

# BETWEEN CLINKER AND CARVEL: ASPECTS OF HULLS BUILT WITH MIXED PLANKING IN SCANDINAVIA BETWEEN 1550 AND 1900

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## Abstract

Half-carvels are vessels on which the lowest part of the hull is built with overlapping strakes of planking, referred to as clinker construction, and the uppermost parts of the hull are constructed with the planks laid side by side, in the carvel fashion. These mixed planking constructions first occurred in the 16th century (as far as we know), but became very common in later centuries. The aim of this article is to highlight the existence of different versions of clinker construction, and to discuss some reasons behind the selection of the technique.

Key words: clinker, carvel, shipbuilding, 17th century, 18th century, naval architecture, wreck, Baltic Sea.

## Introduction

To sort out if a hull is built using the clinker or carvel construction technique is one of the first things an archaeologist will try to assess when confronting a new wreck. The two techniques form a kind of basic perception, as they signify different concepts, not only technically, but also socially. From the 16th century onwards 'clinkers' were the vessels of peasants, while 'carvels' were the ships of merchants, noblemen and the state. To an extent, clinker and carvel are understood and defined in the light of the other.

In Scandinavia, some ships were built using both these techniques: the bottom and the lowest parts of the hull in clinker, and the uppermost in carvel. These are referred to as 'half-carvels' (in Swedish *Halvkravell*; Hasslöf 1970). Besides the half-carvels, there have been some almost forgotten variants of clinker construction. The aim of this text is to discuss the possible motives behind different technical solutions. What does mixed planking, half-carvel/half-clinker signify? What dwells in the sphere between clinker and carvel? What do these constructions say about hulls as a materiality?

## Clinker, carvel, shell and skeleton

On a clinker-built hull, the strakes of planking are laid overlapping, so that the higher strake is fastened outside the underlying strake. This technique is often described as a Scandinavian tradition, in use since the Iron Age. On a carvel-built hull, the strakes of planking are placed side by side, resulting in a smooth hull side. The origin and evolution of this technique, as well as its introduction into northern European shipbuilding,

have been the subject of much research throughout the years (Adams 2003; Lemée 2006). There are several ways to construct a carvel hull. In order to distinguish the different techniques, the concepts 'shell' or 'skeleton' construction are commonly used (Hasslöf 1970).

The term 'shell construction' is used to describe shipbuilding techniques where the planking of the hull is laid first, and the strengthening frames are inserted afterwards. The method is commonly found in clinker constructions, but several carvel-built ships were built in this way as well. Perhaps the best-known of these shell-built carvel hulls are the Dutch method, described by Nicolaes Witzen at the end of the 17th century, where the strakes of planking are held together with clamps (Lemée 2006). But other methods for holding the strakes together existed (Maarleveld 1994, pp.153-163; Pobst 1994, pp.143-152). We can also distinguish these shell constructions as being 'bottom-based': as the bottom of the hull serves as the shape of the hull, a lot is determined by the lowest parts (Hocker 1991; Hocker, Vlierman 1996, p.37ff)

The opposite of shell construction is referred to as 'skeleton construction'. The term is used to describe shipbuilding on pre-erected frames, which may be thought of as ribs on a skeleton. This means that the cross-sectional shape of the hull must be determined in advance, before the frames are cut, shaped and erected. For this reason, skeleton construction is connected to the use of drawings, or other measures enabling a predestined shape. In northern Europe in the 17th century, the use of drawings is associated with English and Scottish shipbuilders among others (Lemée 2006; Landström 1980). However, skeleton-built carvel hulls had been built in the Mediterranean for several hundred years by this point.

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## Societal connection and strakes of planking?

