

‘The Ghost Ship’. An Intact *Fluyt* from c.1650 in the Middle of the Baltic Sea

Niklas Eriksson and Johan Rönby

*Maritime Archaeological Research Institute (MARIS), Södertörn University, 141 89 Huddinge, Sweden,
niklas.eriksson@sh.se, johan.ronby@sh.se*

We report an exceptionally well preserved 17th-century shipwreck in the Baltic Sea. The investigation of the intact 3-dimensional hull at 130 m depth in the cold dark water has demanded new methods of documentation. Field investigation of ‘The Ghost Ship’ has been done in co-operation with a nautical survey company, combining archaeological skills with advanced technology and filming for a television documentary. The discovery offers detailed knowledge about Dutch shipbuilding and the construction of *fluyts*. We also believe that study of the social organisation aboard this small trading ship can give insights into the mentality and ideology of the period.

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The Baltic Sea is one of the best locations in the world for ship archaeology. One reason for this is that the majority of marine organisms which normally consume wood are absent from this cold, brackish sea, including the infamous shipworm *Teredo navalis*. The hulls of wooden wrecks, therefore, can stay in one piece with the masts standing for hundreds of years on the dark sea-floor. Another important factor which contributes to these unusual conditions for maritime archaeology is that this northerly inland sea has for a long time been a busy sea-route and therefore the site of many wrecks. Active communication and more-or-less peaceful maritime contacts can be traced back to prehistoric times. Seafaring, and its practical, material prerequisites in the form of boats and ships, is central to the history of all the countries around the Baltic.

In 2003 the companies Deep Sea Productions and MMT (Marin Mätteknik) discovered a shipwreck which, even for the Baltic, was exceptionally well preserved, c.30 nautical miles east of the island of Gotska Sandön in the middle of the Baltic Sea (Fig. 1). In complete darkness, 130 m below the surface, they had found an almost completely intact old ship standing upright on the sea-floor. The discovery was made during the search for a Swedish reconnaissance plane shot down by the Soviet Union in that area in 1952. An inspection of the shipwreck with a Remotely Operated Vehicle (ROV) showed it to be a merchant ship from the mid-17th century, revealing typical Dutch shipbuilding characteristics from this period. Since 2009 the discoverers of the wreck have been

working together with the Maritime Archaeological Research Institute (MARIS) at Södertörn University in an international scientific project with the object of examining the wreck, now dubbed by the team ‘The Ghost Ship’.

Deep-water archaeology

Besides archaeological research the Ghost Ship project involves the development of technology for deep-water archaeology and archaeological documentation at depths out of reach for divers. Sampling, recovery and archaeological recording have been done using ROVs. Their capabilities have in essence replaced the work of the diving archaeologists.

The Ghost Ship was discovered using a 500 kHz sidescan sonar. The image showed a snub-nosed wooden hull with two standing masts and a very high pointing bowsprit. The picture also showed an unusually high aft section (Fig. 2). The visibility varies 130 m down in the Baltic Sea. A slight current occasionally obscures the wreck in a cloud of silt, which can suddenly disappear and offer an almost clear view. The total darkness 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 survey-vessel, the *IceBeam*. The lights had to be lowered between the wreck’s mast-tops. This required very precise position-holding by *IceBeam* and ship



Figure 1. Location map.

movements were no more than 0.2 m (Dixelius *et al.*, 2011).

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 3-dimensional ship is a different kind of challenge for a maritime archaeologist, both in practical terms and regarding interpretation. A very thorough video record was made for the archaeological site-plans and drawings of the ship. Thanks to precise measurements by laser technology these plans could be exact and correct in scale. The work combines archaeological drawing skills with the use of advanced techniques, and demands many hours in front of the monitor (see Eriksson, forthcoming a).

During the 2010 expedition, *IceBeam* was equipped with a single transducer Reson 7125 multibeam echosounder mounted under a subAtlantic 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 inside of the hull, the quarters, the holds and the forecastle were taken and presented in detail.

The final 3-D model of the Ghost Ship allows us to look inside the ship, to study its inner construction and the location of bulkheads and deck-levels, which allows for interpretation of the various functions performed in different areas 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 between bow and stern (Fig. 3). This is a unique source-material. It can be turned into a construction-design for a small 17th-century ship more than 100 years before such design drawings were made. Mini-robots and a camera mounted on an extension-arm have also

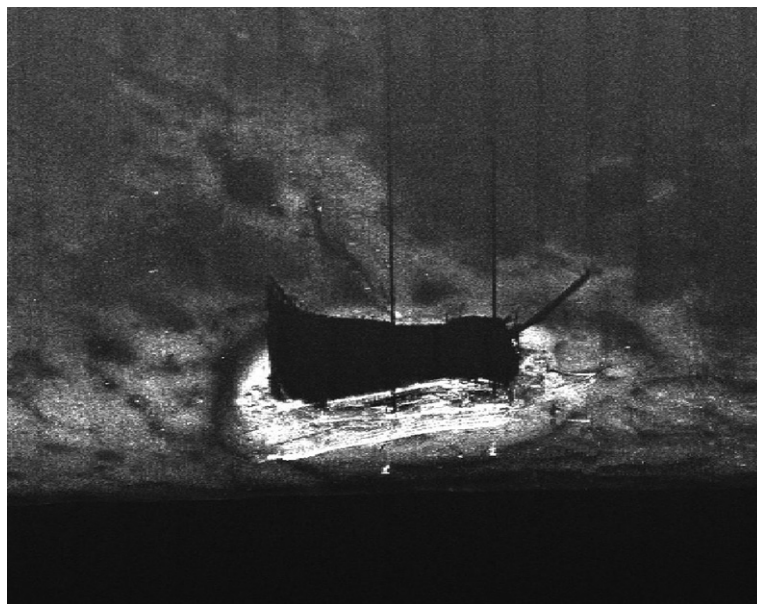


Figure 2. Sidescan sonar image of the Ghost Ship. (MMT)

