Report to the Department of Environment and Coastal Resources of the Turks and Caicos Islands on the Archaeological Survey of Endymion Rock, Nov. 27-Dec. 13, 2007

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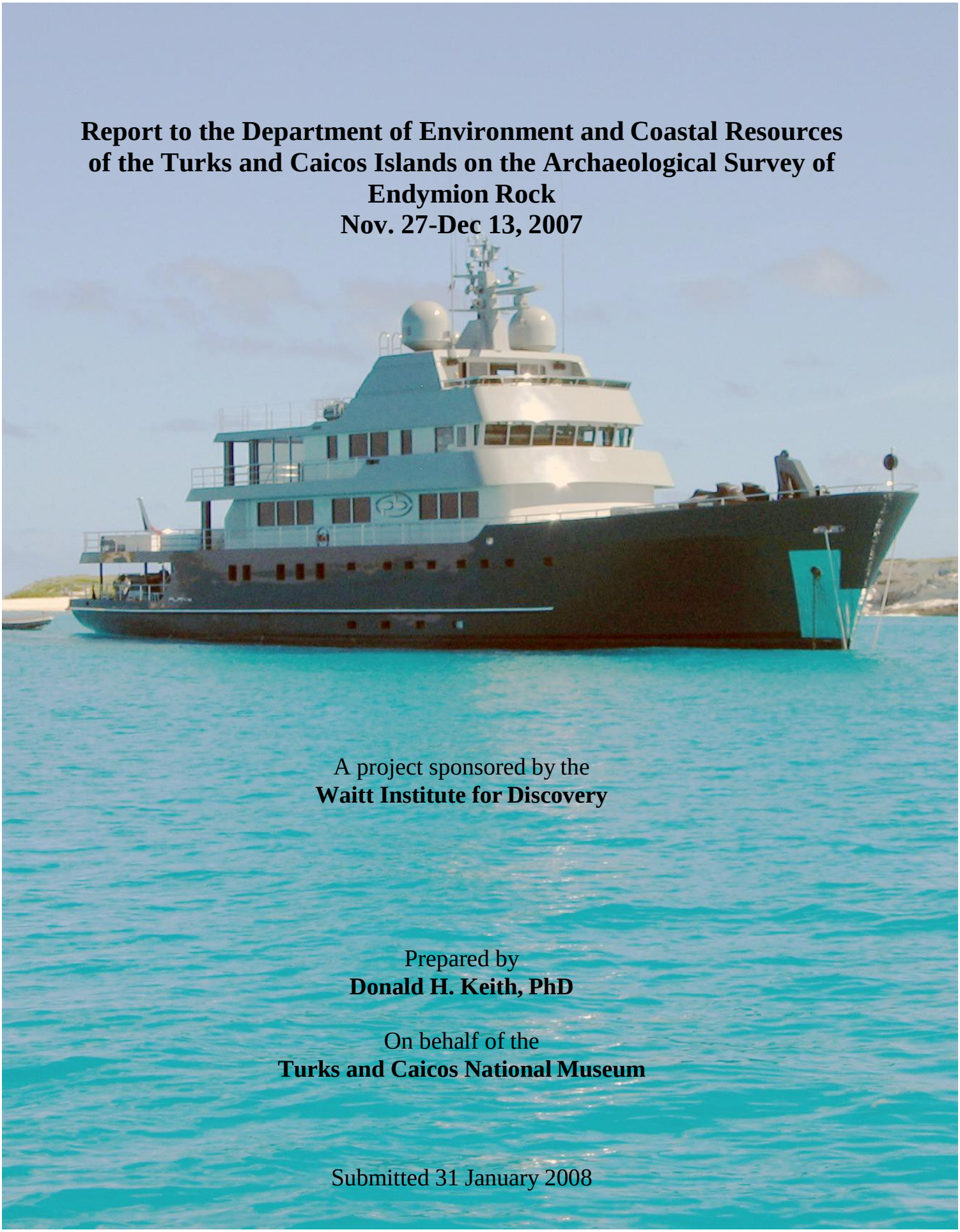

A project sponsored by the
Waitt Institute for Discovery

Prepared by
Donald H. Keith, PhD

On behalf of the
Turks and Caicos National Museum

Submitted 31 January 2008

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Acknowledgements

From the Museum's perspective the Endymion Rock Survey provided a unique opportunity to conduct an intensive remote-sensing survey of a Protected Historic Site and to perform a condition assessment of two important shipwreck sites. The mission was a success from the perspective of the Waitt Institute for Discovery in that it provided a near-perfect test of their equipment and procedures while at the same time performing a service useful to the Museum. The efforts of several individuals deserve special recognition and thanks for making the Endymion Rock Survey a success:

Wesley Clerveaux, Acting Director of the Department of Environment and Coastal Resources (DECR) responded immediately to the Museum's request for permission to conduct the survey.

Deborah Annema, the Museum's Director of Development, made innumerable arrangements coordinating the efforts of the DECR, the TCNM, WID and Ships of Discovery before, during, and after the survey.

Peter Dorrington, Plan B's Chief Engineer, recognized the Companion Wreck's engine, narrowing down its date of manufacture and making identification possible.

Dr. Dominique Rissolo, WID Director of Research, made the decision to partner with Ships of Discovery and the TCNM in carrying out this research project and, armed with the data collected during the survey, produced a credible identity for the Companion Wreck.

Participants

Scientific Team

Steve Bilicki	Senior Surveyor
Mike Cameron	ROV pilot, technician
Dr. Donald Keith	Chief Archaeologist
Lance Milbrand	Cinematographer
Jeff Morris	Survey Operations Director

Waitt Institute for Discovery

Mike Dessner	Logistics Director
Joe Lepore	Diving Safety Officer
Dr. Dominique Rissolo	Research Director

Crew of *Plan B*

Nick Williams	Kai Rasinen	Kelsey Rardon
David Passmore	Nicole Haeck	Audrey Mann
Peter Dorrington	Brent Taylor	Jacques Broodryk
Kris Gibbs	Brooke Hatchman	Matt Quintal

Project Background

After presenting a symposium in January 2007 on the Turks & Caicos National Museum's Search for *Trouvadore* Project, the author was approached by Dr. Dominique Rissolo, Director of Research for the Waitt Institute of Discovery, who showed great interest in our research. Because of that interest and with the idea that there could be some benefit to the *Trouvadore* project or the Turks & Caicos, months later Dr. Rissolo asked the author for assistance in locating a venue for the "shakedown cruise" of his Institute's research vessel, *Plan B* (Figure 1).

Figure 1. Preparing to deploy the side-scan sonar fish from the aft platform of *Plan B*.

The author contacted Dr. Neal Hitch, Director of the Turks & Caicos National Museum, and Deborah Annema, the Museum's Director of Development, with the suggestion that an archaeological survey of the area around Endymion Rock would provide a good test for *Plan B*'s equipment, personnel, and operations policies, as well as a once-in-a lifetime opportunity for the Museum to conduct a thorough remote-sensing and diving survey of Endymion Rock, site of the loss of the British Fifth-Rate warship HMS *Endymion* in 1790 (Figures 2 and 18; Appendix II).

