

THE EXPLORERS CLUB FLAG 132 REPORT

The *Warwick* Project, Bermuda

11 June – 17 July, 2011



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Summary:

From June 11, to July 17, 2011, a team of marine archaeologists, students and volunteers worked to uncover, fully excavate, and scientifically record the hull remains and associated artifacts of the *Warwick*, a 16th century English Merchantman which sank in Bermuda in 1619.

Introduction:

“On October 20th, 1619, en route to Jamestown Virginia, the magazine ship belonging to Sir Robert Rich, the 2nd Earl of Warwick, made a scheduled stop in Bermuda. *Warwick’s* arrival was an important event for the Island. On that voyage, the ship was charged with delivering Captain Nathaniel Butler, the new Governor of the nascent colony. Apart from Butler, *Warwick* was to carry supplies and settlers to the struggling colony at Jamestown, and collect colonial products from Bermuda and Virginia for return to England. While the ship was in port, a devastating hurricane wreaked havoc on Bermuda. Amongst the victims of the tempest, was the *Warwick*, which sank at its anchorage in Castle Harbour” (Bojakowski, 2010).

Almost 400 years later, underwater archaeologists from the National Museum of Bermuda, Texas A&M University, and the University of Southampton are working with local Bermudians to scientifically excavate the sunken remains of the *Warwick*.



"The Warwick entering Castle Harbour". Painting by Stephen Card circa 1980 (Private Bermudian collection)

Historical Significance

The Warwick is both a prime example of a late 16th century naval warship, as well as an early 17th century merchantman that played a fundamental role in supplying the English settlements in North America. *Warwick*, and ships like her, carried the financial interests of small businessmen and English investors. These ships of private enterprise also carried the settlers that would permanently make their homes in Bermuda and the American colonies. Despite the economic and civic importance of these "magazine" ships during the 1600s, the remains of *Warwick* represent the only known example in the world. This site ranks among such historically significant wrecks such as the Tudor warship the *Mary Rose* (sank in 1545) and the English-built *Sea Venture* (wrecked at Bermuda in 1609) (Bojakowski, 2010).

Unlike most 17th century shipwreck sites which often comprise only the keel section of the hull, the remains of the *Warwick* include her starboard side from the turn of the bilge to her gunwale. Archaeologists suspect that as she sank, she listed to starboard and her ballast pile likely shifted on to her side. This action resulted in the preservation of an unusually large portion of the starboard side of the *Warwick* (Tucker, 1979). In terms of significance to nautical archaeology, the remains of the *Warwick* helps us better understand a transitional stage in shipbuilding of which no records, accurate paintings or blueprints exist. The possibility that this ship was built in the late 16th century will provide, once fully analyzed, insight into the construction of English race-built galleons in comparison to the contemporary treatises on ship design. Additionally, the excavation and analysis of the *Warwick* in the context of the "*Gresham Ship*" the *Sea Venture*, and the Swedish Royal galleon *Vasa*, will enable us to study the construction of Northern European ships from the keel to the upper-works while at the same



Map of Castle Harbour

time seeing the evolution of the shipbuilding tradition from the late 16th to the early 17th centuries. Based on our currently limited knowledge of 16th-century and early 17th-century galleons, properly excavating and studying this wreck presents an unparalleled opportunity to expand our understanding of this period (Bojakowski, 2010).

Last but not least, the *Warwick* has special significance to the Explorers Club, as she was first re-discovered in 1967 by Mendel Peterson and Teddy Tucker's Flag Expedition #189.

Aims:

With the permission of the Historic Wrecks Authority of Bermuda, the Warwick Project team intends to excavate, fully and scientifically, the race-built galleon *Warwick*.

Objectives:

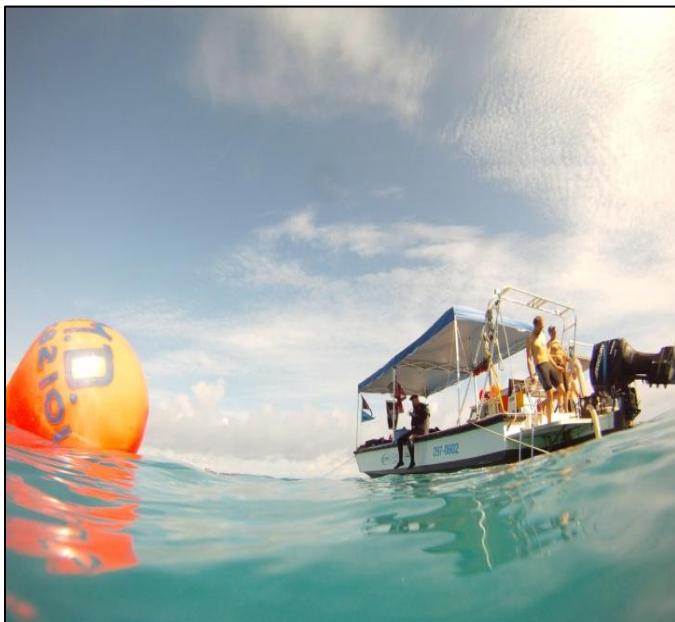
The Project team's primary set of objectives for the Project include:

- Excavate the overburden on the mid-ship section of the wreck site.
- To record and map the timbers and artifacts of the mid-ship section of the *Warwick* using standard recording equipment as well as WEB Program and other 3-D modeling equipment and software.
- To collect wood samples for identification and dendrochronological analysis to date the ship structure and potentially discover the geographical provenance of the timbers.