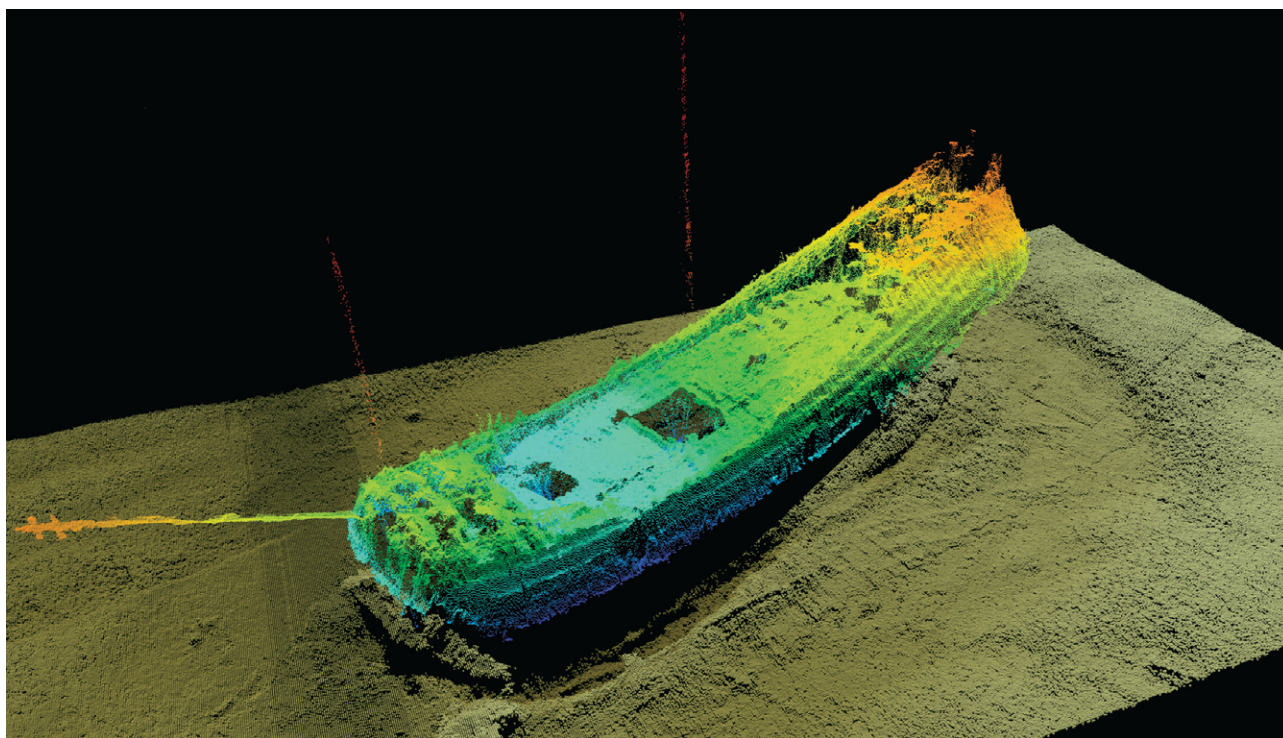


Figure 3. Digital 3-dimensional model of the Ghost Ship. (MMT)

finally allowed the research team to ‘board’ the ship and see details on the inside of the hull.

Description of the hull

Seen from above, the outline of the Ghost Ship’s hull appears like a rectangle with slightly rounded corners (Figs 4, 5 and 6). The hull measures 27 m long and 7 m wide. The uppermost part of the stern rises almost 10 m above the sea-bed, while the top of the stempost is 4.5 m deeper. The difference is explained by the high stern, by the fact that the draught of the vessel was greater in the stern than the bow, and by the bow having penetrated the sediments in the process of sinking.

The hull is carvel-built and the sides have the characteristic ‘tumble-home’ found on 17th-century ships. There are four wales which are nearly twice as thick as the rest of the planking. Above them runs a carefully profiled gunwale through the entire length of the ship. The planking, as well as the wales, is scarf-jointed. In the bow and stern, where the sides of the hull rise above the gunwale, the planking is clinker-laid. These clinker planks are attached to the top-timbers using iron nails, most of which have rusted away. The shape of the top-timbers, however, reveals the number, sheer and location of these strakes of clinker planking. Where the clinker-laid planks end amidships, where there is as a result a drop in the ship’s side down to the gunwale, curved ornaments were placed, so-called ‘hancing-pieces’ (see Laughton, 2001: 210–15). Notches in the

gunwale and stains on the wood underneath reveal the outline and size of these ornaments (Fig. 5). One of these ornaments is stuck underneath the anchor hanging from the port side, near its original position. Two curved ornaments, lying on the sea-bed ahead of the bow, might be two of the three hancing-pieces.

Below the lowest wale, and all the way down to the keel, the hull is sheathed with an outer layer of planking, probably of pine. Similar sheathing is found on several wrecks of *fluyts* and similar Dutch vessels, often with a layer of tarred hair between the sheathing-planks and the hull (*cf.* Cederlund, 1983: 44; Lemée, 2006; Eriksson, forthcoming a).