When discussing the different concepts of shell/skeleton and clinker/carvel, we may try to reflect upon what they represent. The use of one technique over another could be discussed from a functional point of view. The selection of technique can be regarded as the result of a response to different outer parameters. But the selection of technique and design may also be the result of a more or less conscious decision within a specific group, made in order to reflect upon certain social aspirations. At the same time, the ability to create a specific construction puts the stress on know-how. If you do not know the technique, you can imitate the look of it. Material culture is full of these imitations. We could mention 18th-century Swedish houses, and reveal that the red imitated brick, the grey around the windows imitated stone, and the yellow ochre on the doors and window frames imitated oak. The same goes for vernacular furniture: red-painted chairs with black seats were painted in this fashion to give the impression of mahogany and leather. Wealthy farmers built their wooden houses with architectural elements imitating stone architecture.

The distinction between the academic and the vernacular building tradition has been stressed by terrestrial archaeologists (and anthropologists). Vernacular houses are built by their occupants; or, if not, by someone who is well within the occupant's immediate community. James Deetz has pointed out that vernacular structures are the products of their users, and form a sensitive indicator of these people's inner feelings, their ideas of what is or is not right for them. Changes in attitudes, values and world-view are very likely to be reflected in changes in vernacular architectural forms. Academic architecture is designed by architects who were trained in the trade, and reflects contemporary styles that relate to formal architectural order (Deetz 1977, p.92ff).

The distinction between academic and vernacular architecture in housing may to an extent be applied to naval architecture, where carvel forms the academic, and clinker the vernacular. The use of drawings for the shaping of pre-erected frames puts a demand on different abstract skills. In this sense, carvel construction may be regarded as the academic form of shipbuilding. It is no coincidence that the 17th-century Swedish writer Åke Clason Rålamb dedicates one whole book to the subject of shipbuilding when writing a series for the education of noblemen (Rålamb 1943). A learned person should be able to converse on fundamental matters of naval architecture.

## Ships and values

The Dutch to a large extent shell-dominated carvel construction proved very successful. The ships were less expensive than skeleton constructions, and the design relied very much on repeating successful ships and in mass-production. In contemporary accounts, especially by those who spoke in favour of English shipbuilding, we may detect judgements on the disadvantages of Dutch ships (Schama 1989, p.44). Where the English master shipbuilders used rules and calculations, Rålamb also saw shortcuts and fiddling in the Dutch designs (Rålamb 1965, p.44). In spite of these bitter comments by backbiters on Dutch shipbuilding, the fluit and the other ship-types proved very successful, even though their design relied on craftsmanship rather than on abstract calculation and drawings.

The clinker tradition goes parallel with the various ways of putting a carvel-built hull together. Clinker-built vessels belonged to peasants. From the 17th century onwards and with the introduction of carvel construction for big ships, clinker vessels, being built and used by peasants, may be regarded as the vernacular form of shipbuilding. The state helped in carving this image by giving privileges to carvel-built hulls. In wartime, carvels that could be used by the navy, achieved some specific fiscal privileges. Another fiscal coincidence is that peasants were not allowed to sail fully decked boats, a condition that helped to keep these vessels very boat-like (for a thorough description of these circumstances, see G-son Berg 1984).

In conclusion, several techniques existed in parallel from the 17th century onwards. These techniques were evaluated by contemporary society in different ways, and formed preconceptions regarding different shipbuilding techniques. Technique and tradition became associated with different groups of people or with specific stereotypes. The Dutch constructions were associated with profit-chasing merchants, while clinker vessels belonged to peasants.

In order to break this up further, we might list the following preconceptions associated with clinker and carvel. What do the terms clinker and carvel signify in a wider sense?

<b>Carvel</b>	<b>Clinker</b>
Academic	Vernacular
Nobleman	Peasant
Plans and drawings	Freehand
Designed by naval architect	Designed by user
Ship	Boat
Privileges	Unprivileged
Armed <sup>1</sup>	Unarmed

<sup>1</sup> Carvel-built ships could be used by the navy in wartime.

## Half-carvels

In an article from 1970, Olof Hasslöf describes the concepts of clinker, carvel, shell and skeleton. But he also describes what he refers to as 'half-carvels'. These ships have a clinker-built lower hull, which is built using the shell method. When the bottom planking is finished, strengthening frames are inserted. The futtocks rise above the completed clinker bottom of the hull, and form a skeleton for the sides of the hull. The uppermost four strakes of planking are then carvel-laid, side by side, forming a smooth hull side (Hasslöf 1970, 1986, p.51ff; Humbla 1934, p.100).

