In Search of the Dutch Fleet of 1677

Tobago, West Indies

March 7 – 14, 22 May – 28 June, 2014

Figure 1: Dr. Kroum Batchvarov measuring one of eight newly discovered cannon on TRB-5. Photo: Dean Winter

Jason Paterniti, FRGS, FN’10, Douglas Inglis, TM’13
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Project Overview:

This report describes the results of the geophysical survey and archaeological investigations conducted in Scarborough Harbour, Tobago from March 7 to 14, and May 22 to June 28 2014. The objective of this survey was to locate and record 17th century shipwrecks associated with the Franco-Dutch naval battle of 1677. Three search areas covering approximately 5.7 million square feet (131 acres) were surveyed with side-scan sonar and magnetometer. Sixteen anomalies were identified. Thirteen of these targets were investigated by dive teams, and divers were able to identify material creating magnetic anomalies at eight of the sites. Three sites contained modern material. One site contained metal concretions possibly related to a 19th-20th century steam ship. One site contained a 17th-18th century anchor. Another site consisted of a sewer pipe and coherent ballast pile (which was not excavated). The remaining targets proved to be components of a 45 meter long wreck site consisting of a total of eight cannon of various sizes and calibers, galley bricks, ballast stones. The cannon and associated artifacts indicate that it is a coherent and potentially historically significant 17th century wreck site. Beyond these archaeological finds, the team also tested and successfully utilized non-invasive Structure from Motion (SFM) technology for site recording, exploration, planning, communication, logistics and educational outreach.

Figure 2: Flag 117 being positioned over one of eight newly discovered cannon at TRB-5
Historical Background:

The 17th century was a period of great exploration and discovery. Advances in ship technology and construction allowed European nation states to project power around the globe and dominate previously unexploited regions. (Batchvarov K. , 2012) In the struggle to control the Caribbean, the strategically positioned island of Tobago frequently came under attack. For the Dutch, the conflict culminated in March 1677 when a French squadron assisted by a large detachment of troops attempted to wrest control of Tobago from the Dutch West Indies Company. The fleets fought a crucial battle in what is now the modern commercial port of Scarborough Harbor, Rockley Bay\(^1\), on the island of Tobago. It was one of the largest naval conflicts outside Europe in the 1600s (Goslinga, 1971). As many as twelve Dutch ships and four French ships were sunk, lost or destroyed and over 1,200 men, woman, and children were killed in the action.

The battle of 1677 marked the end of efforts by the United Provinces of the Netherlands to assert military and economic influence in the western hemisphere, and one of the most significant turning points in the history of Caribbean settlement (Shomette, 1994). After the French-Dutch conflicts of the 1670’s, the island was effectively abandoned for several decades. As a result the wrecks were buried by sediment running off the surrounding hills, their final resting places eventually slipping out of collective consciousness for over 300 years.

Figure 3: Map showing Scarborough Harbour, the Dutch line of battle and the advancing French Squadron. (deJonge)

\(^1\) Scarborough Harbour is alternatively spelled “Scarborough Harbor”, and Rockley Bay is alternatively spelled “Rockley Bay”. As both modern and historic references are inconsistent, we use “Harbour” and “Rockley” when referring to each specific location.
In 1990, the Tobago House of Assembly (THA) commissioned the construction of a new marine terminal and pier in Scarborough Harbor. This project included dredging the harbor to a depth of negative 10 meters to facilitate larger draft vessels. During this project the drag-line used to dredge the harbor began to lift ballast rock, cannon, ship timbers, associated artifacts and human bones. Based on the material culture discovered by the construction crews, including an bronze 18-pdr cannon bearing the crest of Louis XIV and dated “1663”, the THA concluded that remains from the “Battle of Scarborough Harbor” had been discovered (Hall, Phase 1: A Marine Magnetometer Survey and Submerged Cultural Resource Reconnaissance of Rockly Bay and Scarborough Harbour, Tobago, 1999).

As a result of these finds, the THA commissioned experienced marine archaeologist Wes Hall, (who had been a member of Clive Cussler’s team which identified the submarine C.S.S. Hunley), to conduct an underwater archaeological survey of the inner harbor in 1991. Hall identified two sites containing wreck material designated sites “A” and “B” (Hall, 2012). In 1992, the THA commissioned Hall to conduct a second survey in order to determine the extent of Target “A” (designated in this report as TRB-1) to ensure that a planned construction of a new Coast Guard pier would not impact the site. A single shallow trench was excavated (Hall, 2012).

Figure 4: Map shows the results of the 1999 magnetometer survey by Wes Hall including sites “A” and “B”.
In 1997, the THA contracted Heritage Development Consultants (HDC) to study the shipwrecks in Scarborough Harbour. In cooperation with HDC, Wes Hall conducted a geophysical survey using a marine magnetometer to locate and assess possible ship remains within Rockley Bay. More than 45 anomalies were identified during the survey, which covered the area north of Red Rocks and east of Lodge Point, including all of Scarborough Harbour and the areas around the jetties (Hall, 1999).

HDC invited a dive team from the UK to investigate site “A”. After probing the site, the dive team began excavations in April 2000. They opened two trenches (A and B) across the site, and brought over 150 artifacts from site A to the surface (McKewan, 2006, p. 12). The team also ran a Nautical Archaeology Society (NAS) Part I training course during the project, with the aim of raising awareness of the potential of the project and to provide some initial archaeological survey skills and training for local divers. HDC ultimately abandoned the excavation, and the only published documentation is the 2006 NAS Part II report by L. M. P. McKewan. The artifacts, associated paper records of the artifacts as well as all photographic documentation were left with HDC (Underwood, 2013). The present location of this material is not known.

**The Rockley Bay Research Project:**

The cultural material and artifacts located in Scarborough Harbor potentially comprise one of the world’s most important sources of material concerning 17th century seafaring, ships and maritime culture. As such, a concerted effort was initiated in 2007 by Dr. Kroum Batchvarov, (Assistant Professor of Maritime Archaeology, University of Connecticut) to obtain permission from the THA to conduct proper scientific excavations and conservation of these endangered material remains. In April 2012, after 5 years of lobbying, the THA issued Batchvarov and his project team a permit to conduct an archaeological investigation of the shipwrecks located in Rockley Bay, Scarborough Harbor.

