

A mid-16th century carvel-built ship from Mukran, Jasmund-Peninsula, island of Rügen, Germany

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Abstract: The 16th century ‘Mukran wreck’ is one of the earliest carvel-built ships found in Germany. Naval armament found in the vicinity of the site and traces of fire within the remains may relate the wreck to a hostile encounter between a joined squadron of Danish vessels and ships from the Hanseatic town of Lübeck with Swedish ships in 1565 during the Nordic Seven Years’ War (1563–1570). In 2016 and 2017 a detailed investigation and recording of the wreck was carried out. The wreck represents an important source for the understanding of the development of carvel shipbuilding in northern Europe.

Keywords: 16th century, shipbuilding, Baltic Sea, carvel construction, warship

Introduction

In 1985 divers of the East German Navy found a wooden shipwreck during a diving exercise in the Baltic Sea near the commercial port of Mukran on the island of Rügen (Fig. 1) and lifted the remains of a gun from the site. Although the inscription on the gun pointed to a date of 1551, the discovery caused little interest at first, and a more thorough investigation of the newly found wreck was only attempted after the gun was handed over to the Maritime Museum in the Hanseatic city of Rostock in 1987.

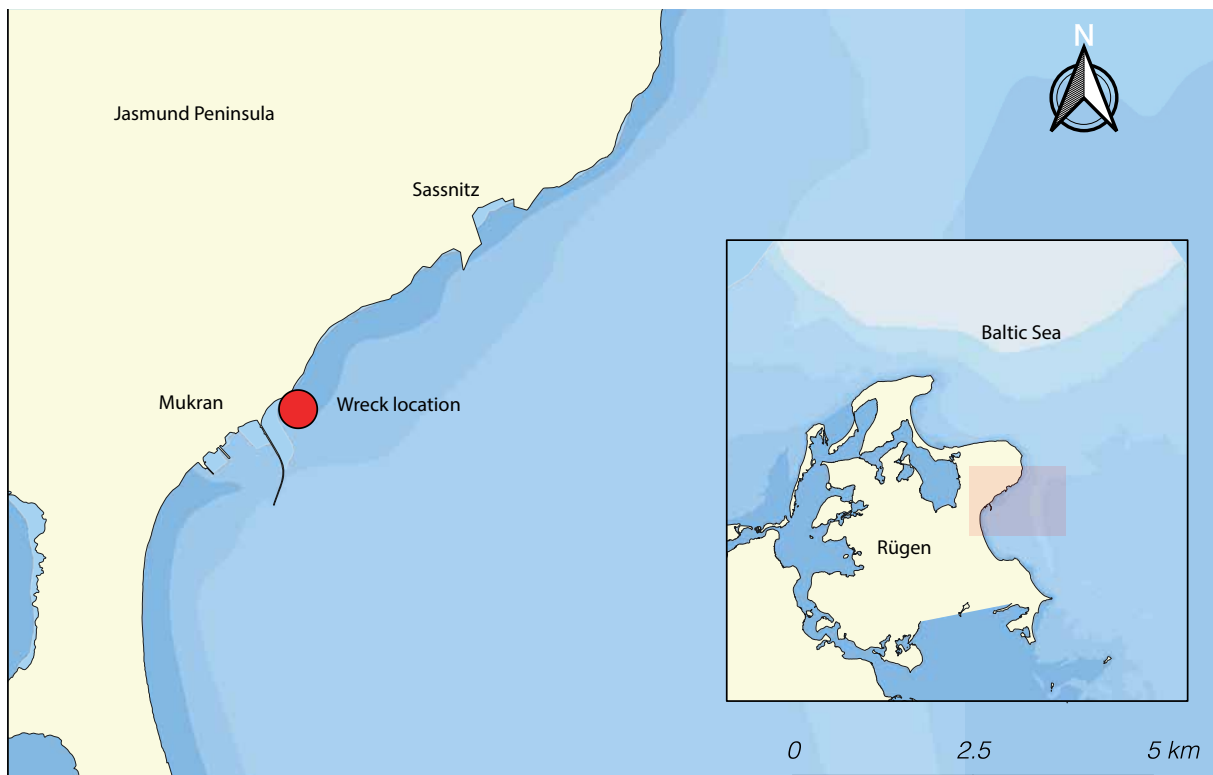


Fig. 1 Location of the so called ‘Mukran’ wreck 250 m off the coast of the island of Rügen in 3 m of water (graphic: J. Auer, LaKD M-V, Mecklenburg Western Pomerania, 2022)