Deborah Annema contacted the Department of Environment and Coastal Resources of the Turks and Caicos Islands (DECR) with a request for permission to conduct an underwater archaeological survey, and permission was granted on 23 November 2007 (Appendix I).

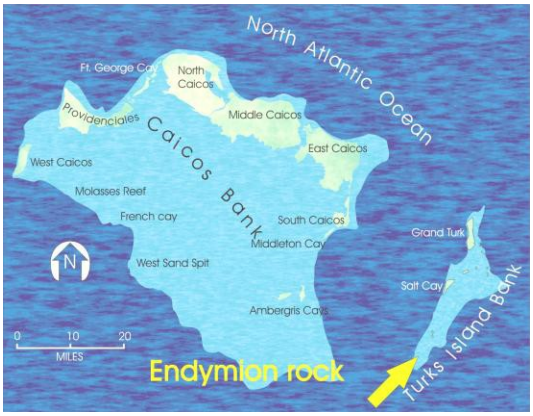

Figure 2. Location of Endymion Rock on the southern end of the Turks Island Bank.

As specified in the permission granted by the DECR, no artifacts were disturbed or removed during the survey and copies of all data recorded and all images taken will be delivered to the DECR within a few weeks of the receipt of this report.

Mission Objectives

The summary of the Waitt Institute for Discovery's mission objectives states: "Primary goal is to trial all survey systems on board in a region of great interest to nautical archaeology and history. During the 18th century, many French and British ships bound for Europe or the West Indies were required to navigate the Turks Island Passage. An unknown number of ships, like the HMS *Endymion*, failed to clear a hidden reef south of Salt Cay, which guards the passage. Though the *Endymion* came to rest in the shallows of the isolated rock, other vessels may have gone down in deeper, un-surveyed waters after striking the reef. The WID team will perform a side-scan sonar and magnetometer survey of a 12 nm^2 area around and beyond the reef in an effort to locate these lost ships." (Figures 3 and 4).

Figure 3. The remote-sensing team monitoring the instrument array during the deep water tow behind *Plan B*. The drum holds 10,000 feet of tow cable.

Remote-sensing equipment aboard *Plan B* included:

- A Klein Model 3000 side scan sonar deployable either directly from *Plan B* for deep-water surveys, or from *Protector*, *Plan B*'s tender.
- A Marine Magnetics Magnetometer also deployable from *Plan B* or Protector.
- A Seaeye Falcon ROV capable of operating beyond safe SCUBA depths and equipped with lights, a video camera and manipulators.

Because deep-water and shallow-water surveys require different techniques and sometimes different equipment, the survey plan called for the first several days to be devoted to the deep-water portion of the survey using Plan B to tow the sonar and magnetometer in tandem at depths between 50 and 500 feet on both the East and West sides of the reef on which Endymion Rock lies. The much shallower main part of the reef was surveyed with the same instruments towed from the *Protector*.

Although this was the first survey conducted from *Plan B*, it was nothing new to the survey team members who have conducted similar surveys all over the world.

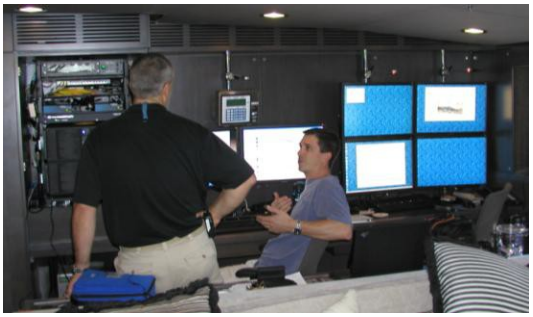

Figure 4. Readouts from the towed instruments were monitored and recorded in *Plan B*'s control room.

Activities

Deep Water Survey

The first procedure was to survey the deep water on either side of the Bank by towing the magnetometer and sonar behind *Plan B* while maintaining parallel "lanes" 100 feet apart. Despite technical difficulties and less than optimal weather, anomalies that could represent shipwrecks or debris from shipwrecks were detected, and their locations noted (Figures 5 and 6; Appendix III).

Shallow Water Survey

Water depth on the top of the Bank is an average of 50 feet except for areas where isolated coral pinnacles, such as Endymion Rock, rise to with about 8 feet of the surface. To survey this area the magnetometer and sonar were transferred to the *Protector*, and lane spacing was reduced to 50 feet for better resolution. The magnetometer easily detected the large magnetic anomaly created by HMS *Endymion* and its "Companion Wreck," an unidentified but much more recent shipwreck, the remains of which partially overlie *Endymion*. Diving operations began immediately in tandem with the on-going shallow water instrument survey.

Site Feature Measurement

The next priority was to measure distances between key large objects scattered throughout the overall site to form a series of interlocking triangles. Called "tri-lateration" this is a simple technique that allows the construction of a rough site plan when used in conjunction with a photo mosaic.

Site Photo mosaic

A photo mosaic is simply a series of overlapping photos taken from a vertical distance above the site by a swimmer passing over the site in parallel lines. Due to parallax problems created by waves on the surface and the undulating shape of the seabed in a finger-and-groove coral reef environment, the mosaic cannot be used to measure actual distances between objects and features, but it can supply far more detail than a site sketch (Figures 7 and 8).

Artifact Measurement

One of the highest priorities for the dive team was to take measurements of a variety of artifacts. Although some measurements were obtained for the HMS *Endymion* 9 years ago (Keith 2001), no dimensions for artifacts from the Companion Wreck or measurements relating them to each other were taken.

Filming

Several hours of HD video tape were shot capturing virtually every aspect of the surveying and diving operations and creating both a record of the condition of the site and a means to share the dive team's activities with the public.

Investigating Anomalies

Using DPV's (Diver Propulsion Vehicles) the dive team also investigated an anomaly detected by both the magnetometer and sonar several hundred yards to the West of the main site which turned out to be a group of 4 large riveted iron compartments with complex shapes, possibly compartments from inside the hull of the Companion Wreck (Figures 9 and 12). Adding supporting evidence to this theory is the trail of small iron object debris leading from the Companion Wreck to the anomaly location.

Figure 5. Survey track lines followed during the survey.

