grains at a depth of 1000 m appeared to be dependent on whether the particles were suspended over depths greater than 3000 m or suspended over slopes. Nevertheless, over a three-year period of time, more than 70 percent of the particles released at a depth of 1,000 meters moved either above 850 m or below 1150 m. Less than 3 percent of the particles moved lower than 1000 m (Welsh and Inoue, 2002). In terms of pollen deposition, pollen may be suspended for extended periods of time in ocean environments, especially those types of pollen that tend to float due to morphology.

5.4.3 Pollen Dispersal, Deposition and Preservation

The limiting factors in pollen dispersal and deposition include the size of the pollen grain, the number of pollen grains that are produced by a given plant, the shape of the pollen, the landscape, the environmental conditions, and the mode of transport. Depending on the evolutionary history of the plant, the pollen will either be dispersed by the wind (anemophilous), by insects (entomophilous), by animals (zoophilous), by self-pollination (autogamous) or a combination of these (Regal 1982; Bryant et al. 1990). Those plants that are pollinated by insects or animals evolutionarily have limited the amount of pollen they produce, while wind-pollinated plants need to produce prodigious amounts of pollen to ensure their survival. Other considerations are the amount of pollen each species produces, the percentage of sporopollenin (a condensed fatty acid polymer) found in the wall of the pollen grain that allows the pollen grains to be preserved (Havinga 1964, 1971, 1984), and the sinking speed of pollen, which refers to how heavy the grain is, and, thus, how far the grain will travel on wind currents (Jackson and Lyford 1999). The size differs from the weight of the pollen grain. For example, pine pollen can be quite large but, because of the structure of the grain it can travel long distances (Figure 5.82).

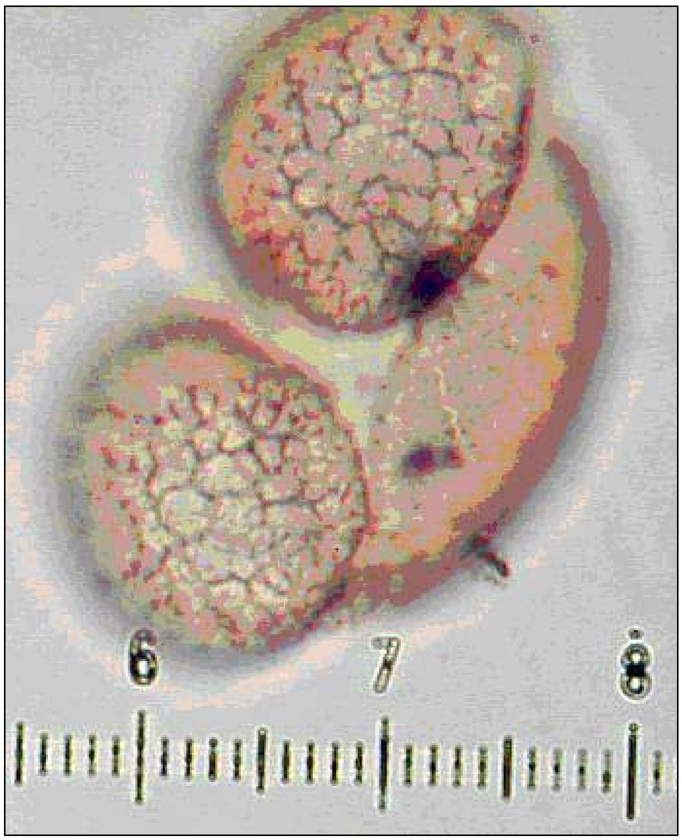

Figure 5.82. Pine pollen grain.

Generally, wind-pollinated plants will produce large amounts of pollen while insect-pollinated plants will produce smaller amounts of pollen. For example, red clover (*Trifolium pratense*) will produce approximately 220 pollen grains per anther, and rye *(Secale cereale*) produces approximately 19,000 pollen grains per anther. These are both insect-pollinated. The wind-pollinated pine (Pinus) produces approximately 160,000 pollen grains per anther, and juniper (*Juniperus*) produces approximately 400,000 pollen grains per anther (Erdtman 1969). Wind-pollinated types such as oak (*Quercus*), pine (*Pinus*) and juniper (*Juniperus* - also referred to as a TCT) tend to be over-represented in pollen samples and insect-pollinated types such as squash (C*urcubita*) and grape (*Vitis*) tend to be under-represented. On the other hand, pollen production type is not always indicative of pollen frequency in the sediment record. Juniper (*Juniperus*) is a high pollen producer. Nevertheless, it is not commonly found in archaeological deposits in large numbers due to the low amount of sporopollenin found in the pollen wall and its spherical shape. Any juniper or TCT pollen found will not stain well and probably will be cracked in two and difficult to differentiate from other non-porate grains unless the preservation is good. (TCT's are pollen grains found in one of three plant families 1) Taxodeaceae, 2) Cupressaceae, and 3) Taxaceae.)

Autogamous, or self-pollinated, types may produce even smaller amounts of pollen than insect-pollinated types (Faegri and Iversen 1989). In relation to the deposition of pollen, according to Tauber (1965), there are three important sources of pollen to consider when examining any type of land deposit: pollen from those plants which release pollen in the canopy or over the tops of trees in a forest, the trunk space or those plants that release their pollen closer to the ground, and pollen that is scoured from the air during precipitation. The deposition of pollen will depend on the surrounding vegetation during the time of deposition, the types of plants found in the surrounding area that may be present due to long-distance transport and deposition of pollen by human means.

The processes that may affect shipwreck sites in an oceanic, rather than terrestrial environment, include alluvial and deltaic deposits, the presence of silts, clays, sands and gravels suspended in water currents that scour and deposit materials, including pollen not associated with the archaeological site, and currents that may remove original components associated with the shipwreck (Gorham and Bryant, 2001). According to Gorham and Bryant (2001), there is a 'secondary *in situ*' depositional context in underwater sites. These deposits represent primary depositional context materials that are present when the ship sinks that are then deposited in lumps, between broken timbers, etc., where pollen and other microbotanical remains may become trapped.

5.4.5 Deep Water Sites

In contrast to shipwreck sites that are accessible by divers, deep-water sites present unique challenges, especially when attempting to collect microbotanical samples. Ideally, any artifact that is to be sampled for pollen should be moved minimally and either placed in a sealable container or the opening of the vessel should be covered prior to removing the artifact to the surface. Because of the extreme depth and the changes in pressure and current movement, removing the artifact to the surface without disturbing the potential microfossils is problematic. Although the practicality of this methodology has not been tested, it may be possible that mesh screening that is less than 10 microns could be employed, to allow for changes in pressure and the movement of water without loss of potential palynological data. Although the samples retrieved from the Mardi Gras Shipwreck were not covered, information from the mostly intact sand/hour glasses indicated that some *in situ* pollen still remained.

5.4.6 Methodology

A total of 30 samples were processed for pollen from the Mardi Gras Shipwreck. The samples were collected by Dr. Helen DeWolf at the CRL. The supernatant from each bottle was sampled with a plastic syringe and placed in sealable containers and labeled "initial draw." The sediment and remaining liquid for each sample was collected and placed in sealable containers and labeled. All samples were delivered to the Palynological Laboratory at Texas A&M for processing and analysis (Table 5.8).

Because of the context, most of the samples contain silicates or sand particles and are high in fine-grained sediments. In an effort to reduce the amount of sand and small particulates, samples were subjected to the following procedures: 1) screen and swirl, 2) hydrofluoric acid, 3) sonication, 4) centrifugation and decanting, 5) acetolysis, and 6) heavy density liquid, each of which is discussed below. Because the "initial draw" samples did not contain the fine particulate sediments, only hydrofluoric acid was necessary to reduce the silicates.

The first step in processing any pollen sample is the addition of marker grains. Marker grains are usually a type of pollen or spore not normally found in the relative geographical area where the fossil pollen samples originate. For the purposes of these samples, the marker grains added were *Lycopodium* spores. Lycopodium is a spore from a type of fern that is hardy, easy to recognize and presently may be purchased in tablet form in which the quantity in known. A marker grain is the "addition of exotic pollen in known quantities" to calculate the absolute population density of fossil pollen" (Benninghoff 1942). In other words, to estimate the number of pollen grains found from a known volume/weight of sample, a known number of exotic pollen grains is added to the unknown fossil pollen sample. Because the number of *Lycopodium* spores is known and the volume/weight of the fossil sample is known, it is possible to calculate the concentration or the absolute number of pollen grains per gram/milliliter of material. The concentration value serves as an indicator of possible differential preservation.

If there are a large number of degraded pollen grains, it is often a good clue that preservation is poor or differential. If there is poor preservation, then the interpretation of pollen data becomes problematic. For example, if only the very hardy pollen grains and those that are easy to recognize are found, then generally there is a problem with the overall preservation (Bryant and Hall 1993). Some researchers have attempted to establish criteria to determine whether a sample is reliable (e.g. Sanchez-Goni 1994), but it depends on the research question and the area sampled. Concentration values become important in an archaeological context when the pollen concentration values for individual pollen types cannot be explained by natural means (Dimbleby 1985). Irregular concentrations may be indicative of human activity, animal activity or both (Dimbleby 1985).

Screening and swirling is a method that assists the palynologist in separating heavier sediments from pollen. The theory behind swirling is that the pollen is lighter and will remain in suspension while the heavier particles will settle (Funkhouser and Evitt 1959; Pohl 1937). The samples from the Mardi Gras generally contained high quantities of silicates or sand and were processed using this separation method.

For soil samples that consist of high-colloidal material or fine-grained materials that tend to be attracted to one another, sonication may be employed. Sonication is the use of sound waves in water to break apart particles that adhere to one another and limit the visibility of pollen. It is usually used in conjunction with a non-foaming soap or other deflocculating agent and centrifugation to remove colloidal materials or fine-grained materials such as found in clay samples, including those from the Mardi Gras. The samples contained fine-grained sediments that had a clay-like consistency. As a result, pollen samples which contained those types

Table 5.8 List of Palynology Samples

TAMU#	Mardi Gras#	Letter	Material/Object	Comments	Volume
1	101		Glass/Bottle	Rxn with HCl/very little amount of sediment after processing	10 ml
2	108		Glass/Bottle	Rxn with HCl/large amount of sediment after processing	16 ml
3	114		Glass/Bottle with partial cork	Rxn with HCl/ significant amount of sediment after processing	10 ml
4	140		From LART/surrounding the encrustation	Rxn with HCl/high clay amounts/black to rust colored soil	40 ml
4a	140		From LART, from piece of wood	Rxn with HCl/high clay amounts/black to rust colored soil	12 ml
5	109	A	Encrustation in side of bottle		5 ml
6	109	B	Bottle Cork in bottle prior to decanting		3 ml
7	103	A	Bottle Cork in bottle prior to decanting		13 ml
8	122	A	Bottle with cork in place		4 ml
9	201	A	Corked bottle contents		4 ml
10	202		Corked bottle prior to decanting		4 ml
11	227		Bottle no cork		2 ml
12	203	A	Bottle cork still in neck prior to decanting		6 ml
13	119	A	Hour glass (lead present)	Light color	25 ml
13	119	B	Hour glass (lead present)	Darker color	10 ml
14	120		Hour glass (lead present)	Reddish sand	51 ml
15	123		Hour glass (lead present)	Two jars combined, very similar contents	13 ml
16	208		Hour glass (lead present) (piece of wood, red paint)		24 ml
17	104		Glass/Bottle	Reddish sand	54.5 ml/subsample 7.5 ml
18	103		Initial draw/Bottle		20 ml total/5 ml sediment
19	103		Cork		20 ml total/10 ml sediment
20	122		Initial draw/Bottle		9.5 ml total/~0.01 ml sediment
21	140		Rope Sample		12 ml total/~0.01ml sediment
22	201		Initial draw/Bottle		~1 ml sediment
23	203		Initial draw/Bottle		10 ml total/0.01 ml sediment
24	Core	A1	500' off site 26.5 cm long/radius 5 cm at 18cm from top	Sediments uniform grey	12 ml total/~0.01ml sediment
25	Core	A2	500' off site 26.5 cm long/radius 5 cm at 7cm from top	Sediments uniform grey	3 ml
26	Core	B1	On site		3 ml
27	Core	B2	On Site		3 ml
28	Core	B3	On Site		3 ml
29	Core	B4	On Site		3 ml
30	117		Hour glass (lead present)	Two distinct bands lighter brown on top; darker on bottom	20 ml

Note - core b seemed to have 4 distinct strata. 1)1-6 cm; 2) 6-11.5 cm + B2 sediments much lighter after HF/light brown see photo; 3) 11.5-15 cm.

of sediments were sonicated with a non-foaming deflocculant for 10 seconds. Upon removal from the sonication bath, water was added, and the samples were centrifuged. The samples were then washed several times with water, centrifuged, and decanted to remove the fine grained colloids.

The following acetolysis procedure accomplishes two important things: 1) removes cellulose and other organic materials inside and surrounding the pollen grain, allowing for surface details and ornamentation to be seen clearly during microscopy, and 2) dissolves extraneous plant materials from the surrounding matrix, thus permitting pollen grains to be concentrated for examination. The acetolysis solution, as described by Ertdtman, is a mixture of acetic anhydride and sulfuric acid. The recommended ratio of acetic anhydride to sulfuric acid is a 9:1 mixture (Erdtman and Erdtman 1933). Nevertheless, different ratios may be used if the samples are high in organics. All of the samples except for samples 18, 20, 22, and 23 were heated at 90^{o} Celsius as a catalyst, in an 8:1 ratio of acetic anhydride to sulfuric acid for seven minutes due to high organic contents.

A mechanical method that helps to separate pollen from the extraneous matrix materials found in samples is heavy density separation. Zinc bromide is one of the heavy liquids that can be modified into a range of densities greater than 1.0, which is the specific gravity of water. This procedure relies on the various specific gravities of certain materials in relation to water and pollen. Specific gravity is defined as the ratio of the mass of a body to the mass of an equal volume of water at 4 degrees Celsius or other specified temperature (Weast and Astle 1981). Water has a specific gravity of 1.0 and pollen has a specific gravity ranging between 1.4–1.6. Most pollen researchers will use a liquid that can be adjusted to between 1.6 to 2.5 to accommodate pollen and phytolith extraction; nevertheless, most heavy-density liquids work similarly; the heavy-density solution is lighter than heavier particles, including metals and silica, which settle to the bottom of the test tube during centrifugation. Meanwhile, the lighter particles, including spores and pollen, will float (Coil et al 2003). Because of the high organic content and smaller silicates found in these samples, the heavy-density liquid zinc bromide was used on the Mardi Gras samples. This step of the processing methodology was repeated for all of the samples except for samples 18, 20, 22, and 23.

The samples were then stained with safranin-O, rinsed with ethanol and suspended in a glycerin medium and placed in 2 dram vials. Slides were made of all of the pollen samples. They were then examined under 40x and 80x magnification, identified, counted and photographed.

Additionally, all of the sand-glass sediments were saved and put aside for further analysis. While processing, it was found that the sand-glasses contained what appeared to be lead slag or lead tailings. Representative samples were tested first with sulfuric acid to establish that they are a metal and then with hydrochloric acid to establish that the metal in question is lead. Both times the material dissolved, which is the positive result for lead (Figure 5.83).

5.4.7 Results

Samples processed from the ocean cores yielded concentration values over 1000 grains/milliliter. Preservation in the cores was differential, varying from well-preserved pollen grains to poorly-preserved. The types of pollen found indicated that the sediments are Holocene

Figure 5.83. Lead grains found in sand-glasses.

to Pleistocene in age. As a result of water pressure, corks were found inside bottles *in situ*. As the bottles were raised to the surface, the pressure pushed the sunken corks into bottle necks; sealing some of the bottles. The sand-glasses contained lead, with sample 14 also containing red-colored sand, presumably from the corroded metal near the artifact. Every sample contained pollen except for the aforementioned initial draw samples, 18, 20, 22, and 23. Most of the samples contained concentration values below 1000 grains/ml with evidence for contamination from the surrounding sediments (Appendix F).

5.4.8 Discussion

The major type of pollen found is from the plant family Pinaceae (pine). Nevertheless, other types were found (Table 5.9).

The samples from the Mardi Gras Shipwreck tended to have differential degradation, varying concentration values and potential contamination. The core samples also showed differential degradation within the same stratigraphic level. Core A did not reflect a distinct stratigraphy, and, as a result, only two samples were taken, one at 7 cm from the top of the core, with the second taken at 18 cm from the top (Figure 5.84). Core B exhibited four distinct stratigraphic levels. As a result, four samples were taken in the intervals of 1–6 cm (B1), 6–11 cm (B2), 11.5–15 cm (B3), and one at 18.5 cm (B4). Core sample B1 sediments are brown/green in color, B2 sediments are darker brown, B3 and B4 sediments are black, with B4 darker than B3. The pollen types that are most distinctive for the core samples are degraded pollen types from the Pinaceae family. The types found were *Abies*, *Picea*, *Pinus* and *Tsuga cf. mertensiana*. These findings are consistent with Holocene and Pleistocene ocean core sediments recorded by NOAA, National Geophysical Data Center (NGDC) in 1986. The initial site record form prepared by Jack Irion (2007), reported that during inspection of the Okeanos gas pipeline following Hurricane Ivan in October of 2004, damage to the archaeological site was incurred by the subcontractor hired for the inspection. The unauthorized visit resulted in destruction and/or damage of several artifacts, including undisclosed bottles. It can be assumed that, as a result of this disturbance, older Pleistocene sediments became mixed with younger Holocene sediments and settled in open bottles and other artifacts. Additionally, this shipwreck site was initially identified in 2002 but not reported until 2004; other unauthorized visits may have occurred, which could also have contributed to the mixed sediments.

Table 5.9

List of Major Pollen Types Identified

Scientific Name	**Common Name**
ASTERACEAE LS	Aster family
BETULACEAEAlnus (4 pores)	Alder
CHENOPODIACEAE/*Amaranthus*	Goosefoot family/Amaranthus
FAGACEAE *Quercus*	Oak
JUGLANDACEAE *Carya*	Hickory
MYRICACEAE *Myrica*	Wax Myrtle
PINACEAE *Pinus*	Pine family
POACEAE	Grass family
SALICACEAE Salix	Willow
ULMACEAE *Ulmus*	Elm

Samples 1, 2, 6, 8, 13A, 13B, 16, 17, and 30 did contain pollen types that were probably from the original or primary context and can contribute valuable information. Sample one was from a glass bottle and contained *Vitaceae vitis* (grape) pollen. Grapes are insect-pollinated and will bloom and fruit simultaneously. As a result, grape pollen will be found in most wine sediments. Because of the context of the samples, it can be assumed with some assurance that the grape pollen was an artifact of the initial use of the bottle, which did at one time contain wine. Nevertheless, *vitis* was also found in sample 13b, which is a sand-glass. A potential cereal grain was also found in this sample. At this time, it is not possible to determine if the pollen was introduced when the sand-glass was initially constructed or as a result of secondary deposition. In addition to the previous pollen types, *Tilia* (basswood) was also found. Since *Tilia* is endemic to states surrounding the coast, including Texas, and the grain was relatively fresh and not degraded, the assumption is that it is a modern day contaminant. Samples 2, 8, 13a, 13b, and 17 contained possible cereal grains or grains from the Poaceae or grass family. Poaceae grains would be present in bottles that contained beer made from cereals such as barley. Nevertheless, although there is a potential for the Poaceae pollen to be in a primary depositional context, pollen grains from this family are endemic and size determinations used to identify cereals grains overlap with regular grass pollen.

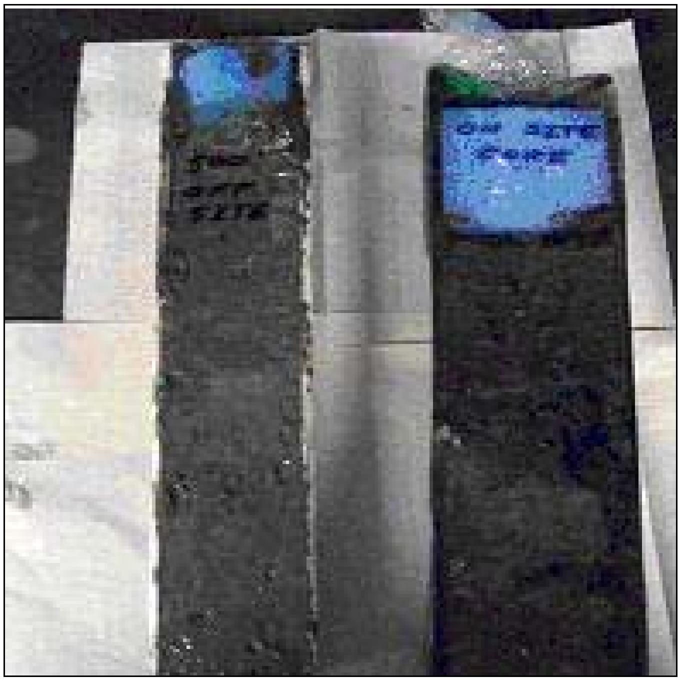

Figure 5.84. Cores A and B.

5.5 Wood Analysis

The five wood samples taken from the Mardi Gras shipwreck were identified by Dr. Regis Miller as American black walnut (Juglans nigra), yellow pine, likely of the southern yellow pine group (Pinus) (three samples), and a species of the white pine group, likely eastern white pine (Pinus strobus). The black walnut sample was removed from the gun carriage, the white pine was a sample of the planking, and the yellow pine included samples from two frames and the spar. American black walnut is native to the central and eastern U.S. The southern yellow pine group includes long leaf pine and southern long leaf pine, and ranges along the coastal plain from eastern Texas through north and central Florida to southeast Virginia. Eastern white pine occurs in eastern North America between Georgia and Newfoundland and as far west as Minnesota.

The presence of southern yellow pine frames suggest that the vessel was built in the southern U.S., possibly along the Gulf Coast. The presence of eastern white pine planking could indicate that the vessel was repaired at a northern port. However, these are tenuous connections given the large range of both species and the extensive use of southern yellow pine in ship construction (Steffy 1994:259).

Steffy (1994:259) noted that southern yellow pine was often used for frames and spars because it is easy to work but also strong and stiff. Yellow pine was specifically noted in the interior planking of the Reader’s Point wreck, the keel of the Clydesdale Plantation wreck, and the hull planks and keel of the Town Point wreck. Furthermore, unidentified pine was employed in sheathing the Rose Hill and Reader’s Point wrecks, as well as Betsy. The keelsons of Betsy and the Clydesdale Plantation wreck were also made of unidentified pine. The keel of the Brown’s Ferry wreck was also unidentified pine, as was its exterior hull planking (Vanhorn 2004:Table A-3).

6.0 Analysis and Conclusions

By Ben Ford

6.1 Vessel Analysis

6.1.1 Dates of Construction and Wrecking

The artifact assemblage and hull remains of the Mardi Gras Shipwreck indicate that the wreck occurred between 1808 and circa 1820. The eight *reales* coin, dated 1808, provides a firm *terminus post quem* for the wreck, but there is no equally obvious *terminus ante quem*. However, the presence of early nineteenth century French wine bottles and creamware ceramics, some of which have shapes distinctive to the first decade of the nineteenth century (see Table 5.1), suggest that the vessel was last outfitted not long after the coin was minted. William Adams (2003:59) suggests that ceramics and glass often had a time lag of 15–25 years between when they were produced and the event that placed them in the archaeological record. Many of the effects that often caused this lag, however, are not applicable to shipwreck assemblages (e.g. rural effect or curation effect). Additionally, the general uniformity of the French wine bottles suggests that they are not a mixed assemblage acquired over time either on the vessel or at the bottling source. Thus, Adams' low estimate of 15 years can be used to suggest that the Mardi Gras ship last departed dock sometime before circa 1820.

It is likely that the vessel was built no more than five to ten years earlier than the wreck date estimate suggested by the artifacts (1798–1815). American ships from the period 1715 to 1765 lasted an average of 4.7 years, and only 9.4 percent survived longer than 10 years. British vessels lasted only slightly longer (Bauer 1988:32–33). The Mardi Gras Shipwreck is of a slightly later period, but the factors that led to ship loss and abandonment in the mid eighteenth century, namely few navigation aids, boring mollusks, and unpredictable weather, still held in the early nineteenth century Gulf of Mexico. The recorded hull remains support the estimated date. While early nineteenth century ship construction in the Gulf of Mexico has not been extensively studied, the visible hull remains do conform to Chapelle's (1935:227) description of hull framing during the late eighteenth and very-early nineteenth centuries. During this period, there was a transition from paired double frames to single sawn (as opposed to naturally curved) frames and a general reduction in frame dimensions. This pattern may have developed earlier and been maintained longer in the Gulf of Mexico, where fast vessels for avoiding predators and light hulls for decreasing draft in shallow harbors were both considerations for ship constructors. One of the archaeological parallels to the Mardi Gras Shipwreck, the Clydesdale Plantation Vessel, which was a coastal sloop constructed in the Carolinas sometime between 1780 and 1820, had similar characteristics despite being a smaller vessel (20–25 tons). The frames of the Clydesdale Plantation Vessel consisted of 5-inch moulded floors notched over the keel with futtocks attached in-line and free-floors situated between. The presence of single frames and the off angle of the weapons box in the Mardi Gras vessel suggest that it may have had an analogous pattern with unattached futtocks above the free-floors, possibly supporting a turn-of-the-nineteenth-century construction date. However, this analysis is based on a small and scattered sample of the hull structure and is only a hypothesis that will require future testing to verify.

6.1.2 Vessel Orientation and Dimensions

The Mardi Gras Shipwreck is oriented with its bow to the north-northwest. This orientation was derived from the linear arrangement and distribution of the artifacts and hull remains. The presence of the anchor at one end of the site and possible cant frames within the concretion retrieved from the other end suggest that the two extremes of the artifact distribution closely approximated the dimensions of the vessel. The presence of the bulkhead and the distribution of personal artifacts to its southeast also support this conclusion, as this closely parallels the cabin configuration of many late eighteenth and early nineteenth century small merchant vessels (see Vessel Layout section below).

This orientation, the angle of the weapons box, the shapes of the two large concretions, and the surviving hull remains suggest that only the starboard side of the vessel was preserved. The weapons box was canted approximately 30^{o} off the seafloor. While it appears to have broken through the ceiling planking, either during the wrecking process or due to degradation of the planking after the wreck settled on the bottom, this is not an angle at which a heavy chest would naturally rest, indicating that it may have been partially supported by hull remains before it was concreted to the bulkhead. The large concretion attached to the north side of the bulkhead also supports this hypothesis. A substantial number of iron artifacts came to rest against the bulkhead and another hard surface for a sufficient period of time to form the concretion. The hard surface that formed the edge of the concretion leading to the cannon was possibly the side of the hull before it deteriorated. Thus, it appears that many of the loose iron objects on the deck and/or inside the hull, including a substantial amount of cannon shot, were transported to the intersection of the bulkhead and the hull. The stern concretion may have been formed by a similar process within the cabin, but its shape is not as indicative of a structural intersection. The possible stringer and keelson identified immediately southeast of the weapons box were also consistent with the starboard side of the vessel. While vessels often had several stringers, the heavier notched timber southwest of the chest has fewer alternative explanations. The notch in the top surface of the possible keelson may have supported a stanchion but further excavation is necessary to verify this interpretation. If this is in fact the keelson, the stringer was likely situated at or near the turn of the bilge, particularly given the observation that the frames began to rise beyond that plank. Tentatively, it appears that the vessel came to rest slightly to starboard and astern, forcing those portions of the vessel into the sediment and causing mobile artifacts to travel to the lowest points. Unfortunately, this position left the remainder of the vessel exposed to boring mollusks and other destructive forces.

The surviving remains suggest that the Mardi Gras vessel was an average-sized schooner for its period of operation. The length of the site (48.5 ft [14.8 m]) corresponds well with the average length of schooners operating in the Gulf of Mexico (56 ft [17.1 m], see Table 4.2) especially because it is unlikely that the stern concretion formed at the aftermost portion of the deck. More likely, the concretion formed within the cabin space and the transom extended the deck several more feet aft. Similarly, the distances from the likely keelson to the bilge stringer (6.5 ft [1.98 m]) and to the side of the hull extrapolated from the edge of the large concretion (9.5 ft [2.9 m]) indicate a vessel with a beam of approximately 18 ft (5.8 m), which is very close to the 17.6 ft (5.36 m) average for Gulf schooners between 1804 and 1820 (see Table 4.2). Assuming that this vessel was also average in its other dimensions, it likely had a depth of hold approaching 6.7 ft (2.04 m) and a capacity of 56 tons (see Table 4.2). Despite this evidence, there was substantial variability among Gulf of Mexico vessels and the dimensions of the Mardi

Gras vessel, especially the depth of hold and tonnage, are only estimates based on the current evidence. Reference to Table 5.7 indicates that the Mardi Gras vessel was more lightly-framed than many known wrecks of the period, but it was also a smaller vessel than any on the list except the Browns Bay and Clydesdale Plantation vessels (similarities between the scantlings of the Mardi Gras vessel and the Browns Bay Vessel are somewhat misleading because the Browns Bay Vessel was partially clinker built and derived much of its strength from its planking). Thus, the scantlings of the Mardi Gras vessel are within reason for a 40–65-ton vessel.