Methodology:

In 2008, the Project team first relocated the site using archival materials from Teddy Tucker's 1967/79 expeditions. Once the general area of the site was located, test trenches were dug to pinpoint the exact position of the wreck. In 2010 preliminary excavations were conducted on the site.

During the 2011 excavation, The *Warwick* Project followed best practices developed for marine archaeology by the Institute of Nautical Archaeology (INA). These procedures begin with the careful excavation of the overburden by hand fanning and water dredges, as well as identification of potential artifacts using non-invasive techniques such as metal detectors. As artifacts are uncovered, they are documented *in situ* by photography and spatial positioning to known control points using Direct Survey



Method (DSM). Only after an object has been photographed, documented by underwater photography and plotted accurately on the site plan using the latest digital software, is consideration given to removing the object from the site for conservation and display¹. When not engaged in underwater excavation work, members of the excavation team work on the surface to completely catalogue every object raised from the site and begin the process of field conservation. At the conclusion of each field season the site must be completely reburied in order to protect it from exposure to currents, worms and other harmful agents.

Archaeologists preparing for a dive from the Warwick project barge

The Project Director, Piotr Bojakowski and Associate Director, Douglas Inglis were responsible for establishing daily schedules and assigning discrete tasks to the team members.

Mike Gilbert, Dive Safety Officer was responsible for monitoring and controlling all dives. Given the shallow depths we were operating in (6 meters on average) no deco stops were required. Typically archaeologists completed 3-5 dives with a total bottom time of 3-4 hours per day, six days a week.

¹ * N.B. It is the Government of Bermuda's policy that all objects recovered remain the property of the people of Bermuda.

Project Team:



Some of the Warwick Project Team pictured Top F.L.T.R: Associate Project Director, Doug Inglis, Dr. Crisman, Maureen Merrigan, Mike Gilbert, DSO, Dr Jon Adams, Bottom: James Davidson, Leah Crisman, Jason Paterniti, Project Director, Piotr Bojakowski, Dr Batachvarov, Susana Vallejos.

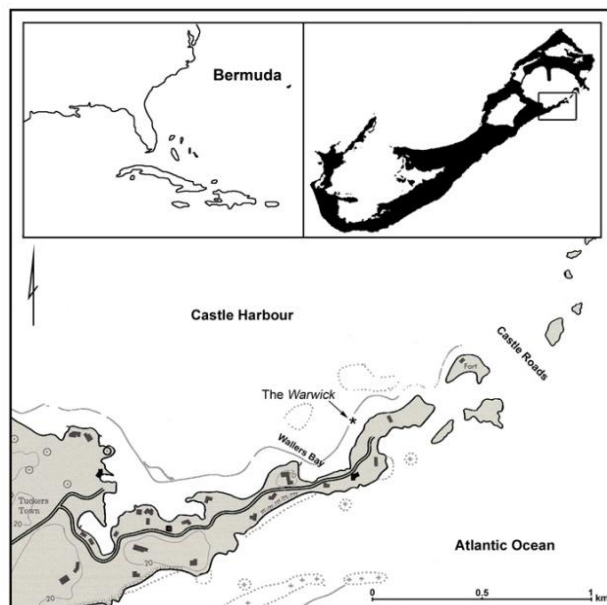
- **Piotr Bojakowski**, Co-Director of the Warwick Project; PhD Candidate in the Nautical Archaeology Program at Texas A&M University, and Archaeologist/Conservator for the National Museum of Bermuda
- **Dr. Katie Bojakowski** Co-Director, Ph.D, Volunteer Archaeologist at the National Museum of Bermuda
- **Dr. Kevin Crisman** of Texas A&M University
- **Dr. Jon Adams** of Southampton University
- **Dr. Kroum Batchvarov**, Ph. D., Institute of Nautical Archaeology
- **Dr. Edward C. Harris**, FI'99, MBE, JP, Ph.D, FSA, Executive Director National Museum of Bermuda
- **Doug Inglis**, Assistant Project Director, Ph.D. student, Texas A&M Nautical Archaeology Program
- **Rodrigo Torres**, Ph.D. Candidate, Texas A&M Nautical Archaeology Program
- **Mike Gilbert**, Project Dive Safety Officer, Masters's student, Texas A&M Nautical Archaeology Program
- **Daniel K. Scott**, Masters's student, Texas A&M Nautical Archaeology Program
- **Maureen Merrigan**, Masters's student, Texas A&M Nautical Archaeology Program
- **Susana Vallejos**, Volunteer
- **Leah M. Crisman**, Volunteer
- **James Davidson**, Project Marine Engineer
- **Jason Paterniti**, MN'10 ,Volunteer
- **Robert Zuill**, Project Videographer & Photographer
- **Zoe Brady, Beth Biccieri, Tarika Brangman, Brit Franklin and Samila Ferreira Torres**, Bermuda Volunteers



Flag #132 on the Warwick

The Warwick Project is honored to have been granted the privilege to carry Flag # 132 into the field. Since 1948, Flag # 132 has been carried on expeditions from Patagonia to the Hindu Kush. Flag #132 has seen its share of marine archaeological work including Robert D. Ballard, Ph.D.'s 1998 expedition to find the German battleship 'Bismarck', Peter E. Hess's 1990 "USS Monitor Expedition", David Concannon's 2001 "Atlantic Sands" and the 2003/5 "R.M.S. Titanic Scientific & Photographic Expeditions.

