ABSTRACT

Jemison R. Beshears. THE MONTE CRISTI PIPEWRECK: AN ARCHAEOLOGICAL ASSESSMENT OF THE HULL REMAINS OF A SEVENTEENTH CENTURY MERCHANT VESSEL AT MONTE CRISTI, DOMINICAN REPUBLIC.

The purpose of this thesis is to document the findings of archaeological fieldwork conducted on the hull remains and contents of a small, mid-seventeenth century European merchant ship located on the north coast of the Dominican Republic at Monte Cristi Bay. Since 1991, the Pan-American Institute of Maritime Archaeology has conducted field investigations on the Monte Cristi site for the cultural ministry of the Dominican Republic. The ongoing project was funded by Earthwatch International and public and private grants. Research teams consisted of graduate students, government representatives and volunteers. Archaeologists installed a grid system on the wreck, mapped the site, and documented the excavation of hundreds of cultural artifacts over a five-year period. The results of this study will contribute to the available data on seventeenth century trade in the Caribbean and ships that carried the cargoes.
THE MONTE CRISTI PIPEWRECK:
AN ARCHAEOLOGICAL ASSESSMENT
OF THE
HULL REMAINS OF A SEVENTEENTH CENTURY MERCHANT VESSEL
AT MONTE CRISTI, DOMINICAN REPUBLIC

A Thesis
Presented to
the Faculty of the Department of History
East Carolina University

In Partial Fulfillment
of the Requirements for
Master of Arts in Maritime History and Nautical Archaeology

by
Jemison R. Beshears

November 15, 2001
DEDICATION

This thesis is dedicated to my partner and best friend,

Angela Patricia Lotspeich.
ACKNOWLEDGEMENTS

I am deeply appreciative of the advice and support given me by Dr. Timothy J. Runyan and Dr. Gordon P. Watts of the Maritime Studies Program of East Carolina University. I am also indebted to Don Pedro Borrell-Bentz of the Comision de Rescate Arqueologico Submarino de la Republica Dominicana for his support of the Monte Cristi Shipwreck Project. Special thanks are also due E. Jansma & E. Spoor of the Dutch Dendrochronology Centre, Rijksdienst Oudheidk. Bodemonderzoek (ROB) of Amersfoort, Netherlands. Pan-American Institute of Maritime Archaeology staff members Neil Fisher, Dr. Ron Halbert, Christopher Adams, Christopher Ellis, Bryan Hanks, Harry Pecorelli III, Michael Krivor, Alex Roberts, Paul Roberts, Amanda Sutherland, Samuel Turner, Richard Wills are each due recognition for their diligent work, ideas and moral support in the gathering of data for this study. I am equally grateful to Amy Mitchell-Cook of The Institute for Wood Analysis and Dr. Bradley Rodgers of East Carolina University for their conservation advice. I would also like to express my appreciation and gratitude to Christopher Taylor Gallo for his valuable computer expertise and technical advice. Finally, thank you to my friend and colleague Dr. Jerome Lynn Hall, Principal Investigator and founder of PIMA, for the opportunity to work on such an exciting project.
# TABLE OF CONTENTS

LIST OF ILLUSTRATIONS ............................................................................. vii

INTRODUCTION ......................................................................................... 1

CHAPTER 1: SITE DESCRIPTION ................................................................. 7

Location and Site Environment ................................................................ 7

Discovery and Preliminary Excavation of the Monte Cristi Site ............. 13

Previous Excavation Activity on Site .................................................... 13

PIMA Excavation History ........................................................................ 15

Camp ......................................................................................................... 16

Mapping the Site .................................................................................... 19

Description of the Vessel Remains and Comparable Sites ..................... 21

Ballast ..................................................................................................... 23

Keel ......................................................................................................... 25

Scarf Joints ............................................................................................. 29

Frames ..................................................................................................... 30

Crosspinning of Futtocks ....................................................................... 31

Ceiling Planking ....................................................................................... 36

Sheathing Deals ....................................................................................... 40

Miscellaneous Wood .............................................................................. 40

Fasteners ................................................................................................. 41

Wood Analysis ........................................................................................ 46
CHAPTER 2: ARTIFACT INVENTORY AND CONSERVATION

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Synopsis of Recovered Artifacts</td>
<td>52</td>
</tr>
<tr>
<td>Ceramics</td>
<td>54</td>
</tr>
<tr>
<td>Rhenish Stoneware Sherds</td>
<td>54</td>
</tr>
<tr>
<td>Glass</td>
<td>61</td>
</tr>
<tr>
<td>Beads</td>
<td>63</td>
</tr>
<tr>
<td>Clay Smoking Pipes</td>
<td>63</td>
</tr>
<tr>
<td>Concretions</td>
<td>67</td>
</tr>
<tr>
<td>Lead Shot</td>
<td>68</td>
</tr>
<tr>
<td>Cannon</td>
<td>68</td>
</tr>
<tr>
<td>Chandelier Element</td>
<td>73</td>
</tr>
<tr>
<td>Candlesticks</td>
<td>75</td>
</tr>
<tr>
<td>Chisel</td>
<td>75</td>
</tr>
<tr>
<td>Nails</td>
<td>75</td>
</tr>
<tr>
<td>Coins</td>
<td>76</td>
</tr>
<tr>
<td>Tacks</td>
<td>85</td>
</tr>
<tr>
<td>Nested Weight Set</td>
<td>86</td>
</tr>
<tr>
<td>Wood</td>
<td>89</td>
</tr>
<tr>
<td>Floral Remains</td>
<td>89</td>
</tr>
<tr>
<td>Ivory Fan Fragments</td>
<td>90</td>
</tr>
<tr>
<td>Basket Fragments</td>
<td>90</td>
</tr>
<tr>
<td>Bones</td>
<td>91</td>
</tr>
</tbody>
</table>
Artifact Conservation ................................................................. 91
Artifact Analysis ................................................................. 92

CHAPTER 3: HISTORICAL BACKGROUND OF THE REGION ................. 95
Pre-Columbian History of Hispaniola ........................................ 95
European Discovery of Hispaniola ........................................... 100
European Challenge to Spanish Claims and Immigration to the Region ........ 103
Slavery and Inter-Island Migration ............................................ 107
Spanish Efforts to Combat Smuggling on Hispaniola ...................... 110
Caribbean Trade and Smuggling in the Seventeenth Century .............. 113

CHAPTER 4: CONCLUSIONS ......................................................... 122
Summary .................................................................................. 122
A Vessel of English Construction ............................................. 123
Route and Destination of the Vessel ......................................... 125
Why was the Vessel at Monte Cristi? ........................................ 128

BIBLIOGRAPHY ............................................................................. 132
LIST OF FIGURES

1. Contemporary map of Dominican Republic, showing location of the Monte Cristi shipwreck. ................................................................. 2

2. Admiralty chart showing the site and surrounding geography. .................. 8

3. Aerial perspective of Isla Cabras, wrecksite and surrounding environs. ....... 9

4. 18th Century map of Monte Cristi Bay showing Isla Cabras as Cayo de Sal. ................................................................. 10

5. Early 19th Century map of Monte Cristi Bay, Manzanillo and Isla Cabras. .... 11


7. An artist’s rendering of wrecksite and diving operations. ......................... 18

8. Fold-out site plan of Monte Cristi shipwreck. ....................................... 22

9. Hypothetical breakup of shipwreck. ................................................... 24

10. Cross-section illustration of keel. ...................................................... 26

11. Illustration of scarf joint. .................................................................. 30

12. Table showing construction notes on comparable shipwrecks. ................. 33

13. Illustration depicting typical futtock and floor arrangement. .................. 34

14. Site plan illustrating grid system over site. ......................................... 35

15. Site plan illustrating elements of hull remains. ..................................... 37

16. Site plan detail from grid squares 174, 159 and 144. ............................. 38

17. Site plan details of grid squares 144 and 129. ..................................... 39

18. Site plan details of grid squares 99 and 84. ..................................... 43

19. Illustration of typical treenails recovered from floors and futtocks. ......... 44

20. Six examples of various nails and fasteners recovered from the site. ......... 45
21. Illustration of lead patch or tingle ................................................................. 48
22. Dendrochronology chart ............................................................................. 48
23. Results of dendrochronology analysis ......................................................... 49
24. Dendrochronological analysis letter from laboratory .................................... 50
25. An example of a Rhenish stoneware or Bellarmine jug ............................... 55
26. Illustrations of sprig-molded Bellarmine Rhenish stoneware bottleneck sherds recovered from the site ......................................................... 56
27. Illustrations of more Rhenish stoneware bottleneck sherds ....................... 56
28. Illustrations of sprig-molded figure medallion sherds ................................... 57
29. Illustrations of ersatz coats-of-arms medallion sherds ................................. 57
30. Illustrations of examples of blue and white earthenware sherds recovered from the site ................................................................. 59
31. Illustrations of examples of blue and white earthenware sherds recovered from the site ................................................................. 60
32. Illustrations of examples of blue and white earthenware sherds recovered from the site ................................................................. 61
33A. Examples of pipe forms from site ................................................................. 65
33B. Morphological features of the seventeenth-century pipe ......................... 65
33C. Examples of pipes and heel stamps from the site ....................................... 66
34. Photo of a selection of whistles carved from kaolin pipestems by 17th century sailors ........................................................................... 67
35. Photo of archaeologists measuring cannon ................................................. 69
36. Illustration of the cannon recovered from the site ....................................... 72
37. Photo of bronze chandelier element recovered from site ............................ 74
38. Photo of eight reale cob recovered from site ............................................... 82
39. Photo of eight real cob recovered from site. .................................................. 82
40. Photo of eight real cob recovered from site. .................................................. 84
41. Photo of brass tacks recovered from site. ....................................................... 85
42. Illustration of brass nested weight set recovered in 1991. .............................. 87
43. Illustration of a pan lamp bracket recovered from the site. .............................. 88
44. Histogram of artifact recovery from the site. .................................................. 92
45. Geographical map of Hispaniola showing provinces of island ..................... 99
46. Illustration of a seventeenth century Dutch yacht ....................................... 124
INTRODUCTION

The shipwreck that is the subject of this thesis is located in Monte Cristi Bay, approximately eighty meters off the tiny island of Cabras which lies off the central northern coast of the Dominican Republic. It remained undiscovered in three meters of water, until the 1960s, when a local fisherman noticed the wreckage. It is known as the “pipe wreck” for the hundreds of clay smoking pipes scattered throughout the site. A large percentage of the pipes bear the hallmark of Edward Bird, an Englishman who lived and worked in Amsterdam between 1630 and 1665. The presence of the pipes, dendrochronological studies of the wood and dated coins found on the site established a terminus post quem of 1665. The site has been surveyed by several salvage and archaeology teams in the past, but the recent ongoing excavation by the Pan-American Institute of Maritime Archaeology (PIMA) represents the first major effort to examine the site systematically, in an attempt to quantify, record and analyze this time capsule of seventeenth century trade.

There is a paucity of archaeological data for seventeenth century shipwrecks in the New World. The shipwreck discovered at Monte Cristi, Dominican Republic, is a European merchant ship that sank on the north coast of Hispaniola during the 1650s from unknown causes. A commissioned dendrochronology study of the ship's timbers confirmed a ship of English construction. Its cargo, however, suggests the vessel may have been in the service of The Netherlands at the time of its sinking. The cargo contained a wide variety of seventeenth century Dutch tin-glazed faience ceramic ware, including many patterns of blue and white earthenware and Rhenish stoneware.
Thousands of kaolin smoking pipes, Venetian glass, trade beads, a nested weight set, iron products, bronze chandelier and candlesticks, a sword, cannon, coins and other European trade goods were also recovered. Comparison of the ship's contents to other contemporary archaeological sites in North America such as Ft. Orange and Schuyler Flatts, New York, strongly suggest a vessel outbound from Europe destined for ports in North America and the Caribbean (Figure 1).

Figure 1. Map showing the location of the Monte Cristi shipwreck.
The island of Isla Cabras [Goat Island] has been a source for reclaimed salt for at least 200 years and it is possible that the vessel stopped at that location for that purpose. A highly prized commodity by the fishing industries of northern Europe and America, the Dutch and English sought sources of this product anywhere in the Caribbean. During the early 1600s, the salt pans of Punta de Araya near the coast of Venezuela provided the Dutch with an abundant supply of salt, but eventually the Spanish were able to patrol this area with more efficiency, forcing the Dutch to find new sources (Davis, 1961: 113). The islands of St. Martin and Tortuga produced salt during the mid 1600s and it is highly probable that with a permanent settlement located at Monte Cristi, that Isla Cabras produced salt also. It is also possible that the ship may have been trading with buccaneers of the northern coast of Hispaniola. The maze of hidden mangrove coves and the high point of observation that the mesa El Morro provides, made Monte Cristi Bay ideal for the smuggling trade.

Despite the present inability to identify the vessel, excavation of the site provides the archaeological community with a unique opportunity to obtain quantitative data on the cargoes of small merchant ships involved in triangular trade between Europe, the Caribbean and North America. Specific cargo elements from the Monte Cristi site appear on Native American (Iroquois) sites along the Hudson River Valley. Among these items are funnel elbow-angle clay tobacco pipes, glass trade beads, a hawk’s bell, cast iron cooking cauldrons and three legged pots. The kaolin pipes and ceramics recovered compare favorably with the archaeological artifact inventory from the Ft. Orange and
Schuyler Flatts sites in New York and other locations in the Caribbean such as St. Eustatius and Barbados.

In 1991, the Pan-American Institute of Maritime Archaeology (PIMA) entered into an agreement with the government of the Dominican Republic to scientifically excavate the site. Under the direction of the *Comision de Rescate Arqueologico Submarino*, PIMA Principal Investigator Dr. Jerome Lynn Hall and PIMA research teams have spent a total of seven years (1991-98) excavating and researching the site to date. Over 15,000 artifacts have been recovered, all undergoing conservation in the *Fortaleza Ozama* laboratory in Santo Domingo. The recovered cultural material will eventually form a permanent exhibit in the newly completed national museum and cultural center *Faro de Colon*, representing a small chapter in the island's maritime history.

Many factors were considered by PIMA in the selection of this shipwreck for its first maritime archaeological project. Situated near the town of Monte Cristi, logistical support was readily available and necessary for the field operations conducted on the site. Located in shallow water near shore, without significant current, the qualities of the site were favorable for a project where volunteer labor could be utilized and advanced diving skills were not an absolute necessity.

Among the goals of PIMA was the desire to promote public awareness of the value of scientific historical research through the involvement of non-archaeologists in the scientific excavation and documentation process of maritime archaeology. The pipewreck project was funded initially through research grants from Earthwatch International, a non-profit entity which provides paying volunteers for worthy research
projects. PIMA utilized this symbiotic relationship where the volunteers help finance the cost of fieldwork and in return, provide PIMA the opportunity to educate the public by involving non-archaeologists in the actual research process.

**PIMA Research Plan**

Prior to going into the field in 1991, several research questions were proposed by the Principal Investigator: Would a close examination of the hull remains reveal a specific type of vessel or nation of origin? Would the many cultural artifacts recovered from the site suggest a destination or port of origin? Will analysis of the archaeological findings reveal the cause of the wreck? Are records available in European archives that document the sinking and the history of the vessel? The answers to these questions were sought and hypotheses tested against data gathered from five years of field investigations on the site.

The excavation of this particular shipwreck will not only provide scholars with new material for analysis, but also an opportunity to impart new knowledge from pre-existing data. In addition to new insights into seventeenth century Caribbean trade and culture, the study of this shipwreck will also contribute to the scholarship on ship construction, seafaring culture, ceramic typology, and the science of the shipwrecking process. Much of the trade in the Caribbean during this period was illegal and archival documentation is rare and seldom reliable. Because of this, the Monte Cristi site may contribute to the historical record of a subject about which little is known. Along with important cultural material, which can provide information on the lives of seventeenth century sailors and the trade patterns of Caribbean merchants, the remains of the ship also
offer archaeologists and historians an opportunity to study vessel construction techniques of mid-seventeenth century English shipwrights.
CHAPTER 1: SITE DESCRIPTION

Location

The Monte Cristi shipwreck is located on the northwest coast of the Dominican Republic approximately 7 miles northeast of the Haitian border. It lies in Monte Cristi Bay, (19 degrees, 54 minutes N., 71 degrees, 40 minutes W.), approximately eighty meters east of the tiny island of Cabras (Figures 2 & 3).

The island consists of approximately 3 square miles of coral atoll formed around volcanic deposition. It rises from near sea level on its eastern shore to rocky cliffs on the western coast, rising to a maximum height of 54 feet. The terrain varies from rocky outcroppings overlooking the southwestern shore and heavy coral deposits on the northern coast, to sandy beaches on the eastern, southern and western approaches. The island supports a variety of vegetation including desert grasses, mangrove, manzanita, mimosa and other smaller trees and shrubs. Varieties of ice plants and succulents are found in abundance over the cliffs of scoria and ancient coral deposits on the northern shore. While uninhabited by any large mammals, the island sustains a wide variety of wildlife including: wetlands bird species, rodents, small snakes and a proliferation of hermit crabs.
The central portion of Isla Cabras [Goat Island], as the island is called by the local population, is near sea level. This physical feature was quickly recognized by early visitors as having the potential to create a marketable product. Evaporative holding ponds were designed and built to trap sea water at high tide. Reaching 2.25 ft., the tidewaters trapped in the ponds soon evaporated, producing a valuable trade commodity in the sea salt that was left behind. Since the salt pans were established in the mid-sixteenth century, the island has continued to produce salt for commercial purposes. An early unidentified map lists the name of the island at that time as Cayo de Sal [Salt Key]; obviously in reference to the salt deposits located there (Figures 4 & 5).
Figure 4. An unidentified 18th Century Spanish map depicting Monte Cristi Bay and surrounding area. Present day Isla Cabras was then referred to as "Cayo de Sal" (Salt Key). Note the east/west orientation of the island during this period, suggesting physical alteration from constant erosion and redeposition. Tracing by Richard K. Willis.
Figure 5  Early 19th Century map showing Monte Cristi Bay, Manzanillo and Isla Cabras. Note town of Monte Cristi and local fort.
During the months of May and June, the weather is dry with an occasional squall or light storm. Humidity is low and days are generally pleasant with an average daytime temperature of 82 degrees. The nights are balmy with an average low temperature of 70 degrees.