In June 2012, The Rockley Bay Research Project (RBRP) team conducted a ten day expedition carrying Explorers Club Flag 117. A subsequent reconnaissance survey was conducted in March 2013 to prepare for the Flag 117 2013 field season (Paterniti, 2012). The 2012 and 2013 surveys selected four sites for investigation,
catalogued as TRB-1 through TRB-4. Starting in May 2013, the team spent two months surveying these sites. Multiple cannon, anchor, metal artifacts, ceramic vessels, and glass bottles were recorded. Test pit excavation excavations were undertaken to uncover hull structure and dendro-chronological data samples were collected for analysis.

**TRB-1**

Site TRB-1 is a large ballast pile just west of the Coast Guard station. The ballast pile was identified as Site “A” in the 1999 survey report by Wes Hall and subsequently investigated by HDC/MRT. Local informants and previous archaeological work indicated that two sites which we have identified as TRB-1 and TRB-2 might be 17th century wrecks. Results from the 2013 RBRP survey indicate that associating the TRB-1 wreck with the 1677 battle may not be correct. Although numerous dendrochronological samples were collected, they did not match known European chronologies. Additionally, initial evaluation of the hull structure suggests that the ship was not constructed in the Dutch fashion, and very likely postdates the 17th century.

**TRB-2**

TRB-2 is a complex, multi-component site lying between the ferry jetties. It includes a 17th century cannon, two 17th or 18th century anchors, and numerous surface artifacts.

![Figure 6 and 7: TRB-2 surface scatter artifacts discovered during 2013 field season Photos: Douglas Inglis](image)

No additional evidence for a 17th century shipwreck was encountered during investigation. The cannon probably dates to the 17th century; however, it has modern wire or cable wrapped around it, and was likely relocated onto site TRB-2 during a failed modern salvage attempt.

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2 See “Rockley Bay Research Project, Tobago 2013” for more information
Figure 8: TRB-2 Cannon Photo Mosaic: Douglas Inglis

**TRB-3**

Site TRB-3 consists of an isolated cannon located just southeast of the long, western cruise ship jetty. It possibly dates to the 17th century, and was initially identified as a potential wreck site in 2012. Excavation at TRB-3 allowed our team to document the cannon, which is similar to the TRB-2 cannon and also likely dates to the 17th century. No evidence of hull structure was encountered at either TRB-2 or TRB-3. (Paterniti&Inglis, 2013)

**TRB-4**

Site TRB-4 is large ballast pile southwest of TRB-3 and the jetty. It appears to contain intrusive material which may post date the 17th century. Further investigations are necessary to try to determine the origin or date of TRB-4.
Project Aim:

The primary research aim of the Rockley Bay Research Project (RBRP) is to locate and survey 17th century shipwrecks associated with the Franco-Dutch naval battle of 1677 which took place in Rockley Bay, Scarborough Harbour, Tobago. As part of this multi-year, multi-disciplinary effort, the RBRP is working closely with the Tobago House of Assembly (THA) and the Tobago Ministry of Tourism to establish conservation and educational facilities on the island of Tobago. The conservation lab will allow for the eventual excavation, recording, documentation and proper conservation of select endangered hull remains and associated cultural artifacts located in Rockley Bay. This lab will also form the infrastructure necessary to build local capacity and a long term sustainable underwater cultural heritage management program.

Figures 9 and 10 THA-RBRP Conservation Facility nearing completion, Tobago March 2014.

Figure 11: Outreach efforts: Dr Batchvarov gives a lecture on Tobago’s maritime heritage to students from Signal Hill high School (Left) and discusses the project with members from the Tobago Historic Trust (Right).

3 The expedition adhered to the policies established by the Explorers Club: “Marine Archaeology Policy Guidelines” and the Institute of Nautical Archaeology (INA). It is the policy of the Project and INA to recover all objects for the sake of the host Government. No artifacts will be owned by the RBRP or sold for profit.
Project Objectives:

At the end of the 2013 season our team had relocated and surveyed all known wreck sites in the eastern section of the harbour where 17th cultural material was believed to be located.

The primary objectives for the 2014 RBRP Flag #117 Expedition were:

1. Locate and investigate magnetic anomalies in Rockley Bay that may be associated with 17th century shipwrecks. This would be accomplished via the collection, analysis, and interpretation of side-scan sonar and magnetometer\textsuperscript{4} data.

2. Deploy dive teams to identify, assess, and investigate as many of the identified magnetic anomalies as possible.

3. Test whether innovations in non-invasive modeling technologies can be used underwater to accurately record large artifacts and sites in 3D space.

\textbf{Figure 12: de Jonge map\textsuperscript{5} overlay on to satellite imagery of Rockley Bay, Tobago}

\textsuperscript{4} A magnetometer is an electronic instrument that measures localized changes in the earth’s magnetic field. By using a magnetometer in a controlled survey, the presence of ferrous materials can be detected. Since most historically significant shipwrecks contain relatively large amounts of iron or steel in the form of fasteners, anchors, cannon, or engines, etc., their presence can frequently be detected by a magnetometer survey. (Hall, Phase 1: A Marine Magnetometer Survey and Submerged Cultural Resource Reconnaissance of Rockly Bay and Scarborough Harbour, Tobago, 1999)

\textsuperscript{5} Prior reports incorrectly attributed this map to Woodcock. It is from Goslinga’s reproduction of ”Map of the French attack on Tobago, March 1677. From J.C. de Jonge, \textit{Geschiedenis van het Nederlandsche zeewezen}.}
Based on analysis of historical documents and local geophysical conditions we extended the 2014 survey area to the west of the 2012 and 2013 survey locations. To delineate our search blocks for survey, we geo referenced the predicted location of each of the ships from both the Dutch and French lines (figure 12) using historical accounts and maps of the battle. The team then calculated the projected path of travel for each of the ships lost during the battle. Analysis was based on historical accounts of the action, and the wind and tide patterns in March. These had to be corrected for modern changes to the coastline, as the north coast of the bay has been extended south by approximately 150-200 meters, and a stone breakwater and coast guard jetty have been erected on the east side of the harbour. Based on this analysis three areas were selected for survey.

