

Medieval Baltic Ships - Traditions and constructional aspects

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INTRODUCTION

Although the Middle Ages are generally considered to have begun in the 5th century AD, documentary evidence of medieval shipping along Baltic coasts goes back no farther than the 9th century. It was then that a number of nations with a typically early-medieval culture established their first permanent settlements on these coasts. Succeeding centuries saw the growth of these communities and the evolution of centres of political and economic power. Gradually they forged trading links and periodically fought wars against one another. Both commerce and hostilities required the use of ships, and these were indeed built on the Baltic.

From the 9th to the 12th centuries the Baltic Sea was most readily accessible to the Scandinavians, the Western Slavs, then known as Wends, and the Balts, subdivided into Prussians and Ests. Some contemporary sources also use the name Ests for the Prussians. Furthermore, some regions were inhabited by smaller nations, such as the Lapps and the Finns, who had settled the north-eastern shores of the Baltic. However, it was the Scandinavians, who lived along the northern coasts of the Baltic, who were in possession of the longest shoreline. At this time the lands of the Slavs stretched from as far west as the area around the present-day city of Kiel to the mouth of the river Vistula (Wista) in the east. Beyond that, towards the east and north, lay the territories of the Prussians and Ests (fig. 1).

Archaeological sources show that up to the early 13th century the Scandinavians and the Slavs were the leading ship- and boatbuilders on the Baltic¹. In the mid-12th century, the Slav tribes inhabiting the lands west of the mouth of the river Odra/Oder, who had not organised a state of their own, suffered a series of setbacks in their wars with the Danes. Thus weakened, their territories were soon conquered by Germanic tribes². In 1158 Henry the Lion, Duke of Saxony and Bavaria, founded the new town of Lübeck near the ruins of the Slav fortress of Lubice, thus making the Baltic accessible to German traders³. Already in the following century, Lübeck was to become the most important Germanic trading centre on the Baltic.

The growth of this now wholly German town was signally influenced by the settlement of the Teutonic Order in the Polish-Prussian borderlands. They had come in 1230 in response to a call by Duke Konrad I of Mazovia for assistance in his struggles with the pagan Prussians. Soon afterwards, however, they had not only

conquered the lands of the Prussians but were also in control of the mouths of the Vistula and Niemen: the newcomers had founded a powerful state⁴. With numerous ties to Germany proper, this new state organism had to develop shipping in order to function properly, and as a result, several new classes of vessel appeared. The expansion of trade in northern Europe gave rise to the Hansa, a mercantile organisation based in Lübeck, which at the height of its influence in the 14th-16th centuries constituted a powerful union of some 200 towns and cities⁵. Denmark had been a long-standing opponent of the Hansa, but so too had the Netherlands, whose merchants effectively took over the commercial initiative in Hanseatic towns on the Baltic towards the end of the 15th century. A contributory factor to this process had been the defeat in the second half of the 15th century of the Teutonic Order by the armies of Poland and Lithuania, as a result of which Poland took control of the Vistula mouth. The trading privileges then bestowed upon Gdańsk produced an upturn in the city's fortunes.

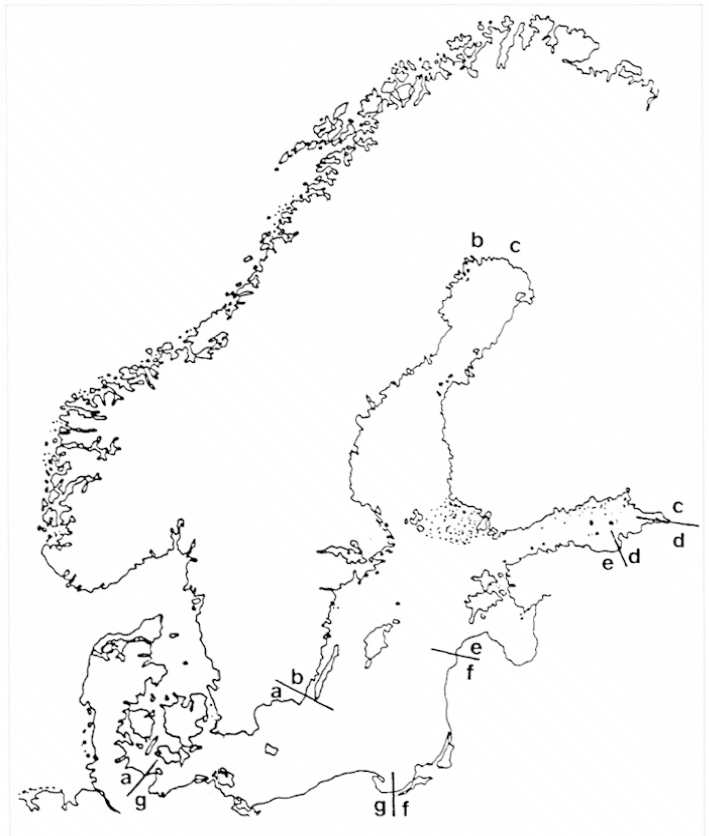


Fig. 1 - The settlements of nations in 10-11 centuries around the Baltic coast : a-a) Danes ; b-b) Swedes ; c-c) Finns ; d-d) Russians ; e-e) Ests ; f-f) Prussians ; g-g) Slavs.

In consequence, Baltic ports witnessed the comings and goings of new types of merchant vessels and warships.

THE OLDEST BALTIC BOATS

The most interesting boatbuilding region on the Baltic appears to be the area of present-day Denmark. The numerous islands and the Jutland peninsula separating the North Sea from the Baltic were a natural and convenient site for the growth of settlement and running a maritime economy. Long before the early Middle Ages this area had been a crossroads where the civilisations of northern and southern Europe met those of the eastern and western Europeans. It thus comes as no surprise then to learn of the numerous and scientifically valuable discoveries of boatbuilding relics in Denmark. Some of these are of exceptional importance, e.g. the Hjortspring boat (fig. 2), dated at the 4th or 3rd century BC⁶, and the Nydam boat (fig. 3), described as the remains of a boat dating from the 4th or 5th century AD⁷. Further wrecks, both of older, Stone Age boats, and of later ones from the Viking era, not to mention ships from the post-Viking period, have made an invaluable contribution to our knowledge of boatbuilding in northern Europe⁸.