A series of smaller surveys and investigations followed from 1990 onwards, but these mostly focussed on a basic assessment of the site and protection *in situ*, rather than the archaeological documentation of the wreck (Förster 1994; 1999; Springmann 1997; 1998; 2014; Auer 2000).

Based on the dating of the guns from the site and the analysis of first dendrochronological samples, the wreck was quickly associated with a naval encounter during the Nordic Seven Years War (1563–1570) in May 1565 between a Danish–Lübeck fleet, under the command of the Dane Peter Hvitfeldt, and a Swedish fleet, commanded by Claes Kristersson Horn (Förster 1994; Springmann 1998). In order to prevent the capture of his ships by the superior Swedish enemy, the Danish–Lübeckian commander ordered his ships to be burned at anchor off the coast of Rügen near the than small village of Mukran. A layer of burnt material on the wreck and guns showing traces of extreme heat or explosion support this theory.

Two maritime field schools

So why return to the ‘Mukran Wreck’ or as it is officially designated, site Jasmund, Ostseebereich VII, Fundplatz 7?

In 2015 the Maritime Archaeology Programme at the University of Southern Denmark planned a course on Early Modern ship construction, which was intended to update a paper on Archaeology and early modern merchant ships by the late Thijs Maarleveld (Maarleveld 1998). The wreck near Mukran was identified as one of the study sites with high potential to reveal more details about 16th century ship construction techniques and the introduction of flush outer planking in Northern Europe. As earlier publications often focussed on the historical events around the wreck site or lacked extensive recording and dendro-sampling, a joint project was planned in close collaboration with the State authority for the protection of culture and monuments in Mecklenburg-Western Pomerania and the German Maritime Museum.

The first campaign took place in 2016 and focussed on recording the archaeological remains to archaeological standards. This was achieved through a combination of photogrammetry and traditional offset recording. Additionally, all artefacts and guns lifted in earlier campaigns were recorded and catalogued and an extensive archive of published and unpublished information on the site was compiled.

In 2017 a second campaign, addressing more targeted questions, followed. Besides excavating a trench through the wreck to document hull construction and waterproofing techniques, an extensive programme of dendrochronological sampling was undertaken in order to establish timber provenance and felling dates.



Fig. 2 Diver on the exposed wreck in about 3 m of water (photo: SDU MAP)

The shipwreck

In the shallow water of the exposed East coast of the island, the lower part of the hull survived with almost no sedimentation cover (Fig. 2). The bottom of the ship is preserved over a length of 17.6 m and a width of 6.4 m in 3 m of water. It lies in approximate East-West orientation with the bow pointing to the West. While the keel still exists over its full length, only the lower remains of the stem and stern post assemblies are preserved *in situ*. The floor timbers still cover the lower part of the turn of the bilge, with remains of ceiling planking on both sides of the heavily eroded keelson, which is covered by a mix of ballast and local stones. Eight strakes of the outer planking are preserved on both sides of the keel. Framing timbers survive at 21 frame-stations, but are mostly eroded or missing in the more exposed aft part of the vessel (Fig. 3). Most of the surviving components are made from oak. Exceptions are some of the filler planks between the stringer-like ceiling planks, which are made from pine (*pinus spec.*) and fir (*abies spec.*). Selected samples of trenails also confirm the use of pine, fir and willow (*salix spec.*).