The deeply-curved stempost is built up from several timbers. In its upper end there is a hole for the ‘gammoning’ (lashing) of the bowsprit. On bigger ships, the gammoning was attached to the beakhead. The cleats on the bowsprit, which stopped the gammoning moving, are still present (for a comparison, see Anderson, 1994: 86–9). Two hawse-holes are situated on each side of the stempost. They seem to lack decoration, but are reinforced on the outside by a horizontal L-shaped timber and a small clamp between the two hawse-holes. The anchor-cable ran through the bowcastle and onto the windlass placed further aft out on the weather-deck.

The windlass barrel consists of a massive timber, stretching from side to side. A series of four square holes for hand-levers, used for rotating the barrel, are visible. The bearings for the windlass are made of two horizontal timbers attached to the inside of the

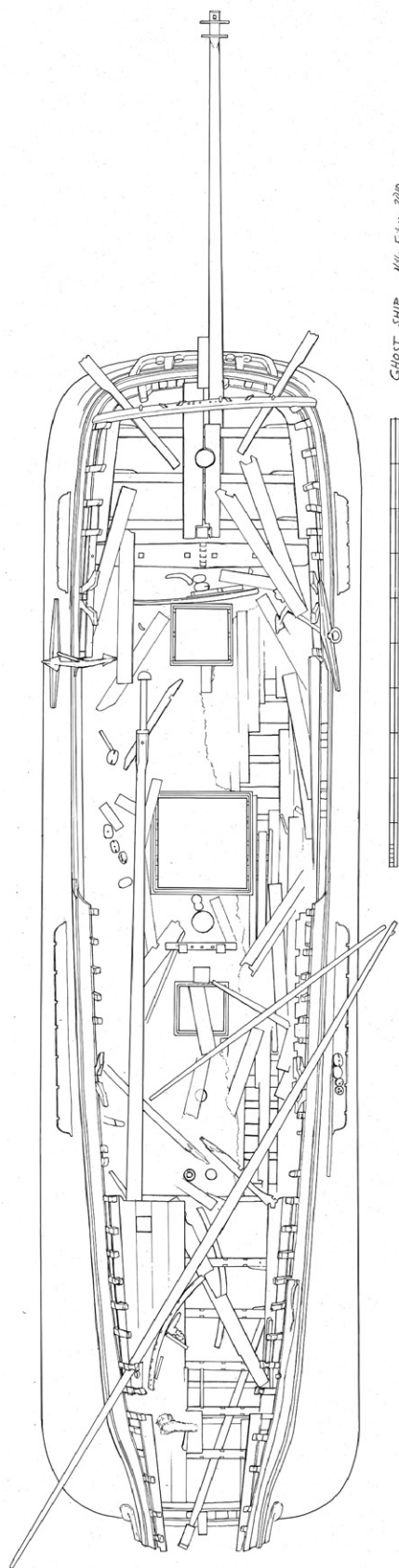


Figure 4. Plan view of the coherent hull structure, made from combining measurements from the computer model with impressions from video. (Niklas Eriksson)

bulwark. The pawl is cut out from the same timber as the drum and connected to the blocking-device situated in the standing timber, the bitt, just before the windlass. Besides being used as the pawl for the windlass, the upper end of the timber has two sheave-holes for connecting the foresail halliard (Fig. 7).

The windlass was used for lifting the anchors as well as other tasks where major force was necessary. In lifting the anchors from the water-surface and onto the ship the cat-heads were used. Both cat-heads are present, although the inner ends have come loose and are now resting at their abutment towards the railing. Originally the cat-head had an additional support consisting of a timber oriented diagonally out from the hull's side. A small sculpture, found on the sea-bed beneath the bow, depicting a bearded man with a flower on his chest, was originally placed as such a bracket (for a comparison see Witsen 1979: 55, fig. XXVI). A similar sculpture, intended for the other cat-head, is likely to be located in the vicinity.

The two big anchors were tied to the side of the hull, in addition to the chain-wales for the foremast. Unsurprisingly both these bow-anchors have been found on the sea-bed underneath their original position. The ship has two additional anchors. One is standing abaft the windlass, resting towards the bulwark on the starboard side, while the other is hanging on the outside of the port side. The stocks of the four anchors consist of two halves joined together with treenails, with no iron bands for additional strength. Anchors of similar construction have been found, for instance, on the *Vasa* (1628) (Cederlund and Hocker, 2006: 467–74).

Foredeck and bowcastle

The foredeck has partly disintegrated. The waterway, as well as the two thicker planks oriented on each side of the centreline, is however still preserved in its original position. The planks in the centre also function as the foremast-partners. The foredeck does not follow the sheer of the planking and the extension of the deck is more horizontal. As a consequence the rise of the top-timbers, above deck-level, becomes greater towards the bow, giving support for a low bulwark. Three top-timbers on each side extend above the bulwark to form *kevel*-heads, used for belaying ropes. Between the two cat-heads is a curved timber, which Nicolaes Witsen calls the '*Beting Balkje*'. This timber, together with the bulwark, forms a railing around the foredeck. This curved timber has eight holes for pins, of which three are still present, as well as two sets of *kevels*. Witsen depicts a similar arrangement of the '*Beting Balkje*' in 1671 (1979: 55, fig. XXVI).