Methodical studies of the history of Scandinavian boatbuilding began in the late 19th century, when a number of boats were excavated from Viking tombs. Ever more archaeological sites are being found, and they are enriching our seemingly already extensive knowledge of Nordic shipbuilding⁹. The upshot of these studies was a fairly early attempt at defining the line of development of Scandinavian floating craft, derived from boats made from hides and skins, and regarded as one of the four prototypes of present-day boats and ships¹⁰. A key role in this theory is played by the oldest known Scandinavian plank boat - the 3rd century BC Hjortspring boat, whose form resembles that of hide

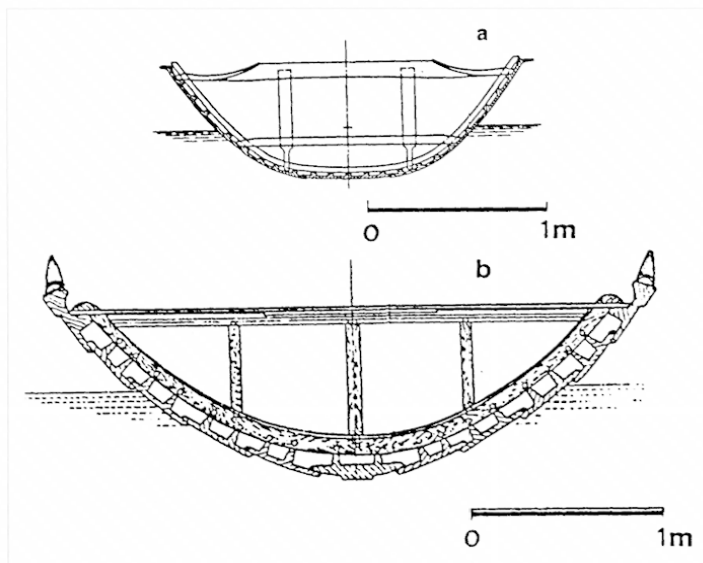


Fig. 2 - Cross-sections of the early wooden Baltic boats : a) the Hjortspring boat - 4th - 3rd BC. ; b) the Nydam boat - 4th - 5th cent. AD.

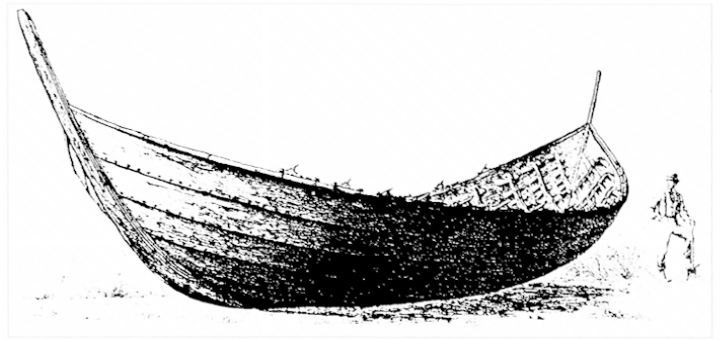


Fig. 3 - The Nydam boat in the reconstruction by Magnus Petersen, published in 1865 by the first investigator Conrad Engelhardt.

boats, but which was constructed from five broad planks of lime wood sewn together with bast cord¹¹. Moreover, the method of forming the ends of the hull is reminiscent of the hide boats depicted in the numerous rock engravings found in northern Scandinavia and dating from a much earlier period. The wrecks of the boats from Björke (1st-2nd century AD)¹² and Nydam (4th century AD) are evidently representative of a later stage in the technical evolution of Scandinavian boats. They were often built from oak, a much stronger kind of timber. The traditional sewing of planks had been replaced by riveting. The introduction of this important innovation became possible once the technique of iron smelting had been learnt in Scandinavia, as a result of which, among other things, nails were produced for boatbuilders.

As far as the historical development of boats from the Baltic coasts of Scandinavia is concerned, the view is that they could have evolved from either rafts or dugouts¹³. In the low-lying areas of today's Denmark and in the forest-covered regions of southern Sweden, there was no lack of materials for building boats. Their construction enlarged the range of Scandinavian boatbuilding techniques, as a result of which a series of interesting boat types emerged during the Viking period. Many of these have been excavated (fig. 4), e.g. the boats from Kvalsund (5th-8th cent.)¹⁴, Oseberg, Gokstad and Tune (9th cent.)¹⁵, Ladby (10th cent.)¹⁶, Skuldelev

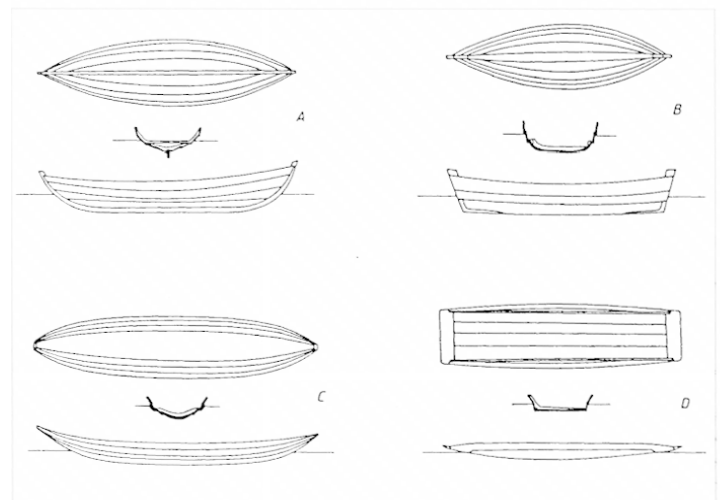


Fig. 4 - Four prototypes of the Nord-European ships in the O. Crumlin-Pedersen's conception : a) the clinker keel boat ; b) the boat with flat bottom and curved stem and sternpost ; c) the boat with a log keel and clinker sides ; d) the boat with a flat bottom.