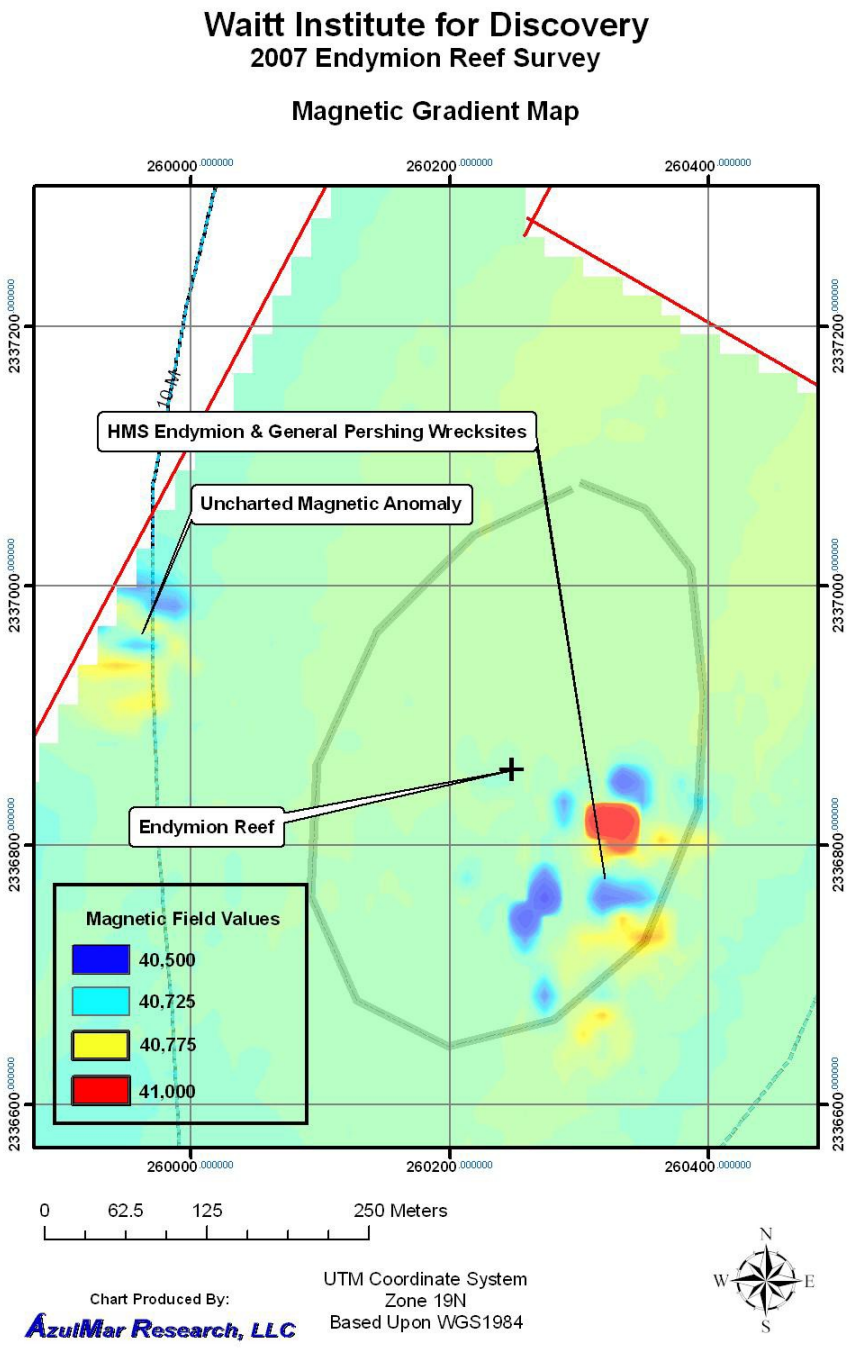

Figure 6. Magnetic map of the area immediately around Endymion Rock showing the two main concentrations of shipwreck debris.

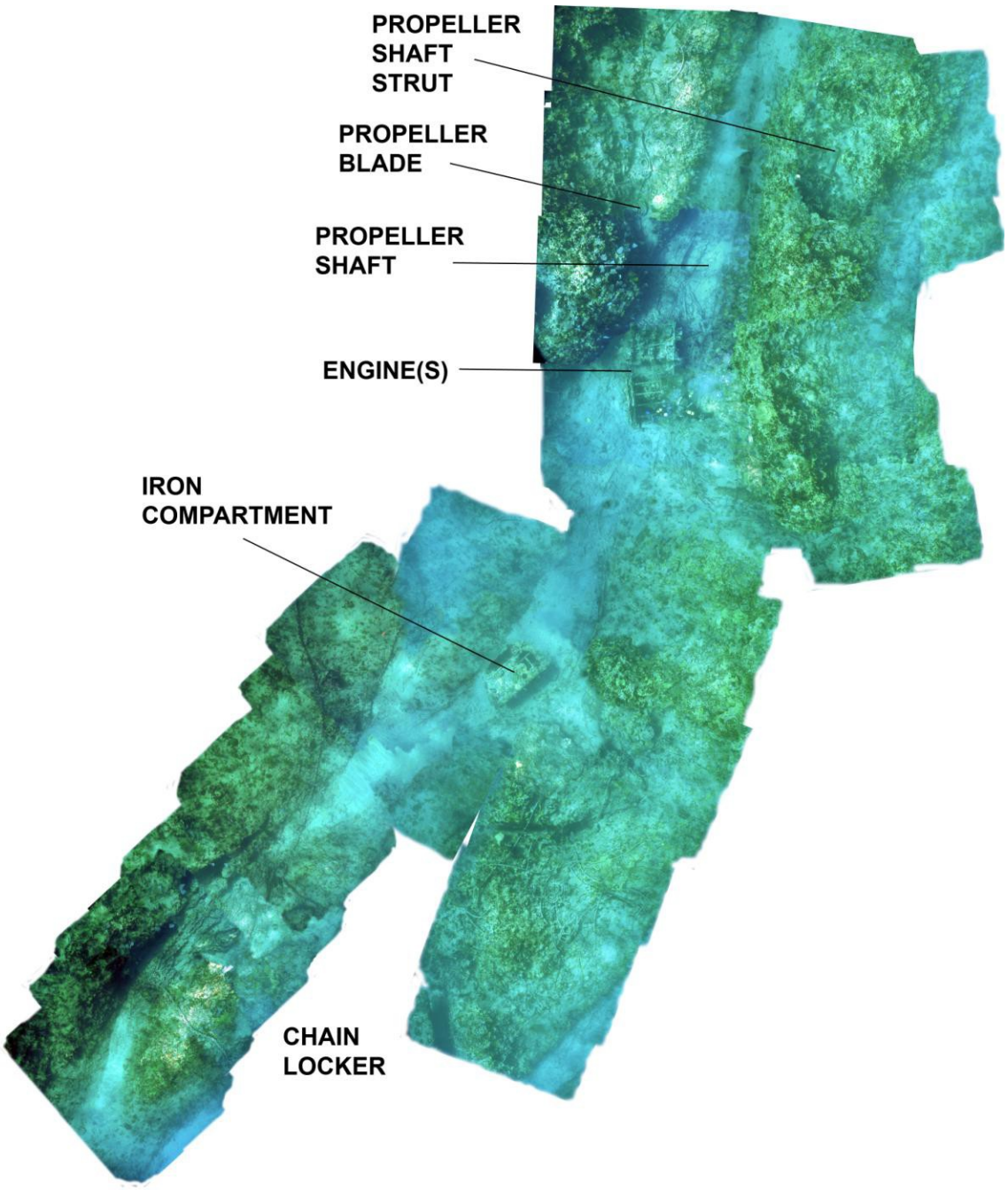

Figure 7. A rough photo mosaic of part of the Companion Wreck site with key artifacts identified.