The room underneath the foredeck is low, only c.140 cm between the decks. In this room a grinding-stone and an anchor-buoy are visible. A pile of what appears to be some form of soft organic material, possibly sailcloth or rope, is also found in this space. One

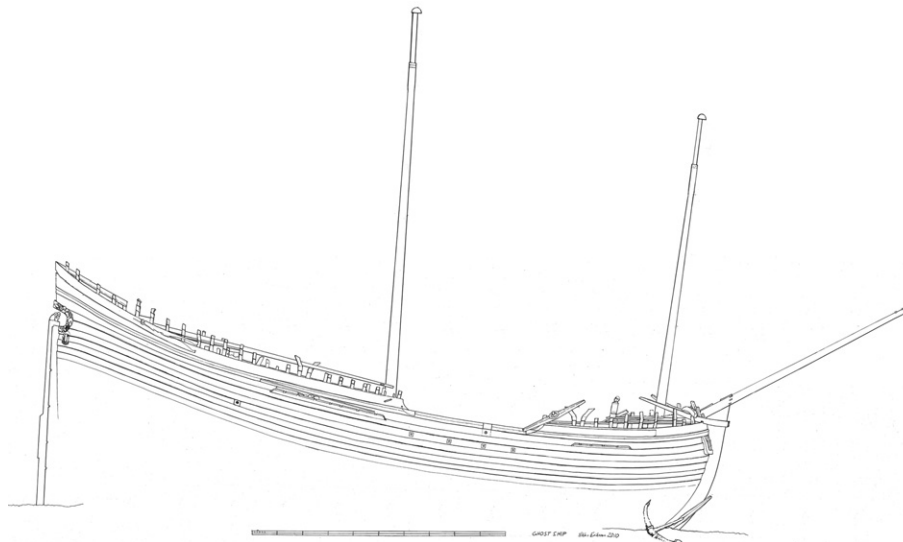


Figure 5. The Ghost Ship as seen from the starboard side. (Niklas Eriksson)

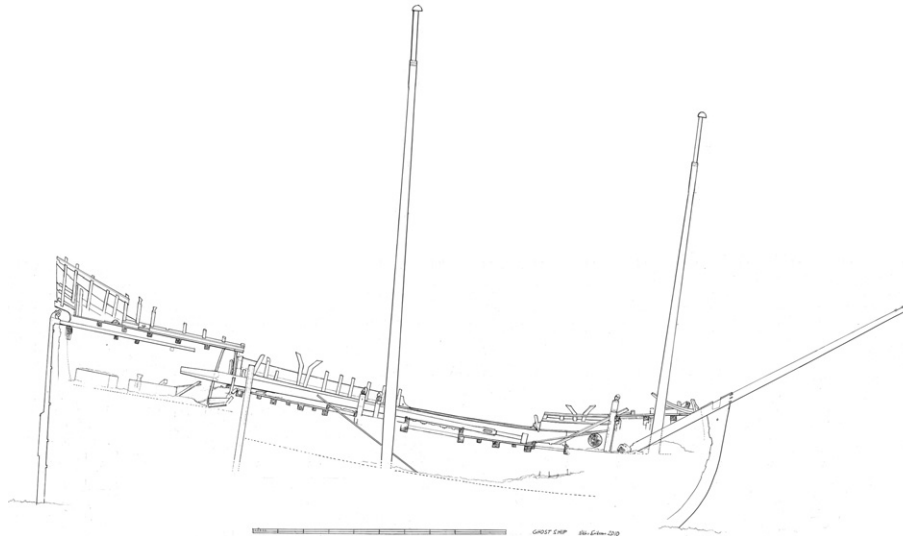


Figure 6. Cut-through, longitudinal section, revealing the information extracted from the video- and multibeam material so far. (Niklas Eriksson)

standing stanchion is connected to the aftermost of the bowcastle's deck-beams, towards the port side, suggesting some kind of bulkhead. But one should question how closed this space really was. The general impression of the bowcastle, as well as the artefacts located in it, suggests that this room functioned as a storage area rather than as accommodation for crew members (for the internal arrangement of *fluyts*, see Hoving, 1992: 49; Hoving and Emke, 2000: 92; Eriksson, forthcoming b).

The main deck and its fittings

The main deck starts at the bow and ends just abaft the pumps (Fig. 6). This deck-level seems more-or-less to follow the sheer, perhaps flattening out a bit towards

the bow. The aftermost deck-beam also serves as the pump-dale. The spout for this pump-dale comes out between the wales on each side of the hull (visible on Fig. 5). Originally the Ghost Ship had two pumps, with the pipes standing immediately before the pump-dale. One of these pipes is preserved in its original location, although damaged, probably by the falling mizzen-mast, while the second pipe, located to starboard, is missing. A circular hole in the deck reveals its original location.

Between the pumps and the aftermost of the hatches on the main deck, another circular opening in the deck is located, partly covered by loose planks. This used to house a capstan, which probably drifted away when the ship sank. As a parallel one may mention that only one of *Vasa's* (1628) three capstans was still in place



Figure 7. The knighthead right before the windlass. An ROV lights up before the bow. (MMT/Deep Sea productions)

when the ship was raised in 1961, and this was the covered one. The two out on the weather-deck were missing (Cederlund, 2006: 324f). Amidships, the bulwark is lowered to the level of the elegantly profiled gunwale. The bulwark has inner planking up to the gunwale. Above this point the hull's inside shows the top-timbers. Two pairs of *kevels* are found on the inside of the bulwark on both sides of the hull.

The main loading-hatch is situated just before midships. The coaming is intact and has a nearly-square opening measuring just over 2 m each side. Notches in the longitudinal timbers of the coaming indicate the location of two cross-beams over the hatch, suggesting the opening could be divided into three. The main hatch provides access to the orlop deck, a deck-level which runs parallel to the main deck. In between the main hatch and the windlass is a smaller opening in the deck, providing access to the cable-tier.

The port-side section of the main-deck is covered with a thin sediment-layer embedding the loose artefacts located there, mostly blocks and similar parts of the rigging. Towards the starboard side the deck has broken up, revealing the dimensions as well as the location of the deck-beams, which are c.20 cm thick. In between these beams, half-beams of thinner dimensions are placed. Under the scarfs between the deck-planks, laths are to be found. These rest in notches in the deck-beams and formed a support for the deck's

caulking. The same construction is found at the quarterdeck, as well as on the now-disintegrated roof of the upper cabin. The foredeck does not have these laths. Perhaps the forecastle did not have to be as watertight as the rest of the ship? Water that entered the ship from above, through high seas or rain, was evacuated through four scuppers on each side of the hull, placed amidships.