(11th cent.)¹⁷, Hedeby (8th-9th cent.)¹⁸ and Galtaback (12th-13th cent.)¹⁹, to mention but a few. Scientific analysis of this rich material has enabled the typical features of Scandinavian boats from the 9th to the 12th century to be established.

STRUCTURAL FEATURES OF 9TH-11TH CENTURY SCANDINAVIAN BOATS

Typical features of early-medieval Scandinavian boats were the rounded stem and sternpost fixed directly to the beam keel, the central part of which was roughly T-shaped in cross-section. Towards both fore and aft the keel became hexagonal so that the planking could be streamlined. At either end of the keel diagonal, lateral connecting pieces made for smooth connections to the stem and sternpost. The carefully worked keel, stem and sternpost were made from oak (fig. 5). Applied from the stern to the bows in clinker fashion, the strakes were fastened together with iron rivets and were caulked with plaited strips of animal hair. The ends of the strakes were usually rabbetted into the sides of the stem and sternpost. By means of a skilfully excised thickening on the surface of the stem and stern-post, the edges of the strakes appeared to continue up the edges of the stem/sternpost, lending a highly aesthetic appearance to the whole craft. Up to around the 9th century every strake of a Scandinavian boat had characteristic elongated projections with openings through which ropes or thongs could be threaded in order to fix the transverse reinforcement elements to the planking. By the end of that century, however, this type of joint had been replaced in western Scandinavia by pegging: the strengthening elements were joined together by means of wooden pegs 20-30 mm in diameter. The state of the boatbuilding art of the day required the boat to be built by the shell technique, and as work progressed, the floor timbers and keelson were fitted into the interior of the hull, followed by the thwarts, knees and stringers. The construction was completed with the addition of oar-rests, either affixed to the top edge of the planking or cut out of the topmost strake. The rudder blade was traditionally hinged to the starboard side of the hull near the stern.

An important aspect of technical progress in the construction and use of Baltic boats was the introduction of sail propulsion; on the Baltic this took place at some time during the 8th or 9th centuries. Therefore, boats that were to be propelled by sail power had a mast step in the keelson and a mast yoke cut out of the thwart immediately above (fig. 6). The rigging consisted of one set of ropes for supporting the mast and another for controlling the sail. In this latter set, the bowlines were of great significance, as they enabled the boats to be close-hauled.

The Scandinavian sagas have handed down a lot of information about the names of the types of vessels sailing in those times. The snekar (snake) and drakar (dragon) were combat craft propelled by oars and sail.

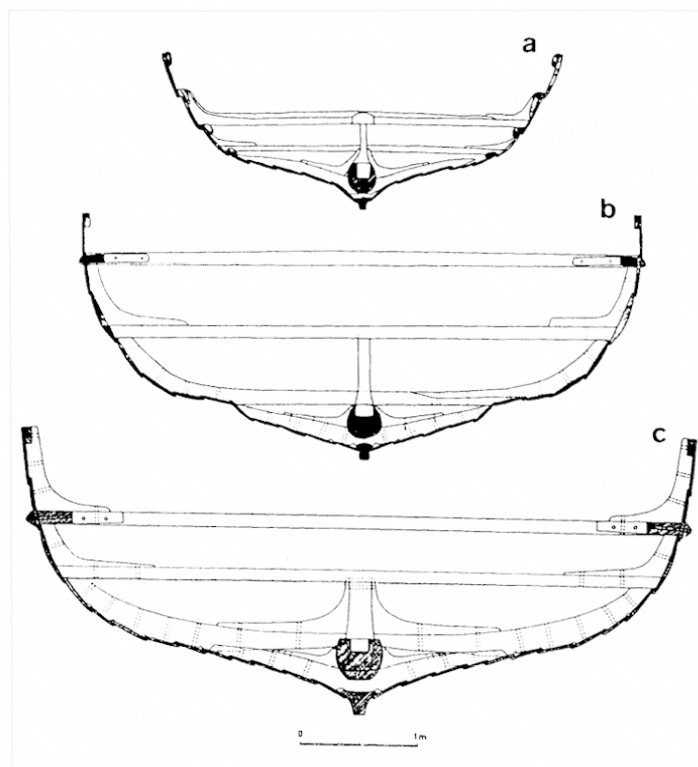


Fig. 5 - Cross-sections of the Scandinavian cargo boats : a) the Skuldelev 3 (the small cargo Baltic boat) ; b) the Skuldelev 1 ; c) the Hedeby 3 (both the ocean-going knarr type craft).

Vessels also came to be known by the number of oars on the each side used to propel them. Usually these were « fifteeners », « twentiers » or « thirtiers », which were classed as « longships » (langskip), although gigantic craft with 60 oars on the one each side were produced from time to time²⁰.

The largest merchant vessel was the *knarr*, and smaller ones included the *byrdingr*, *skuta* and *feria*. Though they were all sailing ships, they could also be rowed over short distances.

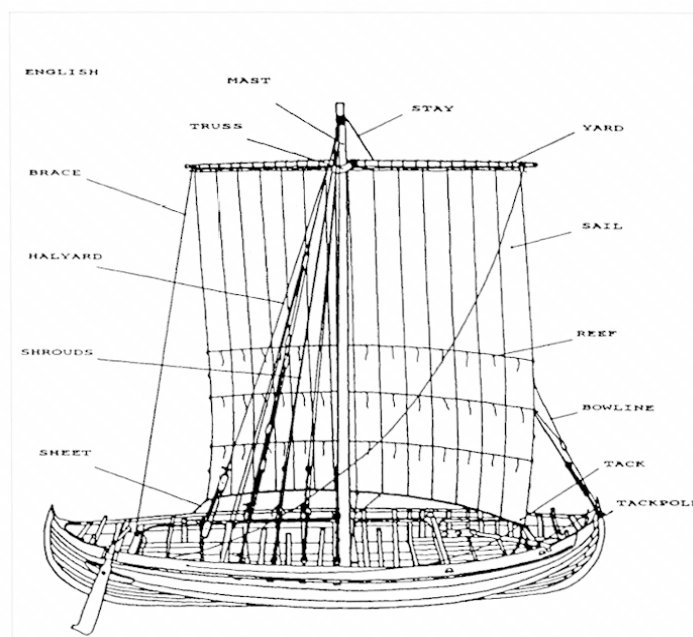


Fig. 6 - The tacking of the Skuldelev 1 replica boat «Saga Siglar».