Figure 13: Google Earth image of RBRP survey blocks
Project Team:

Figure 14: The 2014 RBRP March Survey Team (from left to right): Nicholas Alfred, Ian "Wabba" Milne, Sharma Roopnarine, Andrea Bruce, Dr Levis Guy Oblakor, Dr Kroum Batchvarov, Jason Paterniti MN’10, J.B. Pelletier, Dean Winter

The March Survey Project team was divided into two groups, as noted below:

Survey Team

<table>
<thead>
<tr>
<th>Captain</th>
<th>Pilot</th>
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<tbody>
<tr>
<td>Ian Milne</td>
<td></td>
</tr>
<tr>
<td>Jason Paterniti</td>
<td>Navigator</td>
</tr>
<tr>
<td>Dean Winter</td>
<td>First mate</td>
</tr>
<tr>
<td>J.B. Pelletier</td>
<td>Remote Sensing Specialist</td>
</tr>
<tr>
<td>Kroum Batchvarov</td>
<td>Screen Monitor</td>
</tr>
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Target Identification Team

<table>
<thead>
<tr>
<th>Kroum Batchvarov</th>
<th>U/W Archaeologist</th>
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<tbody>
<tr>
<td>Jason Paterniti</td>
<td>Diver</td>
</tr>
<tr>
<td>Dean Winter</td>
<td>Cameraman</td>
</tr>
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</table>
Figure 15: The 2014 RBRP June Excavation Team (from left to right): Jason Paterniti FN’10, Tom Lacy, Ian Milne, Nigel Nayling, James Davidson, Kroum Batchvarov, Matthew Milne, Michael Gilbart, Robert Spencer, Douglas Inglis TM’13

The June excavation team:

<table>
<thead>
<tr>
<th>Name</th>
<th>Affiliation</th>
<th>Nationality</th>
<th>Role</th>
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<tr>
<td>Dr. Kroum N. Batchvarov</td>
<td>Assistant Professor of Maritime Archaeology, University of Connecticut</td>
<td>Bulgarian</td>
<td>Project Director</td>
</tr>
<tr>
<td>Jean B. Pelletier, M.A., RPA</td>
<td>Senior Nautical Archaeologist &amp; Remote Sensing Specialist</td>
<td>USA</td>
<td>Remote Sensing Specialist</td>
</tr>
<tr>
<td>Nigel Nayling</td>
<td>Professor of Archaeology, University of Wales Trinity Saint David</td>
<td>UK</td>
<td>Dendrochronologist</td>
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<tr>
<td>Douglas Inglis TM’13</td>
<td>Texas A&amp;M University</td>
<td>USA</td>
<td>Assistant Project Director</td>
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<tr>
<td>Michael Gilbart</td>
<td>Texas A&amp;M University</td>
<td>USA</td>
<td>Dive Safety Officer</td>
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<tr>
<td>Veronica Morriss</td>
<td>Texas A&amp;M University</td>
<td>USA</td>
<td>Archaeologist</td>
</tr>
<tr>
<td>Dr. Levis Guy-Obiakor</td>
<td>RBRP</td>
<td>T&amp;T</td>
<td>Government Relations</td>
</tr>
</tbody>
</table>
Jason Paterniti  President, GEOS Foundation  USA  Director of Operations

Iain “Wabba” Milne  Boat Captain  T&T  R.V. Blu Spartan

Dean Winter  First Mate, underwater cameraman  UK  R.V. Blu Spartan

James Davidson  Volunteer  Bermuda  Remote Sensing Specialist

Matthew Milne  First Mate  T&T  R.V. Blu Spartan

Thomas Lacey  East Carolina University  USA  Student

Robert Spencer  University of Wales Trinity Saint David  UK  Student

Mark Wegiel  University of Connecticut  USA  Student

Derek Chung  Tobago Historic Trust  T&T  Diver/Government Liaison

**Logistics:**

Figure 16: R/V Blu Spartan’s stern multi-tasking as a dive platform, sensor deployment-recovery area, crew sleeping quarters and local media interview station (about to board).

To conduct the remote sensing survey and target identification, the 65 foot catamaran R/V *Blu Spartan* was chartered and outfitted. This vessel was also used during the 2012 & 2013 seasons. The boat’s captain and owner “Wabba” Ian Milne was familiar with the harbor and local facilities, and is also an advocate for local heritage. R/V Blu Spartan was also used to transport dive teams to target locations.
**Project Methods:**

**Equipment:**

An onboard computer navigation and data integration system was used during the remote sensing survey. The computer system was interfaced with a Trimble 132 AG Differential Global Positioning System (DGPS).

![Marine Sonic Side-scan Sonar](image1)

![G-882 c-v Magnetometer](image2)

The navigation system was operated using HYPACK™ hydrographic survey software. HYPACK™ was used to guide the survey vessel along preprogrammed survey lines spaced 20 meters apart. It also provided and maintained constant positioning data for both the side-scan sonar and the magnetometer data as it was recorded.

The remote sensing survey was conducted utilizing a Geometrics G-882 cesium-vapor marine magnetometer and Marine Sonics side-scan sonar operating at 600 kHz. The side-scan sonar data allows archaeologists to visualize and identify seafloor structures likely associated with shipwrecks such as cannon, anchors, ballast materials, and galley equipment. The Geometrics G882 magnetometer is an upgraded model from the one that was used during the survey in 1999, with updated software and tailfins to improve stability and reduce magnetic noise.

The power supply used during the survey consisted of a backup gasoline generator with 20 amps maximum power output. Our vessel’s internal generator was abandoned for survey work due to fluctuations in both output voltage and electrical frequencies which created power spikes and electrical noise beyond the tolerances of the survey array.

**Survey**

<table>
<thead>
<tr>
<th>SURVEY BLOCK</th>
<th>PERIMETER (feet)</th>
<th>AREA (sq feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Western Block</td>
<td>9,151</td>
<td>3,845,336</td>
</tr>
<tr>
<td>Jetty Block</td>
<td>3,340</td>
<td>690,368</td>
</tr>
<tr>
<td>Harbour Block</td>
<td>4,391</td>
<td>1,200,007</td>
</tr>
</tbody>
</table>
Figure 19: Magnetometer survey

Figure 20: Dean monitoring side-scan sonar during the survey in Rockley Bay. Photo: K Batchvarov
Data Collection Methodology:

The survey area included all of Rockley Bay, beginning on the northern side of Red Rocks and Scarborough Harbour in and around modern structures, jetties, and anchored vessels.

Survey lines for the Western Block were carried out east and west, beginning on the northern side of Red Rocks. Additional survey lines were conducted north and south in Scarborough Harbour and in the Pier Block to improve data collection in and around harbour obstructions. Several survey lines were conducted parallel with the shoreline to help tie in data missed while turning the vessel around at the end of east/west survey lines.

