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## ARCHAEOLOGICAL EVIDENCE TO THE STUDY ON PEASANT SAILING IN POLAND IN 16<sup>TH</sup>-17<sup>TH</sup> CENTURY

The period between 16<sup>th</sup> and 17<sup>th</sup> century is a very interesting period in the history of shipbuilding when the frame-first method began to be used in the Baltic and North Sea shipyards<sup>1</sup>. At the southern Baltic Sea it took place in the second half of the 15<sup>th</sup> century and in the first half of the 16<sup>th</sup> century, in the period when the Gdańsk shipbuilding industry had its heyday and when Gdańsk shipyards were building the then largest seagoing watercraft. We know from the written sources that in the second half of the 15<sup>th</sup> century ships with the carrying capacity of even 200 lasts were constructed in Gdańsk. In the early 16<sup>th</sup> 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 potential of professional force made it possible to build large ships for export at the end of the first half of the 16<sup>th</sup> century. It was in Gdańsk that three new warships for the navy of Henry VIII, King of England were built<sup>2</sup>.

It is not definitely known when, to what extent and by whom the latest innovation in the form of the frame-first method were applied in Gdańsk. So far it has been believed that it was connected with the arrival of large carvel *Pierre de la Rochelle* from France to Gdańsk in 1462<sup>3</sup>. In Gdańsk the ship was damaged as a result of the mast being clap of the thunder. Having been partially burnt the ship was abandoned by the shipowner. In 1470 the watercraft was

taken over by the city, the hull was dragged to the shore, the ship was rebuilt and adapted for privateer purposes. It is known that soon afterwards in the years 1475 and 1488 two new watercraft were built with flush-laid planking of the sides. In the opinion of some historians the fact that the French carvel was repaired in Gdańsk was to cause a breakthrough in the local shipbuilding industry. It was allegedly from that time that changes in the technique of hull building were to be made: abandonment of overlapping planking to be replaced by flush-laid planking.

It seems that such argumentation cannot be accepted. The very watching, or even repairing of a hull with the frame-first technology which was new in the north of Europe was not enough to learn how to build a new ship from the scratch without having knowledge about the whole technological process. It was already Hasslöf who indicated in his works that flush-laid planking and the frame-first technology did not necessarily go hand in hand<sup>4</sup>. As is proved by the results of investigations of Dutch and Danish wrecks from the turn of the 16<sup>th</sup> and 17<sup>th</sup> centuries, the new method of shipbuilding was adopted to a varied degree and mixed solutions were used<sup>5</sup>. The case must have been similar in northern Baltic shipyards. An item of information has been preserved in the written sources advising that in 1488, Brosien Mellin, a citizen of Gdańsk, laid a keel for a caravel which was 39 m long and 12.5 m wide. The hull of that watercraft above the water line had a caravel planking and the bottom section, was built with the use of the traditional shell-first overlapping method<sup>6</sup>. 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 14<sup>th</sup> century in Gdańsk notwithstanding the fact that

<sup>1</sup> R. Unger, *The Ship in the Medieval Economy, 600-1600*, London-Montreal 1980; F. Hocker, *Technical and organizational development in European shipyards 1400-1600*, [in:] *Maritime Topography and the Medieval Town*, eds. J. Bill, B. L. Clausen, Copenhagen 1999, pp. 21-32; N. M. Probst, *The Introduction of Flush-planked Skin in Northern Europe and the Elsinore Wrecks*, [in:] *Crossroads in Ancient Shipbuildings*, ed. C. Westerdahl, Oxbow Monograph 40, Oxford 1994, pp. 143-152; T. Maarleveld, *Double Dutch Solution in Flush-planked Shipbuilding*, [in:] *Crossroads in Ancient Shipbuildings*, ed. C. Westerdahl, Oxbow Monograph 40, Oxford 1994, pp. 153-164.

<sup>2</sup> M. Bogucka, *Gdańsk jako ośrodek produkcyjny w XIV-XVII w.*, Warszawa 1962, pp. 45-47.

<sup>3</sup> O. Lienau, *Das Grosse Kraweel Der Peter von Danzig 1462-1475, Ein Beitrag zur Geschichte Deutscher Seegeltung*, Danzig 1943.

<sup>4</sup> O. Hasslöf, *Main principles in the technology of Ship Building*, [in:] *Ships and Shipyards, Sailors and Fishermen*, eds. O. Hasslöf, H. Henningsen, A. E. Christensen, Copenhagen 1972, pp. 27-72.

<sup>5</sup> Ch. Lemée, *The Renaissance Shipwrecks from Christianshavn. An archaeological and architectural study of large carvel vessels in Danish waters, 1580 – 1640*. Vol. 6 of the series *Ships and Boats of the North*. Roskilde 2006, pp. 48-76.