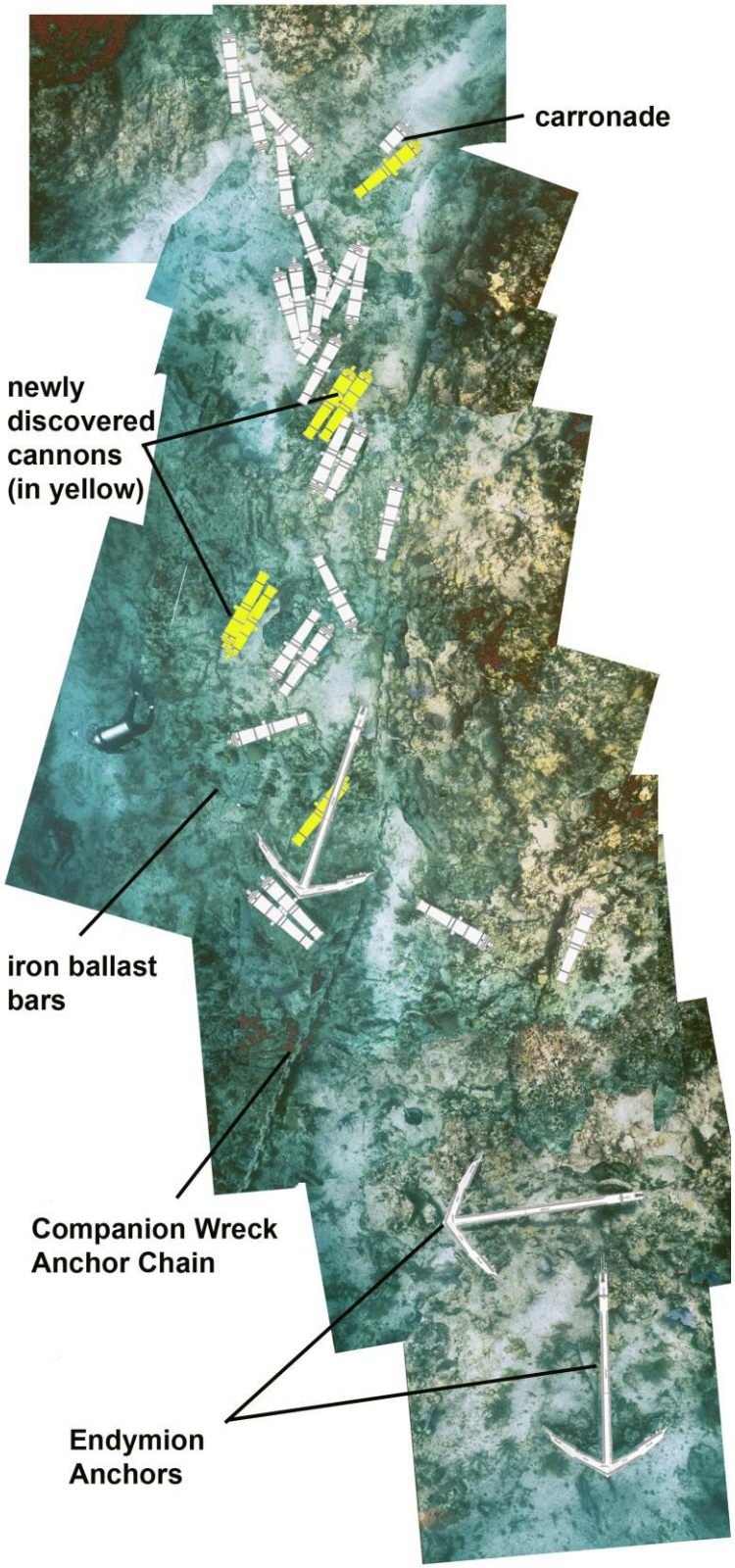

Figure 8. Photo mosaic of part of the HMS Endymion site with cannon and anchor templates positioned over the actual objects. Newly discovered cannons are in yellow.

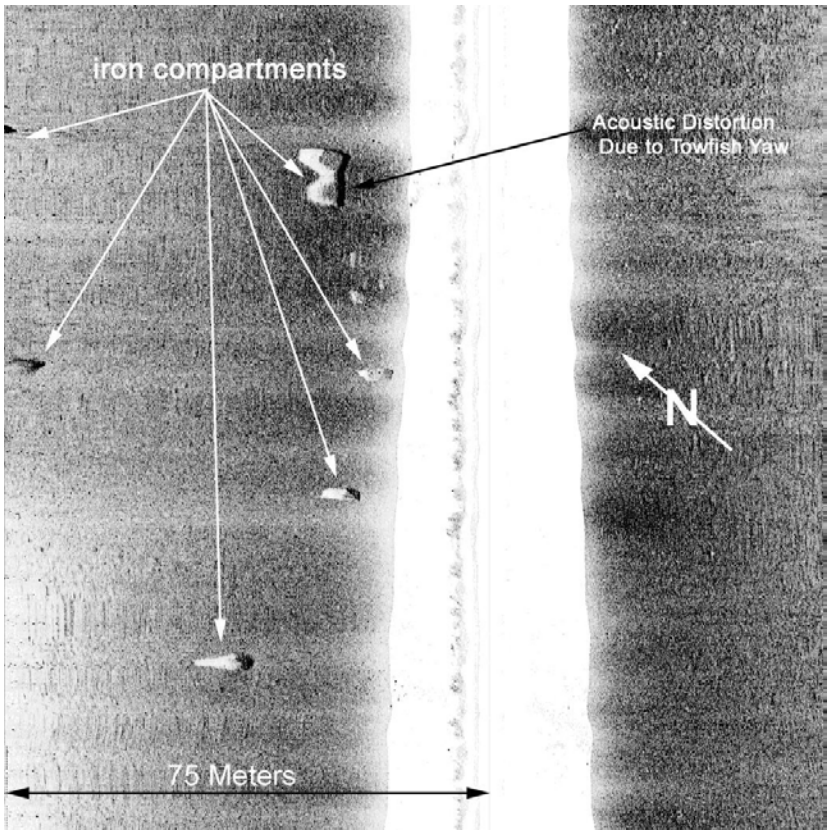

Figure 9. A section of the side scan sonar record showing six anomalies in 54 feet of water. The white acoustic "shadow" cast by each of the objects makes them stand out clearly. The anomalies are large, riveted, multi-faceted iron compartments such as below in Figure 10.

