

The Spodsbjerg Drej wreck

and the origins of “klamp” shipbuilding in Denmark

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Abstract

A small flush-planked wreck from the southern part of the inner Danish waters was recorded as part of a training project for diving archaeologists. Many finds of the crew's personal belongings and tools were recovered from the wreck, as well as some fittings from the ship. Based on these artefacts, the loss of the ship has been dated to around 1800. The construction of the ship itself is interpreted as an early example of the single-masted “jagt”, that was to become the most numerous ship type in Danish waters in the 19th century. The ship was clearly built without the aid of drawings, and a discussion of the “clamp-built” tradition and the technological origins for small-scale shipbuilding of the time preceding the introduction of line drawings on local shipyards is put forward.

Zusammenfassung

Der vorliegende Bericht befasst sich mit dem Wrack eines kleinen karweelbeplankten Schiffes aus den südlichen dänischen Gewässern. Der Schiffsfund war Gegenstand eines Trainingsprojektes für Taucharchäologen. Aus dem Wrack wurden zahlreiche Fundstücke geborgen: Gegenstände aus der persönlichen Habe der Besatzung, Werkzeug und einige Beschläge. Aufgrund der Funde wird der Schiffsuntergang auf/um 1800 datiert. Seiner Bauart nach handelt es sich um ein frühes Beispiel des einmastigen Typs “Jagt”, der im 19. Jh. zum geläufigsten Schiffstyp in dänischen Gewässern wurde. Das Fahrzeug wurde eindeutig ohne die Zuhilfenahme von Zeichnungen gebaut. Der Bericht schließt mit einer Diskussion der karweelen Schalenbauweise mit Hilfe von Klampen und des technologischen Ursprungs für den Bau von Kleinschiffen vor der Einführung von Linienrissen auf den lokalen Werften.

Übersetzung Anton Englert



Fig 1: Map of Denmark with the findspot of the wreck on the east coast of Langeland (all figures Langelands Museum).

In the summer of 1996, a wreck of a wooden ship was found by a skin diver off the eastern coast of the island of Langeland, south of Funen in Denmark (fig. 1). The find was reported by the diver to the Langelands Museum, and a preliminary survey was carried out. The wreck was lying on the sandbank that runs along the eastern coast of Langeland, just a few hundred metres south of the town of Spodsbjerg, at a depth of 2.5 metres. Local fishermen later reported that the wreck has been known for some years, and that it sometimes is covered in sand, and sometimes exposed by the current.

The ship was a small cargo carrier, with a load consisting exclusively of roof tiles, stacked neatly in rows transversing the ships longitudinal axis. The current had washed the sand away from the ships sides, leaving a height of a little less than one metre free from the surrounding sea bottom. The wreck was clearly a historic wreck site by Danish law, i. e. more than one

hundred years old, and therefore protected. The finds from the ship indicated a dating of the loss to around 1800. The shallow depth, and the accessibility only a short distance from the harbour in Spodsbjerg, made it a viable object for documentation by archaeology students and amateur divers with an interest in ship archaeology.

Langelands Museum and The National Museum of Denmark joined forces to form a team of instructors. Ten divers were selected from those responding to the announcement placed by the Langelands Museum, consisting of about equal numbers of archaeology students from the departments in Aarhus and Copenhagen and amateur divers. There was no fixed plan as to the methods of documentation when the field course was set in motion in the summer of 1997. Rather the participants were to decide for themselves how the wreck was to be dealt with – under the guidance of the instructors.

A very traditional approach was taken, and at regular intervals a nail was put into some of the frames and tagged with a number. The circumference of the preserved top level of the frames was then measured by triangulation, and the details of the individual frames and the planking were later added to the site plan from 1:20 drawings made under water (fig. 2). In addition to the site plan, a number of sketches were made of the side view in the stern area, but unfortunately time did not permit the measuring of any sections. The cargo of roof tiles was left *in situ*, and as a consequence the remaining accessible areas were in the stem and stern. These triangular spaces were excavated with the aid of water dredges, and the contents of the nets were sorted at the end of each day, once the team was well ashore.

