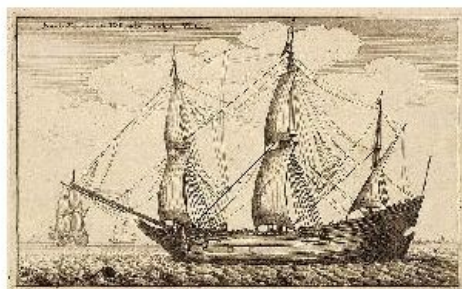
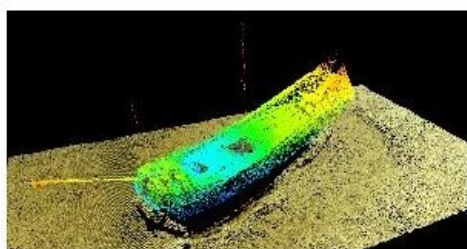


FRONTLINE DEEPWATER ARCHAEOLOGY IN THE BALTIC SEA

The Ghost Ship Expedition

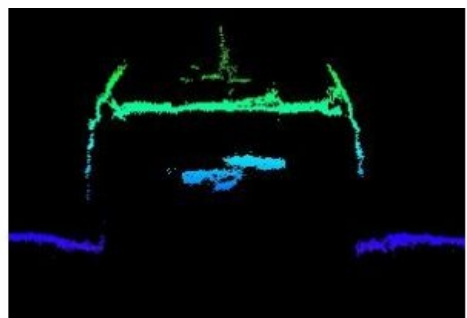


In complete darkness, 125 metres below the surface in the middle of the Baltic Sea, lies a shipwreck. Almost completely intact despite sinking almost 400 years ago. 2009 saw the start of an international research project about this wreck, a combination of maritime archaeological analysis, frontline technical development and a documentary film production for the international market.



The Baltic Sea is probably the world's best location for ship archaeology. One reason is that most organisms that normally consume wood in the oceans are absent in this cold brackish water sea, including the infamous shipworm 'Teredo Navalis'.

The hulls of wooden wrecks therefore stay in one piece with the masts erect for hundreds of years on the dark seafloor of the Baltic Sea. Another important precondition is that this northerly inland sea has long been a busy sea route and the site of many shipwrecks.



The Discovery

In 2003, Deep Sea Productions and MMT (Marin Mätteknik) discovered an exceptionally well-preserved shipwreck about 30nm east of the island of Gotska Sandön. The discovery was made during

a side-scan sonar search for a Swedish reconnaissance plane lost in 1952. Inspection using ROVs (Remotely Operated Vehicles) showed the wreck to be an almost intact merchant ship from the 17th century.

The wreck was visited on five different expeditions between 2003 and 2010. A variety of survey equipment was used, including four different multi-beam echo sounders, two side-scan sonars and six ROVs.

Since 2009, the wreck's discoverers have worked together with the MARIS institute at Södertörn University in an international scientific project aimed at examining the wreck, now dubbed the 'Ghost Ship'. The examination shows that the 25 metre long ship is of a

type called fluyt. Construction details and wood samples indicate that it was built around 1650.

Besides being an archaeological survey, the Ghost Ship project also aims to develop new technological methods for deepwater archaeology and documentation at depths beyond the reach of divers. The work is documented in a TV film produced for National Geographic Television, to be aired in 2011.

Fluyt Ships

The fluyt was a heavy duty, easy-to-handle ship type developed by the Dutch toward the end of the 16th century.

In the 17th century, fluyts and other Dutch-built ships powered the success of the global Dutch economy. In the middle of the 17th century, thousands of Dutch merchant ships visited the Baltic every year, trading manufactured goods, spices, cloth, dried fish and salt. For the return voyage, the fluyts carried raw materials such as iron, chalk, timber and grain.

Underwater Investigations

The Ghost Ship wreck was discovered using a 500kHz side-scan sonar which showed a typical snub-nosed wooden wreck with two standing masts and a very high pointing bowsprit. The image showed an unusually high aft section, indicating a very old vessel.