The Swedish ethnologist Kerstin Berg has written a dissertation dealing with shipping in Roslagen in the middle of Sweden from various points of view. Although the main source material consists of written records, she describes some conditions regarding half-carvels. According to Berg, half-carvels were introduced to the parish of Vätö in the 1830s, and became very popular. However, towards the middle of the century, many of these ships were rebuilt as full-carvels. The half-carvels/half-clinkers were regarded as obsolete, old-fashioned and backward (G-son Berg 1984, pp.131, 188ff). The evolution of half-carvels, and the vessels rebuilt into carvels, as well as the techniques used during their construction, should be viewed as the materialisation of the changing conditions among the people who built and used them. The local seafaring community in the Vätö area, as well as in Sweden in general, underwent important changes in the 19th century. Among others, the fiscal privileges such as those requiring peasants not to use decked boats sprung out of broader changes in society. Should the appearance of new shipbuilding techniques be understood as a result of changing attitudes regarding social equality?

The development of opportunities to carry out trade and shipping not only created a demand for bigger and more appropriate vessels, it also affected the identity of the people who used and built these vessels. Boats are clinker-built, while ships are carvel-built. If you are to become a 'ship-owner', your vessel should look like a ship, and have smooth planking. If you only have the know-how to build a clinker, but you have the social ambitions of the owner of a carvel ship, the technique of the former and the look of the latter form a perfect compromise: you make the ship a half-carvel!

## Archaeological remains

The 19th-century development of vernacular clinker-built small boats into 'real' ships has left one interesting remain. It is an unidentified wreck, located south



Fig. 1. The beak of the *Märsman* as it appeared in the 1960s. The timber now rests on the seabed (photograph by S. Lövstrand).

of Rödlöga in the Stockholm archipelago, called the *Märsman*<sup>2</sup> (Fig. 1). The ship has not undergone any thorough archaeological survey, but from a brief diving visit at the site a couple of years ago, it is possible to make some small comments. Although the ship has disintegrated, it seems to be more or less complete. The two masts have fallen out from the hull and rest outside the starboard side. The location of the mast-steps suggests that she carried gaff rather than square-sails. Contemporary society would probably have recognised the ship as a schooner. The hull measures approximately 23 metres between the stemposts.

The lowest part of the hull is clinker-built. The frames are made out of compass timbers, and the species seems to be pine. They are attached to the planking with wooden pegs. The clinker strakes of planking are nailed to each other with iron nails. The construction of the lowest part of the hull is built in the same manner that clinker-built vessels had been built since the medieval period. Probably the planking is of sawn planks, rather than from split logs.

But from above the bilge, the construction changes character. The side planking is carvel-built, and there are still the clearly visible remains of a massive deck construction. The tiller points aft, which indicates that the ship was steered by a wheel, but also that the stern

<sup>2</sup> There is an oral tradition regarding a ship that sank at this very spot on a stormy night in the 19th century. The following morning only the masts were sticking out of the water. On one of the tops, a member of the crew was tied to the mast and survived. The Swedish word for mast top is *märs*. As the wreck has been associated with this tradition, it has been given the working name the *Märsman*.

had an overhang. Together with the small beakhead in the bow (Fig. 1.), the profile appearance of the hull would not have differed from any carvel-built schooner or brig from the period.

The wreck has been dated, through coins and other artefacts, to the first half of the 19th century, and it may be used to illustrate the conditions described by Kerstin Berg during this particular period. You use the material and the techniques that you are familiar with, even though you try to build up something completely different. The *Märsmän* wreck may be regarded as a large boat dressed up as a ship. One of the ships mentioned in Berg's study is the schooner *Victor*. She was also built during the heyday of 'half-carvels', in 1852. She was later rebuilt, and converted into a full-carvel in 1877. In 1898, she sank outside Ornö in the Stockholm archipelago. As a diver visiting the wreck of the *Victor*, it is impossible to see that the ship was originally clinker-built. Perhaps the *Märsmän* would have been rebuilt in the same way if she had still been afloat in the 1870s?

