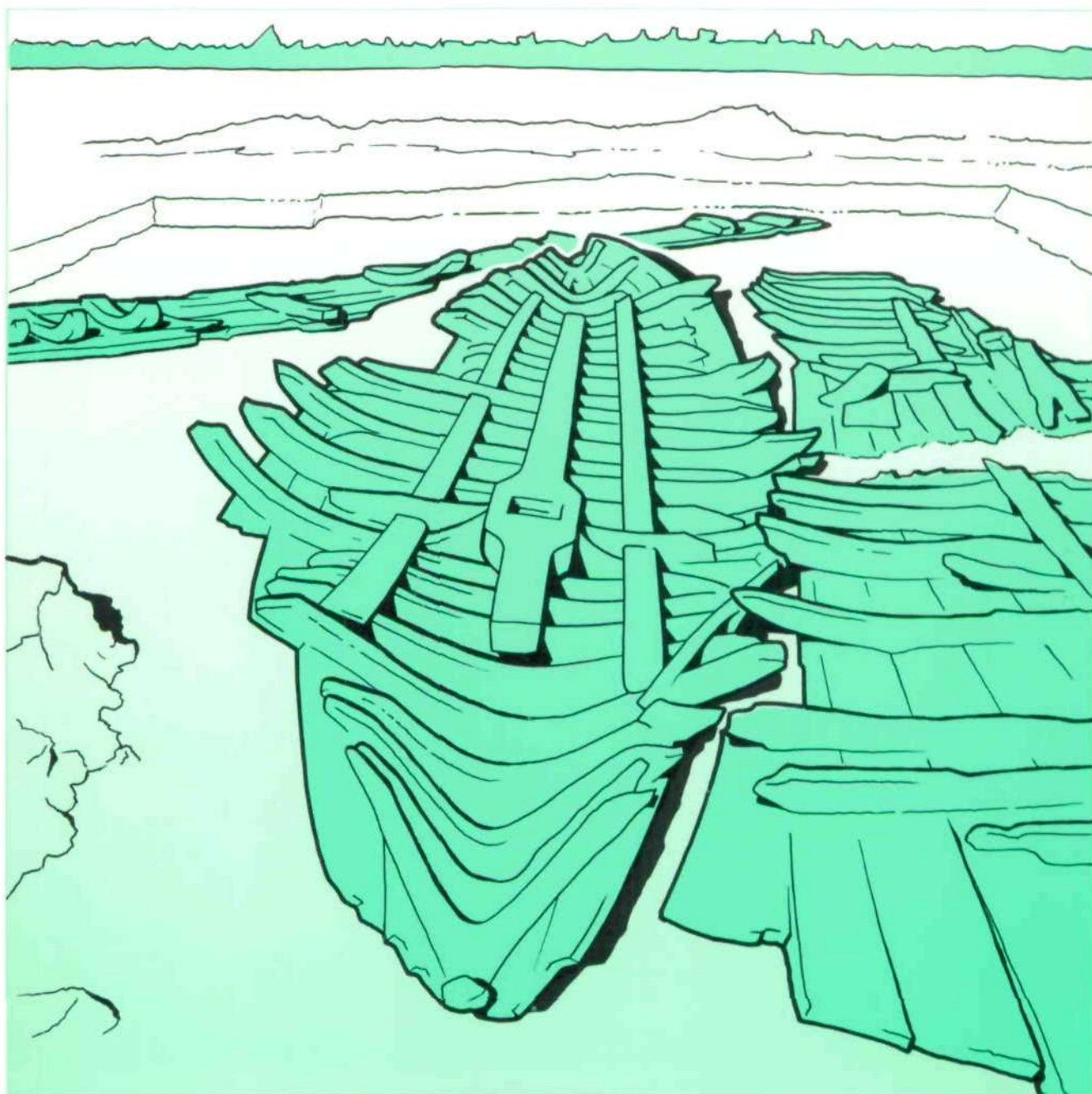


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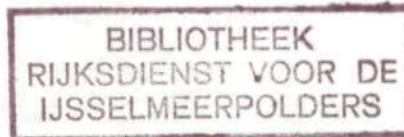
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cog finds from the ijsselmeerpolders



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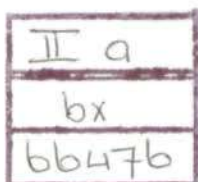
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cog finds from the ijsselmeerpolders

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rapporten inzake de inrichting en ontwikkeling van de ijsselmeerpolders en andere landaanwinningswerken

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Abstract

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Since 1942, about 30 shipwrecks dating from late medieval times have been found in the IJsselmeerpolders, the reclaimed part of the former Zuiderzee in the centre of the Netherlands. A comparison has been made with the 14th century Bremen cog, the best preserved example of this shiptype, in order to determine whether the medieval vessels from the Zuiderzee area show cog-like characteristics. Nine vessels, dating from the 13th and 14th centuries, show similarities concerning the plank keel, the stem and stern hooks, the planking of the hull, and the caulking and fastening methods. The transverse and longitudinal stiffening, on the other hand, vary according to the size of the vessels. Differences in the shape and size of the vessels, as well as in the position of the mast, may be connected with rigging and function. From an archaeological point of view, the nine shipwrecks from the IJsselmeerpolders and the Bremen cog belong to the same shipbuilding tradition.