The small port town of San Fernando de Monte Cristi is located southeast of the island between the prominent mountain of Monte Cristi at Punta de la Granja and the mouth of the Rio Yaque del Norte, three miles southwest on the shoreline. The town of Monte Cristi was founded in 1530 and is the oldest settlement on the northern coast with the exception of La Isabella, the first settlement of Columbus founded in 1493 (Morison, 1942: 286).

Currents on the northern coast of Hispaniola are defined by the Northeast Trade Drift with the prevailing current running westward at 1/2 to 1 knot. Rounding the point at Punta de la Granja and turning into Monte Cristi Bay, the current changes to a general southwest direction, increasing speed at times to as much as 3 knots at high tide. Visibility on the wrecksite is at times clouded by the tidal flow from the interior river sediments deposited into the bay. Local current is heavily influenced by the strength and direction of the trade winds. The coastal winds in turn are affected by the land and sea breezes. During the summer months the winds are generally calm during the early hours, increasing to a brisk northeastly breeze in the early afternoon. The Banco de Monte Cristi, an expansive coral bank extending west, north and east from Monte Cristi Bay within the bay and can be dangerous to inexperienced sailors unaccustomed to rapidly changing weather conditions and the effects they have on the immediate environment.
Discovery and Preliminary Excavation of the Monte Cristi Site

In 1991, the Dominican Ministry of Culture issued a excavation permit to the Pan-American Institute of Maritime Archaeology in the name of Dr. Jerome Lynn Hall. Hall worked previously in the Dominican Republic with the late Peter Throckmorton, noted shipwreck author and a pioneer of marine archaeology. While surveying the site in 1986 Hall realized its archaeological importance to the historical record of seventeenth century Hispaniola.

Previous Excavation Activity on Site

Several amateur exploratory expeditions to the Monte Cristi shipwreck site occurred prior to PIMA’s initial archaeological survey in 1991. Two separate treasure salvage teams visited the site on January 12, 1978 and again on February 21/23/24, 1980 (Figure 6). Both groups were scouting for prospective shipwreck sites that might contain gold or specie. According to notes kept by the crews on these two trips, the ship appeared to be "about 60 to 80 feet long and a draft about 10 feet." The cultural material gathered by the first crew included: "7 conical bowled pipes; 64 bulbous bowled pipes; 44 pieces of pipe stems; 2 Bellarmine [jug] necks, one with a grotesque mask; 4 pieces of blue & white majolica plates; and 1 three-legged pot of about 5 gallons capacity". The second group used a Venturi dredge to clear overburden. The "stern, mid-section & bow" of the wrecksite were examined briefly and numerous artifacts were taken including: "pieces of glassware, 2 three-legged [pots], brass holder???, 25 musket balls, 1 silver spoon, 1 brass handle, 2 hinges, 1 pistle[sic], 1 key 2 1/2" brass, lead sheeting, over 200 pipe bowls, and over 500 pipe stems. One entry in the report notes: "At this time we do not expect large
amounts of artifacts." The second group believed that shipwreck survivors or local fishermen had stripped all the shallow wrecks of anything of value (Duke Long Report: PIMA archives).

Figure 6. Site plan of Monte Cristi shipwreck drawn by commercial salvor Duke Long, circa 1980. While crudely rendered, the illustration reflects the artifact deposition uncovered at the time, much of which was removed prior to recent archaeological excavations (From PIMA archives).
PIMA Excavation History 1991-1994

PIMA conducted field research on the Monte Cristi site every summer of the years 1991 through 1996. Each year the parameters of the excavation were extended and techniques advanced with the knowledge and experience acquired during every successive season. Field excavation was not conducted in 1995. Instead, a team consisting of staff members journeyed to the Dominican Republic to conduct conservation work on the cultural material recovered from the site during the previous four years.

Seasonal weather conditions, staff schedules and availability of volunteers were deciding factors in choosing the months of June, July and August for the field seasons at Monte Cristi. The summer of 1991 provided the first in-depth look at the site. Several days were spent packing, securing transportation and acquiring necessary equipment for maintaining the field team for the summer. After a five hour drive from Santo Domingo to Monte Cristi arrangements were made with officials of the local yacht club to use their facilities as a staging area for moving onto the small island of Isla Cabras which would become our annual base camp for field operations. While the small island was idyllic in its appearance, for staff and volunteers to live on the island for three months required careful planning and preparation. A twenty-minute boat ride from the mainland, the island possessed no amenities beyond a beautiful beach and required logistical support on a daily basis to function as a base camp for the excavation team.
Camp

While much of the island was covered with thorny scrub and rocky terrain, a small grove of trees lined the southern shore and this area quickly became the site for the team’s annual field camp. Near a small harbor protected from the prevailing wind, it provided an adequate location for tents, storage of camp gear and a reasonably comfortable environment for staff and volunteers. Areas were designated for kitchen and food preparation; dining and erecting of tents. Another area was established for the registration and storage of artifact material as well as an equipment area where air compressors could be cleaned and maintained. Latrines were dug several hundred yards from camp and sun shower facilities erected near the beach. A portable darkroom was fashioned from remnants of an abandoned structure close to camp. Lying in the lee of the prevailing northeast wind and possessing a sandy beach, the small anchorage was more than adequate for the needs of the research team.

Materials were brought to the island where a diving platform, humorously named The Rummy Chum was constructed on the island beach and towed into position over the wrecksite. Anchors were set at the four compass points with the northeast corner of the platform set in the direction of the prevailing wind. It remained in position for the entire field season, providing a stable location for two five-horsepower compressors and large enough to accommodate two divers and a dive tender at one time.

The lack of local tank-filling facilities and the shallow depth of the site prompted the decision to use surface supplied air instead of SCUBA. Two five-horsepower compressors rigged with air filters easily provided enough air for six to eight divers at the
depth of the Monte Cristi wrecksite. The lack of bulky tanks made for ease of entry and exit from the dive platform and the compressors also allowed for longer dives, only limited by the amount of fuel in the engine tank. While this choice of air supply was certainly economical and advantageous, it also carried with it certain risks: tangled hoses, working without fins, possible air contamination from engine exhaust, possible hypothermia from longer dives, and a danger of becoming too complacent underwater. These are only a few of the negative considerations created by this choice of air supply. On the other hand, using compressors allowed two to three diver rotations daily and a total of 36 to 54 total diver hours each day, maximizing the amount of work performed by the research team during the three month field season (Figure 7).

A 16-foot Zodiac inflatable boat provided transportation to and from the mainland and the dive platform. The logistical demands of living on a desert island and concerns for safety soon prompted the purchase of a local fishing craft or yola as a second utility vessel. The twenty-foot wooden boat allowed for independent supply trips to and from the mainland while maintaining a boat at the dive platform during all dive operations.

During the initial months of work on the site, excavation of artifact material was limited to hand fanning with the eventual use of a small Venturi dredge constructed from PVC pipe, surplus fire hose and power by a 4.5 horsepower water pump (Wilkes 1971: 222). A spoil screening box was constructed from wood and three-eighths inch grid wire mesh to allow for the retrieval of any artifact material that might escape the eye of the dredge operator. A diver was stationed at the spoil box to periodically empty the screen and act as a secondary defense against loss of any artifact material. Any artifact
uncovered was immediately plotted in and recorded in situ, then carefully placed in a plastic bag and raised in a collective lift basket at the end of each dive. Upon arrival at camp the artifact material was registered, placed in water and stabilized until transported at the end of the field season to the government conservation laboratory in Santo Domingo for final conservation and storage.

Figure 7. An artist's rendering of wrecksite showing diving platform, grid system and dredge operation. Drawing by Richard K. Wills.
Mapping the Site

Once camp was established and the barge positioned and anchored over the wrecksite a measurement system was designed to allow for accurate documentation of the hull remains and the mapping of artifact deposition. A quarter-inch steel cable installed along the length of the keel stretched taut by turnbuckles at each end provided a baseline for all other measurements. Nineteen 2-meter grid squares were assembled from sections of 3/4-inch diameter PVC pipe, painted in alternating 10-centimeter bands of black and white. The initial 22 grid squares extended east and west from both sides of the baseline and encompassed the exposed articulated hull timbers and the immediate surrounding area. An overall site plan was developed from detailed measurements taken from each grid square, documenting the hull timbers and large concretions on the site.

A simple system for the plotting of individual artifacts and hull features was developed using a set of nylon crosslines to plot X and Y coordinates for each artifact discovered. The lines were held in place by hooks fashioned from clothes hanger wire. Tension was maintained by the addition of a small section of elastic at the end of each line. A crosshairs was created for the crossing of lines from a small section of PVC pipe drilled at 90 degree points through which the lines intersect. A carpenter’s plumb bob was then suspended from the crosshairs to the artifact, documenting its location within the particular grid square. This system worked well except on days when the current was strong enough to make measurements difficult.

In an attempt to improve the system of measurement, six data poles of 1-inch rebar were driven randomly in various locations on the site. Use of these datum poles
allowed the utilization of a newly developed computer triangulation program known as Direct Survey Measurement (DSM). This method allows an artifact to be recorded in situ from three or more reference points and to plot an object on a vertical as well as horizontal plane (Anderson 1969; Wilkes 1971; Green 1990). A computer software program was recently developed that allows the three-dimensional plotting of artifacts and hull features. This method, while still in its infancy will make for much greater detail and better diagnostic analysis of artifact deposition and the wrecking process.

In 1993 the excavation area expanded still farther to the southwest where it was shown by test pits that artifact deposition extended farther and deeper than expected. Twelve new datum poles and triangular excavation grids larger than 2 square meters were installed in this area. The DSM system adapted earlier had proved to be accurate and efficient but the newer triangular-shaped excavation areas proved too awkward and more complicated to use than the traditional square grids. This prompted a return to the 2-meter grid square system but discarding the old PVC pipe system for one using the four rebar corners of each square as individual DSM reference datums. This final adjustment was a combination of the two systems and provided an easier network of working areas capable of tying into or overlaying the initial grid pattern. It also eliminated the need for the x/y coordinates and plumb-line system. This method of measurement continued to be used throughout the next four years on the site.
Description of the Vessel Remains and Comparable Sites

The shipwreck site consists of a major portion of the keel, frames, outer and ceiling planking, sheathing deals and several types of ballast rock. Five major coral concretions cover portions of the wreck and have sheltered much of the hull remains from environmental damage (Figure 8). The southernmost and most prominent concretion is a large singular triangular slab or stack of iron plate. It is not clear if the iron was cargo or simply scrap used for ballast, or perhaps both. Only one side of the wreck is visually present and much of it was covered with layers of turtle grass and sand. Over the past three hundred fifty years a small eco-system has developed on the site. The small reef created by the wreck supports a wide variety of plant and animal life.
THE 17TH-CENTURY SHIPWRECK AT MONTE CRISTI BAY.

Jemison R. Behears
25 December 1992
THE PAN-AMERICAN INSTITUTE OF PAST ORI

rishi shipwreck.
The Ballast

The hull remains of the Monte Cristi shipwreck were partially covered with the remnants of the original ballast stone which also lay scattered in copious amounts southwest of the site. Carried by wave action and current in the continued break-up of the wreck over the years following the ship's demise, the ballast provided a potential clue to the identity of the ship or at least suggested possible ports-of-call of the vessel (Figure 9).

The ballast was comprised of three visually distinct types of stone varying in size from pea-size gravel or shingle to stones approximately six inches in diameter. Several samples were of ballast were submitted to geologist Dr. Wayne Ahr of the Texas A & M University Geological Sciences Department for laboratory analysis. Of the three types submitted, sample 1 was determined to be a pegmatite quartz or an igneous vein with a high concentration in silica. This type of stone would normally be found in mountains with igneous veins. It is commonly found in mountain streams. Sample 2 was a very fine grain spicoliferous flint or chert possessing plagioclase feldspars made of alumin or silica. Sample 3 proved to be igneous rock with weathered cracks of calcite (Report of Dr. Wayne Ahr 1992, PIMA archives).
Figure 9. Hypothetical breakup of the seventeenth-century European vessel in Monte Cristi Bay, Dominican Republic. (A) The vessel comes to rest in the shallow water and the upper works disappear; (B) the western half of the vessel disintegrates and washes away or is buried deeply in the sediment; (C) the extant hull of the Monte Cristi shipwreck as encountered by PIMA archaeologists in 1991. Illustration by Jerome Lynn Hall after original by Alejandro Selmi Colominas.
The shingle-type ballast was utilized as a convenient form of added ballast when ships needed additional weight after the unloading of a heavy cargo. For mobile ballast, river stone, with edges worn smooth, was preferred as it did not tend to cut or chafe cargo. In addition, by being smaller and more compact in size, it occupied less space and allowed more room for cargo. Comparison of ballast found on the Monte Cristi site to known European geological deposits revealed numerous possible locations where the ballast may have originated including Bristol, England. The identification of the origin of ballast is complicated as ballast was often taken from mounds of slag stone left at dockside by other vessels that originally obtained the material from another location. This often makes it difficult to establish relationships between the ballast and the ship that carries it.

**The Keel**

The keel, one of the primary features of the wreck, lies exposed to the sea. Approximately 47 ft 6 in (14.5m) in length, it remains in relatively stable condition, though showing evidence of teredo worm action and bacterial growth on parts of the outer surface. The keel lies in a north-south direction, listing slightly to the southwest. Keystone in shape, the profile and construction features are similar to those of the *Dartmouth* (Steffy 1994: 155). A rabbet existed along both sides of the keel. A well-defined 45 degree rabbet profile, though eroded, was clearly discernible at several points on the protected eastern side of the keel’s surface (Figure10). The edge of the rabbet appeared severely eroded on the western side and was probably torn away during the gradual break-up of the ship’s hull, leaving the appearance of a 90 degree rabbet. Close
inspection revealed no evidence of fasteners in the rabbet along either side. The keelson was not present, probably torn away during the wrecking process.

![Figure 10. Cross section of keel.](image)

While little of the hull remains, the length of the existing keel reveals a clue to the size and burden of the vessel. England’s premier Elizabethan master shipwright, Mathew Baker, formulated a tonnage rule in 1582 that was officially adapted by the Crown in 1627 to determine the correct tonnage of any ships built or hired for the king’s service (W. Baker 1958: 5). He explains: ‘By the proportion of breadth, depth and length of any ship to judge what burden she may be of in merchant’s goods and how much deadweight of tons and tonnage. The Ascension of London being in breadth 24 feet, depth 12 feet from that breadth to the hold, and by the keel 54 feet in length doth carry in burden of
merchant’s goods (in pipes of oil or Bordeaux wine) 160 tons, but to accompt her in deadweight, or her ton and tonnage may be added one third part of the same burden which maketh her tonnage 213 1/3” (Oppenheim 1896: 211).

This statement transforms into a workable formula of K (keel) x B (breadth) x D (depth)/100. The calculations of this formula applied to the specific example given here by Baker produces a result in excess of the correct burden by five tons. This discrepancy is more than likely explained by the often confusing manner in which measurements of the three basic dimensions were determined. The correct interpretation of the keel length was the actual length of the keel member resting on the blocks measured from the afterside of the sternpost to the forward scarf, excluding the additional length of the stempost which by the standard of the day was determined by the arc of a circle and scarfed into the forward end of the keel. The breadth of the vessel was determined by the widest point of deck or the maximum molded breadth. The depth was determined by the distance from the top surface of the keel to the height of the maximum breadth. According to Baker, by utilizing a bit of mathematics this method may be translated into a workable formula. To arrive at the Ascension’s burden of 160 tons, the total of her three dimensions are designated by K, B, and D, 54 x 24 x 12 must be divided by 100. Baker’s formula was utilized for a century or more to determine a ship’s burden. The Monte Cristi shipwreck contains only the keel element and fragments of floors and futtocks, so it is not possible to determine the size by Baker’s formula. Despite this, some general approximation of the ship’s size can be made by utilizing the measurement of the keel alone.
The existing 14.5m (47 ft 6 in) keel of the Monte Cristi vessel measured 9.4 meters from the deteriorated northern scarf to the beginning of the scarf joint located beneath the triangular concretion on the southern portion of the wreck. The keel continues from the southern scarf another 5.1 meters where it abruptly ends. There is no solid evidence that the keel continued beyond this existing timber. If this were the termination of the keel and the junction of the sternpost it would explain the absence of any substantial hull wreckage beyond the area to the south. Assuming for a moment that the overall length of the ship’s keel is the existing 14.5m and that the existing building techniques observed compare with that of other English vessels of the period, the length of the keel can then begin to suggest an approximate size and burden. Using this logic in conjunction with existing records of vessels such as the Prudence which had a keel length of 51.5m and a burden of 148 tons, one can speculate the with an existing keel of 14.5 m (47 ft 6 in ), the burden should fall between 100 and 140 tons.

While no floors remained attached to the keel, a treenail pattern was visible along the top. Where floors would have crossed the keel two treenails were spaced diagonally approximately 5 3/4 in (14.5cm) apart. The first, in all probability anchored the floor to the keel, tying the members together. These treenails ranged in diameter from 1 1/3 in to 1 1/2 in (3.5cm to 3.8cm). The keel of the Monte Cristi vessel measured 11 7/8 in (30cm) molded X 12 31/32 in (32.9cm) sided compared to that of the Dartmouth which measured 13 in (33cm) molded X 13 in (33cm) sided (Steffy 1994: 155) and that of an 18th century British transport discovered near Chubb’s Head Cut, Bermuda which measured approximately 12 in (30cm) molded X 16 in (40cm) sided (Watts and Krivor: 1995).
Examination of the bottom of the keel bore no evidence of a keel shoe and no other supplementary elements were observed.