### When did the first half-carvels appear?

The oldest carvel-built ship that has yet been found in the Baltic Sea is the *Kravel*. This ship, loaded with wrought-iron guns, may be regarded as an expression of early 16th-century high tech. It was the top of the line in warfare at that time, and the owner was probably none other than the Swedish king Gustav Vasa (Adams, Rönby 1996; 2009). In the early 16th century, carvel-built ships were probably quite an unfamiliar sight, and many fighting ships were still clinkers. The *Riddarholmsskeppet*, dated to the 1520s, that was found during construction work in the 1930s and is now in the permanent exhibition of the Stockholm Medieval Museum, is an example of this (Fischer 1983). Clinker-built ships were used by the navy later on as well, for carrying provisions and so on, but they did not carry guns.

The oldest half-carvel built vessel that has yet been found is the *Åkroken* wreck, dated dendro-chronologically to 1577. The provenance of the timbers suggests that the ship was built in Jämtland, which is located in the north of Sweden. Only a minor excavation of this wreck has been carried out. The estimated original length of the hull should have been approximately 16 to 17 metres from stem to stern (Eriksson 2008a; 2008b). The *Åkroken* wreck is one of the few properly dated wrecks from the early modern period, and it is interesting to note that what we may call 'traces' of carvel construction started to occur in vernacular

shipbuilding quite rapidly after the first big ships were becoming carvel-built.

From the 17th century onwards, half-carvels seem to become quite common, and the size seems to vary. The so-called Gröna Duvan (the Green Dove, after a plate with a bird that was recovered from the site) unidentified wreck, dated from coins to the 1730s, has a length from stem to stern of 16 metres (Fornsök), while the Bockolmen wreck, located on Åland, dendro-dated to 1788–1790, has a length of 24 metres (Lindholm 2002, p.4ff).

### Half-carvels and the confusion they cause

In the 17th century, big merchant ships of robust construction, such as fluits, East Indiamen and so on, had certain fiscal rights. Their taxes were lower if they could be equipped with artillery and used by the navy in wartime. This tax reduction was known as the *Halva friheten* (half-freedom). The other half was reduced if the ship was built and equipped in Sweden. In reality, clinker-built vessels could not benefit from these fiscal rights. The argument put forth was that they were simply regarded to weak for war use. In a letter from the taxation authorities to the Swedish king, dated September 1687, the fiscal status of half-carvels is stated: 'no vessels [...] built in clinker should receive the half Swedish freedom in the tolls payment, even though they may be good and strong enough, or if they in the waterline in clinker and above in carvel-built are' (Kommerskollegium. Main archive, main ser. B1a:26, Swedish Public Record Office).

Written sources that describe the circumstances of half-carvels and their status in between clinker and carvel are scarce, but there are some interesting exceptions. One is a letter dated May 1777 from the toll director in Underslev in Finland (at that time still a part of Sweden) to all the toll offices in the rest of the country. It is a warning, because it has come to his notice that: 'Owners of ships built using clinker construction, partly under the practice of rebuilding [to carvel], partly where the hull was half-carvel and half-clinker built, have received a certificate from certain officials [...] revealing incorrect information regarding [the vessels'] displacement, construction and strength.' As a consequence, some of these ships received privileges originally intended only for carvel-built ships.

Rebuilding hulls built in clinker fashion into carvel hulls has a long tradition and has been done for various reasons. The schooner *Victor* has already been mentioned. Early examples are the English *Sovereign* (1487–1488) (Adams/Rönby 1996), and the so-called

Maasilinna wreck, dated to the 16th century (Mäss 1994). Conversions seem to have been quite common in Sweden up to the 20th century, sometimes in combination with lengthening the ship. The clinker-built hull was simply cut in two, the ends were pulled apart, and a carvel construction was then built around these separated ends (Hasslöf 1970, p.59ff). The quotation above from the toll director suggests that half-carvels, or conversions from clinker to carvel, not only resulted in the sought-after visual effect. It implies that the bluff was sometimes swallowed, and resulted in some fiscal privileges. Which was the primary aim and which was the spin-off effect, is, of course, difficult to say.