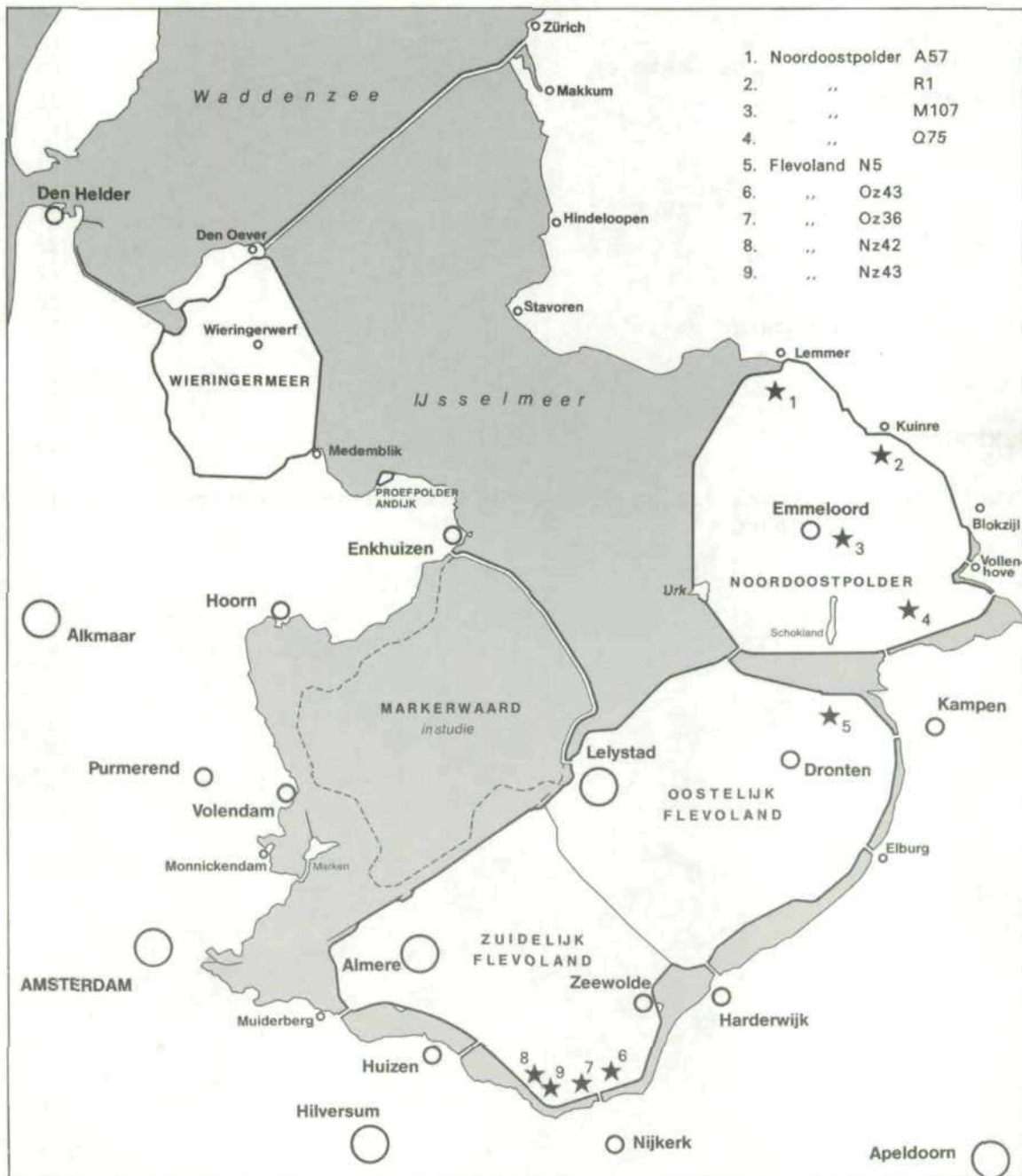
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EUROPE

HOLLAND



1. The IJsselmeerpolders land reclamation project; shipwreck sites, mentioned in this report

Introduction

The Zuiderzee, a vast area of water in the northwest and the centre of the Netherlands, has long been of great importance to inland shipping. Before the opening of the Noordhollandskanaal and the Noordzeekanaal in the 19th century, it was also the only route large merchantmen could take to get from Amsterdam to the North Sea.

The Zuiderzee was a large estuarine area of over 500.000 ha. During the 20th century, the area has undergone great changes due to the execution of the Zuiderzee Project. Within the framework of this project, 375.000 ha of the area have been dammed off and excluded from the influence of the sea. The water in the area has turned into stagnant freshwater due to the inflow of water from the river IJssel. In the dammed off lake, four polders, with a total area of 165.000 ha, have been reclaimed. A fifth polder of 41.000 ha is still in the planning stage.

As soon as a polder is drained, shipwrecks turn up in the former seabed. The IJsselmeerpolders Development Authority, charged with the development of the polders, carries out the investigations of shipwrecks. Since 1942, some 350 ships have been found in the Noordoostpolder and Flevoland. For a survey of nautical archaeology in the IJsselmeerpolders, the reader is referred to Flevovericht 197 (Reinders, 1982).

Until recently, little was known about medieval shipfinds in the Netherlands. Ellmers (1972, 292) mentioned two excavations: Noordoostpolder Q 75 and G 37. However, the first excavation of a medieval vessel in the IJsselmeerpolders, Noordoostpolder M 107 (Modderman, 1945), has remained unnoticed by later authors.