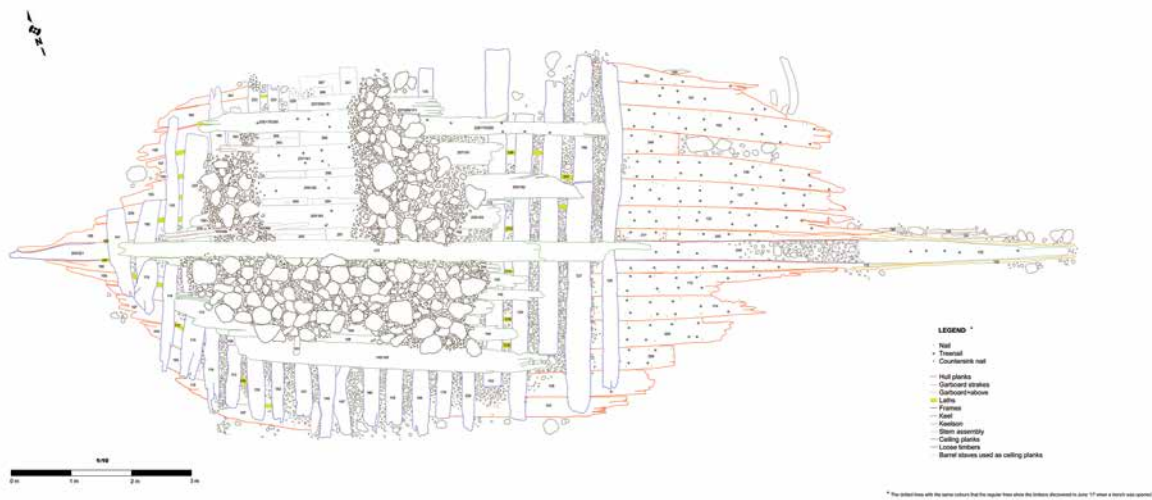


Fig. 3 Overview plan of the site (I. Muñoz, 2019); based on the results of the two field schools and the work of Robert de Hoop, Nicole Schoute and Irene Muñoz (SDU MAP)

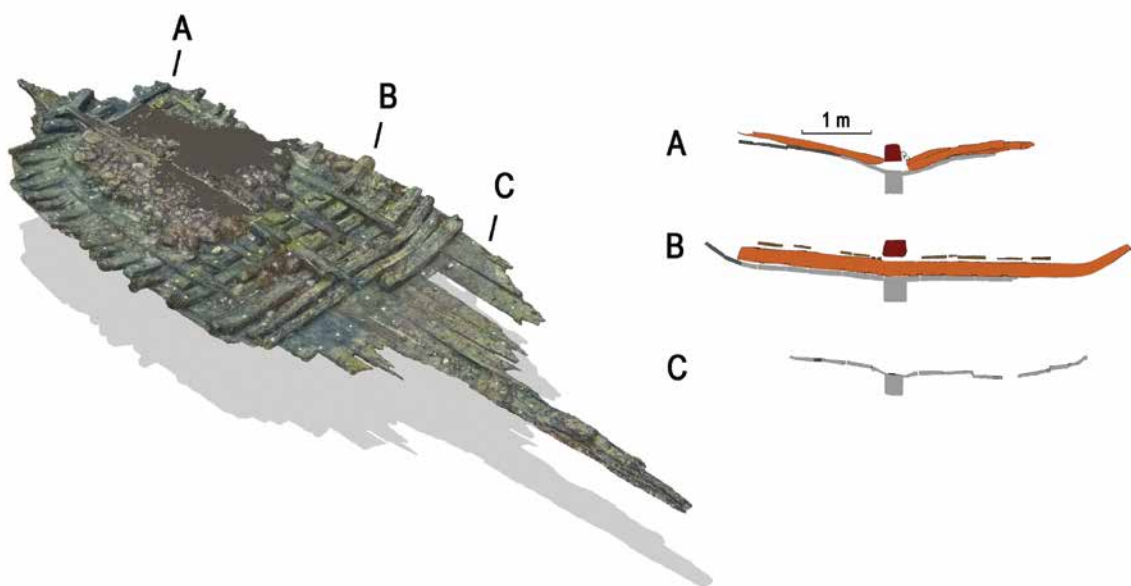


Fig. 4 Perspective view of the photogrammetric model of the wreck with cross-sections on three positions (graphic: M. Belasus, NIhK; model: R. de Hoop, RCE; cross sections by SDU MAP)