EARLY MEDIEVAL SLAVIC BOATS

The oldest written sources telling of the riparian settlements and navigation of the Slavic peoples date back to the 6th century AD. The West Slavs first ventured out into the open sea in the 9th century²¹. To meet their needs for fishery and transportation, they produced rafts and dugouts, the latter from the trunks of various tree species, especially oak, pine, willow and poplar. To sail in safety at sea, however, appropriately constructed craft were required. Though better than a raft for this purpose, even a dugout had to undergo modification. This involved raising its sides by attaching overlapping planks to them. In the larger boats, the dugout part of the bottom was of no great significance and, in time, came to be left as a semicircular beam - the keel²². This development is well illustrated by the keel of the wreck of a 9th century fishing boat found at Szczecin (fig. 7, 8)²³.

By the end of the 9th century keels had become T-shaped in cross-section. Dugout keels in small local boats persisted on the southern Baltic until the beginning of the 20th century²⁴. Ancient Slavic boatbuilding reached the peak of its development in the 11th-12th centuries, when large plank-built boats undertook quite long



Fig. 7 - The wreck of the fishing boat at Szczecin, *in situ*.

commercial voyages and naval campaigns, against the Vikings among others. Many wrecks and parts of Slavic vessels from this period have been discovered, not only along the southern shores of the Baltic but also in Denmark, Sweden and Germany²⁵.

Slavic boats of the 9th-12th centuries had a number of characteristic structural features: they were made of oak; in silhouette, they resembled Viking ships, but their cross-sections were different (fig. 9); their bottoms were flat even though they were made from overlapping planks luted with moss; the use of 9-30 mm diameter pegs to fix the structural elements together showed that nails had become obsolete for this purpose. It is certain that such boats were built by the shell technique (fig. 10).

Originally propelled by oars, these boats were additionally fitted with a rectangular sail from around the 10th century onwards. As in the Scandinavian boats of the period, the rudder was attached to the stern end of the starboard side (fig. 11). The surviving sources make no mention of the names of these boat types; presumably, however, like the Scandinavian boats, they did have names.

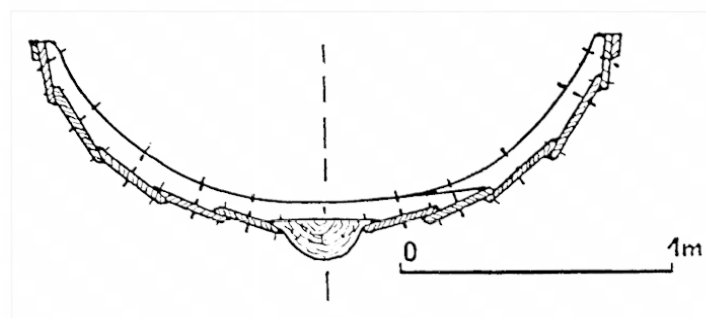


Fig. 8 - The Szczecin boat's cross-section.

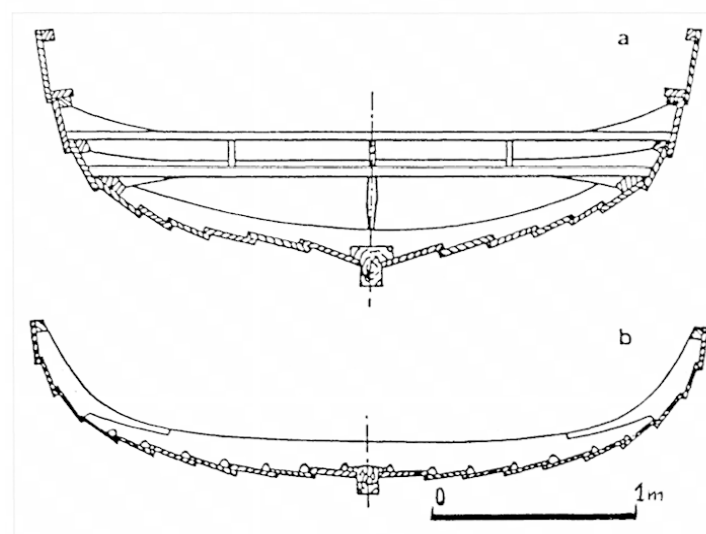


Fig. 9 - Cross-sections of the Scandinavian and Slavonic typical boats represent typical form of the bottom : a) the Skuldelev 3 ; b) the Czarnowsko I.

EARLY MEDIEVAL PRUSSIAN BOATS

The eastern neighbours of the Slavs on the Baltic were the Prussians, up to their demise in the 13th century, when they were conquered by the Teutonic Order. Their boatbuilding traditions were clearly influenced by the Scandinavians if one accepts that the wrecks excavated here were built locally in the early Middle Ages (fig. 12)²⁶. Their hull shapes were reminiscent of typical Baltic boats, but some constructional details were clearly derived from local traditions. Archaeological excavations on the presumed site of Truso (fig. 13) have brought new material to light, *e.g.* traces of boats whose sides had been fastened with iron rivets²⁷.