There is a reflexive relationship between the likely rig of the vessel and its size. The size of the ship suggests that it was a schooner, and the dimensions of the recovered boom (5.9 inch [15 cm]) closely match the dimensions for the third-quarter of a boom for the smallest sloops (70 tons) and schooners (110 tons) listed in 1794 by Steel (1982). It is possible that the Mardi Gras vessel was rigged as a sloop, as these vessels were approximately the same size as schooners in the early nineteenth century Gulf of Mexico and the boom dimensions work equally well for both. However, there were 179 schooners (51 percent) hailing from Gulf ports between 1804 and 1820, while there were only 23 sloops (7 percent) during the same period. The schooner rig divides the sail between two masts so that less crew is required to work the same amount of sail used to drive a similarly-sized sloop. North American mariners had largely adopted the schooner rig for their vessels by 1790, and, by 1810, it was rare to see sloops engaged in blue water trade (Chapelle 1935:221, 298). Assuming that the Mardi Gras vessel was rigged as a schooner, it was likely a topsail schooner (rigged with a square sail as the foretopsail and often the main-topsail), as this was the most common rig for an offshore schooner in the late eighteenth and early nineteenth centuries (Bauer 1988:32; MacGregor 1980:84; Steel 1982:Plate XLVIII).

6.1.3 Vessel Layout

Given the distribution of artifacts across the wreck site and their relationship to the surviving hull remains, it is likely that many of the artifacts did not travel a great distance during or after the wreck and their recovered locations can be grossly associated with their pre-wreck locations. Thus, the original layout of the vessel can be extrapolated from the archaeological remains.

Comparison with other vessels of the same size and period (illustrated in Chapelle 1935; Gardiner 1995; MacGregor 1980,1984a, 1988; Marquardt 2003) suggests that the Mardi Gras vessel likely had a single cabin located aft and possibly a forecastle deck or cabin situated forward of the fore mast. The surviving bulkhead was likely the forward wall of the after cabin. The forward portion of the wreck was not excavated and no evidence of the forward deck or cabin was noted; consequently, it is impossible to determine if this structure was part of the original vessel. The space forward of the bulkhead was likely used for carrying cargo and was possibly decked over. The locations of the cannon and stove within this area suggest that the vessel had a deck on which these artifacts originally sat. It would have been odd to have a cannon on its carriage below deck on a vessel of this size. Little evidence survived to suggest the original location of the cannon. The presence of an additional cannon and/or swivel gun was indicated by the varying calibers of shot noted in the nearby concretion. This shot could have been used as ballast, as was done on *Auguste*, but shot was more likely to be carried for use or as a cargo in the Gulf of Mexico during this period (Ascroft and Rochette 1992). There was also evidence that the stove had shifted, as it was no longer centered on the lead sheet that protected the deck from heat, but it was situated closer to the center of the wreck than the cannon and may have indicated the approximate location of the main mast.

No direct evidence for the masts survived. However, a summary of similar vessels of the period (Table 6.1) indicates that, regardless of size, the position of the main mast remained relatively constant at 42 percent of the vessel length as measured from the stern (standard deviation of 3 percent). The fore mast similarly tended to be situated at 80 percent of the vessel's length as measured from the stern (standard deviation of 4 percent). As the only undisputed structural evidence noted on the Mardi Gras Shipwreck, the average position of the forward bulkhead of the stern cabin was also noted. This ratio varied more than those for the masts and did not fluctuate regularly in respect to vessel size, rig, or construction date. The percent of the vessel included in the stern cabin varied from 21 percent to 43 percent, with an average of 30 percent and standard deviation of 8 percent. A comparison between the locations of the bulkhead and the main mast for the ships listed in Table 6.1 indicates that the main mast on a 56-ft (17.1-m) vessel could range from 0.6 ft (18.3 cm) aft of the bulkhead to 13.2 ft (4 m) forward. The average distance between the bulkhead and main mast on a 56-ft vessel was 5.9 ft (1.8 m). On the Mardi Gras Shipwreck, 5.9 ft forward of the bulkhead was the center of the stove. While this is likely a coincidence, it is not inconceivable that the heavy stove remained relatively close to its original location. Single-decked merchant vessels often carried their stove on deck aft of the fore mast. However, it was not unheard of for the stove to be situated near the main mast, such as on *Neptunus* (113 tons, built 1843) where the stove was in a small galley shed erected on the main deck immediately forward of the main mast (MacGregor 1984b:75).

The remaining hull area, aft of the bulkhead, contained artifacts likely associated with a stern cabin. This space generally served as the business office and mess of the vessel, as well as the captain's quarters (crews on small vessels often slept on deck or in the hold). The artifact assemblage of the Mardi Gras Shipwreck reflects these uses. The only domestic artifact recovered forward of the bulkhead was a stoneware jug (artifact no. 300). All other table and teaware, as well as all of the bottles, were recovered aft of the bulkhead. This distribution suggests that the ceramics were stored within the cabin and meals may have been eaten there as well. The linear arrangement of many of the ceramics (artifact nos. 211–215 and 219) and their association in stacks of like wares (artifact nos. 213 and 214-1, 214-2, 214-3, 219-1, and 219-2) suggest that at least some of the ceramics were stored in a cabinet. The presence of this cabinet is further suggested by the nearby drawer-pull (artifact no. 216). The cabinet likely survived the wreck with the ceramics inside but subsequently deteriorated, leaving only its hardware and dropping the ceramics in place. Similar furniture with specially-constructed cupboards was noted on the Yorktown shipwreck YO88 (Renner 1987). Other pieces of ceramics and the flatware were strewn across the aft cabin area, suggesting that not all of the table and teaware were secured in a cabinet.

The shapes of ceramics recovered did not shed any light on the types of foods eaten by the crew. Given the predominance of soups and stews in maritime diets and the presence of the tureen, large bowl, and spoons, it was odd that no individual-sized bowls were recovered, especially, as the days of the communal trencher had generally passed prior to the Revolutionary War (Deetz 1996). However, the deep-bodied plates could have been used to eat stews as well as the more-solid food suggested by the charger and fork- or knife-handle scales. Whatever was eaten would have been spiced or sweetened by powdered mustard from the "London" bottle and sugar, salt, or pepper from the caster.

Name	Length (ft)	No. Mast	Rig	Date	Stern to Main Mast (ft)	Stern to Fore Mast (ft)	Stern to Bulkhead (ft)	Main Mast Percent	Fore Mast Percent	Bulkhead Percent	Source
Duchess of Manchester	71	2	Brig	1757	32	62	n/a	0.45	0.87	n/a	MacGregor 1980:81
Marblehead Schooner	59	2	Schooner	1767	26	50	n/a	0.44	0.85	n/a	Marquardt 2003:103
Sultana	50.5	2	Schooner	1768	23	44	20	0.46	0.87	0.40	Gardiner 1995:24
Chaleur	72	2	Schooner	1768	33	64	16	0.46	0.89	0.22	Marquardt 2003:104
Chapman's Schooner-Rigged Bark	87	2	Schooner	1768	33	68	34	0.38	0.78	0.39	Marquardt 2003:98
Helena	76.5	2	n/a	1778	35	67	n/a	0.46	0.88	n/a	MacGregor 1988:30
Berbice	72.6	2	Schooner	1780	31	58	17	0.43	0.80	0.23	Marquardt 2003:40
Fly	46	1	n/a	1787	35		20	n/a		0.43	MacGregor 1988:26
Ornen	74	2	Schooner	1800	29	63	26	0.39	0.85	0.35	Marquardt 2003:101
Unnamed	53	2	Schooner	1803	20	41	13	0.38	0.77	0.25	MacGregor 1980
Schooner For Port Jackson	53	2	Schooner	1803	21	44	11	0.40	0.83	0.21	MacGregor 1980:160; Marquardt 2003:109
Shamrock	74	2	Brig	1805	30	57	17	0.41	0.77	0.23	MacGregor 1988:54
John	43.8	2	Schooner	1805	15	36	11	0.34	0.82	0.25	MacGregor 1980:109
US Revenue Cutter	77	2	Schooner	1812	33	65	24	0.43	0.84	0.31	Marquardt 2003:123
Nielson	91.3	2	Brig	1824	40	80	31	0.44	0.88	0.34	MacGregor 1984a:38
US Revenue Cutter	63	2	Schooner	1825	25	52	22	0.40	0.83	0.35	Marquardt 2003:122
Glasgow	72	2	Schooner	1826	30	57	n/a	0.42	0.79	n/a	MacGregor 1984a:52
Morris	67	2	n/a	1830	27	54	25	0.40	0.81	0.37	MacGregor 1984a
Enterprize	57	2	Schooner	1831	24.5	48.5	21.5	0.43	0.85	0.38	Marquardt 2003:119
Dos Amigos	80	2	Schooner	1832	37	67	16	0.46	0.84	0.20	Marquardt 2003:114
Santiago	68	2	Schooner	1833	28	58	20	0.41	0.85	0.29	Marquardt 2003:126
Halifax	60	2	Schooner	1840	26	50	23	0.43	0.83	0.38	Marquardt 2003:67
Neptunus	73	2	Brig	1843	27	57	n/a	0.37	0.78	n/a	MacGregor 1984b:75
Vigilant	56	2	Schooner	1843	23	45	n/a	0.41	0.80	n/a	Marquardt 2003:127
Average								**0.42**	**0.80**	**0.3**	

Table 6.1 Ratios of Masts and Cabin Positions

As discussed in Chapter 5, all of the recovered ceramics were of the least-expensive variety available in the early nineteenth century. Whereas some ship masters invested in displays of wealth, the operator of the Mardi Gras vessel appears to have been more frugal. It is dangerous to read too much into the choice of ceramics; however, they do hint at the utilitarian nature of the vessel. Even ceramics that were often used for ostentatious display on land, such as teawares, were of the plainest variety.

The beverages served at the ship's table are somewhat easier to identify. Based on the artifact and pollen data, the French wine bottles likely contained wine, possibly the then-popular claret (Jones and Smith 1985:14). The British-beer shaped bottles, with their varying shapes and inconclusive pollen data, were more difficult to identify, but likely also contained spirits. Coffee was also likely served. The presence of beans in the stern concretion matrix and the mill recovered near the weapons box, as well as the cups and saucers that historically were used for both tea and coffee, indicate that the crew, or at least the master, also had access to fresh-brewed coffee. This preference also helps date the wreck to the second decade of the nineteenth century. Coffee did not become prevalent in the U.S. until the War of 1812 made coffee the popular and, in many cases, only available form of caffeinated beverage.

In addition to the evidence of food and drink, the cabin area contained the remains of crew clothing. This includes one shoe or boot heel and several buttons likely belonging to six different garments, or possibly fewer items with mismatched fasteners. The heel was recovered near the stern concretion, while the majority of the buttons were recovered from a 0.8 X 1.5-ft (24 X 45.7-cm) area aft of the weapons box. Given the close proximity of this variety of buttons, it is likely that the clothes were stored in a chest or similar piece of furniture nearby. The two Spanish coins were also recovered from this area, indicating that they may have been stored in the same piece of furniture with someone's clothing and personal possessions. It is unlikely that the coins were money in the pocket of a sailor wearing the boot associated with the heel and the clothes that were fastened with the buttons given the distance between the heel and the buttons and the wide variety of buttons recovered (likely representing six garments).

The cabin also held tools associated with the maintenance, defense, and navigation of the vessel. An implement from the ship carpenter's kit, a smoothing plane, was recovered near the ceramics cabinet. The remainder of the kit has not yet been identified but may be contained in the stern concretion, and it is unknown where these tools were stored. Conversely, the weapons used to defend the ship are still secured in their box (see Cargo section below for further discussion), and the shot and flints likely associated with these guns still retained evidence of the box that held them near the stern concretion.

While it is possible that the contents of the weapons chest were cargo, the navigational instruments located within the cabin are almost assuredly associated with the vessel. The compass and binnacle, the fragments of which were recovered from near the stern concretion, may have been situated on the quarter deck immediately in front of the tiller and only settled into the cabin area as the hull began to decompose. However, it is possible that the binnacle was stowed in the cabin during inclement weather at the time of sinking. The remaining instruments, including sand-glasses, sounding lead, telescope, and octant, were more likely stored in the cabin. The presence of various ship-log timing sand-glasses and the absence of watch-clocks, which would have been kept near the helm, also suggest that the surviving instruments were in the cabin rather than on the deck.

These instruments indicate that the vessel was well-appointed for navigation following turn-of-the-nineteenth-century trends (Stanbury 1991). The captain or navigator not only had the means to determine his location along a familiar shore by searching for hints with the sounding lead and telescope, but he also likely had charts, no longer extant but indicated by the measuring compass, that would have allowed him to find his way in unknown waters. He also had the ability to navigate out of sight of land by taking measurements with the octant and bearings with the two compasses that would have allowed him to cross the Gulf of Mexico.

Analysis shows that these instruments were not of the same vintage or quality and were likely acquired at different times. The compasses were not a matched set, and the octant and telescope were likely constructed at least two decades apart. Furthermore, the telescope was constructed by a firm that received two royal appointments during the second decade of the nineteenth century, while the octant appears to have been an inexpensive model constructed primarily of wood. It remains unknown whether these purchases reflect the changing economic situation of the captain during his career or some other factor.

Finally, the scattered distribution of the sand-glasses is worth noting. These artifacts were collected throughout the area likely occupied by the stern cabin. It seems unlikely that these fragile glasses were thrown throughout the cabin without breaking. An alternative possibility is that the air contained within the glasses allowed them to float near the cabin ceiling until they slowly filled with water that pressed in through their corks and caused them to settle into the wreck.

The final and largest artifact of note, the stern concretion, is actually several artifacts concreted together. This concretion contains many of the loose artifacts that were situated within the stern cabin at the time of the wreck. While the ceramics, navigational instruments, clothes, and personal effects were likely contained in furniture or containers that partially prevented their free movement throughout the cabin, other artifacts were certainly loose. This concretion appears to contain a substantial amount of cannon shot as well as other iron artifacts, including scrap iron and a box containing an axe-head and other items. It is still unclear why cannon shot would have been kept in the cabin. The continued excavation and conservation of these artifacts may lead to a better understanding of the contents and uses of the stern cabin and the activities that took place within this compartment.

6.1.4 Vessel Correlates

Based on the above discussion, it is possible to identify three parallels for the Mardi Gras vessel from historically-recorded vessels. None of these possible vessels match the hull design and layout of the Mardi Gras vessel exactly; however, all three represent viable options, and their similarities and differences are discussed in turn below. Furthermore, no images of any of the wreck candidates, discussed in that section below, survive, so it is useful to refer to better-documented vessels that are not the Mardi Gras Shipwreck but were constructed with similar characteristics. It should also be noted that all of these vessels were cargo carriers. Merchant schooners were the most common vessels in the Gulf of Mexico during the early nineteenth century and, given the available data, a merchant vessel is the most parsimonious interpretation of the shipwreck. However, privateers and slave ships were also present. Without full artifact recovery or the definitive identification of the vessel it is impossible to rule out these types of vessels and they should be considered in any future analysis of this shipwreck.

“Schooner For Port Jackson,” which was likely built as *Mercury* (Figures 6.1, 6.2, and 6.3), was designed by the British Navy Board in 1803/04 and launched in Sydney, Australia in 1807 (Marquardt 2003). Despite being built on the opposite side of the earth from the Gulf of Mexico, its date, size, and interior layout may have been similar to those of the Mardi Gras vessel. *Mercury* measured 53 ft (16.2 m) on deck, 17.5 ft (5.3 m) in beam, with a depth of hold of 8 ft (2.4 m) and a capacity of just over 60 tons. In addition to being slightly beamier than the average Gulf schooner of the same period (length to beam ratio of 1:3 as compared to 1:3.2 for Gulf vessels), *Mercury* had almost 1.5 ft (45.7 cm) more depth of hold, which allowed it to carry slightly more cargo than the average Gulf schooner. These differences are noteworthy, especially the increased depth of hold, but are well within the range of Gulf schooners operating during the first and second decades of the nineteenth century.

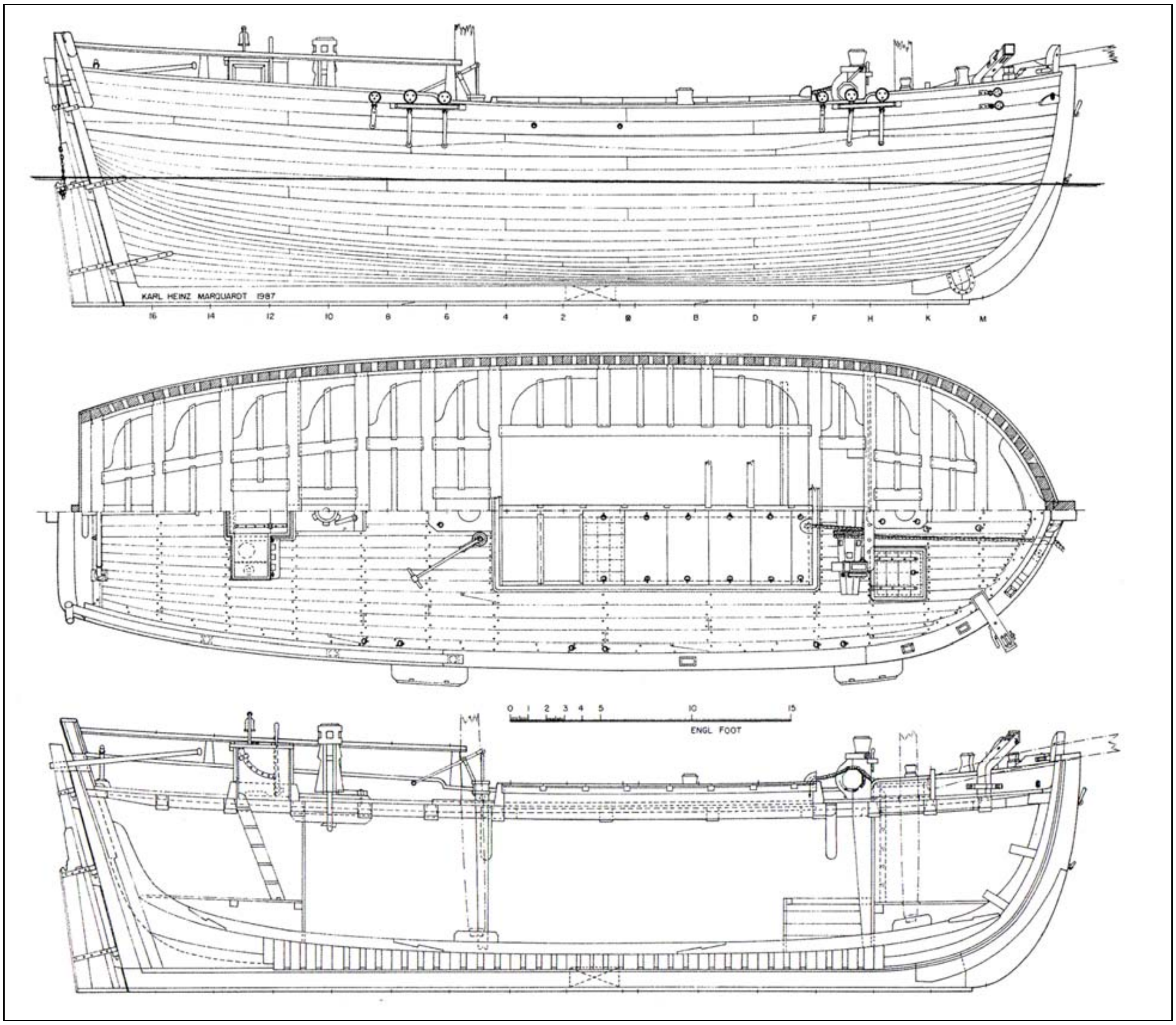

Figure 6.1. Sheer plan, deck arrangements, and longitudinal view of “Schooner For Port Jackson,” likely *Mercury* (source: Marquardt 2003:105).

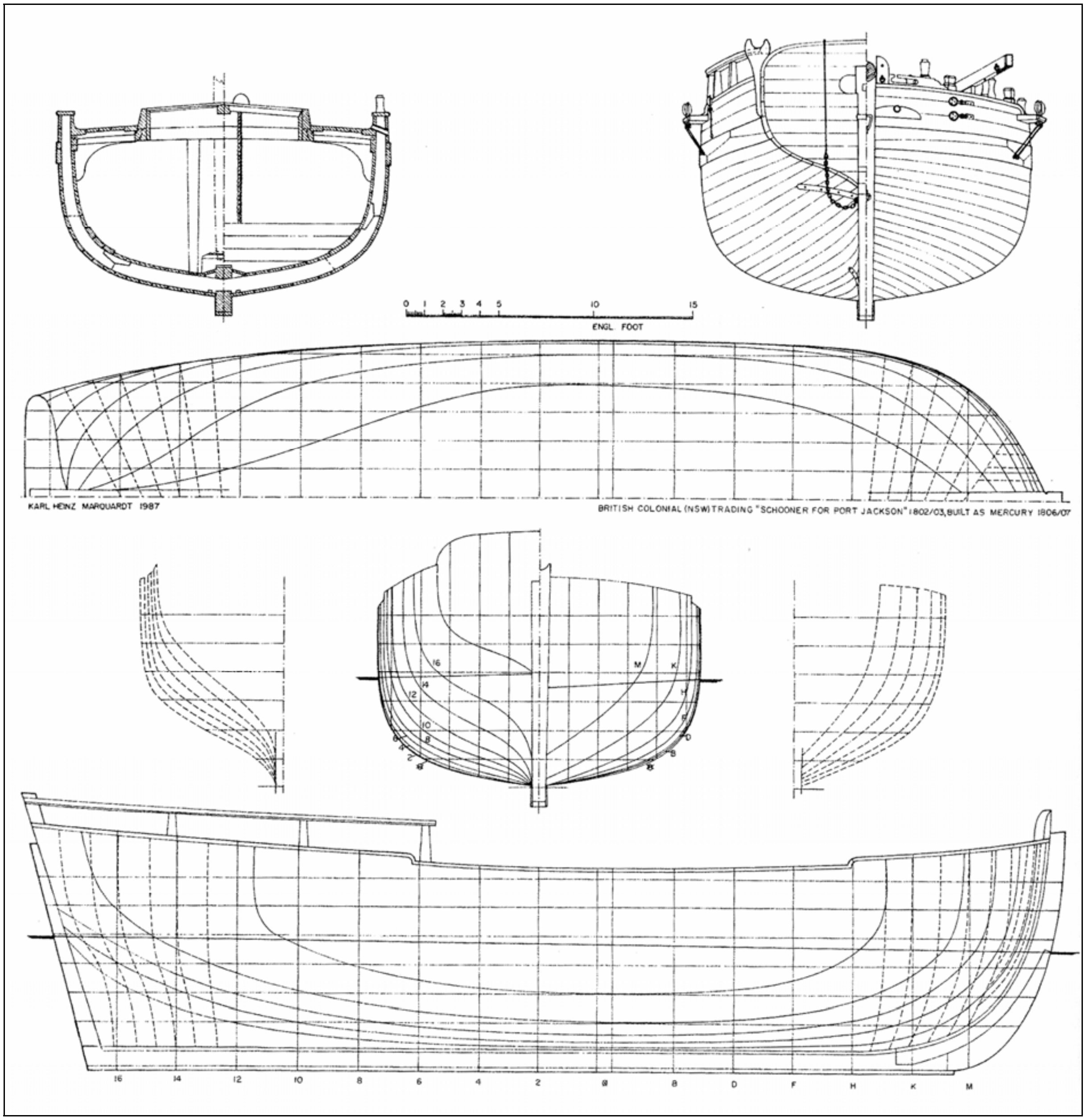

Figure 6.2. Lines drawings, bow and stern view, and main frame cross-section of "Schooner For Port Jackson," likely *Mercury* (source: Marquardt 2003:106).

Mercury was flush-decked with a small cabin in the stern and a single large cargo hatch between the masts. With the exception of the stern cabin, these features are not extant on the Mardi Gras Shipwreck but were possibly part of its construction. *Mercury* also had a small forward compartment entered through a hatch on the starboard deck. No evidence for such a compartment was recorded on the Mardi Gras Shipwreck but this portion of the wreck was not investigated. *Mercury* was steered with a tiller, which was common for a vessel of this period (MacGregor 1984a; Marquardt 2003). A similar arrangement, with the binnacle placed near where *Mercury*'s bell is depicted, may have been used on the Mardi Gras vessel. The topsail schooner rig of *Mercury* (see Figure 6.3) was also likely very similar to that of the Mardi Gras vessel.

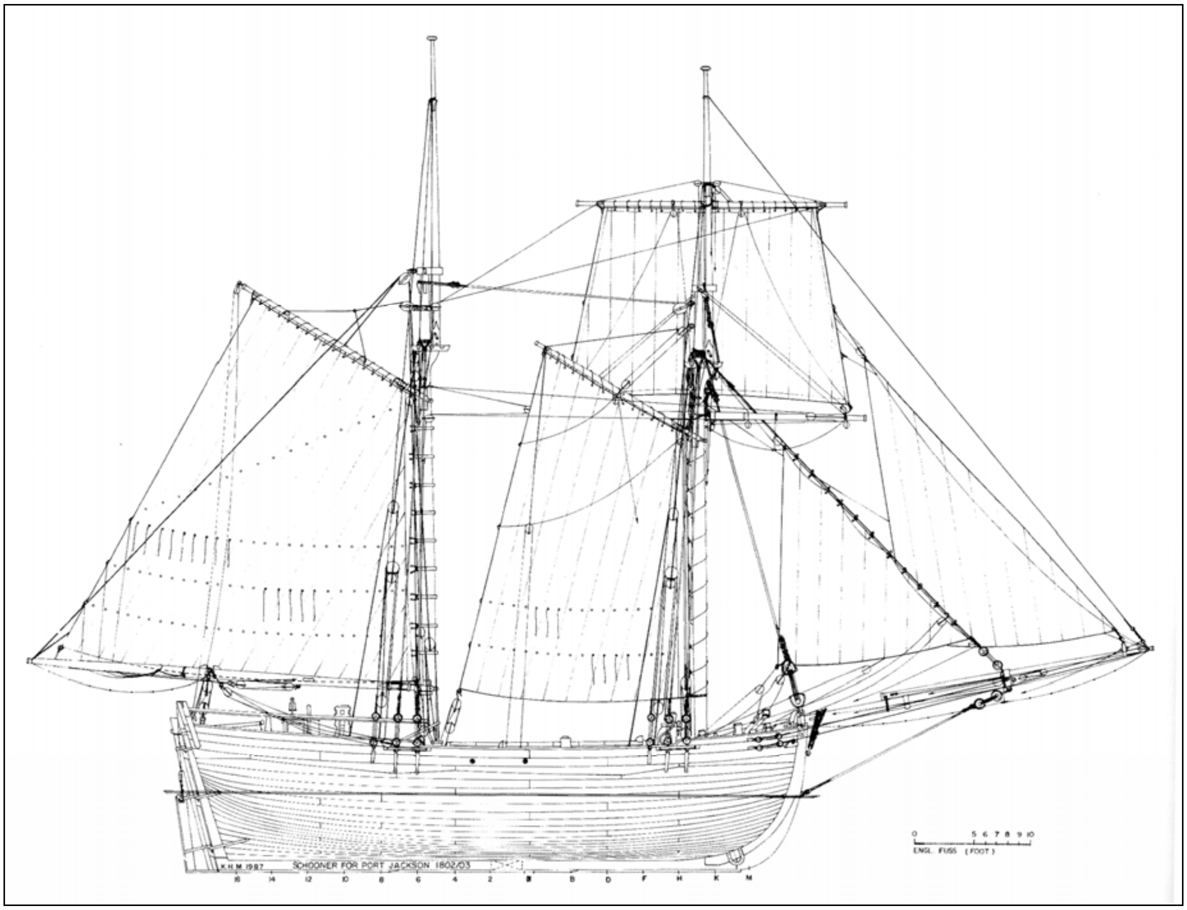

Figure 6.3. Rigging plan of "Schooner For Port Jackson," likely *Mercury* (source: Marquardt 2003:108).

The greatest deviation between *Mercury* and the Mardi Gras vessel is the stern of *Mercury*. Its flat, boat-like appearance is very different from the overhanging stern and counter common on most American vessels of the period. This stern and the substantial draft (approximately 7 ft [2.1 m]), which would have prevented the vessel from entering major Gulf ports such as Pensacola as late as 1819 (*Orleans Gazette* 18 June 1819), suggest that *Mercury* is a good, but not perfect correlate, for the Mardi Gras vessel.

The schooner *John* (Figure 6.4) likely errs in the opposite direction, with its exaggerated stern overhang. However, at 43.8-ft (13.4-m) total length, *John* is a good correlate for a vessel at the smallest end of the Mardi Gras vessel range. It was built in Bristol in 1803 to engage in inter-island trade out of Barbados and had a beam of 15 ft (4.6 m) and a depth of hold of 6 ft (1.8 m) for a tonnage of 43–50 (MacGregor 1980). This vessel had a slightly raised quarter deck with a covered hatch leading down into an aft cabin. The remainder of the vessel appears to have been used for cargo, but there may have been a small forward compartment, although no hatch is indicated. Two cargo hatches situated immediately forward of the main mast allowed cargo to be placed in the hold. This arrangement leaves more room at the waist for a gun to be operated. While *John* was a simple capacious merchant vessel that likely had many of the features of the Mardi Gras vessel, it was slightly beamier (1:2.92) than many Gulf schooners and had a deeper draft. Many of the Caribbean islands had good ports that allowed deeper vessels to enter making cargo capacity more of a concern than a shoal draft.