Figure 21: Google Earth image of RSST survey lines

Magnetometer and GPS data were fed into one laptop. A second PC received data from the side-scan sonar. J.B. Pelletier, our remote sensing specialist (on loan from URS Corp.) monitored the survey and magnetic signatures, using his keyboard to start/stop logging data on every lane, changing lanes, marking and annotating targets that are synced to the GPS, while also taking notes.

Based on experience with prior survey projects, it was recommended that the pilot have his own monitor with only navigation information, controlled from the main laptop. The pilot would then be able to navigate and focus on avoiding shallow areas, marine hazards, and other boats. If the GPS/Magnetometer monitor was positioned directly in front of the pilot, then the remote sensing
specialist would have difficulty seeing the magnetometer signature and using the keyboard on the laptop at the same time. (Cartellone, 2014).

![Figure 22: J.B. at his on-board work station. Photo Dean Winter](image)

Due to R/V Blu Spartan’s configuration of a pilot deck on an upper level and the lack of VGA cable it was not possible to provide a navigation monitor to the pilot. A handheld GPS was used instead. The vessel’s autopilot and depth gauge were not functioning during our expedition which required pilot and navigator to constantly make course corrections throughout the three day survey.

In the cabin, Dr. Batchvarov acted as screen monitor working with J.B. to follow the side-scan sonar monitor screen, call targets, and take notes.

**Data recording:**

Magnetic data, along with corresponding positioning data, was recorded at .1 second (10 Hz), intervals (or approximately one full field reading every 60 cm along a track line at 3.5-4 knots) using HYPACK™. We ran transects at 20 meter intervals.
Figure 23: Sonar image of Coast guard Jetty, TTCG vessel and pier pilings. Cursor on screen pointing to TRB1

Interpretation:

Multi-component targets have the highest potential of being associated with a significant cultural resource (i.e., historic shipwrecks). Dipolar magnetic anomalies with relatively high intensity Gamma\textsuperscript{6} signature and durations also have a high potential to be associated with a historic shipwreck. Those magnetic anomalies with low intensity and duration have a limited possibility to be associated with a significant cultural resource (Pelletier, 2014)

\textsuperscript{6} Gamma is essentially a means to measure a field shift in the earth’s magnetic field due to the presence of ferrous metal objects.
Underwater Investigations:

Once targets were identified by magnetometer and GPS system, a buoy tied to a lead line was used to mark the target area. Divers were then deployed to conduct searches to identify the objects producing the magnetic signatures. Significant surge was experienced at some of the sites. Divers also reported repeated “stinging” over any exposed skin including lips and ears. While these short term stings or bites were distracting, they would not prevent archaeologists working in these areas. However, the surge was identified as a potential issue for our team’s recording efforts.

Structure from Motion:

The 2014 season targeted a section of the bay which afforded better visibility than previous seasons. As a result, Assistant Project Director Douglas Inglis TM’13 was able to test new imaging technologies for underwater recording by creating Structure from Motion (SfM) models of the excavation. SfM is a range imaging technique which estimates three-dimensional structures from two-dimensional photographic or video sequences. By recoding the site each day, this technology allowed us to create a 3D time series model of our excavations throughout the season.

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7 We later learned the locals call the unidentified organisms “sea ants”- we had not encountered them in the harbour during our previous field seasons.
In order to collect data, Inglis dived the site each morning and collected photos prior to the day’s excavation work. The photo collection process involved linear transects, as typically used in creating a photomosaic, as well as following the contours of complex objects (such as trenches or cannons) to image hard to reach areas. Inglis covered the site with 60+ permanent marker tags which helped the software align the photos during processing.

In the afternoon Inglis processed the data collected during the morning dive using Photoscan™. He initially collected high-resolution (12 MB) photos. While the results were highly detailed, processing hundreds of high-resolution photos with a field laptop proved to be too time consuming. In order to generate data that could be used in real time, Inglis decided to collect two sets of photos. The first set of data was captured as VGA photos which could be rapidly processed. The resultant SFM models generated from this data were used to plan for the next day, provide visitors to the project with up to date virtual site tours, keep colleagues around the world informed of progress as well as to discuss findings and obtain expert input on our findings in real time. Inglis also collected sets of higher resolution photos (3 or 12 MP) for processing in the off season.

To compare the accuracy of SFM to traditional methods, the team plotted the reference points using the Direct Survey Method (DSM), a method frequently used by underwater archaeologists to record the position of artifacts in three-dimensional space. DSM involves collecting a web of measurements between fixed points using a measuring tape. The data is then processed with Site Surveyor™ 4 software, which triangulates the position of the points in space. Our team collected over 500 measurements between the 60 control points to create a model with less than 1 cm residual horizontal error.

![Figure 25: low resolution 3D SFM model of the TRB-5 excavation trench. This image shows the Westerwald jug in situ, before it was raised for documentation. The yellow tags are calibration targets used for both SFM and DSM.](image)
Project Results:

Pier Block Survey:

Significant ferry and commercial traffic (including an unexpected arrival of a sand barge) limited access to survey the pier and harbor block for the first two days. This was fortuitous, as it forced the project team to investigate the western survey block, which would not have otherwise been immediately prioritized. Once our team was able to successfully survey the pier block, we found that the piers, docks, bulkhead, and debris on and within the bottom (both historic and modern) caused anomalous readings, and made it difficult to effectively utilize the marine magnetometer.

Figure 26: Scarborough Harbour Block: Sand barge and T&T Ferry unexpectedly docked in our intended search area
Harbour Block Survey:

The inner harbour also proved to be a very difficult environment for conducting a marine remote sensing survey, as all of our activity in this area had to be conducted around the commercial traffic schedules. The resulting magnetometer survey data proved to be inconclusive. In order to identify buried shipwrecks in the vicinity of the inner harbour, systematic bottom testing will be required. During the 2015 season we will conduct further investigations using a video probe to test for evidence of shipwrecks. If probing results are encouraging, a series of test excavations might be required.

Western Block:

The western block survey provided conclusive results. We ran transects along headings of 50° and 230° TN. While our survey vessel did not have operational navigation equipment, depth gauge, or autopilot, we were generally able to maintain the targeted survey lines using a hand held Garmin™ 62St and the experienced hand of our captain, despite battling against strong currents and winds. The western block survey initially identified 14 anomalies (2 additional targets were later identified by our remote sensing specialist). Six of these targets were investigated by divers and are described below.

RB30

RB30 is located roughly in the middle of the western survey block. Diver investigations identified a large field of concreted ferrous objects. This material appears to be related to a more modern shipwreck possibly a steamer.

