

42 Two double-planked wrecks from Poland

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Introduction

Towards the end of the Middle Ages, a new, large sailing ship was developed in Europe, with three or four masts, capable of carrying large cargoes and transporting them over long distances. The cornerstone was the development of a new skeleton-first technique which permitted the building of ships with capacities greater than before. The origin and development of this new building technique in the southern Baltic region is poorly understood.

A flush-laid hull could be built in several different ways. Olof Hasslöf hypothesises that this form of construction underwent a stage-by-stage development and shifted from a shell-first method to a combination of both shell and skeleton construction to the final stage, which was a strictly skeleton-first technique (1972). He presented examples of ship construction as evidence that the shell-first method was used to build a carvel hull, or that combinations of these two construction techniques were used with the end result being the so-called half-carvel.

These methods have been traced through archival sources all the way back to the 16th century (Hasslöf 1972: 59).

Since the year 2000, a research project supported by the State Committee for Scientific Research entitled *Pomeranian boat- and shipbuilding in the Middle Ages in light of tree-ring analysis* (grant No 1H01 H026 18) has been carried out at the Polish Maritime Museum in Gdańsk. Under this project, archaeological investigations were launched on two double-planked wrecks. The aim of this paper is to briefly present the results of recent research conducted on these finds.

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Wreck W-36

In the years 2001–2002 the remains of two ships, in which double-planked techniques were found, were uncovered on the Polish shore (Fig. 42.1). The first wreck was

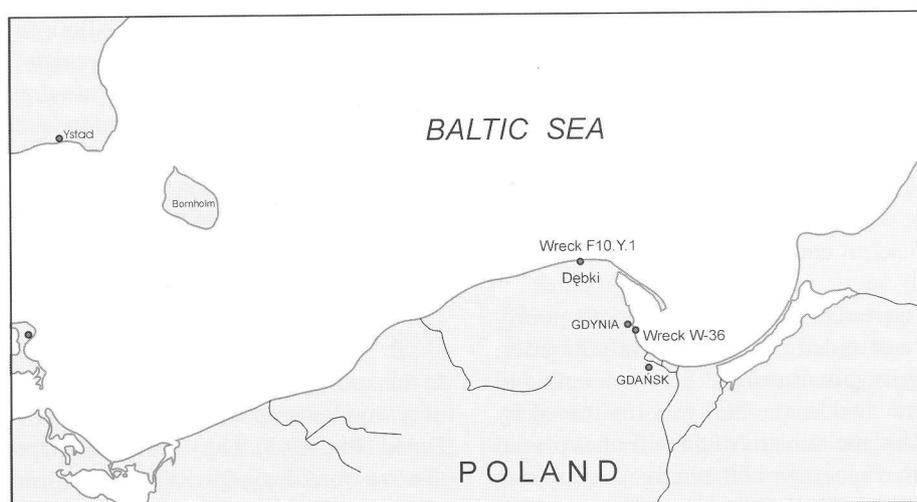


Fig. 42.1. Map of the southern Baltic Sea showing location of the two double-planked wrecks from Poland mentioned in text (drawing by author).

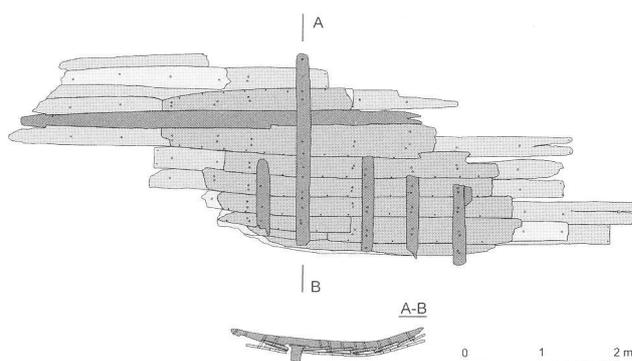


Fig. 42.2. Wreck W-36 – preserved parts of the hull (drawing by author).