**Scarf Joints**

Two scarf joints were discovered in the keel; one vertical scarf located near the south end under the large triangular concretion measured (173.5cm). Butted at both ends, the top seam of the scarf exhibited no capping strip as that on the Dartmouth but did show evidence of repair or composite construction. The lower portion of a highly degraded vertical scarf joint was also discovered at the extreme northern end of the keel 30 ft 8 in (99.4cm) from the scarf located on the southern end (Figure 11). Little remains of this northern scarf but it is possible that this was the junction of the keel and stempost as the radius of the floor timbers in this area begin to decrease, suggesting close proximity to the bow. It must be stated, however that the bow and stern have yet to be determined.
The Frames

At the conclusion of the 1992 season, 26 frames had been uncovered, including one and possibly two floor riders. Construction details of certain frames were inaccessible beneath the large concretions and remain incomplete pending future examination. Spacing of floors along the keel ran every 7 to 12 in (18 to 31cm) averaging 10 5/8 in (27cm). Futtocks appear to have been set between the floors after the latter were secured and they bear evidence of diagonal cross-pinning with small treenails or toenailing to floors with iron nails. In comparing the floor/futtock arrangement to those of
the *Dartmouth*, the difference is quite profound. Those of the *Dartmouth* were not overlapped but connected end-to-end and joined by a chock, treenailed through to the deadwood (Steffy 1994:156).

In only one instance was horizontal treenailing discovered in the fastening of floors to futtocks. In most cases the first futtocks begin at the second strake of outer planking which compare favorably with those documented in the *Sea Venture* and *Stonewall*. Most frames exhibited smooth, vertically cut faces except those where sapwood was present. No evidence of any second futtocks remained and all existing futtocks were highly degraded at the heads. There was no evidence however of spacers being present adjacent the first futtocks as the case in the hull remains of the *Sea Venture* (Adams 1995: 9). No fillet pieces were discovered on the site and do not appear to have been utilized as on the Chubb’s Head Cut vessel. Unfortunately so little remains of the hull and keel assembly it is difficult to speculate on its construction beyond what has been cited.

**Cross-pinning of futtocks**

One of the more interesting diagnostic finds was the discovery of diagonal cross-pinning of first futtocks to floors. This discovery of downward angled treenails suggested the possibility that the futtocks were cross-pinned to the floors after the floors were fastened to the keel. If the frames were pre-assembled prior to placement on the keel, this diagonal cross-pinning would not have been necessary. Six instances were recorded where this method of fastening was employed. Floors 3 and 4 have futtocks cross-pinned to their northern faces. The treenails fastening floor 3 to futtock 4 was driven from south
to north. The treenails joining futtock 5 to floor 4 was driven from north to south, futtock to floor. This method of fastening exhibited an alternating pattern in five of the instances encountered, floor 6 being the exception (Turner 1992: notes in PIMA archives). This pattern of fastening may simply be the result of repairs, the consistency of examples, however, suggests the installation of floors prior to the addition of futtocks. The sided dimensions of the frames varied between 8 5/8 and 9 7/8 in (22 and 25 cm), the molded dimensions between 5 5/8 and 8 in (14.5 and 20.5 cm). The lengths of the frames discovered ran from 3 ft 8 in to 8 ft 6 in (1.16 m. to 2.6 m) (Figure 12).
Outer Hull Planking

Including incomplete planks, 9 outer planking strakes have been uncovered thus far. Though completely waterlogged, many of them appeared in excellent condition, suggesting they may have been protected by alkaline bilge deposits covering this area. The planking varied between 2 in to 2 1/2 in (5 to 6.4 cm) in thickness and between 2 in (5 cm) and 15 3/8 in (39 cm) in width. According to wood specialist Rowena Gale, the outer plank samples tested were revealed to be of spruce or larch, a wood found in England and Northern Europe (Gale 1992: PIMA archives). The outer planking was fastened to the frames by treenails and in several instances at butt joints and repairs, iron nails were also employed. No evidence of clamping was discovered on any outer planking that was removed and there appeared to be no caulking bevel on any of the planks examined (Figures 13 & 14).
Figure 13. Site plan illustrating grid square system as installed on site. Drawing by Jemison Beshears.
Figure 14. Site Plan with elements numbered for reference. Drawing by Jemison Beshears and Jerome Hall.
Ceiling Planking

Counting partial boards, there were 6 ceiling planks found attached to the frames. These were all fastened by treenails. The ceiling averaged 2 1/8 in (5.3 cm) in thickness and between 9 7/8 and 13 in (25 and 33 cm) in width (Figures 15, 16 & 17).
Figure 15. Site plan detail from grid squares 174, 159 and 144.

Sheathing with cattle hair matrix

Triangular concretion

Keel
Figure 16. Site plan detail of grid squares 144 and 129, Illustration by Jerome L. Hall.
Figure 17. Site plan detail from grid squares 99 and 84 depicting floor, futtock and planking configuration.

Drawn by Jerome L. Hall (S) Sheathing, (P) Planking, (Ft) Futtock, (F) Floor, (*) Treenails, (RI) Rider.
Sheathing Deals

The outer hull planking was covered with a sacrificial layer of sheathing measuring 5/8 to 7/16 in (1.5 to 1.7 cm) in thick by 8 1/4 in (21 cm) wide. A black resinous compound of animal hair and tar was discovered between the outer planking and the sacrificial layer. While initially thought to be a type of vegetable matter, subsequent scientific testing by Chris Allen at the Hair and Fiber Unit of the Federal Bureau of Investigation, Washington, D.C. positively identified the material as cattle hair mixed in an unidentified mastic compound (Allen, personal communication to Hall, 1992). The sheathing was fastened to the outer planking by rectangular shanked nails averaging 1 7/8 in (4.8 cm) in length. Spacing on the nails varied throughout but from several sections recovered in situ they appear to have been nailed on average 7 7/8 to 11 in (20 to 30 cm). The highly degraded condition of the sheathing prevented conclusive identification of the timber. However, Donna Christensen of the Center for Wood Anatomy Research, U.S. Forestry Laboratory in Madison, Wisconsin suggested that the examples tested were most likely spruce or larch (Hall 1996: 70) [for discussion on the history of the use of hair matrix and wood sheathing for hull protection see Clowes, G.S. Laird, Ships: Their History and Development as illustrated by the collection of ship models in the Science Museum, London, 1952].

Miscellaneous Wood

While no decking, masts, apron or deadwood were uncovered at the site, other wood fragments were found. Among these was a small portion of thin wood, approximately 1/4 in (7 mm) thick which is possibly the remains of a clay pipe shipping
crate. A wood species identification test revealed it to be spruce or larch \([Picea \text{ sp.} /Larix \text{ sp.}]\) (Gale 1992: 1). A small lathe-turned fragment of wood (PW 860), the obvious remnant of a table leg or piece of ship’s furniture was also recovered. The existing fragment, if complete, would represent a cylindrical ring approximately 4 1/8 in (10.5 cm) in diameter. Hundreds of bits of charred wood were recovered throughout the site, more prevalent near the outer edges of the hull planking and frames, suggesting the vessel may have burned to the waterline, prior to sinking. The failure to discover the slightest remnants of upper deck timbers or other major hull elements during five field seasons, supports the theory of the probability of a major fire. In addition to the charred wood, chunks of lead slag were discovered throughout the site. These too, while possibly created from crewmen casting lead shot, they could also be evidence of a shipboard fire.

**Fasteners**

Treenails were the primary fastener used on elements of the wreck. They were polygonal in profile, usually with eight sides. They varied in diameter from 1 1/4 in to 1 1/2 in (3.2 to 3.8 cm). With the exception of one deatul or small square plug, most were not wedged and no specific pattern of placement was observed.

Iron fasteners were found where repairs were apparent. The heads were varied in shape and ranged in size from the small nails mentioned earlier used to attach sheathing, to iron nails approximately 4 3/4 in (12 cm) long used beside treenails at butt joints on the outer planking. In this instance they were probably used to temporarily secure the plank while the treenail was being fitted. There was no evidence of tar on recovered treenails (Figures 18 & 19).
Figure 18. Two examples of treenails recovered from floors and futtocks. The majority of treenails were not wedged and all appeared to be octagonal in form, though many facets were uneven and inconsistent in dimension. Illustration by Jemison Beshears.
Figure 19. Six examples of various nails and fasteners recovered from the site. Most iron examples recovered were iron oxide shells while smaller nails and tacks were of brass alloy composition. Illustration by Jemison Beshears.
Repairs were discovered in several locations. The major keel scarf located under the large triangular concretion showed evidence of partial replacement. It appeared that a damaged portion was removed and repaired with a compound block of new material. A small block measuring 3 1/2 in X 10 1/4 in X 2 1/2 in (9 X 26 X 6.5 cm) was fastened with two iron nails to a larger L shaped element which in turn was treenailed to the keel (figure 20). This could be a leaky stopwater repair. The scarf, situated beneath a major concretion, made examination and analysis of this feature quite difficult. The inaccessible location of this wood splice could also suggest it may have been created during the original construction of the vessel, perhaps a repair to an otherwise suitable keel timber (Watts communication with author 1998).

Figure 20. Small section of outer planking with lead patch attached. Illustration by Jemison Beshears.

Some outer planking bore evidence of repairs. In three locations outer planking strakes were notched on the edge to accommodate a narrow strip of planking
approximately 47 3/8 in long X 2 in wide (120.5 cm long X 5 cm wide). These graving pieces were fastened by an iron nail at each end and appeared to be a replacement for the decayed portion of the seam between two planks. A large wedge of wood measuring 13 3/4 in X 7 7/8 in X 4 1/3 in (35 X 20 X 11cm) and containing two treenails was fastened to the top of a floor. This piece of wood had no visible function and may have been installed to support a piece of cargo. Portions of outer planking also revealed evidence of lead patches secured by small nails. One of these patches, or tingles, was discovered on a disarticulated remnant of planking (Hanks 1997: 25-26).

**Wood Analysis**

The first look at the shipwreck site revealed the remnants of the ship’s hull protected by existing ballast and covered by approximately 350 years of shifting sands and plant growth. Despite the many years of exposure in a shallow, surf zone environment, the remaining timbers appeared in surprisingly excellent condition. The molded sides of timbers appeared sharp, with little surface deterioration in evidence. While toredo worm channels were encountered during excavation, much of the timber contained little worm damage.

The research team was quite surprised to discover that despite the fact the hull remains were situated in warm shallow water, in a highly aerobic environment for over three centuries, the amount of actual wood deterioration to the lower hull timbers was minimal. The large amount of slag-type ballast, heavy in lime content, together with the accumulation of bilge muck in the hold prior to sinking may have contributed to the preservation of the wood structure.
Samples of wood were taken from thirteen different timbers on the wreck for dendrochronological testing. The samples were chosen based on soundness of the wood, the presence of sapwood and the location of the sample. Moisture content and specific gravity tests were performed on seven of these samples by Amy Mitchell-Cook of the Institute for Wood Analysis at East Carolina University. The tests revealed wood in a severe state of degradation, the average moisture content in the samples ranging between 40-70%. The specific gravity tests revealed cellulose content in the wood ranging between 18-28%. All samples tested were determined to be oak. (Mitchell-Cook 1992: 1)

The dendrochronology analysis was performed by the Dutch Dendrochronology Centre (ROB) of Amersfoort, Netherlands. Four of the samples chosen proved to be unsuitable for testing, either because of damage or the lack of growth rings. The remaining samples were cross-referenced with indexes for Dutch, German, Belgian, French and Baltic chronologies which revealed that none of the timbers sampled grew in continental Europe. The ring patterns on the samples fit together well, suggesting they were all from the same general geographic area. The sample dating ranged between 1485-1642 which coincided well with our window of 1651-65 as a working date for the shipwreck (Figures 21, 22, 23 & 24). The conclusion of the report strongly suggests the wood was a product of England, and that since no trade in wood existed between The Netherlands and England during this time period, the ship could not have been constructed in the Netherlands (Jansma 1992: 2).

Unfortunately, documented and researched sites comparable in date, size of vessel and nationality relative to the Monte Cristi site are limited in number and the sites that do
compare include little structure beyond that preserved below the ballast or waterline. Of the existing seventeenth century English shipwreck inventory, only the Sea Venture (1609) and the Stonewall (1685), both sunk off Bermuda, resemble the Monte Cristi vessel in size and general construction features.

<table>
<thead>
<tr>
<th>Sample</th>
<th>Date 1</th>
<th>Date 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>D2</td>
<td>1497</td>
<td>1610</td>
</tr>
<tr>
<td>D4</td>
<td>1508</td>
<td>1642</td>
</tr>
<tr>
<td>D6</td>
<td>1483</td>
<td>1633</td>
</tr>
<tr>
<td>D7</td>
<td>1516</td>
<td>1603</td>
</tr>
<tr>
<td>D8</td>
<td>1505</td>
<td>1624</td>
</tr>
<tr>
<td>D10</td>
<td>1508</td>
<td>1596</td>
</tr>
<tr>
<td>D11</td>
<td>1560</td>
<td>1621</td>
</tr>
<tr>
<td>D13</td>
<td>1563</td>
<td>1630</td>
</tr>
</tbody>
</table>

Figure 21. Dendrochronology chart illustrating test results on Monte Cristi ship timbers performed by E. Jansma and E. Spoor of the Dutch Dendrochronology Centre (Rijksdienst Oudheidk. Bodemonderzoek) of Amersfoort, Netherlands.
<table>
<thead>
<tr>
<th>Findno.</th>
<th>Filename</th>
<th>sapwood/bark</th>
<th>no. rings</th>
</tr>
</thead>
<tbody>
<tr>
<td>D2</td>
<td>MPW031</td>
<td>-</td>
<td>113</td>
</tr>
<tr>
<td>D4</td>
<td>MPW011</td>
<td>28 sapwood rings including the ring directly under the bark</td>
<td>135</td>
</tr>
<tr>
<td>D6</td>
<td>MPW021</td>
<td>-</td>
<td>149</td>
</tr>
<tr>
<td>D7</td>
<td>MPW051</td>
<td>-</td>
<td>88</td>
</tr>
<tr>
<td>D8</td>
<td>MPW041</td>
<td>3 sapwood rings</td>
<td>120</td>
</tr>
<tr>
<td>D9</td>
<td>MPW071</td>
<td>-</td>
<td>98</td>
</tr>
<tr>
<td>D10</td>
<td>MPW061</td>
<td>-</td>
<td>89</td>
</tr>
<tr>
<td>D11</td>
<td>MPW091</td>
<td>-</td>
<td>62</td>
</tr>
<tr>
<td>D13</td>
<td>MPW081</td>
<td>6 sapwood rings</td>
<td>68</td>
</tr>
</tbody>
</table>

The other samples (D1, D3, D5 and D12) are unsuitable for dendrochronology dating, because they have been damaged or have too few rings.

**Statistics**

<table>
<thead>
<tr>
<th>Findno.</th>
<th>Reference Chronology</th>
<th>Date of sample</th>
</tr>
</thead>
<tbody>
<tr>
<td>D2</td>
<td>object chronology Pipe Wreck against England</td>
<td>1497-1610 AD</td>
</tr>
<tr>
<td>D4</td>
<td>idem</td>
<td>1506-1642 AD</td>
</tr>
<tr>
<td>D6</td>
<td>idem</td>
<td>1485-1633 AD</td>
</tr>
<tr>
<td>D7</td>
<td>idem</td>
<td>1516-1603 AD</td>
</tr>
<tr>
<td>D8</td>
<td>idem</td>
<td>1505-1624 AD</td>
</tr>
<tr>
<td>D9</td>
<td>idem</td>
<td>-</td>
</tr>
<tr>
<td>D10</td>
<td>idem</td>
<td>1508-1596 AD</td>
</tr>
<tr>
<td>D11</td>
<td>idem</td>
<td>1560-1621 AD</td>
</tr>
<tr>
<td>D13</td>
<td>idem</td>
<td>1563-1630 AD</td>
</tr>
</tbody>
</table>

Except D9, all samples that were measured crossdate among each other. The mean correlation between each sample and the master chronology of the remaining samples, is 0.51 according to program COFECHA (Holmes 1984). The mean chronology of the samples (detrended, pre-whitened), could be dated with an English oak chronology of which we do not have the reference, but which was probably produced in Eckstein's laboratory in Hamburg, Germany:

Figure 22. Results of dendrochronology analysis as performed by the Dutch Dendrochronology Center.
<table>
<thead>
<tr>
<th>Object Chronology</th>
<th>Reference Chronology</th>
<th>Date of sample</th>
<th>$pa$</th>
<th>$t$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pipe Wreck</td>
<td>England</td>
<td>1485-1462 AD</td>
<td>65.1%</td>
<td>6.03</td>
</tr>
</tbody>
</table>

$pa =$ Percentage agreement between an undated chronology and a master chronology at the position of overlap where they match best.

$t =$ The value which results from a Student’s $t$-test applied to the cross-correlation between the undated and master chronologies at the position of overlap where they match best. A $t$-value of 6.0 is ok.

**INTERPRETATION OF THE DENDROCHRONOLOGY**

The only sample of which the sapwood is complete, is D4. The last ring of D4 dates from 1642 and was complete (i.e., summerwood was formed in the ring), which means that the tree from which this sample came, was felled between Oktober 1642 and March 1643. The outer rings of the other samples are older than 1642, which is in agreement with the fact, that their sapwood is incomplete.