At the time of the Bremerhaven symposium on Medieval Ships and Harbours in Northern Europe in 1979, medieval shipfinds were still few in number. Some of the shipfinds - Noordoostpolder Q 75 and M 107, and Flevoland N 5 - showed unmistakable characteristics of a cog, but in view of their modest dimensions - in comparison with the Bremen cog - there was some hesitation in naming them cogs (Reinders, 1979). The last few years a larger number of medieval ships has been found in Zuidelijk Flevoland, along the south coast of the former Zuiderzee. Many of them showed the characteristics of a cog, such as the vessels Flevoland N 5, NZ 42, NZ 43, OZ 43. The latter one, OZ 43, was of greater dimensions than the former vessels.

During the excavation of Flevoland OZ 43, the remains of another medieval ship were found at a nearby lot OZ 36. A trial investigation produced a beam that had been protruding through the hull. In earlier IJsselmeerpolders-cogs, no beam of this type had ever been found, but it is a known feature of the Bremen cog. As the wreck was situated just beneath the surface and part of the wood had already started to decay, it was decided to excavate the ship in 1983. Preparatory to its investigation, all data gathered from previous excavations of IJsselmeerpolders-wrecks showing cog-like characteristics have been studied. Apart from the ones mentioned above, these included Noordoostpolder R 1 - a stern fragment - and Noordoostpolder A 57, an as yet unexcavated vessel of which the keelson and several ribs had been unearthed during draining activities.

In this preliminary report the main characteristics of these ships are discussed and compared with what is known about the Bremen cog and other shipbuilding traditions of the same period. The report is meant in the first place to contribute to the discussion on cogs. No effort is made to give a complete survey. Many of the observations are of a provisional nature and the added drawings are meant to compare the available data, in anticipation of a final report.

1. Research concerning cogs

Before the first cogs were excavated a lively discussion on medieval shiptypes had been going on, of which among others Heinsius (1956) has given a survey. As his book was published before the discovery of the Bremen cog, it lacks many important archaeological data, except concerning the vessels found in Kalmar. Just like in earlier investigations, Heinsius based his findings primarily on written sources and illustrations of medieval ships. The vessels depicted on seals had been identified by Hagedorn (1914) as keel, hulk and cog. Heinsius (1956, 247) described the cog as follows: "Die Koggen waren ein geradkieliger, hochbordiger Fahrzeugtype mit ziemlich geraden und recht steilen Steven.... Ausserdem zeigen einige Reliefs auf den Siegeln, dass die Fahrzeuge oft ein recht gedrungene Form hatten. Trotzdem war ihr Unterwasserschiff verhältnismässig scharf gebaut und zum Segeln gut geeignet".

Furthermore Heinsius (1956, 113) considered the ship to be of a revolutionary type: "Die Leute die den neuen den Schiffbau revolutionierenden Schiffstyp ersannen kamen selbst ganz offenbar nicht aus den Schiff- oder Bootsbauerhandwerk sondern anscheinend aus einer anderen handwerklichen Schule". He reported that the construction of keel, stem and stern posts and frames had preceded the fastening of the hull (Heinsius 1956, 111).

After Heinsius, the discussion was given a fresh contribution by Crumlin-Pedersen and Ellmers, who included the archeological finds. Crumlin-Pedersen (1965, 1969, 1979) agreed with Heinsius that the cog had straight stem and stern posts and high sides. But he succeeded in proving that the seemingly straight keel, as shown in the illustrations, was in fact a carvel-built bottom without a keel. He also claimed that the cog was not a revolutionary shiptype, but originated from Frisian vessels suited for sailing the Waddenzee. The Frisians are considered to have called at Baltic trading ports with these vessels as early as 800 AD. For navigation on rivers and the open sea they are considered to have used a stem- and sternless round bottomed type, like the Utrecht vessel.

Crumlin-Pedersen and Ellmers (1972) pointed out the imitations of coins from Dorestad which were most probably minted in Haithabu. These coins, presumably dating from the 9th century, show ship's depictions among which could be distinguished, apart from the hulk and a Viking ship, a third type which they interpreted as a cog. In some depictions the bottom fore and aft is raised, characteristic also of the Waddenship of more recent date and designed to prevent the vessel from being sucked down into the mud when it is left out at low tide (Ellmers 1972, 111). Furthermore Ellmers gave a survey of the written sources from the 9th to the 11th centuries featuring the word 'cog': Kugghamm, cogscult, Cokingi, kocho. These data lead Ellmers to conclude that the cog can be traced back to the 9th century. Crumlin-Pedersen (1983, 11) went back as far as the 2nd century AD for the construction of the maststep of the Kollerup cog, showing resemblance with the mastframe of the Brugge and Blackfriars I boats.

In Crumlin-Pedersen's as well as in Ellmers' studies, the Noordoostpolder Q 75 wreck plays an important role (fig. 2). They both based their assumption that the vessel had been wrecked in the 12th century upon data provided by Van der Heide (1955). If indeed this small vessel had

been wrecked in the 12th century, this would be most important to explain the link between the large amount of data on the cog in the 13th and 14th centuries and the hypothesis of the cog originating from a Frisian Waddenship. The date of wreckage of the Q 75, the 12th or even the 11th century, is based on the discovery of a layer of shells, usually dated around 1200, positioned above the shipwreck (Van der Heide 1974, 221). However, re-examination of the soil profile showed that this layer of shells was not situated above but underneath the shipwreck. Consequently, Q 75 should be dated to the first half of the 14th century (Reinders 1979, 38 and appendix 1).