Fig. 42.3. Wreck W-36 – stages of construction of the hull (drawing by author).

discovered by divers in 2001, approximately 250 meters from the shore in Gdynia-Orłowo, at a depth of 2.7 metres. It appeared under the water as a small mound of bricks constituting the vessel's main cargo. Inside the hull, beneath the evenly stowed bricks, 6.5 x 14 x 29 cm, a few fragments of dishes and Dutch pipes from the mid-17th century were found. On the basis of the size of the structural elements it is possible to estimate that the hull was originally 15–18 metres long, hence wreck W-36 is probably the remains of a small ship used in coastal or local navigation in the Bay of Gdańsk. The results of dendrochronological analysis show that the timber to build the sailing ship was cut in the area of the Vistula Bay; it was probably built in the same region. There are numerous brickyards known in this area starting from the beginning of the 16th century, and this vessel may have been used for transporting bricks to coastal locations in the Bay of Gdańsk.

After the bricks were removed, the remains of a poorly preserved hull were revealed (Fig. 42.2). Only its after, bottom section survives, measuring 8.8 m in length and inclined to starboard. Inside, the hull was reinforced by three floor timbers and the remains of three frames placed fairly regularly, with a spacing of 60 cm. Six overlapping strakes on the starboard side and two strakes on the port side were uncovered. Protruding from beneath were planks which formed a second layer of planking. As it was the

first solution of this kind to be found in Poland, it was decided to extract all the elements in order to analyse them in a more detailed way.

Following suitable preparations, the whole wreck was dismantled, and all the elements were lifted and transported to the Conservation Workshop of the Polish Maritime Museum, where detailed documentation was carried out. The study of the extracted elements revealed a number of details, which allowed the construction process to be reconstructed.

From the longitudinal timbers, only an oak, T-shaped keel 5.3 m long survives. This was 18 cm high and with a maximum width of 21 cm. The after end was formed by a 28-cm-long, bevelled, flat scarf for the sternpost, with traces of six nails, 0.5 and 1 cm in size, which must have been used to fasten the sternpost.

There were two layers of planking. The first layer was made of overlapping, sawn, oak planks fastened by iron rivets. Luting material was animal hair. No remains of iron nails have survived, only traces of metal roves measuring 2.3 x 2.4 cm, spaced every 20 cm, could be seen underneath the floor timbers. The 3-cm-thick, oak planks were 3.5 to 3.7 m long and reached widths of 32 to 35 cm. The lands were 4–5 cm wide with a cove for plaited animal hair on the inner surface. The 30-cm-long, vertical planking scarfs were caulked with animal hair and tar and fastened by 5 nails driven in a vertical line along the edges.

Frames were fastened by means of oak treenails, 27 mm in diameter, and were placed into a hull made using the shell-first method (Fig. 42.3-1). Dendrochronological analysis showed that that stage of the ship's construction took place after 1596. At a later time, pine fillers with a triangular cross-section were fastened to the outer surface of the planking with small metal nails as a levelling layer (Fig. 42.3-2). Onto this surface another, complete layer of sawn pine planks, 3 cm thick and 23 to 31 cm wide, was laid. The planks were flush-laid and fastened at their edges by nails driven in every 35 cm (Fig. 42.3-3). These planks were also fastened to the floor timbers and futtocks (Fig. 42.3-4) by means of oak treenails 32 mm in diameter (Fig. 42.4). The oak treenails were dotted on the outside and wedged on the inside. Unfortunately, dendrochronological analysis of the pine planks has not been successful, and it is not possible to determine the period of time which elapsed between the building of the outer and inner planking.

Wreck from Dębki (F 10.Y.1.)