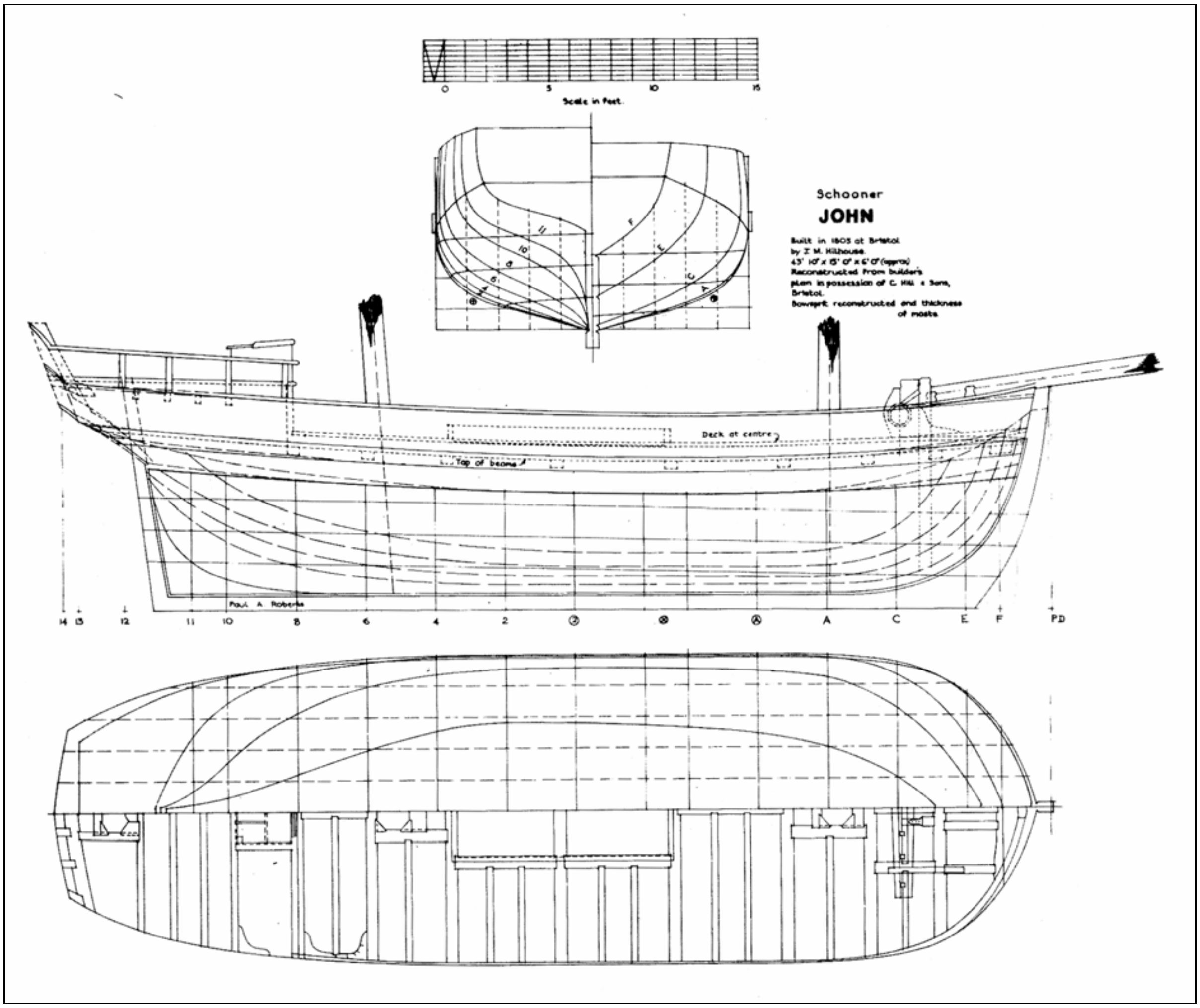

Figure 6.4. Lines and deck plan of *John* (source: MacGregor 1980:109).

The final possible correlate, the U.S. schooner *Vigilant*, is the only one of the three that was built specifically for the Gulf of Mexico, but at a later date. No good reconstructions of Gulf vessels from the early nineteenth century are available for review; however, the 1843 *Vigilant* was built along the same lines as the 1833 *Santiago* and demonstrates many of the construction characteristics that would have been important to earlier Gulf captains. *Vigilant* was 56 ft (17.1 m) on deck, had a moulded beam of 17 ft (4.6 m), a depth of hold of 4.3 ft (1.3 m), and a capacity of 50 tons (Marquardt 2003). Despite the slightly shallower than average hold, these values conform very closely to those of the average Gulf schooner of two decades earlier (see Table 4.2), as does *Vigilant*'s entry, which likely conforms to the sharp schooners described by Chapelle (1949:217). The broad and flat floors of *Vigilant* may be an exaggerated design to allow the schooner to chase smaller vessels into shoal waters. *Vigilant*'s design was also facilitated by the presence of a centerboard within the vessel's hull. Centerboards were introduced during the eighteenth century and came to prevalence in the Great Lakes following the War of 1812 (Chapelle 1935:166, 268); however, it is unknown when they were introduced to the Gulf of Mexico. Despite these caveats, the hull of *Vigilant* is likely a closer approximation of the hull form of the Mardi Gras vessel than either of the previous correlates. Conversely, the deck and interior arrangements of *Vigilant* (not shown) may not mirror those of the Mardi Gras vessel because *Vigilant* was outfitted solely for combat, not commerce. Similarly, the rig of *Vigilant* with its dolphin-striker and later schooner design is probably more complex than the spars and sails of the Mardi Gras vessel. Dolphin strikers were introduced ca. 1793 but may not have been fully-adopted by schooners of this period in the Gulf (Jackson 1969:71, 80, 86; Lees 1984:32). Beyond being more modern, *Vigilant*'s rig was more aggressive than that of most contemporary merchant vessels, with more sails worked by a larger crew.

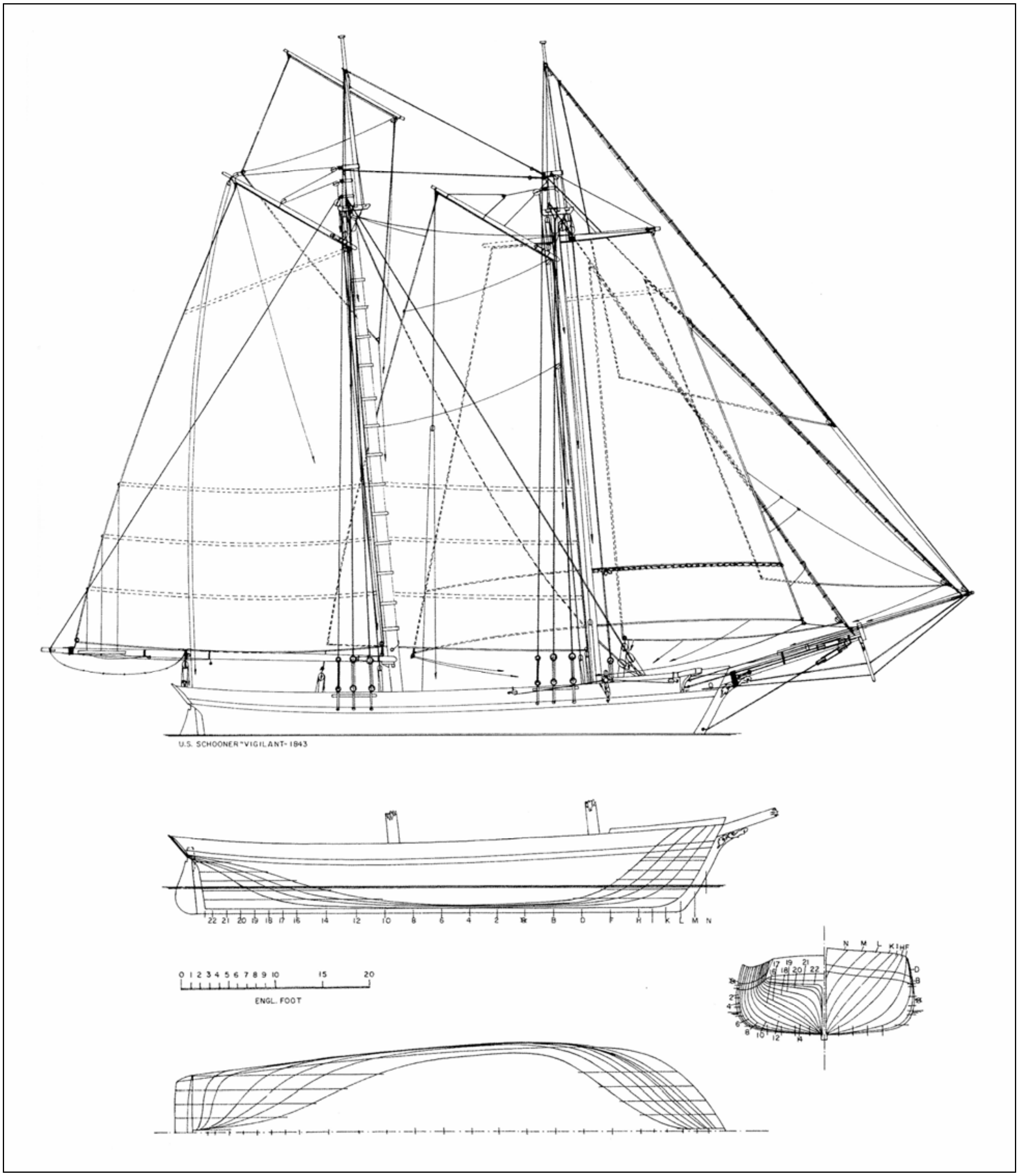

Figure 6.5. Lines and sail plan of U.S. schooner *Vigilant* (source: Marquardt 2003:127).

In summary, it is possible that the Mardi Gras vessel had a hull form similar to, but slightly deeper than, that of *Vigilant*, but with a rig more akin to that of *Mercury* (however, since each rig was balanced to the needs of the hull, it would be a mistake to simply transfer *Mercury*'s rig to *Vigilant*). The deck arrangement and interior divisions may have been similar to those of *Mercury* and *John.* It is unknown if the Mardi Gras vessel had a quarter deck like *John* or was flush-decked similar to *Mercury*. However, it was almost certainly steered with a simple tiller attached to the rudder.

6.2 Crew Size and Nationality

The number and nationality of the men (no evidence of women was recovered from the wreck, see the discussion of buttons in the Metal section of Chapter 5) who inhabited these spaces will likely never be known for certain; however, the archaeological and historical records do provide some clues. Several sets of three were noted among the Mardi Gras tablewares, including three spoons, three tea bowls and saucers, and three plates. It is unknown if this number corresponds to the entire crew or just those who messed with the captain in the cabin, but the diminutive size of the stove argues for a small crew. Many primary and secondary sources discuss larger vessels (e.g. 10 men for a 200 ton ship, or 6 men for a later brig of approximately the same size [Gardiner 1993:45–46; MacGregor 1980:8]), but Francaviglia (1998:88) states that the early nineteenth century schooner *Lively* of approximately 30 tons was crewed by four or five. This low number is supported by data from the consular records of Matamoras and Galveston and other Gulf of Mexico primary sources that indicate that most merchant vessels similar in size to the Mardi Gras vessel carried two to eight men (average of five) while privateers were often crewed by upwards of 18 individuals (see section 4.8). Similarly, British vessels working the coast of England that averaged 43 tons and were crewed by an average of 2.8 men per vessel (Gardiner 1995:23). Closer to the wreck site, the average tons per man ratio for all of the North American colonies in 1772 was 13.9, or approximately 4 men for a vessel similar to the Mardi Gras Shipwreck (Gardiner 1995:28). Consequently, three should be considered the minimum crew of the Mardi Gras ship, but it is possible that other individuals were also onboard. While even a crew of six may seem remarkably low, both the late eighteenth-century introduction of the schooner rig and the improvements to Gulf ports during the early nineteenth century helped to increase shipping efficiency and keep crew costs low. Schooner rigs require fewer men than sloop rigs for similarly-sized vessels because the sheets were divided into more manageable portions. Fore-and-aft sails also generally required fewer sailors than square-rigged sails due to the mechanics of handling sails (Gardiner 1993: 45–46; Gardiner 1995:28). Efficient ports with loading and discharging facilities and stevedores further helped reduce the number of crew that the vessel carried (MacGregor 1980:8). As commerce developed in the major Gulf ports, vessels only had to carry sufficient men to operate the ship, rather than including extra men to help with handling the cargo.

Archaeologists often argue for the nationality or cultural affiliation of a vessel's crew based on the artifacts recovered from the wreck. This argument is generally made based on the origins of the personal artifacts and tablewares, following the assumptions that, even at sea, sailors would want some small piece of home, and that few aspects of culture are more closely associated with the home-hearth than food. However, this argument does not apply to the crew of the Mardi Gras vessel. They ate with French spoons off British creamware and chased their French wine with coffee, possibly obtained from Brazil and served in British tea bowls (Pendergrast 1999). The identifiable navigation instruments were predominantly of English manufacture, but London instruments were carried by mariners world-wide (Stanbury 1991:197). Conversely, the weapons associated with the vessel were a motley assortment, including at least one German or Dutch longarm. Even American producers were possibly evident in at least one of the stoneware jugs (artifact no. 205). The only pattern discernible from this wide variety of artifacts is that of a captain operating in a cosmopolitan region with no strong ties to any single nation or identity. The captain appears to have given up any markers of his birth nation in favor of items that were readily available and fulfilled his needs at the time. It is unlikely that the captain bought spoons from one nation and ceramics from another in an attempt to disguise his nationality, but such a mixed assemblage may indicate an individual not tightly bound to a single nation. Similar to employees in modern transnational corporations, this may have been a conscious decision to identify himself as a citizen of the Gulf, rather than as a citizen of a specific nation, in order to make it easier to navigate the treacherous political scene of the Gulf of Mexico during the late eighteenth and early nineteenth centuries. The artifact assemblage may also be indicative of the Creole culture of Louisiana or the generally multi-cultural nature of the Gulf of Mexico, or it may have simply been the result of many small purchases with no driving philosophy. These same arguments may have been true of the crew as well, but their signature is less evident in the material culture record.

6.3 Cargo and Ports of Origin and Destination

Little, if any, evidence of the Mardi Gras cargo is extant. Presumably, the space between the bulkhead and the anchor was the cargo hold, and the vessel appears to have had a cargo when it sank, as no ballast stone was noted. No trenches were excavated in the center of the shipwreck site so it is possible that ballast lays undiscovered beneath the sediment. It can be inferred that the vessel was carrying a perishable cargo that did not survive two centuries on the seafloor. The principal exports of New Orleans, cotton, tobacco, coffee, and sugar, fall into that category, as do many of its secondary goods (Bauer 1988:128; De Grummond and Morazan 1961:62; *Mississippi Messenger* 11 February 1808). Core samples and pollen analysis of sediments from this portion of the site could potentially identify the main cargo.

The contents of the weapons box may or may not have been intended for sale. While there is ample evidence that gun-running was a profitable and popular occupation in the Gulf of Mexico, and the guns could have been carried as part of a mixed cargo, there is evidence that no conscientious captain would venture out into the Gulf of the early nineteenth century without sufficient arms to protect his vessel (see Chapter 4). A cargo of a single crate of mixed weapons, containing approximately 21 longarms, seven pistols, and two edged weapons, is far lower than the average arms cargo for this period (see Arms and Munitions section of Chapter 4; Davis 2005:309; Faye 1939:1091). However, this number also exceeds the number of weapons necessary to arm a merchant crew, although each man could have used more than one weapon in a pitched battle where reloading took valuable time. A well-armed crew on deck may have also been a deterrent to an attacker. The position of the crate within what may have been the stern cabin also suggests that it may have been part of the ship's equipment rather than cargo. While this area would have likely been drier than the hold and could have been used to transport valuable cargo, the numbers of guns carried as cargo on other vessels of the period suggest that weapons cargos were regularly carried in the hold.

Without knowing the cargo of the vessel it is difficult to hypothesize the origin or destination for the Mardi Gras vessel on its final voyage. The location of the shipwreck, at the cross-roads of the historic Gulf of Mexico shipping lanes, similarly offers no clues (see Figure 4.1). The only suggestion of the vessel's port of origin comes from the mixed artifact assemblage. Most major ports in the region, including Pensacola, New Orleans, Jamaica, Campeche, and Veracruz, would have offered goods from around the world. However, the spoons (artifact no. 228) and the stoneware ink or oil bottle (artifact no. 102) both hint at a recent stop in New Orleans. While France was a major producer of pewter, its production for the American market lagged far behind that of Britain and was consequently not often encountered outside of French-dominated portions of the United States (Farber 1974:ix; Hornsby 1983:20). As a stronghold of French culture on the Gulf Coast, even after France's official removal from the region, New Orleans is the most likely source of these spoons. Similarly, the stoneware bottle was likely produced in France and is strongly associated with New Orleans (Greer 1981:247–248). These artifacts, as well as the location of the site, suggest that the vessel may have been leaving New Orleans or returning there as its home port when it wrecked.

6.4 Mardi Gras Shipwreck Candidates

The difficulties of identifying specific wrecks in the deep waters of the Gulf of Mexico have been noted elsewhere (Garrison et al. 1989a:II-115; Lugo-Fernández et al. 2007; Pearson et al. 2003:3–10). These difficulties stem from the unlikelihood that anyone would have survived a wreck far from shore or that the location of the sinking would have been accurately noted by passing vessels. The situation is further exacerbated by the paucity of surviving historical documentation for wrecks in the Gulf of Mexico during this period and the tendencies of swamped vessels to float partially submerged for substantial distances before settling on the ocean floor (Oertling 1984:8–10). Thus, there are a substantial number of vessels that are described as "lost at sea" or that simply disappear from the historical record.

These generally-accepted assumptions were borne out by the review of historical newspapers. Five shipwrecks were identified in these newspapers: *Resource* (*Louisiana Advertiser* 14 July 1820), *Harriet* (*Alabama Watchman* 18 August 1820), *Constitution* (*Louisiana Advertiser* 18 November 1820), *Williams* (*Louisiana Advertiser* 22 July 1820), and an unknown ship (*Orleans Gazette* 3 July 1819). All of these vessels were lost on rocks, reefs, or banks in the vicinity of shore and, with the exception of the unnamed ship, had known survivors.

Despite these difficulties, Table 6.2 lists ten vessels that could be the Mardi Gras Shipwreck. This list was extracted from the Gulf of Mexico Ship Database compiled by Amy Borgens from primary and secondary sources. The criterion for inclusion on this list was wrecking between 1808 and 1825 in the Gulf of Mexico either in the vicinity of the Mardi Gras Shipwreck or within the Gulf without specific coordinates or geographic features. Given our limited knowledge of the Mardi Gras Shipwreck and the relative silence of the historical record, caution dictates that the list of wreck candidates remains long and that it be remembered that the name of the wrecked vessel may not appear in the table.

Despite these caveats, some of the vessels in Table 6.2 are better candidates than others. For example, the ship *Cacique* and the frigate *Muros* were likely significantly larger than the vessel suggested by the debris scatter and scantlings of the Mardi Gras Shipwreck. Other vessels, such as *Lynx* and *General Jackson*, were much more heavily-armed than the Mardi Gras vessel. However, given the disagreement that accompanies most armament lists and the potential for guns to be lost overboard during a wreck, these vessels can be considered low-to-

Table 6.2 Mardi Gras Shipwreck Candidates

Vessel Name	Nationality	Vessel Type	Notes	Armament	Year of Loss	Location of Wreck
Bermuda	Britain	Sloop	Vessel of the British royal Navy under the command of John Pakenham captain with a crew of 76 men. Only one man lost (Gilly 1850:314).	Unknown	1816	On passage from Gulf of Mexico
Cacique	France	Ship	Traveling from Boudreaux to Veracruz on 9 May 1824 and was lost in the Gulf of Mexico. Crew arrived safely at Sisal Yucatan (Lloyd's List, no. 5933, 13 August 1824 from Marx1981:64).	Unknown	1824	Lost in the Gulf of Mexico on its way from Boudreaux to Veracruz
Federal	Mexico	Schooner	Pilotboat/schooner acquired by Mexico in 1825. Broken up in a storm in 1825 (Bidwell 1960:360, 370).	Unknown	1825	Gulf of Mexico
General Jackson, (La Caridad, La Cubana, Atalanta, Bolívar, General Bolívar)	United States, Cartagena	Schooner	*La Caridad* (La *Cubana*) was originally owned by Spanish citizen Christobel Iuando of Santiago de Cuba and was captured by Reneto Beluche in route from New Haven to Cuba in October 1813. Beluche enrolled the vessel in the service of Cartagena under the command of Joseph Clement. The schooner was sent to New Orleans and repaired by Joseph Carpentier. The schooner was captured by the US Navy at Grande Isle during its seizure in September of 1814 but was released when Beluche produced seemingly genuine papers from Cartagena. The vessel was later sighted off the Louisiana coast in 1814, following the US Navy seizure of Grande Isle. The USS *Carolina* chased the vessel but she eventually surrendered when fired upon by auxiliary gunboats. Patterson's men seized $4753 in goods and the vessel itself, valued at $5813. *General Bolívar* was owned by Abner Duncan, of the New Orleans Association in 1815 and renamed *General Jackson. General Jackson* was to carry a cargo of 1200 muskets and four field cannon to Boquilla de Piedras in August 1816 (PL 303). *General Jackson* sustained heavy damage and lost a mast during an altercation with Spanish warships (*Diana, Cazador*, and another vessel) off Veracruz in August 1816. Twenty-two men from *General Jackson* were wounded during the engagement. The vessel was not seen again. This vessel supposedly sailed on a filibustering expedition in late August 1816 under the name *Patriota Mexicano* and *Tarántula* with Northup as captain (Davis 2005:191, 193, 229, 265, 303; De Grummond 1983:74; Faye 1939:1060; London Times 12 December 1816; Warren 1938a:209).	One long brass 18-pounder, one long brass 6-pounder, two 12-pounders	1816	At sea (last seen near Veracruz)
Los Tres Hermanos	Campeche	Brig	Captured by Renato Beluche and *L'Intrépide* in May or June of 1810. The vessel was originally sighted by the privateer 300 miles southeast of the mouth of the Mississippi. The vessel was bound from Campeche to Havana with a cargo of logwood. The crew was transferred to *L'Intrépide* and the prize was burned (De Grummond 1983:59).	Unknown	1810	Southeast of New Orleans

Vessel Name	Nationality	Vessel Type	Notes	Armament	Year of Loss	Location of Wreck
Lynx	United States	Schooner	U.S. naval vessel stationed off Barataria, with *Hornet*, *Surprise*, and *Bulldog* in 1819. Commodore Patterson, of the New Orleans Naval Center, sent the vessels to Barataria in response to a rumor that William Mitchell was reestablishing a pirate camp at that location. *Lynx* was to patrol the coast between Belize and Galveston in 1819 looking for smugglers. The vessel left St. Mary's, Georgia in January 1821 to patrol for pirates off of Cuba. Neither *Lynx* nor its captain Lieutenant Madison, were heard from again (Davis 2005:404, 414, 451).	One long 12-pounderer, six 12-pounder carronades	1821	At sea
Muros	Spain	Frigate	Vessel lost but all crewmembers were saved (Lloyd's List, no. 4255, 24 May 1808 from Marx 1981:62).	Yes	1808	Gulf of Mexico
Petite-Milan (Louisa Antonia, President Aguila, Eagle, Philanthrope)	Cartagena		A Spanish schooner captured by *Dorada* off of Veracruz in 1813 laden with a valuable cargo of silver. Along with *Dorada* and *La Diligent*, this vessel formed part of Lafittes' privateer fleet in 1813. The vessel was at Grande Isle in September 1814 and was seized by the US Navy. Purchased by West in 1814 and renamed *Aguila* (*Eagle*). The vessel, with a crew of about 20 men and half a dozen passengers serendipitously traveled to Grand Isle and was outfield as a corsair departing for the Mexican coast. Sailed as *Philanthrope* under Capt. Gambi. As *Philanthrope* the vessel captured the Spanish brig *Fernando* and the vessel *Marcela* off Tampico on 22 February 1815. Lt. Thomas Cunningham captured *Eagle* near Cat Island in April 1815. Offered at auction in 1815. Vessel was freed on a bond paid by Amigoni. In February 1815, as *President* (owned by New Orleans merchant John K. West) the vessel transported munitions and insurgent officers to Nautla. While near Veracruz (after transporting cargo and officers) Gambi captured the vessels *Nuestra Señora de Rosario* and *Santa Rita* and brought them to Barataria on 10 April 1815. Used by Toledo, in 1815, to travel to Nautla, in order to acquire species for his revolutionary cause. As *Petite Milan*, the vessel carried arms and supplies (for Toledo) to revolutionaries at Boquilla de Piedras in October of 1815. Vessel was escorted by *Firebrand* by order of Commodore Patterson. Vessel used to transport contract arms to the Mexican coast. These were probably the 29,000 muskets contracted by Toledo for $12 a piece. These weapons were to be transported along with 9000 saddles. The New Orleans merchants responsible for the sale were Vincent Nolte, Abner Duncan, John B. Gilly and Thomas Hartman. Sank during a storm around March 1816 while en route from New Orleans to Boquilla de Piedras. (Davis 2005:105, 187, 191, 192, 228, 233–237, 244, 261, 276, 299; Faye 1939:1035–1037; Warren 1938a:207).	9-pounder, and a smaller pivot gun	1816	Between New Orleans and Boquilla de Piedras
Santa Maria	Mexico	unknown	Small sailing vessel of San Jacinto. Dr. Johnson Hunter had a permit to sail the vessel (Barker 1927:691).	Unknown	1823	Gulf of Mexico
Sea Horse (Seahorse)	United States	Schooner	Vessel of the New Orleans Naval Station under the general command of Thomas ap Catesby Jones. On 13 December 1814 Jones sent sailing master William Johnson on board *Sea Horse* to remove channel markers and to destroy supplies at Bay St. Louis prior to the anticipated British naval attack. While engaged in destroying the supplies at Bay St. Louis, the vessel was engaged by three British barges. After four additional barges joined in the attack, Johnson burned *Sea Horse* to prevent its capture. *Sea Horse* was armed with one 6-pounder (Smith 2000:27).	one 6-pounder cannon	1814	Off of Bay St. Louis, MS

Table 6.2 (continued) Mardi Gras Shipwreck Candidates

moderate potential candidates. Also of moderate potential are *Santa Maria* and *Federal*. Both of these vessels were Mexican in origin and do not fit with the artifacts recovered from the shipwreck. Given the cosmopolitan nature of the Gulf of Mexico during the early nineteenth century, these wrecks can not be ruled out absolutely, but more evidence than two Mexico-minted coins would be expected on a Mexican vessel.

The remaining four vessels should be considered moderate-high potential candidates, partially through our ignorance of their nature and demise. *Los Tres Hermanos* was sighted and pursued approximately 250 miles (400 km) from the Mardi Gras Shipwreck site. However, it was not recorded where the vessel was taken and burned. It is possible that the vessel was chased a substantial distance before being taken and may have also floated prior to sinking. The lack of evidence for burning on the Mardi Gras Shipwreck, however, is troubling. Carbonized wood generally survives better underwater than unburned wood because boring mollusks do not attack it and it is less susceptible to other forms of degradation. Similarly, none of the recovered artifacts were fire damaged.

Very little is known about the sloop *Bermuda* that was lost in 1816. The date and approximate size of this vessel are consistent with the Mardi Gras Shipwreck. Similarly, the presence of 76 men on the vessel could explain the lack of evident cargo. However, based on the good preservation of personal belongings in the cabin, some of these men's possession would have been expected to have been exposed forward of the bulkhead.

Sea Horse would be an excellent candidate except its recorded location of loss is nearly 100 miles (160 km) from the wreck site. *Sea Horse* was approximately the same size as the Mardi Gras Shipwreck and its armament of a single 6-pounder matches the recovered cannon. However, *Sea Horse* was destroying supplies at Bay St. Louis when it was attacked by seven British barges. The continued and effective assault of these barges suggests that the entire engagement likely took place in protected waters. While it is possible that the barges chased *Sea Horse* into the open Gulf, it is less likely that Master Johnson would have felt pressed enough by them to burn his vessel once he reached open water. Consequently, the burning *Sea Horse* would have had to drift a substantial distance, possibly past the Chandeleur Islands, to reach the Mardi Gras Shipwreck site. The mixed longarm assemblage associated with the shipwreck would not be expected with a military vessel.

The final shipwreck candidate, *Petite-Milan*, is also a close, but not perfect, match for the Mardi Gras vessel. The rig and approximate size (50 tons) of this vessel suggest it was similar to the Mardi Gras vessel (Davis 2005:191). The fact that it was sailing out of New Orleans when it was lost in a March 1816 storm also places it within the geographical and chronological scope of the Mardi Gras Shipwreck. The armament of *Petite-Milan*, including a nine-pound cannon and a smaller gun mounted on a pivot, was slightly larger than the six-pound cannon recovered from the wreck site, but this difference is not significant, given the flexibility of most vessel arms lists, and the fact that these guns were recorded a year before the vessel was lost (Davis 2005:236). The biggest difficulty with identifying the Mardi Gras Shipwreck with *Petit-Milan* is that *Petite-Milan* may have been carrying a cargo of guns when it sank during a storm between New Orleans and Boquilla de Piedras, north of Veracruz (Davis 2005:299). The historical record is not clear on the nature of *Petite-Milan* cargo when it sank, but its primary occupation around the time of its loss seems to have been transporting arms. If the vessel was carrying guns, they may have been salvaged from the vessel before it sank. However, the lack of any testimony regarding the loss of *Petite-Milan* suggests that no one saw it sink and that it was not in a convoy.