As the aim of the field course was twofold, on the one hand to perform an archaeological investigation, and on the other to train inexperienced divers, the six-day season of 1997 must be labelled a success. A general site plan was obtained, and the excavation of the stem and stern areas yielded a number of objects that would prove valuable in the analysis of the find. Furthermore a ship had been the object of a field course in maritime archaeology, giving students and enthusiasts a rare opportunity to cut their teeth on an actual historic wreck.

However, some important questions still

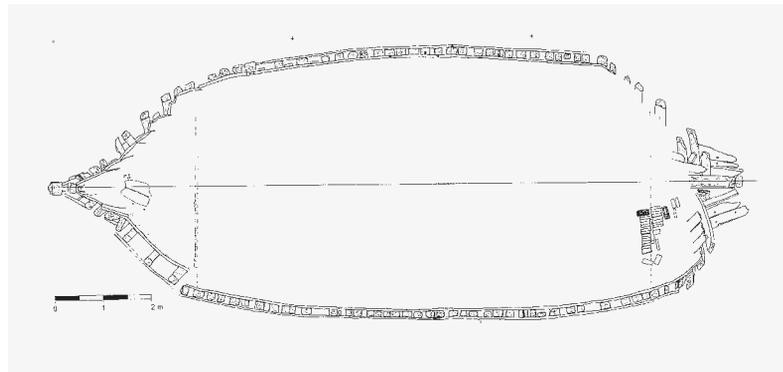


Fig. 2: The site plan recorded during the 1997-season. The uneven framing is clearly visible. In the central part of the hull, between the two bulkheads the hold was filled with roof tiles.

remained to be answered. The objects – more of which later – would provide a basis for dating the ship, the date of the foundering on the sand bank off Langeland, but not give us an exact date of the ship itself. Secondly, only the plan view of the wreck was recorded, which doesn't tell a lot about the construction and building sequence of the ship, since the outline is arbitrarily determined by the degree of deterioration. Also ships tend to be rather uniform when sliced laterally. A second visit to the site was necessary in order to obtain more information about the ship itself, and in the summer of 2004, a team of two archaeologists and a conservator went out of Spodsbjerg harbour to dive on the sand bank.

Finding the wreck proved difficult. The spot itself was easily found with the aid of bearings, but despite intensive criss-cross swimming in the very clear water, no sign of the wreck presented itself. The sand bank had covered the ship once more. The search area was extended slightly, and the efforts were rewarded with the find of a fragment of the wreck. This consisted of three pieces of planking, and two pieces of frame timbers (fig. 3). The distance from the fragment to where the wreck was expected to be found, was only about 50 metres. With some effort the hull fragment was raised from the seabed onto the dive boat, and brought ashore for documentation. Finding this "sample" of the ship also meant, that one of the goals of the investigation could be fulfilled, as the timbers would be well suited for dendrochronological analysis.

The samples collected were analysed by Aoife Daly (dendro.dk), and showed the last ring in the sequence to be grown in 1759 AD. The felling of the trees is believed to have taken place after 1775. The sequence was compared with