### Other façades

A hull side may be compared to the façade of a house. The wooden wall is articulated by different construction elements, which reveal the techniques used when building the ship. These construction elements, however, are often designed and modelled in order to appear a certain way. The profiled gunwales seen on ships from the 17th to the 19th centuries add nothing to the function. They are shaped in that way in order to make the shadows fall in a desired way, articulating the side of the hull to achieve a visual effect. In some cases, wide planks have been divided by longitudinal lines graven into the surface (Hocker 1991, p.197ff). The aesthetic aspect of the hull side in itself has not drawn as much attention as, for instance, the carved decorations of ships (Carr, Soop 1986; 2007). It is obvious, however, that the shaping of the outside could include stylistic aspects. As an example, 19th-century merchant ships, from brigs to clippers, were equipped with painted gunports, just for the look of it. The half-carvels should also be seen as an expression of such intentions. But there are other odd kinds of clinker construction that might have derived from a similar mindset regarding stylistic, aesthetic and architectural ambitions.

The kind of clinker I have in mind has a conventional clinker-built lower hull, but on the side the landing alternates (Fig. 2). Instead of placing the upper strake of planking on the outside of the lower, every second strake is placed on the inside. This technique is known from some wreck finds. The oldest might be the Melböda wreck from Öland, surveyed by Carl Ekman and Harald Åkerlund in 1951 and 1952. The wreck was dated on the basis of topography and layers to the late medieval period or the 16th century (Ekman 1954, pp.5-42). This technique has also been noted in the Danish area. The 'Sandskude' seems to have been built using this technique as well (Göthche 1985, p.299ff; 1991, p.85ff). Carl Ekman estimated the original length of the Melböda ship to be approximately 16 or

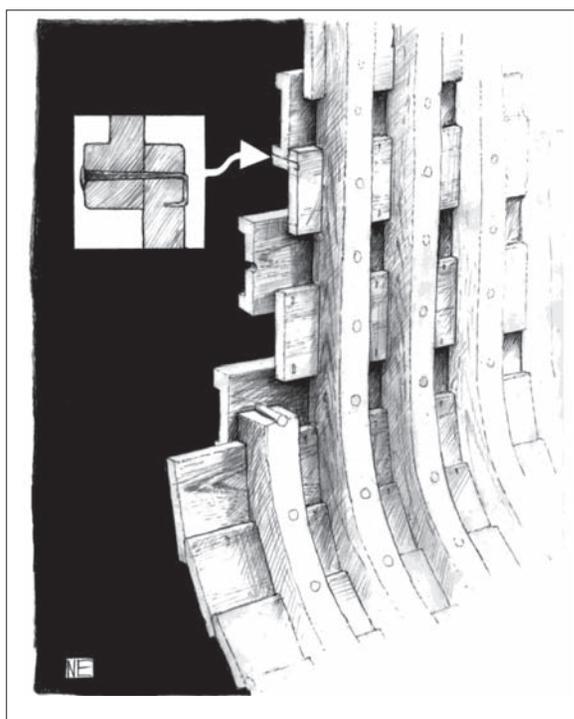


Fig. 2. A sketch showing the configuration of the planking on the Björns wreck (by Eriksson).

17 metres. The Danish find is a bit smaller, estimated to have been ten to 12.5 metres from fore-stem to stern.