Similarly, the loss of the schooner in a storm likely precluded the organized and complete removal of all crates from the hold. However, the vessel may have been on the return leg of its journey, having disposed of the guns in Boquilla de Piedras, explaining the absence of an arms cargo. Similarly, all but one of the crates of weapons could have been jettisoned prior to the sinking if the crew was attempting to save the ship by lightening its burden.

Thus, *Petite-Milan* and *Sea Horse* are the strongest identified candidates for the Mardi Gras Shipwreck. However, neither is a perfect match and it is very possible that a yet unidentified shipwreck is a better candidate. While it is tempting to associate the Mardi Gras Shipwreck with a pirate ship once owned by the Laffite brothers (*Petite-Milan*), such a claim cannot be made with any certainty and is possibly contradicted by the available evidence. Piracy and the Laffites are an important aspect of Louisiana and New Orleans popular culture and pirates were certainly active in the Gulf of Mexico (Davis 2005; De Grummond 1983; Faye 1939). It is exceptionally difficult to distinguish armed merchant vessels and privateers/pirates, especially in the Gulf of Mexico where many privateers carried only one or two cannon (Skowronek and Ewen 2007). However, pirate vessels and privateers were a minority to lawful commercial vessels, and given the lack of conclusive evidence, there should be no rush to identify the Mardi Gras Shipwreck as anything other than a merchant vessel. Lusardi's (2006:215) comments on the much more substantiated connections between the Beaufort Inlet Shipwreck and Black Beard's *Queen Anne's Revenge* are pertinent: "Unfortunately, circumstantial evidence alone does not warrant a positive identification," especially in regards to such a publicly attractive topic as piracy.

6.5 Directions for Future Research at the Mardi Gras Shipwreck

None of the above should be taken to imply that the Mardi Gras Shipwreck is not a significant archaeological site. The Mardi Gras Shipwreck is considered potentially eligible for listing on the National Register of Historic Places. If the shipwreck is in fact the remains of a privateer it would be one of only a small number of similarly identified vessels. As a cargo-carrying merchant vessel it has the potential to substantially increase our understanding of commerce and ship construction in the early nineteenth-century Gulf of Mexico. To that end, there are several additional research questions that can still be addressed through the Mardi Gras Shipwreck. These questions extend beyond the research questions identified in Chapter 3 and addressed throughout this report.

One of the easiest additional questions to answer would be the cargo of the vessel. Since a perishable cargo was likely and much of the perishable goods transported through the Gulf of Mexico were plant products, several cores taken from the area forward of the bulkhead and analyzed for pollen remains could address this question. If cargo or ballast is situated beneath the sediment, they would be encountered in these cores and suggest the need for further excavation. Similarly, a lack of pollen would suggest another cargo that could be investigated through test excavations within the hold area.

These excavations would be best conducted in conjunction with another research objective such as studying the hull of the vessel. Very little is known about late eighteenth and early nineteenth century ship construction in the Gulf of Mexico. Much of what we know about merchant ship construction for this period comes from historical documentation of the U.S. East Coast and occasionally the Caribbean Islands, both of which had different forms of commerce and ports. The early nineteenth century was a period of significant changes in wooden ship construction as industrialization spread through shipyards and the global economy became more pronounced.

Consequently, one of the primary questions remaining about the Mardi Gras Shipwreck vessel is how it was built. Based on the results presented in this report, it is possible to estimate the location of the keelson and mast-steps. Focused excavations in these areas as well as a trench across the beam of the vessel to investigate the framing pattern would help to place the Gulf within the larger history of wooden ship design and construction. For example, the number and position of the mast-step(s) would conclusively identify the rig of the vessel, while basic dimensions and descriptions of the floors and futtocks would help to explain the intentions of its original constructor. It would also be useful to identify the ends of the keel and possibly the remains of the posts to solidify the length of the vessel.

A more advanced research question would be to identify the shape of the hull. The small excavations conducted as part of this data recovery plan suggest that the lower hull on at least the starboard side is partially intact beneath the sediments. Measurements of the angles of these timbers would suggest the shape, size, and capacity of the vessel. It would also be interesting to note if there was evidence of a centerboard. The use of centerboards is known from other shoal environments of the early nineteenth century and later periods in the Gulf of Mexico; however, its introduction to the Gulf has not been effectively dated. These excavations would also identify any ballast, which would bear on the type of cargo the vessel was carrying.

Finally, these excavations would likely identify other artifacts. The mandate of this data recovery program was to remove visible artifacts from the seafloor. Thus, excavation was not a primary goal. It is likely that there are still artifacts between where the stern concretion was situated and the weapons box. Similarly, an excavation near the anchors may reveal evidence of a larger crew housed in the forecastle. The most easily identified of these additional artifacts is the weapons box, but it is not likely alone within the wreck site. The weapons box casts a shadow on a sector-scanning sonar image (see Figure 3.8), and may as a result attract unwanted attention to the site. This crate may also contain clues to the identity of the wreck. As stated in Chapter 5, such assemblages may contain important diagnostic information such as national affiliations, dates, manufacturers, and military designations. However, given the clearly mixed nature of the weapons and the wealth of other artifact data recovered from the site, the weapons box may not significantly refine the current interpretation. Consequently, unless the visibility of the crate is of primary concern or other diagnostic artifacts are uncovered by natural processes, the relatively simple task of collecting core samples and the more involved but potentially very informative investigation of the hull remains should be given precedent over additional artifact recovery.

The Mardi Gras Shipwreck and other deep wrecks in the Gulf of Mexico should also be considered in terms of their preservation and the types of information that can be gathered from these sites. Neither of the well-investigated Gulf of Mexico deep wooden shipwrecks, Mardi Gras or Mica, contain particularly well-preserved hull remains. The Piña Colada Wreck, located in a similar latitude, appears somewhat better-preserved but certainly deteriorated. Much of this deterioration appears to be due to deep-adapted boring mollusks that were likely present within the hull when the wrecks occurred. This state of preservation is in direct opposition to wrecks situated deep in northern lakes (e.g. *Hamilton*, *Scourge* and *E. Nordevall*) and seas (e.g. *Anna Maria* and *Vrouw Maria*) that exhibit tremendous preservation (although they are much shallower than the Mardi Gras vessel). Nor do the iron artifacts from the Mardi Gras Shipwreck exhibit a significantly different state of preservation from iron artifacts recovered from other marine contexts (John Hamilton, personal communication). Large-scale archaeological investigations of the specific factors pertaining to preservation in the Gulf of Mexico have been initiated but will require additional work (Church et al. 2007). In the meantime, data from individual deep-water shipwreck excavations should be collected and the preservation of each wreck judged on an individual basis.

6.6 Future Directions in Deep-Water Archaeology

Deep-water archaeology is a nascent field with few successful excavations (Alfsen 2006; Jeffrey Morris posting on SUB-ARCH 28 October 2007) and widely varying opinions about its feasibility, especially vis-à-vis the costs (SUB-ARCH discussion 28–29 October 2007). For these reasons, there are few standard procedures for excavations in deep water and each project provides the opportunity for substantial improvement over the last. For example, the Mardi Gras Shipwreck excavation made significant strides beyond the Mica Shipwreck excavation (Atauz et al. 2006; Jones 2004), partially as a result of the similar environments of the two wrecks and the involvement of many of the same parties. However, there is still much room for advancement within the science of deep-water archaeology.

In deep water, where visibility is less of a problem than the dexterity to collect trilateration or direct survey measurements, the creation of an accurate photomosaic is an excellent way to map the site. The mosaic of the Mardi Gras Shipwreck and the site plan created from this mosaic ultimately achieved an accuracy of approximately 30 cm. However, there were several setbacks that required a significant amount of time to rectify that could be avoided in the future. Much of the difficulty faced during the Mardi Gras Shipwreck data recovery program stemmed from the mosaic and image capture capabilities of the project. These difficulties can be traced to two sources: the ROV and the camera. Future deep-water mosaicing projects must utilize a ROV with both a gyro and a motion sensor. The gyro would allow the ROV pilot to maintain a consistent heading rather than relying on planned survey track lines. Similarly, the motion sensor would allow for better navigation, recording the pitch, roll, yaw, and altitude of the ROV. These attributes should be recorded or linked to each image to permit automatic mosaicing in ER-Mapper or similar software. The ROV should also be outfitted with a minimum of four HMI lights to illuminate the entire field of view. The best arrangement for these lights is several feet away on all sides of the camera in order to limit or eliminate the appearance of shadows.

Several improvements to the camera would also facilitate the creation of deep-water mosaics. The camera must be able to collect images in a raw format in order to facilitate post-process color balancing. Images saved as jpegs are insufficient for this process. The camera should also be able to record and display both still photographs and live video without text overlay. The automatic attachment of data to the margins of photographs is beneficial for some photographs but leads to difficulties in images used for mosaics. The ability to control camera functions (in particular, shutter speed, white balance, and ISO) from the surface would also make for better images and consequently better mosaics. External to the camera but closely-related to its successful operation, a direct feed between the camera and the surface along with appropriate laser scales are also beneficial. Blue-green laser scales should be employed throughout the mosaic image collection process to ensure that the ROV altitude is monitored and accurately recorded. A direct connection between the camera and surface is preferable to storing the images on the camera because it allows for nearly unlimited memory and, consequently, extended ROV flights, while collecting the highest possible quality images. This direct link would also permit better management of the data, without the chance of the ROV descending before previous images were downloaded and with fewer opportunities for the image files to be mislabeled or stored in the wrong location.

The photomosaic collection methodology could also be altered with good results. Instead of taking all mosaics from a single altitude it would be better to collect images for several mosaics at different scales. By beginning with a high-altitude mosaic constructed from a few images, and moving to an intermediate-altitude mosaic, before collecting the high-resolution, low-altitude mosaic images, the archaeologists would have multiple images that they could compare. The high-altitude mosaic would not be acceptable as a site map due to the information lost through low-light and turbidity, but it would help to anchor the other mosaics through the relative positions of large or highly visible artifacts. Conversely, the difficulties in accurately assembling the high-resolution mosaic would be mitigated by comparing them with the high-altitude image. The moderate-altitude image could be used as a bridge between the high- and low-resolution mosaics and employed to resolve any apparent conflicts between the images. All of this technology and the associated methodologies should be tested in a controlled environment prior to the beginning of fieldwork. Deep-water archaeology is too expensive and prone to technological difficulties for any controllable variable to be left to chance.

In addition to these specific adjustments to the photomosaic collection, several other general suggestions can be made for future excavations. A more-refined excavation method needs to be developed. Just as backhoes are often appropriate for terrestrial archaeological surveys and site identifications, but not generally employed for data recoveries unless the site is deeply buried, uncontrolled dredging should be avoided during deep-water data recoveries. While the system employed on the Mardi Gras Shipwreck resulted in acceptable provenience data for the majority of artifacts, the system could be improved through modified dredge and collection tools. A precision dredge with a smaller head and the ability to draw at less than 17 gallons per minute would be beneficial, especially for working in areas with heavy artifact concentrations or the expectation of a significant number of small finds. This technology would lend itself to the identification and mapping of small finds before they were gathered by the dredge.

The efficiency of each ROV dive could also be increased through the use of a compartmentalized collection unit. The current collection method, with a single expanded-steel mesh “backpack,” allowed for the collection of artifacts from only one area at a time. Given the long ascent and descent times associated with working in deep water, this configuration tended to place pressure on archaeologists to excavate a larger area than would be acceptable in a similar situation on land or in shallower water, and, therefore, reduce the control over provenience. The use of veins or cylinders within the “backpack” would alleviate this pressure by permitting multiple areas to be excavated before the ROV needed to return to the surface (Donny Hamilton, personal communication; Jack Irion, personal communication). With this arrangement, areas of a specified extent and depth could be excavated and the associated artifacts segregated before moving to another area. Multiple small areas could be precisely excavated using this methodology with no loss in efficiency.

Excavation and artifact recovery would also benefit from the application of specific “soft-touch” tools. “Soft-touch” tools are those that introduce a medium of padding or protection between the artifacts and the ROV manipulators, which have no sense of feeling and can apply sufficient pressure to crush nearly all archaeological materials, while still maintaining a substantial amount of rigidity and control to facilitate precise manipulation of the tool. The suction pickers, especially the bellows variety, used to recover much of the glassware and ceramics from the Mardi Gras Shipwreck typify this type of tool. These tools will need to be specifically designed for the excavation at hand but should feature sufficient capacity to recover a range of artifacts and collection edges/mouths that permit them to gather a desired artifact in a single attempt with minimal disturbance of the bottom and without the potential to push the artifact into undisturbed sediments. These tools should also be shaped so that they provide good visibility for the ROV pilot while causing the least possible amount of disturbance to the seafloor. These collection tools could be aided by an excavation method that combines a secure grip on the artifact with precise dredging of the contiguous sediments. This methodology would likely require an ROV with two seven-function manipulators, but it would allow the available suction pickers to be used on a wider range of artifacts. The greatest difficulty with the suction pickers is their inability to form a tight enough seal on the artifact to provide sufficient suction to pull the artifact free of the bottom. The addition of a small dredge would allow the surface of the artifact to be cleaned prior to the application of the suction picker, allowing for a better seal and limiting the potential for the picker to become clogged with debris. The lifting power of the picker could also be augmented by using the dredge to break the surface tension of the sediment and relieve the picker of the initial effort.

In conclusion, the Gulf of Mexico clearly contains deep-water shipwrecks from all periods of European occupation; many of these wrecks will have the potential to contribute significantly to our understanding of commerce, technology, and culture. However, each shipwreck must be considered individually in terms of its preservation and potential significance in relation to the cost of excavating in deep water. As the methodologies and technologies for deep-water excavations are refined through well-funded and intelligently-conceived projects, these costs will likely be reduced and investigations of a wider variety of sites will become feasible.

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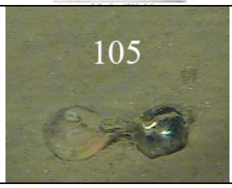
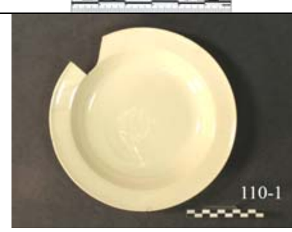
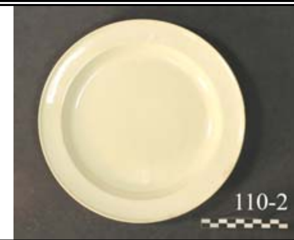
Appendices

APPENDIX A: ARTIFACT CATALOG

(as of 31 MARCH 2008)

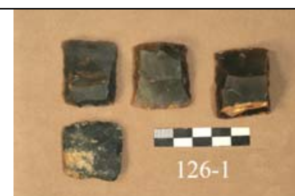
Number	Quantity	Material	Object	Notes	Image
101	1	glass	bottle	broken; height = 29.4 cm; body diameter = 7.75 cm; neck diameter = 2.79 cm; volume = 800 ml	
102	1	stoneware	bottle	length = 14.9 cm; rim diameter = 3.10 cm; base diameter = 5.9 cm	
103	1	glass	bottle	intact; height = 29.2 cm; body diameter = 7.8 cm; neck diameter = 2.96 cm; volume = 700 ml	
104	1	glass	bottle	broken; height = 29.1 cm; body diameter = 7.67 cm; neck diameter = 3.02 cm; volume = 800 ml	
105	1	glass	sandglass	NOT RECOVERED; estimated length = 10 cm	

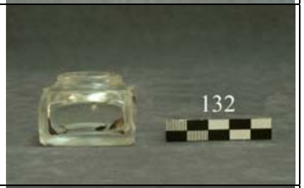
Number	Quantity	Material	Object	Notes	Image
106	1	glass	bottle base	broken; not associated with recovered broken necks; body diameter = 8.65 cm (est.)	
107	1	glass	bottle base	broken; associated w/ 124-2 and 124-2.1; body diameter = 8.45 cm (est.); associated w/ np fragment	
108	1	glass	bottle	broken w/ cork; height = 29.6 cm; body diameter = 7.6 cm; neck diameter = 2.63 cm; volume = 800 ml	
109	1	glass	bottle	intact; height = 29.5 cm; body diameter = 7.72 cm; neck diameter = 2.72 cm; volume = 700 ml	
110-1	1	creamware	soup plate	lot 110- indicates two stacked plates with same artifact no.; chipped rim; diameter = 24.2 cm; height = 3.5 cm	

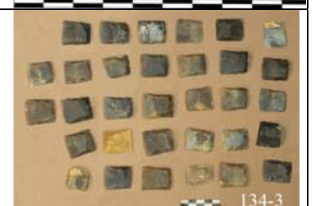
Number	Quantity	Material	Object	Notes	Image
110-2	1	creamware	plate	intact; diameter = 24.2 cm; height = 2.5 cm	
111	1	creamware	bowl	intact; rim diameter = 30.5 cm; foot diameter = 14.1 cm; height = 10.7 cm	
112	5	glass	bottle	broken (neck, base, 3 frag.); assoc. w/ 121 (cork); height = 30.08 cm (est.); body diameter = 8.23 cm (est); neck diameter = 2.75 cm	
113	1	creamware	tureen lid	intact; assoc. w/ 212; oval widths = 27 x 20.6 cm	
114	1	glass	bottle	intact w/ partial cork; height = 28.9 cm; body diameter = 7.67 cm; neck diameter = 3.31 cm; volume = 800 ml	
115	1	creamware	teapot	intact; height at shoulder = 14.1 cm; opening = 10.2 cm	

Number	Quantity	Material	Object	Notes	Image
116	1	creamware	pitcher	intact; height = 17.5 cm; base diameter = 11.3 cm; opening diameter with spout = 13.3 cm	
117	1	glass	sand-glass	length = 13.66 cm; max. diameter = 6.14 cm	
118	1	glass	condiment bottle	"LONDON" Post 1806; height = 14.1 cm; body diameter = 4.36 cm; neck diameter = 3.1 cm; volume = 59 ml	
119	1	glass	sand-glass	length = 10.62 cm; max. diameter = 3.66 cm	
120	1	glass	sand-glass	length = 14.1 cm; max. diameter = 6.23 cm	
121	1	cork	bottle cork	associated w/ 112 (bottle fragments)	
122	1	glass	bottle	intact w/ cork; height = 29.5 cm; body diameter = 7.91 cm; neck diameter = 3.07 cm; volume = 800 ml	

Number	Quantity	Material	Object	Notes	Image
123	1	glass	sand-glass	length = 9.66 cm; max. diameter = 4.07	
124-1	2	glass	neck and base	broken; est. height = 31.5 cm; est. body diameter = 8.04 cm; neck diameter = 2.7 cm; volume = n/a	
124-2	1	glass	neck	broken neck and cork; length = 16.07 cm; diameter = 2.57 cm; associated w/ base 107	
lot 125		multiple materials	multiple objects	artifacts from lot 125- recovered with dredge at south end of concretion (135); artifacts collected in the ROV dredge basket	
125-1	93	lead	shot	average diameter = 1.60 cm (.63/.64 caliber)	
125-1.1	1	lead	shot	shot noticeably smaller from lot above; diameter = 0.9 cm (.36 caliber)	
125-2	3	flint	gun flints	larger two flints, length = 3.3 cm; smaller flint, length = 2.0 cm	

Number	Quantity	Material	Object	Notes	Image
125-3	1	bone	fragment	unmodified faunal remain; 2.5 x 1.9 x 1.9 cm	
125-4	19	wood	fragments	unidentified wood fragments; various sizes	
lot 126		multiple materials	multiple objects	artifacts from lot 126- recovered with dredge at south end of concretion (135)(at a deeper depth than lot 125); artifacts collected in the ROV dredge basket	
126-1	4	flint	gun flints	flints above scale, length = 3.3 cm; flint to the left, length = 2.9 cm	
126-2	13	lead	shot	diameter = 1.61 cm (.64 caliber)	
126-3	1	glass	fragment	curved pc. of glass, max. length = 2.4 cm	
127	40	copper alloy	compass	gimbal diameter = 20 cm; compass bowl diameter = 18.2 cm	

Number	Quantity	Material	Object	Notes	Image
128	24	glass, copper alloy, wood	compass	gimbal diameter = 21.6 cm; compass bowl diameter = 18.4 cm	
129	1	glass	pane	15.1 x 9.55 cm	
130	1	creamware	shaker	intact; 10.9 cm tall; base width = 4.6 cm; widest width = 5.6 cm; and rim width = 3.6 cm	
131	1	wood, copper alloy	octant fragment	horizon mirror; associated w/ 133; length = 9.7 cm	
132	1	glass	inkpot	4.55 cm on sides; 3.24 cm high; 3.1 cm circular opening	
133	1	glass, copper alloy, wood	octant fragment	Index mirror; associated w/ 131; length = 9.4 cm; height = 6.5 cm; mirror = 5.6 x 3.4 cm	
lot 134		multiple materials	multiple objects	artifacts from lot 134- recovered with dredge on the west side of concretion (135); artifacts collected in the ROV dredge basket	
134-1	1	bone	knife handle	handle = 9.8 x 2.5 cm	

Number	Quantity	Material	Object	Notes	Image
134-1.1	1	bone	knife handle	handle = 5.9 x 2.2 cm	
134-1.2	1	bone	knife handle	handle = 5.3 x 2.5 cm	
134-2	2	stone?	unknown	non-descript stones	
134-3	32	flint	gun flints	flints ranging in length from 3.0 to 4.0 cm; average dimension = 3.3 x 2.8 x 0.7 cm	
134-3.1	7	flint	gun flints	flints with lengths ranging from 2.0 to 3.0 cm; average dimension = 2.4 x 1.7 x .07 cm	
134-4	4	brass	octant fragments?	possible assoc. w/ artifact nos. 131 and 133 (octant remains)	
134-5	3	leather	pieces	unidentified leather	
134-6	2	bone or wood	brush head and handle	crossmend; head length = 4.9 cm; 1.1 cm wide; with 31 bristle holes; handle diameter = 1.3 cm, and 5.6 cm long	

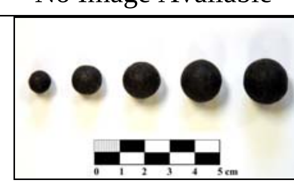
Number	Quantity	Material	Object	Notes	Image
134-7	1	concretion	mold		
134-7.1	1	concretion	mold		
134-8	20	glass	bottle fragments	various sizes of bottle shards	
134-8.1	13	glass	glass pane fragments	various sizes of broken glass pane	
134-9	52	lead	shot	diameter = 1.62 to 1.59 to 1.62 cm (.64 caliber)	
134-9.1	1	lead	shot	single smaller shot; diameter = .11 cm (.43 cal)	
134-10	11	wood	Possibly diagnostic pieces		

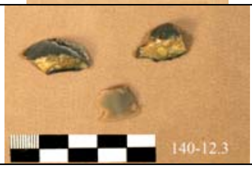
Number	Quantity	Material	Object	Notes	Image
135	1	multiple materials	stern concretion comprising of multiple objects	artifacts from lot 135- excavated from concretion (135) at the Conservation Research Laboratory (CRL)	
135-1	100	lead	shot	Sample shown = 100 of 222; total will increase as excavation of 135 continues; diameter = 1.52 to 1.72 cm (.64 to .68 caliber)	
135-2	1	iron	shot	removed from concretion; diameter = 8.9 cm (use with 6-pounder cannon)	
135-2.1	1	iron	shot	removed from concretion; diameter = 8.1 cm (5-pounder)	
135-2.2	1	iron	shot	removed from concretion; 7.1 cm diameter (3-pounder)	
135-3	5	rope	rope	removed from concretion	
135-4	1	wicker	wicker	removed from concretion	No Image Available
135-5	7	coffee bean (*Coffea* sp.)	coffee bean	removed from concretion	

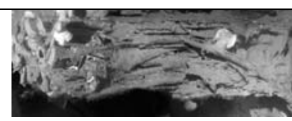
Number	Quantity	Material	Object	Notes	Image
135-6	14	wood	wood	removed from concretion	
135-7	7	leather	leather	removed from concretion	
135-8	33	iron	fragments	removed from concretion, various sizes of non-descript iron fragments	
135-9	1	wood	handle	removed from stern concretion, length = 11.8 cm	
135-10	1	wood	box	enclosed box containing additional artifacts; box removed from concretion 135	
135-11	4	paper	paper	removed from stern concretion	
135-12	1	flint	gunflint	removed from stern concretion; dimension = 3.3 x 2.4 x .7 cm	
135-13	1	wood	frame		
135-14	1	wood	handle	length = 12.3 cm; diameter = 1.25 cm	

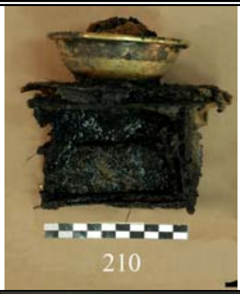
Number	Quantity	Material	Object	Notes	Image
135-15	1	epoxy	chisel	epoxy cast made from void left by disintegrated artifact	
135-16	1	rope, leather	parceled rope		No Image Available
135-17	1	rope, iron	weight with rope attached		
135-18	1	burlap or canvas	burlap or canvas		
135-19	1	iron	handle		
135-20	1	iron	cast iron with handle		
135-21	1	bristle, wood	broom head		
135-27	1	iron	bar shot		
135-78	1	iron	bar shot		No Image Available
136	1	copper alloy	ring	diameter = 5.6 cm	

Number	Quantity	Material	Object	Notes	Image
137	1	copper alloy	ring	likely associated w/ 127 (possible compass cover); diameter = 18.9 cm	
lot 138		multiple material	multiple objects	artifacts from lot 138- recovered with dredge on the north side of concretion 135; artifacts collected in the ROV dredge basket	
138-1	1	flint	gun flint	length = 3.5 cm; width = 2.6	
138-2	1	leather	shoe heel	length = 5.8 cm; width = 6.4 cm; thickness = 1.1 cm	
lot 139		multiple material	multiple objects	artifacts 139- collected with dredge near the south side of the gun box (artifact no. 207)	
139-1	4	pewter	spoon	broken, 4 pc.; bad condition; crossmend, 1 spoon	
139-2	5	wood	fragment	utilitarian shaped wood fragments; possible gaming pieces; largest piece is 8.9 X 2.6 X 0.3 cm	
139-3	1	leather	fragment		

Number	Quantity	Material	Object	Notes	Image
139-4	1	copper alloy	fragment	2.7 X 0.66 cm	
140		composit; wood, orgainics, glass, flint	multiple artifacts	artifacts 140-r are from the sediment matrix recovered with concretion (135); sediment was screened at the CRL; screen size = ¼ inch	
140-1	3	wood	sheave	Crossmend, 1 sheave; pin length = 10.3 cm, 2.1 cm diameter; sheaves diameter = 14.5 cm, 2 cm thick	
140-2	2	leather, rope	loop and leather	leather piece and leather and rope; parceled; length = 64 cm; diameter of rope and leather = 6 cm	
140-3	1	leather	sheath		No Image Available
140-4	1	wood, rope	handle	small pieces of rope associate	No Image Available
140-5	1	rope	rope		No Image Available
140-6	1	textile	textile		No Image Available
140-7	1	bone	bone		No Image Available
140-8	1	wood	wood		No Image Available
140-9	1	glass	glass		No Image Available
140-10	1012	lead	shot	sample of 270 tested; diameter range from 0.9 to 1.8 cm (.33 to .70 caliber)	
140-12	4	flint	gunflint	larger flints w/ an average dimension = 3.3 x 2.8 x 0.7 cm	

Number	Quantity	Material	Object	Notes	Image
140-12.1	3	flint	gunflint	smaller flints w/ an average dimension = 2.4 x 1.7 x .07 cm	
140-12.2	3	flint	flint	flint shards; length under 2.5 cm	
140-13	1	leather	leather		No Image Available
140-16	1	coffee bean (*Coffea* sp.)	coffee bean		
141	1	wood	fragment		
142	2	wood	spar fragments	section of yard; length = 220 cm, 15 cm in diameter	
201	1	glass	bottle	blue, w/ cork; post 1810; height = 24.4 cm; body diameter = 8.96 cm; neck diameter = 3.48 cm; volume = 780 ml	
202	1	glass	bottle	w/ cork; height = 22.3 cm; body diameter = 9.78 cm; neck diameter = 3.3 cm; volume = 800 ml	

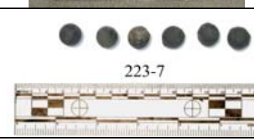
Number	Quantity	Material	Object	Notes	Image
203	1	glass	bottle	height = 29 cm; body diameter = 7.6 cm; neck diameter = 2.75 cm; volume = 700 ml	
204	1	creamware	soup plate	diameter = 24.2 cm; depth = 3.5 cm	
205	3	stoneware	jug	broken, 3 pc; height = 39 cm; maximum width = 29 cm; base diameter = 16cm; volume = 1200 ml	
206	1	glass, copper alloy, wood	telescope	T. Harris and Son, maker; length = 35 cm; outside tube diameter = 5.82 cm; eye-piece diameter = 3.4 cm	
207	n/a	wood, glass, copper alloy, iron	weapons chest	NOT RECOVERED; estimated size = 150 x 50 cm	
208	1	glass	sand-glass	length = 9.38 cm max. diameter = 4.7 cm	
209	2	leather	fragments		