Figure 27: RB30 anomaly.  
Figure 28: Metal concretions. Photos: K Batchvarov
RB 25

RB25 is located along the northern shoreline of the bay, east of a north-south oriented reef. This site corresponds to historical accounts of ships sunk during the historic battle between the French and the Dutch in 1677. RB25 is located close to the modern shore in a highly dynamic surf zone with a sandy bottom. Our single one foot square test trench revealed minor layers of compacted organic material and possibly a single ballast shingle. Further identification of the magnetic anomaly will require testing with a video probe and investigation with a metal detector.

RB 39

The location of target RB39 corresponds to historical accounts of ships sunk during the historic battle between the French and the Dutch in 1677. We probed down through six feet of overburden and hit compacted sand but could not identify the source of the magnetic anomaly. A local man (apparently inebriated) swam from shore to our location disrupting work and dislodging our buoy marker. This site location may present a security issue given its proximity to shore.

RB33

The location of target RB33 corresponds to historical accounts of ships sunk during a historic battle between the French and the Dutch in 1677. We encountered the sandy bottom but did not probe. Identification of the material producing the magnetic anomaly will require testing with a video probe and further subsurface investigations by a dive team.

TRB-6 Ballast Pile

The target location corresponds to the location of a sewer line running across the top of a ballast pile. Local informants say a shipwreck had been found when a sewer line was built in the bay during the 1990's. During the project, construction crews reported observing “skeletons and shackles” while excavating a hole through the ballast pile. Based on historical records, the Dutch ships Sphera Mundi or the Gouden Monnick held the Dutch colony’s slaves during the battle, and it is possible that this ballast pile is associated with one of those ships. Surface investigation of the ballast pile identified modern construction debris as well as 19th century brick, both of which appear to be intrusive components. Further investigations, including subsurface testing, are needed at this site.

RB 31 & RB 32 (TRB-5)

The magnetic anomalies RB31 and RB32 were associated with a single site, designated as TRB-5. It consists of a large debris field containing bricks, cannon, ballast stone and a significant quantity of cultural material. Site TRB-5 was the focus of the 2014 excavation season, detailed below.

During his 1999 survey west of the piers, Wes Hall identified a site 30 meters west of the TRB-5 site. Hall concluded that it was an “18th century wreck”. It is not known what material was found or what led Hall to select this date range. Prior to his death in 2012 Hall recommended we survey in this area further.
TRB-5 Excavation & Recording

Site TRB-5 consists of a large, dispersed ballast pile and eight associated cannon. The ballast is comprised of jumbled, encrusted bricks and ballast stones. As a smooth layer of mineral encrustation has formed atop the bricks, they appear similar to the surrounding limestone outcrop; as such, the full extent of the ballast pile has yet to be determined. It is distributed across at least a 20 meter long by 10 meter wide area. Our team excavated a 6.5 meter long, 0.5–0.7 m deep test trench across the pile just northeast of Cannon #4 and #5. Excavations were documented each day using SfM. The entire site, and each of the cannon were also documented with SfM.

Figure 29: Dr. Kroum Batchvarov excavating TRB-5. Photo: D. Inglis, TM ’13

Cannon:

Divers identified and recorded eight cannon arranged in a 45 meter long linear alignment. The guns were heavily concreted, some almost completely embedded into the surrounding reef. The southeastern-most gun (#1) was roughly 2 meters long. It was positioned near a pair of guns lying side by side (#2 and #3), that were respectively 2.85 and 2 meters long. The muzzle of cannon #3 may have broken off or been damaged. A second set of guns (#4 and #5) were just west of this pair. They were
positioned at right angles, with their muzzles pointed toward each other. Cannon #4 was roughly 1.65 meters long, while the cannon #5 was 3.1 meters long, possibly a 24 pdr. A heavily concreted 1.7 m long linear concretion just northwest of these guns was designated as Cannon #6, though its status is unclear. It is surrounded by numerous other concreted bolts and large pieces of iron. Two more guns were identified west of this cluster of guns. Cannon #7, 14 meters northwest of #5, was 2.3 m long. Cannon #8, 16 meters northwest of Cannon #7, was roughly 1.7 m long; however, it was buried in the reef and difficult to measure accurately. Although concretion covered many of the details and prevented borehole measurement, at least 3 caliber weapons are present, with the largest guns being 18 or 24 pdrs. The range of calibers is consistent with the armament of a smaller to middling-sized 17th century men-of-war (Batchvarov K.). A wreck associated with the battle could have discharged smaller artifacts along its path to its final resting place on a reef where heavier items like cannon settled in a concentrated pattern. As the ship burned, lighter cannons could have fallen through the decks to rest next to larger cannons from the gun deck.

Figure 30: Dr. Batchvarov recording one of the cannon found at TRB-5. Photo: Paterniti

To see the RBRP team’s actual discovery of TRB-5 click TRB-5 Discovery of a 17th century Wreck
Figure 31: TRB-5 Interim Site Plan, based on DSM data and sketch maps. Courtesy D. Inglis, TM '13
Figure 32: 3 meter cannon possibly a 24 lb cannon

Figure 33: 1.5 meter possible “Falcon or Minon”. Photos Paterniti

Figure 34: TRB-5 (left) 2.9 meter possible 8 to 12 lb

Figure 35: (lower gun) 2.8 meter possible “Saker”
Figure 36: Divers Batchvarov and Paterniti discussing the 1.8 meter cannon. Photo Dean Winter

Figures 37 and 38: Divers recording cannon at TRB-5. Photo: Dean Winter
Figures 39 and 40: Divers exploring in search of evidence of the 1677 battle of Rockley Bay

Anchor

One of the targets corresponded to the location of a partially buried upright anchor lodged against the side of the reef located between the original position of the Dutch line and the site TRB-5. It is located approximately 20 meters east of the center of the cannons at TRB-5.
Artifacts:

Bricks

During excavation, divers recorded numerous concreted bricks at TRB-5, some of which appeared to be burned. Research suggests that the brick dimensions (ca. 18 cm x 9 cm x 4 cm) match the “standards of Leiden” in the Netherlands: 18.3x9.2x3.9 cm. (Batchvarov K.) Historian Frank Fox provided the following information regarding galley configurations of 17th century Dutch war ships:

“The cookroom of Dutch warships up until at least the 1730s was on a platform in hold perhaps seven feet beneath the gundeck forward of the mainmast and main hatch. It consisted of a broad brick apron and a high brick wall extending most of the breadth of the ship, with hooks in the wall for suspending copper kettles or other cooking receptacles over the fires on the apron. There might be a copper chimney extending to the upper deck, but apparently not above it.”