Orientation:



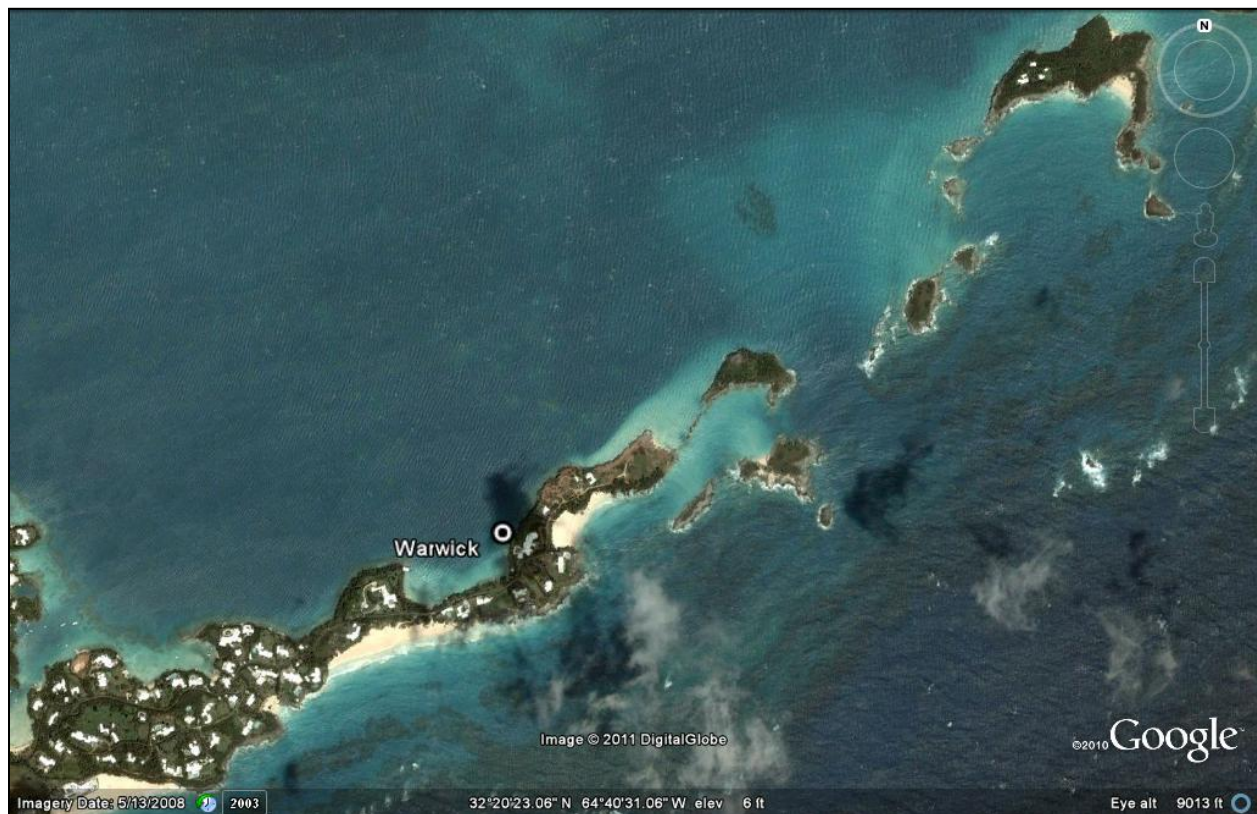
Map of the Warwick Site by P. Bojakowski

Bermuda was once a far larger landmass than the roughly 30km long fish hook shaped chain of islands that exists today. The Bermuda islands together with a submerged, encircling reef are in fact the remains of a volcanic caldera rising thousands of meters from the ocean floor. On top of the cooled magma forming the volcano, lies a layer of limestone. This upper layer of sediment was formed as thousands of generations of calcium secreting marine organisms came to rest on top of the cooled magma. During the last ice age when water levels were lower, this limestone cap was exposed. Over time, the elements broke down the concreted limestone and winds whipped the particles into sand dunes. Finally these dunes settled into the limestone rock base of the island we see today.

Surrounding the island, lie hundreds of square miles of shallows and a dangerous reef line encircles the island like a deadly necklace. Locals estimate there are over 400 wrecks in and around Bermuda. What makes navigation extremely challenging is that there were only two natural breaks in a reef line which reaches to within a few meters of the island's shoreline in some places.