The dendrochronological analysis of the oak-timbers indicates a felling of the trees in the winter of 1557/58 possibly in the wider lower Elbe region (Daly 2017). However, fir has no natural distribution in the North. It originally only grew South of the central mountain ranges of Europe. Therefore, fir timbers are likely connected to timber-rafting on the Elbe River, which rises in the Giant Mountains in Czech Republic. This result supports the theory put forward by Maik-Jens Springmann (1997) that the vessel may have been built in the vicinity of Hamburg.

The hull has a flat bottom with no bilge or detectable deadrise in its central section (Fig. 4). The considerable width just before the stem post remains suggests a wide and bluff bow construction. The surviving part of the lower stem post assembly suggests a curved shape in its lower section.

The lack of framing timbers and the eroded state of all outer planks except the garboard strakes make it difficult to describe the hull shape in the aft part of the vessel. The remains of the surviving lower sternpost assembly are c. 3.7 m long. It is constructed from several components, which could not be identified individually due to the timbers' deterioration. Fragments of the horizontal arm of a knee and an unknown number of filling pieces are on top of the keel. The actual sternpost itself is missing, leaving a gap between the garboards above the keel (Fig. 5a). The garboards are an integral part of the sternpost construction, covering the keel, the lower parts of the knee, the filling timbers, and the missing sternpost and serving as a connection between these timbers. The ship's stern is the only spot where the cross-section of the keel of 0.11×0.11 m could be documented. It gets wider towards the middle and reduces again slightly towards the bow. It measures 0.32 m at the last surviving floor-timber towards the ship's aft and 0.26 m at the remains of the stempost. The lower part of the keel is still buried in the sediment under the wreck's remains. Its length can only be estimated to be between 14 m and 16 m. However, it is currently not clear if it is beam- or plank-like in shape.

The garboards have no direct connection to the keel apart from the area covered by the sternpost construction, and probing the seam towards the keel with a thin blade gave no indication of any kind of rebate. The garboards are fastened to the frames at a 90° angle towards the keel in the ship's central section, resulting in no visible deadrise. They are twisted by 90° towards the stern. Here, the garboards are bent from horizontal to vertical within a distance of 3.0-3.5 m to cover the keel and stern post components. Each garboard strake is made up of at least two planks. The distribution of impressions of round nail heads at the scarf indicates a flat diagonal stop-scarf, which was connected by double-clenched or riveted iron nails (Fig. 5b).