The best-preserved example of a hull built in this fashion is located at Villinge in the Stockholm archipelago. The vessel is almost 19 metres between the stem-posts, and 5.2 metres wide (Fig. 3). It has a full deck, the galley was located between the bilge pump and the stern cabin (Eriksson 2004). The layout is quite similar to the orientation of these rooms found in small fluit-ships of the 17th century (Eriksson, forthcoming). The water depth here is a mere seven metres, and the explanation for the coherence of the hull structure is to a large extent a matter of its cargo. It consisted of burnt limestone. When the ship sank, the limestone reacted with the water and formed a massive support for the ship's interior. The wood has been dendrochronologically dated to the 1740s, with its provenance pointing towards the island of Gotland, the limestone island that was an extensive producer and exporter of burnt limestone from the 18th century onwards.<sup>3</sup>

The Björns wreck originally had two masts. The location of the foremasts suggests square sails for both of the masts, in a similar fashion to the Stinesminde wreck. This ship, however, is of a completely different nature when it comes to its construction. It is a robust carvel construction, with three so-called whales, thicker strakes of planking, strengthening the hull

<sup>3</sup> More ship timbers originating from a hull built in the same way as the Björns wreck have been found at Gotland (Jonsson 2009).

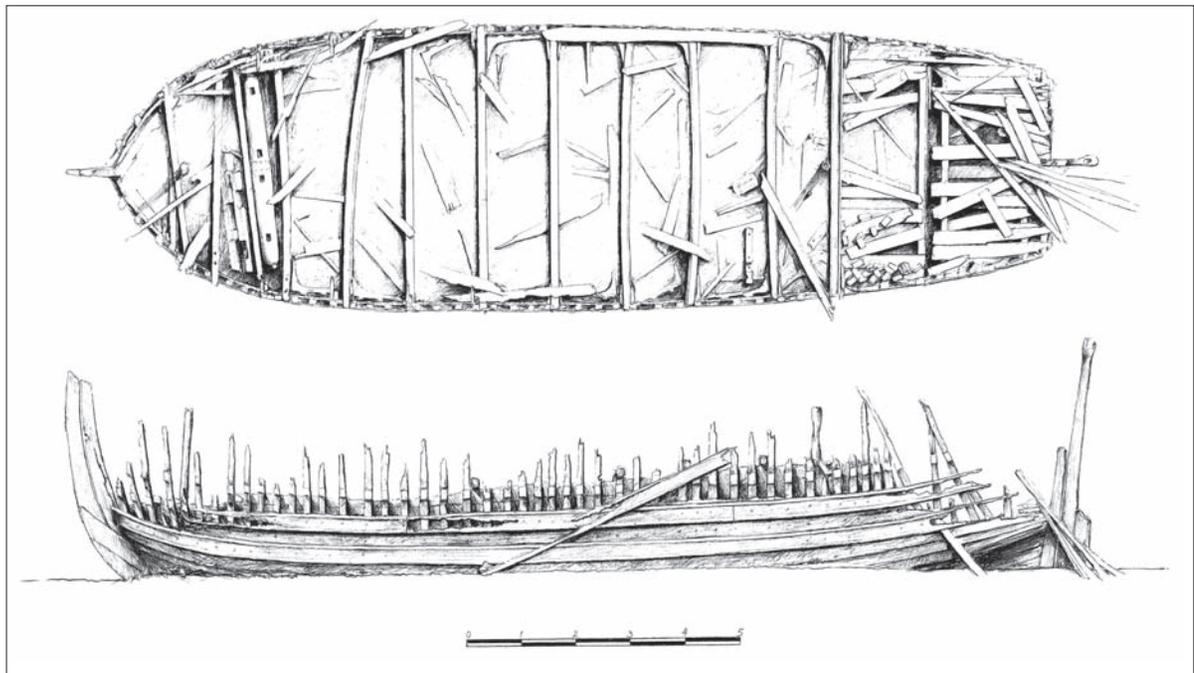


Fig. 3. A plan and side elevation sketch of the Björns wreck, a small 18th-century vessel loaded with burnt limestone (by N. Eriksson).

sides. Even if the Björns wreck is clinker-built, the ship originally would have appeared very much like the ship from Stinesminde when viewed from the side. The whales of the Stinesminde ship (Göthche/Rieck 1990, pp.157-171) correspond to the side planking of the Björns wreck, something I do not want to view as a coincidence.