Number	Quantity	Material	Object	Notes	Image
210	1	wood, copper alloy	coffee grinder	square shape, 4.1 cm per side; height = 7.9 cm; copper bowl	
211	1	creamware	platter	intact, royal pattern; ovoid shape = 30 x 24.2 cm	
212	8	creamware	tureen	broken, 8 pc; associated w/ 113; oval opening = 27 x 20.6 cm; base width = 18.9 cm; total height = 13.4 cm	
213	1	creamware	tea bowl	intact; height = 6.5 cm; rim diameter = 10.5 cm; foot diameter = 5.6 cm	
214-1	1	creamware	saucer	chipped rim; 15.3 cm diameter	
214-2	8	creamware	saucer	broken, 8 pc; 15.3 cm diameter	
214-3	11	creamware	saucer	broken, 11 pc; 15.3 cm diameter	
215-1	5	creamware	tea bowl	broken, 5 pc; height = 6.5 cm; rim diameter = 10.5 cm; foot diameter = 5.6 cm	

Number	Quantity	Material	Object	Notes	Image
215-2	12	creamware	tea bowl	broken, 12 pc; height = 6.5 cm; rim diameter = 10.5 cm; foot diameter = 5.6 cm	
216	1	copper alloy	drawer pull	8.1 cm long and 3.8 cm wide; thickness ranges from 0.5 to 0.9 cm	
217	1	bone	knife handle	length = 9.5 cm; width = 2.2 cm	
218	1	wood	plane	Iron blade reduced to a stain; length = 18.8 cm; width at widest point = 7.6 cm; height = 7.1 cm	
219-1	1	creamware	plate	intact; 24.2 cm in diameter; 2.5 cm high	
219-2	1	creamware	plate	24.2 cm in diameter; 2.5 cm high	
219-3	1	creamware	platter	intact, royal pattern; 30 x 24.2 cm	
220	3	wood	fragments		

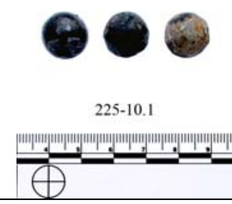
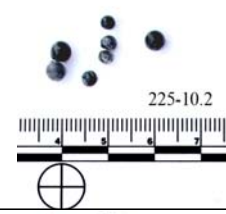
Number	Quantity	Material	Object	Notes	Image
221	2	brass, painted enameled iron	watch face	brass face w/ paint and brass bezel; circa 1720; face diameter = 4.8 cm; bezel = 5.3 cm diameter, 0.31 cm thick	
lot 222		multiple material	multiple objects	artifacts 222- collected in an area on the south side of the gun box (artifact no. 207)	
222-1	1	creamware	fragment		
222-2	2	copper alloy	button	w/ broken shank; button diameter = 2.66 cm; shank length = .75 cm	
222-3	1	wood	knife handle	length = 5.2 cm; width = 1.9 to 1.5 cm	
222-4	2	flint	gun flints	smaller flints w/ an average dimension = 2.4 x 1.7 x 0.7 cm	
222-5	1	copper alloy	fragment	bent disk; diameter = 2.3 cm; possible association with navigation equipment	

Number	Quantity	Material	Object	Notes	Image
222-6	1	wood	button	button diameter = 1.7 cm; thickness = 0.7 cm	
222-7	1	silver	coin	Spanish; 8 reales, 1808; A = reverse with bust of Charles IV; B = obverse with royal coat of arms	
222-8	1	silver	coin	Spanish; 2 reales, date uncertain; A = unreadable reverse; B = obverse with royal coat of arms.	
222-9	1	concretion	nail mold		
222-10	2	charcoal	charcoal		
222-11	1	copper alloy	button	possible British origin; weave pattern with laurel decoration on obverse, button diameter = 2.5 cm	
222-12	1	copper alloy	button	possible British origin; weave pattern with laurel decoration on obverse, button diameter = 2.5 cm	
lot 223		multiple material	multiple objects	artifacts 223- collected with dredge on the south side of the gun box (artifact	

Number	Quantity	Material	Object	Notes	Image
				no. 207)	
223-1	2	bone	unknown		
223-2	1	copper alloy	unknown	maximum width = 2.0 cm; possible association with navigation equipment	
223-3	1	flint	pistol flint	2.4 x 1.7 x 0.7 cm	
223-4	1	copper alloy	fragment	7.7 x 2 x 0.2 cm; possible association with navigation equipment	
223-5	7	leather	fragments		
223-6	1	copper alloy	button	button diameter = 2.3 cm	
223-7	6	lead	shot	diameter = 1.51 cm (.60/.61 caliber)	
223-7.1	1	lead	shot	diameter = 1.62 cm (.64 caliber)	

Number	Quantity	Material	Object	Notes	Image
223-8	5	wood	fragments	w/ lead shot impressions	
224	0	textile and creamware	bowl and cloth	NOT RECOVERED (fell out of basket)	
lot 225		multiple material	multiple objects	artifacts 225- are from an excavated area immediately southeast of the gun box (207)	
225-1	1	concretion	mold	possible iron fastener; length = 8.8 cm;	
225-2	1	copper alloy	dividers	length = 6.5 cm; diameter of circular pivot = 1.3 cm; width of legs = 0.4 cm	
225-3	1	metal	ring	diameter = 1.9 cm; thickness = 0.1 cm	
225-4	2	flint	gunflints	larger flints w/ an average dimension = 3.3 x 2.8 x 0.7 cm	

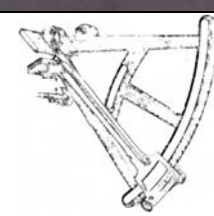
Number	Quantity	Material	Object	Notes	Image
225-4.1	2	flint	gunflints	smaller flints w/ an average dimension = 2.4 x 1.7 x .07 cm	
225-5	4	wood	fragments		
225-6	1	rope	rope fragment	length = 3.9 cm; diameter = 0.7 cm (made of two 0.3 cm strings)	
225-7	1	bone	knife handle	length = 9.3 cm; width = 2.5 cm	
225-8	3	leather, wood	fragments	2 leather, 1 rope	
225-9	1	copper alloy	button	button diameter = 2.2 cm; reverse undecorated, obverse decorated with flower bouquet	

Number	Quantity	Material	Object	Notes	Image
225-9.1	1	copper alloy	button	button diameter = 2.5 cm; possible cone shank	
225-9.2	1	copper alloy	button	diameter = 2.5 cm; shank = .66 cm	
225-10	1	lead	shot	diameter = 1.63 cm (.64/.65 caliber)	
225-10.1	3	lead	shot	diameter = 1.5 cm (.60 caliber)	
225-10.2	7	lead	birdshot	range in diameter from .39 to .42 cm	
225-11	3	leather	fragments		
226-1	451	lead	bird shot	range in diameter from .21 to .42 cm	

Number	Quantity	Material	Object	Notes	Image
226-2	1	metal (appears to be iron)	can	length = 15.2 cm; width = 10.2 cm	
227	1	glass	bottle	height = 26.5 cm; body diameter = 8.02 cm; neck diameter = 2.74 cm; volume = 600 ml	
228-1	1	pewter	spoons	makers mark: “FABREGUETTE / JEUNE A BORDX”; length = 22.3 cm; ovoid bowl = 7.8 x 4.1cm	
228-2	1	pewter	spoon	“FABREGUETTE / JEUNE A BORDX” plus asterisk “X” and “BDF”; length = 22.3 cm; ovoid bowl = 7.8 x 4.1cm	
229	1	brass	butt plate	Germanic – Dutch origin; makers mark ‘N’ on butt; length of butt = 11.10 cm; length of tang = 14.64 cm	

Number	Quantity	Material	Object	Notes	Image
230-1	1	copper alloy	buttons	Orange treble gilt; button diameter = 2.4 cm	
230-2	1	copper alloy	buttons	Orange treble gilt; button diameter = 2.4 cm	
300	1	stoneware	jug	intact; height = 37 cm; maximum width = 23.5 cm; base diameter = 15.3 cm; volume = 9250 ml; inscribed w/ ‘4’ on shoulder	
301	2	lead	sheeting	larger lead sheet approx. 85 x 80 cm	
302	14	iron	stove	broken, 14 pc; rectangular dimensions = 49 x 68 cm; max. height = 57.6 cm	
400	1	iron	cannon (associated artifacts are sub lot 400-#)	British, 1797; 6-pounder; cannon length = 137.16 cm; diameter ranges from 18.35 to 32.10 cm; bore diameter = 9.47 cm	
400-1	1	wood	gun carriage	carriage cheek; black walnut; 52.7 x 29.1 cm; thickness approx. 9.88 cm	No Image Available
400-2	1	wood	gun carriage	capsquare; black walnut; 29.0 x 16.36 cm	No Image Available
400-3	1	rope, leather	parceled rope		No Image Available

Number	Quantity	Material	Object	Notes	Image
400-4	1	wood	tampion	removed from bore	No Image Available
400-5	1	rope	rope	removed from bore; length = 61.0 cm; diameter = 0.88 cm(comprised of 3 strands, each 0.45 cm)	No Image Available
400-6	1	rope	rope	removed from touch hole	No Image Available
400-7	1	leather	fragment		
400-8	1	leather	loop and leather	from cannon cascabel	
400-9	1	flint	gunflint	crude bifacial flint; dimensions = 1.6 x 1.3 x 0.7 cm	
400-10	1	wood	truck		
400-11	1	textile	textile	sample	No Image Available
400-12	1	rope	rope	sample	No Image Available
400-13	1	leather	leather	sample	No Image Available
400-14	1	bone	bone	sample	No Image Available
400-15	1	wood	wood	sample	No Image Available
400-16	1	glass	glass	sample	No Image Available

Number	Quantity	Material	Object	Notes	Image
600	2	concretion	barstock?	squared ends	
601	1	leather	loop	leather sheave for parceled rope; length = 61 cm; 4.1 cm	
NP	1	glass	fragment		
01	1	ceramic	bowl	removed August 2004	
02	1	ceramic	pôt de crème	removed August 2004	
03	1	presumed wood, copper alloy	octant	unsupervised removal from site, October 2004 – artifact missing and is not in collection	 (drawing)

APPENDIX B: SITE PHOTOMOSAIC, PRE-DISTURBANCE

MARDI GRAS SHIPWRECK SITE

Pre-Disturbance Mosaic

May 2007

APPENDIX C: SITE PHOTOMOSAIC, AFTER BACKFILLING

MARDI GRAS SHIPWRECK SITE

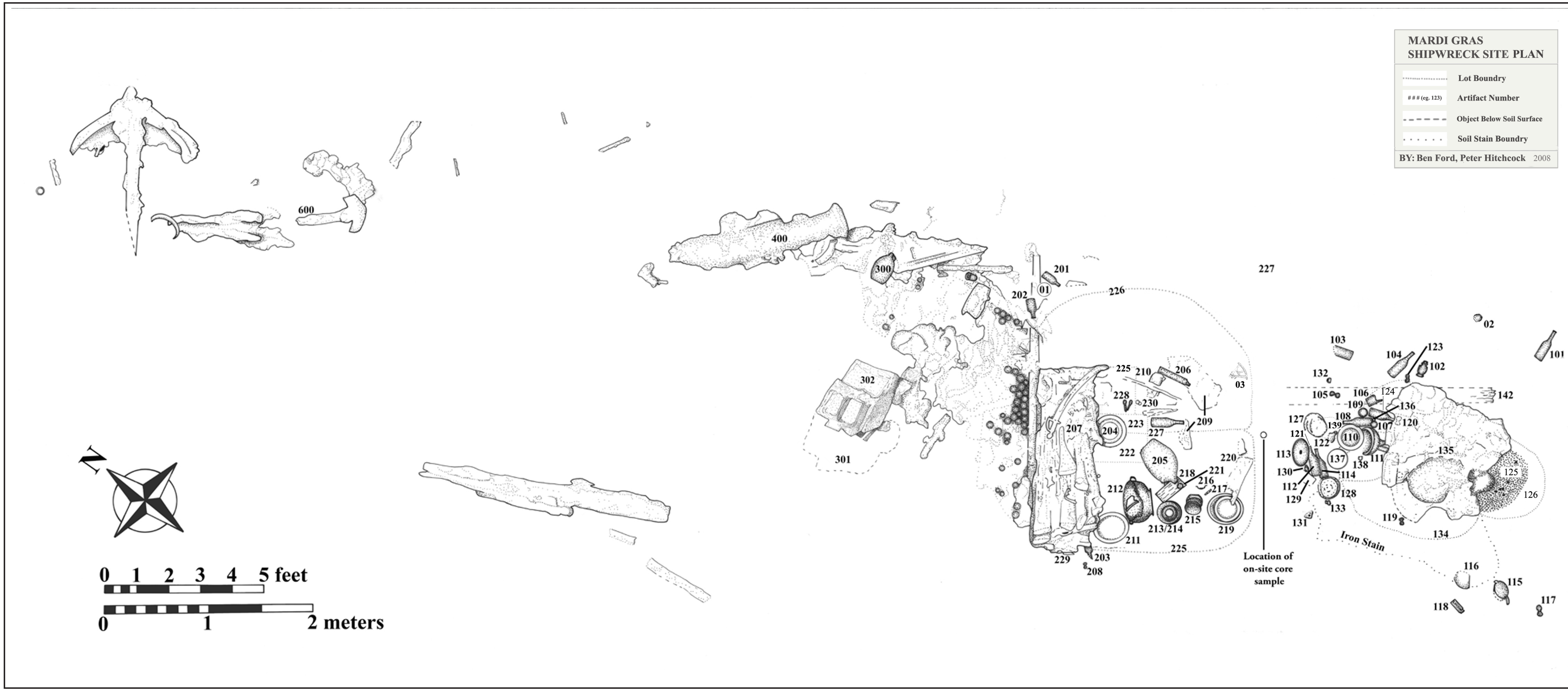
Post-Disturbance Mosaic

June 2007

APPENDIX D: SITE PLAN

MARDI GRAS SHIPWRECK SITE

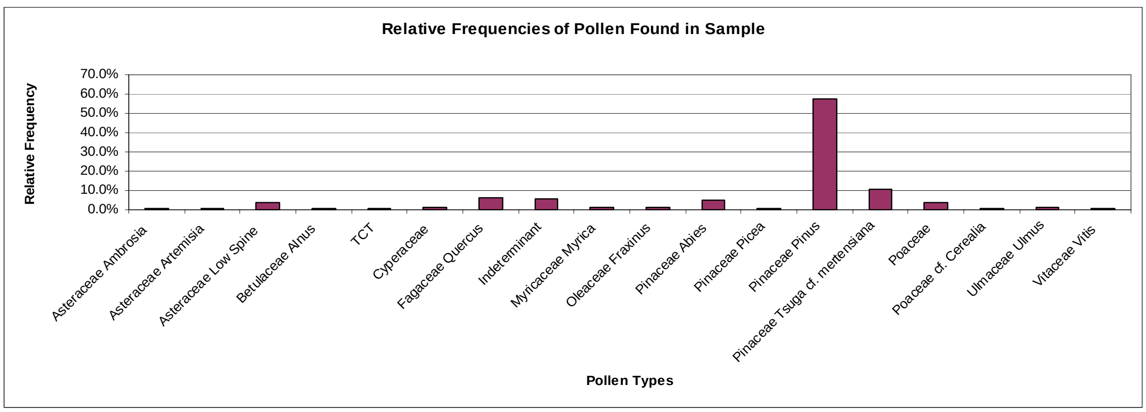
Site Plan



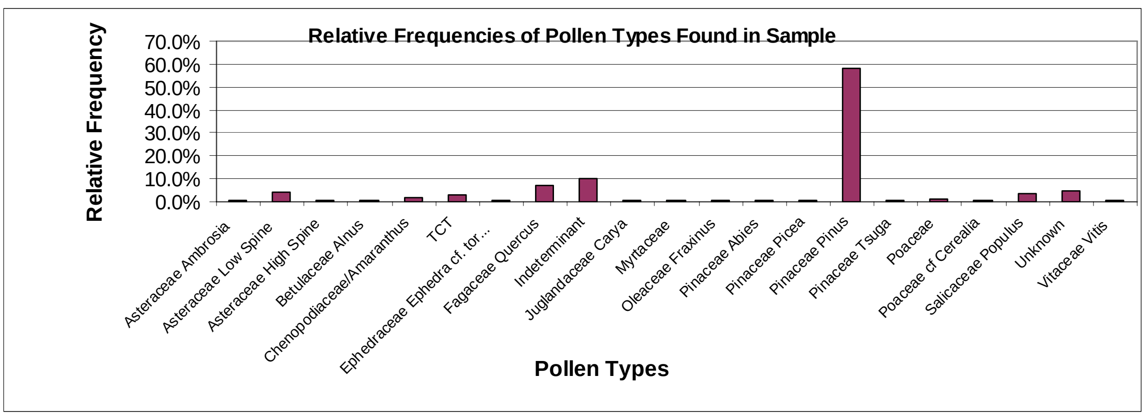
APPENDIX E: POLLEN COUNTS

TAMU #	MARDIGRAS #	LETTER/SPLIT SAMPLE	MATERIAL/OBJECT
1	101		Glass/Bottle
2	108		Glass/Bottle
3	114		Glass/Bottle (with partial cork)
4	140		From bucket/ surrounding the encrustacean
4a	140		From bucket from piece of wood
5	109	A	Encrustacean inside bottle
6	109	B	Bottle Cork in bottle prior to decanting
7	103	A	Bottle Cork in bottle prior to decanting
8	122	A	Bottle with cork in place
9	201	A	Corked bottle contents
10	202		Corked bottle prior to decanting
11	227		Bottle no cork
12	203	A	Bottle Cork still in neck prior to decanting
13	119	A	Hour Glass (Lead present)
13	119	B	Hour Glass (Lead present)
14	120		Hour Glass (Lead present)
15	123		Hour Glass (Lead present)
16	208		Hour Glass (Lead present) (piece of wood, red paint)
17	104		Hour Glass (Lead present)
18	103		Initial draw/ Bottle
19	103		Cork
20	122		Initial draw/ Bottle
21	140		Rope sample
22	201		Initial draw/ Bottle
23	203		Initial draw/ Bottle
24	Core	A1	500' off site 26.5 cm long/ radius 5 cm at 7 cm from top
25	Core	A2	500' off site 26.5 cm long/ radius 5 cm at 18 cm from top
26	Core	B1	On site - No context*
27	Core	B2	On site - No context*+
28	Core	B3	On site - No context*
29	Core	B4	On site - No context*
30	117		Hourglass (Lead present)
			*note - core B seemed to have 4 distinct stratigraphies
			1.) 1-6 cm
			2.) 6-11.5 cm + B2 sediments much lighter after HF/ light brown see photo
			3.) 11.5-15 cm, and 4.) 18.5 cm

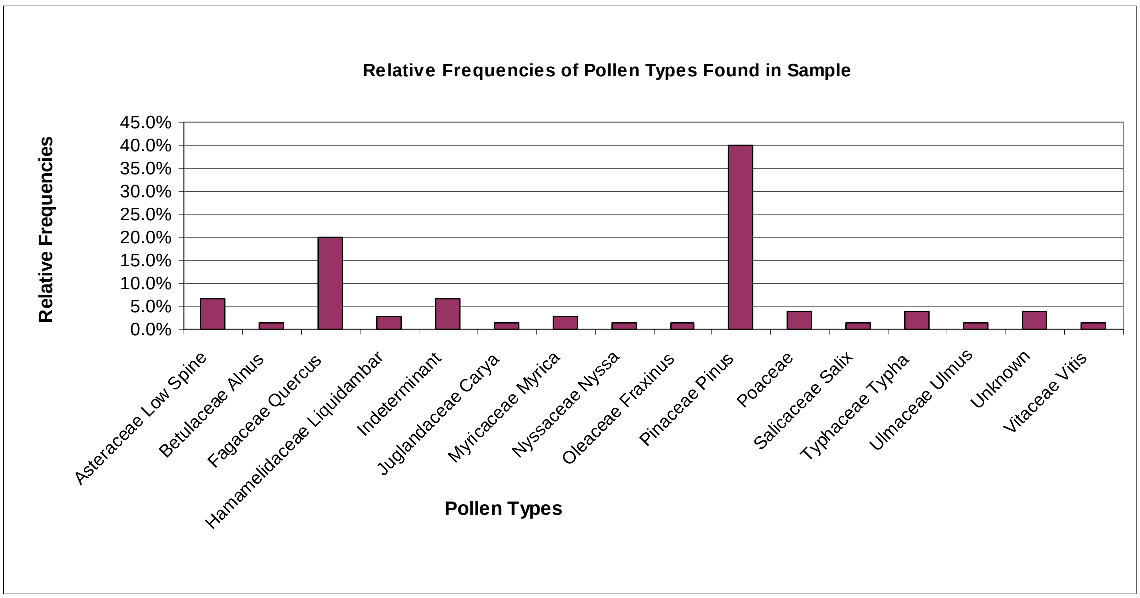
101 TAMU 1	Relative Frequency	Glass/Bottle	Common Name(s)	Arboreal (AP)/Nonarboreal(NAP)
1 Tablet/10ml				
Asteraceae *Ambrosia*	0.5%	1	Ragweed	NAP
Asteraceae *Artemisia*	0.5%	1	Wormwood	NAP
Asteraceae Low Spine	3.7%	7	Composites-usually weeds	NAP
Betulaceae *Alnus*	0.5%	1	Alder	AP
TCT	0.5%	1	-	AP
Cyperaceae	1.1%	2	Sedge Family	NAP
Fagaceae *Quercus*	6.3%	12	Oak	AP
Indeterminant	5.8%	11	-	-
Myricaceae *Myrica*	1.1%	2	Wax Myrtle/Bayberry	AP
Oleaceae *Fraxinus*	1.1%	2	Ash	AP
Pinaceae *Abies*	4.7%	9	Fir	AP
Pinaceae *Picea*	0.5%	1	Spruce	AP
Pinaceae *Pinus*	57.4%	109	Pine	AP
Pinaceae *Tsuga cf. mertensiana*	10.5%	20	Hemlock	AP
Poaceae	3.7%	7	Grass Family	NAP
Poaceae cf. Cerealia	0.5%	1	Possible Cultigen	NAP
Ulmaceae *Ulmus*	1.1%	2	Elm	AP
Vitaceae *Vitis*	0.5%	1	Grape	NAP
Total		190		
Lycopodium (Marker Grains)		102		
Concentration				
Value grains/ml		2515		



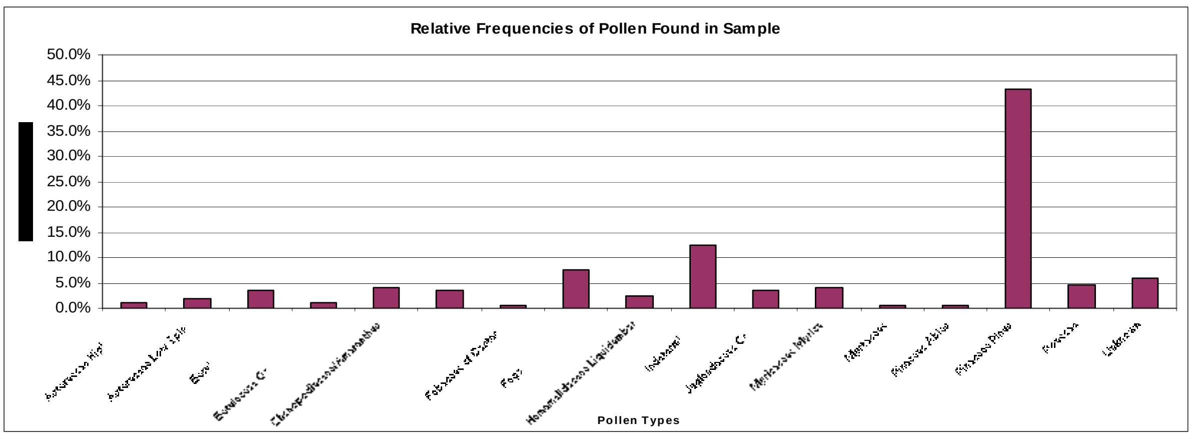
108 TAMU 2	Relative Frequency	Glass/Bottle	Common Name(s)	Arboreal (AP)/Nonarboreal(NAP)
1 Tablet/16ml				
Asteraceae *Ambrosia*	0.8%	2	Ragweed	NAP
Asteraceae Low Spine	4.1%	10	Composites-usually weeds	NAP
Asteraceae High Spine	0.4%	1	Composites-usually weeds	NAP
Betulaceae *Alnus*	0.8%	2	Alder	AP
Chenopodiaceae/*Amaranthus*	1.6%	4	Goosefoot Family/Amaranth	NAP
TCT	2.9%	7	Cypress Family	AP
Ephedraceae *Ephedra cf. torreyana*	0.4%	1	Ephedra/Ma huang	NAP
Fagaceae *Quercus*	6.9%	17	Oak	AP
Indeterminant	9.8%	24	-	-
Juglandaceae *Carya*	0.8%	2	Hickory	AP
Myrtaceae	0.4%	1	Myrtle Family	AP
Oleaceae *Fraxinus*	0.4%	1	Ash	AP
Pinaceae *Abies*	0.8%	2	Fir	AP
Pinaceae *Picea*	0.8%	2	Spruce	AP
Pinaceae *Pinus*	58.4%	143	Pine	AP
Pinaceae *Tsuga*	0.4%	1	Hemlock	AP
Poaceae	1.2%	3	Grass Family	NAP
Poaceae cf Cerealia	0.8%	2	Poss. Cultigen	NAP
Salicaceae *Populus*	3.3%	8	Poplar/Cottonwood/American Aspen	AP
Unknown	4.5%	11	-	-
Vitaceae *Vitis*	0.4%	1	Grape	NAP
Total	100.0%	245		
Lycopodium (Marker Grains)		75		
Concentration				
Value grains/ml		2,756		



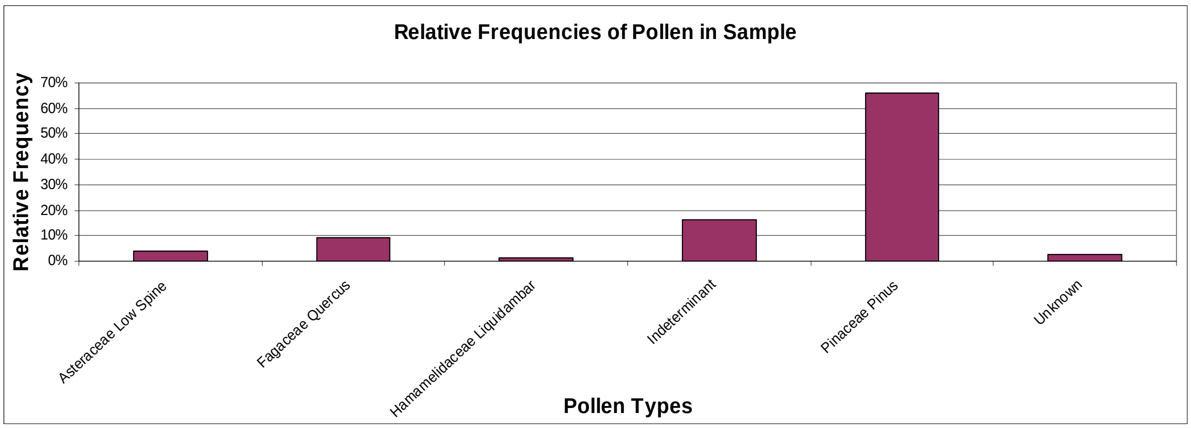
114 TAMU 3	**Relative Frequency**	**Glass Bottle w/ partial cork**	**Common Name(s)**	**Arboreal (AP)/Nonarboreal(NAP)**
1 tablet/10ml				
Asteraceae Low Spine	6.7%	5	Composites-usually weeds	NAP
Betulaceae *Alnus*	1.3%	1	Alder	AP
Fagaceae *Quercus*	20.0%	15	Oak	NAP
Hamamelidaceae *Liquidambar*	2.7%	2	Sweet Gum	AP
Indeterminant	6.7%	5	-	-
Juglandaceae *Carya*	1.3%	1	Hickory	AP
Myricaceae *Myrica*	2.7%	2	Wax Myrtle/Bayberry	AP
Nyssaceae *Nyssa*	1.3%	1	Tupelo	AP
Oleaceae *Fraxinus*	1.3%	1	Ash	AP
Pinaceae *Pinus*	40.0%	30	Pine	AP
Poaceae	4.0%	3	Grass	NAP
Salicaceae *Salix*	1.3%	1	Willow	AP
Typhaceae *Typha*	4.0%	3	Cattail	NAP
Ulmaceae *Ulmus*	1.3%	1	Elm	NAP
Unknown	4.0%	3	-	-
Vitaceae Vitis	1.3%	1	Grape	NAP
Total Pollen	100.0%	75		AP
Lycopodium (Marker Grains)		79		
Concentration				
Value grains/ml		1,282		