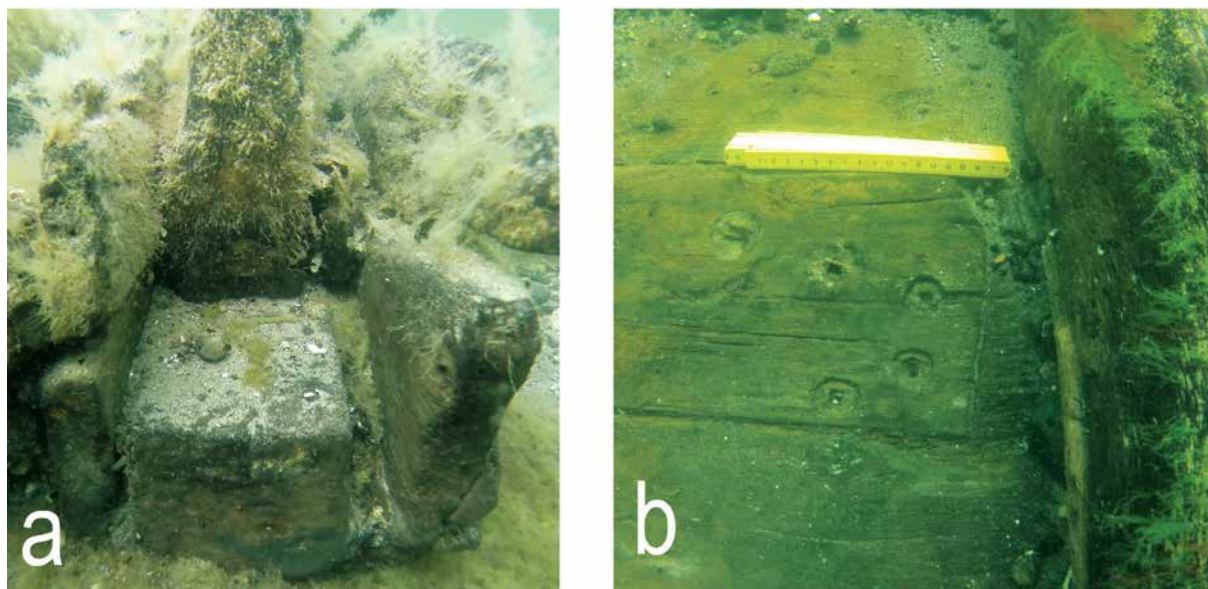


Fig. 5 a) Stern post assembly showing the gap of the missing post; b) Impressions of iron nail heads at the garboard scarf (photos: SDU MAP)

The surviving framing components are mainly rather straight floor timbers in the centre and towards the bow. They are between 0.17 and 0.38 m wide and 0.15 m high. They increase in curvature only in the bow section following its shape. Most of the floor timbers extend to the lower part of the turn-of-the-bilge on one end, which is alternating between portside and starboard. Only in a few cases do fragments of the first futtocks survive. These were only connected to floor-timbers where they were positioned close to the turn-of-the-bilge. In these spots, they were either nailed to the

top of the upper surface of the floor timber, or a recess was cut out of the futtock to create an overlapping lip, which served as a simple preliminary connection between the timbers. In cases where the floor-timber ends already in the horizontal part of the bottom and at a distance to the turn-of-the-bilge, they simply abut the futtocks.

About 9.7 m of the keelson is preserved, while possibly another one-third towards the stern is missing; no evidence for a mast-step was found. The keelson is 0.22 m wide, which increases to 0.3 m in the mid-ship section. It runs parallel to the keel on top of the floor timbers. Ceiling planking is preserved under a stone cover to both sides of the keelson. The ceiling consists of at least four oak planks or floor-stringers on the starboard and portside. They are between 0.33-0.41 m wide and about 0.05 m in thickness and are fastened with treenails and iron nails to the floor timbers. The gaps between them are filled with planks, 0.11-0.27 m wide and about 0.035 m high, and barrel staves in multiple layers. These gap-filling elements were made from oak, pine, and fir.

The remains of the outer planking have a width range between 0.37 and 0.435 m and are 0.054 m in average thickness. The planks within the strakes are butt-end joined with their ends secured to the frames by two or three 0.01 m square shanked iron nails, while two treenails of 0.035 m diameter per frame-station were used to connect outer planks, framing timbers, and ceiling planks everywhere else. Observations on a few treenails indicate that the treenails were expanded with an inserted wooden wedge on the inboard side and had dome-shaped nail heads slightly thicker than their shaft diameter. Along the long sides of the planks, additional iron nails were documented, suggesting a focus on securing the seams between the strakes.

The caulking process seems to be supported or accompanied by the installation of short laths, which are placed on the inside of the hull between the frames over the seams. They are fitted into shallow recesses on the lower edge of the frames (Fig. 6). The recesses were either square or consisted of a roughly axe-bevelled edge. The function of these laths might have been to prevent the caulking material from being pressed out of the seams on the inside during the caulking process. However, considering their rather loose fit, their function as a possible precaution to enable quick repairs of leaking seams while at sea may also be considered. The lath-feature is among others also present in the wrecks of the *Mars* and *Elefanten*, which also sank in the Nordic Seven Years War (Adams 2013: 87 ff.) and seems to be a common technique in Northern shipbuilding of the time. Two samples of caulking material have been recovered from the wreck and are currently being analysed. They appear to be highly fragmented plant fibres.