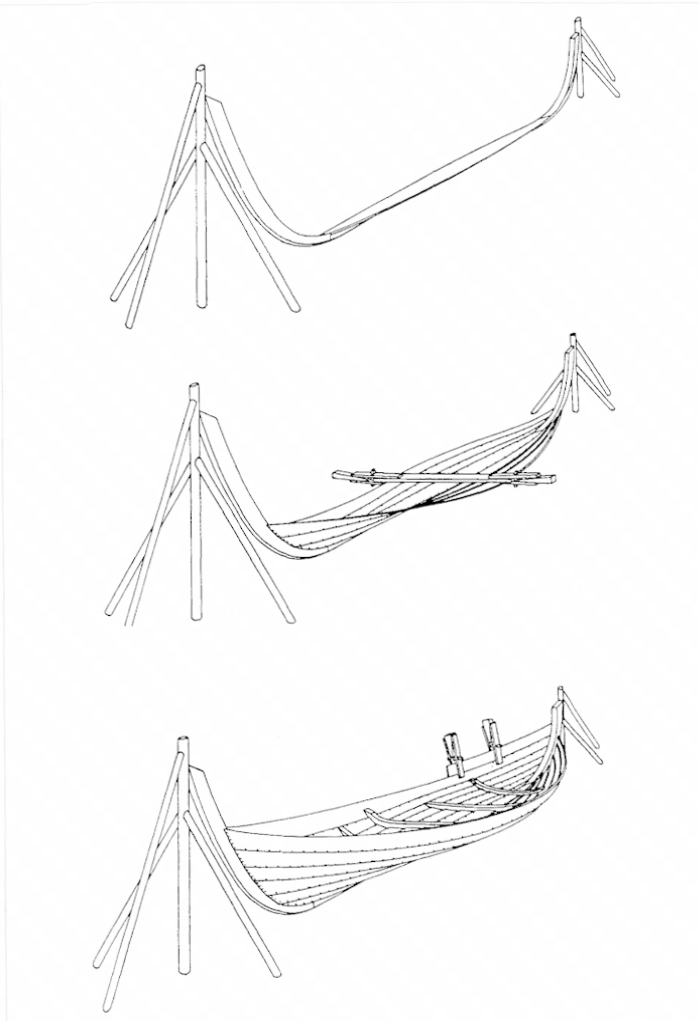


Fig. 10 - Three stages of a boat construction in the shell technique.

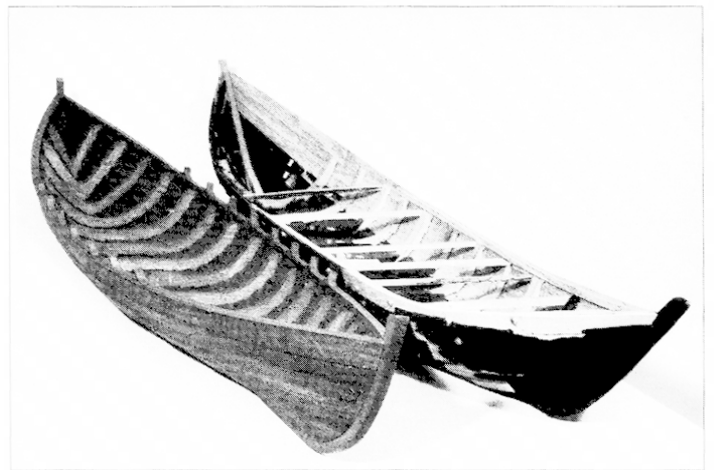


Fig. 12 - Two reconstruction models of similar medieval boats from Prussian area : on the left the Frauenburg (Frombork) boat from the Viking period, according to investigations from the year of the discovery in 1895 ; on the right the Tolkmicko 1 boat, from the end of 15th cent.

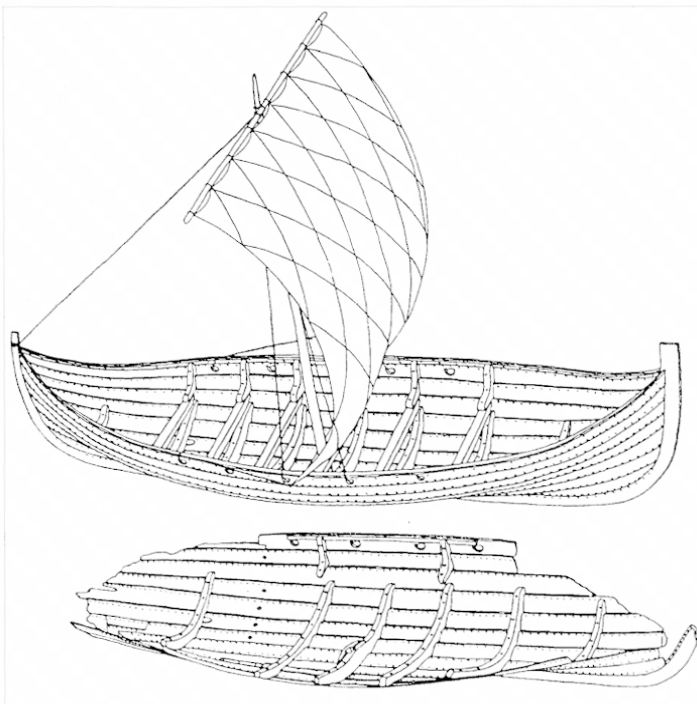


Fig. 11 - The Ralswiek 2 boat and its reconstruction by Peter Herfert.

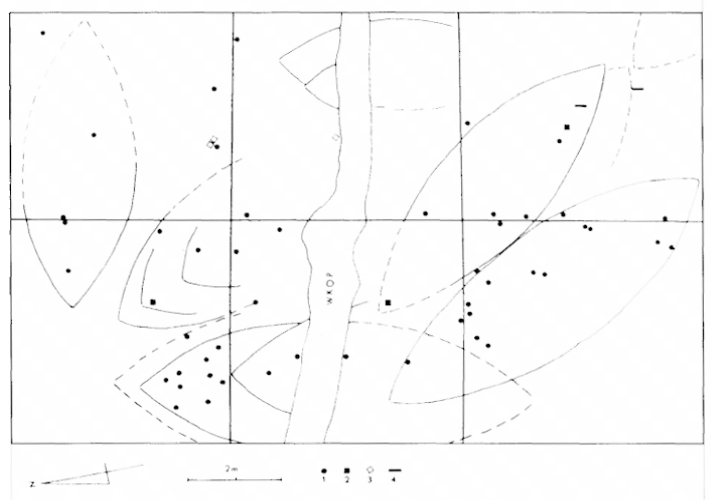


Fig. 13 - Traces of boats in the place of excavations on the presumed site of Truso, the famous in the 9th cent. Prussian harbour.