The orlop

ROVs have explored those parts of the orlop deck which are directly accessible from the main loading-hatch, right before the mainmast, and the smaller hatch, right abaft the windlass. Amidships the orlop deck seemed almost empty, apart from the accumulated sediments covering the deck. Probably these sediments also cover a hatch which allows access to the hold from the orlop.

When the ROV was looking down the smaller hatch, broken barrels and wooden cases were seen. Judging from other site-formational indications from the site, it seems as if loose objects were pushed forward as the ship hit the sea-bed. The location of the casks and other objects situated below the small hatch may therefore not have been intentional. They may originally have been stowed further aft, but been pushed forward towards the bow during the wrecking process. A small

hatch is placed right abaft the mainmast but a loose plank blocked the way in for the ROV.

Aft structures

The decks and floors abaft the pump-dale are oriented horizontally and follow the waterline instead of the sheer of the planking. The foremost of the quarterdeck's beams cracked when the mizzenmast fell. The remains of this beam are found in two pieces underneath the mizzenmast, before the pumps. Notches in this deck-beam reveal the location of a door-frame. This door was oriented towards the starboard side and allowed entrance to the area under the quarterdeck. After entering this door one would step down onto the floor, which was lower than the weather-deck. Consequently there should be a small stair inside the door. The step for the mizzenmast was originally located in the galley floor. It has been torn away as the mast fell, and in its place there is simply a hole.

The hearth is located towards the port side. It is built up like a box with four corner stanchions still standing, reaching up to the quarterdeck which forms the roof of the galley. The hearth has internally been enclosed with bricks and glazed tiles, still *in situ*. The square opening in the quarterdeck, which used to house the chimney, is clearly visible in the preserved quarterdeck planking. After passing through the galley one enters the main cabin. A now-disintegrated bulkhead used to separate the two rooms. The cabin is a proportionally large room, and probably served as accommodation for all the ship's crew. It is not yet established whether this space was further divided by bulkheads. There are, however, indications of such constructions, which need further analysis.

According to Richard Unger, seven men and a boy could handle a *fluyt* of 150 tons in the Norwegian trade, and the size of the crew did not rise in proportion to the tonnage (1978: 45; 1994: 122). The number of crew on board the Ghost Ship would have been between 7 and 10 depending on the season.

When the ROV was filming down between the quarterdeck beams, remains of furniture came into view. In the middle of the room is a table, now resting upside down. Two chests, partly embedded in sediments and loose planks, have also been seen. The size of the chests suggests they functioned as seating at the table, besides providing storage. Three people on each chest, and perhaps one person at each end of the table, would have gathered the whole crew around the same table.

The cabin has five openings towards the stern. Two of these used to house windows. The shape of the frame has an elegant curved upper part and is surrounded by ornaments, of which some are preserved in their original position (Fig. 8). Two hawse-holes are situated on each side of the sternpost, likewise surrounded with ornaments, and appear almost like miniature versions of the windows. On the starboard side, below these windows and hawse-holes, there is a square loading-

port. Long objects which could not enter the hold via the main loading hatch were taken on board through this port. The location means that planks, spars and timber were loaded onto the orlop deck via the great cabin and the galley. Slightly below this port, there is a nailed-down hatch. This was used in a similar way as the upper loading-port but for loading long objects into the hold.

The tiller enters the ship via a low channel above the roof of the main cabin, referred to as the *hennegat* in Dutch terminology. The helmsman stood out on the quarterdeck and steered the ship using a whipstaff, connected to the tiller in the galley, below his feet. This seems to be the common arrangement on board *fluyts* (see for instance Harland, 2011: 97–102). The location of the whipstaff bearing, in relation to the mizzenmast, is in fact indicated by the outline of a loose quarterdeck plank, now oriented diagonally to the centreline (see Fig. 5).

Abaft the helmsman, on top of the main cabin and the *hennegat*, was another small cabin. The roof has disintegrated, as well as the bulkheads forming this space. The deeply curved beams which used to form the roof of the upper cabin reveal the general shape of this room. No clearly identifiable objects have been found to indicate how this space was used. A chest found on the sea-bed on the starboard quarter probably derives from this room. On the inside of the uppermost clinker-laid planking on the port side there are remains of a bulkhead made out of vertical planks. In connection to this bulkhead the planking of the quarterdeck ends. The bulkhead is placed c.80 cm before the taffrail, forming a very small room, with no floor. A suggested function to this space is as sanitary accommodation.

Decoration and name

The Ghost Ship has the characteristic pear-shaped stern recognizable from 17th-century depictions of *fluyts*. The rudder is loose and stands on the port side of the sternpost. Marks from six pintle-and-gudgeon assemblies are clearly visible. It looks as if the rudder was partly lifted when the ship hit bottom, which explains its present position. The tiller is still attached to the rudder-head, which is decorated with three flowers, a motif traditional for Holland, and which can also be seen on later ships (Fig. 9).