The investigation of the Bremen cog also contributed to the collecting of material used in comparing the many constructional details with small local craft. Ellmers (1979a) mentioned, among other examples, the Hasselø logboat, the 'block kahn' from the Steinhuder Meer and the 'Havelkahn'. Constructional details also appeared to be important to



gain a better understanding of the details depicted on the seals. Stem and stern posts of the Bremen cog have a rabbet to which the four bottom planks are fastened. The eight strakes of the sides, on the other hand, enclose the stem and stern posts and are fastened at the outside. This construction is also visible on the Lübeck seal from 1256, thus indicating an early stage in the development of the cog (Ewe, 1972); in a later stage, 'false' stem and stern posts were fastened to stem and stern (Ellmers 1979a, 9). At first these false posts were narrow laths, as is visible on the Lübeck seal from 1280 and the Harderwijk seal from 1263, but later on they were heavy elongated beams, as can be seen on the Stralsund seal from 1329, representing a cog, according to a written source (Fliedner, 1982). The differences are also shown clearly on the Elbing seals from 1242 and 1350.

It is clear that the ships' illustrations on the seals mark a certain evolution. 'Bürgermeister und Ratmannen waren offensichtlich vielmehr bestrebt, mit dem in ihren Stadtsiegel abgebildeten Schiff aktuell zu erscheinen' (Ewe, 1972). That applies also to the construction of the rudder. According to Heinsius (1956) the Lübeck seal of 1257 also represents a cog. It is equipped with a side-rudder, which Ellmers (1979b, 21) compared to the 'firrer' of a 'Steinhuder Kahn'. There are other seals, among which the Elbing seal from 1242, showing a cog with a stern-rudder which was commonly found in cogs on later seals.

The development of the cog in the 13th century can also partly be traced in the excavated cogs. The Bremen cog, built around 1380, has a heavy



3. Excavation at lot OZ 43 in Flevoland

beam which is fastened against the stem, whereas Flevoland OZ 43 (fig. 3), wrecked in the second half of the 13th century, only had a narrow lath. Until now, however, no ships have been excavated that support the hypothesis of the development of the Frisian Waddenship into the 13th century cog, which took place in the preceding period.

From the 13th and 14th centuries onwards, we have the disposal of written sources, ship's depictions and shipfinds, which may relate to cogs. Besides, it is only from that period onwards that the word cog as the name of a shiptype becomes widely used.

2. Construction

The discussion about cogs had already been going on for a century or so, when in 1962 the Bremen cog was found, followed, at the end of the seventies, by Danish cog finds: Vejby in 1977 and Kollerup in 1978. It turned out that the fragments of an earlier find at Kolding in 1943 were cog fragments as well (Crumlin-Pedersen, 1979). At about the same time, several medieval ships were found in Flevoland near the villages of Nijkerk and Spakenburg. Table 1 gives some general information on the IJsselmeerpolders-wrecks discussed in this report. In this chapter we will focus on some constructional characteristics of these vessels.

Table 1. Cog finds from the IJsselmeerpolders

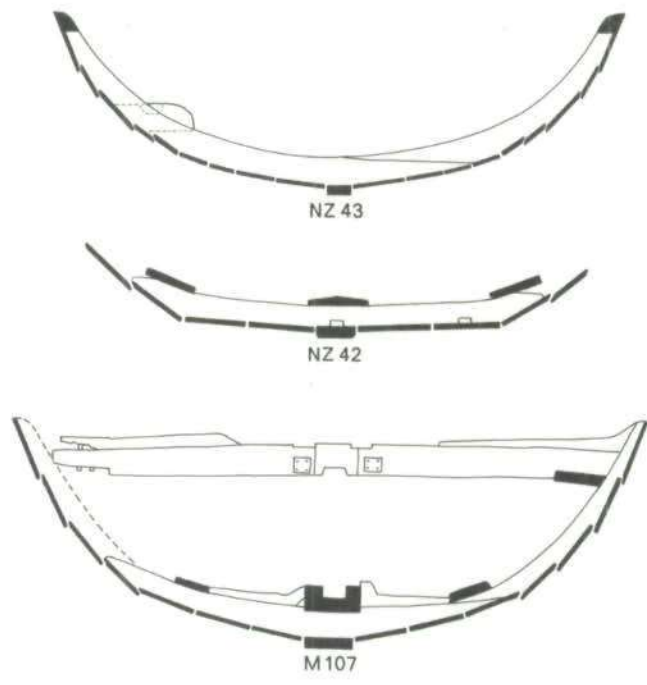
Polder	Lot	Year of Excavation	Nearby village	References
Noordoost-polder	M 107	1944	Marknesse	Modderman (1945)
	Q 75	1949	Ens	Van der Heide (1955)
	R 1	Fragment	Kuinre	
	A 57	Not excavated	Rutten	
Flevoland	N 5	1976	Dronten	Reinders (1980)
	NZ 42	1979	Spakenburg	
	NZ 43	1979	Spakenburg	Reinders (1982)
	OZ 43	1981	Nijkerk	Reinders (1982)
	OZ 36	1983	Nijkerk	

2.1. Plank keel

The IJsselmeerpolders-ships all have a plank keel; the width of this plank keel varies from about 0.18 to 0.34 m, and its thickness from 0.07 to 0.10 m, as is shown in the cross-sections in figures 4 and 5.