<sup>6</sup> M. Bogucka, *op. cit.*, p. 47.

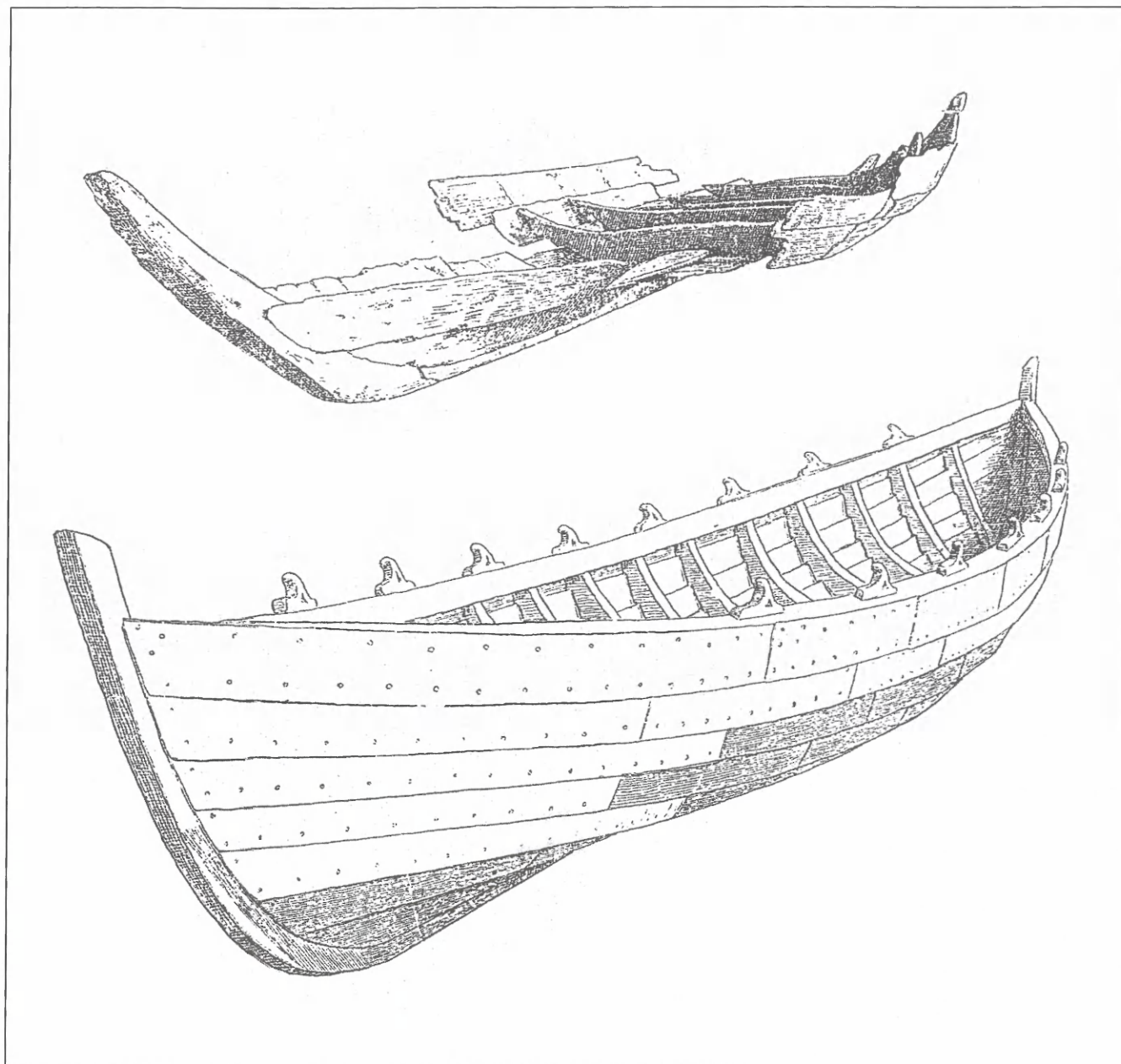


Fig. 1. The Frombork wreck – a documentation made by Johannes Heydeck.

they were built with the use of the shell-first method or rather bottom-based<sup>7</sup>.

The 15<sup>th</sup>, 16<sup>th</sup> and 17<sup>th</sup> centuries saw dramatic and rapid change in the technological geographical, social political and economic structure of seafaring in Europe. The technical and organizational changes in large scale shipbuilding are reflected also in the body of small vessels found in Polish waters from 16<sup>th</sup> century onwards. In this paper we are going to briefly present a most important wrecks from that period.