In the spring of 2002, following a storm, a large fragment of a wooden ship was washed ashore near the village of Dębki (Fig. 42.5). During the site inspection it turned out that we were dealing with the remains of a section of hull bottom built of two layers of planking, with a broken keel, resting on the shore upside-down. In order to secure the wreck, the hull was cut into three sections, lifted and

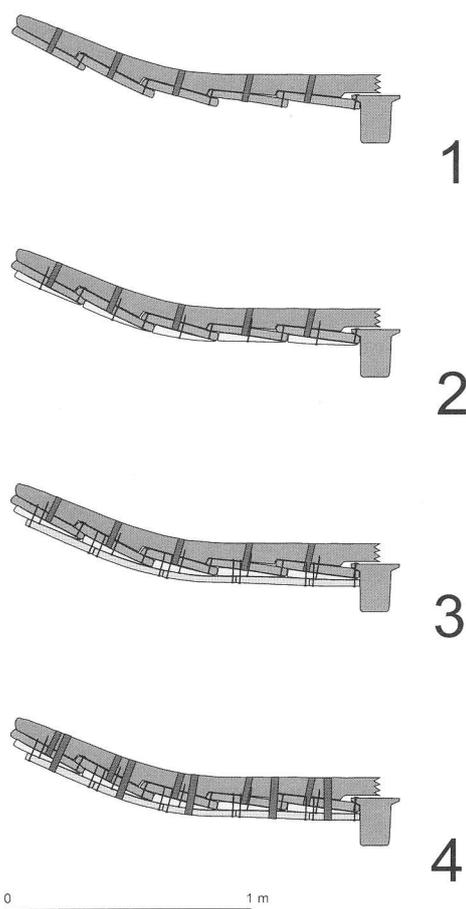


Fig. 42.4. Wreck W-36 – double-treenailed frames (photo by author).

taken to the Conservation Workshop in Tczew for further investigations.

Closer inspection revealed that this was the bow end of a ship's bottom, with preserved dimensions of 9.2 m long and 3.5 m wide. The inner layer of planking was of clinker planks, 3–3.5 cm thick, up to 36 cm wide and caulked with animal hair. The land was 4 cm wide and the planks scarfs were 13 cm long, fastened with nails. The strakes were fastened with iron rivets and rectangular roves, spaced 14–15 cm apart.

The flush-laid outer strakes were of pine, 6 cm thick and only 17–22 cm wide. The keel and garboards were fastened to the floor timbers by means of metal bolts, 22 mm in diameter. The transverse scarfs of the carvel planking were each fastened with two oak treenails of rectangular cross-section, 18 mm square.

A characteristic feature of this ship is the frame elements, which were fastened to the planking very closely to one another. They are not interconnected, show great variability in scantlings and are of highly variable length; some are secondarily used (Fig. 42.6). There were 23 floor timbers, 11–18 cm sided, spaced approximately every 20 cm. The strakes were fastened to the frames by treenails, 34 mm in diameter, and by metal bolts. Ceiling



Fig. 42.5. The Dębki wreck – a part of the ship washed ashore in 2002 (photo by author).



Fig. 42.6. The Dębki wreck – timbers have very variable scantlings and some are secondarily used (photo by author).

planks 45 mm thick and 16 cm wide were laid directly on the floor timbers.

Since the extracted sections are preserved intact and have not been dismantled, it has only been possible to study the building sequence at the five cross-sections which were made as a result of cutting the hull into pieces (Fig. 42.7). In all cases it has been observed that it is not possible to distinguish which treenails were used to join overlapping planks and which were used to fasten flush-laid ones. The oak treenails were dotted on the outside and wedged on the inside and were of the same length, so as to simultaneously join the ceiling, the frames and the



Fig. 42.7. The Dębki wreck – double layer of outer planking (photo by author).

outer and inner planks. Hence, if we assume that the holes for treenails were not drilled twice, then the construction sequence differs from that of the former wreck. At first, the overlapping planks were fitted and fastened using the shell-first method (Fig. 42.8-1). Then, some or all of the frames must have been fastened in place with nails. The levelling planks and the carvel planks were nailed to this structure and caulked with moss (Fig. 42.8-2). Next, more floor timbers and futtocks (possibly all of them) were laid in and the ceiling was nailed from above (Fig. 42.8-3). It was only then that all of these elements were joined together using wooden treenails (Fig. 42.8-4). Hence, the double planking was not a result of repairs or rebuilding but rather it was part of the original construction.