BOATS OF THE PEOPLES OF THE NORTH EASTERN BALTIC

Archaeological relics indicate that the boats built on the Gulfs of Bothnia, Finland and northern part of Sweden in the early Middle Ages were no different in external appearance from their Scandinavian prototypes. However, the remoteness of these boatbuilding sites from the main trading centres precluded frequent contact with them and contributed to the survival of ancient boatbuilding techniques into the 19th century. These included the mechanical splaying (by steaming) of a dugout's edges, which were subsequently raised by planks aligned in the clinker fashion and sewn on to them²⁸. The capacity of the hull was thus increased. The dugouts and the planks used to raise their sides often had projections to which the frames could be lashed.

13TH-14TH CENTURY BALTIC SHIPS

Urban growth in Western Europe created a great demand for raw materials and agricultural produce. The holds of the very much larger ships built since the 12th century now carried not luxury items but bulk cargoes, and in the 13th century vessels of this kind became and ever more frequent sight on the Baltic. These ships, including types such as the nef, cog and holk, had come originally from ports on the North Sea. The increase in trade stimulated Baltic boatbuilders to construct new types of ships, not only similar to those arriving from elsewhere, but also evolving from traditional sea-going craft; this activity gave rise to ships like the krejer and burdyna. However, the most common class of ship on the Baltic in the 13th and early 14th century was the cog. This had been developed from a river ship which, by being fitted with raised sides and a deck, was converted into a seaworthy craft. It is generally thought that the cog came into existence at the mouth of the Rhine, and that the Frisians were responsible for spreading its design to northern Europe. It is known from written sources that cogs were arriving at Gdańsk already in the first half of the 13th century and that they were the largest vessels to sail even a long way up the Vistula²⁹. By the end of that century they were certainly being built in Baltic shipyards³⁰.

As a result of the numerous discoveries of wrecks identified as cogs, our knowledge of this particular ship is now extensive. Particularly significant was the discovery, excavation and scientific examination of the cog discovered at Bremen in 1960³¹. Its constructional details tallied with those of contemporary illustrations, so that it was possible to identify the wreck beyond any shadow of doubt.

The earliest design of a Baltic cog is depicted on a seal of the town of Elblag from 1242 (fig. 14 et 15). This image is regarded as one of the earliest showing a single-masted ship with a hinged rudder rather than a starboard steering oar. The straight, beam stem and

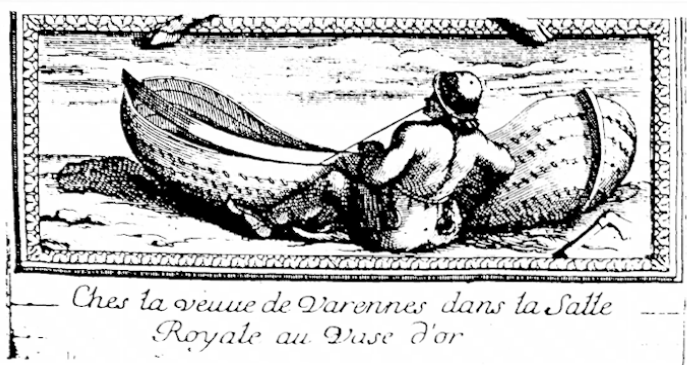


Fig. 14 - The oldest known illustration of the sewn boat from Finland : the part of the title page of the French translation (1674) of J. Schefferus book *Laponia*.



Fig. 15 - The seal of Elblag (Elbing) from 1242 represents the type of early cog.

sternpost are also an innovation. A late-13th century seal from Gdańsk depicts a cog with crenellated platforms above the bows and stern. Further modifications to the cog's design are reflected in the 14th-century seals from Baltic towns, e.g. Stralsund and Elblag (fig. 16), and these versions are very similar to the Bremen cog. These ships still have the characteristic straight, sloping stems and the castle above the stern.

Cogs had a flat bottom, and sides clinker-built by the shell technique (fig. 17). They had fairly short, low beam-keels extended at either end by naturally grown crooks, and these in turn were raised by the stem and sternpost. Ships with such features could therefore have come into existence on the large rivers flowing into the North and Baltic Seas. Inland ships would have been unsuitable for sailing on the Baltic or the North Sea, where the waves are short but high. So the flat part of the bottom of a river ship venturing out to sea was narrowed and even rounded, and the sides were raised. Characteristic of all wrecks identified as cogs are the methods of joining the planks and caulking the hull. The planks were nailed together, with the end of the nails being bent inwards on the inside³².

The gaps between the planks were usually caulked with strips of moss held in place with wooden slats sta-



Fig. 16 - The seal of Elblag (Elbing) from 1350 represents the typical cog from 14th century.

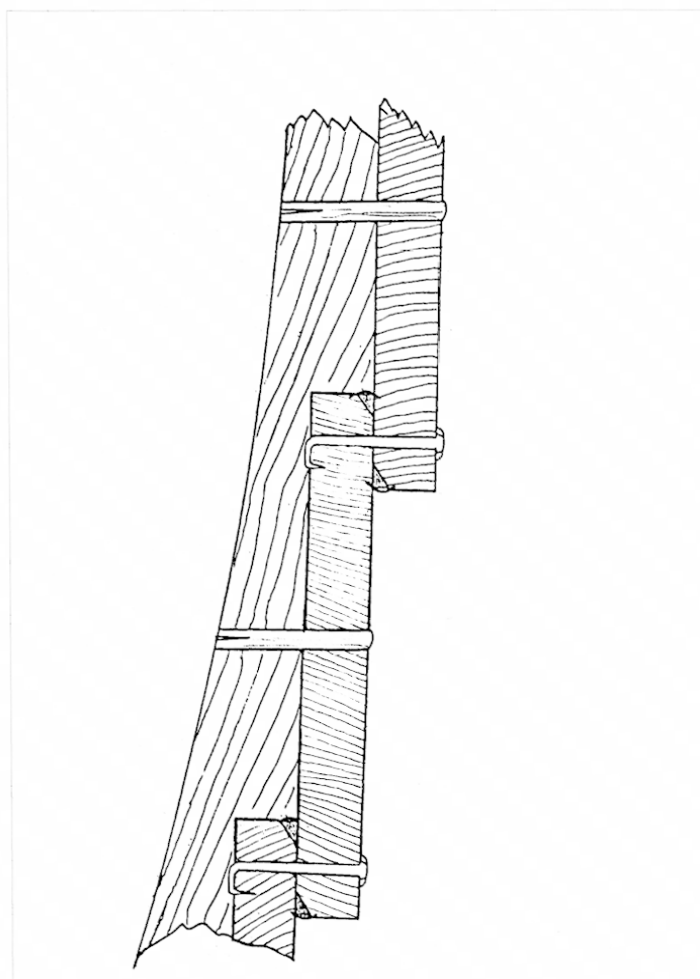


Fig. 17 - Typical overlapping sides planks observed in wrecks of the cog ships, clenches nails and the caulking compressed by battens stapled to the planks.

pled to the planks. Both sides of the planking were caulked.