The first wreck was found during drainage work carried out 31 October 1895 in the wet meadows on the

south-western periphery of Frombork<sup>8</sup>. Judging from the reconstruction found in the drawings of J. Heydeck the boat had a hull of seven strakes on each side braced by a total of 15 floor timbers (Fig. 1). The heaviest middle floor timber supposedly had a mast step. Only the length of the keel (15.3 m) and the width of the boat (2.8 m) were recorded by J. Heydeck by whom the ship was dated to c. AD 500/600, the period during which craft propelled by the force of the wind had been introduced to the Baltic. Basing on a large number of finds of Scandinavian artifacts from the coast of Sambia, which he himself had studied earlier, Heydeck concluded that the boat from

<sup>7</sup> W. Ossowski, *Przemiany w szkatnictwie rzeczonym. Studium Archeologiczne*, Gdańsk 2010, pp. 51-53.

<sup>8</sup> J. Heydeck, *Das Wikingerschiff von Frauenburg*, Kr. Braunsberg, „Sitzungsberichte der Altertumsgesellschaft Prussia“, H. 21, Königsberg 1900, pp. 67-72.

Frombork was a Viking ship. The main views on the subject of this craft, repeated after Heydeck in subsequent scholarly publications and literature aimed at the general public, with time became established both among the laymen and in academic circles.

The boat of interest, and this is something which is mentioned only rarely, was not the only find discovered at this location. In issue no. 21 of the Antiquarians Society 'Prussia' there is a reference to a meeting of 17 November 1899 during which Heydeck reported on the discovery of another craft made in Frombork the same year.

Fortunately, the archive of the local museum in Frombork (Muzeum Mikołaja Kopernika) preserves a handwritten note, complete with sketches, from an excavation made in Frombork on 11 March 1899 by Heydeck, with additional details about this second boat and circumstances of its discovery<sup>9</sup>. Of this craft a fully preserved 4.79 m long oak keel had survived. Its cross-section was like the letter 'T', its width was 32.5 cm and the base was 9x6.5 cm. Attached to the keel on the bow side was the stem. The oak strakes were joined with iron nails, overlapping with the planks below, luting using animal hair, fixed to seven frames with pegs of juniper. In the third frame, counting from the bow, there was a maststep which, together with the foundation for the mast, defined the width of the boat as 1.5 m, something which is much more plausible than the information found in the reports of 'Prussia' Society. The frames, which according to the same document were of fir wood, were badly preserved and the upper part of the hull was missing.

This second ship had been discovered close to the first. It appears from the data on stratigraphy recorded in the same document that the keel of this craft rested at a depth of 75 cm below the level of the turf, embedded in a layer of sand. Its shallower position and the proportions of its hull suggest that it was younger than the first, but the author of the investigation (J. Heydeck) was convinced that this boat also dated from the Viking Period. The planking bore traces of repeated damage and repairs. Heydeck emphasised that, similarly as in case of the first ship, the timbers of this craft did not bear traces of having been worked with a saw<sup>10</sup>.

The soundest proof helpful for establishing the age of the Frombork ship would be to investigate a sample of the surviving timbers using methods of absolute dating. However, all the three ships which had been placed on display in Königsberg, were destroyed during a British bomb raid of 31 August 1944.

Destroyed during the last war the ship finds from Frombork no longer can be dated with any accuracy. And there is little hope that any further remains of their timbers will be recovered. Even so, more than a century after their discovery we may be forthcoming from a large number of new finds of boats recorded on the southern Baltic.

The largest complex of old ship construction finds from the area of the Vistula Lagoon to have undergone research to date from wrecks of Tolkmicko investigated in 1980-1982<sup>11</sup>. In 2001, further archaeological investigation was commenced<sup>12</sup>. The Tolkmicko boats had a keel, a flat bottom and rounded sides (Fig. 2). Their transverse timbers consisted of a flat floor timber which covered three strakes of the craft's bottom, and ribs laid over its ends. The transverse internal timbers were mostly composed of two parts, that is, of a floor timber and another frame, and were spaced quite densely, at irregular intervals. The strakes were joined together with iron rivets and with animal hair as luting material; in ships Tolkmicko IV and VI, the transverse seams between the planks were used moss as luting material. A characteristic feature is a maststep, hewn in the main floor timber, which suggests that this was a sail boat, and that the 'oarlocks' in the Frombork ship may be considered Heydeck's invention, not supported by the sources. During the cutting of samples, numerous new constructional details were observed on the wrecks of Tolkmicko. One section of the outer hull planking consisted of wood with wide, irregularly distributed annual rings. The planks were cut for the most part tangentially or radial-tangentially, often from inferior wood. The surfaces of many planks exhibit clear traces of sawing. It was determined that the longitudinal seam between the planks of the same strake exhibited moss luting material in the Tolkmicko II, IV and VI wrecks.