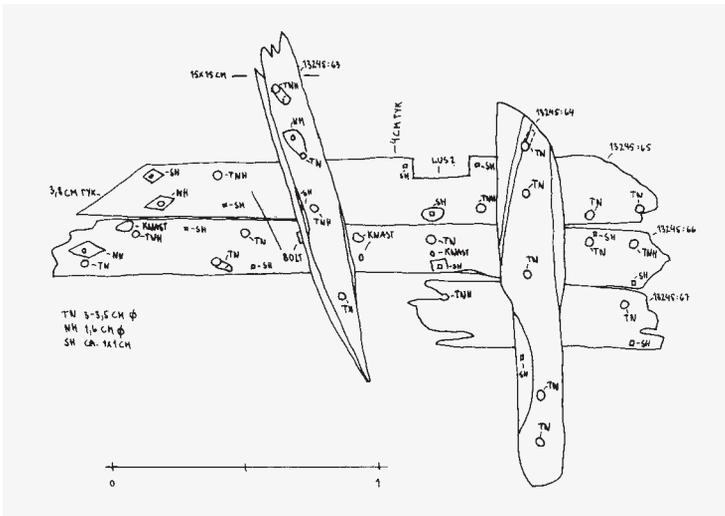


Fig. 3: The fragment of the wreck raised in 2004. The oblique scarf is not likely to be a hood end, since no nails holes can be seen.

regional curves, and gave a t-value of 8.11 with the curve for Schleswig-Holstein, a rather convincing affinity, especially taking into consideration the cargo of tiles and the geographical location of the find (DALY 2004).

With the evidence gathered in 1997 and 2004, the wreck can be described as very well preserved to a level near the turn of the bilges; anything that had been uncovered for any extended period of time was eaten away by teredo worms. The part of the ships sides that were washed free from the sand bank, could only have been so for just some months. The ship had been very small, and the preserved length was only 14.6 m, and the beam 5.6 m. The sides were amidships preserved to a little above the turn of the bilge, with flush planking consisting of 22–25 cm wide and 4 cm thick oak planks. Ceiling planking was oak and reportedly beech. Fastenings of the planks to the frame timbers were by trenails 3.5 cm in diameter, set in each planks lower part, and in addition 1.6 cm square-shanked nails were banged into the upper part. The frames were of uneven scantlings between 15 and 20 cm squared, and very irregularly spaced. There was no sign of any frame timbers being fastened to each other. The sternpost had a deep rabbet for the hood ends of the planking, and a heavily corroded gudgeon was present. On the planking of the forward starboard side, remnants of shroud fittings were present, giving the only clues for rigging details. Timber quality was rather poor, as sapwood was to be seen on the frames, and knots in the planks were frequent.

The cargo consisted entirely of roof tiles, stacked in neat rows in all of the central part of the

hull. The tiles are "winged" and had a knob on the underside, and are similar to modern Danish roof tiles, with dimensions of 40 x 23 cm. A count revealed that approximately 320 tiles were stored per cubic metre. A calculation of the size of the hold made by Morten Gøthche of the Viking Ship Museum in Roskilde, suggests that it was of around 80 cubic metres. Accordingly roughly 25,000 tiles could have been carried in the ship. A calculation of the cargo capacity based on the dimensions of the ship arrives at 65 tons, which amounts to a rating of about 17 lasts.

Bulkheads must have been present fore and aft of the tiles, making up a forecastle forward of the hold, and a cabin aft. These spaces had a multi-purpose role, as for instance yellow bricks found in the forward one suggest that the galley was placed here, as does the find of two pieces of firewood (beech) and a rectangular piece of peat. The pewter mounting for a lid to a mug was also found in this area as well as earthenware pottery and a glass bottle.

One of the larger objects found was a circular iron flange, which is believed to be a fitting from where a chimney went through the deck (fig. 4). This was however found in the stern cabin, so either there was a stove for heating here, or the chimney fitting shifted aft when the deck collapsed. Other finds from the forecastle indicating a galley are a wooden spoon and several sherds of pottery. That the after cabin might have been a little more comfortable and nicely furnished is suggested by the finds of a moulded board presumably from a closet and a decorated peg. In this area fragments of two glass bottles and some porcelain also came to light. The cabin most likely had a window in the transom, as fragments of windowpanes and putty were found here. Pipe smoking must have been quite popular judging by the copper alloy mounting to a pipe lid which was found in the forecastle, and fragments of clay pipes found in both ends of the ship. One should probably not expect a very big difference in levels of luxury between the aft cabin and the forecastle, or a corresponding wide gap in prestige from the skipper to his one or two sailors.