In 1619, only a few dozen ships had ever made anchorage in Bermuda, and almost all of them had moored in Castle Harbour, the only accessible anchorage for deep-hulled craft. Castle Harbour must

have appeared to be a more than adequate anchorage, being a well-protected natural harbor. However, as the Captain of the *Warwick* and many Bermudians over the centuries learned, Castle Harbour does not provide adequate shelter from a northwesterly storm. Today *Warwick* rests approximately 10-15 meters off the eastern cliffs of Castle Harbour in approximately 6-7 meters of water.



Stratigraphy:

A fine layer of sediment covers most of Castle Harbour. This material, which is easily disturbed, is a thought to be a byproduct of the dredging work conducted by the U.S Army corps of engineers in building an airbase runway during the Second World War. Beneath this sediment is a layer composed of white coral and sand mixed with broken shell. This sand layer is many meters thick in places. The *Warwick* sits one to two meters below this sand and shell layer. Inboard of the wreck site a large layer of ballast rock also covers the wreck amidships. Underneath this ballast is 2-5cm layer of gray organic material.

In terms of the dynamic environment around the site, the seabed is in a constant state of flux with tidal changes of over one meter. Currents run with the tides, going out as the tide falls and running in as the tide rises. Visibility typically deteriorated significantly as the tide ran out.

Field Journal:

11 June 2011

The project team, comprising archaeologists from Brazil, Sweden, the UK, Texas, California, Connecticut, New York are starting to arrive on site. During the first week, a rented barge was positioned over the



Piotr and Maureen preparing to dive on Warwick

site. This will be our floating project base for the coming weeks. On site we have two underwater dredgers, one provided by the National Museum of Bermuda and the other lent to the project by James Davidson, a local Bermudian who is our project Marine Engineer. Dredging the over-burden covering the section of the ship to be recorded this season is expected to be a significant project and two dredgers will make this task significantly easier to accomplish.

15 June 2011



Ceiling planks and hull timbers of the Warwick uncovered for the first time in nearly 400 years

The team began this week to uncover the overburden on the mid section of the wreck. In the first few days of work the ballast pile is located and is significantly larger than anticipated. It also contains many artifacts such as plate shards, and bones, which may have been provisions in a barrel.

Under the ballast pile and remaining overburden lies the well-preserved starboard section of the vessel from the turn of the bilge to the gun wale.

23 June 2011

After many dives the team has dredged approximately two meters of sand and coral overburden off an area of 5 x 10 meters. Below this lies a surprising large ballast pile which is primarily composed of river rocks. This ballast pile represents a double edge sword for the project; as it slows down excavation work but it has also directly contributed to the protection of the fragile timbers underneath from exposure to damaging currents and shipworms which bore into and destroy any submerged wood.

A section of hull heavily damaged by *Teredo navalis* commonly known as shipworm.

Damage to the Warwick timbers caused by burrowing Teredo worms can be seen in the photo above. The tube-like objects running through the wood artifact are calcareous build ups created by the worms as they burrow.

25 June 2011

With a significant amount of ballast now shifted off of the wreck we can start to see the overall design of this ship. In a few more weeks we should be able to start recording the newly exposed hull timbers and frames.

Dredgers removing overburden. Exhaust from the dredgers is directed onto screens to make sure no artifact is missed

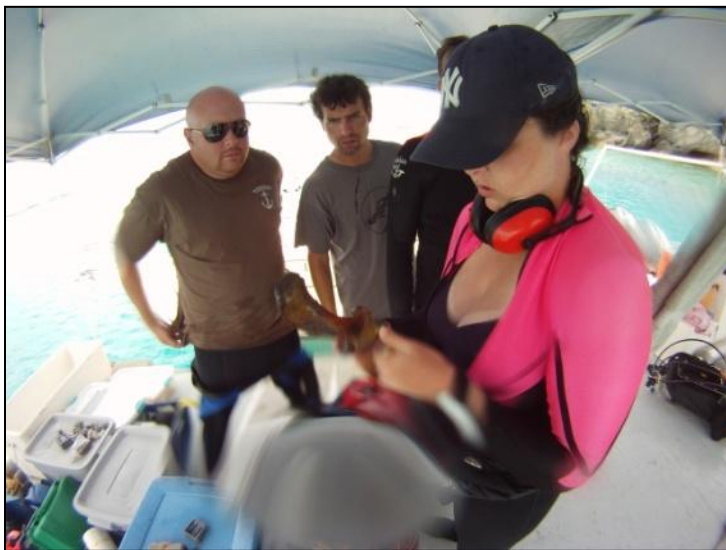
26 June 2011

After our morning debrief, we head out to the site, where today's diving team includes Piotr, James, Maureen, Doug, Leah, Danny, Rodrigo and Mike. Our first task is to continue clearing ballast from the



midship section. In the late morning we switched to the dredgers. The afternoon dives were spent on the screens sifting through debris which has been carefully excavated from the hull. In addition to clay pottery shards, we found more animal bones. We also found a number of wooden strips of saplings which might have been "withies" used to instead of iron or copper bands around the staves making up a barrel.

Archaeologists sorting artifacts for conservation

27 June 2011

When the *Warwick* sank, it took with it supplies and stores bound for the Jamestown colony.