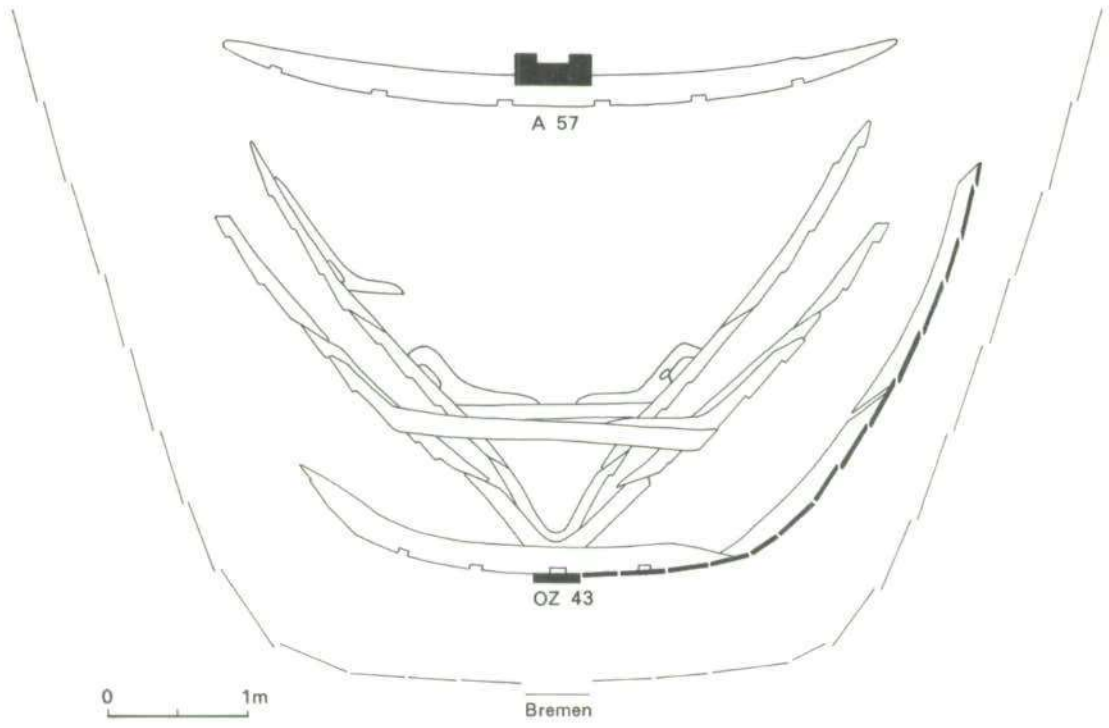
Scandinavian vessels of the Viking Age have a T-shaped keel with the garboards placed against the vertical part of the keel and fastened to the two horizontal parts, while the garboard of the cog-like vessels is not fastened to the plank keel. Exceptions are the rabbeted keels of the Skuldelev ships 1, 2 and 6 (Crumlin-Pedersen 1967, 164). The ships investigated by Marsden (1979) in London are equipped with a T-shaped plank keel, like in the Graveny vessel (Fenwick 1978, 298). A T-shaped keel is also commonly found in ships constructed in the Slavonic tradition (Ellmers 1972, 98 and Smolarek, 1983).

The plank keel of the IJsselmeerpolders-wrecks shows resemblance to the one in the Bremen cog. Judging from the published reconstruction drawing (Ellmers 1979, 8) this plank keel must have been about 0.45 wide and 0.15 m thick.