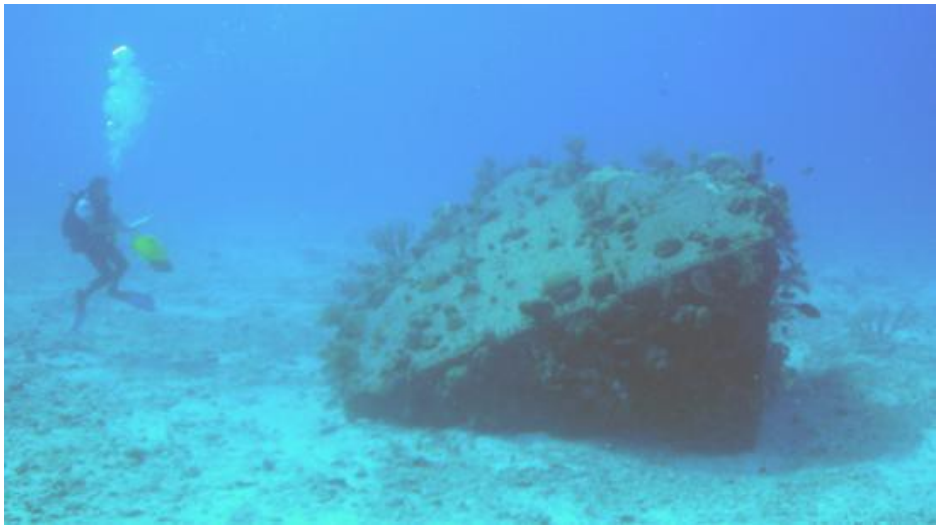

Figure 10. One of the group of four intact riveted iron compartments found at 259958 E, 2336960 N, several hundred meters to the West of the main site.

Results

The success and benefits of the project to the TCI, the DECR, the TCNM, the WID, and Ships of Discovery should be evaluated from three different standpoints: The archaeological/ historical perspective, the conservation perspective, and the tourism/diving perspective. Elsewhere in the world shipwreck sites frequently visited by divers have been stripped of portable artifacts, impoverishing them and diminishing the experience for those who come after. While there can be little doubt that many visitors to the site have helped themselves to small finds, it does not appear that the site has been extensively disrupted by modern salvagers or treasure-hunters.

From the **archaeological/historical perspective** the survey:

- Refined mapping of the Endymion Rock site and produced a photo mosaic of the Companion Wreck site for the basis of a site plan.
- Tentatively identified the Companion Wreck through analysis of the engine and other machinery on the site (Appendix II).
- Located and identified other shipwreck material near Endymion Rock.
- Identified 6 cannons not previously noticed on the *Endymion* site, and raised the possibility that most, if not all of the 44+ guns are still on the site (Figure 11).

From the **conservation perspective** the survey:

- Elevated appreciation for the uniqueness and historical importance of the Companion Wreck.
- Located magnetic and sonar targets that may represent additional shipwrecks near Endymion Rock (Figure 9).
- Produced an excellent photographic and video record of the condition of both shipwreck sites to serve as a "baseline" against which to compare future changes in the site brought about by natural or human agencies.

Figure 11. Cannons on the HMS *Endymion* site lie stacked one atop another making it impossible to see how many are present.

From the **tourism/diving perspective** the survey:

- Produced sufficient video coverage of the entire project to create a broadcast quality documentary for international distribution.
- Produced sufficient photographic images and information to create a "field guide" that would help divers who wish to visit the site to interpret the artifacts they see and have a more meaningful experience.
- Made it possible to seriously consider exhibit possibilities for the history, images, and even artifacts from the site.

Although some of the mysteries of the Endymion Rock were solved, new mysteries emerged, such as:

- If the Companion Wreck really is *General Pershing*, what happened to the cargo of coal that it was listed as carrying?
- Why is there no trace of the Companion Wreck's wooden hull?
- Did the Companion Wreck have two 4-cylinder engines mounted side-by-side, or one 8-cylinder engine that is now broken in two?
- On the HMS *Endymion* site itself, where are such large and important artifacts as the ship's bell, which would have been made of bronze and would have weighed hundreds of pounds? Or the hundreds of solid iron shot for the cannons, which would have weighed many tons?
- Where is the third wreck that some visitors to the site have reported seeing? "Further off lies the relic of a turn-of-the-century ship, with side plates, telegraph, and some glass-intact portholes visible." (Times of the Islands 1995).

Questions like these can only be answered through additional research both in the archives and on the site.

What's Next?

It has been almost two decades since the discovery of the Endymion Rock site was announced by Salt Cay resident Brian Sheedy (Times of the Islands 1995). It is now an official Protected Historic Site, but its potential is still largely unrealized.

Enhancing the Diver Experience

For divers, the Endymion Rock experience could be enhanced if a plan or guide to the site were made available. In the Cayman Islands, Florida, and Australia archaeologists have installed interpretive plaques on shipwreck sites to guide divers along underwater "trails." Another possibility is the creation of a laminated written guide showing the relative locations of special features on the site and explaining their significance. The fact that there are at least two wrecks at the site offers divers an almost unique opportunity to learn about one of the most dramatic periods in the history of seafaring - the transition from the Age of Sail to the Age of Motor Power, and makes the Endymion Rock experience more than just another dive. Such a guide to the site would be relatively easy to compose and produce.

Monitoring the Site

There is much more non-invasive work to be done on the Endymion Rock site. An effort should be made to determine exactly how many shipwrecks are represented at the site. Such an effort would begin with schematic and photographic documentation of identifiable elements such as anchors, engines and drive systems, followed by archival research which to match the remains on the seabed with specific ships, dates of loss, and (hopefully) first-hand accounts. Regular check-ups on the site would readily reveal the extent to which the site is being plundered, if at all.

Selective Artifact Recovery and Exhibition

Because the site is in an exposed location far from land and often unreachable due to wind and high seas, it receives few diving visitors. Consequently, the recovery of a few of the most dramatic and illustrative artifacts for prominent display in the Islands is an option. If the artifacts were carefully chosen their removal would not adversely affect the site's integrity or its visual impact on divers. Good candidates for removal, conservation, and display include:

- One of the large 18-pounder cannons
- One of the small carronade cannons
- One of the four anchors on the site
- The large bronze horseshoe clamp wedged under an anchor (Figure 12)
- One of the large iron ballast bars

Figure 12. This large double-horseshoe clamp wedged beneath one of Endymion's anchors could easily be removed for museum display without disturbing anything else on the site.

Such an assortment of properly conserved and reconstructed artifacts with wooden carriages for the cannons and a wooden stock for the anchor, in addition to underwater photographs of the site, a brief history, and perhaps a detailed drawing or model of the ship would make an impressive exhibit that many more people would see.

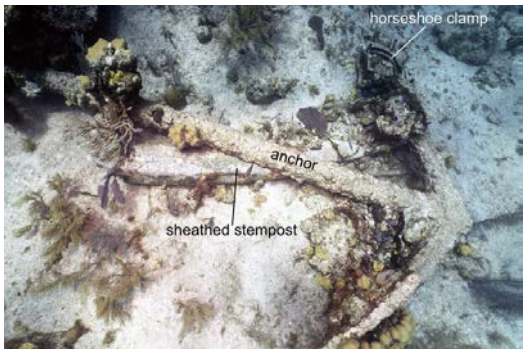

Figure 13. One of the four anchors of HMS *Endymion*. The shank is more than 16 ft long and the spread of the arms is about 10 ft!