(Fox, Dutch men-of War at the battle of Tobago, 1677, 2014)

Figure 43: Bricks found at TRB-5 arrayed for SfM and recording. Photo: T. Lacy
Pipes

More than 100 broken clay pipes, pipe bowls, and stem fragments were recovered. Many had decoration, including insignia on the heels, traditional Dutch “Gouda” designs on the sides of the bowl, and even elaborate floral and heraldic decorations. The pipes all have shapes which are consistent with dating from 1650 to 1680 (Batchvarov K.)

Figures 44 and 45: Mark carefully excavating a red clay pipe. Photo: D. Inglis, TM ’13

Figure 46: Examples of pipes documented from TRB-5. Photo: V. Morriss
Wood:

A large fragment of timber was uncovered near the brick pile. It might be the remnant of a frame, but it was left in situ and not uncovered to preserve it for the following season. There are numerous, smaller, unidentifiable wood fragments at the site.

Ceramics:

Numerous ceramic fragments were uncovered on site. These included a fragment of a large, salt-glazed Bellarmine jug (a.k.a. a Bartman jug) with the remnant of an escutcheon, as well as a small, complete, undecorated Bellarmine jug. Divers also recovered a bowl fragment with relief decoration. The most impressive piece of potter recovered from the site was a large Westerwald jug decorated with three elaborate escutcheons.

Figure 47: Pottery recovered from TRB-5. Photo: V. Morriss
Large Concretions:

Archaeologists observed a large concretion which may be a bolt, associated with timber noted above. A large concretion that may be the top of a key-lock bolt, surrounded with wood fragments, was also discovered.

Metal objects:

Archaeologist uncovered multiple forks and spoons in various states of preservation. Other metal fragments of note include what appears to be the guard from the trigger of a firearm and a serpentine spring from a firelock of a firearm. We also found six lead shot, two of which were pistol shot, while the rest were likely from muskets. Several may have been used, though some retained spurs and an undistorted shape. Additionally a round metal disc was uncovered this is likely a token or jetton.
Discussion:

Question: Is TRB-5 a 17th century Dutch wreck? If yes, can her identity be established?

The 2014 remote sensing survey of Scarborough Harbour resulted in the identification of numerous targets, 13 of which were investigated by divers. Three of these targets revealed what appears to be an associated anchor and eight heavily concreted cannon which group in two "heavy" cannon types plus one or two (more probably) smaller calibers groups.

![GIS overlay of contemporary maps with modern survey maps](image)

Figure S2: GIS overlay of contemporary maps with modern survey maps

While by no means conclusive, based on predicted wind and tide patterns, both the TRB-5 and TRB-6 are in the right position for a burning ship from the middle of the Dutch line to drift to, run aground on the 4 meter reefs noted in both contemporary de Jonge and modern bathymetric maps.

Based on our research we are not aware of any major battles being fought on Tobago in later periods and we have yet to find reference to any other man-of-war lost in the bay after the battle of 1677.

Cannon

Finding such a concentration of cannon of different size and calibers could be indicative of a wreck of a two-Decker man-of-war, with the heavy calibers coming from the gun decks. The lighter pieces may have come from the quarterdeck and forecastle. The assortment of guns is fairly typical for the Dutch Navy of the period. This finding is not consistent with what one would expect to find on the wreck of a merchantman or a later frigate (Batchvarov K., 2012).
Of the eight (heavily concreted) cannon that we have observed, two at least seem to be 18 to 24-pounders. In terms of dating the cannon, all appear to have flat breeches. On all the cannon observed, their trunnions are below the centerline of the gun. Both of these characteristics - particularly the flat breech - are diagnostic features of early period guns. The flat breeches are found up to the early 18th century, however old cannon could have been used on more modern ships so cannon dating cannot be relied upon (Batchvarov K.)

**Bricks**

The shapes and sizes of the bricks are consistent with Dutch 17th century forms. The concentrations of brick material next to the central cluster of cannon could be indicative of a galley. Historians believe that the galley of 17th century Dutch warships were located below the gundeck forward of the mainmast and main hatch (Hoving, 2014) (Fox, 2014). The location of the brick pile adjacent to the cluster of different caliber guns is consistent with the hypothesis that Dutch men-of-war carried their galleys under the forecastle where smaller armament would be located above and large ordinance forward and below.

**Artifacts:**

Based on preliminary analysis the Pipes, Bellarmine jars, metal ware and fragments found in situ at TRB-5, the site appears to be consistent with a late 17th century Dutch date range.

**Dendrochronological Analysis:**

The wood samples collected from TRB 5 will undergo dendrochronological analysis to try to determine provenance and date. This analysis is not yet complete.

**Absence of Material:**

Lack of other artifacts associated with a more modern ship wreck supports a hypothesis that TRB-5 could be the remains of a 17th century ship. To date, we have found no in situ material that does not fit into this date range. Also we have not found intermingled modern 18th-19th materials which would indicate the presence of a later period wreck component.

**Identity of the TRB-5 Wreck**

Based on above, and pending results of dendrochronological analysis, we believe the cultural material found in situ at TRB-5 is consistent with 17th century Dutch ship. If this is hypothesis can be confirmed with further research, is there also sufficient information to reasonably determine the identity of TRB-5?

According to historical research, of the 11 Dutch Ships which sank in the bay during the battle of 1677, only *Huis de Kruiningen*, *Middleburgh* and *Leyden* were large enough to carry 18 pound cannon observed at TRB-5. Based on contemporary accounts of the battle from the Dutch and French, *Leyden* was located at the Eastern most end of the Dutch Line whereas the other two ships where located in the middle of the line (see figure 52). Based on interviews conducted in 2014 with local mariners and port officers, the wind and tide patterns typically observed during March would indicate that *Leyden* was not
moored in a position where it would have drifted to the location of TRB-5 (though this possibility cannot be ruled out completely).