The data recorded via two separate surface-mounted multi-beam 300kHz and 90kHz echo sounders were unfortunately very unsatisfactory. Wooden wrecks on a very soft muddy seafloor seldom yield satisfactory bathymetry data. One explanation is that the energy may be absorbed both by the seafloor and the relatively soft water-drenched wood.

The total darkness at 125 metres demands considerable artificial light. For detailed inspection the limited view from standard ROV video is sufficient, but to achieve an overview, the entire vessel needed illumination. This was provided by four LED lights mounted above the ROV as well as a 50,000 lumen light ramp lowered from the aft A-frame of the IceBeam. The lights had to be lowered below the wreck's mast tops. This required very precise position holding by IceBeam and ship movements were no more than 0.2 metres.

Very thorough video documentation was made for the archaeological work, including site plans and sketches of the ship. Thanks to precise measurements by laser technology these plans are exact and correct in scale.

An Entire Ship

Archaeology is often about research and reconstruction of scarcely distinguishable residues, hard to interpret remnants or crumbling ruins. Not so with the Ghost Ship. An almost intact three-dimensional ship is a different kind of challenge for a maritime archaeologist, both in practical terms and regarding interpretation.

During the 2010 expedition, IceBeam was equipped with a single transducer Reson 7125 multi-beam echo sounder mounted under a sub-Atlantic Mohican ROV. It recorded reference points for the entire wreck site.

The beams of the echo sounder penetrated the upper deck and the holds so very accurate measurements of the outer hull, the captain's quarters, the holds and the forecabin were taken and presented in extraordinary detail.

The final detailed 3D model of the Ghost Ship allows scientists to look inside the ship, study its inner construction and distribution of space, and the functions performed in various parts of the ship. The model, which collates over 6 million depth soundings, can also create cross-sections of the ship, both lengthwise and across the beam from bow to stern. This is absolutely unique material, of unequalled value to researchers. It can be turned into a construction design for a small 17th century ship more than a hundred years before such designs were made.

Boarding the Ship

Mini-robots and a camera mounted on an extension arm allowed the scientists to 'board the ship'. Through a window in the stern, furniture and equipment can be distinguished. In the middle of the cabin there is a table turned upside down, a seaman's chest and benches along the sides. A small 6-7 man crew lived in a confined space aft.

A Swan?!

The top of the rudder, in the stern, is decorated with three flowers. This motif is traditional for Holland and recurs on later ships.

Above the rudder on either side of the stern there were originally two male wooden sculptures depicting Dutch mid-17th century merchants in fashionable clothing sporting bulging money pouches in their belts. The sculptures have fallen off and are now lying on the seafloor beside the wreck. One of these 'corner men' (hoekman in Dutch) was salvaged during the 2010 expedition.

The Ghost Ship is virtually complete, with the exception of the top part of the stern, called the transom, which is missing. Parts of the transom are lying on the seafloor behind the ship. Here too are the flagpole and the large ship's lantern. A sculpted piece of wood lying among other timbers has been identified as the body of a swan. It was customary in those days to have a large sculpture on the transom depicting the name of the ship. The real name of the Ghost Ship was probably The Swan!

Abandon Ship!

Two out of three masts are still pointing towards the surface. Following the shipwreck the sails and rigging remained intact, but as ropes and sailcloth deteriorated over the years, yards and mast tops collapsed. By documenting their current position it is possible to deduce how the sails were set at the time of the disaster. This in turn tells us what the crew must have been doing just before the ship went under.

The impression is that they were trying to slow her down and stop her at sea. Maybe the ship was leaking and because the pumps couldn't keep her afloat the crew decided to abandon ship. They tried to keep her steady enough to give everyone a chance to get into the work boat they probably had in tow. No human remains have been identified on the wreck of the Ghost Ship.

Acknowledgements

The Ghost Ship Project is a joint operation between Deep Sea Productions, MMT and MARIS, Södertörn University.

Partners:

The Maritime Section of the Dutch Cultural Heritage Agency

The Institute of Nautical Archaeology, Texas A & M, USA

The National Maritime Museums, Sweden

Kalmar County Museum, Sweden

The Ghost Ship project receives funding from the Knowledge Foundation, Sweden.