The Companion Wreck

Although HMS *Endymion* is the "star of the show," the Companion Wreck, possibly the *General Pershing*, also has a story to tell, although we don't yet have it all. It should be possible to locate photographs of the ship and first- hand accounts of the wrecking and sinking. Artifacts from the Companion Wreck that could be removed for exhibit include:

- One of its four anchors
- Anchor chain
- The driveshaft and propeller
- An engine

Raising and restoring an entire marine engine would be difficult and costly, but it has been done before (McCarthy 2000) and--at 14 ft tall, 10 ft wide, and 7 ft deep--it would make an impressive, one- of-a-kind exhibit!

Figure 14. One of the four anchors of the Companion Wreck. Anchor is 8 ft long, 4.5 ft wide. Photo by Ethan Gordon.

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Further Reading

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APPENDIX I

MINISTRY OF NATURAL RESOURCES

DEPARTMENT OF ENVIRONMENT AND COASTAL RESOURCES
GRAND TURK, TURKS AND CAICOS ISLANDS, BRITISH WEST INDIES

To : **Curator**
Turks and Caicos Museum
Grand Turk
Turks and Caicos Islands

From : **Director (Atg)**
Department of Environment & Coastal Resources
Turks and Caicos Islands
wvclerveaux@gov.tc

Date : **23 November 2007**

Subject: **ENDYMION ROCK SURVEY**

Dear Sir

Please be informed, the DECR have received and reviewed the proposal submitted on behalf of the Waitt Institute for Discovery (WID), for an underwater archaeological survey in the Turks and Caicos Islands for the end f November and early December 2007.

Please be further informed that approval is herby granted for the research expedition provided the research proponents abide by the following guidelines and conditions;

1. The DECR reserve the rights to have an officer of the DECR or an observer designated by the DECR to be permitted onboard to inspect and oversee the operation at all times;

2. Any artifacts or ships discovered should not be removed, and be reported to the DECR at once, and by this letter be made clear that all artifacts remain the property of TCIG;

3. Copies of any documents, pictures film and/ or recording produced from the expedition are forwarded to the DECR for comments prior to publication;

.....
WESLEY CLERVEAUX
ACTING DIRECTOR, DECR

GRAND TURK OFFICE TEL: 649 946 2855/2970 FAX: 649 946 1895 1

APPENDIX II

The tentative identification of the Endymion Rock "Companion Wreck" as *General Pershing* was made through analysis of its remains, particularly its engine. Information below is derived from the Northern Shipwrecks Database based in Bedford, Nova Scotia, Canada.

Vessel: *General Pershing*
Type: wooden hull, 5-masted, auxiliary gas-screw schooner
Year built: 1918
Built by: Olympia Shipbuilding Co., Olympia Washington
Year lost: July 11, 1921
Location: 260340 E, 2336777 N (UTM Zone 19N, Datum WGS 1984)
Final voyage: Norfolk to Seattle
Cargo: coal
Gross ton: 2,450
Length: unknown at this time
Breadth: unknown at this time
Draft: unknown at this time
Captain: Ross
Registry: Possibly Norwegian

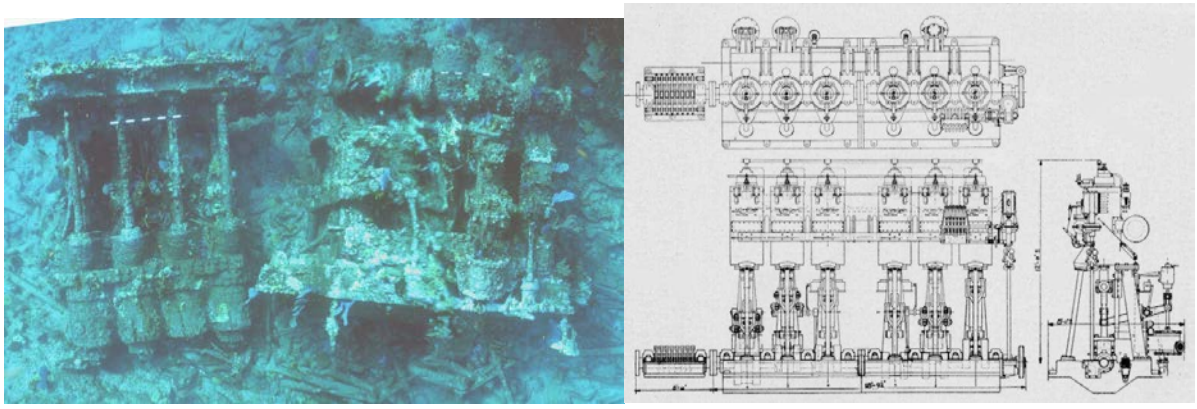

Figure 15. Left - the hot bulb oil (diesel) engine of the Companion Wreck. It has not yet been determined conclusively if it is a pair of 4-cylinder engines or a single in-line 8-cylinder engine. The enormous size of the engine(s) can be appreciated by comparing them to the meter-long black-and-white measuring sticks. Right - drawing of a hot bulb oil engine very similar to that of the Companion Wreck, but arranged in two banks of three cylinders rather than two banks of four cylinders.
(Credit: http//www.oldengine.org/members/ diesel/Marine/Sumner/html)

The following data on HMS *Endymion* is taken from Bound (1998: 204,210). Additional information may be found in the National Maritime Museum Picture Library, London.

Vessel: *HMS Endymion*
Type: wooden hull, 3-masted, Roebuck Class 44-gun Fifth Rate
Year built: 1779
Built by: Grave Yard, Limehouse
Year lost: August 23, 1790
Location: 260282 E, 2336738 N (UTM Zone 19N, Datum WGS 1984)
Final voyage: Halifax, Nova Scotia to Port Royal, Jamaica
Cargo: warship
Tons displacement: 894
Length of keel: 115’ 7”
Beam: 38’ 1”
Depth of hold: 16’ 4”
Captain: Lt. Dan Woodriff