The objects found on the wreck do however offer an insight into the everyday lives of the people aboard. In the forecastle leather objects were found, which consisted of several shoe fragments, a complete shoe and what appears to

be a sleeve. Having examined the shoe fragments and the complete shoe, it is possible to differentiate what would have been at least 2 pairs of shoes. Even though the shoes are mostly represented by fragments, it appears that two of these make up a pair. Both of these fragments consist of outer soles with heels attached, the heels being made up of two pieces of leather. The heels are in both cases attached to the outer soles with wooden pegs driven in from the heel side, along the edge of the heel piece. The wooden pegs are square in cross section and taper to a point. The shoe fragments making up a pair, appear to have been repaired in different ways. Normally shoes consist of at least two soles of the same size. But in one case, it appears that the upper part of the outer sole has been worn through as this has been replaced by a new piece. The repair is visible as the old outer sole has been cut straight across the shoe about 2 cm. above the heel, (at the arch). Wooden pegs driven in from the heel side secure the new part of the sole to the old which overlaps the former. This shoe furthermore consists of a middle sole and inner sole. However the fit, especially of the middle sole, is very poor. The sole ends 2.5 cm from the heel cap and is much narrower across the waist than the outer sole. In fact it is only due to the alignment of the wooden nails through all the soles that it is possible to ascertain that the middle sole is part of the same shoe. This indicates that the middle sole was also added when the repair to the outer sole was made. This suggests that the new replacement upper part of the outer sole was itself very worn, in fact, the toe is totally missing. The very back of the sole and heel have been removed by a straight cut across the shoe which suggests that the back of the shoe had been worn down and therefore rendered unfit to wear. The repair method of cutting the worn part away and replacing it by a new one has been used for many hundreds of years. Similar repairs have been noted on shoes from Anglo-Scandinavian York (MOULD/CARLISLE/CAMERON 2003) and the same method of repair is still in use today (VASS/MOLNÁR 1999). In this case however, it looks like the repair was never completed. A black substance, appearing very much like tar is to be seen on the heel of the shoe. A possible explanation is that the wearer had stepped in wet tar used on the ship. The other shoe fragments consist, as mentioned earlier, of an outer sole with a heel attached but in this case a fragment of the insole of the same size as the outer one has also been preser-

ved with some of the heel cap and heel stiffener still attached as well as fragments of the rand. Between the outer and inner soles is a layer of wooden slithers. Today cork fillings are used in handmade rand shoes to fill out a void and help stabilise and cushion the sole. The wooden slithers were probably intended for exactly the same purpose as the cork fillings are today. The very back of the outer sole has been cut off which suggests that it was so damaged that the shoe no longer functioned satisfactorily. The shoe has however been repaired by attaching a new piece of leather, the size of the cut off piece, to the inner sole with wooden pegs, so making the shoe serviceable again. The fact that repairs to both heels had been necessary gives an indication of the stance and gait of the wearer. In a normal healthy foot the greatest wear can be expected postero-laterally under the heel (GROENMAN-VAN WAATERINGE 1988).

The one complete shoe found on the wreck is very light in construction and fits the description of the kind of shoes known as "pumps" (fig. 5). This type of footwear was supposedly often used for going ashore during the 18th and 19th century (HENNINGSEN 1979). The shoe in question is made of very soft calf skin leather and all the parts which make up the upper are separately lined with the same material. The upper part of the shoe consists of a vamp, two sides and a heel cap. The grain side of the leather is outward on all these parts, but positioned towards the foot on the parts used for lining the shoe. The bottom of the shoe consists of an inner, middle and outer sole to which a heel was attached, the heel consisting of 7 layers of lea-



Fig. 4: The iron fitting believed to be a flange for letting a chimney pass through the deck.