Fig. 6 Lath over seams between the frames (photo: SDU MAP)

During his investigation of the wreck site, Thomas Förster assumed the ship was built in the shell-first Dutch-flush building method (Förster 1999). However, the recovery of timbers during the second field school in 2017 produced no evidence for this hypothesis. No traces of plugged iron nail holes as confirmation for a preliminary assembled outer plank shell were found. Instead, a building process can be considered where the shape of the hull was created in a frame or floor-timber-guided fashion. In this process, only a few floor timbers or frames would have been firmly attached to the keel to be used as guidance for the bottom planks. Such a firm connection might be indicated by the only iron-bolt connection between a floor timber and the keel that could be documented about 2 m from the sternpost construction. The planks would have defined the shape of the hull between the floor timbers. The fact that no proper joint between framing components is present at any frame station can be seen as argument against a fully frame-based construction. Altogether, one could probably describe the process employed in the construction of the Mukran Wreck as a bottom-first approach which differs from the Dutch-flush shell-first construction in that a number of floor timbers are used to define the shape of the lower hull.

Concluding remarks

The so called 'Mukran Wreck' might well be one of the armed merchant vessels in the Danish-Lübeck fleet which Peter Hvitfeld ordered to be burnt at anchor in 1565 (Springmann 1998). The dendrochronological analysis points to a construction after 1558 with timbers from the Lower Elbe region, while dimensions and shape are indicative for a merchant vessel. As such, the wreck fits into Maarleveld's category of German and Scandinavian shipbuilding, exemplified by sites such as the Swedish warship *Elefanten* or the 'Wittenbergen Wreck' (Maarleveld 1998: 90 ff.). Based on a small sample of known wrecks from this area, Maarleveld stated that the "...archaeological evidence seems to indicate that..., the scheme of 'commonplace carvel building practice' in which built-up frames are used and the planking is added later has not been applied rigidly around the Baltic and that possibly the same applies for the North German shores" (Maarleveld 1998: 92). This statement certainly holds true for the 'Mukran Wreck' as well. The hull shows evidence of remnants of medieval shipbuilding methods and was probably built in what might be called a frame-guided construction. As has been pointed out by Adams (2013: 90), the use of caulking laths seems to be "...a local variant in building procedure associated with the retention of caulking" and supports the impression that the wreck exemplifies the long period of adaptation of the flush planked outer hull in Northern Europe. Altogether, the construction of the 'Mukran Wreck' shows that during the 16th century the process of the construction of carvel ships in Northern Europe was far from a simple transfer of knowledge. Instead, it involved adapting old techniques as well as creatively finding new solutions to problems encountered along the way.

Acknowledgements

The authors would like to dedicate this paper to the late Prof. Thijs Maarleveld who sadly passed away in 2021. Not only did his work inspire the fieldwork on the 'Mukran' wreck, Prof. Maarleveld also participated in both field schools, pitching his characteristic canvas tent next to those of his students. He was an enormous inspiration for his colleagues and for generations of students at the University of Southern Denmark and will be dearly missed. The authors would also like to thank both field school teams and all project contributors for their dedication, hard work and input.

Abbreviations

LaKD M-V = Landesamt für Kultur und Denkmalpflege Mecklenburg-Vorpommern (State authority for culture and monuments, Mecklenburg Western Pomerania)

NiHK = Niedersächsisches Institut für historische Küstenforschung (Lower Saxony Institute for Historical Coastal Research)

RCE = Rijksdienst voor het Cultureel Erfgoed (Cultural Heritage Agency of the Netherlands)

SDU MAP = University of southern Denmark Maritime Archaeology Program

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