In order to determine the age and place of origin of the wreck a number of samples were taken for tree-ring analysis and given to the dendrochronological laboratory of the Mining and Metallurgy University in Krakow. This analysis did not succeed in determining the age of any of the timbers on the basis of the dendrochronological curves available in Polish laboratories, but the set of 6 samples did show the highest similarity to the chronology from Hamburg ($t=4.7$) for the period 1508–1653 AD (Ossowski 2004).

The tree-ring curve generated for the ship did not match any of the master curves available in Polish laboratories. It seems to show that the ship was built from raw material originating from distant areas, perhaps from the northern Baltic. At the present time the results obtained from the samples are being tested in laboratories of other Baltic states, which may make it possible to determine the provenance of the wood used to build the vessel. In one case the tests confirmed that the clinker planks are of the same age as the flush-laid planks. This is confirmed by the observed fact that the inside and outside planking was built at the same time.

Finally, in order to determine the vessel's age, radiocarbon dating was conducted and the rendered result was

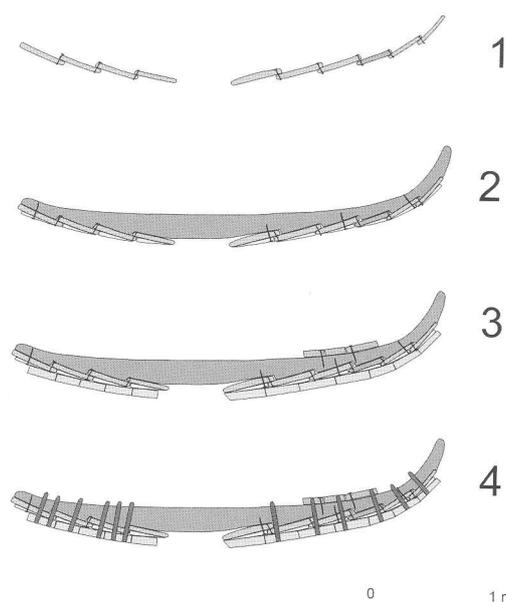


Fig. 42.8. The Dębki wreck – stages of construction of the hull (drawing by author).

105 ± 35 BP. Unfortunately the ^{14}C date is very close to the present, and with such a date the calibrated age fits in a very wide range, from the late 17th century through the whole 19th century.

Other double planked wrecks from the Baltic

In 1991, at the 6th ISBSA conference in Roskilde (1991), Vello Mäss presented the results of the investigation of an interesting wreck discovered near Maasilinn on the island of Ozylia in Estonia (1994). The remains represented a small single-masted sailing ship from the mid-14th century known as a *uisk*, which was used in navigation between the mainland and the islands of Dago, Ozylia and Muhu. A characteristic feature, which had not been encountered in the Baltic before, was that the ship's hull was built of two layers of planking – thin, overlapping inner planks were covered with thick, strong, flush-laid strakes. Although this may appear to be the result of repair or rebuilding, some structural features show that the hull was initially built with two layers of planking so as to be stronger. This is evidenced by the lack of any fastening of the keel to the floor timbers. They do not contact the keel, and the hull is joined to the keel by the outer planks only. The seemingly later carvel planking was thus necessary to support the keel and had to be laid simultaneously with the overlapping planks to reinforce the whole structure. This means that the keel section had to be moved forward ensuring better seaworthiness and to allow goods to be carried in a drier condition. This is evidenced by the slaked lime found inside the wreck, the likely remains of the main cargo. As it was difficult to haul such a ship onto the beach, the

reinforced hull may have been suitable for wintering on the water in ice.

Double planking has been also found in the hull of a medieval ship from Gellen, which was discovered in 1996 near the old western entrance to Stralsund, currently at the Hiddensee island shore, west of Rügen. This sank with a cargo of Öland limestone slabs (Förster 2000). The ship was originally 28 m long and 8 m wide, and had been built primarily of pine. Unlike cogs, which were common in the 13th and 14th centuries and had flat, flush-laid bottoms and overlapping side planks, this craft is characterized by overlapping planks from the keel to the sheer. The overlapping planks were levelled by triangular-sectioned planks onto which another layer of flush-laid planks was set. Tree-ring analysis shows that the clinker construction was made about 1339 of timber originating in the south-eastern Baltic region. About the year 1364 the ship underwent a major repair, when the flush-laid planking layer was added.