From the morning dives we brought up a clay pipe fragment, a round wooden disk, a treenail and a small round shaped wooden fragment which may have been a stopper for a jug.

Early afternoon dives brought up large amounts of coal, a number of wooden wedges, and a large animal bone.

Cattle bones recovered from the ballast pile



A diver recording Warwick's ceiling planks

28 June 2011



Rodrigo examines a wooden artifact with multiple nail holes

On the surface, items are quickly analyzed and then placed back into tubs filled with water to minimize exposure to air. By the end of the day we had most of the exposed ballast pile removed from the site.

We are making good progress clearing the overburden. Our first task of the morning was to reposition the dredgers.

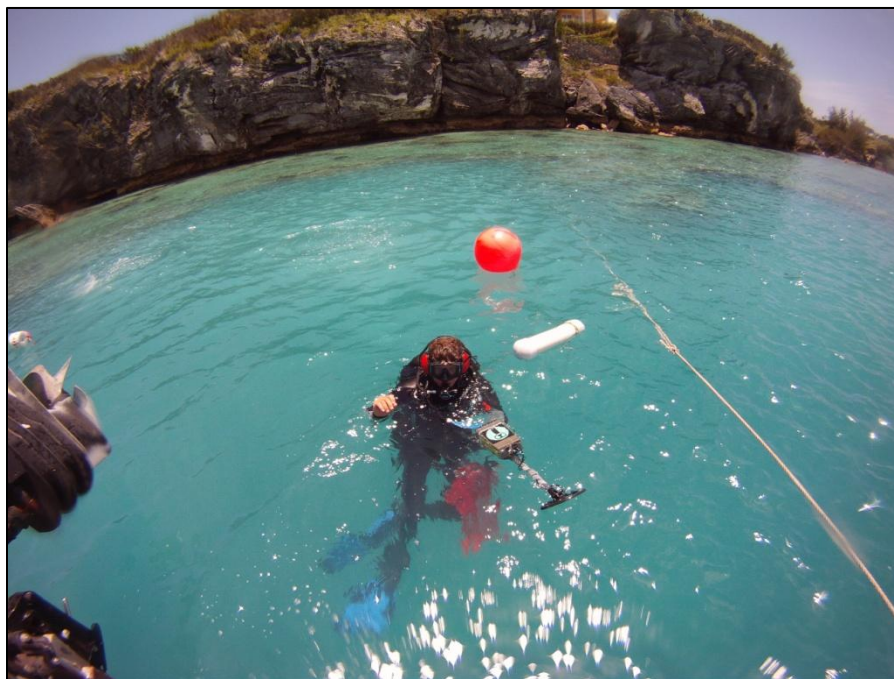
Throughout the day we methodically we shift through the debris from the dredgers which is deposited on the screens, allowing us to start recording the site using cameras and video.

29 June 2011

Flag 132 over the project Site

Prior to commencing work on the wreck this morning, we made a photo survey to record progress over the last few days. While Piotr was recording, Mike and James perform some routine maintenance on one of the dredgers. With repairs completed, it was back to clearing the overburden.

While much of the structure remains in place on the sea floor, occasionally an artifact is dislodged. If it cannot be associated with its immediate surroundings, the item is recovered, brought to the surface,



recorded and measured and then either conserved or reburied.

In the afternoon we completed a survey of the area around the uncovered hull with a metal detector.

A number of concretions were discovered and other possible targets marked for testing.

Jason Paterniti MN'10 preparing to search the site with a metal detector

30 June 2011

Professor Jonathan Adams who is the Head of Archaeology at the University of South Hampton arrived today. Dr Adams is a specialist in maritime archaeology and was the Deputy Director of the *Mary Rose Project*, the Amsterdam (UK), and the *Sea Venture* (Bermuda).

Significant progress was made on removing rock ballast from the exposed timbers today. A “deadeye” which was exposed a few days ago has been cleaned and we may try to recover it tomorrow weather permitting.

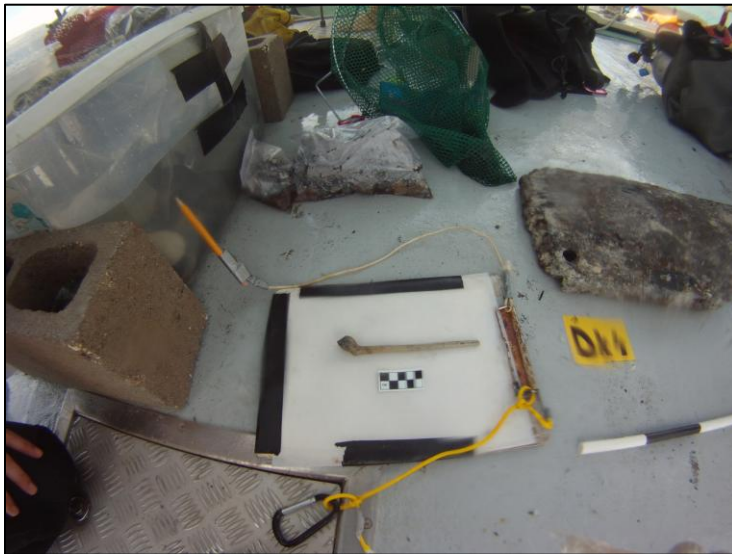
Figure 1 Flag #132 behind the chain plate of the Warwick

Using a metal detector James and Maureen recovered a lead weight, an excellent example of a musket charge cap, an unidentified lead-strip, and a ball padlock similar to one which was recovered from the *Sea Venture*.