<table>
<thead>
<tr>
<th>Nederlandse Schepen</th>
<th>Type</th>
<th>Condition</th>
<th>Year</th>
<th>LENGTH</th>
<th>Beam</th>
<th>Draft</th>
<th>Guns</th>
<th>Men</th>
<th>Command</th>
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<tr>
<td>de Zaajer brander De Zacier</td>
<td>Fireship</td>
<td>burnt</td>
<td>0</td>
<td>19</td>
<td>Comm Heertje Carstens</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Duc de Yorck vict schip</td>
<td>merchant ship</td>
<td>burnt</td>
<td>26</td>
<td>33</td>
<td>Comm Fred Sweers</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Huis te Kruiningen</td>
<td>ship</td>
<td>burnt</td>
<td>1653</td>
<td>140</td>
<td>56</td>
<td>Kapt Roenter Vlaq</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>de Gouden Monnik, vict schip</td>
<td>merchant ship</td>
<td>burnt</td>
<td>31</td>
<td>28</td>
<td>Comm Dirk Schoen</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Middelburgh</td>
<td>ship</td>
<td>burnt</td>
<td>1661-5</td>
<td>125</td>
<td>32</td>
<td>14</td>
<td>36</td>
<td>83 Kapt Jan Suart</td>
<td></td>
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<tr>
<td>de Gouden Star</td>
<td>ship</td>
<td>burnt</td>
<td>10</td>
<td>28</td>
<td>74 Pieter Corentan</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Popkesburg</td>
<td>ship</td>
<td>burnt</td>
<td>10</td>
<td>24</td>
<td>52 kapt Pieter Stolwijk</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Leyden</td>
<td>ship</td>
<td>burnt</td>
<td>34</td>
<td>73 Kapt Galtje Galtjes</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>de Fortuin adv Jagt</td>
<td>dispatch</td>
<td>burnt</td>
<td>0</td>
<td>25 Comm Jan Erasmus</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>t schepje Starrenburg,</td>
<td>ship</td>
<td>burnt</td>
<td>0</td>
<td>0 door lekkage alhier</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>de Sphera-Mundi, vict sch</td>
<td>merchant ship</td>
<td>burnt</td>
<td>12</td>
<td>30 Comm Wylof Lartyereys</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Figure 53: Listing of Dutch ships lost during the battle of 1677. Source: De Jonge, Vreugdhenhil (Publications of the Navy records Society) (Fox, Dutch men-of-War at the battle of Tobago, 1677, 2014)

While Leyden could have carried 18 pound cannon of the size found at TRB-5, we also know from contemporary records that only three of the Dutch ships: Bescherming, Huis de Kruiningen and the Middelburgh actually did carry armaments similar to what we believe we have found at site TRB-5. (Hooghe, 1677) As Bescherming was one of the few Dutch ships not lost in the battle, we can eliminate her as a possibility.

There were two “Middelburgs” in the Dutch 17th century navy. One was a ship of up to 50-guns built for the Admiralty of Zeeland in 1653 which was equipped with 24-pdrs at times. However, this was not the ship lost at Tobago, since she was still in service as late as 1693. The other Middelburg, which was destroyed at Tobago, was a 36-gun frigate built by the Admiralty of Amsterdam in either 1661 or 1665. She might have had a pair or two of 18-pounders but she could not have carried 24 pound cannon as we believe are located at TRB-5. Frigates of this size more commonly had nothing larger than 12-pounders. (Fox, 2014) Thus, it is unlikely that the TRB-5 wreck is Middelburgh.

The Huis de Kruiningen was built in 1653 for the state of Genoa but was acquired by the Admiralty of Amsterdam (Harrison, 2014).

Figures 54 and 55. Two views of the 56-60 gun Huis de Kruiningen built in 1653, lost during the battle of 1677. (Fox, 1996)
The *Huis de Kruiningen*'s armament included four 24-pounders in 1665, but in 1666 the largest guns were only 18-pounders. By 1677 the Admiralty of Amsterdam acquired more 24-pounders, so the ship might have again had some aboard when she went to the Caribbean. (Fox, 2014).

*Huis de Kruiningen* was positioned in the middle of the Dutch line and very well could have foundered to the north-west along the reef line where numerous anomalies, including the cannons at TRB-5, have been identified.

![Figure 56. Location of Huis de Kruiningen. From De Jonge](image)

During the battle, *Huis de Kruiningen* was boarded by the French. Vlacq, her captain, had her cables cut to run her aground and then intentionally set her on fire so that the French could not seize her (Batchvarov). She blew up, killing all the boarders. As Dutch ships located their main powder room aft, the forward half of the ship may well have survived (Fox, 2014).

**Conclusions:**

Based on the material observed at TRB-5, the RBRP team believes it has discovered a coherent and potentially historically significant 17th century Dutch wreck, possibly the *Huis de Kruiningen*. Beyond this important archaeological find, the team also tested and successfully produced new recording methods utilizing *Structure from Motion* technology. Based on our findings, we believe SfM will become an important new tool for nautical archaeologists. SfM allows field projects to better understand, plan and disseminate information about a site in real time. As SfM recording capabilities continue to evolve, the unintended damage done by physical excavation work can be better mitigated as a permanent virtual
record of the site can be captured. This will allow future scientists and the general public from anywhere in the world to virtually re-explore and study the site as it was found in situ through to the final day of excavation.

Next Steps:

- Excavate test trenches at sites TRB-4 & TRB-6
- Continue excavation of TRB-5
- Further examination of the TRB-5 cannon. If TRB-5 is the *Huis de Kruiningen*, the guns may show the arms of the Admiralty of Amsterdam (crossed anchors and double "A"s) on the first reinforce just forward of the touch hole (Fox, 2014).  

Lessons Learned:

- Make sure serial numbers of any equipment are itemized and printed for customs importation
- Advise logistics teams that US Customs requires a new form for re-export of US items
- Primary generator did not provide clean power to the remote sensing equipment. Make sure a UPS is carried to difficult locations with unreliable power supply sources. The generator we had rented could not maintain a constant clean power output which caused the Hypack™ system to trip and lose GPS.
- Photograph each site investigated (not just the ones where anomalies are identified), to provide future survey leaders with a visualization of the operating environment for planning purposes.
- Plan a minimum full day for set up/testing of equipment for any remote sensing survey project.
- When interpreting the work of prior experts/projects make sure you understand the motivations and objectives of the author. In our case, the prior remote sensing specialist may have provided select or redacted data in his reports to protect the cultural material. Additionally

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8 As the Admiralty may have supplied ships with purchased or captured guns (versus specifically cast for the Admiralty), the lack of an arms mark is also possible. (Batchvarov K.)
when he brought our project team to the site for the first time he recommended we focus on an area of the harbour where he knew a wreck was located. He based his assessment that this site was a 17th century wreck on the work of others which he does not identify. Perhaps Hall wanted to show us a site he believed was 17th century and knew had hull structure versus taking us west where he could not guarantee cultural material would be found? The project team spent three seasons in this area. Should a different path have been followed? While it is difficult to say, we spent a season determining wrecks A and B are not likely 17th century, as originally suggested by prior excavations. In complicated, complex sites like Scarborough Harbour, this is normal part of the scientific process of hypothesis testing. As a result, we have a far better understanding of the site-formation process (Batchvarov K.). By conducting our own survey of the bay in 2014, our team was able to establish a wider, less biased view of the historical landscape, develop a clear picture of the work that remains to be done, and identify the previously unknown remains of a 17th century Dutch vessel.
Works Cited:


Woodcock, H. I. (1866). *A History of Tobago*. Port of Spain, Trinidad: Columbus Publishers Ltd.
Acknowledgements:

- Mr. J.B. Pelletier, Senior Nautical Archaeologist & Remote Sensing Specialist, URS Corp for volunteering his valuable time and assistance with this remote sensing survey.