Above the rudder the ship had a flat, narrow stern. An ornament, consisting of carved leaves, flowers and grapes surrounds the *hennegat*, where the tiller enters the hull, and connects the round-tucked lower part of the stern with the flat stern. The wall which formed the flat stern was built up with planks, which might have already disintegrated while the ship sank. The only coherently preserved *fluyt* taffrail, in Söndre Harritslevs church, in Denmark, reveals horizontally-oriented planking (Hoving and Emke, 2000: 99), so does *Vasa* (1628) (Cederlund and Hocker, 2006:

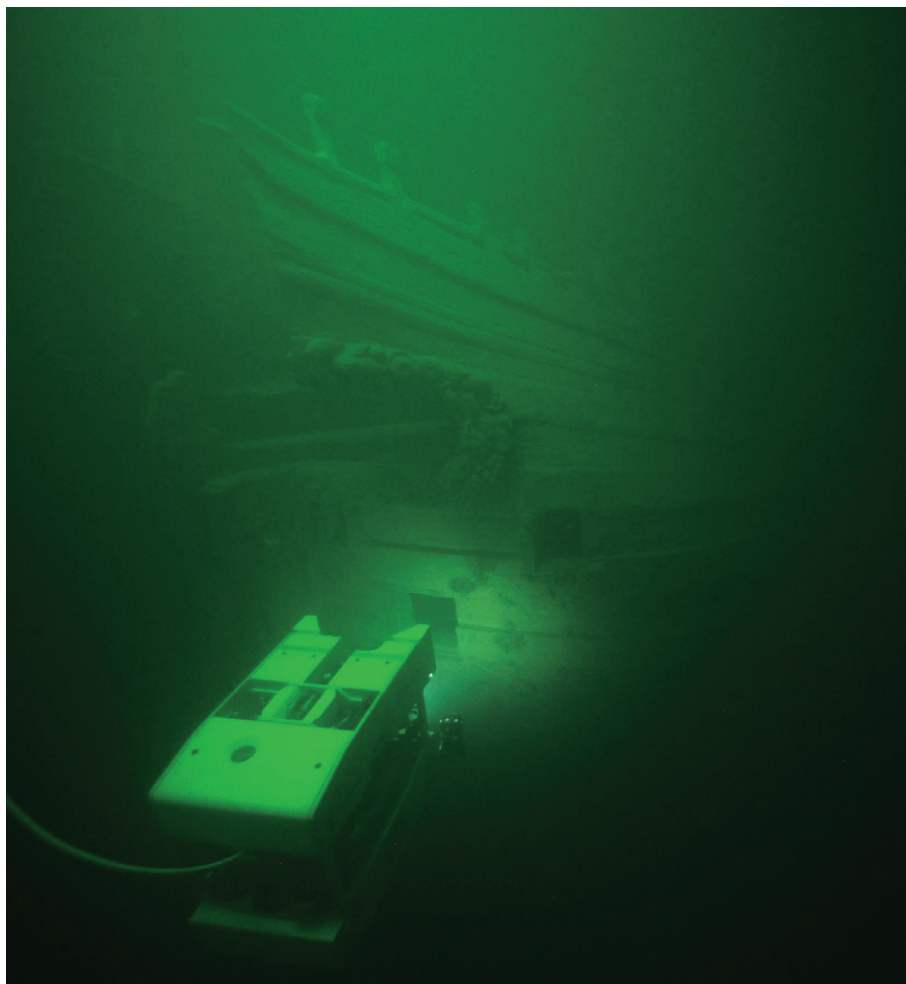


Figure 8. The ROV is peeping through the windows of the cabin in the Ghost Ship's stern. (MMT/Deep Sea productions)

pl. IV-5). The Ghost Ship probably had a similar construction. A coherent part of the stern is resting abaft the ship on the starboard side. It is a stanchion which was located at the centre of the taffrail, forming a supporting structure for the panelling.

Across the mid-stanchion is attached a curved beam, with an elegant, planed profile in section. This curved timber defines the uppermost extension of the taffrail. On top of it was a crest, now resting on the sea-bed next to the sternpost. The mid-stanchion continues above the curved timber and ends with a small mast-cap of the same style as those connecting the topmast to the under-masts. This was used for fastening the flagstaff in the stern. But the mid-stanchion reveals still more information. Below the curved taffrail beam there is a round hole, which used to house a bent iron rod to which the ship's lantern was attached. The lower part of the lantern was also found in connection to these structures.

The stern was flanked by two life-size sculptures depicting Dutch mid-17th-century merchants in fashionable clothing, with bulging money-pouches on their belts. These have fallen off and were found on the

sea-floor next to the wreck. One of these 'corner men' (*hoekman* in Dutch) was salvaged in May 2010 by an ROV fitted with a mechanical claw. A brief inspection after the sculpture was brought to the surface revealed red paint on the hat and black on the coat (Hocker, 2010). The sculpture has been sent Holland for conservation and further analysis of the traces of paint and colouring.

The field in between the two *hoekmen* on the transom, the field originally covered with horizontal panelling, is of prime interest. In a time when most people could not spell their own name, names of ships were signalled through symbols, allegoric depictions of familiar episodes from the bible and similar. Consequently, when reading written sources from the period one stumbles across ship-names such as *Half-Moon*, *Virgin Mary*, *The Rose*, and *Prophet Abraham*, all possible to articulate with sculptures and ornaments. When the ROV surveyed the area abaft the ship a sculpted piece of wood lying among other timbers came into view. It has been identified as the body of a swan, carved in deep relief. This shows that the original name of the Ghost Ship probably was



Figure 9. Carved flowers on top of the rudder. (MMT/Deep Sea productions)

The Swan, or at least the word ‘swan’ was part of the name.

The decorations on the ship are impressive but not extraordinary for the period. It is more correct to say that they are characteristic of that date. Compared to the decorations on warships from this era, they are more discreet. A comparison of the decoration of this wreck with motifs and designs on warships of the time would be an interesting task. The flower ornamentation and the reason for the renewed popularity of plant-related decorations during this period is yet another area of study. An analysis of the ornamentation and a interpretational discussion in this connection would also relate to general ideological aspects of the successful, yet strongly reformist, Christian Dutch tradition. The historian Simon Schama has dubbed their attitude as one of an ‘embarrassment of riches’ (Schama, 1987: 289–43).