Important elements in the cog's construction were the transverse reinforcement beams. These were attached to the planking during the hull's construction at the point where the clinker sides were higher than the expected draught line.

The discovery of the Bremen cog (fig. 18) also made it possible for the method of deck construction on a medieval ship to be examined. Since the hull was built by the shell technique, and the transverse reinforcement constituted not a frame but merely a set of crooks abutting on to one another in various ways, the transversally aligned deck planks were supported on longitudinal beams. These in turn lay on some of the beams of the transverse reinforcement holding the hull together.

Although the technical equipment of the cog was not particularly sophisticated, it did have horizontal halliard and anchor hoisting winches; the Bremen cog, moreover, was fitted with a capstan which revolved in a special cradle on the sterncastle platform.

THE HOLKS

In all probability, the earliest holks were built on the North Sea around the 10th century; however, they did not become common in the Baltic until 400 years later. In the opinion some researchers, they were technically the successor to the boat derived from raising the sides of a dugout³³. Other researchers, however, consider the holk to have evolved from the early medieval plank boat³⁴. Though it resembled the cog from the technical standpoint, the hull of a holk was clinker-built in its entirety, and the steeply rising stem was rounded (fig. 19). The hull was built by the shell technique, and the gaps between the planks were caulked with strips of animal hair and riveted. The deck, laid out transversally as on the cog, was supported on longitudinal beams.

The remains of the vessel generally known as the «Copper Ship », raised in 1975 by the Polish Maritime Museum in Gdańsk (fig. 20), are presumed to be the structural elements of a holk³⁵. Even so, the appearance of the « Copper Ship » cannot be described with any certainty. The stern planking makes a sharp angle with the sternpost; this aspect of the design is similar to that of the ship on the 1424 Elblag seal, which is a holk (fig. 21).

In the 15th century, holks had two and then three masts. An innovation was the use of a triangular lateen sail on the rear mast, a borrowing from Mediterranean ships.

Besides cogs and holks, smaller types of Baltic craft were built. For instance, the ferry used in coastal shipping as a lighter was flat-bottomed, as the wrecks at Falsterbo have shown³⁶. Other types, like the *krejer*, *smaka*, *ligurna* and *bordyna* were large, clinker-built ves-

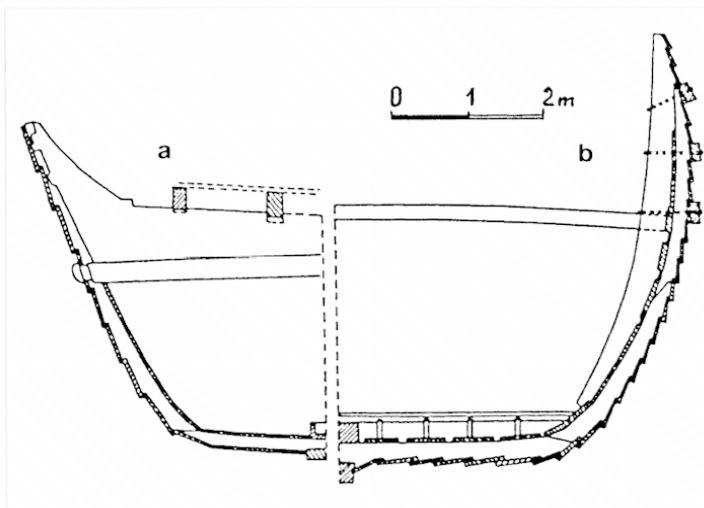


Fig. 18 - Various cross-sections of the medieval most popular ships : a) the Bremer cog ; b) the «U 34» ship from Holland represents the holk.

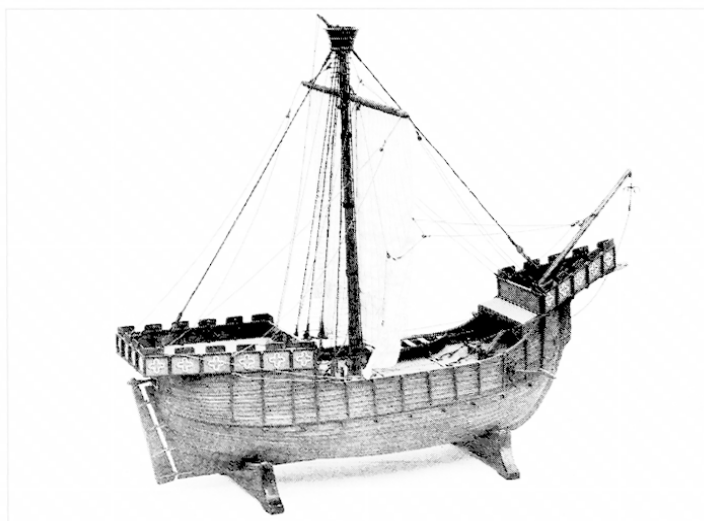


Fig. 19 - The model of the holk : reconstruction of the holk from the seal of Gdańsk from 1400, built by the author.

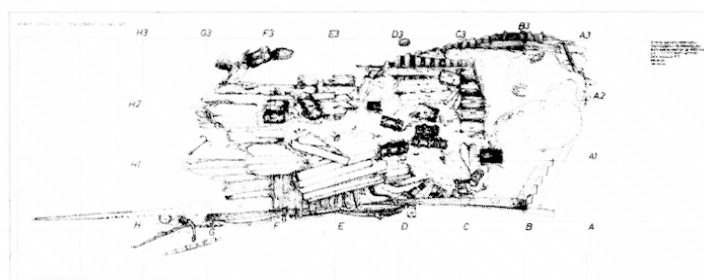


Fig. 20 - Site plan of the « Copper ship » raised from the Gdańsk Bay in 1975 by the Polish Maritime Museum.