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- Mr. Perry Naughton, Jessica Block and Dr Al Bert Lin at UCSD for their assistance in processing remote sensing data for the project.
### Magnetic Anomalies

**REMOTE SENSING SURVEY TOBAGO**

locations given in Universal Transverse Mercator (UTM) Grid Coordinates, Zone 20 (WGS 1984):

<table>
<thead>
<tr>
<th>TARGET RB</th>
<th>TYPE</th>
<th>MAG SIG GAMMA</th>
<th>AREA</th>
<th>DEPTH METERS</th>
<th>DATE INVESTIGATED</th>
<th>RSST NOTES</th>
<th>3-D</th>
<th>DIVE TIME (mins)</th>
<th>DEPTH (feet)</th>
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<tr>
<td>11</td>
<td>MULTI- COMPONENT</td>
<td>227</td>
<td>15</td>
<td>5</td>
<td>3/10,11,12/2014</td>
<td>5-6 cannon located and mapped</td>
<td>154</td>
<td>14</td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>MULTI- COMPONENT</td>
<td>28</td>
<td>5</td>
<td>3</td>
<td>3/12/2014</td>
<td>The target location along the northern shoreline corresponds to historical accounts of ships sunk during a historic battle between the French and the Dutch in 1677. Additional diver investigations and sub-bottom testing are recommended to identify the material creating the magnetic anomaly. Site is close to shore in surf zone. Sandy bottom, dynamic environment. 1 foot test trench revealed minor layer of organic material possible single ballast shingle. Need hydro probe/metal detector for further analysis</td>
<td>8</td>
<td>14</td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>MULTI- COMPONENT</td>
<td>326</td>
<td>12</td>
<td>6</td>
<td>3/12/2014</td>
<td>multiple concreted metal fragments concreted to reef. Need metal detector</td>
<td>25</td>
<td>17</td>
<td></td>
</tr>
<tr>
<td>32</td>
<td>DIPOLAR</td>
<td>154</td>
<td>8</td>
<td>4</td>
<td>3/12/2014</td>
<td>1.8m cannon flat breech (this site may actually be part of site RB 31 if so this cannon is associated is one of the 6 previously found at RB31</td>
<td>25</td>
<td>17</td>
<td></td>
</tr>
<tr>
<td>39</td>
<td>DIPOLAR</td>
<td>139</td>
<td>9</td>
<td>6</td>
<td>3/12/2014</td>
<td>The target location corresponds to historical accounts of ships sunk during a historic battle between the French and the Dutch in 1677. Additional diver investigations and sub-bottom testing are recommended to identify the material creating the magnetic anomaly. Sandy bottom need metal detector probed to 6 feet hit compacted sand bottom. A local man swam from shore for a visit disrupted work and moved buoy marker. Site location may be a security issue.</td>
<td>14</td>
<td>17</td>
<td></td>
</tr>
<tr>
<td>33</td>
<td>MULTI- COMPONENT</td>
<td>86</td>
<td>6</td>
<td>6</td>
<td>3/12/2014</td>
<td>The target location corresponds to historical accounts of ships sunk during a historic battle between the French and the Dutch in 1677. Sandy bottom did not probe. Need hydro probe/metal detector. Additional diver investigations and sub-bottom testing are recommended to identify the material creating the magnetic anomaly.</td>
<td>10</td>
<td>32</td>
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Equipment manifest:

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<th>L (inches)</th>
<th>W (inches)</th>
<th>H (inches)</th>
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<td>52</td>
<td>14</td>
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<td>Side scan cables &amp; GPS</td>
<td>86</td>
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<td>20</td>
<td>12</td>
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<tr>
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<td>11</td>
<td>grey plastic case</td>
</tr>
</tbody>
</table>

Dutch Ships

Figure 57: Bescherming

Figure 58: Gouden Star

Figure 59: Popensburgh

Figure 60: 4 days Battle: Bescherming

Source: Catalog of van de Velde drawings at Boymans Beuningen Museum in Rotterdam
<table>
<thead>
<tr>
<th>Name</th>
<th>Fleet</th>
<th>Type</th>
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<th>Guns</th>
<th>Men</th>
<th>Commander</th>
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<tbody>
<tr>
<td>de Zaaier (brander De Zacier)</td>
<td>Dutch</td>
<td>Fireship</td>
<td>burnt</td>
<td>0</td>
<td>19</td>
<td>Comm Heertje Carstens</td>
</tr>
<tr>
<td>Zedandia (provencie van Zeelong)</td>
<td>Dutch</td>
<td>Ship</td>
<td>ashore, destroyed</td>
<td>44</td>
<td>118</td>
<td>Kapt Pieter Constant</td>
</tr>
<tr>
<td>L'Alcion Fransche prijs</td>
<td>Dutch</td>
<td>Ship</td>
<td>ashore, destroyed</td>
<td>24</td>
<td>25</td>
<td>Comm Corn Stolwyck</td>
</tr>
<tr>
<td>de Bescherming</td>
<td>Dutch</td>
<td>Ship</td>
<td>ashore refloated</td>
<td>50</td>
<td>153</td>
<td>Comm Jacob Binkes</td>
</tr>
<tr>
<td>Duc de Yorck vict schip</td>
<td>Dutch</td>
<td>merchant ship</td>
<td>burnt</td>
<td>26</td>
<td>33</td>
<td>Comm Fred Sweers</td>
</tr>
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<td>burnt</td>
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<td>Ship</td>
<td>burnt</td>
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Figure 61: Battle of 1677 causality list Source: Mynheer Romein de Hooghe, Amsterdam Admirlity Broadsheet, 1677