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4. Cross-sections



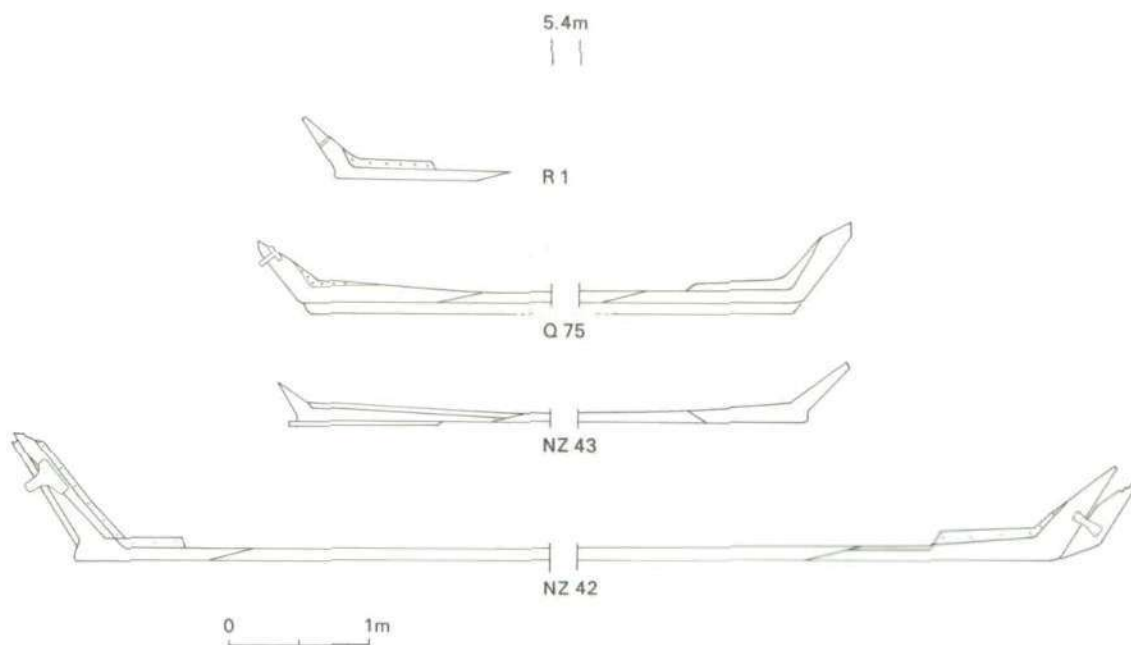
0 1m

Bremen

5. Cross-sections

2.2. Hooks and posts of stem and stern

Another feature is the construction of keel, stem and stern. In the Dutch ships from the 16th - possibly even the 15th - century onwards, the usual position of the stem and stern posts is at both ends of the keel. The ships discussed here show a different construction. At the ends of the plank keel, two knee-shaped timbers were placed called 'Stevenhaken' (stem hook and stern hook) by Ellmers (1972, 292). They consist of a horizontal part, the continuation of the keel, and a part that slopes upward, the lower part of the stem and stern (figures 6 and 7). These hooks are connected to the plank keel with an oblique scarf. This construction is found in the IJsselmeerpolders-wrecks and also in the Bremen cog (Ellmers, 1975). Straight stem- and sternposts were characteristic of the cog-type vessels, but in the 13th and 14th centuries straight posts were also introduced in the clinker built vessels of Scandinavia (Crumlin-Pedersen 1981, 18).

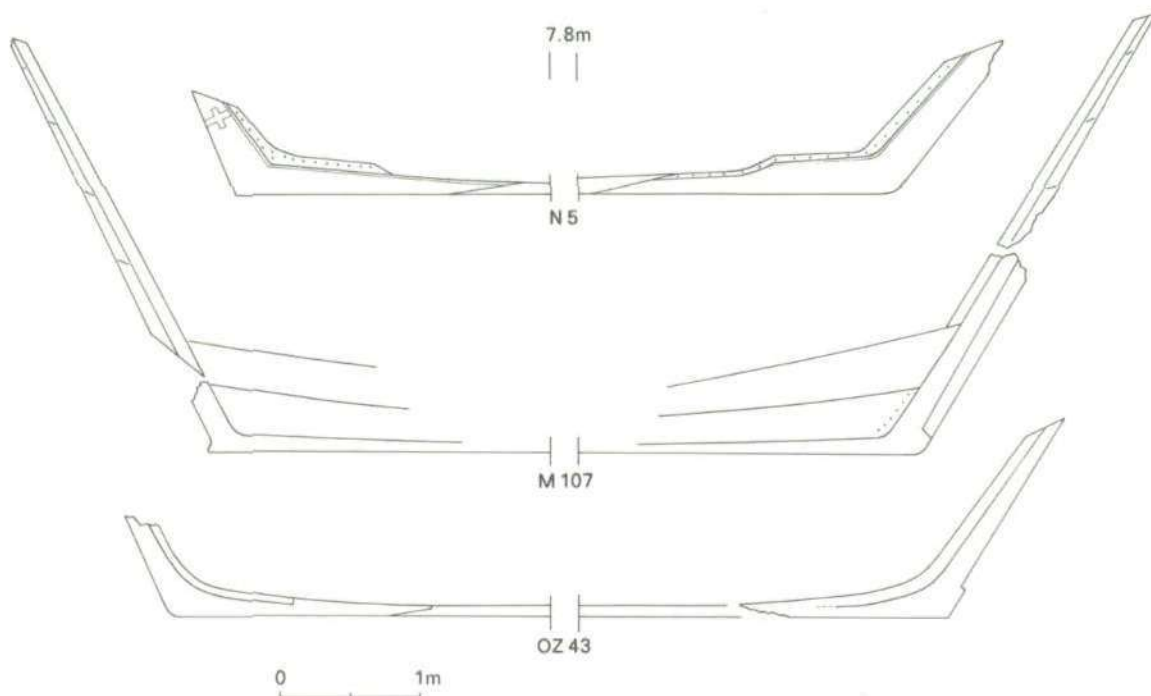


6. Longitudinal sections of plank keel and stem and stern

The same construction occurs in the vessels found in Kalmar, i.e. in the stern of Kalmar 1 and in the stem of Kalmar 2. Unfortunately, the available drawings are not sufficiently clear to allow detailed comparison of the constructions (Åkerlund, 1951). The 'Stevenhaken' can be compared with the intermediate timbers in ships of the Scandinavian tradition, connecting the keel to the stem, for instance in the Skuldelev 1 vessel (Crumlin-Pedersen 1967, 99).

2.3. Strakes of bottom and sides

The bottom of the vessels is formed by a varying number of strakes which lay flush (figures 4 and 5). They are fastened only to the ribs, not to



7. Longitudinal sections of plank keel and stem and stern

one another. Figure 4 shows that the bottom shapes vary from flat and hard chined, to rounded. In almost all the vessels, however, a bilge-strake can be distinguished at the transition between the bottom and the sides; sometimes this transition is extremely smooth (Flevoland OZ 43).

The bilge-strake is laying flush against the bottom strakes, but in most vessels the strakes of the sides overlap (figure 4). There is one exception, Flevoland OZ 43, which has the fifth, sixth and seventh strake - as counted from the keel - laying flush (figure 5).

This type of construction - flush-laid bottom planking and overlapping side planking - is also found in the Bremen cog and the Danish cogs. This makes them notably different from the Scandinavian and English vessels, which are characterized by overlapping planking of both bottom and sides (Crumlin-Pedersen 1983, 7), made of 'cloveboards', while the cog vessels had sawn planks (Crumlin-Pedersen 1983, 17).

The construction fore and aft is different from amidships. Fore and aft the bottom planks are turned a quarter to fasten them to the stem and stern hooks. In this part the planks do overlap. Flevoland OZ 43 is an exception to this, as the lower strakes fore and aft are flush-laid.