1 July 2011

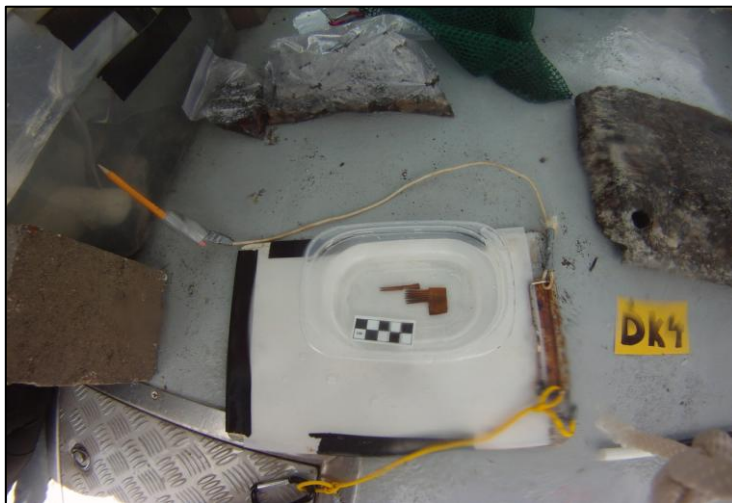
Most of the uncovered section of the hull is now cleared of ballast pebbles and debris and today turned out to be an exciting day of finds for the team.

Ceiling timbers of Warwick. One timber is missing showing the seabed underneath the wreck

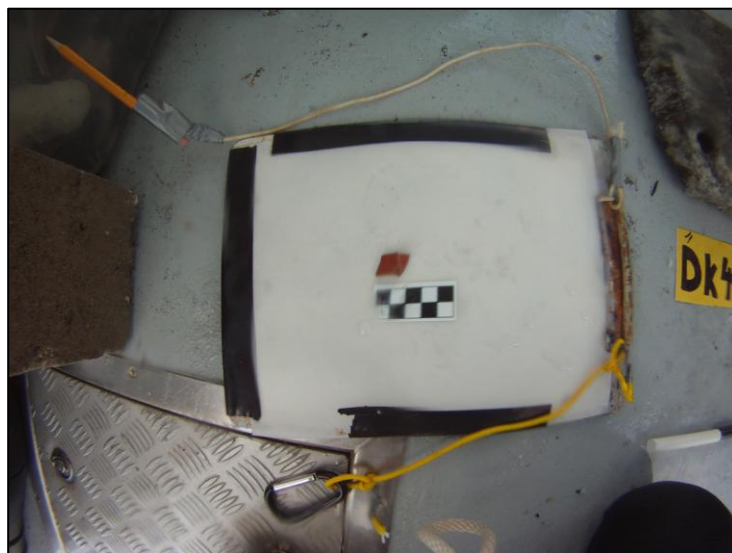


Using a metal detector James and Maureen recovered a large concretion located to the north west of the wreck which has numerous musket shot and other ferrous artifacts.

While dredging, Rodrigo uncovered a nearly complete clay pipe (left).



Also we recovered a comb made possibly of bone (left).



A good example of Roman era pottery known as *Terra Sigillata* "small figures" was also recovered. This artifact may have ended up in Bermuda as part of *Warwick's* ballast- which was likely to have been dredged rock from English rivers which are full of Roman era pottery.

2 July 2011

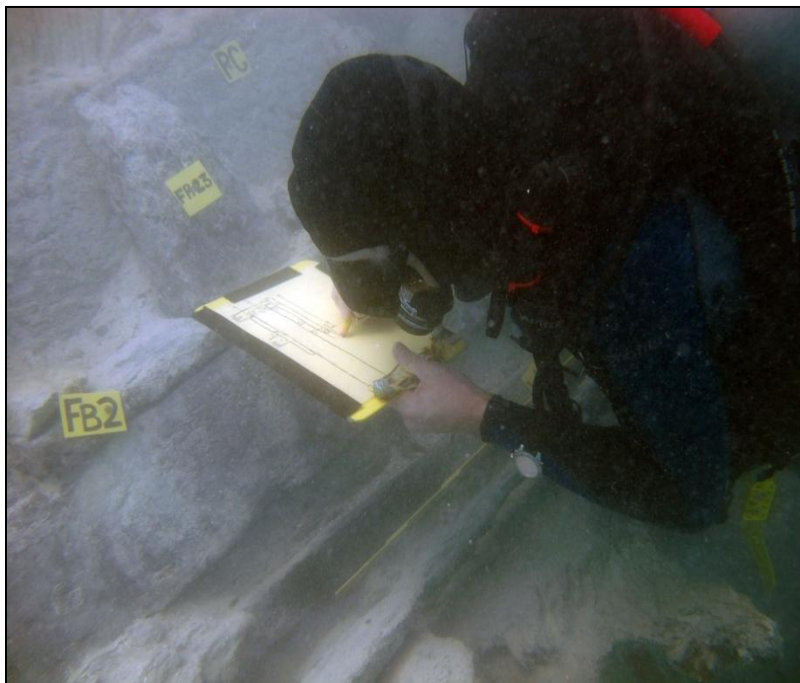
With the discovery of well over 400 artifacts, the hardworking Warwick Project crew spent their weekend recording rather than resting.