Another double-planked wreck was found in 1981 at Nors Å in Denmark. The clinker-built vessel had flush laid planks which were nailed directly onto the outside, without levelling wedges. According to Morten Gøthche, the wreck could be of the *sandskude* type, ships used in so-called *skudehandel*, the trade between Norway and Denmark in the 17th–19th centuries (1985). Because such vessels were owned by local farmers and landed directly on the shore, this gave the name to the vessels in this particular trade. The remains of small craft of the 17th–19th century craft from Denmark often represent a special type or a combination of techniques employed during building (Gøthche 1991). The Nors Å ship was a typical example of giving an old vessel new life using a method popular in Scandinavia known as *putte det i konvolut* – “putting it into an envelope” – i.e. strengthening by laying new carvel planking on top of the original clinker sides (Gøthche 1985).

Discussion

The two wrecks from Poland presented here have revealed very interesting and rarely seen design solutions in the form of double planking and have shown that such planking can be joined in different ways with the framing. The analyses which have been conducted so far and the poor condition in which the watercraft have been preserved have not made it possible at this stage to explain clearly the reasons why such design solutions were employed. The use of double planking may be explained in the following way:

- an attempt to make repairs to extend the life of the vessel
- reinforcement of the hull as was necessary to drag the watercraft onto the flat and sandy shore of the southern Baltic, where there were no natural ports, or to protect the hull against ice
- an attempt to increase the hull's watertightness for

the carriage of bulk cargos such as lime, salt or grain, which are readily spoiled by water

Hull repairs using double planking of the bottom are known from ancient times. With regard to the southern Baltic Sea, we know from written sources that repairs of this type were made in the 16th century in shipyards on the Vistula River estuary. For example, an item of information has been preserved in the books of an Elbląg carpentry workshop: In the year 1587, builder Claus made various repair works, including reinforcement of 24 oak hull planks by providing an additional outside layer and by caulking them with moss and oakum (Gierszewski 1961: 80). When comparing that note with the findings concerning the Gellen wreck, it may be noted that the use of double planking was a fairly popular way on the southern shores of the Baltic Sea of repairing a hull made of overlapping planks.

The wrecks discussed originate in a very interesting period in the history of shipbuilding, when the frame-first method started to be used in Baltic and North Sea shipyards. In the southern Baltic, this transition took place in the second half of the 15th century and in the first half of the 16th century, in the period when the Gdańsk shipbuilding industry had its heyday and when Gdańsk shipyards were building the largest seagoing ships in northern Europe. We know from written sources that in the second half of the 15th century, ships with a carrying capacity of up to 200 lasts were constructed in Gdańsk and that the works were conducted by foreigners – as we can, for instance, read in Caspera Weinreich's chronicle recording the death in 1473 of a certain Lombard, who was constructing a huge vessel with a keel that was 29 m long (Lienau 1943: 43). In the early 16th century, the demand for new ships was systematically growing. It was conducive to an increase in the number of specialists employed in a shipyard. According to the census of 1526 there were as many as 130 ship carpenters in Gdańsk. Such a workforce made it possible to build large ships for export at the end of the first half of the 16th century. It was in Gdańsk that three new warships for the navy of Henry VIII, King of England, were built (Litwin 1998: 31).

It is not definitely known when, to what extent and by whom the latest technological achievements in the form of the frame-first method were applied in Gdańsk. So far it has been believed that was connected to the arrival of carrack *Pierre de la Rochelle* from France in 1462. The ship was damaged in Gdańsk as a result of the mast being struck by lightning. Having been partially burnt, the ship was abandoned by the owner. In 1470 the vessel was taken over by the city, the hull was dragged to the shore, the ship was rebuilt and adapted for privateer purposes. The works having been completed, the warship began its service under the name of *Peter von Danzig*. It was described as a huge carvel, although it represented a type called a carrack in other places. It is known that soon afterwards, in the years 1475 and 1488, two new ships

were built with flush-laid planking. In the opinion of some historians, the repair of the French carrack in Gdańsk caused a breakthrough in the local shipbuilding industry (Lienau 1943). It was allegedly from that time that changes in the technique of hull building were made: overlapping planking was replaced by flush-laid planking.