At present, the first boat from Frombork appears to show greatest resemblance to ships Tolkmicko I, IV and V. Basing on similarity of their construction and the shape of their hull all of them may be said to belong to one type of craft, built at a local shipbuilding works on the Vistula Lagoon – the ship no. V, dating from c. 1550, is built of local material. Judging by common features with regard to construction technique and hull form, Wreck Nos. I, III, IV, V and VI are presumably all remains of one and the same ship type. The investigations have furnished proof of the fact that the oldest of the five wrecks – No. III

<sup>9</sup> W. Ossowski, *Z badań nad wrakami fromborskimi*, [in:] *Baltowie i ich sąsiedzi, Marian Kaczyński in memoriam*, eds. A. Bitner-Wróblewska, G. Iwanowska, Seminarium Bałtyjskie, vol. II, Warszawa 2009, pp. 579-594.

<sup>10</sup> W. Ossowski, *Z badań nad wrakami...*, pp. 579-594.

<sup>11</sup> P. Smolarek, *Wraki spod Tolkmicka – nowe źródło do dziejów sztuki*, „Kwartalnik Historii Kultury Materialnej”, vol. 31, No 2, 1983, pp. 171-185; P. Smolarek, *The unknown boat-building of a forgotten people*, [in:] *Local Boats*, ed. O. L. Filgueiras, BAR International Series 438 (1), Oxford, pp. 55-62.

<sup>12</sup> W. Ossowski, M. Krąpiec, *Die Wracks von Tolkmicko am Frischen Haff im Lichte der letzten Forschungen*, „Deutsches Schiffahrtsarchiv“, vol. 26, 2003, pp. 135-156.