Of the individual samples, some crossdate well with the England master chronology, and some don’t. However, the tree-ring patterns of the samples fit together quite well, which means that they probably grew in the same geographical region. Also, the crossdating of the mean chronology of these samples with the England chronology is good. The standardizing, averaging and pre-whitening of individual tree-ring patterns should result in an object chronology in which the non-climatic variations are reduced. Such a chronology should theoretically crossdate better with other material, than the raw ring-width series. This explains the fact, that the Pipe Wreck object chronology crossdates better with the England chronology, than the individual series do.

The timbers used to construct the Pipe Wreck are definitely not continental, because they do not crossdate with any of the Dutch, German, Belgian, French or Baltic chronologies that are available to us. As a result, the dating of the Pipe Wreck cannot be verified independently (this is normal procedure when working with continental oak). Most likely, the wood grew in England. In the seventeenth century no trade in wood existed between The Netherlands and England. The Dutch mainly used timber from Germany and the Baltic region. This means, that the Pipe Wreck was not constructed in The Netherlands. Might the wreck be English??

Needless to say, the year in which a tree was felled may not coincide with the year in which the end-product was ready. In order to interpret the dendrochronological date of the Pipe Wreck correctly, it is necessary to take into account how long it must have taken, to build this ship.

Please let us know, if you have any further questions.

Sincerely yours,

[Signature]

(Esther Jansma)

---

Figure 23. Results of dendrochronology analysis.
<table>
<thead>
<tr>
<th>Keel</th>
<th>Monte Cristi 1651-1665</th>
<th>Sea Venture 1609</th>
<th>Stonewall 1685 ±10 yrs</th>
<th>Sparrowhawk 1626</th>
<th>Chubb’s Head Cut 1780</th>
<th>Dartmouth 5th rate frigate sunk 1690 - 36 guns 266 tons</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>47½&quot; (14.5m) existing 1 vertical oak scarf 11 7/8&quot; (30cm) molded</td>
<td>52&quot; existing 15.5 molded 12 1/2&quot; sided 316mm</td>
<td>18.2123m long molded in exess 12in (0.3216) sided 16in (0.47m) above rebbeets</td>
<td>28&quot; 10&quot; 8in sided 6in molded Eng. Elm</td>
<td>69'9&quot; remain 12&quot; molded 16&quot; sided</td>
<td>vert. scarf 4'2&quot; long 80&quot; long (24.4m) 43&quot; square (33cm) 6 iron bolts (Half Floors)</td>
</tr>
<tr>
<td>Floors</td>
<td>12.3/32 (32.6cm) sided spring 7-12in (18-25cm) averaging 10 59&quot; (27cm) 12-13&quot; squared allowed to run to end of limb 4 meters long not well-finished</td>
<td>18-30cm sided 24-32cm molded to keel</td>
<td>7&quot; 1&quot; long amidships</td>
<td>12&quot; side 12-13&quot; molded 10-12&quot; long oak</td>
<td>8&quot; molded (20cm) 10&quot; sided (25cm) spaced 1&quot; apart on centers (30.5)</td>
<td></td>
</tr>
<tr>
<td>Futtocks</td>
<td>8 5/6-9 7/8 sided (20cm 15cm) 5 5/6-8 (14.5cm &amp; 20.5cm)</td>
<td>17-20cm sided 18-21cm molded</td>
<td>2&quot; overlap w/glut or chock</td>
<td>4-10&quot; sided</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Outer Plank</td>
<td>2&quot;-2 1/2&quot; thick (5cm to 6.4cm) 2&quot; (5cm) to 15 3/8&quot; (39cm) wide</td>
<td>9cm thick 20-42cm wide</td>
<td>2&quot; thick 10&quot; wide</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>3in thick 11 7/8&quot;-12 1/4&quot; wide (0.30 to 0.31m)</td>
<td>2.5-3in (6.3-7.6cm) thick</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Garboard</td>
<td>26cm wide 11cm thick</td>
<td></td>
<td></td>
<td>8 3/4&quot;wide</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Treenails</td>
<td>Not wedged Octagonal</td>
<td>4-6cm octagonal</td>
<td>1&quot; wedged both ends</td>
<td>1 1/2&quot; diam</td>
<td>wedged 1 1/2&quot; (3.8cm)</td>
<td></td>
</tr>
<tr>
<td>Sheathing</td>
<td>5/8&quot; to 7/16&quot; thick (1.5 to 1.7cm) 8 1/4in wide (21cm) Spruce or Larch</td>
<td>Pine 16-24cm ±2cm thick</td>
<td>1&quot; thick (25mm) 10&quot; (0.25m) wide Scotch Pine</td>
<td>1/2in, (1.3cm) for over 1/8in. tar matrix hair</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>Sleepers present</td>
<td></td>
<td></td>
<td>Breadth 25' (7.6m) depth in hold 10' (3.05m) Draft 12ft. (3.66m) tons 266</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Figure 24. Construction notes on comparable shipwrecks.
CHAPTER 2: ARTIFACT INVENTORY AND CONSERVATION METHODS

Synopsis of Recovered Artifacts

During the seven years of excavation of the Monte Cristi site, thousands of artifacts were recovered which, like so many pieces of a puzzle, have little meaning individually, but when observed in relationship to each other and in context with other factors begin to unveil their importance to the site as a whole. The Monte Cristi artifact inventory consisted of cultural material typically found in any seventeenth century Dutch or English merchant vessel. The *Sea Venture* (1609), the *Vergulde Draeck* (1656) and the *Batavia* (1629) carried many of the same items as the Monte Cristi vessel. Like these other four shipwrecks, the uniqueness of the Monte Cristi site will begin to emerge when the artifacts reveal their relationship between time, typology of material and location.

The artifact inventory from the site contains a panoply of diagnostic material including a single iron cannon, an iron bar shot, lead pistol and rifle shot, remnants of a sword, pistol stock and ceramics. The ceramic samples include Dutch blue and white tinglazed earthenware similar to examples found at the Ft. Orange, Schuyler Flatts and Van Buren sites in New York (Wilcoxen 1987: 86-89). Rhenish stoneware with "splashes of cobalt blue" on their tiger-glazed sprig-molded medallions were recovered. These are similar to those found on the *Batavia* and also at Schuyler Flatts (Green 1977/ Wilcoxen 1987). Items such as trade beads, needles, thimbles, a comb, fish hooks, curtain rings, hanging oil lamps, wick tweezers and other utilitarian items were recovered as well. Spanish silver coins, one dated 1649, established a *terminus ante quem* for the site and provided valuable clues to the date of the ship's demise. An interesting and unique
bronze baluster-shaped chandelier element was found in 1992. A brass nested weight set similar to one discovered on the Sea Venture was recovered in 1986 "atop a planking timber" (Hall 1996: 189). A bronze candlestick and hundreds of concreted metal objects yet to be analyzed were also excavated. In addition to these material items, diagnostic faunal and floral remains such as pig bones, animal teeth from the crew’s mess and buckwheat chaff utilized for packing kaolin pipes were discovered. A large deposition of Dutch kaolin smoking pipes manufactured by numerous identifiable seventeenth century Dutch pipe makers including Edward Bird and William Hendricks identify the vessel to a specific window of time and offer a clue to explain why the ship was at Monte Cristi. All artifacts continue to be studied in the search for information to answer the research questions set forth at the beginning of this thesis. This process will hopefully reveal clues to the puzzle of this vessel’s history.

The fact that Edward Bird manufactured clay pipes between 1630 and 1665, and the dendrochronology testing revealed the timbers to be dated from within that period, strongly suggest that the Monte Cristi vessel sank within that window of time. The heavy concentration of Dutch manufactured goods carried on the vessel is strong evidence that the origin of much of the material was Holland and that the cargo was destined for at least some Dutch occupied ports-of-call. Of course, cargoes were brokered and traded between ports of different nationalities and it is entirely possible that these goods were intended for Anglo-American ports. Perhaps they were illicitly obtained by an English merchant trader from a Dutch port-of-call in exchange for other commodities. The
presence of funnel elbow-angle pipes on the site is evidence of intent to trade with a
Native-American contingent either in North America or the Caribbean.

**Ceramics**

Ceramics constitute the largest percentage of artifacts recovered from the Monte
Cristi wrecksite. They consisted of white-glazed tin enamelware, blue-and-white tin-
glazed enamelware, lead-glazed earthenware and Bellarmine or Rhenish stoneware. The
tin-glazed enameled ceramics showed a fine fabric, void of inclusions and varied from
off-white to light tan in color. In some instances they showed an additional lead glaze
coating (Erwin 1994: 4).

Some examples of the tin-glazed earthenware showed evidence of surface
crazing. Many sherds were in friable condition with losses to finish and pattern. A large
percentage of tin enamelware sherds showed evidence of black metallic sulfide stains,
often obscuring the surface patterns and turning the white areas a dirty grey.

**Rhenish Stoneware Sherds**

The Monte Cristi wrecksite yielded a large number of Rhenish stoneware or
"Bellarmine" sherds. During the 1991 and 1992 field seasons many small body sherds
were uncovered during the excavation and mapping of the hull timbers. These were
usually plain without design, some exhibiting a crazed caramel colored salt glaze over the
natural grey clay. It was this glaze that led the to the term “tigerware” (Figure 25). In
1993, 1994 and 1995 as the excavation expanded to the southwest in the direction of the
current, many larger examples were discovered, including complete baarthman jug
necks with handles and large examples with sprig-molded designs including bearded
faces and simulated coats-of-arms. One unique example bore the sprig-molded image of a seventeenth-century man within a medallion (Figures 26, 27, 28 & 29).

Figure 25. A Rhenish stoneware jug similar to sherds recovered from the site. (Wilcoxen 1987: 86).
Figure 26. Two views of a rhenish stoneware jug neck sherd from the Monte Cristi site. Illustration by Jerome Hall (Hall 1996: 166).

Figure 27. Rhenish stoneware jug sherds from the Monte Cristi site. (A) PW1253; (B) PW809; (C) PW2464; (D) PW2381; (E) PW1510; (F) PW723. Illustrations by Jerome Hall (Hall 1996: 167).
Figure 28. Decorative vignettes or medallions containing various figural forms found on Rhenish stoneware jug sherds from the Monte Cristi site. Illustrations by Jerome L. Hall (Hall 1996: 170).

Figure 29. Rhenish stoneware medallion sherds from the Monte Cristi site. (A) L1723; (B) PWA1482; (C) PW3277; (D) PW2569; (E) PW1265; (F) PWA1487; (G) PW63. Illustrations by Jerome L. Hall (Hall 1996: 171).
A large number of diagnostic Rhenish “bellarmine” stoneware sherds were recovered in 1993 and 1994. All stoneware sherds with the exception of jug bottom fragments showed a typical stippled, caramel-colored glaze mixed with subtle shades of transparent cobalt blue enamel, despite Wilcoxen’s assertion that the cobalt glaze had long been discontinued by the middle of the seventeenth-century (Wilcoxen 1987: 75). Among the recoveries were complete *barthmannkruge* jug spouts, some with intact bearded faces, sprig-molded ersatz coats-of-arms and decorative medallions. Their interior texture showed wheelwork patterns and the fabric tended to be fine and consistent with a light to medium grey color throughout.

These Rhenish stoneware jug sherds were similar to many of those recovered from colonial American sites including those of Jamestown, Virginia, Fort Orange and Schuyler Flatts, New York (Wilcoxen 1987: 76, 86). Jugs of this type were used throughout Europe and the New World and are often found on Dutch and English underwater shipwreck sites. Examples have been recovered from the *Sea Venture* (1609), *Batavia* (1629) and *Vergulde Draeck* (1656).

Ceramics recovered from marine sites usually require minimum conservation treatment because they generally survive well in marine environments (Pearson 1987b). Most insoluble salts and calcareous deposits were carefully removed from the stable surfaces by hand, using a scalpel or dental pick. Unfortunately, the earthenware sherds recovered from the site were saturated with soluble salts which contribute heavily to the exfoliation and friability of glazes and the loss of important diagnostic information in the process. To remove these, the sherds were repeatedly rinsed in a three-tiered desalination
system. The level of chlorides were monitored using silver nitrate until they were stable. After this, the sherds were removed from the system and allowed to air dry. The enamelware blue-and-white sherds were consolidated by immersion in 5% Paraloid B-72 in 75:25 acetone: toluene (Erwin 1994:5). Each sherd was then registered, labeled in permanent ink with a registration number, bagged in plastic and stored with others for later research (Figures 30, 31, 32).

Figure 30. Examples of blue and white earthenware sherds recovered from the site. Illustration by Jerome Hall.
Figure 31. Examples of blue and white earthenware sherds recovered from the site.
Glass

Many small pieces of glass were recovered from the site. Among them were delicate shards of transparent turquoise Venetian-style glass. One small fragment appeared similar to a portion of a diamond-etched stem goblet identified as "Dutch glass, Venetian style" (Moore 1924: 46). Several green-tinted transparent shards recovered appear to have been from flat-paneled case bottles with screw-top pewter caps, one of which was also found on the site. According to Paul Huey, these bottles are typical of those found on other North American sites such as Ft. Orange in New York (Hall 1996: 214). Another transparent fragment examined by Huey, probably from a stem glass or goblet, was tested under ultra-violet light and determined to contain no lead. As leaded glass was not manufactured until 1690 this discovery is important evidence supporting a terminus ante quem for the Monte Cristi site (Huey as cited by Hall 1996: 214).
The majority of the shards suffered no leaching or devitrification and most showed no abrasion, but were as clean and sharp as the day they were broken. According to one conservator, glass excavated from an alkaline environment is less likely to have laminated layers because there is an abundance of hydroxyl ions to react with the silica network (Hamilton 1996: 22). The lowest part of the hull remains, amid the bilge muck and ballast in fact, proved to be highly alkaline, this perhaps contributed to the stability of the glass shards recovered in that area. Glass is usually the most stable archaeological material recovered from a wrecksite. It should consist of 70-73% silica, 16-22% alkali or soda ash (sodium carbonate) or potash (potassium carbonate), and 5-10% flux (calcium oxide) (Erwin 1994: 6).

Treatment involved cleaning each shard with a soft bristle brush to remove surface dirt and insoluble salt. The glass was then desalinated in purified water until void of chlorides, then dehydrated by immersion in acetone to dry and stabilize the glass from further breakdown. Friable shards were consolidated with Paraloid B-72. All shards were then labeled with their registration number and stored in vented plastic bags for further reference. Glass is vulnerable to the high humidity environment found in the Caribbean tropics, for this reason periodic monitoring of the collection is necessary to prevent future deterioration (Erwin 1994: 7).

Beads

Over 700 glass trade beads were recovered from the site. They appear black with a greyish-white patina, the majority recovered in one partially melted and fused cluster,
evidence they had been subjected to intense heat, suggesting a shipboard fire. This discovery together with melted lead slag and an abundance of charred timbers, adds further weight to the hypothesis that fire played a role in the demise of the Monte Cristi vessel.

Samples of the beads were sent to Karlis Karklins, Senior Material Culture Researcher at Parks, Canada for analysis. They were classified as Kidd’s Type Ha6 and Ha7, types often encountered on New World sites. In an attempt to determine the origin of their manufacture, examples were tested by Robert Brill at the Corning Museum of Glass in Corning, New York but the tests were inconclusive (Hall 1996: 217).

Noreen G. Carroll, graduate student at the State University of New York, is currently in the process of conserving, drawing and analyzing the bead collection for PIMA. She has observed that inside the fused mass of beads, there appears to be a linear pattern to their arrangement, suggesting they were strung together in necklace form, as they would have been merchandised and shipped during the seventeenth-century (Hall 1996: 217-218).

Clay Smoking Pipes

The most prolific artifact material recovered from the site has been the approximately 13,400 clay smoking pipe bowls, stems and fragments. The extensive inventory has been the subject of a Ph.D. dissertation by the founder of the Pan-American Institute of Maritime Archaeology and Principal Investigator of the Monte Cristi Shipwreck Project, Dr. Jerome Lynn Hall of Texas A & M University.
The pipes recovered from the site fall into two distinct types, the bulbous bowl variety and the funnel angle elbow type. Of the 1,194 pipe bowls recovered, 399 bore the manufacturer's heel stamp of Edward Bird, an Englishman who emigrated to Amsterdam in 1630 and established a factory where he produced pipes until his death in 1665 (Hall 1996:129). Other bulbous bowls recovered bore stamps D*C; WC; fleur-de-lys within a diamond; a Tudor rose; P*C and that of a flower, all of Dutch manufacture (Figures 33A, 33B & 33C). Of the funnel angle elbow variety, eighty-eight bowls were recovered. According to Hall's extensive research, of the heel stamps that are identifiable as to manufacturer and date, nearly all examples have been found on North American and Native American sites and specifically those associated with Dutch settlements or Dutch-related trade centers. This knowledge supports the hypothesis that the Monte Cristi ship was carrying cargo bound for destinations in the North America. Known dates of pipe manufacture compare favorably with the dendrochronology studies of the wood timbers, supporting the author's theory that the Monte Cristi ship sank between 1651 and 1665.
Figure 33A. Examples of the bulbous (A) and funnel elbow angled pipe (B) forms found at the Monte Cristi site. Illustrations by A. Roberts (Hall 1996: 119).