Fig. 21 - The seal of Elblag (Elbing) from 1424 represents the typical holk from the first half of the 15th century.

sels. The wrecks excavated at Falsterbo and Kalmar are the remains of such craft³⁷.

THE MYSTERIOUS « BALTIC CARAVELS »

By the turn of the 15th century the first three-masted merchantmen from south-west Europe, made their appearance in Baltic countries, principally in Gdańsk Bay. They had been set in motion by the carracks that sailed here from the west coast of France. Because of their characteristic flush planking, they became known as carvels or caravels, although they were quite different from the true caravels of Spain and Portugal.

The techniques of carrack construction were unknown to Baltic shipbuilders. Those of Gdańsk had to wait until 1470, when they were able to examine one of those carvel-built hulls in detail. This happened after the « Peter van Rosseel », a carrack of enormous proportions (fig. 22), had caught fire and had been abandoned by her French owner in the port of Gdańsk. The ship was taken over by the city authorities and put back into service around 1470. Now named *Peter von Danzig*, it functioned as a privateer, and was the contribution of Gdańsk to the Hanseatic league in its war against England³⁸.

Some researchers believe that the refit of this carrack in Gdańsk was crucial in the acquisition by the local shipbuilders of this new technique. This fact should not be overestimated, however. It seems unlikely that even a close examination of a finished hull could ensure the successful application of the new technique without a knowledge of the intricacies of construction. This would have required many years of practical experiments which, so far as one can judge, were undertaken. Shipbuilding records do not make it clear whether early 16th-century Baltic ships were carvel-built. Conservative

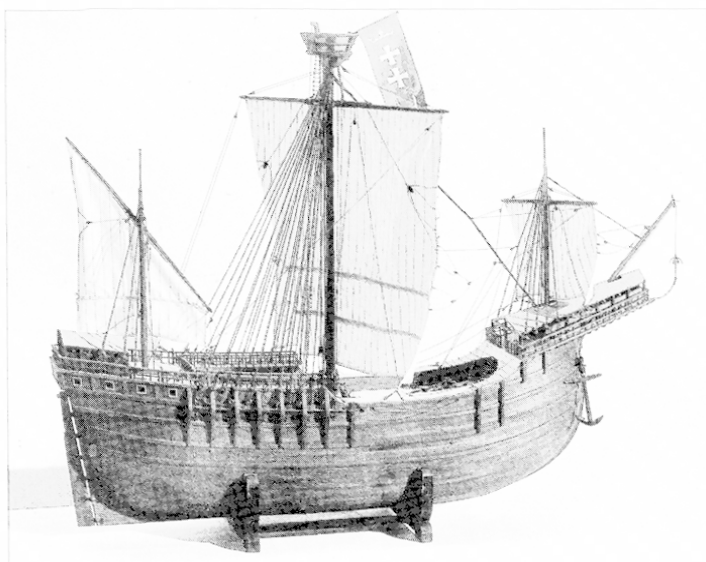


Fig. 22 - The O. Lienau's reconstruction of the «Peter von Danzig» : model in the Polish Maritime Museum collection.

attitudes probably prevailed and most vessels continued to be built with clinker hulls. Other shipyards in northern Europe also attempted to build the new type of hull. Nevertheless, the pictorial evidence shows that even as late as the 17th century many north European shipyards were still using the shell technique to construct carvel hulls.

The conversion of vessels into fighting ships is quite clear from images of cogs and holks. They have crenellated fore- and sterncastles, and similarly protected platforms on the masts. As the standard sea-battle strategy at that time involved boarding, this was facilitated by special anchors at the end of chains cast from raised bowsprits on to the deck of the enemy vessel, and the hooked ends of the mainsail yard-arms. When in the 15th century firearms first were used on ships, the first arquebuses and cannon were placed at the sides of the castles. It was not possible to accommodate what were quite heavy guns on the decks as they were made at that time. Deck structures had to be strengthened, something which was accomplished during the Renaissance.

FINAL REMARKS

The Middle Ages witnessed significant changes in the constructional techniques used by Baltic shipyards. Up to around the 12th century, boatbuilding techniques had been quite distinctive; after this time, however, both the types of ship and the methods of constructing them came to resemble those of Western Europe. As a result it is difficult for present-day researchers to state unequivocally the provenance of 13th-15th century wrecks, unless their mast steps happen to conceal locally minted coins, which in ancient shipyards were placed there « for luck ». There were such coins in the mast step of the cog discovered near Vejby in Denmark. They had been

minted at the Teutonic Order's mint, so the ships could have been built at Gdańsk³⁹. The surviving elements of its bottom are very reminiscent of the constructional technique used in the wreck of another cog which was never launched at Bremen but probably sank during a flood.

A bottom construction quite different from that characteristic of the cog was brought to light by the wreck of the medieval ship popularly known as the « Copper Ship » recovered from the waters of Gdańsk Bay. Identified as a holk, this ship displays similarities in construction with a number of other recovered wrecks, in particular the one discovered on the French coast – *the Aber Wrach I^o* and another – *U 34* excavated from a polder near Leystad in the Netherlands⁴¹. Furthermore, the bottom construction of this latter wreck is interesting in that the clinker planking is joined alternately by wooden pegs and iron rivets in a regular sequence of three pegs followed by one rivet. Where the ship was built is open to question. It could have been built on the Baltic, where pegs may still have been used to join planks after the 12th century. One fact supporting the plausibility of this interpretation is an entry in the chronicle of Gdańsk stating that a large holk had been built and launched directly on the seashore, not in a shipyard, for a certain citizen of the city, a Dutchman by origin.

By the final years of the Middle Ages and the beginning of the Renaissance, shipbuilding on the Baltic had become a highly developed industry. Evidence of this are the purchases of warships at Gdańsk and Lübeck by the English king Henry VIII in the early 16th century, or the documentary proof of the building of cargo ships ordered *inter alia* in Gdańsk by a Venetian merchant⁴².

Notes

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