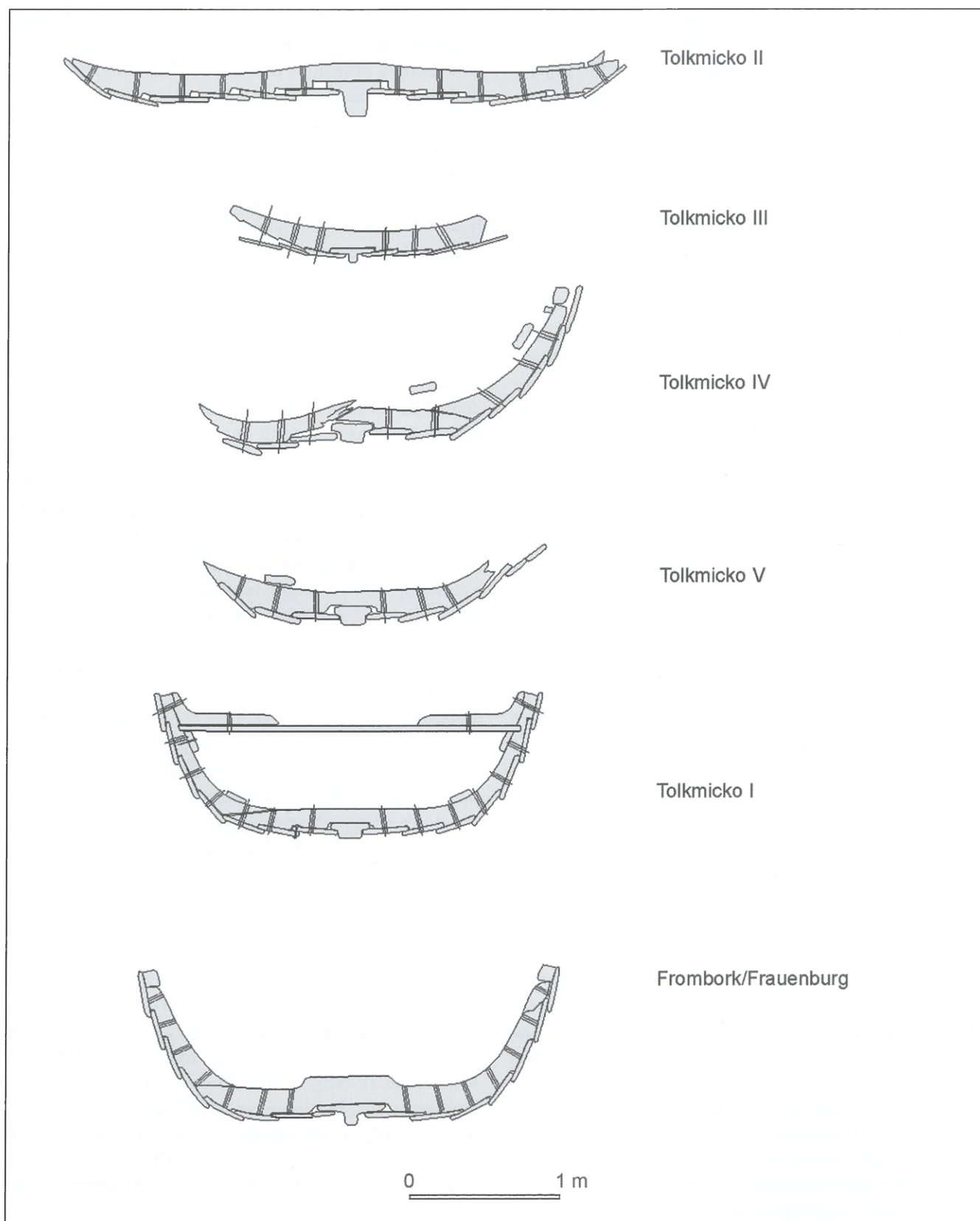


Fig. 2. The cross-sections of the wrecks from the modern period found on the Vistula Lagoon.

of the end of the fifteenth century – and Wreck No. V of the mid sixteenth century were built of local materials in a native boatbuilding workshop on the Vistula Lagoon, possibly in Tolkmicko. The wrecks labelled Nos. IV and VI, on the other hand, contain wood obtained from farther

away to meet the demand of the local boat builders. The results of the investigation show that the Tolkmicko II wreck, which differs in type from the other objects discussed above, likewise could have been built in a local boatbuilding workshop.

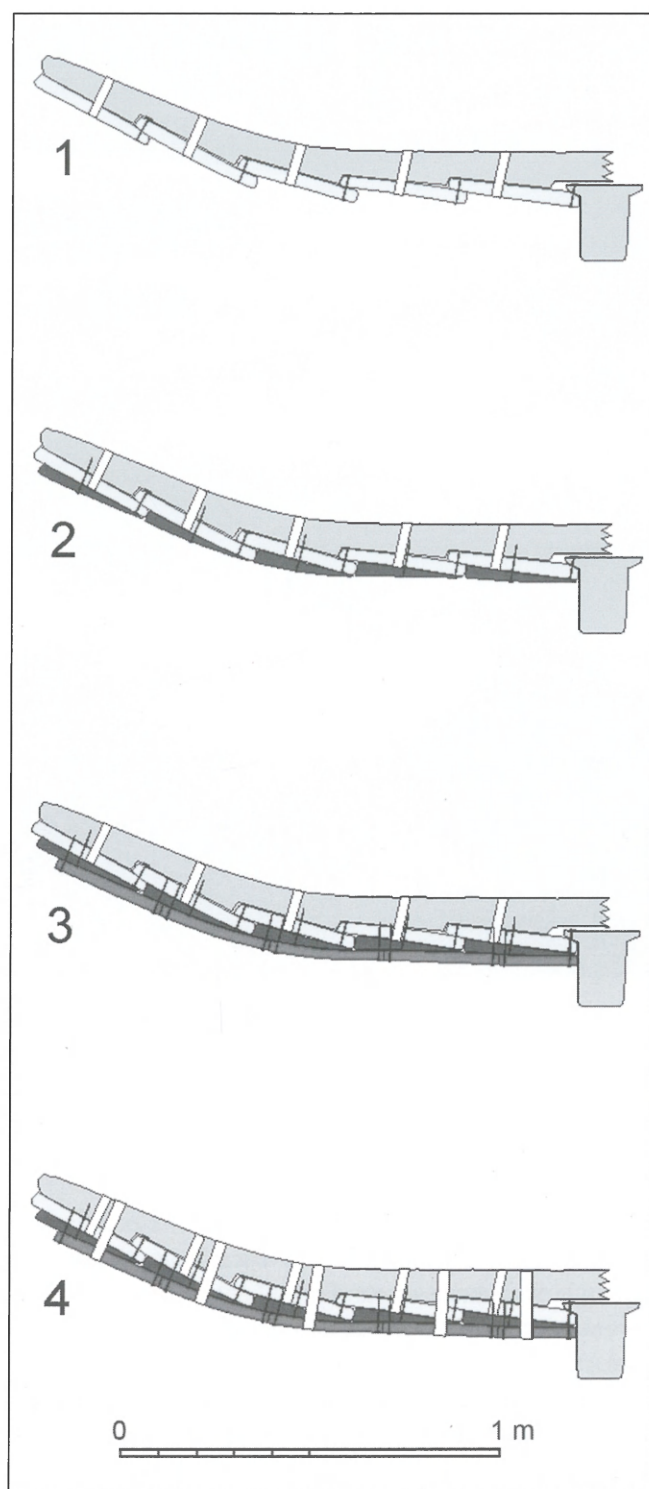


Fig. 3. Wreck W-36 – stages of construction of the hull.