Figure 33B. Morphological features of the seventeenth-century European bulbous-bowl pipe. Illustration by A. Roberts (Hall 1996: 111).
Figure 33C. Several examples of pipes and corresponding heel stamps found on the Monte Cristi site. Illustrations by A. Roberts.
Concretions

Approximately 3,500 metal concretions have been recovered from the site. Among them are recognizable items such as three-legged pots or cauldrons, various ship fittings, nails and other fasteners, bar-shot, a sword, a chisel, the mechanism to a wheel-lock pistol, hull patches and sheathing, spoons, a metal lid to a small box, and many unidentifiable concretions ranging from objects of less than an inch to large multi-element concretions weighing upwards of fifty pounds. All concretions recovered were measured in situ, raised, registered, drawn and transported to a laboratory. They are stored in laboratory water tanks, awaiting x-ray analysis and conservation treatment. Due to the diagnostic importance of this artifact material, funding is now being sought to provide the necessary equipment needed to properly evaluate and treat the large body of
concreted artifacts recovered to date. The information gathered from the ship fittings alone would contribute to theories on the vessel’s size and configuration of rigging.

**Lead Shot**

Numerous examples of lead shot were recovered including multiple finds in several locations. Six were located within a foot of each other near the southern extremity of the keel and three were excavated in the central section of the hull remains. Of those recovered, most were between .36 and .45 caliber, one example was .52 caliber. All are typical of those used during the mid-seventeenth century. In addition to shot, numerous lead gobules were also found, suggesting either cast off lead slag from shot molding or evidence of a hull fire. One example of iron bar-shot was also recovered.

**Cannon**

The largest and one of the important diagnostic artifacts recovered from the site was a ship’s cannon made of iron and measuring 220 cm. end to end. It was the only one recovered in five seasons of excavation. While it may have been carried for added ballast, it is more likely that due to the shallow depth of the wreck, the remainder of the vessel’s ordnance was salvaged. This particular cannon was possibly overlooked or perhaps trapped in an inaccessible section of the vessel and eventually became buried in the shifting sands until discovered during the excavation (Figure 35).
A cannon of similar shape and dimensions, is part of the permanent outdoor exhibit on display near the west wall of the Tower of London. It was observed during a study trip to London in 1995. Coated with multiple layers of red paint, no markings or dates were observed, but a Tower docent commented that it was an “English cannon of the seventeenth-century.”

During excavation, a bronze alloy candlestick was found concreted to the cannon, along with numerous clay smoking pipes and pipe fragments. The cannon was covered by a rough layer of calcium carbonate and under that, a black layer of magnetite which, in the anaerobic environment of the wrecksite, provided a protective shell, preserving much of the artifact’s metallic content.
Iron is usually difficult to treat because once removed from the water and exposed to the environment, corrosion accelerates the oxidation process, causing the surface to flake off. In cast iron, an alloy of iron and 3-5% carbon, corrosion will be oriented around the graphite cathodes, leaving the carbon behind. The process forms an internal galvanic corrosive series, from most noble to least noble, until all of the iron is removed (Erwin 1994: 10).

As one of the least noble metals, iron serves as the anode in galvanic coupling during the corrosion process. The rate of corrosion of iron in salt water is determined by the rate of oxygen reduction at the cathode. The combination of the anodic and cathodic activities produces ferrous hydroxide which then undergoes a number of reactions dependent upon the amount of oxygen present. Where oxygen is limited, the corrosion products form hydrated iron oxide, or rust. Finally, chloride ions intensify galvanic pitting. Therefore, treating iron involves both the stabilization of the iron and the removal of chlorides (Erwin 1994: 10).

The cannon was raised from the site in 1993, transported to Santo Domingo and placed in a laboratory tank for electrolytic reduction. After one year of intermittent electrolysis, the cannon was examined and a decision was made to drain the tank and manually remove much of the concreted material mechanically, which by then had become somewhat loosened by the electrolytic process. Approximately 80% of the existing concretion was removed in this way. After mechanical cleaning, much of the molded surface detail of the cannon was revealed, suggesting that once stabilized, the diagnostic features of the cannon would be preserved for comparison and study.
this, in 1993 the cannon was returned to the electrolytic tank, filled with fresh water and a 5% sodium carbonate electrolyte solution for further treatment. Supported by wooden blocks, the cannon was surrounded by a sheet of expanded steel wire mesh and attached to the positive terminal of a DC power source [battery charger] to receive a constant current flow of approximately .001 to .005 amps/cm squared (Hamilton 1996: 57). During this process, the positively charged ions in the corrosive compounds will be transformed into a metallic state and the negatively charged chlorides are removed as they are transferred to the anode (Erwin 1994: 11). The current state of the cannon is unknown, but efforts will be made in the future to identify and date its manufacture by close comparison to known examples (Figure 36).
Overall length: 220cm  
Base ring to end of 1st reinforcement: 15 cm  
Length to base ring: 15 cm  
1st reinforcement to 2nd, 3rd: 46cm, 42cm  
Chase length: 72cm  
Length of chase girdle: 5cm  
Length of vent field: not visible  
Muzzle length: not taken  
Length of muzzle neck: 8cm  
Cascabel button to trunnion center: 100cm  
Trunnion center to muzzle: 120cm  
Diam. of base ring: 18cm  
Diam. of chase girdle: not taken  
Diam. of muzzle neck: 18-20cm  
Diam. of muzzle face: 18cm  
Diam. of muzzle swell: 18cm  
Trunnion position: low  
Width across trunnions: not available  

Note: Measurements are not exact  
(Due to accretion)

Figure 36. Cannon Diagram and measurements.
Chandelier Element

An unidentified bronze baluster-shaped object was recovered which initially created a bit of mystery and consternation. After a brief flirtation with the notion that it was a central element to an early navigation device called a *cosmolabe*, a visiting colleague of the excavation team correctly identified the object as the central column to a chandelier. Several bronze candleholder brackets were eventually found confirming its function. The discovery of this item suggested the vessel was enroute to an important trading port. The chandelier would be of great value; perhaps it was destined for an important planter or colonial official (Figure 37).
Figure 37. The central element of a bronze chandelier found on the site. Illustration by Jerome Hall.
Candlesticks

A bronze candlestick was found concreted to the cannon and later determined to belong to the chandelier assembly. Two others were reported to have been salvaged from the wreck by treasure hunters prior to the PIMA excavation. Two examples reportedly were in the possession of one member of the salvage team. Efforts were made by the primary investigator and the author to examine these artifacts, but to no avail. One example, said to be of silver, could possibly have had hallmarks which might have provided evidence for dating the site.

Chisel

During the 1996 season a large carpenter's chisel was excavated from the central hull area. Bearing no significant diagnostic markings it was still an important discovery. Coated with a thin layer of iron oxide it still retained a sharp edge after three hundred fifty years.

Nails

Numerous ferrous and brass alloy nails and fasteners were recovered from the site as well as magnetite shells of the same. These varied in size from small brass nails used in furniture construction, sheathing nails used to fasten lead patches, various sized iron nails found in wooden elements and concretions and larger brass or bronze spikes utilized in securing larger timbers. Of the hundreds of concretions recovered, many appear to be or contain fasteners of some kind and await detailed analysis after proper conservation.
Coins

Approximately 30 assorted coins were excavated from the site during the first three field seasons. They were comprised primarily of silver *ocho reales* commonly known as cobs or pieces-of-eight. Many were partially reduced from oxidation, leaving severely eroded edges and losses to detail. The majority of coins were recovered from the southern section of the hull area. This location yielded numerous diagnostic artifacts including several small three-legged pots, galley spoons, wick tweezers and other utilitarian items.

The first Spanish coins were minted during the reign of Ferdinand and Isabella in 1474 (Calico/Trigo 1988: 17-21). These coins were typical in general appearance to other European coins of the period, circular in shape and molded from dies bearing the Spanish coat-of-arms and the image of the king and queen. After the discovery of the New World and the establishment of the first colonial mint in Mexico City in 1535, a simple and more economical method of minting coins was sought resulting in the first formal issue of New World coinage in 1536. As the main volume of coinage was meant for bullion specie shipped directly to the king’s treasury, the need for uniformity in coin design was not considered necessary.

The first colonial silver coins were not cast in molds but created from irregular pieces cut from cylindrical bars into different denominations, based on the weight and silver content of each. The rough-cut blanks were weighed and pared to the correct value by shears or a chisel. The leftover scrap was later re-melted. The blank planchets were then reheated or annealed to make them soft enough to take the impression of the dies.
The dies were stamps created with the embossed image of the Spanish coat-of-arms and the Cross of Jerusalem. The stamp was placed on each rough coin blank and manually struck, leaving behind a crude, one-of-a-kind coin. In addition to the royal stamp, each assayer or mint master had his own particular identifying stamp or stamps which was intended to be a guarantee of weight and purity.

These irregular coins were called “cobs.” This term derived from the Spanish term *cabo de barra*, literally translated into “cut from a bar” (Petersen 1975: 44). A piece-of-eight is roughly the same value as an American silver dollar. In fact, the U.S. silver dollar is a direct descendent of the Spanish eight-reale, the first coin used in colonial America. While pieces-of-two and pieces-of-four were also minted, low circulation often prompted the physical cutting of a single piece-of-eight into eight separate pie-shaped wedges as a way of making change. It was this process that led to the term, “piece-of-eight.” The American colloquial expression of “two bits”, meaning twenty-five cents, is derived literally from “two bits” of eight. Spanish *ocho reales*, or pieces-of-eight, were not minted until 1573.

The prescribed weight of a *reale* was 27.4680 grams between their earliest mintage and the year 1728, and 27.0642 grams thereafter. The king required the silver to be refined to slightly over 93% purity, the remaining percentage to be of copper, tin or zinc to produce a coin hard enough to hold up to circulation. After stamping, the coins were then blanched, a form of tempering to re-harden and produce a finished sheen or luster (Sedwick 1990: 19).
Despite strict regulations, pieces-of-eight were seldom accurate in weight. Their irregular shape invited dishonesty and unscrupulous individuals often shaved off slivers of silver, knowing that the coins were not likely to be weighed during a transaction. “Slingers”, as they were called, put dozens of coins in a canvas bag and slung them against rocks, breaking off chips of silver in the process from the many coins. They removed the chips and returned the balance to circulation. The bag was then burned. Illegal practices such as these eventually led many merchants to weigh every piece of silver during a transaction. This was the main disadvantage of the cob over a circular coin as a unit of exchange.

The standard royal coat-of-arms reproduced on most Spanish coinage incorporated symbols of the king of Spain’s dominion in Castile, Aragon, Leon, Naples, Sicily, Austria, the Spanish Netherlands, Burgundy, Brabant, Flanders, Tyrol and Grenada. The legend encircling the coat-of-arms reads: PHILLIPVS-III-D-G+, which translates as “Philip IV. by the grace of God.” On the reverse side of the cob was an embossed Cross of Jerusalem surrounded by the date of manufacture and the legend REX-HISPANIARVM-ET-INDIARVM or “King of Spain and India.” Many cobs were struck rendering much of the written text and the date illegible. For this reason, many appear to be undated. This was also true of the coins recovered from the Monte Cristi site. While certain details were quite clear, none of those recovered bore a legible date (Hall 1996: 203).

Despite the absence of dates and the poor condition of the Monte Cristi reales, enough physical detail remained on several coins to identify their origins and provide
valuable clues to their dates of manufacture. This evidence allowed Mr. Henry Taylor, a specialist in Spanish coinage and a PIMA consultant, to establish a *terminus post quem* that superceded earlier dates determined by the clay pipes (1630) and ship’s timbers (1642). Of approximately 30 reales recovered, 6 were positively traced by Taylor to the Peruvian mint of Potosi, and a single rare example (PW 788B) to the Nuevo Reina mint at Bogota, Columbia.

The first major bullion shipment to Spain from the New World mines in 1538, was transported by a fleet under the command of Blasco Nunez Vela. In addition to the 268,750 ducats of gold, the treasure shipment contained 335,000 pieces-of-eight (Petersen 1975: 36).

In 1545, a rich silver vein was discovered in the Potosi mountain range of upper Peru. This event rapidly increased the volume of silver bullion produced for the royal coffers of Spain. According to Antonio Vasquez de Espinosa, a Carmelite friar at Potosi who kept a record of mine activities, the mines yielded between the years 1545 and 1628, over 1,800,000,000 pesos. To achieve this incredible volume, the mint used the slave labor of over 13,300 Mita Indians. The discovery and use of the mercury process to amalgamate silver also added to the efficiency of operations and volume of silver recovered (Petersen 1975: 37). The Potosi mine contained the richest silver deposits of any in the New World. Like many of the mines of the American west three hundred years later, the mines were so productive that the community around them contained 80 churches, 36 gambling houses, 700 gamblers and 120 prostitutes (Menzel 1992: 50 as cited in Hall 1996:203). Christened Villa Imperial, the population rose to 160,000
inhabitants by 1611 and became the largest city in the New World (Murray 1986: 2477 as cited in Hall 1996: 205).

According to Taylor, a scandal occurred at the Potosi mint during the early to mid 1600s in which the purity of the silver was compromised with copper and other contaminants. Between “25 and 50%” of the whole volume was affected. In 1644, the viceroy of Peru, Marques de Manxcera, detected fraud at the Real Hacienda at Potosi, but nothing was done for fear of interrupting the mining operation and flow of bullion. An investigation was conducted in 1649 by Dr. Nestares Marin in which numerous officials were found guilty of corruption and fraud. Many went to prison and some were executed. The scandal led to the devaluation of Potosi reales in the years 1649 and 1651 from eight to seven and-one-half reales. During these years, the mint counter-stamped the coins with one of 23 different stamps, identifying the devaluation (Figure 38). Coins produced before 1649 were reduced in value to six reales but were not stamped (Hall 1996: 205). The records of the Potosi mint reveal that a total of 4,002,076 reales were produced during the years 1649-1651, a slight but not significant decrease in the volume of production in the years immediately previous to the scandal (TePaske and Klein 1982: 310-315).

This information provides important clues to the dating of the Monte Cristi shipwreck. Of the Potosi coins recovered, three show evidence of counter-stamps. Artifact PW 923a, an ocho reale, bears the mark (O) of Juan Rodriguez de Roas, an assayer who arrived in Potosi in 1649. He was replaced by Antonio Ergueta, whose mark was (E), in 1651. This is important for it strongly suggests that the Monte Cristi vessel
could not have sunk before 1649 when de Roas arrived in Potosi. This fact, when combined with the known dates of clay pipe manufacture (1630-1665), leaves a window of 16 years (1649-1665) during which time the vessel could have sunk.

Other Potosi counter-stamped coins have been recovered from other wrecksites including three from the *Nuestra Señora de Las Maravillas*, lost near the Bahama Islands in 1656; also from the *Vergulde Draeck*, which sank off western Australia in 1656; the Chanduy Reef wreck off Ecuador, which sank in 1654 and a Spanish wreck at Jupiter Inlet, Florida (Hall 1996: 208) (Figure 39).
The rarest of all the *ocho reales* recovered from the site was manufactured in the Nuevo Reino mint at Bogota, Columbia. In 1620, King Philip III authorized the opening of a private mint in the region of Nuevo Reino de Grenada, a branch of the Santa Fe de Bogota Real Hacienda. The king assigned control of this new operation to Captain Alonso Turillo de Yebra. The Nuevo Reino mint was the first of the colonial New World enterprises to manufacture gold coins, although for more than a century it was limited to the production of one and two escudos. As this region produced little silver ore, all silver coins made at the Nuevo Reino mint were by-products of the gold manufacturing process and are considered extremely rare. The obverse side of the Monte Cristi coin (PW 788b)
bears a small pomegranate in the lower center of the coat-of-arms signifying the arms of Grenada (Figure 40).

Dr. Frank Sedwick, rare coin dealer and noted authority on Spanish colonial coinage, states: “... in many cases the assayers’ [marks] found on dated coins do not correspond to the mint records of these assayers’ dates of tenure, while still other dated coins bear initials that cannot be logically substantiated by the mint records of any period.” He also notes that silver issues at the Bogota mint changed from the Cross of Jerusalem to pillars-and-waves in 1651, one year earlier than at Potosi (Sedwick 1990: 15). The design symbolized the Pillars of Hercules and the Straits of Gibraltar, gateway between the Old and New World.
Figure 40. A rare eight reale cob from the Nuevo Reino mint at Bogota. It bears a pomegranate in the lower panel, signifying the Arms of Grenada. Photo by Jillian Nelson.
Tacks

Five years of excavation produced 56 brass-alloy upholstery tacks. These were primarily round and domed in shape with a four-sided tapered shank. The diameters of the heads measured 0.8cm, 1.2cm, 1.8 to 2.0cm and 2.4cm. Similar tacks were used to attach leather straps to the seats of chairs. They were also used to decorate leather-covered trunks or sea chests. The author viewed such a chest in the Tower of London on a 1995 trip to U.K. The limited number of tacks recovered to date suggests that they were probably part of the ship’s furniture and not part of the ship’s cargo (Figure 41).

Figure 41. Photo of brass tacks recovered from site. Photo by Jillian Nelson.
Nested-Weight Set

During a survey dive in 1986, a small concretion was recovered that bore the tell-tale blue-green tint of a brass-alloy object. When freed from its crusty encasement we were pleased to discover a brass nested-weight set. Subsequent analysis suggested it was a product of Nuremberg, manufactured during the mid-seventeenth century. The set consisted of seven individual cups, each one weighing exactly twice that of the next one inside the nested stack and one small disc weighing the same as the smallest cup. The set was recovered complete including the outer cup with a hinged lid acting as a case for entire set (Hall 1996: 191). Nested-weight sets have been recovered on numerous shipwreck sites including the Sea Venture (Adams 1985); the Batavia (Stanbury as cited by Hall 1996) and the Whydah (Clifford 1993). The author observed a similar partial set on display in the Lighthouse Museum in Bermuda in 1991. Another comparable set was reportedly salvaged from the Monte Cristi site during the 1970s (Hall 1996). This suggests that the weight sets were probably merchandise and not simply the property of the captain or member of the crew. Hall was able to determine that the set found on the Monte Cristi site was probably calibrated in English pounds, suggesting it was intended for use among Anglo-American communities (Figure 42).
Oil-Pan Lamp Hooks

Several fish-hook or small harpoon-shaped spiked objects were found which prompted numerous opinions on their intended function or purpose. From their basic appearance, it seemed that they must be fish-hooks or perhaps clock keys. An eyelet at one end strongly suggested that they were meant to be tied to a line for some function, such as fishing. As more fragments were recovered it became more apparent that they were in fact hooks designed to hold small oil-pan lamps widely used during the period as an inexpensive method of lighting (Figure 43). The hooks could be utilized by hanging over a limb, ceiling timbers or fireplace to suspend an oil-pan lamp filled with grease or whale oil. They could also be used as alternative tool such as a fishing or hunting barb, all useful trade items for colonists and frontier settlers.
Figure 43. Illustration of a pan lamp bracket recovered from the site. Illustration by Jerome Hall.
Wood

In addition to the hull timbers, other items of wood were also discovered during the five years of excavation, including remnants of wood packing crates used to ship the kaolin smoking pipes. These measured approximately 1/4 inch thick and appeared to be 1 foot long. Small lathed pieces of wood found within the wreckage were probably pieces of a chair leg or other ship furniture.