Rig

The *fluyt* was the most standardized ship of its time, and this included the rigging. The common arrangement, as seen in various depictions, was three masts, fore, main and mizzen. Squaresails were carried on the main- and foremasts as well as under the bowsprit, the spritsail. Besides the courses the fore- and mainmast carried topsails. Occasionally the bowsprit

carried a spritsail topmast and the mizzen had a top (*cf* Unger, 1978: 36ff; Hoving, 1992: 34–54). The Ghost Ship wreck-site provides spars, yards and other rigging parts that allow us to reassemble such a rig.

The Ghost Ship’s lower fore- and mainmasts are still standing, while the mizzen fell towards the bow in the process of wrecking, probably when the ship hit the sea-bed. An explanation to why this mast fell while the other two remain in place is that the structure supporting the mizzen is less robust when compared to the main- and foremast. These latter were stepped, more or less, on top of the keel, while the mizzenmast foot stood on the floor of the galley. In addition to and underneath the top of the mizzenmast are the remains of a top. Aft the mainmast three knightheads are placed (Fig. 10). The aftermost of these was connected to the main halliard. The two before the main-halliard knighthead are connected by a cross-beam, which functions as a pinrail. One of the pins is still in place. The three knightheads all have carefully carved heads. The knighthead for the main halliard is of a bearded man, with his gaze aiming up and abaft.

The chain-wales for both fore- and mainmasts are preserved. On the starboard main-chain-wale are lying two deadeyes and a couple of blocks. The bowsprit rests in a support on the starboard side of the stempost. At the end of the bowsprit there is a square hole and two small timbers fitted vertically. The outer end of the

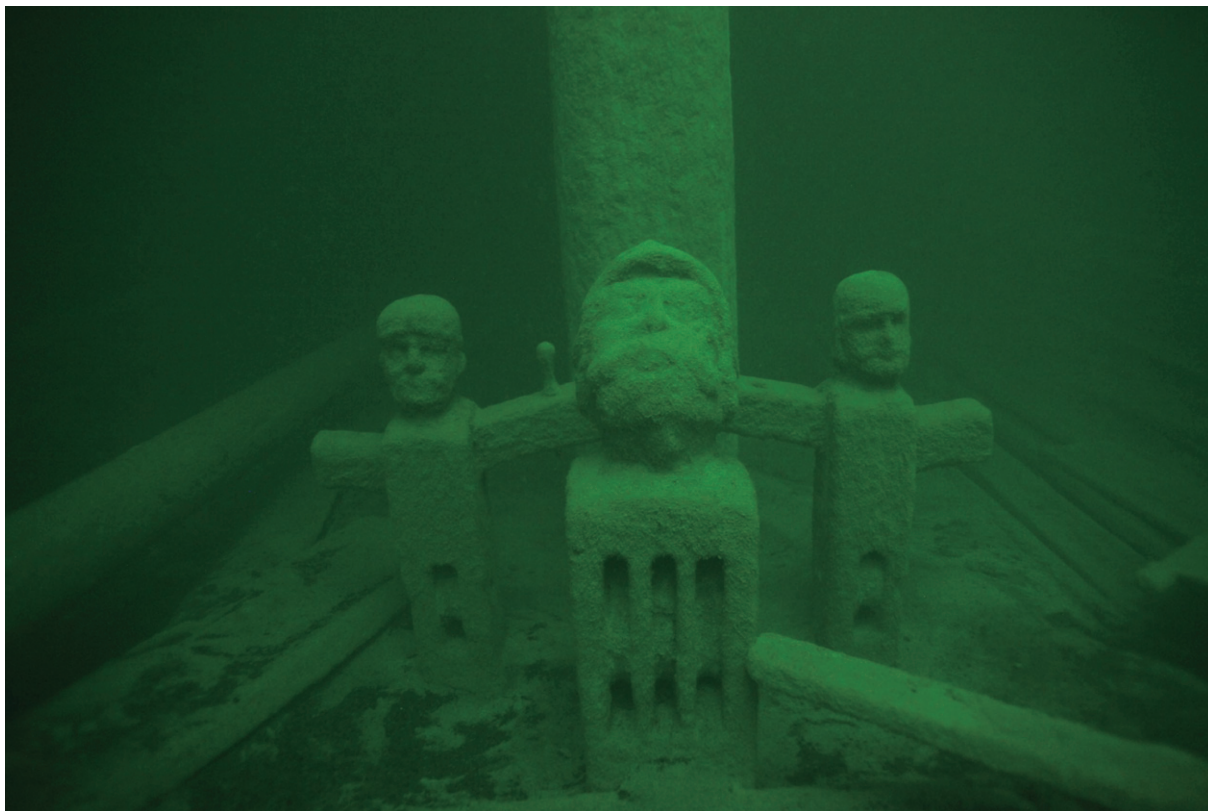


Figure 10. The three knightheads abaft the mainmast. (MMT/Deep Sea productions)

bowsprit was originally fitted with a sprit topsail on a separate mast out on the bowsprit.