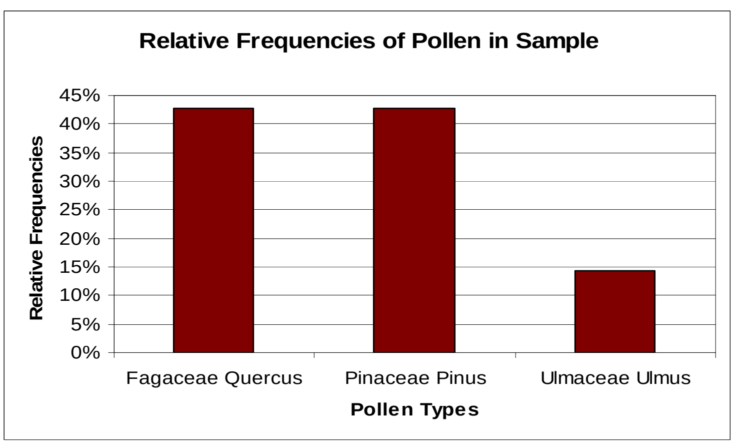
140 TAMU 4	Relative Frequency	From large encrustacean	Common Name(s)	Arboreal (AP)/Nonarboreal(NAP)
2 Tablet/40 ml				
Asteraceae High Spine	1.0%	2	CompositeFamily/mostly weeds	NAP
Asteraceae Low Spine	2.0%	4	CompositeFamily/mostly weeds	NAP
Betulaceae *Alnus*	3.5%	7	Alder	NAP
Betulaceae *Ostrya/Carpinus*	1.0%	2	Hop Hornbeam/American Hornbeam,Ironwood	AP
Chenopodiaceae/*Amaranthus*	4.0%	8	Goosefoot Family/Amaranth	NAP
TCT	3.5%	7	Cypress Family	AP
Fabaceae *cf Castanea*	0.5%	1	Chestnut	AP
Fagaceae *Quercus*	7.5%	15	Oak	AP
Hamamelidaceae *Liquidambar*	2.5%	5	Sweet Gum	AP
Indeterminant	12.4%	25	-	-
Juglandaceae *Carya*	3.5%	7	Hickory	AP
Myricaceae *Myrica*	4.0%	8	Wax Myrtle/Bayberry	AP
Myrtaceae	0.5%	1	Myrtle Family	AP
Pinaceae *Abies*	0.5%	1	Fir	AP
Pinaceae *Pinus*	43.3%	87	Pine	AP
Poaceae	4.5%	9	Grass	NAP
Unknown	6.0%	12	-	-
Total	100.0%	201		
Lycopodium (Marker Grains)		87		
Concentration				
Value grains/ml		1,559		



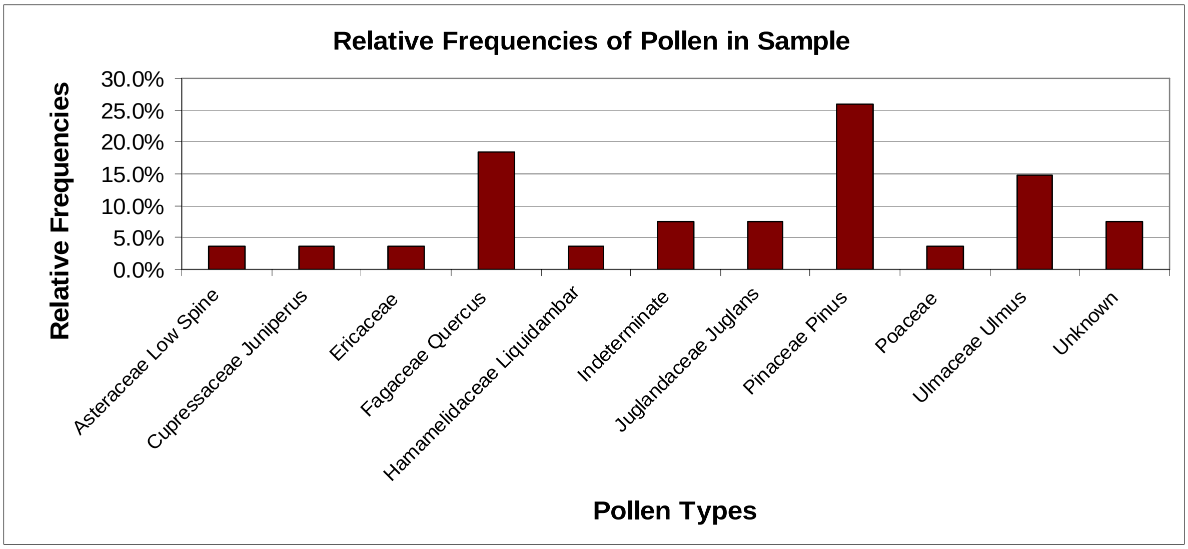
140 TAMU 4A	Relative Frequency	From large encrustacean	Common Name(s)	Arboreal (AP)/Nonarboreal(NAP)
1 Tablet/12 ml				
Asteraceae Low Spine	4%	3	Composite/usually weeds	NAP
Fagaceae *Quercus*	9%	7	Oak	AP
Hamamelidaceae *Liquidambar*	1%	1	Sweet Gum	NAP
Indeterminant	16%	12	-	-
Pinaceae *Pinus*	66%	49	Pine	AP
Unknown	3%	2	-	-
Total	100%	74		
Lycopodium (Marker Grains)		29		
Concentration Value grains/ml		2,871		



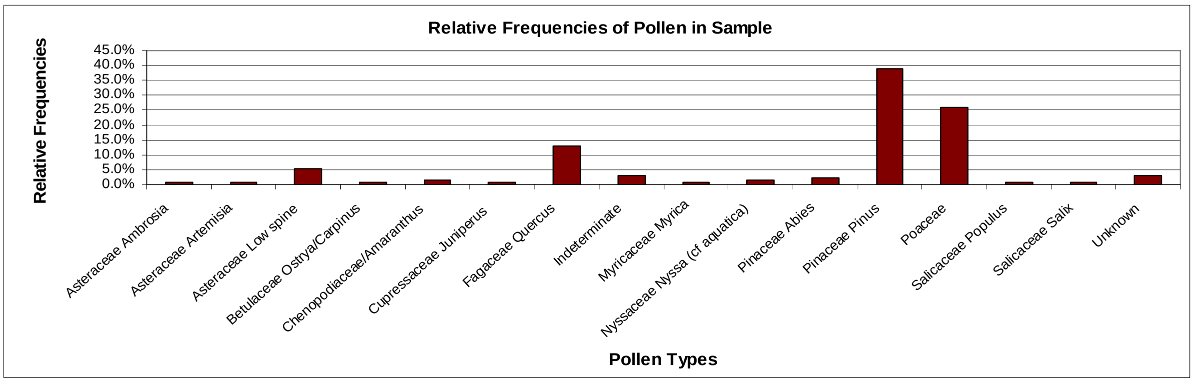
109A TAMU 5	Relative Frequency	Encrustacean in bottle	Common Name(s)	Arboreal (AP)/Nonarboreal(NAP)
1 Tablet/5ml				
Fagaceae *Quercus*	43%	3	Oak	AP
Pinaceae *Pinus*	43%	3	Pine	AP
Ulmaceae *Ulmus*	14%	1	Elm	NAP
Total	100%	7		
Lycopodium (Marker Grains)		42		
Concentration Value grains/ml		450		



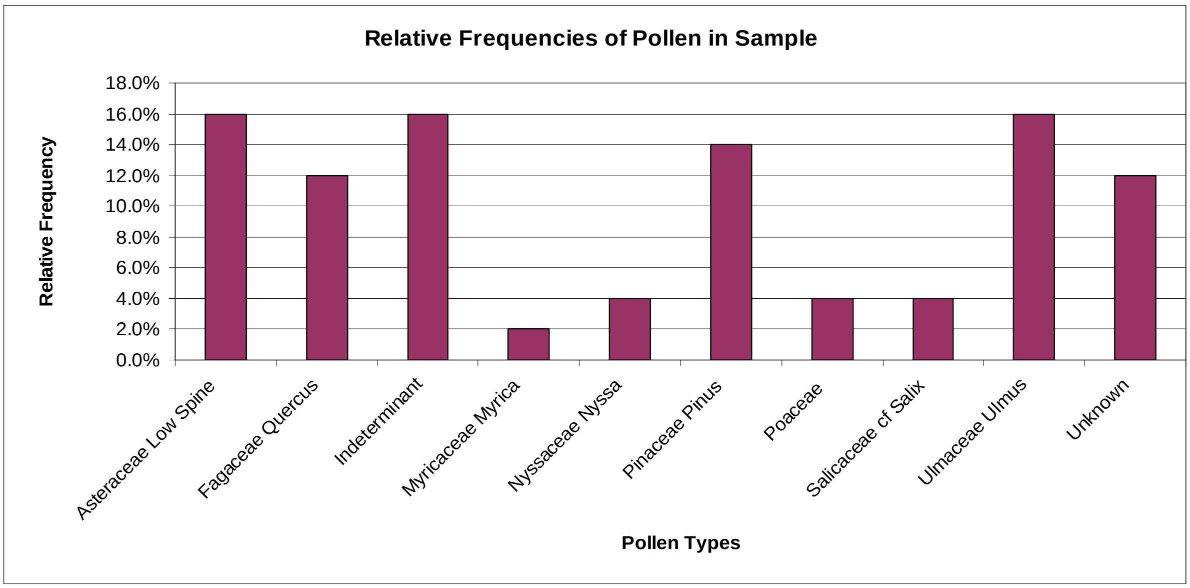
109B TAMU 6	Relative Frequency	Cork in bottle before decanting	Common Name(s)	Arboreal (AP)/Nonarboreal(NAP)
1 Tablet/3 ml				
Asteraceae Low Spine	3.7%	1	Composite/usually weeds	NAP
Cupressaceae *Juniperus*	3.7%	1	Juniper	AP
Ericaceae	3.7%	1	Heath Family	NAP
Fagaceae *Quercus*	18.5%	5	Oak	AP
Hamamelidaceae *Liquidambar*	3.7%	1	Sweet Gum	AP
Indeterminate	7.4%	2	-	
Juglandaceae *Juglans*	7.4%	2	Walnut/Hickory	AP
Pinaceae *Pinus*	25.9%	7	Pine	AP
Poaceae	3.7%	1	Grass Family	NAP
Ulmaceae *Ulmus*	14.8%	4	Elm	AP
Unknown	7.4%	2	-	
Total	100.0%	27		
Lycopodium (Marker Grains)		134		NAP
Concentration Value				NAP
Value grains/ml		907		



103A TAMU 7	Relative Frequency	Cork in bottle before dec.	Common Name(s)	Arboreal (AP)/Nonarboreal(NAP)
1 Tablet/3ml				
Asteraceae *Ambrosia*	0.8%	1	Ragweed	NAP
Asteraceae *Artemisia*	0.8%	1	Wormwood	NAP
Asteraceae Low spine	5.3%	7	Composites/mostly weeds	NAP
Betulaceae *Ostrya/Carpinus*	0.8%	1	Hop Hornbeam/American Hornbeam,Ironwood	AP
Chenopodiaceae/*Amaranthus*	1.5%	2	Goosefoot Family/Amaranth	NAP
Cupressaceae *Juniperus*	0.8%	1	Juniper	AP
Fagaceae *Quercus*	13.0%	17	Oak	AP
Indeterminate	3.1%	4	-	-
Myricaceae *Myrica*	0.8%	1	Wax Myrtle/Bayberry	AP
Nyssaceae *Nyssa (cf aquatica)*	1.5%	2	Tupelo	AP
Pinaceae *Abies*	2.3%	3	Fir	AP
Pinaceae *Pinus*	38.9%	51	Pine	AP
Poaceae	26.0%	34	Grass Family	NAP
Salicaceae *Populus*	0.8%	1	Poplar/Cottonwood/American Aspen	AP
Salicaceae *Salix*	0.8%	1	Willow	AP
Unknown	3.1%	4	-	-
Total	100.0%	131		
Lycopodium (Marker Grains)		129		
Concentration Value grains/ml		4,570		



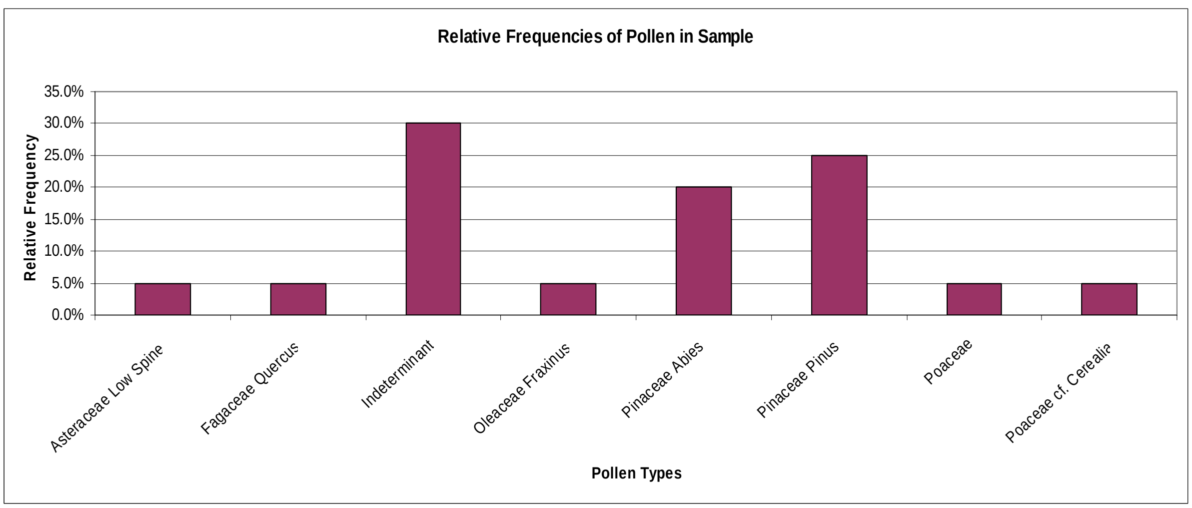
122A TAMU 8	Relative Frequency	Bottle with cork in place	Common Name(s)	Arboreal (AP)/Nonarboreal(NAP)
1 Tablet/4ml				
Asteraceae Low Spine	16.0%	8	Composites/mostly weeds	NAP
Fagaceae *Quercus*	12.0%	6	Oak	AP
Indeterminant	16.0%	8	-	NAP
Myricaceae *Myrica*	2.0%	1	Wax Myrtle/Bayberry	AP
Nyssaceae *Nyssa*	4.0%	2	Tupelo	AP
Pinaceae *Pinus*	14.0%	7	Pine	AP
Poaceae	4.0%	2	Grass Family	NAP
Salicaceae cf *Salix*	4.0%	2	Willow	AP
Ulmaceae *Ulmus*	16.0%	8	Elm	AP
Unknown	12.0%	6	-	AP
Total	100.0%	50		
Lycopodium (Marker Grains)		246		
Concentration Value grains/ml		686		NAP



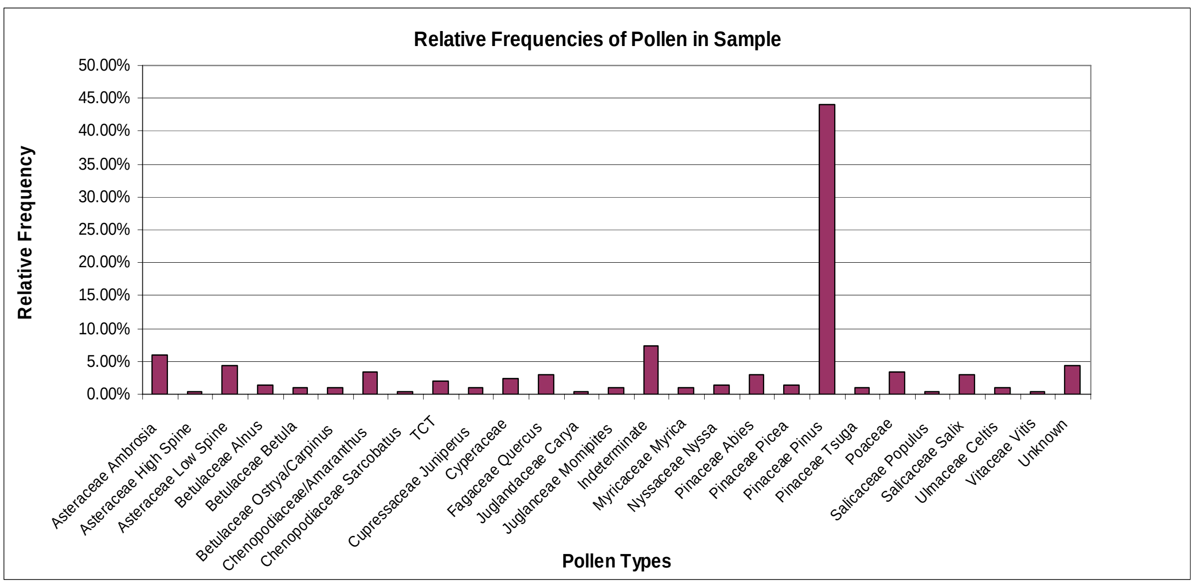
201A TAMU 9	Relative Frequency	Corked Bottle Contents
1 Tablet/4ml		
Unknown	100%	1
Total		1
Lycopodium (Marker Grains)		79
Concentration Value grains/ml		427

202 TAMU 10	Relative Frequency	Corked Bottle Prior to Decanting	Common Name(s)	Arboreal (AP)/Nonarboreal(NAP)
1 tablet/3 ml				
Indeterminant	0.28%	2	-	
Fagaceae *Quercus*	0.28%	2	Oak	AP
Total	0.56%	4		
Lycopodium (Marker Grains)	3.47%	25		
Concentration Value grains/ml		720		

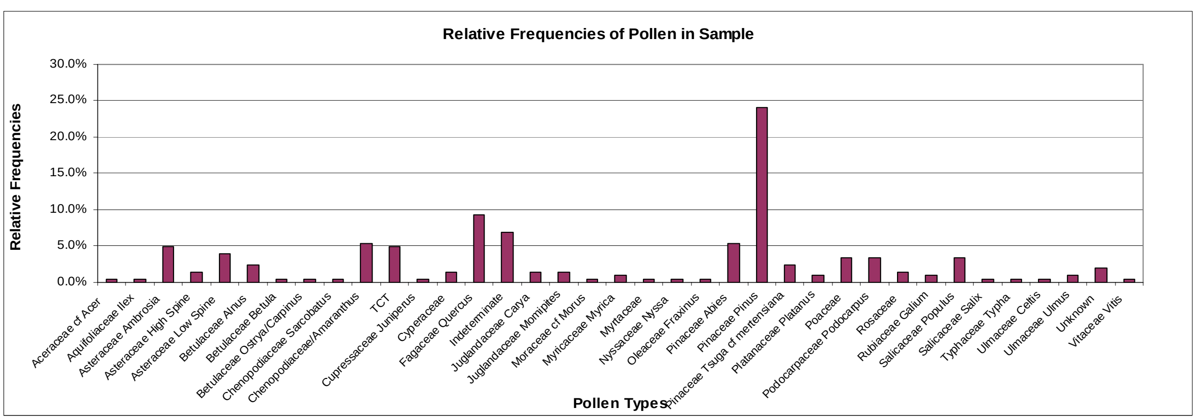
227 TAMU 11	Relative Frequency	Bottle no cork	Common Name(s)	Arboreal (AP)/Nonarboreal(NAP)
1 tablet/2 ml				
Asteraceae Low Spine	5.0%	1	Composites/mostly weeds	NAP
Fagaceae *Quercus*	5.0%	1	Oak	AP
Indeterminant	30.0%	6	-	-
Oleaceae *Fraxinus*	5.0%	1	Ash	AP
Pinaceae *Abies*	20.0%	4	Fir	AP
Pinaceae *Pinus*	25.0%	5	Pine	AP
Poaceae	5.0%	1	Grass Family	NAP
Poaceae cf. Cerealia	5.0%	1	Possible Cultigen	NAP
Total	100.0%	20		
Lycopodium (Marker Grains)		122		
Concentration Value grains/ml		1,107		



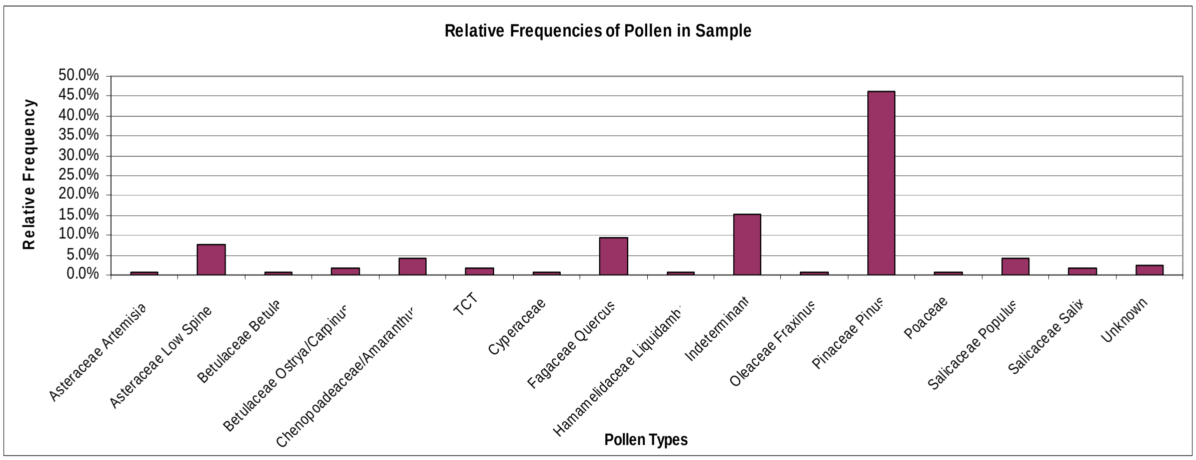
119 TAMU 13A	Relative Frequency	Hour Glass (lead present)	Common Name(s)	Arboreal (AP)/Nonarboreal(NAP)
1 Tablet/25ml				
Asteraceae *Ambrosia*	5.88%	12	Ragweed	NAP
Asteraceae High Spine	0.49%	1	Composites/mostly weeds	NAP
Asteraceae Low Spine	4.41%	9	Composites/mostly weeds	NAP
Betulaceae *Alnus*	1.47%	3	Alder	AP
Betulaceae *Betula*	0.98%	2	Birch	AP
Betulaceae *Ostrya/Carpinus*	0.98%	2	Hop Hornbeam/American Hornbeam,Ironwood	AP
Chenopodiaceae/*Amaranthus*	3.43%	7	Goosefoot Family/Amaranth	NAP
Chenopodiaceae *Sarcobatus*	0.49%	1	Greasewood	AP
TCT	1.96%	4	Cypress Family	NAP
Cupressaceae *Juniperus*	0.98%	2	Juniperus	AP
Cyperaceae	2.45%	5	Sedge Family	NAP
Fagaceae *Quercus*	2.94%	6	Oak	AP
Juglandaceae *Carya*	0.49%	1	Hickory	AP
Juglanceae *Momipites*	0.98%	2	Walnut Family/Eocene pollen	AP
Indeterminate	7.35%	15	-	-
Myricaceae *Myrica*	0.98%	2	Wax Myrtle/Bayberry	AP
Nyssaceae *Nyssa*	1.47%	3	Tupelo	AP
Pinaceae *Abies*	2.94%	6	Fir	AP
Pinaceae *Picea*	1.47%	3	Spruce	AP
Pinaceae *Pinus*	44.12%	90	Pine	AP
Pinaceae *Tsuga*	0.98%	2	Hemlock	AP
Poaceae	3.43%	7	Grass Family	NAP
Salicaceae *Populus*	0.49%	1	Poplar/Cottonwood/American Aspen	AP
Salicaceae *Salix*	2.94%	6	Willow	AP
Ulmaceae *Celtis*	0.98%	2	Hackberry	AP
Vitaceae *Vitis*	0.49%	1	Grape	NAP
Unknown	4.41%	9	-	-
Total	100.00%	204		
Lycopodium (Marker Grains)		25		
Concentration				
Value grains/ml		4,406		



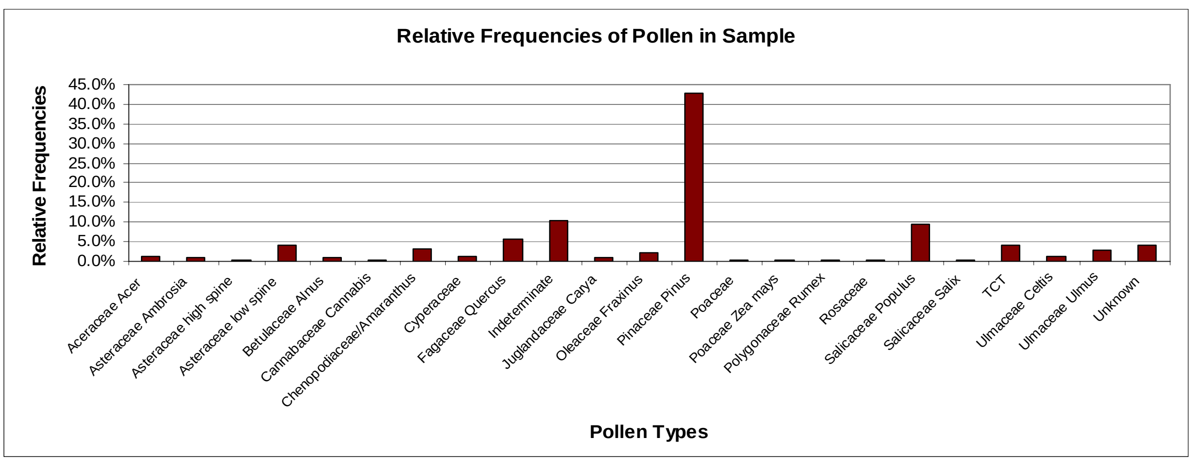
119 TAMU 13B	Relative Frequency	Hour Glass (Lead present)	Common Name(s)	Arboreal (AP)/Nonarboreal(NAP)
1tablet/10ml				
Aceraceae *cf Acer*	0.5%	1	Maple	AP
Aquifoliaceae *Ilex*	0.5%	1	winterberry, black alder, coralberry	AP
Asteraceae *Ambrosia*	4.9%	10	Ragweed	NAP
Asteraceae High Spine	1.5%	3	Composites-usually weeds	NAP
Asteraceae Low Spine	3.9%	8	Composites-usually weeds	NAP
Betulaceae *Alnus*	2.5%	5	Alder	AP
Betulaceae *Betula*	0.5%	1	Birch	AP
Betulaceae *Ostrya/Carpinus*	0.5%	1	Hop Hornbeam/American Hornbeam,Ironwood	AP
Chenopodiaceae *Sarcobatus*	0.5%	1	Greasewood	AP
Chenopodiaceae/*Amaranthus*	5.4%	11	Goosefoot Family/Amaranth	NAP
TCT	4.9%	10	Cypress Family	AP
Cupressaceae *Juniperus*	0.5%	1	Juniper	AP
Cyperaceae	1.5%	3	Sedge Family	NAP
Fagaceae *Quercus*	9.3%	19	Oak	AP
Indeterminate	6.9%	14	-	-
Juglandaceae *Carya*	1.5%	3	Hickory	AP
Juglandaceae *Momipites*	1.5%	3	Walnut Family/Eocene pollen	AP
Moraceae *cf Morus*	0.5%	1	Mulberry	NAP
Myricaceae *Myrica*	1.0%	2	Wax Myrtle/Bayberry	AP
Myrtaceae	0.5%	1	Myrtle Family	AP
Nyssaceae *Nyssa*	0.5%	1	Tupelo	AP
Oleaceae *Fraxinus*	0.5%	1	Ash	AP
Pinaceae *Abies*	5.4%	11	Fir	AP
Pinaceae *Pinus*	24.0%	49	Pine	AP
Pinaceae *Tsuga cf mertensiana*	2.5%	5	Hemlock/Moutain Hemlock	AP
Platanaceae *Platanus*	1.0%	2	Sycamore	AP
Poaceae	3.4%	7	Grass Family	NAP
Podocarpaceae *Podocarpus*	3.4%	7	Yew Pine/Buddhist Pine/Chinese Yew/Podocarpus	AP
Rosaceae	1.5%	3	Rose Family	AP
Rubiaceae *Galium*	1.0%	2	Bedstraw	AP
Salicaceae *Populus*	3.4%	7	Poplar/Cottonwood/American Aspen	AP
Salicaceae *Salix*	0.5%	1	Willow	AP
Typhaceae *Typha*	0.5%	1	Cattail	NAP
Ulmaceae *Celtis*	0.5%	1	Hackberry	AP
Ulmaceae *Ulmus*	1.0%	2	Elm	AP
Unknown	2.0%	4	-	-
Vitaceae *Vitis*	0.5%	1	Grape	NAP
Total	100.0%	204		
Lycopodium (Marker Grains)		79		
Concentration Value grains/ml		3,486		