Rodrigo Torres shows a young Bermudian how to record artifacts.

4 July 2011

It is July 4th. Fireworks are going off here in Bermuda, celebrating the American War of Independence. Somewhat ironically, we spent the day recording a shipwreck that is a reminder that the early North American colonies were completely dependent on the British Empire. When Warwick sank in Bermuda, it was a devastating blow to the Jamestown community. Warwick was a key link in the lifeline that

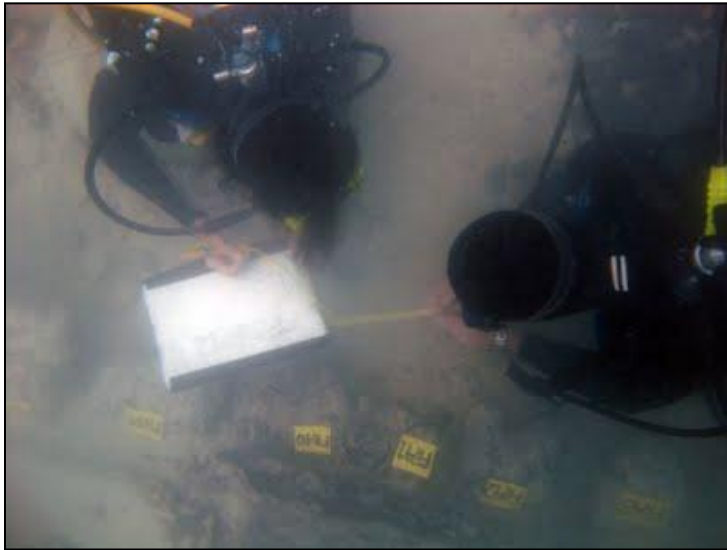
connected colonial Virginia, Bermuda and England. (Inglis)



Professors Dr. Kevin Crisman and Dr. Kroum Batchvarov arrived today. Working alongside Dr. Jon Adams, the three Nautical Archaeologists began labeling timbers, established baselines, and recording the hull.

Dr Crisman of Texas A&M University recording timbers

Recording the wreck from both ends: Dr. Crisman (previous photo) is busy drawing the top timbers while Dr. Batchvarov and his assistant Susana (Below) are recording the bottom timbers.



We also continued exploring east of Warwick's stern with the metal detector. Large concretion of bolts, wood and other metal objects were identified. In order to preserve the objects, they will be recorded *in situ*, and then raised stored in water containers and taken to the lab for x-ray to see what is inside. We also recovered some lead shot and a powder charge, sometimes referred to as an "Apostle".

James Davidson (Above) is using a metal detector to locate musket balls

5 July 2011



This morning we were joined by Robert Zuill, who is producing a film documentary on the project. Robert filmed divers as they recorded the wreck, moved ballast with lift bags and excavated a concreted chain plate. We are thrilled to have him participating. Unfortunately, just after Robert left the site, we found, mapped and raised a large concretion of cannonballs.

Long tails fly over the dive barge (team photo)

After Warwick wrecked, parts of the hull were salvaged, and other parts left to fall apart on their own.



There are numerous loose deck planks on the wreck, lying randomly across the beams and top timbers. Although not necessarily in their original position, these planks can be great sources of information. Each artifact is raised and then traced on clear plastic acetate, recording important features such as fasteners, tool marks and grain pattern. These minute details provide significant information on how the ship was designed and built.

Doug Inglis recording timbers on the bottom

Tonight Dr. Adams, Dr. Batchvarov and Project Director Piotr Bojakowski gave public lectures at the Bermuda Aquarium in the evening. Public outreach, especially involving local Bermudians is a key objective of the project. Some 80 people crammed in between the tanks of fish to learn about the *Warwick* as well as other significant projects. We are thrilled with the turnout, and owe a debt of gratitude to both the National Museum of Bermuda and the Aquarium for their support. (Inglis)

10 July 2011



This morning James and Maureen recovered a concreted mass containing with at least two cannon balls. One of which was easily removed from its concreted encasing revealing a beautifully preserved iron canon ball as well as bar shot.

Another significant artifact brought to the surface today was a “gudgeon”, which is essentially a metal bracket used to attach the rudder to the ship.



Above left James Davidson carefully hand fanning to expose a “gudgeon”. Above right, image of a rudder held in place with use of pintles & gudgeons (Wikipedia).