Not only can we reassemble more or less the entire rig, it is also possible to reconstruct what the crew were doing just before the ship sank, and the last trim of the sails! The spars and yards have fallen down below their original positions as the cordage holding the rig together rotted away. In consequence the position of the rigging-parts at the site indicates how the sails were set when the ship sank. It is actually possible to read the course of events. The mizzen-yard, which used to hold the lateen sail, rests diagonally on top of the stern, oriented as if the wind came from starboard. The fore-yard has a similar orientation, although it has fallen down and rests towards the port side. The main yard is found outside the starboard side. Its orientation is the reverse when compared to the fore- and mizzen-yards. This indicates that the sails were set to 'heave to', to slow down the ship. Heaving-to involves backing one or more sails in order to balance the driving force from the others. This manoeuvre is used whenever there is reason to slow the ship down. As this was the last manoeuvre carried out on board the Ghost Ship before it sank, the reason for 'heaving-to' may have been to be able to operate the pumps or even to get into the lifeboats. The main cause of the sinking, why water entered the hull, remains unknown.

Site formation

The c.350 years which have passed since the ship sank seems to have been remarkably uneventful. Down in the dark and cold brackish water time has passed extremely slowly, and the appearance of the Ghost Ship was probably much the same in the 17th century as it is today. As a consequence of the state of preservation, traces of the wrecking process are still apparent. There are indications that the ship struck the sea-bed bow-first. The cargo on the orlop deck has been pushed forward, towards the bow, and planks originating from the foredeck have been found on the sea-bed ahead of the ship. The mizzen-mast fell forward and came to rest on the main deck towards the port side.

When the mast fell it broke the foremost deck-beam of the quarterdeck, which is now found in two pieces underneath the mast. The plank, which comes up from the smaller hatch abaft the mainmast, originates from the quarterdeck and has been thrown into this secondary location by the falling mizzen. Its original position can be deduced through the cut-aways for the whipstaff-bearing and the mizzen-mast. The plank also functioned as the mast-partner for the mizzen-mast. The other half of this mast-partner was pushed towards the port side. When falling, the mast also kicked out the bulkhead separating the galley and the

stern cabin. From a general point-of-view the deck is more broken on the starboard side than on the port. The reason for this may be that the ship heeled over to port when sinking, and air-compression underneath the deck may have pushed the deck-planks up from underneath.

A Dutch Baltic ship

The ship is undoubtedly an example of Dutch shipbuilding from the middle of the 17th century. It is the kind of ship we meet on paintings by masters such as Reiner Nooms, the van der Veldes and Ludolf Bakhuizen. The most common denomination of Dutch long-distance trading ships of this period was the *fluyt*. A small *fluyt* was often called a *bootjen*. Their basic construction was, however, the same and The Ghost Ship is definitely built in the '*fluyt* tradition'. The wreck, therefore, gives us a chance to study the construction of a type of ship that we so far know only from pictures, written sources and significantly-less-intact wrecks. Dutch shipbuilding was world-leading in the 17th century, not just by virtue of shipbuilding traditions, but also through innovative practices in both technology and production methods. Even though the Dutch had to rely on windmills for power, the shipping industry became a forerunner of 19th-century industrialisation (*cf* Unger, 1978: 2).

The fact that it is built in the Dutch tradition, however, is no guarantee that the vessel was owned and sailed by Dutchmen. Dutch shipyards regularly built ships for buyers from other nations, such as Sweden (a well-known, wrecked example is the *fluyt Anna Maria* which foundered in Dalarö harbour in 1709, see for instance Ahlström, 1997: 87–110). But even though they were built at the slipways around Amsterdam, the raw material for these ships—wood, iron and tar—often originated from the Baltic area. The Ghost Ship to some extent confirms these conditions. In 2008 one wood-sample was raised. The wood lacked outer rings but was estimated to be from c.1640 \pm 4 years (with a maximum time-span of between 1636 and 1666). The provenance was suggested to be the island of Gotland (Linderson, 2009).

More research perspectives

The Ghost Ship is an exceptional maritime archaeological find, which in terms of its state of preservation probably has few equals in the world. As described above it gives us a rare opportunity to study a ship

like this in detail. This regards specifics of both how it was built, and the practical organisation on board. The potential for research and analysis includes several other topics beyond the technicalities of construction. *Fluyts* and small common trading ships like the Ghost Ship were an important tool for contemporary society. They are a part of the history behind the success of trade and the Dutch economy in the 17th century and the driving forces behind this development. This process includes the introduction of a global economy, East Indian trade and the establishment of trading-posts in the New World. Baltic trade had also a special importance for the Dutch, and upwards of 2000 trading-ships would sail into the Baltic each year. Salt and manufactured goods were brought to the north, raw materials such as iron, limestone and timber were carried from the coasts of the Baltic to Amsterdam and other towns in the Netherlands.

From a general historical perspective the wreck can be seen as part of Baltic history and also theoretically as part of a processes related to the pre-industrial development of capitalism. A discussion in this field can touch on the importance of technology as a driving force in history but also the role and the significance of reformist morality in this connection. This is a classic historical questions with references both to Karl Marx and Max Weber (Rönby, forthcoming).

As demonstrated above the intact state of the hull also provides a rare opportunity to study the spatial configuration of a 17th-century ship. The social aspects of the arrangement of space have been studied before. The relations between rooms may be regarded as a reflection of the people who inhabit them. Spatial configuration may be used for a deepened understanding of the mentality of the societies which have produced these structures. This well-preserved wreck may be interpreted from a somewhat similar point of departure. As even furniture and personal belongings are preserved in nearly their original positions it enables reliable assessment of the use of each space (Eriksson, 2012; forthcoming b).

We do not yet know whether the crew managed to reach land after 'heaving-to' and jumping down into the ship's boat. If they did, and that led to some written documents, we might be able to find more information on what really happen out there in the middle of the Baltic Sea. But that is another chapter, and so is the question as to whether this remarkably well-preserved ship may some day leave the bottom and be taken up into the light again to become a unique museum object.

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