2.4. Fastening of bottom and side planking to stem and stern

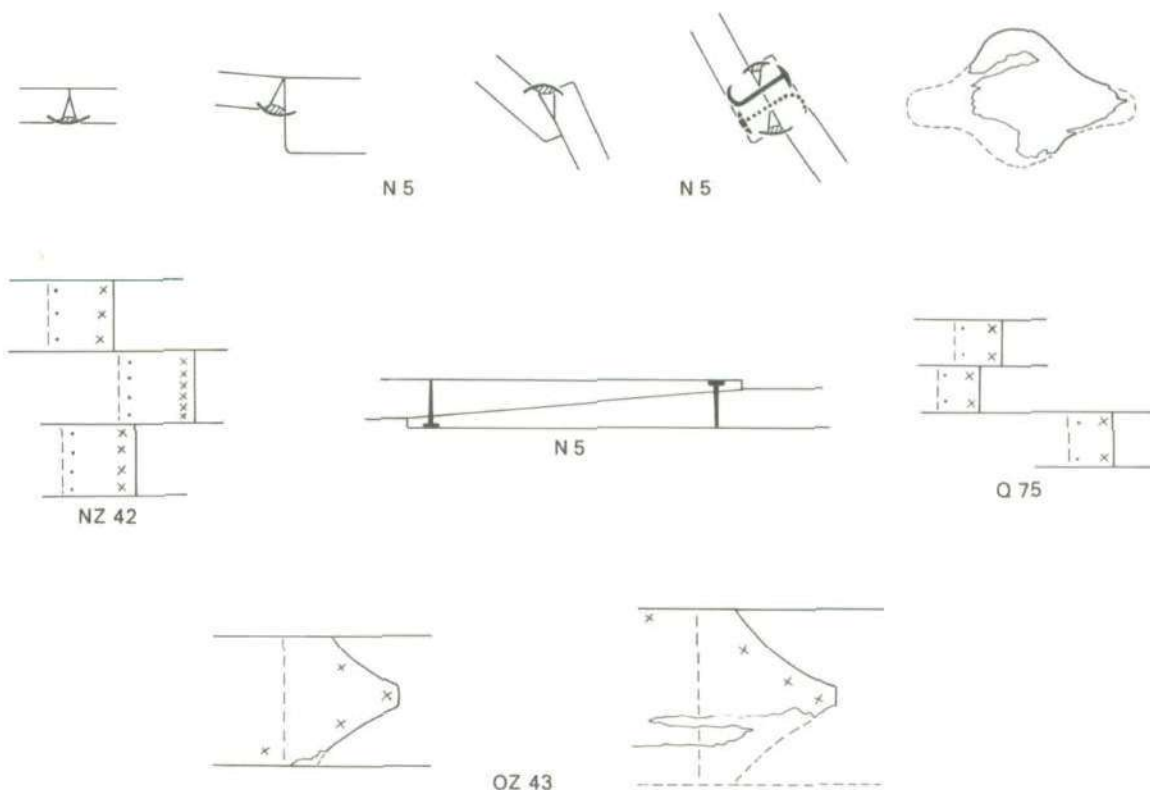
Only a small part of the original length of the stems and sterns of IJsselmeerpolders-ships has remained intact. Besides, their upper parts were rather damaged, so this element of construction can never be completely reconstructed.

The hooks of stem and stern have a rabbet to which the ends of the garboard and the bottom planks are fastened (figures 4 and 5). The planks are fastened to the hooks with nails. The rabbet is missing in the upper part of stem and stern. The planks of the sides enclose the stem, which in Noordoostpolder M 107 is pentagonal in section, and are fastened with nails at the front. Noordoostpolder M 107 and Flevoland OZ 43 must have had a thin false or outer stem, judging by the protruding hook below (figure 7).

This construction - the bottom planks and the bilge-plank fitting into a rabbet and the side-strakes enclosing stem and stern - was also used in the Bremen cog (Ellmers 1979, 9), be it that here heavy beams served as outer stem and stern posts. As far as can be told from the drawings, this construction was also used in the first Kalmar vessel (Åkerlund 1951, pl. 7a and 7b), but not in the Scandinavian ships or in the English vessels.

2.5. Fastening of the overlapping planks

The term overlapping, 'overnaads' (Dutch), denotes the overlapping of the strakes, whereas the term clinkerwork, 'klinkerwerk' (Dutch) and 'Klinkerbau' (German) denote the way the strakes are fastened to one another with rove and rivet. In the vessels from the Zuiderzee-area the strakes of the overlapping side planking are fastened by means of nails, which were twice bent, so that the point re-enters the wood (figure 8). The Bremen cog has this same fastening, and Ellmers (1979)



8. Caulking method, nails and scarfs

refers to these nails as cog-nails. Separate finds of twice bent nails do not necessarily point to shipfinds, as they were also used to fasten two planks or a plank and a beam in roofs and doors.

The twice bent nails are found in other ships too, like in the medieval 'waterschepen' of the Zuiderzee-area, but they are absent in other shipbuilding traditions. By far the best known are the rove and rivet (German: 'Eisenniet', Dutch: 'klinknagel') found in the Scandinavian ships from the Viking period as well as in medieval ships in England (Ellmers 1972, 227 and Marsden, 1979). There is another technique found in Poland (Ellmers 1972, 303; Crumlin-Pedersen 1969, 24) and England (Marsden 1979, 82), in small ships sailing the inland waters; here, the overlapping planks are fastened by means of thin wooden pegs.