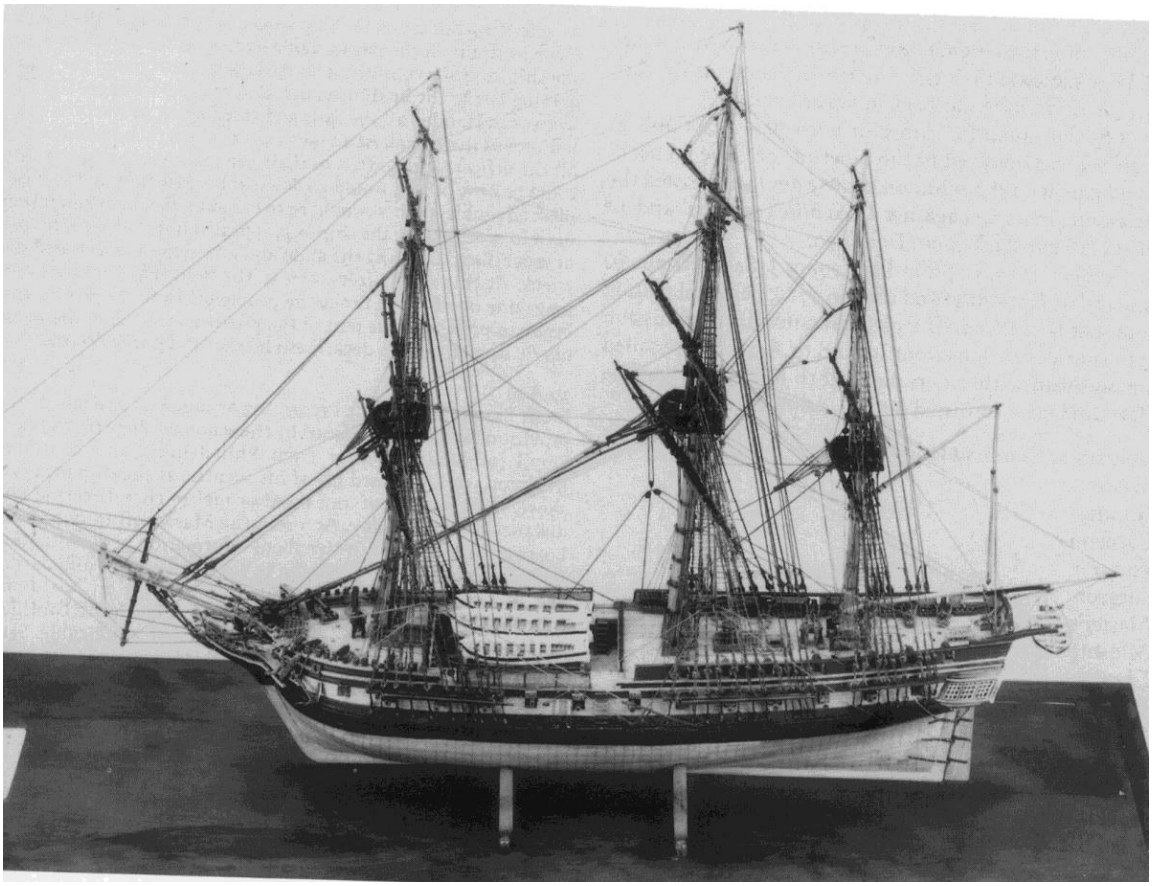

Figure 16. This 19th century model gives the layman a better idea of what HMS *Endymion* looked like.

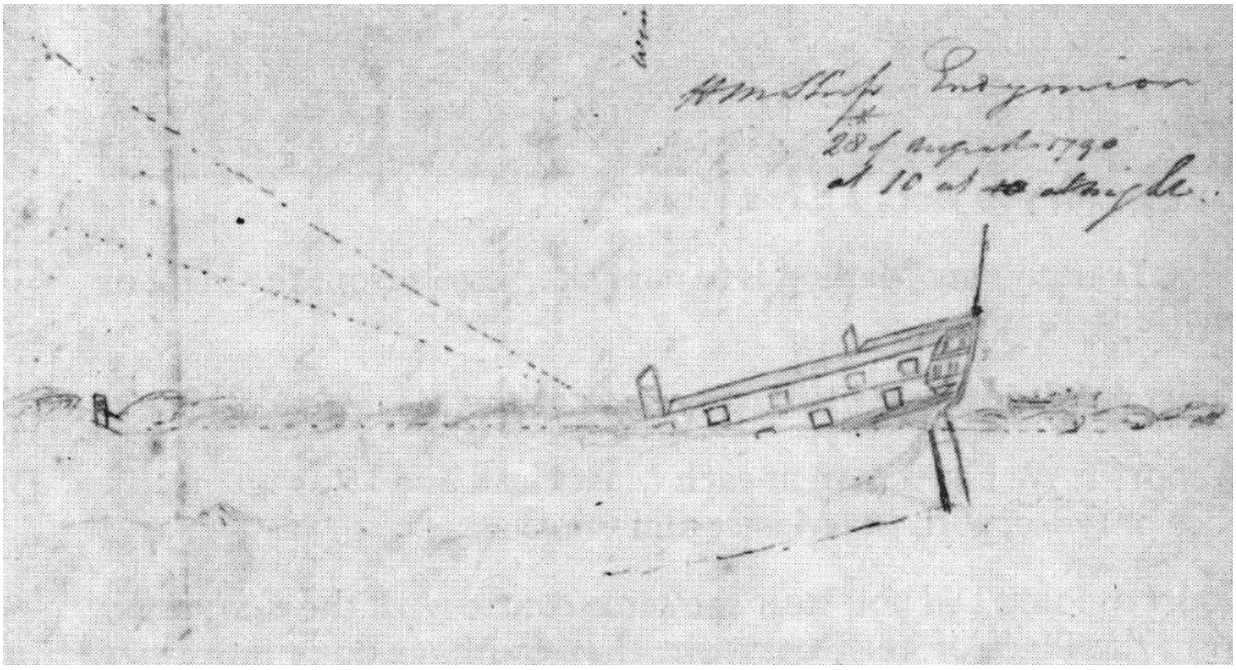

Figure 17. HMS *Endymion*'s last moments before going under--a sketch thought to have been made by her Captain.

APPENDIX III
Remote-Sensing Methodology, Equipment Used, and Findings
By Jeff Morris, Director
AzulMar Research, LLC

Survey Area Description

Endymion Rock is located in the Caribbean Sea on the southeastern end of the Turks Island Passage. The reef that formed Endymion Rock is the southernmost shoal of the Turks Island chain. The survey area lay directly over the top of Endymion Rock, extending out to deeper water in all directions. The area surveyed measured approximately 1250 by 4400 meters. Due to a weather system that prevented the completion of the survey, a roughly 2600 meter by 350 meter section of the survey box to the north of Endymion Rock was not completed (Figure 5).

The bottom in the area is mostly sand with coral outcrops, except for the area directly over Endymion Rock which has formed a large spur and groove formation reef. Water depths throughout the survey area ranged from approximately 3 to 300 meters.

The Waitt Institute for Discovery (WID) survey was conducted using the Universal Transverse Mercator Projection (UTM), based upon the World Geodetic System 1984 datum (WGS84). The survey area lies in UTM Zone 19 North. All coordinates and measurements listed in this document are in meters based upon UTM Zone 16N using the WGS84 datum.

Remote Sensing Survey Methodology

WID personnel reviewed historic and location data provided by Ships of Discovery to determine an effective and efficient methodology to locate previously unidentified submerged cultural resources and determine the extent and nature of previously known underwater archaeological sites. The methodology that WID personal selected was to conduct a simultaneous marine acoustic and magnetic survey of Endymion Rock and the waters surrounding it. This survey was designed to identify any seafloor anomalies in the area that contain any ferrous materials and any unusually shaped protrusions from the seafloor. The thought process behind the survey was that while some ships might have sunk directly on the reef it was possible that others struck the reef, floated off a distance, and then sank. The goal was to identify through remote sensing all man-made objects in the area. To accomplish this, WID personnel selected a lane spacing of 15 meters in shallow areas (less than 15 meters) and 30 meters in deeper waters. The rationale behind this methodology is that the density of man-made debris tends to be significantly higher in shallow waters. By conducting a survey with closer lane spacing, it is significantly easier to detect and delineate smaller objects. This survey grid and lane spacing provided WID personnel with acoustic images of the seafloor at approximately 20cm resolution and magnetic field readings every 45 cm along track.