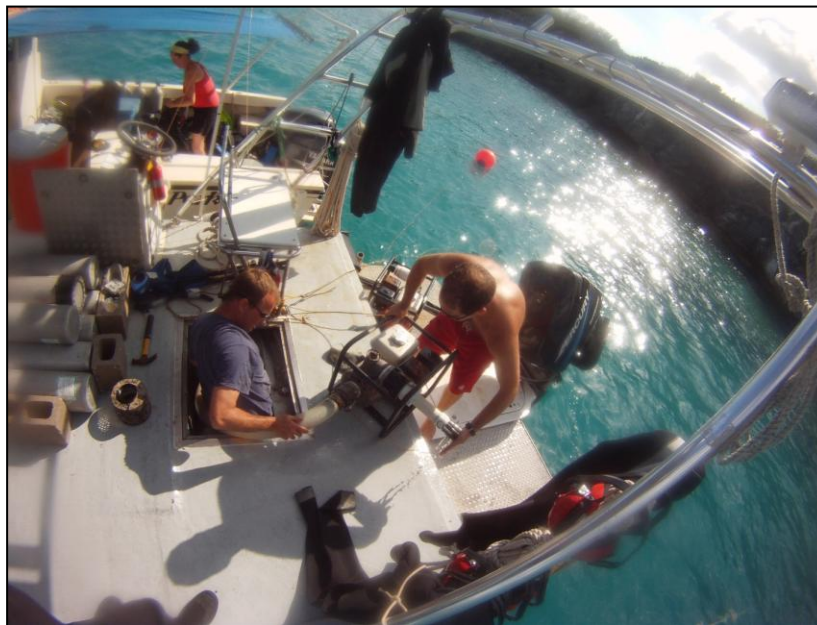
11 July 2011

With the weather closing in on us Dr. Adams, Dr. Batchvarov and Project Director Piotr Bojakowski, Susana, Maureen, Mike and Danny spent the morning recording and measuring timbers.

Meanwhile James and Jason recorded a number of metal objects identified with a metal detector including a lead sheet and nail. In the afternoon a large concreted mass was brought up to the barge which contained a handle shaped object which is wrapped with a metal wire.

12 July 2011

Tuesday morning was spent with taper measurers, pencils and clip boards of Mylar paper. Mid day our friends from BIOS brought a group of young Bermudians out to the site to snorkel and dive above the archaeologists at work. In the afternoon recording continued and we excavated a pintle—a pin or bolt—usually inserted into a gudgeon which is used as part of a pivot or hinge to keep a rudder attached to a boat.

13 July 2011

Over the last few days our work platform appears have taken on water and is listing despite attempts to pump out the bilge.

This morning James Davidson our marine engineer was able to use one of our dredgers to pump out excess water from the bilge which appears to have stabilized the barge.

Pumping out the barge bilge using our dredger



Dr Batchvarov in a field of "Kroum Sticks"

Meanwhile, 6 meters below, Dr. Kroum Batchvarov and his assistant complete final hull measurements on the Warwick. This system was designed by Dr. Batchvarov and first used on the *Vasa* in Sweden. This innovative non invasive technique uses sticks placed between planks to obtain accurate measurements of framing timbers which are located below the floors.

14 July 2011

At the conclusion of each season, a site must be protected from exposure to currents, worms and other agents which could damage artifacts. Typically this process starts with covering the timbers with sand and silt. In this case, this was accomplished using the blue half-barrel we have on site and small buckets. Piotr the Project Director determined that the site needed to be further protected with a tarp. The team prepared the tarp on the surface and took it down. One edge was weighted with lead weights. After positioning it, the team slowly started to unroll it while large stones were placed all over it. Using everyone available, the tarp was weighted down. It is hoped that the tarp will provide the anaerobic conditions and slow the deterioration of the timbers. After this Piotr decided to run a dredge for 2 more dives to bury the tarp. This provided uniform layer coverage. Because some parts, especially along the top, were still not fully buried, during the last dive the team used a blue bucket and put a few loads of sand over the exposed sections.

Conclusion:

During the seven-week field season the Warwick Project team successfully excavated the overburden on the mid-ship section. Despite delays caused by an unexpectedly large ballast pile, the team did complete the recording and mapping of the timbers and artifacts and a number of wood samples were collected for identification and dendrochronological analysis.



Canon ball recovered from the Warwick with Flag 132

Having now completely reburied the exposed site, the fieldwork part of the project for 2011 is complete. Over the coming months dendro samples will be examined in the lab and the project team will spend winter inputting data to create a 3-D model of all of the frames and timbers which were recorded during the season. In 2012 the team will re-assemble to complete work on the bow section and surrounding areas of the site.

For more information on this expedition including video documentaries please visit: www.G-EOS.org

Acknowledgments:

We would like to thank the following groups and individuals who have made the Warwick Project possible:



The Warwick Team with one of the project sponsors, Mr. Ross Perot

- Mr. Nick Hutchings, Mr. Harold Conyers, Chairman, and the Bermuda Historic Wrecks Authority
- Institute of Nautical Archaeology
- Texas A&M University
- The National Museum of Bermuda
- The Perot Foundation
- KPMG Bermuda
- Mr. Jason Carne
- Tucker's Point Dive & Water Sports Centre Terry, Dawn and Heidi. Terry and company have long been supporters of the Warwick project going back to the first assessment surveys, and we are all extremely grateful for their continued generous assistance.
- Tuckers Point Hotel for providing both food and accommodation to the project team during the entire excavation period. This project could not have continued without your support.

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