Assuming that the second boat from Frombork was only 6–7 m long, this would make it the smallest boat with a sail discovered so far on the southern coast of the Baltic; with no parallel finds from archaeology we need to look for ethnographic analogies among the great number of small boats used in fishing on the Vistula Lagoon.

A comparison made of the two Frombork ships with other finds of boats known at present from the southwestern Baltic suggests that, rather than originating from

the Viking period as previously thought, they dated from the late medieval or post-medieval age. As such they were connected with the economic life of Frombork, the mainstay of its inhabitants, starting from the time of the town's inception during the 14<sup>th</sup> century, was fishing and agriculture.

The next shipwrecks dated to 15<sup>th</sup>-17<sup>th</sup> century discovered in Poland have a characteristic feature, the ship's hull built of two layers of planking – the thin overlapping planks were covered with thick, strong, flush-laid strakes.

The first wreck (Wreck W-36) was discovered by divers in 2001, approximately 250 meters from the beach shore in Gdynia-Orłowo, at the depth of 2.7 metres<sup>13</sup>. It delineated itself under the water as a small hillock formed by bricks constituting the main cargo of the watercraft. When the bricks had been excavated the remains of the hull were uncovered which has survived in a very poor condition to date. It is only its bottom stern section, 8.8 m long, inclined to the right side that has been preserved. Inside, the hull was reinforced by three floor timbers and the remains of 3 frames distributed fairly regularly with a spacing of 60 cm. Six overlapping strakes on the right side and two strakes on the left side were uncovered. Underneath, protruding were planks which formed a subsequent layer of planking. As it was the first solution of that kind to be found in Poland it was decided to extract all the elements in order to analyse them in a more detailed way.

The study of the structural elements revealed a number of details allowing the hull building process to be reconstructed (Fig. 3). From the longitudinal timbers, only an oaken T-shaped keel which was 18 cm high and with a maximum width of 21 cm on a section 5.3 m long has been preserved. Transverse reinforcement elements fastened by means of oaken trenails, 2.7 cm in diameter, were placed into a hull made with the use of the shell-first method. The conducted dendrochronological tests show that that stage of the ship's construction took place after 1596. At a later time, pinewood planks, with a triangular cross-section, forming a levelling layer were fastened from the outside by means of small metal nails. Onto that surface another, second layer of planking consisting of saw pinewood planks, 3 cm thick and 23 to 31 cm wide was laid. The planks were flush-laid and fastened by nails driven every 35 cm at the edges of each of them. Moreover, the planks were fastened to the floor timbers and frames by means of oaken trenails of a diameter of 3.2 cm which was larger than in case of the previously used ones. The trenails made of oak were dotted on the outside and wedged on the inside. Unfortunately the dendrochronological analysis of the pinewood planks have been unsuccessful and at the

<sup>13</sup> W. Ossowski, *Two double planked wrecks from Poland*, [in:] *Connected by the Sea. Proceedings of Tenth International Symposium on Boat and Ship Archaeology, Roskilde*, eds. L. Blue, F. Hocker, A. Englert, Oxford 2006, pp. 259-260.



Fig. 4. The Dębki wreck – double layer of outer planking.

present moment it is not possible to determine the period of time which elapsed between the building of the outside and inside planking.

Inside the hull, beneath a cargo of evenly placed bricks, 6.5 x 14 x 29 cm in size, fragments of potteries and clay pipes from the mid-17<sup>th</sup> century were found. On the basis of the size of the structural elements it is possible to estimate that the hull was originally 13–18 metres long, hence wreck W-36 would be the remains of a small ship used in shore or local navigation at the Bay of Gdańsk. The results of tree-rings analysis show that the timber to build the sailing ship was cut in woods by the Vistula Bay and that it was probably built in that region. It was also there where numerous brickyards were known starting from the beginnings of the 16<sup>th</sup> century and the watercraft in question may have been used for transporting bricks to seaside locations at the Gdańska Bay.

In the summer of 2002, following a strong storm a large fragment of a wooden ship (wreck F 10.Y.1.) was washed ashore to the beach near the village of Dębki<sup>14</sup>. During the site inspection it turned out that we were dealing with

the remains of a bottom hull section built of two layers of planking, with a broken keel, resting on the shore with the bottom being on top.