During the excavation southwest of the hull in 1994, a log with an ax hewn end was recovered from beneath a section of bottom hull planking. Measuring 6 inches in diameter and 6 feet long, it was extremely dense and had a hollow center. Subsequent testing proved it to be dyewood, a product sought as a source of dye often found at Campeche on the Yucatan peninsula. This may have been simply a piece of ship dunnage or possibly the only surviving example of the ship’s cargo of dyewood.

Floral Remains

While the inventory of floral remains from the Monte Cristi site was not prolific in volume, numerous individual items were recovered by the research teams including a peach or nectarine pit, a clove, five unidentified nuts or seeds and a deposit of buckwheat chaff, utilized as packing excelsior in wooden packing crates to protect fragile kaolin pipes during shipment. After recording their location the items were conserved and sent away for analysis by Philippa Tomlinson of the University of York, England, and by Alison Lean of the National Fruit Collections, Wye College, Kent, England. According to Tomlinson, the buckwheat was similar to that found in a wooden box containing clay
pipes on the *Vergulde Draeck*, a Dutch VOC ship sunk off Western Australia in 1656 (Green as cited by Tomlinson, PIMA archives).

Several olive pits were among the floral remains discovered amid the bilge timbers. Analysis and research revealed the olives possibly came from the eastern seaboard region of America, another bit of evidence supporting the possibility that the ship may have been to the ports of the Chesapeake (Lean, 1992 PIMA archives).

**Ivory Fan Fragments**

In 1992, small, slender pieces of ivory were discovered which were later determined to be the remains of a seventeenth-century fan. Scattered across several grid squares, enough fragments were collected to suggest the general shape of the original object. Most elements measured under three inches and were scalloped along one edge. Each contained tiny holes which at one time were used to connect the elements together with thread, forming an elegant traditional accordion-type fan, no doubt intended for a woman of position in the New World.

**Basket Fragments**

Several small fragments of basketry were uncovered beneath existing planking. The material appeared to be made from palm fronds, each strip measuring approximately 3/4 inch in diameter, woven in a simple over and under pattern to create a durable, utilitarian basket. As only small fragments were recovered, the size of the original container could not be determined. Several contemporary baskets for sale in the local markets appeared quite similar in pattern, supporting the theory that a utilitarian object
such as a basket never outgrows its usefulness, or simplicity of design. The fragments have yet to be analyzed to confirm their specific origin.

**Bones**

Numerous faunal remains were recovered from the shipwreck. Pig, sheep, and bovine bones were excavated from the site as well as the jawbone of a common rat and a single tooth from an unidentified animal. Many of these finds were discovered with evidence of cutting, suggesting that they were remnants of the crew’s or passenger’s mess and not elements of commercial cargo.

**Artifact Conservation**

Due to the large volume of artifact material recovered by each field team, a certain amount of triage was utilized in the process of conservation. After recording the location of the artifact, each item was raised and transported by boat to base camp on Isla Cabras. Here the items were identified, registered and put into temporary storage prior to shipment to the laboratory in Santo Domingo, eventually becoming part of the national collection on display at the Faro de Colon. Volunteers were instructed on cleaning procedures and assigned ceramic materials to be mechanically cleaned and drawn in field notebooks. Metallic concretions were drawn and bagged for transport, to the laboratory.
Artifact Analysis

The limited structural remains of the Monte Cristi vessel make definitive conclusions regarding its size, identification and destination difficult at best, but analysis of the artifact material recovered from the site supports some of the theories regarding the vessel. Much of the recovered material is similar to that found on other shipwrecks of the period. The type and origin of certain items strongly suggest several regional ports-of-call and suggest an approximate *terminus post quem* for the vessel. The variety of cultural material contained in the vessel strongly suggests trade with affluent Europeans as well as Native Americans. While only one cannon was recovered, the size and type offers clues to the vessel’s size and nationality. Organic artifact material recovered from the site reveals shipboard conditions and life among Caribbean sailors during this period. The
physical condition and location of certain items speak to the wrecking process and possible demise of the vessel.

The cultural material recovered from the site falls into four general categories: 1) ceramic items including clay smoking pipes, Rhenish stoneware sherds, tin-glazed earthenware sherds, a few green and yellow lead-glazed sherds and various bricks and brick fragments 2) metal artifacts including many iron objects contained in concretions, copper alloy items and objects of lead, pewter and silver manufacture 3) glass items including shards and beads 4) organic artifacts including seeds, bones, textiles, dye and animal hair mastic.
CHAPTER 3: HISTORICAL BACKGROUND OF THE REGION

Pre-Columbian Hispaniola

Prior to European discovery, the island of Hispaniola was occupied by the first “Indians” of the New World. A single type of indigenous people and culture occupied the Greater Antilles as a whole, including Cuba, Haiti, Puerto Rico, Jamaica and the Bahama Islands. Known as Arawaks, they are more recently known anthropologically as the Taino, the name deriving from a single social class (Loven 1935: 16). Much of what we know of the Taino is based on the written accounts of the earliest chroniclers of the islands: Peter Martyr, Fernandez de Oviedo y Valdes and Bartolome de las Casas. Peter Martyr d’Anghiera, an Italian cleric, royal tutor and member of the Spanish court, wrote extensively on the native culture of the New World from 1493 until his death in 1526. Another writer, Fernandez de Oviedo y Valdes did not arrive in the New World until 1514. The author of several works on the history of Hispaniola, his most important contribution was the Historia Natural y General de las Indias, a natural history written in 1526 during the decline of the Taino culture. Bartolome de las Casas, the Catholic priest who spent over ten years in Hispaniola is probably the best and the most frequently quoted of the early historians on native Caribbean culture. His treatment of the subject took forty years to complete and is considered by many historians to be the authoritative work on the Taino culture. According to historian Carl Ortwin Sauer, Las Casas was an attentive and accurate observer, appreciated the fact that he was recording history for posterity and was careful to cite his sources in his various works on the Taino culture and the impact of Spanish occupation of the Caribbean (Sauer 1966: 56).
The social structure of the Taino consisted of numerous villages, each controlled by a chief, or cacique. His subjects were divided into upper and lower classes, the nitaino and naboria. Primarily agricultural in nature, the Taino society developed a sophisticated system of subsistence farming, producing cassava, beans, corn, peanuts, turnips and other crops. These products provided the Taino with the necessary carbohydrates and sugar of their diet, while the protein and fat were obtained from fish, turtles and waterfowl (Sauer 1966: 58).

In addition to agricultural and hunting skills, the Taino developed a sophisticated system of inter-island travel and trade conducted over long distances by utilizing dugout canoes. It is apparent from the historical record and archaeological findings that trade existed between the native people of Hispaniola and those of Central America. References to native ocean going canoes are found in abundance in the journals of early Spanish adventurers. Columbus' took notice of the construction methods in his journal: “[The canoe] . . .was made of the trunk of a tree like a long boat and all of one piece and fashioned with great skill, holding from one to forty-five people, propelled by a shovel like that of a baker, and bailed by calabashes.” Ferdinand Columbus, during a stop on the Isle of Pines, on the Honduran coast, observed a native trading vessel: “. . .there came at that time a canoe as great as a galley, eight feet wide, all of a single trunk, and made like the others, which came loaded with merchandise from western parts, from the side of New Spain. Amidships it had a canopy of palm leaves, like that of gondolas in Venice, which protected what was underneath in such a manner that neither rain nor waves could wet anything within. Under this canopy were the children, women and all
the baggage and merchandise.” The large size and capacity of the canoes noted by Fernandez and other contemporary historians strongly suggests extensive trade between islanders of the Caribbean and the Mesoamerican culture of Central America before European contact (Sauer 1966: 131).

The island of Hispaniola is comprised of two nations with different histories and distinctly different cultures. The Republique of Haiti occupies the western third of the island while its neighbor, the Dominican Republic, possesses the eastern two-thirds. The nations are divided north and south along the Massacre River. According to the first cartographic survey of the island conducted by Andres de Morales in 1508, the natives of Hispaniola divided the island into five separate provinces. The native Arawak name for the island was Quisqueya which translates into “a thing than which there is nothing greater” (Sauer 1966: 45). The first province, which incorporated the whole southeastern peninsula was known as Caizcimu. Cimu translates as “front” or “beginning.” This region was the first point of entry by the native population. The northeastern province of Huhabo extended along the north coast from Samana Bay to the Rio Yasica. Its interior borders the mountain range of Sierra de Quitaespuela. Sparsely populated and of minor interest to the occupying Spaniards, offered little in the way of mineral wealth or other amenities. The third province and second largest of the five was Cayabo. It is today the western section of the Dominican Republic. Its border extended on the northern coast from the Rio Yasica on the east, westward past the settlements of La Isabella, Monte Cristi and beyond the original site of Navidad. It crossed the island to the southern coast where it spanned east and west from the Ozama river to Ocoa Bay. Beyond its borders,
the fourth province of Bainoa encompasses the larger part of present Haiti with the exception of the southwestern peninsula which made up the fifth province of Guacayarima. Its name means the posterior, or end of the island (Sauer 1966: 47) (Figure 45).

The Taino culture was eventually destroyed by Spanish domination, imposed slavery and diseases imported by their European slave masters. The villages located in the Monte Cristi area of the northern coast were eliminated during the administration of Columbus’s brother, Bartolome Colon, during the early 1500s (Hall 1996: 11).
Figure 45. Geographical map of Hispaniola showing Taino provinces of island. Based on Morales, 1508. (Sauer 1966: 46).
European Discovery of Hispaniola

Columbus became aware of the island of Hispaniola on December 5, 1492. On December 6, the *Santa Maria* anchored in Port St. Nicolas, named for the vigil of the feast of St. Nicolas, patron saint of children. Anxious to continue his discoveries, he sailed east on December 7. Hugging the coastline, Columbus took his entourage east and anchored in a harbor he named Puerto de la Concepcion for the vigil of the Conception of the Virgin. It is now known as Moustique Bay. It was here on December 9th, after commenting on how much the island reminded him of Spain, that he named the island La Isla Española. Peter Martyr later latinized the name to Hispaniola. During this stop, a native girl was captured and given good treatment, encouraging her to stay with the “men from Heaven.” After a thorough interrogation the girl was sent with an escort to make contact with the native population. She led the sailors to a village of 2,000 people who greeted Columbus and his men with gifts of parrots and food. Columbus queried the Indians on the location of Babeque (Great Inagua), where he expected to find gold. He subsequently sailed through the channel south of Tortuga where his ships made contact with a solitary Indian who agreed to serve as an intermediary with the local villagers. It was here that Columbus met the son of the local *cacique* Guacanagari and saw the first gold of the New World. Though Columbus treated his guest with generosity, his writings reveal the intent to betray the trust of the natives for the sake of gold and riches (Morison 1942: 287-289).

Through incorrect translations and mistaken identity, Columbus confused the name *Cibao*, the mountainous central region of Haiti with *Cipangu*, the legendary city,
known for its gold-roofed palaces. In his haste and driven by his greed to locate this fantasy city of gold, the admiral grounded the Santa Maria near Puerto Navidad on Christmas Day, 1492. Unable to free the wrecked vessel, Columbus decided to put ashore and establish a camp. With timber salvaged from the wreck, the first European edifice was erected in the New World. After an anxious but successful rendezvous with Martin Alonzo Pinzon, Columbus continued his voyage on January 4, 1493 in his new flagship, Nina. With 39 men of his entourage stranded at Navidad, and fearful that Pinzon might beat him back to Spain and take credit for the new discoveries, Columbus immediately sailed for Spain. After a half day’s sail, he spotted a prominent island or mountain to the southeast “in the shape of a very fine tent” which he named Monte Cristi (Morison 1942: 307-308). The following day, he anchored in the lee of the mountain near Isla Cabras, a small island not far from the present location of the Monte Cristi shipwreck. It was at this anchorage that Pinzon came aboard the Nina to plead innocent to charges that he abandoned Columbus and to relate his adventures which included an inland trip to the gold region of Cibao. During two windbound days in Monte Cristi Bay, Columbus had the Nina caulked, gathered food and water, and sent an exploration party up the Rio Yaque del Norte where gold flakes were discovered the size of lentils, the first virgin gold recovered by the Spanish in the New World.

Columbus returned to Monte Cristi on November 25, 1493 on his second voyage to the New World. He anchored once again off Isla Cabras where a shore party discovered the decomposed remains of two men on the banks of the Rio Yaque, part of the group left behind the year before. After proceeding to Navidad and learning the story
of the tragic fate of the small colony at the hand of the local Indians, Columbus began to seek a location for a permanent settlement on Hispaniola. He retraced his route, beating against the strong easterly wind, arriving back at Monte Cristi on December 8, 1493 (Morison 1942: 423-429). After many days in the Mariagalante, Columbus’ party of seventeen ships arrived on the northern coast of Hispaniola. He chose this place as the first formal Spanish colony and settlement of the New World, and named it Isabella after the queen.

The first authorized expansion of settlements or “villas” in Hispaniola came in 1501 when Governor Nicolas Ovando received the following instructions: “It is necessary to establish some settlements and it being impossible to determine from here their proper form, you shall inspect the places and sites on said island and according to the quality of land, place, and people in addition to the present pueblos you shall undertake to establish others in the number that seems proper to you, in the places and locations that seem proper.” Fifteen official “villas” were established in 1504 and 1505 throughout the island, Puerto Real the nearest to Monte Cristi. All immigrating Christian immigrants were required to reside within the villas, the central areas of official development in the region (Sauer 1966: 152-53).

The primary interest in the western settlements was the organized subjugation of the native population into slave labor to work newly established copper and gold mines. Spanish immigration to the villas increased from the original three hundred with Ovando to eight to ten thousand by 1508. Ovando’s administration encouraged immigration by entrepreneurs to Hispaniola, promising them four-fifths of all gold they mined.
(Sauer, 1966: 150). Mass exploitation of the native population occurred between 1501 and 1504. Six of seven Indians on the island died through overwork, disease or harsh treatment by the *encomenderos* who imposed taxation, trade requirements and established organized slave labor for the villas (Las Casas, Bk II, ch. 37). The lack of substantial gold deposits and exploitation of the native population produced a decline in the island’s development as governmental interests turned to Central America and neighboring islands.

Dominican friars who arrived in 1510 were shocked to discover the status of native inhabitants. Las Casas, working closely with the friars, helped document the poor conditions of the native population and foster improvements in their treatment. Despite these efforts, the native population continued to decline, accelerated by smallpox epidemics in 1518.

**European Challenge to Spanish Claims and Immigration to the Region**

For almost a hundred years after Columbus discovered the New World, Spain was virtually unchallenged in its domination of the western hemisphere. However, by the middle of the seventeenth-century the West Indies had become an economic war zone for the nations of Europe. The Treaty of Vervins (1598) between Henry IV of France and Philip II of Spain established the maxim of “No peace beyond the Line.” This vast area west of the longitude of the outermost Azores and south of the Tropic of Cancer became the focus of a prolonged struggle for the economic wealth of the Caribbean and the Spanish Main. Spain attempted to defend its claims from encroachment by the nations of northern Europe, but soon discovered the task was beyond its capability.
English challenges to Spanish domination of the New World increased following the defeat of the Spanish Armada in 1588 and continued with raids on Spanish held New World ports by Sir Francis Drake in the late 1500s. "After 1625 swarms of English and French colonists poured like flies upon the rotting carcass of Spain's empire in the Caribbean, and within ten years the West Indian scene was changed forever" (Bailyn 1955: 84). English and Dutch adventurers established claims "beyond the line," and armed conflict began in earnest over the geographical and economic wealth of the region. The capture and occupation of these Caribbean islands led thousands of English, Irish and Dutch citizens to voluntarily leave their home countries for prospects in a foreign and hostile environment.