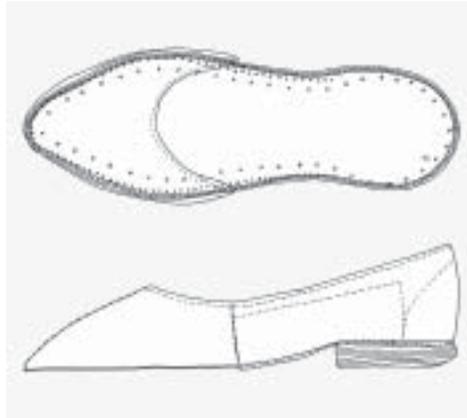


Fig. 5: The "pump" shoe that is almost entirely preserved.

ther. The outer sole is very worn, and the upper half is missing. In this case, thin wooden slitters were also placed between the outer and middle sole. The heel differs from the other shoe fragments with heels, as this heel is not only held in place by wooden pegs, but 4 iron nails were also used. (These have badly deteriorated, but can be seen as black stains on the leather surface). The thread is still preserved in some of the stitch holes. The shoes might tell us something about the fashion of the time, the financial status of the wearer, as well as about the size of the wearer and as mentioned earlier how that person walked. The "pump" is altogether very different in feel and quality to the fragments of the other shoes that were made of stiffer heavier leather and repaired at least once which the "pump" is not. It seems much more likely that the shoes were worn on special occasions, like going ashore. The presence of this type of shoe also shows that at least one of the crew had the financial means to be able to purchase items of fashion, and an interest in doing so. It has been possible to estimate the size of the fragmented pair of shoes, in order to compare them to the "pumps". The "pumps" are at least a couple of sizes smaller than the others, and it therefore stands to reason that the pairs did not belong to the same person.

A rather unusual leather object is a sleeve for a jacket or such like (fig. 6). It consists of a rectangular piece of leather (ca. 58 x 19 cm) made from quite thick cattle skin (4 mm after conservation). It has maintained its shape during conservation, which is that of a slightly bent arm. It has holes along both the long sides (16 on one side, 19 on the other), and there are still fragments of a vegetable based thread in some

of the holes, which shows that the two sides had been laced together. When worn, the lacing would have faced inwards towards the body. Tooling can be seen on the end of the sleeve near the hand. A couple of centimetres above the tooling, two holes 1 cm apart can be seen. The function of these is not clear, but they might have been used to thread through a lace or string, in order to tie the sleeve tightly around the arm. On the other, short side, there are 4 holes of different sizes, approx. 5 cm from what would have been the edge, however the piece along the edge is missing. These holes could have been used to secure the sleeve to a bodice. The signs of wear on the sleeve show that the area corresponding to the elbow is most heavily worn which is as one would expect. The thickness of the leather, the design and the wear on the sleeve, suggest that it was part of a garment which first and foremost served a functional purpose.

Along with the personal items, examples of tools were also found on the wreck. These include the turned handle of an awl, which not only could have been used for carpentry work, but also for leatherwork. A brush handle was also found and a collection of what appears to be brush hairs of animal origin. The range of objects recovered from the wreck give us an insight to the people manning the ship, and reflect both their personal and working lives. Objects of this type in association with wrecks are relatively rarely represented in the archaeological records and therefore have added further important knowledge to our understanding of how "ordinary" seamen lived and to the period in general.

So far the construction of the ship itself has briefly been labelled "flush planking", but it is possible to describe the technology behind it further. Flush planking is not synonymous with the term "carvel", which should be applied to ships with built-up pre-erected frames. Using the planking as the primary - and initial - hull feature can also arrive upon flush planking, as the research in Dutch bottom-based tradition has shown (HOCKER 1991, MAARLEVELD 1991, 1992). The Spodsbjerg Drej wreck show features similar to those of this technology. The fragment that was raised in 2004 showed no sign of the individual frame timbers being fastened to each other, and the preserved top ends of the framing can be seen on the site plan as very unevenly spaced. This would not have

been the case in a truly carvel-built ship with its frames erected on the keel before any planking was added. The planking of the Spodsbjerg Drej wreck has not been sufficiently documented to be put forward as an argument in this respect and the characteristic plugged nail holes from temporary battens have not been recorded.