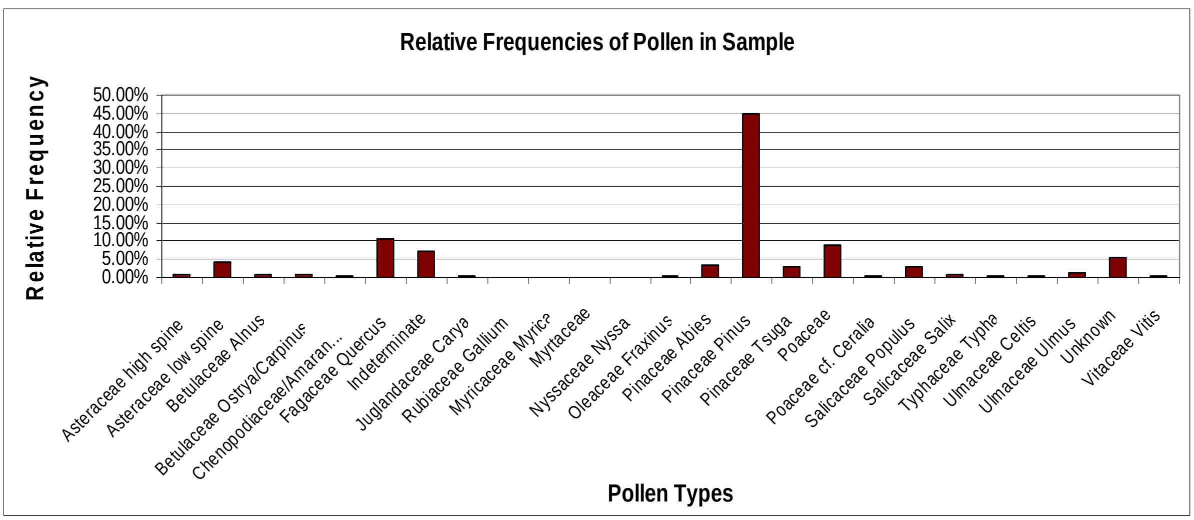
120 TAMU 14	Relative Frequency	Hour Glass (lead present)	Common Name(s)	Arboreal (AP)/Nonarboreal(NAP)
1 tablet/51ml				
Asteraceae *Artemisia*	0.9%	1	Wormwood	NAP
Asteraceae Low Spine	7.7%	9	Composites-usually weeds	NAP
Betulaceae *Betula*	0.9%	1	Birch	AP
Betulaceae *Ostrya/Carpinus*	1.7%	2	Hop Hornbeam/American Hornbeam, Ironwood	AP
Chenopoadeaceae/*Amaranthus*	4.3%	5	Goosefoot Family/Amaranth	NAP
TCT	1.7%	2	Cypress Family	AP
Cyperaceae	0.9%	1	Sedge Family	NAP
Fagaceae *Quercus*	9.4%	11	Oak	AP
Hamamelidaceae *Liquidambar*	0.9%	1	Sweetgum	AP
Indeterminant	15.4%	18	-	-
Oleaceae *Fraxinus*	0.9%	1	Ash	AP
Pinaceae *Pinus*	46.2%	54	Pine	AP
Poaceae	0.9%	1	Grass Family	NAP
Salicaceae *Populus*	4.3%	5	Poplar/Cottonwood/American Aspen	AP
Salicaceae *Salix*	1.7%	2	Willow	AP
Unknown	2.6%	3	-	-
Total	100.0%	117		
Lycopodium (Marker Grains)		67		
Concentration				
Value grains/ml		462		



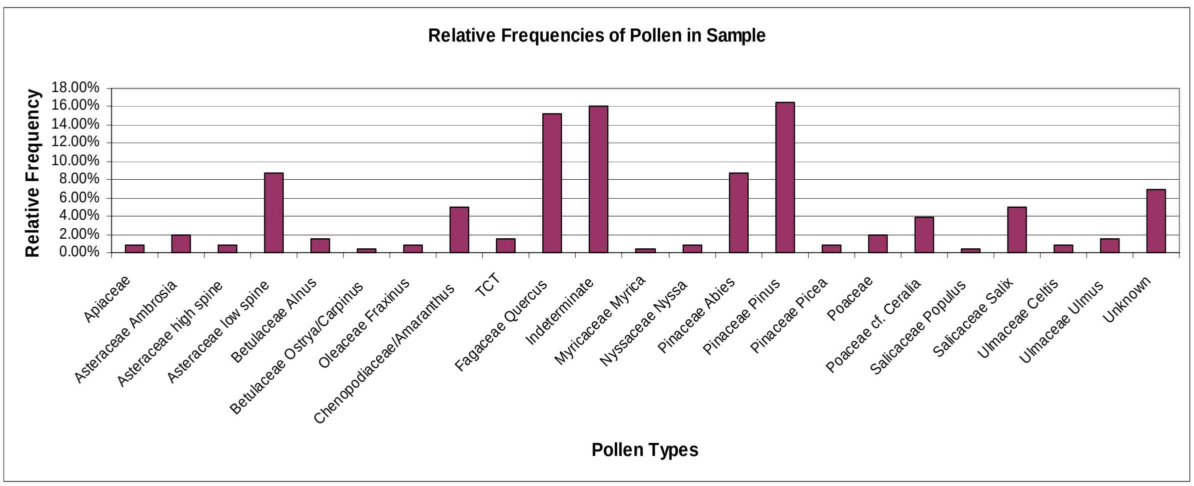
123 TAMU 15	Relative Frequency	Hour Glass (lead present)	Common Name(s)	Arboreal (AP)/Nonarboreal(NAP)
1 tablet/13ml				
Aceraceae *Acer*	1.4%	3	Maple	AP
Asteraceae *Ambrosia*	0.9%	2	Ragweed	NAP
Asteraceae high spine	0.5%	1	Composites-usually weeds	NAP
Asteraceae low spine	4.2%	9	Composites-usually weeds	NAP
Betulaceae *Alnus*	0.9%	2	Alder	AP
Cannabaceae *Cannabis*	0.5%	1	Hemp	NAP
Chenopodiaceae/*Amaranthus*	3.3%	7	Goosefoot Family/Amaranth	NAP
Cyperaceae	1.4%	3	Sedge Family	NAP
Fagaceae *Quercus*	5.6%	12	Oak	AP
Indeterminate	10.2%	22	-	-
Juglandaceae *Carya*	0.9%	2	Hickory	AP
Oleaceae *Fraxinus*	2.3%	5	Ash	AP
Pinaceae *Pinus*	42.8%	92	Pine	AP
Poaceae	0.5%	1	Poaceae	NAP
Poaceae *Zea mays*	0.5%	1	Corn	
Polygonaceae *Rumex*	0.5%	1	Dock/Sorrel	NAP
Rosaceae	0.5%	1	Rose Family	AP
Salicaceae *Populus*	9.3%	20	Poplar/Cottonwood/American Aspen	AP
Salicaceae *Salix*	0.5%	1	Willow	AP
TCT	4.2%	9	Cypress Family	AP
Ulmaceae *Celtis*	1.4%	3	Hackberry	AP
Ulmaceae *Ulmus*	2.8%	6	Elm	AP
Unknown	4.2%	9	-	-
Vitaceae *Vitis*	0.9%	2	Grape	NAP
Total	100.0%	215		
Lycopodium (Marker Grains)		182		
Concentration				
Value grains/ml		1,227		



208 TAMU 16	Relative Frequency	Piece of wood, red paint	Common Name(s)	Arboreal (AP)/Nonarboreal(NAP)
		Assoc. with Hour Glass		
1 tablet/24ml				
Asteraceae high spine	1.02%	5	Composites-usually weeds	NAP
Asteraceae low spine	4.09%	20	Composites-usually weeds	NAP
Betulaceae *Alnus*	0.82%	4	Alder	AP
Betulaceae *Ostrya/Carpinus*	1.02%	5	Hop Hornbeam/American Hornbeam,Ironwood	AP
Chenopodiaceae/*Amaranthus*	0.41%	2	Goosefoot Family/Amaranth	NAP
Fagaceae *Quercus*	10.63%	52	Oak	AP
Indeterminate	7.16%	35	-	-
Juglandaceae *Carya*	0.61%	3	Hickory	AP
Rubiaceae *Gallium*	0.20%	1	Bedstraw	NAP
Myricaceae *Myrica*	0.20%	1	Wax Myrtle/Bayberry	AP
Myrtaceae	0.20%	1	Myrtle Family	AP
Nyssaceae *Nyssa*	0.20%	1	Tupelo	AP
Oleaceae *Fraxinus*	0.41%	2	Ash	AP
Pinaceae *Abies*	3.48%	17	Fir	AP
Pinaceae *Pinus*	44.99%	220	Pine	AP
Pinaceae *Tsuga*	3.07%	15	Hemlock	AP
Poaceae	8.79%	43	Grass Family	NAP
Poaceae cf. Ceralia	0.61%	3	Poss. Cultigen	NAP
Salicaceae *Populus*	2.86%	14	Poplar/Cottonwood/American Aspen	AP
Salicaceae *Salix*	1.02%	5	Willow	AP
Typhaceae *Typha*	0.41%	2	Cattail	NAP
Ulmaceae *Celtis*	0.61%	3	Hackberry	AP
Ulmaceae *Ulmus*	1.23%	6	Elm	AP
Unknown	5.32%	26	-	-
Vitaceae *Vitis*	0.61%	3	Grape	NAP
Total	100.00%	489		
Lycopodium (Marker Grains)		42		
Concentration				
Value grains/ml		6,549		

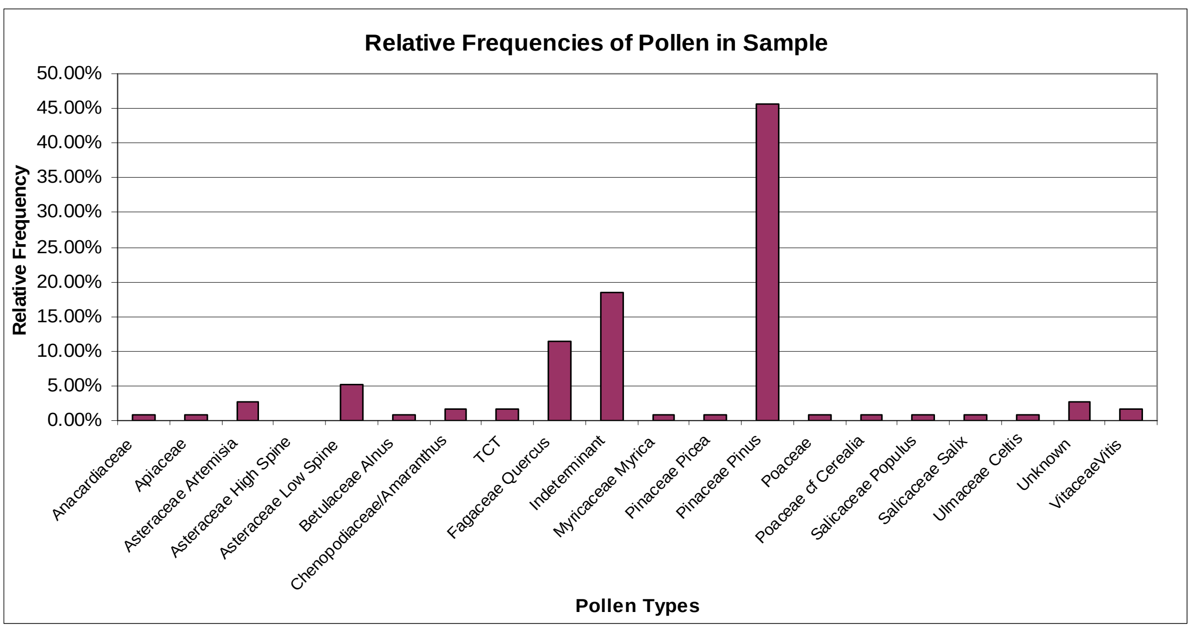


104 TAMU 17	Relative Frequency	Hour Glass (lead present)	Common Name(s)	Arboreal (AP)/Nonarboreal(NAP)
1 tablet/7.5ml				
Apiaceae	0.76%	2	Carrot Family	NAP
Asteraceae *Ambrosia*	1.91%	5	Ragweed	NAP
Asteraceae high spine	0.76%	2	Composites-usually weeds	NAP
Asteraceae low spine	8.78%	23	Composites-usually weeds	NAP
Betulaceae *Alnus*	1.53%	4	Alder	AP
Betulaceae *Ostrya/Carpinus*	0.38%	1	Hop Hornbeam/American Hornbeam, Ironwood	AP
Oleaceae *Fraxinus*	0.76%	2	Ash	AP
Chenopodiaceae/*Amaranthus*	4.96%	13	Goosefoot Family/Amaranth	NAP
TCT	1.53%	4	Cypress Family	AP
Fagaceae *Quercus*	15.27%	40	Oak	AP
Indeterminate	16.03%	42	-	-
Myricaceae *Myrica*	0.38%	1	Wax Myrtle/Bayberry	AP
Nyssaceae *Nyssa*	0.76%	2	Tupelo	AP
Pinaceae *Abies*	8.78%	23	Fir	AP
Pinaceae *Pinus*	16.41%	43	Pine	AP
Pinaceae *Picea*	0.76%	2	Spruce	AP
Poaceae	1.91%	5	Grass Family	NAP
Poaceae cf. Ceralia	3.82%	10	Poss. Cultigen	NAP
Salicaceae *Populus*	0.38%	1	Poplar/Cottonwood/American Aspen	AP
Salicaceae *Salix*	4.96%	13	Willow	AP
Ulmaceae *Celtis*	0.76%	2	Hackberry	AP
Ulmaceae *Ulmus*	1.53%	4	Elm	AP
Unknown	6.87%	18	-	-
Total	100.00%	262		
Lycopodium (Marker Grains)		22		
Concentration				
Value grains/ml		21,436		



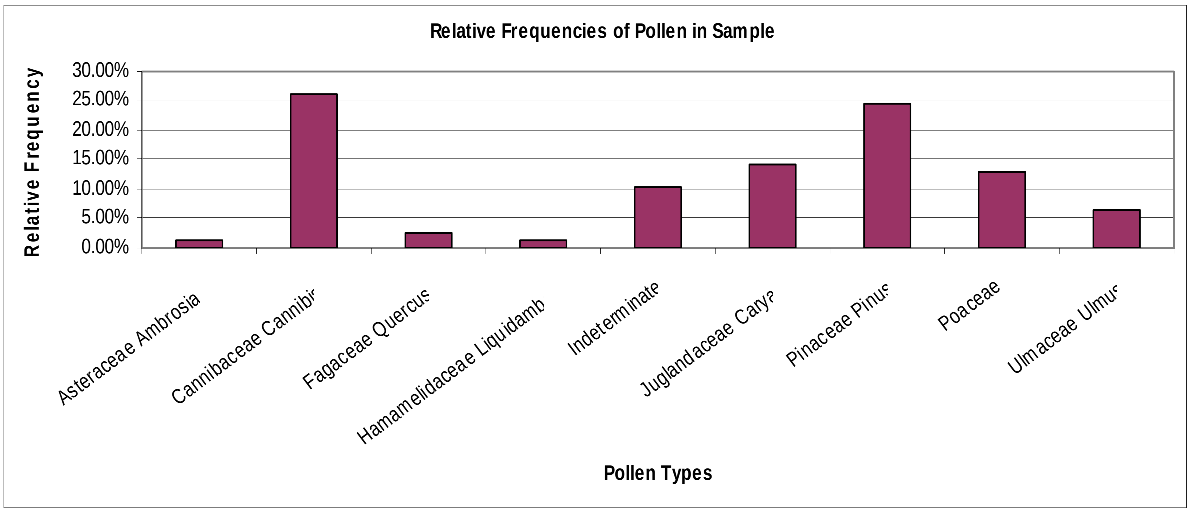
103 TAMU 18	Relative Frequency
1 tablet/.5 ml	1 slide counted
No Pollen	
Lycopodium (Marker Grains)	97
Concentration	
Value grains/ml	0
No Pollen	

103 TAMU 19	Relative Frequency	CORK	Common Name(s)	Arboreal (AP)/Nonarboreal(NAP)
1 Tablet/10 ML				
Anacardiaceae	0.88%	1	Cashew/Plum Family	AP
Apiaceae	0.88%	1	Carrot Family	NAP
Asteraceae *Artemisia*	2.63%	3	Wormwood	NAP
Asteraceae High Spine	0.00%		Composites-usually weeds	NAP
Asteraceae Low Spine	5.26%	6	Composites-usually weeds	NAP
Betulaceae *Alnus*	0.88%	1	Alder	AP
Chenopodiaceae/*Amaranthus*	1.75%	2	Goosefoot Family/Amaranth	NAP
TCT	1.75%	2	Cypress Family	NAP
Fagaceae *Quercus*	11.40%	13	Oak	AP
Indeterminant	18.42%	21	-	-
Myricaceae *Myrica*	0.88%	1	Wax Myrtle/Bayberry	AP
Pinaceae *Picea*	0.88%	1	Spruce	AP
Pinaceae *Pinus*	45.61%	52	Pine	AP
Poaceae	0.88%	1	Grass Family	NAP
Poaceae *cf Cerealia*	0.88%	1	Poss. Cultigen	NAP
Salicaceae *Populus*	0.88%	1	Poplar/Cottonwood/American Aspen	AP
Salicaceae *Salix*	0.88%	1	Willow	AP
Ulmaceae *Celtis*	0.88%	1	Hackberry	AP
Unknown	2.63%	3	-	-
Vitaceae*Vitis*	1.75%	2	Grape	NAP
Total		114		
Lycopodium (Marker Grains)		48		
Concentration				
Value grains/ml		3206		



122 TAMU 20	
no pollen	

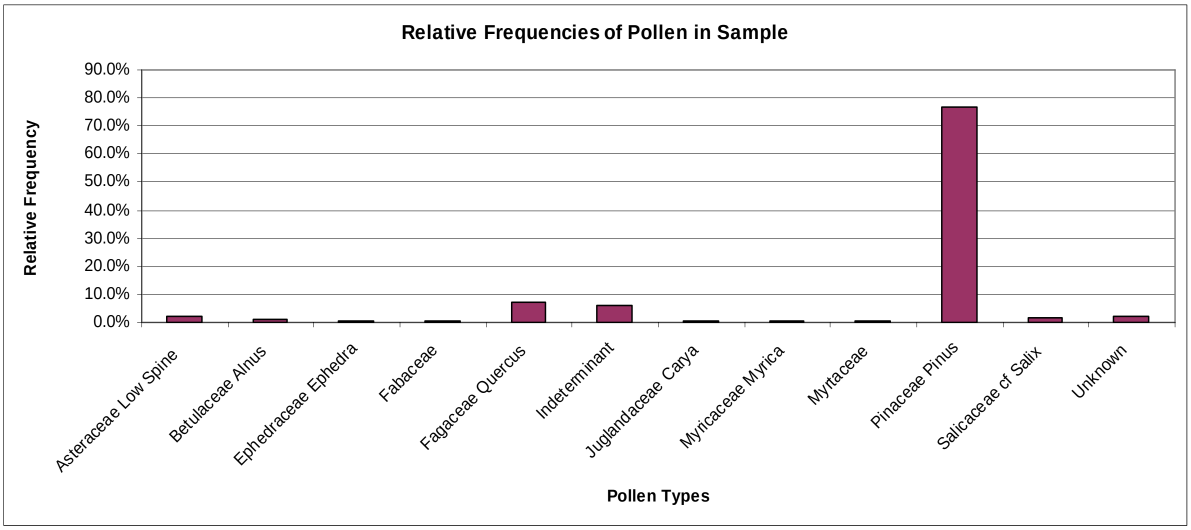
140 TAMU 21	Relative Frequency	Rope Sample	Common Name(s)	Arboreal (AP)/Nonarboreal(NAP)
~1ml				
Asteraceae *Ambrosia*	1.30%	1	Ragweed	NAP
Cannibaceae *Cannibis*	25.97%	20	Hemp	NAP
Fagaceae *Quercus*	2.60%	2	Oak	AP
Hamamelidaceae *Liquidambar*	1.30%	1	Sweetgum	AP
Indeterminate	10.39%	8	-	-
Juglandaceae *Carya*	14.29%	11	Hickory	AP
Pinaceae *Pinus*	24.68%	19	Pine	AP
Poaceae	12.99%	10	Grass Family	NAP
Ulmaceae *Ulmus*	6.49%	5	Elm	AP
Total	100.00%	77		



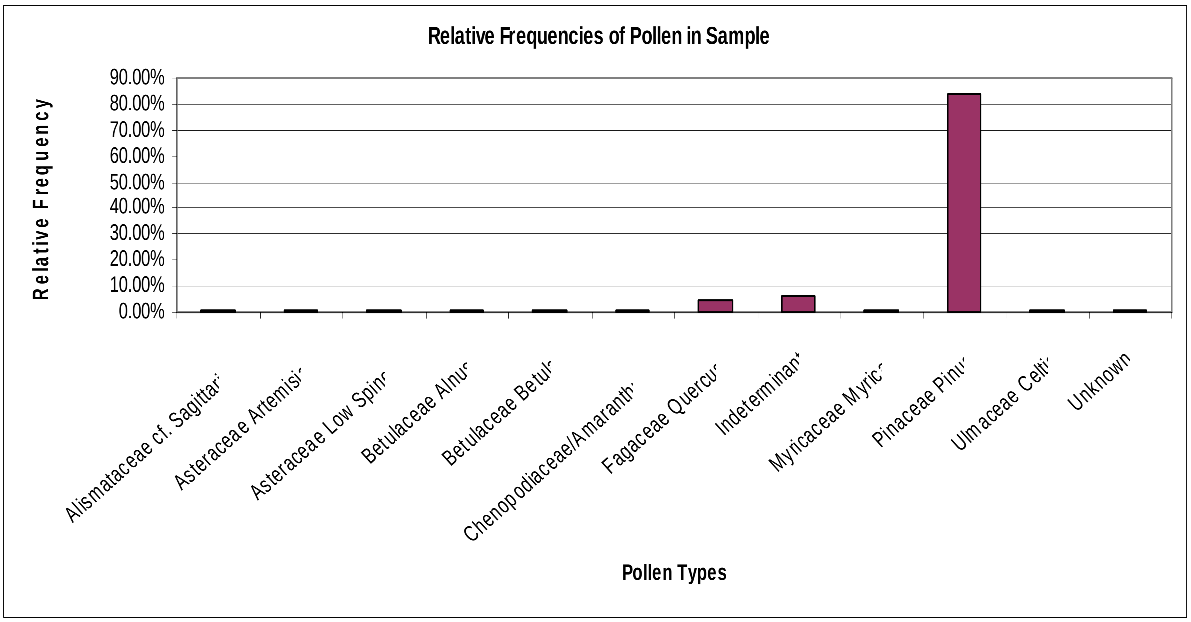
140 TAMU 22	
no pollen	

203 TAMU 23	
no pollen	

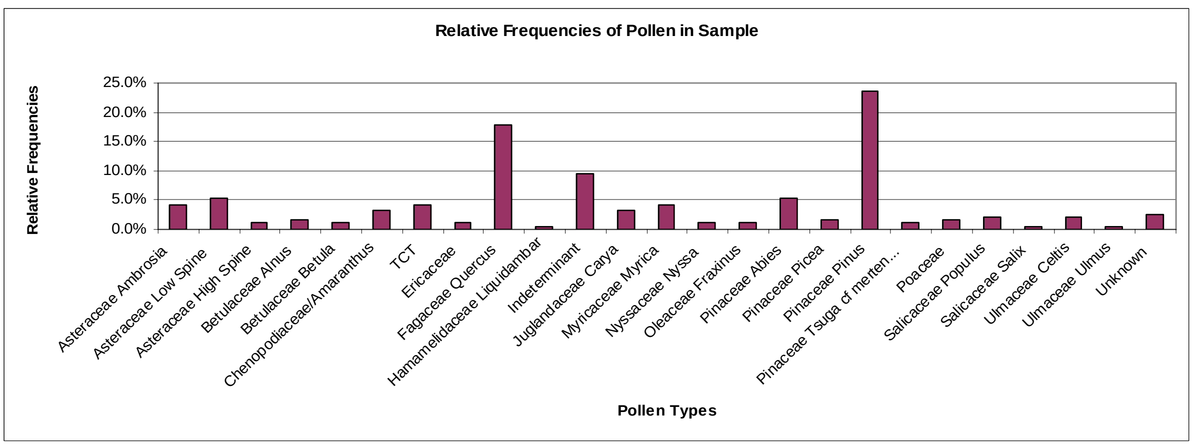
A1 TAMU 24 Core A	**Relative Frequency**	**Core A off site**	**Common Name(s)**	**Arboreal (AP)/Nonarboreal(NAP)**
1 tablet/3 ml		1 slide		
Asteraceae Low Spine	2.4%	5	Composites-usually weeds	NAP
Betulaceae *Alnus*	1.0%	2	Alder	AP
Ephedraceae *Ephedra*	0.5%	1	Ephedra/Ma huang	NAP
Fabaceae	0.5%	1	Legume Family	AP
Fagaceae *Quercus*	7.2%	15	Oak	AP
Indeterminant	6.3%	13	-	-
Juglandaceae *Carya*	0.5%	1	Hickory	AP
Myricaceae *Myrica*	0.5%	1	Wax Myrtle/Bayberry	AP
Myrtaceae	0.5%	1	Myrtle Family	AP
Pinaceae *Pinus*	76.8%	159	Pine	AP
Salicaceae *cf Salix*	1.4%	3	Willow	AP
Unknown	2.4%	5	-	-
Total	100.0%	207		
Lycopodium (Marker Grains)		136		
Value grains/ml		6,849		



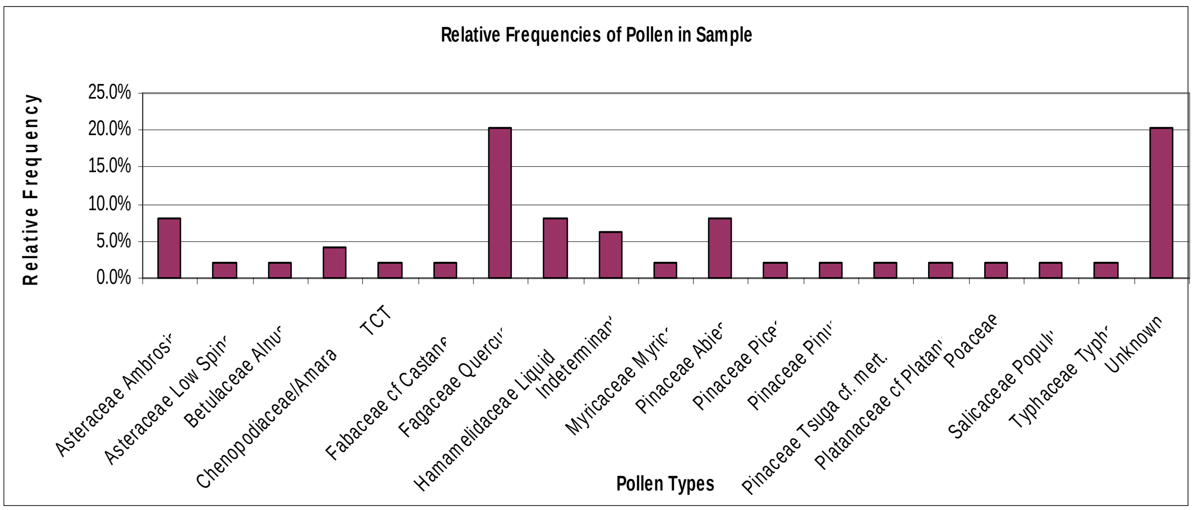
A2 TAMU 25 Core A	Relative Frequency	Core A off site	Common Name(s)	Arboreal (AP)/Nonarboreal(NAP)
1 Tablet/3 ml				
Alismataceae *cf. Sagittaria*	0.61%	1	Arrowhead	NAP
Asteraceae *Artemisia*	0.61%	1	Wormwood	NAP
Asteraceae Low Spine	0.61%	1	Composites-usually weeds	NAP
Betulaceae *Alnus*	0.61%	1	Alder	AP
Betulaceae *Betula*	0.61%	1	Birch	AP
Chenopodiaceae/*Amaranthus*	0.61%	1	Goosefoot Family/Amaranth	NAP
Fagaceae *Quercus*	4.27%	7	Oak	AP
Indeterminant	6.10%	10	-	-
Myricaceae *Myrica*	0.61%	1	Wax Myrtle/Bayberry	AP
Pinaceae *Pinus*	84.15%	138	Pine	AP
Ulmaceae *Celtis*	0.61%	1	Hackberry	AP
Unknown	0.61%	1	-	-
Total	100.00%	164		
Lycopodium (Marker Grains)		45		
Concentration				
Value grains/ml		16,400		