Reasons for northern European migration varied among the social classes. The gentry were motivated by the desire for further riches and power. Among this group were men who sought to recoup fortunes they had lost during the English civil war while the poor sought land and security from authoritarian repression and poverty. All were intent on replacing the native culture of the Caribbean with that of their homeland. While religious persecution was a motivating force in the Puritan migration to North America, it did not influence English immigration to the Caribbean islands (Bridenbaugh 1972: 16-23). The Dutch, masters of maritime proficiency and money management, saw immense opportunity for commercial gain in the region and both nations rapidly moved to challenge the Spanish hold on the area. The English moved first, establishing a colony on the island of St. Christopher in 1623, while the Dutch followed in 1624 with the capture of the important Brazilian port of Bahia. The next year Barbados was occupied by
England and in 1630 the Dutch seized the islands of Curacao, Saba, St. Martin and St. Eustatius. The colonization of these islands during the 1620s and 30s required cheap labor to clear forests and plant commercial crops. This led to a period of indentured white slavery as rich merchants recruited thousands of dispossessed men and boys and signed them to long terms of indentured servitude in Caribbean colonization schemes. Most came to escape famine and poverty and many were tricked or shanghaied by unscrupulous merchant adventurers. While the majority of male immigrants possessed some degree of husbandry, most were illiterate and unskilled. Most had little knowledge of what lay in store for them once they arrived at their destination. All suffered a poor diet, labored long hours with no recreation and under constant threat of attack by hostile natives or Spanish patrols. The majority of immigrants were single males, separated from family and friends who lacked the emotional support needed in an environment devoid of social and religious structure common in their homeland. By 1643, 20,000 Irish immigrants worked the fields in St. Christopher. Barbados was gradually transformed into dozens of tobacco plantations, employing thousands of indentured English and Irish. Between 1645 and 1655 an exodus began to take place among the white male immigrant population in the Caribbean islands. As early as 1640, Richard Hackett led a party of runaway indentured servants to settle on the island of Hispaniola. All were killed or eventually died of disease. In 1647 William Jackson organized 750 disgruntled indentured servants on a raiding expedition to the Spanish Main. All the reasons cited earlier created the climate for desertion and rebellion. Many individuals sacrificed their
freedom from owners where they had no future at barely survival wages, for a chance at plunder on the Spanish-held island (Thomas 1995: 120).

Henry Whistler when speaking critically of Barbados in 1654 noted that, “This island is the dung hill where on England doth cast its rubbish” (Bridenbaugh, 1972: 166). The thousands who emigrated to the islands of the Caribbean quickly discovered that ingenuity and adaptation were necessary skills for survival. There were no real houses for the workers, only grass huts. Most immigrants lacked the proper tools to clear away the heavy forests and thick vines covering most of the usable land. During the first years of occupation, the labor required to clear the land forced many to plant crops between the limbs of felled trees, rather than removing them. Despite their efforts, by 1650 only the coastline littoral zones had been cleared of forests. Food consisted of casava, potatoes, maize and kidney beans, supplemented by wild game and occasionally fish. Immigrants soon learned that small plot farming was not economical and almost always produced too little food for adequate sustenance.

Survival proved to be too difficult for many early arrivals. The hot and humid climate made labor difficult under the best of conditions. Insects were prevalent and lack of sanitation and bad water rapidly produced diseases to which most were not immune. Ships brought rats leading to outbreaks of cholera and the plague, killing and weakening hundreds at a time. Constant forced labor and the lack of medical care and proper diet led to depression and indulgence in alcohol. A large portion of the male population suffered from alcoholism. Many of the poorer immigrants drank an alcoholic concoction called Mobbie, made from fermented sweet potatoes. In addition, the import of the sugar
industry from Brazil brought about a proliferation in the manufacture of rum. Between the boredom, hot climate and poor living conditions, many men consumed 30 drams of rum per meal. It has been said that many passed out on the road and had their fingers and toes bitten off by crabs without raising from their drunken stupor. It was common for the plantation owners and upper class gentry to present their guests after dinner with a trencher full of tobacco and pipes and another full of brandy. They would smoke and drink until they passed out (Bridenbaugh 1972: 50). Nor was alcohol the only diversion among the men. Just as a majority of the male population bore evidence of an immoral and questionable background, the women of the indentured class who emigrated to the Caribbean either by choice or necessity, were given to whoring and prostitution. According to Bridenbaugh, sodomy, bestiality, adultery and incest were prevalent in the early years of island immigration. One observant gentleman at the time stated: “A whore if handsome, makes a wife for some rich planter.” Sea captain James Fuller, commenting on the debauched state of island government noted: “If all whoremasters were taken off the bench, what would the governor do for a council?”

Clearing the land for tobacco crops demanded manpower and in most instances the only men who could be convinced to emigrate were those in prison or those of lower social order, outcasts who had little choice in life but a long term indenture to unscrupulous masters who worked men ruthlessly and often forced female conscripts into sexual slavery or prostitution. Forced immigration was often the norm for men as well as women. Many arrived in overcrowded and disease infected ships and then rapidly transmitted their illness to the local population. Twenty men died a week during the
smallpox epidemic of 1646-48, but these were quickly replaced by other arrivals
convinced that a better life could be had if one worked hard enough. More than 12,000
prisoners of war were sailed from England in 1652
to be used as field laborers (Davis 1967: 69).

**Slavery and Inter-island Migration**

The 1650s brought distinct and profound changes in the society of the Caribbean
islands as events began to alter the cultural composition of the region. As early as 1630,
the islands of Barbados and St. Christopher began to receive a limited number of African
slaves into the labor force. In the 1640s the English Civil War stopped the flow of
indentured Englishmen, and the Dutch began to import more slave labor as the white
immigrant population became impacted by disease. By 1650, over one half of all white
indentured persons had died. In 1654, the Dutch colony at the port of Recife-
Pernambuco on the coast of Brazil was retaken by the Portuguese (Boxer 1990: 125).
This ended the lucrative slave trade established in that region and forced the Dutch to
look about for another base from which to continue the profitable trade in African
manpower. Many Dutch and Jews migrated to Barbados and began to import slaves
from Africa to increase the production of sugar (Thomas 1997: 187). The first triangular
slave voyage took place in 1643 when a New England trader returned from the Canary
Islands with tobacco from the island of Barbados which he had received in return for
slaves he had procured on the island of Maio in the Cape Verde archipelago. This voyage
suggested to the merchants of New England the rich possibilities of commerce with the
islands of the Caribbean (Bailyn 1955:84). From a land of 11,000 impoverished farmers
in 1645, Barbados transformed itself by 1667, through the import of African slaves, into an island of 745 plantation owners in command of 80,000 slaves. This dramatic change in the labor base made the island twenty times richer than it had been during the first 25 years of European occupation. The addition of African slave labor to the region brought two groups of unfree immigrants into conflict with each other which in turn led to profound changes in the island’s demographics. White and black culture, Christian and pagan, temporary servant and chattel slave, the two groups never combined or amalgamated into a cohesive society. Instead, this rather sudden transformation forced all newcomers in the Caribbean into a permanent state of personal conflict with each other and the environment (Bridenbaugh 1972: 400-413).

The increase in African slave importation to the Caribbean islands was the primary reason for the beginning of a new immigration spirit within the Caribbean itself. The new slave laborer had several things in his favor. He was easier acclimated to the climate of the region; because his labor was cheap and efficient, his permanence was assured. Small independent farms gave way to plantation style farming. Black slaves were often imported with their families intact which made adjustment easier and relieved the loneliness. Single white men did not have this important support for peace of mind. George Downing, commented on the importation of slaves to Barbados in 1640: “I believe they have bought this year no less than 1000 negroes, and the more they buy, the better they are able to buy, for a year and a half they will earn as much as they cost.” (Bridenbaugh 1972: 33) This fact resulted in better treatment of African slaves than their white counterparts. They were considered more valuable. There were, of course, other
endemic reasons for this new spirit. Spanish reprisals, overcrowding, political struggles, food shortages, epidemics and pervasive restlessness and failure contributed heavily to this change during the 1650s (Bridenbaugh; Davis; Thomas et al.). These reasons and a general displeasure with the success of immigration by English entrepreneurs caused one official to cynically comment: “Certainly these islanders must be the very scum of scums, and mere dregs of corruption and upon whose endeavors it was impossible to expect a blessing” (Bridenbaugh 1972: 18).

While migration from England to the American colonies and the Caribbean had flowed steadily throughout the 1620s and 30s, by 1640 it almost ceased. In New England, the community leaders’ hopes for a more populous commonwealth disappeared as Parliament’s first acts toward “a general reformation both of church and state. . .caused all men to stay in England in expectation of a new world” (Bailyn 1955: 46).

The Buccaneers and Spanish Efforts to Combat Smuggling on Hispaniola

By the end of the Ovando administration in 1508, the gold deposits sought after by the Spanish crown began to diminish in quantity and deeper mining techniques were required to obtain shrinking amounts of the precious metal. The native labor force, enslaved to service the mines, suffered a high degree of attrition from disease and overwork, greatly reducing the flow of capital from the mining districts (Sauer, 1966: 156). According to Las Casas, between 1494 and 1508, over three million natives perished on the island, a staggering statistic if even an approximation. The decline in gold
production caused the Ovando administration to seek better prospects in Cuba, Puerto Rico, Central America and Mexico.

As government interest and control of the island diminished, the wilds of the northwestern coast began to attract large numbers of shipwrecked sailors, runaway slaves and indentured servants. Over the years, domestic cattle and swine proliferated in the wild and had become a source of survival and a trade commodity for these vagabond hunters. They came to be known by the term boucaniers, a term derived from the Arawakan word boucan which describes a small, specific type of thatched hut with a wooden grill designed for smoking and drying large strips of meat. Buccaneer clothing consisted of little more than a coarse linen shirt and drawers, held together by a rawhide belt that contained their knives, a leather pouch for powder and ball and perhaps a hide canteen. Shoes were most likely crude rawhide strips molded while wet and sewn with sinew to conform to the feet. Mosquitoes were kept at bay during the night by a primitive cloth sack drawn over the body. Their costume was completed with a peaked hat with pointed brim and matchlock arquebus or musket. These rough and fierce characters projected a frightful appearance with their clothing covered in dried blood and grease from butchering game. They survived on a diet of fresh game, together with bread made from the cassava plant. By this time, vegetable plants imported from Spain had become established and domestic fruits were plentiful. According to early French Catholic missionaries residing in the region, the boucaniers chose to be nomadic, living and hunting in small social groups of six to ten. They lived in makeshift shelters called ajoupa erected in remote locations to avoid contact with soldiers or representatives of the
government (Galvin, 1999: 111). According to the journals of Dominican missionary Pere Labat, merchant traders stopped in these wayward outposts and traded powder, shot and manufactured goods to the Boucaniers for hides, tallow, lard, tobacco, sugar, and other commodities (Battle 1974: 101).

During the early 1600s the colonial population in the northern regions of Hispaniola grew desperate for continued re-supply by the Spanish government, especially in manufactured goods. The lack of response to these needs fostered a black market in European goods furnished by wandering merchant sea captains willing to risk the reprisals of government patrols. Local middlemen established primitive dockside warehouses in secluded ports to hold trade merchandise for both parties of exchange. These trade rendezvous, known as ferias, filled the needs of the local colonists for quality trade goods at reasonable prices. The ferias became trade fairs for untaxed illegal merchandise (Hall, 1996: 22). These illegal traders were known as contrabanistas and along with the buccaneers, generated most of the illegal trade in the region. The success of these market fairs prompted the establishment of a major base for buccaneers on the offshore island of Tortuga. Located five miles from the northern coast of Hispaniola, the island possessed several quality harbors, high cliffs for long range observation of ship traffic and sufficient fresh water and game for survival. It was strategically located for illegal trade and was a geographical fortress that became the center of buccaneering and piracy in the Caribbean during the seventeenth century.

As early as 1576, Antonio Barbuda, Hernan Manrique de Rojas and Juan de Valladares, important officials and influential merchants of Santo Domingo requested the
assistance of royal naval galleys to control smuggling on the northern coast of
Hispaniola. These requests had generally been ignored until an urgent appeal was put
forward to police the area by the Audencia’s president, Dr. Gregorio Gonzalez de Cuenca
in May, 1579 (Boulind, 1972: 298). This action resulted in the dispatch of several galleys,
one of which was lost because of a mutiny in 1583. In 1598, Baltasar Lopez de Castro
proposed forced emigration of the major commercial centers of Monte Cristi and Bayahba
to eliminate the Dutch merchants who were a bad influence on the local populace. After
these efforts failed, King Philip II issued a Royal Decree in 1606, calling for the
elimination of several centers of commerce including that of Monte Cristi (Hall, 1996:
24). Other depopulation attempts of the northwestern districts occurred during the years
1605-07, leading to the gradual occupation of Tortuga by Dutch, French and English

Another reason for the increase in smuggling was the devaluation of the local
coinage or vellon by certain elite financiers of Santo Domingo who manipulated the
currency by fraudulently debasing the silver content of the coinage with ever higher
percentages of copper. This action increased the profitability of smuggling by allowing
animal hides to replace the reale as a unit of exchange. As a trade commodity, the hides
from wild cattle of the northern coast were far more desirable than worthless specie.
According to a written account by Captain Bigges, an officer with Drake when he
captured Santo Domingo in 1586: “the golde and silver Mines of the Island are wholy
given over, and thereby they are faine in this Island to use Copper money, whereof was
found in very great quantitie” (Boulind 1972: 20-21).
Caribbean Trade and Smuggling in the Seventeenth Century

Preliminary analysis of the cultural material recovered from the Monte Cristi wrecksite exhibits a profile commensurate with typical trade goods of the period. The majority is primarily of Dutch origin, while the ship itself appears of English construction. With this in mind, it is important to survey the character and evolution of trade in the region during the period of the ship’s demise.

During the early 1600s, Spain concentrated its efforts in the New World on the refining and shipment of gold and silver bullion, while the English focused on colonization and product development. The Dutch, manifesting a true entrepreneurial spirit, emphasized the maritime movement of goods. The rapid acquisition of islands in the Caribbean necessitated an increase in maritime trade in order to keep the initial colonies supplied with manufactured items unavailable locally. This need for products and the desire for profits eclipsed any political barriers that may have existed between England and the Netherlands during this period.

The Dutch and English cooperated in the triangular trade of the period despite Parliament’s imposition of the Navigation Acts installed to protect trade. By the seventeenth century, English shipping had become so deplorable that English sailors were now defecting to Dutch merchant ships (Wilcoxen 1987: 15). Plantation owners, most of whom were English, preferred Dutch goods: linen, lace, gold watches, ceramics, cheap clothing for slaves, hats, shoes, wines from Madeira, French brandy and virtually every manufactured utilitarian product. In 1645, New England and other American colonial merchants began to realize the potential profits to be made in trade with the islands of the
Caribbean, particularly Barbados, whose rapid development of the sugar industry began to increase the volume of island trade. By 1647, the American colonial merchants realized that the men in Barbados “are so intent upon planting sugar that they had rather buy foode at very deare rates than produce it by labour, soe infinite is the profit after once accomplished” (Bailyn 1955: 85).

As the demand for sugar increased, New England exports to the Caribbean began to increase. Plantation owners wanted fish, furs, pork, peas, onions, Pennsylvania flour, weapons, tools, scrap bronze, iron nails and even livestock and work horses. The Monte Cristi wreck revealed numerous examples of these products including scrap iron, dyewood, iron pots, tools and clay smoking pipes. These products were traded for cotton, tobacco, indigo, ginger, dyewood, hides, anatto and of course, sugar. By 1650, sugar was the largest item of exchange for the Dutch. Sugar profits were four times that of tobacco and far surpassed all other products as a cash crop. The demand in Europe was so great the English could not produce enough to fill 21 new ships built specifically to haul sugar (Bridenbaugh 1972: 75). According to merchant entrepreneur John Winthrop, Jr., by 1647 the men in Barbados “are so intent upon planting sugar that they had rather buy foode at very deare rates than produce it by labour, soe infinite is ther profitt from sugar workes after once accomplished” (Bailyn 1955: 85). After only thirty years, England dominated the sugar trade of Europe. English plantation owners learned improved planting techniques and production methods from Portuguese planters in South America. With the proliferation of the sugar industry came the mass production of rum and
subsequent increases in illegal shipments to the American colonies, adding one more item to the smugglers list of marketable products.

By 1650, a polygon of trade routes extended from Pernambuco, Guiana, Curacao, St. Eustatius, the leeward islands of Barbados and St. Christopher, New Netherland, New England, Luanda and other ports in West Africa, the Cape Verde and Canary Islands, and of course London, Amsterdam or other European centers of maritime trade (Bailyn 1955: 86). Even isolated Spanish ports welcomed trade with English and Dutch merchants whose products were of a higher quality and deliveries more consistent than those from Spain. Hides, salt, dyewood and cochineal were desirable commodities of exchange the Spanish offered in return for European or American manufactured goods. Amsterdam was the entrepôt of European trade and the banking industry during the mid-seventeenth century. Its capital and influence were instrumental in the rapid increase in maritime trade activity in the region. The Dutch bought tobacco and cotton from England as early as 1630. Dutch goods were so popular with English plantation owners that Lord Willoughby once suggested to Parliament that all trade in the Caribbean should be with the Dutch (Bridenbaugh 1972: 66). While this candid comment offended the loyalty of many members of Parliament, the landowners on the islands felt little desire to change the status quo of trade with the Dutch during the period. This attitude continued, even after the English annexation of New Netherland in 1664. According to Bridenbaugh, fifty or so New York City or Albany merchants engaged in commerce with Amsterdam entrepreneurs between 1666 and 1690. Much of this trade was illegal and involved smuggling on a large scale. The ports of New England and New Jersey became
the gateways for Dutch goods into America. Illegal traffic was prolific enough to prompt an English merchant, when charged with smuggling in 1676, to comment that he could not sell his goods because of the volume of cheap Dutch goods in Albany that had not cleared English ports (Ritchie 1976: 22). Smuggling was so prevalent within the maritime trade that virtually everyone participated in some manner of corruption, including such high officials as the Mayor of London and the Governor of Virginia. The powerful English East India Company, whose charter specifically provided harsh penalties against any member caught in the act of smuggling, was rise with captains and crews who conspired to put ashore illicit cargoes prior to their official arrival from trading abroad (Williams 1959: 64).