The hull shape of the present wreck shows a small, but very beamy ship that originally was no more than 15 m long, but with a beam of about 5.5 m, giving an index of less than 1:3! The time frame around 1800 suggests a ship of this size as being a "jagt", a single-mast ship rigged with a gaff main sail and stay foresail. The appearance above the water line is well known from various graphic sources, and the Spodsbjerg Drej wreck would have had a transom stern, and no deck structures apart from the central hatch. It should be noted however, that the Spodsbjerg Drej ship with its date of construction in the last quarter of the 18th century, is somewhat older than the earliest portraits of "jagts", and could in this respect serve as a clue to the origins of this, the most common of Danish ship types.

Among historians, specialising in seafaring over the past few centuries, not much attention has been devoted to the actual construction of ships, in the sense of hull shape conception and technological ancestry. What *is* noted is the introduction of drawings, and scientific, truly constructional approach, the concepts of which are still valid in modern naval architecture, and require no further explanation. But the details of the preceding technology are little known, and are referred to in Denmark as building by "klamp", which just means shipbuilding without drawings. The nature of "klamp" in the 18th and 19th century would be worth studying, and ship archaeology could provide data to clarify these questions. Detailed studies of 19th century small scale seafaring, convey valuable information when stating that certain master shipwrights would take the dimensions of well-handling ships, and copy them in their own constructions (MONRAD-MØLLER 1988). Others would be known as working "from their own invention", suggesting a method incorporating experience and rule of thumb. Central to this lack of interest in the "klamp" shipbuilding, is the fact that there are no historic sources from where one can investigate the hands-on procedures involved, not to mention

the mental process of conceiving the hull form, and evidence of the origins of the technology. To just label early modern shipbuilding without drawings as "tradition", would not explain very much. Another tendency in contemporary – written – descriptions from the time when drawings made their way to the local slipways, is that the old shipwrights would have been practising a simplified and "illiterate" adaptation of the proper scientific ship construction. In other words they would have to extract skills and results from the scientific shipbuilding, in order to do any work themselves.

It is hereby suggested that the local shipwrights of the first flush-planked "jagts" and before them maybe a flush-planked variant of the "skude", wouldn't have to rely on technology derived from drawing-based shipbuilding, as to their ability to create a hull shape. As scientific ship construction spread from the royal dockyards, some characteristics in appearance might have been copied, but to take over and master the integrated package of line drawing would have been impossible. Instead they would be trained by manual tradition to a technology based on the Dutch bottom-based shipbuilding. This is present as a distinct technology in the Baltic at least from around 1570, with several finds in Denmark and Sweden (ULDUM 2000). This technology was the way small flush-planked ships were built on small slipways around Denmark, and had been so since the importance of clinker had diminished in the second half of the 16th century and the first half of the 17th century.

Despite the modest amount of field work that has gone into the investigation of the Spodsbjerg Drej wreck, a generous amount of data has come to light, both with regard to the objects found in the wreck, and to the construction of the ship itself. The small ship that foundered with its cargo of roof tiles, from maybe a



Fig. 6: The leather sleeve, the signs of wear show that it is from the left side of the jacket. To the left is the decorative tooling near the cuff. The lacing holes are clearly visible.

works in southern Jutland, is hereby interpreted as an example of a ship building technology that has been known and described for some time, but the significance of which has yet to be fully assessed. What actually happened when other ship types superseded the clinker built "skude" of late medieval times? We know for certain that the scientific naval architecture spread from the royal dockyards, and did not enter the small yards until about 1840. A couple of hundred years still have to be accounted for, as far the technology and traditions employed in smallscale regional ship building is concerned. A link to the Dutch bottom-based shipbuilding that entered the Baltic around 1570 is seemingly an explanation.

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