We are dealing here with a fragment of a bottom bow ship section, 9.2 m long, 3.5 m wide. The clinker construction was made of planks, 3–3.5 cm thick and up to 36 cm wide which were sealed with animal hair (Fig. 4). The strakes were fastened by rivets with a spacing of 14–15 cm. The flush-laid outside planking was built of pine-wood planks, 6 cm thick and only 17–22 cm wide. The keel and garboard strakes were fastened to the floor timbers by means of metal bolts, 2.2 cm in diameter. A characteristic features of that ship are transverse timbers which were fastened to the planking very closely one to another, are not interconnected, show great variability in scantlings and are of very variable length.

Since the extracted sections are preserved in whole and have not been dismantled, it has been possible to track the sequence of joints on 5 cross-sections which were made as a result of cutting the hull into sections. 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 treenails made of oak were dotted on the outside and wedged on the inside

<sup>14</sup> W. Ossowski, *Two double planked...*, pp. 260–262.

and were of the same length so as to simultaneously join the ceiling, the reinforcing elements and the outside and inside planks. Hence, if we assume that the holes for treenails were not drilled, then on that basis another sequence of stages of building/rebuilding of the ship than in the case of the former wreck will appear. At first clinker-built planks were fastened with rivets. Then, some or all transverse timbers must have been fitted with nails. To a hull formed in such a way, the levelling layer planks and the flush-laid planks were nailed. Next, further or all floor timbers and frames were laid from the inside to which ceiling planks were nailed from above. It was only in the end that all those elements were joined together by wooden treenails. Hence, the double planking was provided not as a result of repairs but rather it was formed at the stage of whole hull building.

In order to determine the age and place of origin of the wreck a number of samples were taken for dendrochronological analysis. 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 for the period 1508-1654. In one case the tests confirmed that the planks from the clinker construction (i.e. theoretically earlier) 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 watercraft's age radiocarbon dating was conducted and the result was the 105±35 BP. Unfortunately the radiocarbon date is very early and with such a date the calibrated age fits in a very wide range from the late 17<sup>th</sup> century to the whole 19<sup>th</sup> century.

The two presented wrecks have revealed very interesting and rarely seen before construction features in the form of double planking and have shown that such planking can be in different ways joined with transverse timbers.

The study which have been conducted so far and the poor condition in which the wrecks have been preserved have not made it possible at that stage to clearly explain the reasons why such solutions were employed. The use of double planking may be explained in the following way<sup>15</sup>:

<sup>15</sup> M. Götche, „*Sandskuder*” – vessel for trade between Norway and Denmark in the 18th and 19th centuries, [in:] *Postmedieval Boat and Ship Archaeology*, ed. C.O. Cederlund, BAR International Series 256, Stockholm 1985, pp. 299-314., idem, *Three Danish 17<sup>th</sup>-19<sup>th</sup> century wrecks as examples of clinker building techniques versus carvel building techniques in local shipwrightry*, [in:] *Carvel Construction Technique*, eds. R. Reinder, K. Paul, Oxbow Monograph 12, Oxford 1991, pp. 85-88, V. Mass, *A Unique 16th Century Estonian Ship Find*, [in:] *Crossroads in Ancient Shipbuildings*, ed. C. Westerdahl, Oxbow Monograph 40, Oxford 1994, pp. 189-194, B. Grundvad, *A clinker vessel converted*, „Maritime Archaeology Newsletter from Denmark”, No 26, 2011, pp. 24-27.

- an attempt to make repairs to extend the life of the ship;
- reinforcement of the hull as it was necessary to drag the watercraft on the flat and sandy shores of the southern Baltic where there were no natural ports or to protect the hull against ice;
- an attempt to increase the hull tightness in view of the carried bulk cargoes of little resistance to the action of water such as lime or salt;
- the double layer was a part of the original design. If the converted clinker vessel was originally built with the double layer, it could illustrate an attempt to follow the new tendencies of building carvel hulls instead of the “old fashion” clinker hulls.

Although, so as to explain such a solution it may be said that it is the effect the ship's being rebuilt at a later time, nevertheless, some structural features show that the double planked hull was built straight away so as to be stronger and more watertight. This is evidenced by the lack of any fastening of the keel to the floor timbers. They are to be found above the keel, and the hull is joined with the keel by the outside strakes only. The seemingly older 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 made the keel section to be moved forward ensuring better navigability and allowing goods to be carried in a drier condition. This is proved by the slaked lime found inside the wreck which must have been the main cargo. As it was difficult to drag such a ship to the shore the reinforced hull may have been suitable for wintering on water in ice.