### Between clinker and carvel, a parting shot

The shipbuilding techniques so briefly described here, the half-carvels, but also the vessels built with alternating strakes of clinker planking, may be regarded as a compromise between technology (clinker) and an aesthetic ambition (carvel). There may, of course, be other motives behind the selection of one technique over the other. The alternating strakes of clinker planking may well be a necessity of the shell-based shaping of the hull. Building the ship with conventional clinker planking up to the gunwhale would have widened the ship considerably. However, the parallel hull sides and the slight tendency of tumble-home, seen at the Björns wreck, is a borrowing from carvel ship architecture.

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## TARP KLINKERINĖS IR KARAVELINĖS LAIVŲ KORPUSŲ STATYBOS – MIŠRŪS LAIVŲ KORPUSŲ STATYBOS ASPEKTAI SKANDINAVIJOJE 1550–1900 M.

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### Santrauka

Mediniai laivų korpusai galėjo būti gaminami karaveline technika, korpuso lentas jungiant vieną prie kitos ir taip formuojant vientisą laivo korpuso šoną. Vėliau laivo korpusas buvo formuojamas perdengiant lentas. Nuo XVII a. tarp karo ir prekybos laivų aptinkami karavelinio tipo laivai. Priešingai, klinkerinis laivo korpuso sujungimo būdas buvo naudojamas statant neprestizinio tipo laivus, t. y. prasciokų laivus. Klinkerinis laivų korpusų statybos būdas niekada nebuvo finansuojamas išdo.

Karaveliniu būdu laivų korpusai Baltijos jūros areale pradėti statyti XVI a. pirmojoje pusėje. Jie reprezentavo aukštą to meto laivų statybos technologiją. Tačiau greitai karavelinės laivų korpusų statybos elementų pradėta pastebėti klinkerinės laivų korpusų statybos technologijoje. Šie laivai įvardijami kaip „pusiau karaveliniai“, jų apatinėje korpuso dalyse buvo naudojama klinkerinė konstrukcija, o viršutinėje – karavelinė.

Pavyzdžiui, statant pusiau karavelinį laivo korpusą buvo naudojama keletas technologinių variantų. Statant tokio tipo laivų korpusus, buvo naudojama paprastesnė technologija, bet tai galėjo turėti keletą funkcinių ypatumų. Be to, galėjo būti ir pamėgdžiojimas. Karavelinė laivų korpusų technologija naudota statant valstybinius ir prekybos laivus. Dekoravimu pasiekta, kad klinkerinė technologija atrodė kaip karavelinė. Pusiau karavelinė technologija buvo idealus kompromisas, kai buvo norima pastatyti laivo korpusą, kad jis atrodytų kaip karavelinis. Tokie laivai buvo visapusiška karavelinių laivų statybos imitacija. Tuo metu tokiu pat būdu pasiturintys fermeriai mediniuose namuose naudojo akmens imitacijas, ir tai nebuvo blaškymosi, bet greičiau estetiškos technologijos panaudojimo būdas.

Pusiau karavelinė laivų statybos technologija atrodė kaip plati to meto jūrinės architektūros visuma. Pavyzdžiui, XIX a. pusiau karavelinė technologija buvo susijusi su denio struktūra, suformuojant snapo formą laivagalyje ar panašiai. Faktiškai pusiau karavelinio tipo laivus tapo sunku atskirti nuo karavelinių. Iš rašytinių šaltinių žinoma, kad pusiau karavelinio tipo laivai buvo laikomi karaveliniais. Tuo buvo siekiama

mokestinių nuolaidų, kurios būdavo taikomos karavelinio tipo laivams.

Pusiau karaveliniu korpusu laivai nuo XVII a. nebuvo tik vienas iš variantų, pereinant iš klinkerinio tipo laivų prie karavelinio. Lentų klojinys klinkerinio laivo korpuse buvo kaitaliojimas. Apatinėje laivo korpuso dalyje lentų klojinio briauna buvo iš išorės, bet viršutinėje laivo korpuso dalyje – iš vidaus. Todėl susidaro įspūdis, kad laivo korpuso šonas iš išorės, iki vandens grimzdės linijos, yra karavelinės technologijos.

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