While Dutch trade with American colonies was maintained until the end of the seventeenth century, it reached a high point around 1650. It was so successful that despite governmental disproval, it was often tolerated and on occasion, protected by law (Wilcoxen 1987: 19). The Treaty of Southampton enacted on September 7, 1625 legally installed a trading amnesty between the English and Dutch and "the ports shall be open an free for the subjects of both parties as well as merchants" and that Dutch merchant ships could call at English ports without paying duties (O'Callaghan 1853). This policy was eventually cancelled with the imposition of the Navigation Acts in 1650-51, but during the 1640s while England struggled with domestic problems created by the civil war, illegal trade continued unimpeded. This was due primarily to the imposition of harsh taxes by the Crown, prompting merchant Richard Chambers to comment that "...the merchants are in no part of the world so screwed and wrung as in England"
(Bridenbaugh 1972: 306-307). This view became so commonplace that able and respected lawyers such as Sir Thomas Hardress successfully defended smugglers in the court of the Exchequer (Williams 1959: 75). The lure of greater profits quickly led to the organization of complicated underground trading syndicates by powerful Huguenot refugees residing in London, comparable in status to the organized crime families of today. These groups operated with impunity, counterfeiting customs seals and bribing officials before the goods ever reached the retail vendor. While numerous records document trade in the Caribbean from the beginning of the eighteenth century, records of illegal trade are scarce. Historian Ralph Davis, commenting on English shipping of the seventeenth century states: “From the onset of the Civil War a statistical darkness falls. The Privy Council ceased its inquiries, and no further survey of English shipping was made until 1702” (Davis 1972: 11).

There is one rare exception, however, the Coppie Booke of Lettres, Anno 1678 to 1684, an obscure manuscript left to posterity in the dusty archives of the Institute of Jamaica by a William Freeman. One of the early settlers and plantation owners of St. Christopher, his unique and candid record reveals a glimpse of just how crafty and enterprising a seventeenth-century English merchant smuggler could be when put to the task. In 1678 he ordered from his partner William Helmes in Nevis, eighty large casks to be sent to London in the ship Olive Branch. Upon arrival, the partners purchased the ketch Batchellor, had her refitted and loaded with the empty casks and a small amount of brandy. Captain William Clayton, then proceeded to sail the vessel and skeleton cargo to a secret location in France near the mouth of the Loire, where he secured twenty tons of
French brandy, again in West Indian casks, buried them in the hold under a layer of salt, and then proceeded to Waterford. Upon arrival, he sold the salt and took on as much salted beef as he could carry. The captain's orders were to proceed to Nevis, lay over "an hour or two" at Montserrat, where Mr. Robert Helmes would be waiting to give him further instructions, and to see that "all things may be carryed out with Seaftey and Silence." Helmes even cautioned him to keep the crew on ship in case they might get drunk and let something slip "amongst their comrades." Helmes was told by Freeman that Batcheller's manifest would show the entire cargo of French brandy as shipped out of London. "We must use a little art in making a small alteration" of amounts, so there can be no evidence against us. According to plan, at Montserrat, Helmes had the beef unloaded and later shipped to Nevis in a sloop, then he casually sent the brandy through customs. On the return trip, Helmes took on thirty or forty tons of sugar and cleared customs for either London or Liverpool in the name of William Fox of Nevis so that the partners' names were not revealed on any shipping documents. The complex plan went off without a hitch though Freeman judged the brandy as "not according to Expectations" (Freeman, Coppie Booke: 15, 27-80).

On another voyage, the clever partners utilized a larger vessel, the Adventure. Freeman shipped 20 to 30 tons of brandy secreted in English beer barrels. On this voyage Captain Clayton called at Nantes where he loaded French linens in 20 English-made trunks that were listed in the manifest as "Canvis and Dowlies," and 80 hogsheads labeled as "Aquavitae, under which Denomination Brandy is now generally Shipt out." Freeman instructed Helmes to try to bribe the customs officer at Montserrat when the
cargo was off-loaded and to ship the cargo to Nevis when convenient. Despite several close calls, this second voyage also succeeded. Captain Clayton then sailed the Adventure to Boston loaded with cloth and other illegal products cleverly listed on the manifest as "Rum and Molasses" for a Mr. Peter Sargent, who in turn, sent back to Nevis a reciprocal cargo including 150 barrels of fish to the value of 300 pounds. The shipment was sold in the Leeward Islands and the Adventure returned to England with a hold full of sugar. Due to high rates, Freeman chose not to insure his ship and its cargo. The savings on insurance, the gain from evading the Navigation Acts, the profit from the side trip to Boston, and, with the complicity of the governor, the smuggling of the linens and brandy into Antigua, resulted in a substantial profit from this complex venture. Knowledge was gained during each new smuggling scheme, producing new and more profitable operations, all owing much of their success to William Freeman's meticulous planning and tight secrecy. Due to careful planning and bold execution, Freeman, like many enterprising entrepreneurs during this period, was able to retire from business with substantial wealth. This unique and candid manuscript reveals the complexity and ubiquitous nature of smuggling during the seventeenth century.

While voyages such as the ones described were quite common, not all ventures were as successful as those of William Freeman. Maritime smuggling was risky and penalties were severe. Government agents and spies, pirates, inconsistent availability of products, accidents and bad weather as well as the king’s navy were many of the concerns facing smugglers. Parliament began efforts to prevent its colonies from trading with the Dutch in the Act of 1650 and strengthened the restrictions in the Navigation Act of 1651. That same year Sir George Ayscue’s fleet captured twelve Dutch smuggling
vessels, disguised as merchantmen, lying unladen in Carlyle Bay (Bridenbaugh 1972: 177). In addition to public corruption, England during this period, lacked the ships, sailors and economic organization to supply the many colonies and island outposts in the Caribbean. This enabled an independent, enterprising and bold ship captain the opportunity to fill the void.

According to historian Neville Williams, the smuggler became a celebrated hero to the working class, celebrated in the works of Robert Burns (The Exciseman); Sir Walter Scott and Robert Louis Stevenson. While a hero of romance, the figure was more than often drawn from life (Williams 1961: 92).

*The English serf, allured by hope of gain,*

*Here toiled and found his golden hopes were vain,*

*Then dying, Homeward turned his falling eye,*

*And murmured ‘England’ with his latest sigh.*

A Barbadian poet

Official records for Dutch maritime trade in the Caribbean during this period are scarce because most of the archive of the Dutch West India Company was sold for scrap in 1821. Some records exist pertaining to the first Dutch West India Company, founded in 1621, but the entries for the years 1637-1668 have been lost or destroyed, essentially erasing much of the important history of trade to this region (Meilink-Roelofz 1954: 2). According to Meilink-Roelofz, had the company records survived they would not prove very reliable due to internal corruption and unreported transactions.
The author traveled to London in 1996 to search for any available records pertaining to English trade in the Caribbean region during the mid 1600s. After a five-day search through index files in at the Public Record Office in Chancery Lane and the British Museum, little relevant information was discovered except an occasional anecdotal reference. The author was told by the reference librarians that not many official records of trade in the West Indies were kept during the Cromwell administration. The suggestion was made that Lloyds of London records might contain some useful data, but the author was told that there were no shipping records on file dating prior to the eighteenth century. There were of course, many other repositories where related data may exist, but time constraints did not allow for further research at that time.

As far as Dutch maritime trade records are concerned, Meilink-Roelofz suggests that recorded accounts of commercial matters have a very limited scholarly value; that they are nearly always concerned with trade values, not volume, are usually vague and very often propagandist and demonstrably inaccurate. His conclusions support the possibility that marine archeological data from shipwrecks of the period is at least as reliable as the historical record for analysis of maritime trade of the era.
CHAPTER 4: CONCLUSIONS AND RECOMMENDATIONS

FOR ADDITIONAL RESEARCH

Summary

The goals of this thesis were to examine the hull remains and the artifact material of the Monte Cristi shipwreck site. Other objectives were to identify the type of vessel, the destination of the vessel, and to determine when and why the vessel sank. These questions were pursued using scientific methods. Proper archaeological procedures were employed for excavation of the site, documentation of the hull remains and cultural material, conservation of artifacts, analysis of all data and finally, interpretation of the site.

The limited vessel remains and diagnostic artifacts recovered from the site to date allow for only general speculation on the answers to most of the research questions proposed. The investigation of the site has not been completed and there is little doubt that as new evidence is examined a more precise picture and history of the vessel will emerge. Until then, we have enough information from the data gathered to at least address the proposed research questions. Any conclusions are, of course, subject to revision when confronted with new evidence. Until then, the best attempts to solve the riddle of the pipe wreck will still be speculative based on the information available to date.
A Vessel of English Construction

The research question of the origins of the vessel may be the easiest to solve of those proposed. From the dendrochronological testing of the ship’s timbers we know it is highly probable that the Pipe Wreck was a ship of English origin, that it was built sometime after 1642, and that it was constructed of English oak. The outer hull was also sheathed with a sacrificial layer of planking applied over a mastic layer of pitch and animal hair to protect the main hull planking from the highly destructive teredo worm and other biological degradation. Existing evidence suggests a ship of 15 to 25m in length with an approximate beam width of 6.0m. In all probability it was a small yacht, fluyt or galley, carvel-built plank on frame, ship-rigged with an estimated burden of 140-200 tons (Figure 46).
The lack of a complete keel assembly and limited structural data prevent a precise estimate of the vessel's size. Small ships of all types were active in Caribbean trade during the seventeenth century and carried cargo similar to the items found on the
shipwreck site. While none of the superstructure has survived, the starboard hull remains strongly suggest a vessel constructed in England. None of the construction details normally associated with Dutch construction techniques have been observed. The dimensions of the keel, outer planking and the general placement of floors and futtocks compare favorably with those of the Sea Venture, Dartmouth and the Stonewall. Even though Dutch shipwrights by the middle of the seventeenth century were using plank on frame technique, the fact remains that the dendrochronology testing revealed the wood to be English oak, strong evidence to support the argument for a ship built in an English shipyard. According to wood specialists Jansma and Spoer of the Dutch Dendrochronology Centre (ROB): “...since no trade in wood existed between The Netherlands and England during this time period, the ship could not have been constructed in the Netherlands” (Jansma, personal communication, 1992).

The Route and Destination of the Vessel

One could make a strong argument that the route and destination of this vessel might not have been much different than that of most small Atlantic trading vessels of the era. Artifact analysis shows that most of the ceramic items recovered, especially the Rhenish stoneware and blue-and-white Dutch tin-glazed earthenware, are found on most North American and Native American sites, including both Dutch and English American settlements. Elements of these ceramics have also been found on other shipwrecks such as the Sea Venture, Batavia and Vergulde Draeck. They are also found on land sites in St. Eustatius and Barbados in the Caribbean.
As related earlier, polygon trade between Northern Europe, New England and the Caribbean with stops in the Cape Verde islands on the return, were typical during this era of European expansion into the New World. The types of goods recovered from the Monte Cristi shipwreck fit the general profile of ships running those routes. The lack of any Westerwald ceramics, ornate Dutch glassware and yellow brick has prompted speculation that the ship would not have been destined for a Dutch-American port where these items were highly prized (Havisier as cited in Hall:1996: 231). This is an astute observation, and in the author's opinion suggests the Monte Cristi ship was not bound for a Dutch-American port.

Jerome Hall suggests that the vessel was enroute to an Anglo-American destination. Paul Huey, a noted material culture specialist on Anglo-American sites, observed that the material culture found on the Monte Cristi vessel closely parallels the artifact deposits found on the Compton, Rhode Island site. Both contain funnel angle elbow pipes, a popular trade item with Native Americans. Edward Bird-marked pipes and others with marks consistent with the Monte Cristi inventory have also been recovered at Compton (Hall 1996: 233). The prolific tobacco trade between the Dutch and English colonies in Virginia lends strength to the argument for Virginia or Maryland as a destination. Virginia had produced tobacco since 1612 and trade between English colonies and the Dutch continued until the end of the century, peaking around 1650. The English ban on trade with the Dutch was unofficially ignored and trade was actually encouraged (Wilcoxen 1987:19).
In 1632, Virginia tobacco growers were licensed and heavily taxed by the king. The product was so popular that tavern owners profited highly from selling smuggled tobacco by the pipe and illicit sales flourished everywhere. In the opinion of Charles I, the Virginia colony was "wholly built upon smoke" (Williams 1961: 67).

While the proposition that the Monte Cristi vessel was enroute to a Virginia colony is a strong one, there remains some evidence for alternative theories. The large iron concretions, so prominent on the site, could be nothing more than scrap iron conveniently used for ballast. Alternatively, it could be cargo outbound for ports in the Lesser Antilles or Barbados. The New England ironworks located at Saugus and Braintree were established in 1642 under The Company of Undertakers for the Ironworks. This company was established to produce iron for trade with England and other nations. It was formed out of the need to find a new product that could be traded for needed manufactured goods. By 1648 the company was producing a ton of iron a day. By 1650 the stock at the Hammersmith factory included 106 tons of scrap iron and over seven and a half tons of cast iron pots. The facilities sported a "blast furnace, refinery, a slitting and trimming mill, storage barns and warehouses, and even a private wharf and vessel" (Bailyn 1955: 65).

As the ironworks became more profitable, the company accountant was given instructions to pay attention to local needs and according to Bailyn "he was to note especially the demand for nails and iron rod and not overlook the boom market of Barbados for the sale of such items." This certainly leaves the door open to consider that the vessel might have been trading with merchants in Barbados and acquired the pipes,
earthenware and other items in return for iron goods and perhaps was on the return leg, hoping to trade with Spanish colonists at Monte Cristi who were in need of iron items and manufactured goods.

The fact that the vessel carried ballast rock consistent in geological make-up with river gravel from Bristol, England or other northern European river ports prompts consideration that the vessel may have been a New England trader doing business with England, thus explaining the Bristol river rock ballast. While the cargo is definitely consistent with Dutch cargoes of the period, the Bellarmine and Dutch tin-glazed earthenware was so prevalent during this period it is a possible red herring. Another point is that many iron cauldrons were recovered from the site, consistent with trade goods more likely manufactured in England or New England than the Netherlands.

**Why was the vessel at Monte Cristi?**

One could easily speculate on the reasons why this small vessel ended up in Monte Cristi Bay. The most logical reason the ship was there was for economic reasons, primarily to trade with the local community and buccaneers. As discussed earlier, the ship was carrying cargo that would be desirable to residents of Monte Cristi and the surrounding area. There is also a possibility that the ship was there to buy or gather salt as a trading commodity in Virginia or New England. Early maps list the island as Cayo de Sal or Salt Key, a direct reference to the fact that salt is a part of the island’s early history.

It is possible that the ship called at Monte Cristi simply to seek shelter from a storm and ran around due to changing winds or shallow water. In 1992 the PIMA
research team camped on the Isla Cabrita experienced first hand, the speed with which the weather can change on Monte Cristi Bay. The wind can change directions rapidly and if a captain were careless, he might easily pull anchor and run aground before getting control of his ship. We know the ship sank after 1651 and that fire may have contributed to its demise. Although the wood was English, like the Stonewall, it remains to be seen if the vessel was of English registry. It is possible that it was constructed in England, but employed in the service of another European country. It may also have been a New England trader or a captured prize from the first Anglo-Dutch War converted for use in the smuggling trade. According to maritime historian Ralph Davis, England lost between 1000 and 1800 vessels during the years 1655-60 (Davis 1962: 51). If this is the case, the vessel could have been a merchant vessel of the Dutch West India Company. The Dutch had been trading in the Caribbean and Spanish Main since establishing colonies on Curacao, St. Eusiatius an Tobago in the early 1600s. The possibilities are numerous. One fact is undeniable, unless the ship was sailing under a Spanish flag, which is unlikely, it was on the northern coast of Hispaniola illegally. For that reason alone it is worthy of close scrutiny; its presence in the area strongly suggests involvement in smuggling.

The hull remains and artifacts recovered from the wrecksite help identify the type of vessel and possibly clues to its nationality. While the scientific evidence is rather convincing that the vessel was built in England, it is more difficult to determine under whose flag she sailed when she sank at Monte Cristi. The results of research conducted on the material culture recovered from the shipwreck thus far is inconclusive, but it indicates the vessel was English, Dutch or possibly North American. As the chapter on
artifact inventory suggests, the majority of items recovered were typical of those found on Dutch and English sites in North America. In addition to the Monte Cristi site, Dutch blue and white earthenware and Rhenish stoneware sherds have been recovered from the Sea Venture (1609), Batavia (1629), and the Vergulde Draeck (1656) shipwrecks, as well as land sites in colonial America such as Ft. Orange, Schuyler Flatts and Jamestown.

The coinage recovered, while Spanish in manufacture, is often found on English and Dutch shipwrecks and was common currency in the Caribbean for all nations. It contributes little to solving the mystery of the wreck beyond the important act of establishing the earliest date the ship could have sunk.

Perhaps the most important phase of research on this vessel has yet to be completed. A search and examination of the Archives of the Indies in Seville, Spain, pertaining to the specific history of the northern coast of Hispaniola during the 1640s and 50s might reveal valuable information on the Monte Cristi site. The entire story of this shipwreck may lie in a dusty legajo waiting to be discovered by some energetic scholar. The Spanish administrators were noted for their diligence and attention to detail. Any vessel captured or sunk during the violation of trade policy in the Caribbean would surely be noted in the official record. A cursory search conducted by the library staff of the Seville archives in 1998 failed to reveal a seventeenth century shipwreck in the area of Monte Cristi. This was not an exhaustive search. A Dutch researcher was contracted by PIMA in 1994 to search the archives in the Hague for any clues to the site. The results were disappointing. Research will continue on the cannon, ceramics and other artifact
material. This extraordinary shipwreck has provided a remarkable amount of information.

Other of her secrets remain to be discovered.
BIBLIOGRAPHY


Hall, J. L. A Seventeenth-Century Northern European Merchant Shipwreck in Monte Cristi Bay, Dominican Republic. Dissertation, Department of Anthropology Texas A & M University, College Station, Texas, 1996.


Hanks, B. Monte Cristi Shipwreck field notes. PIMA archives. San Francisco, California, 1996.


Newton, A.P. The European Nations In the West Indies. London, 1933.