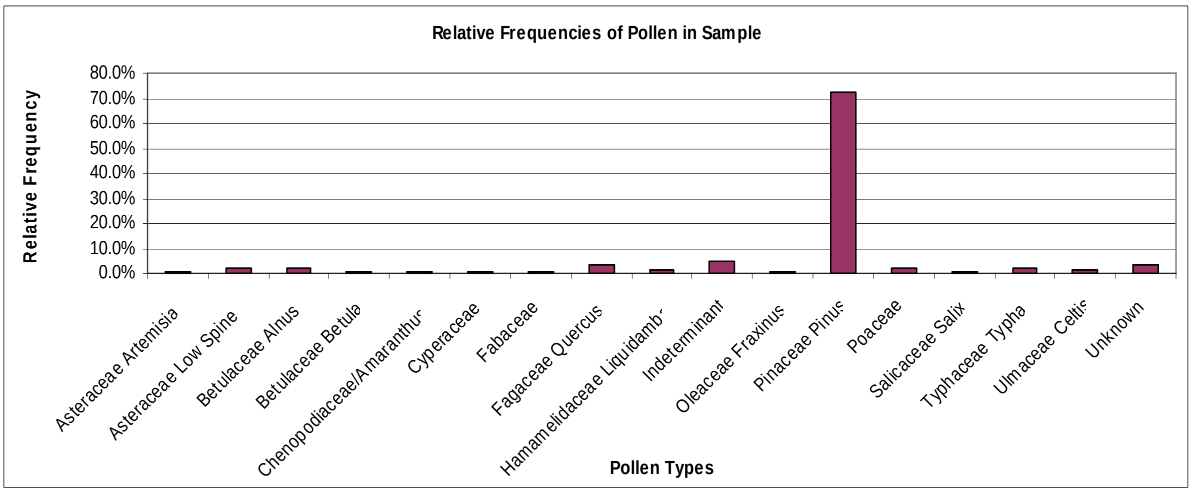
B1 Core B TAMU 26	Relative Frequency	Core B on site	Common Name(s)	Arboreal (AP)/Nonarboreal(NAP)
1 Tablet/3 ml				
Asteraceae *Ambrosia*	4.2%	8	Ragweed	NAP
Asteraceae Low Spine	5.3%	10	Composites-usually weeds	NAP
Asteraceae High Spine	1.1%	2	Composites-usually weeds	NAP
Betulaceae *Alnus*	1.6%	3	Alder	AP
Betulaceae *Betula*	1.1%	2	Birch	AP
Chenopodiaceae/*Amaranthus*	3.2%	6	Goosefoot Family/Amaranth	NAP
TCT	4.2%	8	Cypress Family	NAP
Ericaceae	1.1%	2	Heath Family	NAP
Fagaceae *Quercus*	17.9%	34	Oak	AP
Hamamelidaceae *Liquidambar*	0.5%	1	Sweetgum	AP
Indeterminant	9.5%	18	-	-
Juglandaceae *Carya*	3.2%	6	Hickory	AP
Myricaceae *Myrica*	4.2%	8	Wax Myrtle/Bayberry	AP
Nyssaceae *Nyssa*	1.1%	2	Tupelo	AP
Oleaceae *Fraxinus*	1.1%	2	Ash	AP
Pinaceae *Abies*	5.3%	10	Fir	AP
Pinaceae *Picea*	1.6%	3	Spruce	AP
Pinaceae *Pinus*	23.7%	45	Pine	AP
Pinaceae *Tsuga cf mertensiana*	1.1%	2	Hemlock	AP
Poaceae	1.6%	3	Grass Family	NAP
Salicaceae *Populus*	2.1%	4	Poplar/Cottonwood/American Aspen	AP
Salicaceae *Salix*	0.5%	1	Willow	AP
Ulmaceae *Celtis*	2.1%	4	Hackberry	AP
Ulmaceae *Ulmus*	0.5%	1	Elm	AP
Unknown	2.6%	5	-	-
Total	100.0%	190		
Lycopodium (Marker Grains)		184		
Concentration Value				
Value grains/ml		4,647		



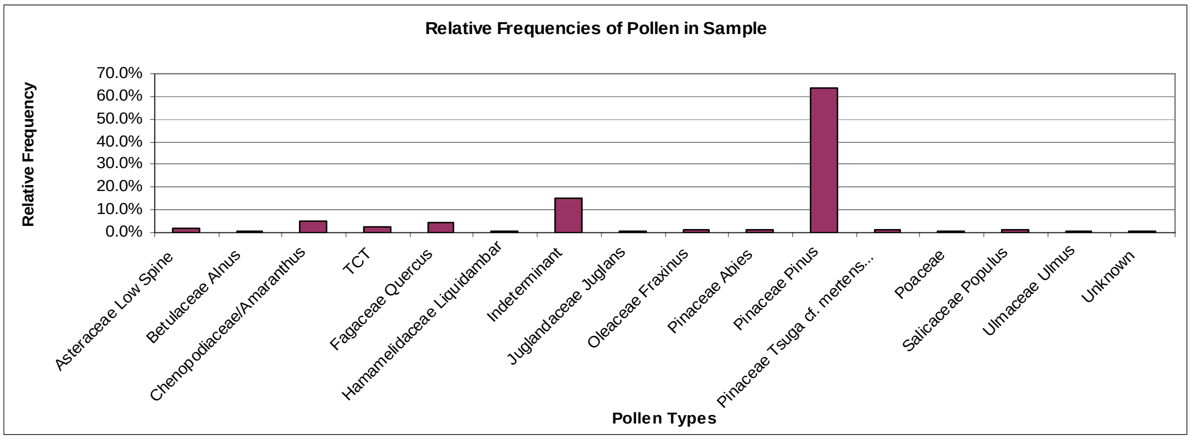
B2 TAMU 27	Relative Frequency	Core B on site	Common Name(s)	Arboreal (AP)/Nonarboreal(NAP)
1 Tablet/3ml				
Asteraceae *Ambrosia*	8.2%	4	Ragweed	NAP
Asteraceae Low Spine	2.0%	1	Composites-usually weeds	NAP
Betulaceae *Alnus*	2.0%	1	Alder	AP
Chenopodiaceae/*Amaranthus*	4.1%	2	Goosefoot Family/Amaranth	NAP
TCT	2.0%	1	Cypress Family	AP
Fabaceae *cf Castanea*	2.0%	1	American Chestnut	AP
Fagaceae *Quercus*	20.4%	10	Oak	AP
Hamamelidaceae *Liquidambar*	8.2%	4	Sweetgum	AP
Indeterminant	6.1%	3	-	-
Myricaceae *Myrica*	2.0%	1	Wax Myrtle/Bayberry	AP
Pinaceae *Abies*	8.2%	4	Fir	AP
Pinaceae *Picea*	2.0%	1	Spruce	AP
Pinaceae *Pinus*	2.0%	1	Pine	AP
Pinaceae *Tsuga cf. mertensiana*	2.0%	1	Hemlock	AP
Platanaceae *cf Platanus*	2.0%	1	Sycamore	AP
Poaceae	2.0%	1	Grass Family	NAP
Salicaceae *Populus*	2.0%	1	Poplar/Cottonwood/American Aspen	AP
Typhaceae *Typha*	2.0%	1	Cattail	NAP
Unknown	20.4%	10	-	-
Total	100.0%	49		
Lycopodium (Marker Grains)		113		
Concentration Value				
Value grains/ml		1,951		



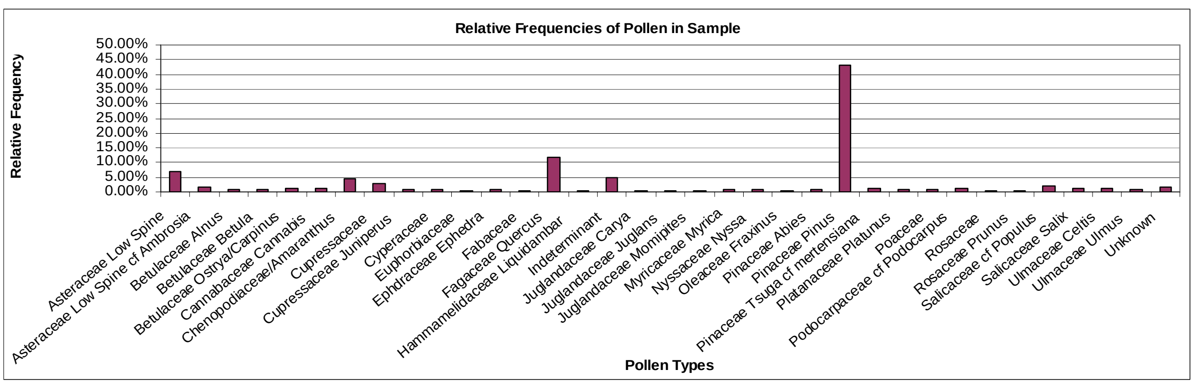
B3 TAMU 28	Relative Frequency	Core B on site	Common Name(s)	Arboreal (AP)/Nonarboreal(NAP)
1 Tablet/3ml				
Asteraceae *Artemisia*	0.5%	1	Wormwood	NAP
Asteraceae Low Spine	2.3%	5	Composites-usually weeds	NAP
Betulaceae *Alnus*	1.8%	4	Alder	AP
Betulaceae *Betula*	0.9%	2	Birch	AP
Chenopodiaceae/*Amaranthus*	0.9%	2	Goosefoot Family/Amaranth	NAP
Cyperaceae	0.5%	1	Sedge Family	NAP
Fabaceae	0.5%	1	Legume Family	AP
Fagaceae *Quercus*	3.7%	8	Oak	AP
Hamamelidaceae *Liquidambar*	1.4%	3	Sweetgum	AP
Indeterminant	4.6%	10	-	-
Oleaceae *Fraxinus*	0.5%	1	Ash	AP
Pinaceae *Pinus*	72.6%	159	Pine	AP
Poaceae	2.3%	5	Grass Family	NAP
Salicaceae *Salix*	0.5%	1	Willow	AP
Typhaceae *Typha*	2.3%	5	Cattails	NAP
Ulmaceae *Celtis*	1.4%	3	Hackberry	AP
Unknown	3.7%	8	-	-
Total	100.0%	219		
Lycopodium (Marker Grains)		178		
Concentration				
Value grains/ml		5,537		



B4 Core B TAMU 29	Relative Frequency	Core B on site	Common Name(s)	Arboreal (AP)/Nonarboreal(NAP)
1 Tablet/3 ml				
Asteraceae Low Spine	1.9%	4	Composites-usually weeds	NAP
Betulaceae *Alnus*	0.5%	1	Alder	AP
Chenopodiaceae/*Amaranthus*	5.3%	11	Goosefoot Family/Amaranth	NAP
TCT	2.4%	5	Cypress Family	AP
Fagaceae *Quercus*	4.3%	9	Oak	AP
Hamamelidaceae *Liquidambar*	0.5%	1	Sweetgum	AP
Indeterminant	14.8%	31	-	-
Juglandaceae *Juglans*	0.5%	1	Hickory	AP
Oleaceae *Fraxinus*	1.4%	3	Ash	AP
Pinaceae *Abies*	1.4%	3	Fir	AP
Pinaceae *Pinus*	63.6%	133	Pine	AP
Pinaceae *Tsuga cf. mertensiana*	1.0%	2	Hemlock	AP
Poaceae	0.5%	1	Grass Family	NAP
Salicaceae *Populus*	1.0%	2	Poplar/Cottonwood/American Aspen	AP
Ulmaceae *Ulmus*	0.5%	1	Elm	AP
Unknown	0.5%	1	-	-
Total	100.0%	209		
Lycopodium		244		
Concentration				
Value grains/ml		3,855		

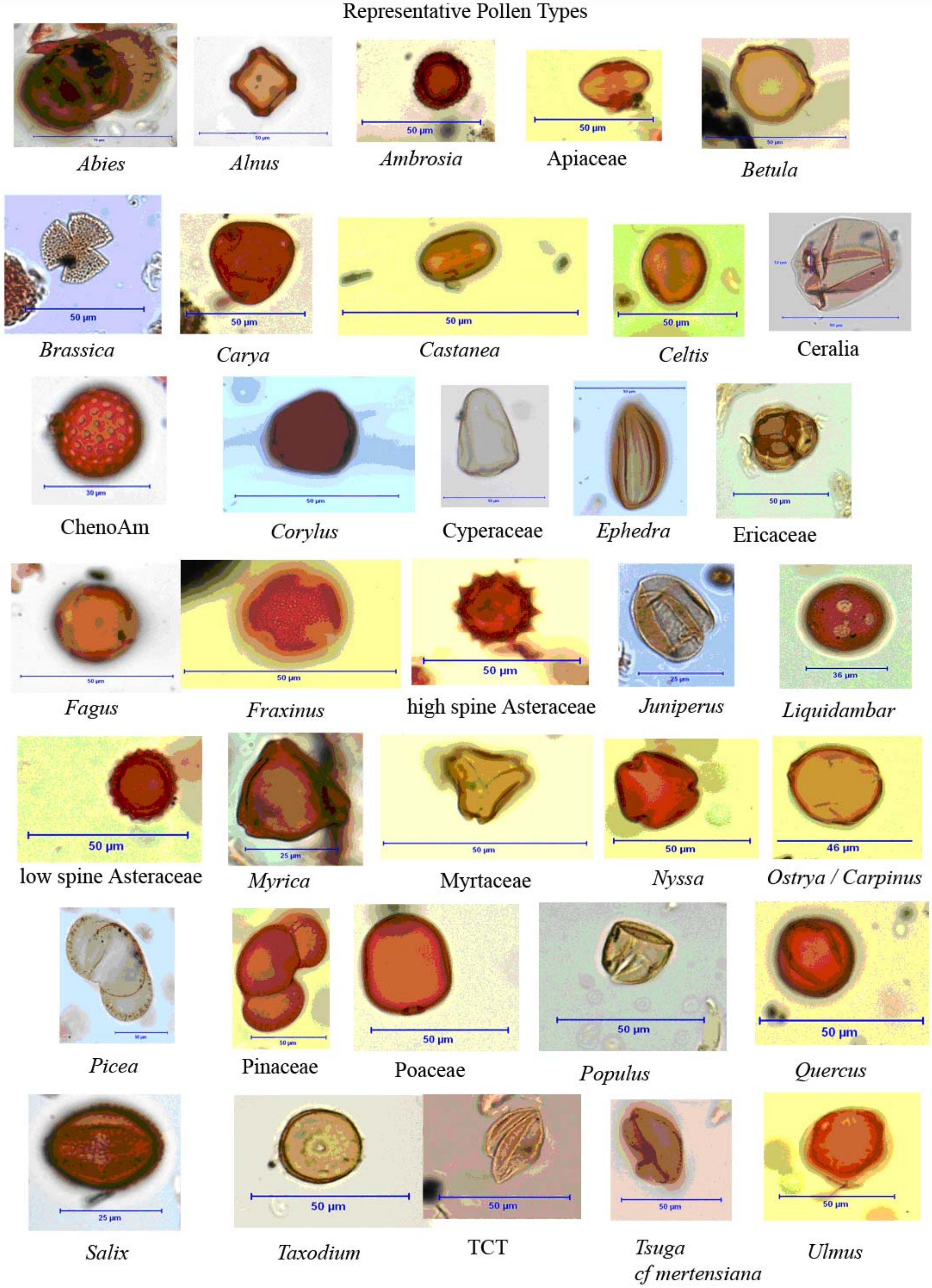


117 TAMU 30	Relative Frequency	Hour/Sand Glass	Common Name(s)	Arboreal (AP)/Nonarboreal(NAP)
1 Tablet/20 ml				
Alismataceae *cf Sagittaria*	0.34%	1	Arrowhead	NAP
Aquifoliaceae *Ilex*	0.34%	1	Holly	NAP
Asteraceae High Spine	0.67%	2	Composites-usually weeds	NAP
Asteraceae Low Spine	6.71%	20	Composites-usually weeds	NAP
Asteraceae Low Spine *cf Ambrosia*	1.68%	5	Ragweed	NAP
Betulaceae *Alnus*	1.01%	3	Alder	AP
Betulaceae *Betula*	0.67%	2	Birch	AP
Betulaceae *Ostrya/Carpinus*	1.34%	4	Hop Hornbeam/American Hornbeam,Ironwood	AP
Cannabaceae *Cannabis*	1.34%	4	Hemp	NAP
Chenopodiaceae/*Amaranthus*	4.36%	13	Goosefoot Family/Amaranth	NAP
TCT	3.02%	9	Cypress Family	AP
Cupressaceae *Juniperus*	0.67%	2	Juniper	AP
Cyperaceae	0.67%	2	Sedge Family	NAP
Euphorbiaceae	0.34%	1	Spurge Family	NAP
Ephdraceae *Ephedra*	0.67%	2	Ephedra/Ma huang	NAP
Fabaceae	0.34%	1	Legume Family	AP
Fagaceae *Quercus*	11.74%	35	Oak	AP
Hammamelidaceae *Liquidambar*	0.34%	1	Sweetgum	AP
Indeterminant	5.03%	15	-	-
Juglandaceae *Carya*	0.34%	1	Hickory	AP
Juglandaceae *Juglans*	0.34%	1	Walnut/Hickory	AP
Juglandaceae *Momipites*	0.34%	1	Walnut Family/Eocene pollen	AP
Myricaceae *Myrica*	1.01%	3	Wax Myrtle/Bayberry	AP
Nyssaceae *Nyssa*	0.67%	2	Tupelo	AP
Oleaceae *Fraxinus*	0.34%	1	Ash	AP
Pinaceae *Abies*	0.67%	2	Fir	AP
Pinaceae *Pinus*	42.95%	128	Pine	AP
Pinaceae *Tsuga cf mertensiana*	1.34%	4	Hemlock	AP
Platanaceae *Platunus*	0.67%	2	Sycamore	AP
Poaceae	0.67%	2	Grass Family	NAP
Podocarpaceae *cf Podocarpus*	1.34%	4	Yew Pine/Buddhist Pine/Chinese Yew/Podocarpus	AP
Rosaceae	0.34%	1	Rose Family	AP
Rosaceae *Prunus*	0.34%	1	Cherry	AP
Salicaceae cf *Populus*	2.01%	6	Poplar/Cottonwood/American Aspen	AP
Salicaceae *Salix*	1.34%	4	Willow	AP
Ulmaceae *Celtis*	1.34%	4	Hackberry	AP
Ulmaceae *Ulmus*	1.01%	3	Elm	AP
Unknown	1.68%	5	-	-
Total	100.00%	298		
Lycopodium (Marker Grains)		54		
Concentration Value				
Value grains/ml		3,725		

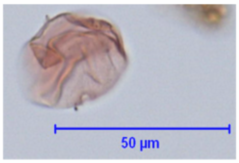


APPENDIX F: REPRESENTATIVE POLLEN TYPES

Representative Pollen Types

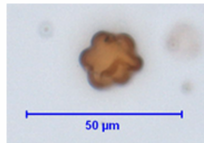


Representative Pollen Types



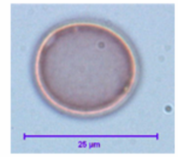
Cannabis

cf Euphorbiaceae



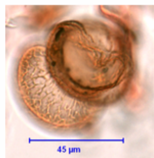
Gallium

Momipites

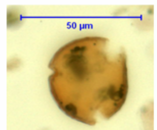


Morus

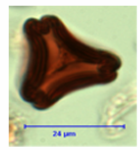
cf *Platanus*



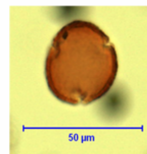
cf *Podocarpus*



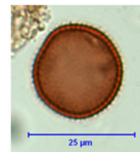
Prunus



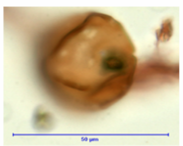
Rhanmnacaeae



cf *Rosa*

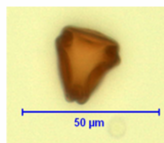


Sagittaria



Sarcobatus

Typha



Vitis

Zea mays

APPENDIX G: WOOD SAMPLE REPORT

Dear Mr. Hitchcock,

The five wood specimens you submitted for identification are as follows:

1 -- American black walnut (*Juglans nigra*)

2, 3, & 5 -- species of yellow pine, most likely a species in the southern yellow pine group (*Pinus*)
4 -- species in the white pine group, probably eastern white pine (*Pinus strobus*)

Best regards.

Regis

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Wood Identification & Information Specialist
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Email: ***rmiller1@wisc.edu***

Web: ***http://www.woodid.net/***

APPENDIX H: CANNON REPORT

Report No 91 (Ruth Rhynas Brown)

6 pounder, 4½ feet merchant gun cast by Clyde Company, 1797

This is a typical gun sold for the merchant market dating from the late 18th century. The characteristics of these guns are their small calibre - 3, 4, or 6 pounder - and the fact that they are shorter than the government equivalent which would be 6 feet in length. This is a transition period where this market is turning to "gunnades" which bear a superficial resemblance to the carronade but are really a small calibre, short merchant gun in a different guise. The term "insurance guns" is usually reserved for the gunnade but also applies to these short merchant guns. However they were not merely for insurance purposes; at this period in the late 18th and early 19th century, merchant ships faced real dangers. The Napoleonic wars created chaotic times across the world's oceans with the opposing navies, privateers and pirates searching for likely targets. Carrying cannon was an insurance in its own right. In addition these guns were also used by vulnerable communities and landowners such as those who lived by the sea or who felt threatened. Today they are often found in country houses, particularly in Ireland or along British west coasts.

This example is similar to examples produced by other iron founders in the late 18th century but has two features which indicate a date after the 1780s. These are the band between the vent field and the trunnions is plain and flat- earlier examples were more elaborate- and the breech and cascable appear to be modelled on the carronade. Both these features were not adopted by British guns until the late 1780s.

This is a 6 pounder weighing 8 cwt 2 quarters. It was cast by the Clyde Company and its serial number 2012 indicates its position on the list of Clyde's castings.

Left trunnion
2012 - Serial number
CLYDE - Name of manufacturer
1797- Date

Right trunnion
6 P - Calibre of gun
8=2=0 Weight of gun (8 hundredweights = 8 X 112 pounds + 2 quarters (2 X 28 pounds making 952 lbs)

CLYDE

This is the mark of the Clyde Company, Glasgow, Scotland. A letter from an Ordnance official to Thomas Edington records that his guns were marked CLYDE plus numbers (BL 8, 12 June 1795). The Clyde Company based their method of marking their guns from that used by the older Carron Company.

This company was founded near Glasgow, Lanarkshire, by Thomas Edington, formerly a traveller for the Carron Company and William Hood, Carron's London agent in 1786. Within a short time they had two coke furnaces in blast. Edington also ran several ironworks in the Scottish Lowlands. In October 1793 he offered to supply the Board of Ordnance with shot and shell for the use of the British armed forces, and the following year he offered 12 and 18 pounder guns. In April 1795 Eddington answered an advertisement from the Ordnance to supply 500 tons of iron guns, and after satisfactorily answering the Board's fears over proof, the Clyde company were at last given orders (WO 47/2558). The first guns were delivered in 1795.

Edington was one of the leading ironmasters in Scotland. He co-ordinated the trade's resistance to government attempts to increase the tax on iron during the French Wars (Evans, 1993). However in about 1805 Thomas Edington left the company to set up his own ironworks. Clyde Company was then owned by the Caddell family and run by James Outram from the Derbyshire family of ironmasters. In 1810 the company passed into the ownership of the Dunlop family

The Clyde works were visited by the Swedish ironmaster, Svedenstierna, on his tour of Britain during the Peace of Amiens in the early 1800s, when it was being managed by Outram. He mentioned that it was the largest iron works in Scotland after Carron. There were now three blast furnaces and he watched a machine which could bore four cannon at once. Svedenstierna was impressed by the technological advances he saw at Clyde, such as Outram's device for drilling out vents more easily and his special truck to move the guns about. He also noted that the 'cast iron was unusually strong and dense, but on the other hand so soft that it could almost be filed like wrought iron'.

Clyde specialized in producing smaller calibre guns. From 1795 to 1796 their attempts to supply larger calibre guns, 18 and 32 pounders, to the British government were not very successful and later they stuck to supplying carronades to the Navy from 12 to 32 pounder. In 1803 they cast carronades for delivery to Dublin and Scotland (WO 47/2576). They also produced shot, shell and iron carriages. As well as carronades for the government they cast carronades, gunnades and small calibre guns for the merchant market.

Other examples from the CLYDE Company can be found at the Barracks, Berwick upon Tweed; the Army Museum in Vienna; a gunnade at Princess Royal Fortress in Australia, dated 1804; a 32 carronade from the wreck on the HMS *Pomone* lost and dated 1803 and two gunnades from unidentified wrecks in the Bahamas and New Jersey.

The gun presently at Berwick, probably dated 1799- the trunnion is a little damaged- is the closest to this gun in that it is a short merchant gun. Interestingly Edington continued to make this type of cannon after he set up his own works and there is a surviving example at Culzean Castle on the Scottish coast by Edington, dated 1813 which is also very similar to this example.

At present this is the earliest dated Clyde gun of which I have a record; the next are two guns of 1799. However as the markings are engraved on, they are often easy to damage, so that others may have survived, but at present are unrecognized. However it is certainly early in the Company's history at the very least.

APPENDIX I: DESCRIPTION OF 26 OCTOBER 2004 INCURSION

At 16:19 the ROV left the pipeline and approached the Mardi Gras Shipwreck Site from the northwest, coming in over the anchor. The ROV then moved along the northeast side of the wreck, northeast of the cannon, pausing to inspect the stove, gun box, and artifacts east of the gun box. At 16:23 the ROV picked up an octant (position indicated on site plan) with its five-function manipulator. This octant appears to be similar to the instrument represented by the recovered octant fragments (artifact nos. 131 and 133); however, there are differences, including the apparent absence of shades, which indicate that the recovered fragments are not from this octant. After picking up the octant, the ROV backed to the northeast before flying over the anchors and then returning to the stern concretion from the north. During this time, the octant was held above and out of sight of the camera. While hovering near the stern concretion an unidentified object fell through the frame of vision. It is uncertain where the object originated, but it was likely a fragment of the octant. Still holding the octant out of sight, the ROV camera zoomed in on the northeast side of the stern concretion, focusing on the bottles (artifact nos. 104, 106, and 107), sand-clock (artifact no. 120), compasses (artifact nos. 127 and 128), as well as the teapot and pitcher (artifact nos. 115 and 116). While hovering near the teapot and pitcher (16:29), the ROV disturbed the sediment and left the bottom to allow the visibility to clear. The ROV pilot took this opportunity to inspect the octant still in the five-function manipulator. The ROV then returned to its tether management system (TMS) (16:37) and attempted to place the octant in a recovery basket (16:38). The recovery basket was an egg crate with cloth secured over the top. Unfortunately, the placement of the octant in the basket appeared rough and it is likely that the artifact was broken in the process.

At 16:42 the ROV returned to the site, approaching from the southwest. It was noted at this time that the tether was draped across the cannon in a northeast/southwest direction. The tether was partially taken up by the TMS in attempt to disentangle it from the cannon resulting in the removal of an anemone and possibly a portion of the carriage from the cannon. The ROV then turned to inspect the cannon before realizing that the tether was once again across the cannon where it was abrading the carriage remains. The pilots decided to ignore the tether and move the ROV to the southeast. The ROV next attempted to pick up the blue bottle (artifact no. 201). The bottle was raised a few feet off the bottom before falling out of the manipulator and coming to rest near its original location (16:46). The ROV next moved over the gun box from the northwest. At 16:48 an attempt was made to pick up one of the stoneware jugs (artifact no. 205) by its handle resulting in the breaking of the handle but not moving the jug. The ROV then (16:49) moved to the creamware tureen (artifact no. 212) and attempted to lift it by its southeast edge successfully breaking the rim.

At 16:50 the ROV moved towards the south of the site and attempted to raise a bottle (appears to be artifact nos. 106 and 122) that was originally situated near the northwest edge of the stern concretion. The ROV managed to rise several feet off the seafloor before the bottle was smashed in the manipulator. It was also noted at this time that artifact no. 107 was broken prior to the ROV incursion. At 16:52 the ROV zoomed in on the northeast compass (artifact no. 127) and pressed down on the compass cover with the manipulator breaking the glass and disturbing the compass rings. Next (16:53), the ROV attempted to lift a bottle (artifact no. 108) near the creamware bowl (artifact no. 111) but aborted with no damage to the artifact or site. Instead the ROV moved the rings on the southwest compass (artifact no.

128) and brought the manipulator up under the rim of the creamware bowl (artifact no. 111), changing its orientation and moving it to the position where it was recorded during the data recovery. The ROV then (16:55) inspected the stoneware bottle (artifact no. 102) before backing through the site to the northwest.

The ROV paused to inspect the blue bottle before slowly flying west through the site. It next paused to observe the stove and then backed to the northwest where it closely inspected the long timber that is the western margin of the site. Once again the ROV inspected the cannon, approaching it from the northwest before flying around it to the east. At 17:02 the ROV was over the anchors and it left the site at 17:03, returning to the pipeline at 17:04.

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Library of Congress Cataloging-in-Publication Data

Cooke, Edward William, 1811–1880.
[Sixty five plates of shipping and craft]
Sailing vessels in authentic early nineteenth-century illustrations : sixty five plates of shipping and craft / by Edward William Cooke.
p. cm.
Reprint. Originally published: Sixty five plates of shipping and craft. London, 1829.
ISBN 0-486-26141-7
1. Cooke, Edward William, 1811–1880. 2. Sailing ships in art. I. Title.
NC978.5.C66A4 1989
741.6′4′092—dc20 89-11923
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As a bureau of the Department of the Interior, the Minerals Management Service's (MMS) primary responsibilities are to manage the mineral resources located on the Nation's Outer Continental Shelf (OCS), collect revenue from the Federal OCS and onshore Federal and Indian lands, and distribute those revenues.

Moreover, in working to meet its responsibilities, the **Offshore Minerals Management Program** administers the OCS competitive leasing program and oversees the safe and environmentally sound exploration and production of our Nation's offshore natural gas, oil and other mineral resources. The MMS **Minerals Revenue Management** meets its responsibilities by ensuring the efficient, timely and accurate collection and disbursement of revenue from mineral leasing and production due to Indian tribes and allottees, States and the U.S. Treasury.

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