Hull repairs by using double planking of the bottom were made as early as in the ancient times. With regard to the southern Baltic Sea areas we know from written sources that repairs of such type were made in the 16<sup>th</sup> century in shipyards at the Vistula River estuary. For example, an item of information has been preserved in the books of an Elbląg carpentry workshop that in the year of 1587, builder Claus made various repair works including reinforcement of 24 oaken hull planks by providing an additional outside layer and by luting or caulking them with moss<sup>16</sup>. When comparing that note with the findings mentioned above it may be regarded that the use of double planking was a fairly popular way of repairing a hull made of overlapping planks on the southern shores of the Baltic Sea.

The feature that the wrecks presented here have in common is that they were small vessels, with regional features, that must have been built in local boatbuilding centres. We can observe the technical changes in the hull

<sup>16</sup> S. Gierszewski, *Elbląski przemysł okrętowy w latach 1570-1815*, Gdańsk 1961, p. 80.

structure of small vessels. Sawn planks are replacing split and hewn ones in the clinker built boats used for local and regional trade and technical solutions know from the construction of large ships find their way also into these mundane vessels.

The available results of the study conducted on the double planking of the Dębki wreck show that the structure was made straight away and may illustrate an attempt to adoption the frame-first technology by using the traditional method to obtain a hull bottom section made of flush-laid planks. This may reflect attempts to apply the new achievements in the course of building or repairing small watercraft used in local navigation in which also rich peasants indulged at that time. Although no intensive studies are available on that subject, materials from the area of Gdańsk and Elbląg show that some peasants not only indulged in navigation but organized shipbuilding on their own as well, and those were not sporadic cases. More light is thrown on that process in Western Pomerania in the 18<sup>th</sup> century where 2-3 last barges and 5-last yachts were used in navigation<sup>17</sup>.

When studying the presented wrecks one should also take into account the issues related to the organization of shipbuilding in the 16<sup>th</sup>-18<sup>th</sup> centuries. Like craftsmen

in almost all other trades at that time the craftsmen who were involved in shipbuilding were organized in a guild organization. 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 guild organizations. Similarly to other Baltic regions, together with the skills of foreign boatbuilders new methods were transferred in order to build large ships, mainly upon the king's orders initially. And local traditions could be still seen in ships built for private owners. Construction of smaller ships in smaller towns was limited mainly to river and coastal watercraft and it usually did not require special knowledge and costly equipment. It is known from written sources that the ability to build ships of that type was covered by the scope of knowledge of village and small town carpenter masters. 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 city and settled in smaller towns bringing the whole acquired experience with them<sup>18</sup>. It was in smaller towns located at the Bay of Gdańsk or the Vistula Bay that they cultivated local traditions and built ships employing the shell-first method with overlapping planking still till the mid 20<sup>th</sup> century.

### Streszczenie

#### Źródła archeologiczne do studiów nad żegluga chłopską w Polsce w XVI-XVII wieku

Okres pomiędzy XVI a XVII wiekiem jest bardzo interesujący w dziejach budownictwa okrętowego, wówczas to bowiem technika szkieletowa zaczyna być stosowana w stocznjach Bałtyku i Morza Północnego – obserwujemy wtedy szybkie i nagłe zmiany w strukturze ekonomicznej, geograficznej i społecznej żeglugi europejskiej. Przemiany te widoczne są w cechach konstrukcyjnych mniejszych jednostek używanych w żegludzie bliskiego zasięgu w rejonie południowego Bałtyku od XVI wieku. Niniejsza praca zawiera charakterystykę najważniejszych wraków tego typu odkrytych dotychczas Polsce.

Największa grupa znalezisk pochodzi z obszarów Zalewu Wiślanego i tworzy ją 6 wraków odkrytych w Tolkmicku oraz dwa znalezione we Fromborku. Kolejne dwa z tego okresu (okolice Gdyni i Dębek) charakteryzują się

niezwykłymi cechami konstrukcji w postaci dwóch warstw poszycia wykonanych z pasów montowanych na zakładkę przykrytych klepkami łączonymi na styk.

Wszystkie omówione wraki to niewielkie jednostki przeznaczone do żeglugi lokalnej wykonane w małych, lokalnych ośrodkach szkodniczych. Cechą charakterystyczną dla jednostek z tego okresu jest wykorzystywanie klepek z tarcicy zamiast klepek dartych w płaszczyźnie promieniowej jak to robiono wcześniej. Widoczne są również naśladownictwa technik stosowanych w dużych ośrodkach szkodniczych przede wszystkim w postaci prób wprowadzania metody szkieletowej przez nakładanie drugiej warstwy gładkiego poszycia z klepek łączonych techniką karawelową.

<sup>17</sup> *Ibidem*, p. 112.

<sup>18</sup> *Ibidem*, pp. 186-187; S. Gierszewski, *Życie gospodarcze Tolkmicka jako królewskiej (1569-1772)*, „Rocznik Elbląski”, vol. 5, 1972, p. 170.