Survey Equipment

All shallow water survey operations were performed from a 28-foot Protector Boats rigid inflatable (RIB). Aboard that vessel, navigation and positioning data was received on a permanently mounted Raymarine E80 integrated navigation system which included a Wide Area Augmentation System Differential Global Positioning

System (WAAS DGPS), digital echo-sounder, and radar. The vessel DGPS signal is provided to the primary survey data collection system via an RS-232 cable. Hypack, Inc.'s hydrographic survey suite served as the primary survey navigation system. Hypack provided the capability to layout survey lines, collect navigation and magnetic data, and provided an accurate real-time visual representation of the survey vessel and survey lane tracking. Additional ship-board power is provided by a portable Honda generator, rated at 2000 watts.

All deep water survey operations were performed from the 50 meter MY *Plan B*. Aboard the *Plan B*, navigation and positioning data was received on a permanently mounted Furuno GP137 GPS that includes shipboard Wide Area Augmentation System Differential Global Positioning System (WAAS DGPS). The vessel DGPS signal was provided to the primary survey data collection system via an RS-232 cable. Hypack, Inc.'s hydrographic survey suite served as the primary survey navigation system. Hypack provided the capability to layout survey lines, collect navigation and magnetic data, and provided an accurate real-time visual representation of the survey vessel and survey lane tracking.

Acoustic Data Collection

Acoustic data was collected using a Klein 3000 digital side scan sonar system. The Klein 3000 system is dual frequency unit operating at 132 and 455 kHz with selectable range control ranging from 12.5 to 1000 meters. WID personnel operated the sonar in the high frequency 455 kHz mode and selected range scale settings of 50 and 75 meters to ensure that high quality sonar records were recorded. Aboard the survey tender *Protector*, the output of the Klein 3000 sonar was recorded using Hypack, Inc.'s, survey software that provided sonar and navigation data collection, real-time sonar data analysis and targeting, and sonar and navigation data post-processing capabilities.

Aboard the *Plan B*, the output of the Klein 3000 sonar was recorded using Klein SonarPro software which provided sonar and navigation data collection, real-time sonar data analysis and targeting, and sonar and navigation data post-processing capabilities. WID personnel configured SonarPro to record the sonar data in Triton exchange format (XTF) files for post processing in Echovision's 2020 software. The survey target database, coverage, and towfish track were generated using Echovision's 2020 software.

Magnetic Data Collection

Magnetic data was collected using a Marine Magnetics SeaSpy overhauser magnetometer. The SeaSpy magnetometer can detect variations in the earth's magnetic field to 0.001 nano-tesla (Gamma) and takes readings of that field 4 times a second (4 Hertz). The Hypack survey software recorded the magnetic readings along with navigation data for each survey lane. WID personnel configured Hypack parameters to record magnetic readings at 4 Hertz and account for the towfish layback behind the survey vessel. All magnetic data collected during the survey was analyzed and edited in Hypack's single beam survey editor and exported into an XYZ point file. The XYZ files were imported in ESRI's ArcGIS Geographic Information System (GIS) where the data was processed using the ArcGIS 3D Analyst extension to generate magnetic gradient overlays and contour maps.

Survey Data Integration

All survey data was integrated for visualization and the production of survey maps using ESRI's ArcGIS software. Magnetic gradient maps, the survey geo-database, as well as data from published navigation charts were integrated into a single ArcGIS project. This GIS project allowed WID personnel to analyze the spatial relationships between magnetic anomalies and the surrounding geology.

Findings

WID personnel began the survey along the western edge of the survey box in deep water (*i.e.* deeper than 15m) operating from the *Plan B*. The survey team chose to start at that location because there is very deep water to the west and if there were uncharted portions of the reef, this would allow the master of the P*lan B* to divert the ship off the planned survey line into deep water. After completing the deep water survey on the west side of Endymion Rock, the team began surveying on the east side, again starting on the outside survey line where the water was the deepest.

The deep water surveys to the west and east of Endymion Rock did not identify any remote sensing targets that exhibited characteristics consistent with submerged cultural resources. The acoustic survey did locate many small coral outcrops to the east of Endymion Rock, however, none of them had acoustic characteristics consistent with shipwrecks or associated magnetic signatures. Post processing of the data did reveal one problem with the way that the survey was conducted. The magnetometer towfish was towed too close to the *Plan B.* This flaw in the operation of the equipment resulted in increased background noise in the magnetic data that varied based on the heading of the ship. This can be seen as stripes on the magnetic background that are parallel to the survey lines in the magnetic gradient map. This increased background noise was relatively constant while the ship was on the survey line so changes in the magnetic field due to a ferrous object would still have been easily recognizable in the data.

At the completion of the deeper water survey, the WID survey team transferred the remote sensing equipment to the tender *Protector*. Initially, the team began surveying where the *Plan B* survey had left off on the east side of Endymion Rock. The following day, the weather calmed significantly providing the team with the perfect opportunity to survey the water directly over Endymion Rock. After completing the survey directly over the reef the team moved first area south of the reef, then to the west. Unfortunately the weather picked up significantly, 2-3 meter seas, preventing any further survey work. This left a section of the original survey box approximately 350 by 2600 meters, unfinished.

The shallow water survey located two distinct remote sensing features, a large multi-component magnetic anomaly along the east side of the rock and a smaller multi-component magnetic anomaly with associated acoustic targets to the west of Endymion Rock. The large multi-component anomaly along the east side of the rock was confirmed by divers to be the intertwined shipwrecks of the HMS *Endymion* and the Companion Wreck. That anomaly is centered at 260304E / 2336780N and the area of magnetic influence measures approximately 220 meters by 130 meters (Figure 6). The anomaly consists of at least 9 dipolar or monopoly signatures and has a minimum magnetic reading of 40, 489 gammas and a maximum reading of 41, 457 gammas. Unfortunately, the side scan sonar was unable to detect much of the shipwrecks due to the significant heave that was induced

on the sensor over the shipwrecks sites in combination with the fact that the wrecks are imbedded in the reef.

The multi-component anomaly to the west of Endymion Rock was centered at 259957E / 2336964N and covered an area measuring approximately 120 by 63 meters (Figure 6). This area is very close to the drop off on the western side of Endymion Rock. The anomaly consists of at least 4 monopolar and dipolar magnetic signatures with a minimum magnetic reading of 40,700 gammas and a maximum reading of 40,797 gammas. Side scan sonar data of the area shows 6 distinct objects protruding from the bottom (Figure 9). Those objects all had similar acoustic characteristics. They were all roughly 2-3 meter geometric objects that protruded from the seafloor 1-2 meters. The acoustic energy returned from them indicated that they were a very hard material like iron or steel. These anomalies were confirmed by divers to be large iron boxes with geometric shapes (Figure 10).