It seems that such argumentation cannot be accepted. Just inspecting, or even repairing a hull built using frame-first technology (which was new in the north of Europe) was not enough to learn how to build a new ship without having knowledge about the whole technological process. It was Hasslöf who first indicated in his works that flush-laid planking and the frame-first technology did not always go together (1972). As is proved by the results of investigations of Dutch and Danish wrecks from the turn of the 16th and 17th centuries, the new method of shipbuilding was adopted to a varied degree and mixed solutions were used (Maarleveld 1994, Lemée 2002). The case must have been similar in northern Baltic shipyards. An item of information has been preserved in written sources indicates that in 1488, Brosien Mellin, a citizen of Gdańsk, laid a keel for a carvel which was 39 m long and 12.5 m wide. The hull of that watercraft, above the water line, had carvel planking and the bottom section, the most difficult section to form, was built with the use of the traditional shell-first overlapping method (Litwin 1998: 30). The latest archaeological discoveries show that not only the bottoms of cogs but also the sides of large inland navigation watercraft were flush-laid as early as in the 14th century in Gdańsk, notwithstanding the fact that they were built with the use of the shell-first method (Ossowski in press).

The feature that the wrecks presented here have in common is that they were low-tonnage vessels, with regional features, that must have been built in local boatbuilding centres. The available results of the tests conducted on the double planking of the Dębki wreck show that the structure was made all at once and may illustrate an attempt to follow frame-first technology by using the shell-first method to obtain a hull bottom section made of flush-laid planks. This may reflect attempts to apply new achievements in the course of building or repairing small watercraft used in local navigation, in which rich farmers and peasants also participated at that time. Although no exhaustive studies are available on that subject, materials from the areas of Gdańsk and Elbląg show that some farmers not only indulged in navigation but organized shipbuilding on their own as well, and these were not isolated cases. More light is cast on this process in Western Pomerania in the 18th century, where 2–3 last *skuta* and 5-last yachts were used in navigation (Gierszewski 1961: 112).

When studying the wrecks presented here, one should also take into account the issues related to the organization of shipbuilding in the 16th–18th centuries. Like craftsmen in almost all other trades at that time, the craftsmen who were involved in shipbuilding were organized in a guild.

The Gdańsk shipbuilding industry, however, was based not only on guild craftsmanship but also on craftsmen and designers of foreign origin, who were not associated in guilds. As in other Baltic states, foreign boatbuilders, with their skill and new methods, were brought in to build large ships, mainly upon the king's orders at first (Adams and Rönnby 1996, Lemée 2002, Probst 1994). Local traditions could still be seen in ships built for private owners. Construction of smaller ships in smaller towns was limited mainly to river and shore watercraft and it usually did not require special and costly equipment or special knowledge. It is known from written sources that the ability to build ships of this type was covered by the scope of knowledge of village and small town master carpenter (Gierszewski 1961: 54). It was also as a result of conflicts with employers and the city council, as was for instance the case in Elbląg, that ship carpenters left their towns and settled in smaller towns, bringing their experience with them (Gierszewski 1961: 186–187; 1972: 170). It was in smaller towns located on the Bay of Gdańsk or the Vistula Lagoon that they continued local traditions and built ships still employing the shell-first method with overlapping planking into the mid-20th century (Fornacon and Salemke 1988).

Hence, the two newly discovered wrecks may show that the need to build larger, stronger and more watertight vessels led to attempts to reinforce the hull by using additional planking, which, while imitating the solution used on larger ships used in 16th–19th century navigation, was nonetheless still based on the old rules of constructing them.

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