2.6. Caulking method

All the vessels discussed in this paper and the Bremen cog as well (Ellmers, 1975) have been caulked the same way, using moss, lath and sintels (Reinders 1979, 42). The seams between the bottom planks have caulking underneath. The seam is filled up with moss, kept in position by a lath and sintels (figure 8). For the overlapping strakes, the seam is usually situated at the inside, but sometimes also at the outside; moss, lath and sintels were used here too.

This caulking method was not used in other shipbuilding traditions, with the exception of the ships found in the river Rhine area (Arnold, 1977 and Reinders, 1984) and in Russia and the Baltic states (Cederlund 1978, 78 and Ellmers 1972, 310). Other methods like sealings of twined cow-hair were found in, for instance, the Haithabu ship (Crumlin-Pedersen 1969, 15).

2.7. Scarfs

We will briefly discuss the joints between the plank keel and the stem and stern hooks, and those between the planks of the hull. The former are scarfs, fastened by two rows of nails. The stem and stern hooks are connected to the upper parts of stem and stern by a scarf as well. The two parts were probably connected by wooden pegs.

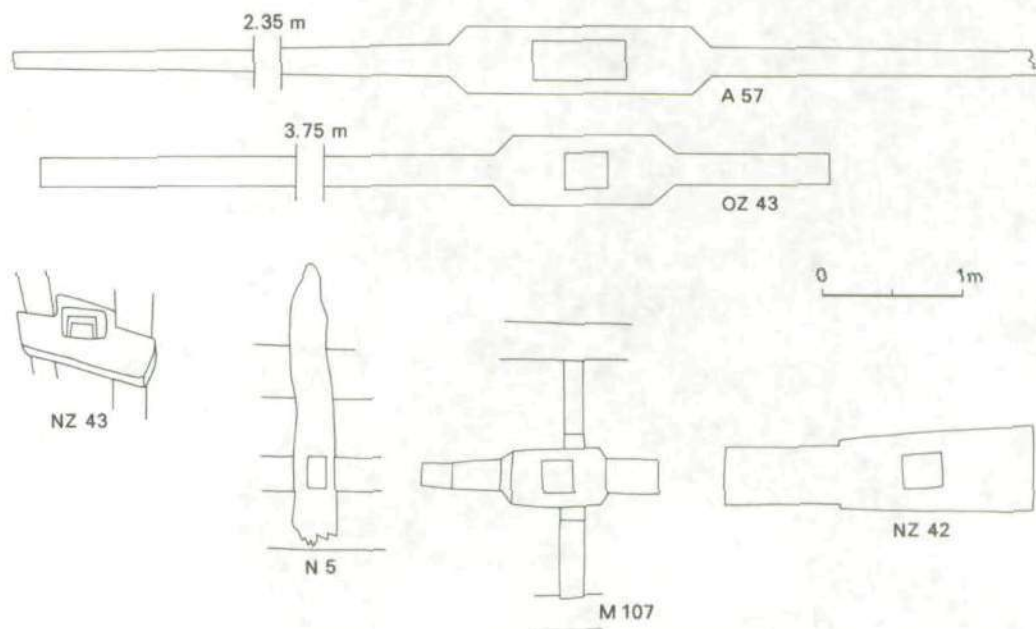
The planks of the hull are joined by scarfs, which are fastened by two rows of nails, as shown in figure 8. In most cases, plenty of moss has been used between the ends of the planks. In Flevoland OZ 43 all the ends of the planks, save two, have been cut straight, as in the other IJsselmeerpolders-vessels and in the Bremen cog. The two exceptions are two planks in a corresponding strake, opposite to each other, cut in a tongue shape (figure 8). An ornament?

In Scandinavian ships dating from the Viking period, planks with tongue-shaped ends are not at all exceptional. They are in fact also scarfs with the overlapping part, visible from the outside, cut in the shape of a tongue as is shown in the Haithabu ship (Crumlin-Pedersen 1969, 16). The planks are fastened with rove and rivet: one row at right angles to the longitudinal axis of the ship and another row along the edges of the tongue-shaped end.

Skuldelev wreck 1 offers another example of both types of scarfing. All but two strakes have scarfs with straight cut ends, while the tongue scarf is found in the ninth and tenth strake, to join the ends of long broad planks (Crumlin-Pedersen 1967, 101).

2.8. Construction of the maststep

As far as the above-mentioned features are concerned, the IJsselmeerpol- ders-ships are similar to one another and to the Bremen cog, but they differ greatly as to the construction of the maststep (figure 9).



9. Maststeps

In Noordoostpolder Q 75 the maststep was missing, but indications such as an extra wooden peg in the ribs above the plank keel and nails in some ribs made us assume that just like in Flevoland NZ 42 the maststep was formed by a wooden chock fastened by means of wooden pegs and nails (figure 10).

Another example is found in Flevoland N 5 (Reinders 1980). Here the mast-hole was cut in one of the ribs, which was heavier than the other ribs and widened at the spot where the mast had been. A similar construction has been found in wrecks from the Tolkmicka area in Poland (Smolarek 1983, figs. 9, 14-16) and in the Kollerup cog (Crumlin-Pedersen 1979, 29). I doubt whether the resemblance of this construction with the mastframe of the Brugge and Blackfriars boats supports Crumlin-Pedersen's (1983,18) thesis that these vessels and the Kollerup cog belong to one and the same family, based on the assumption that there were no parallels from other medieval ship finds in Northern Europe.



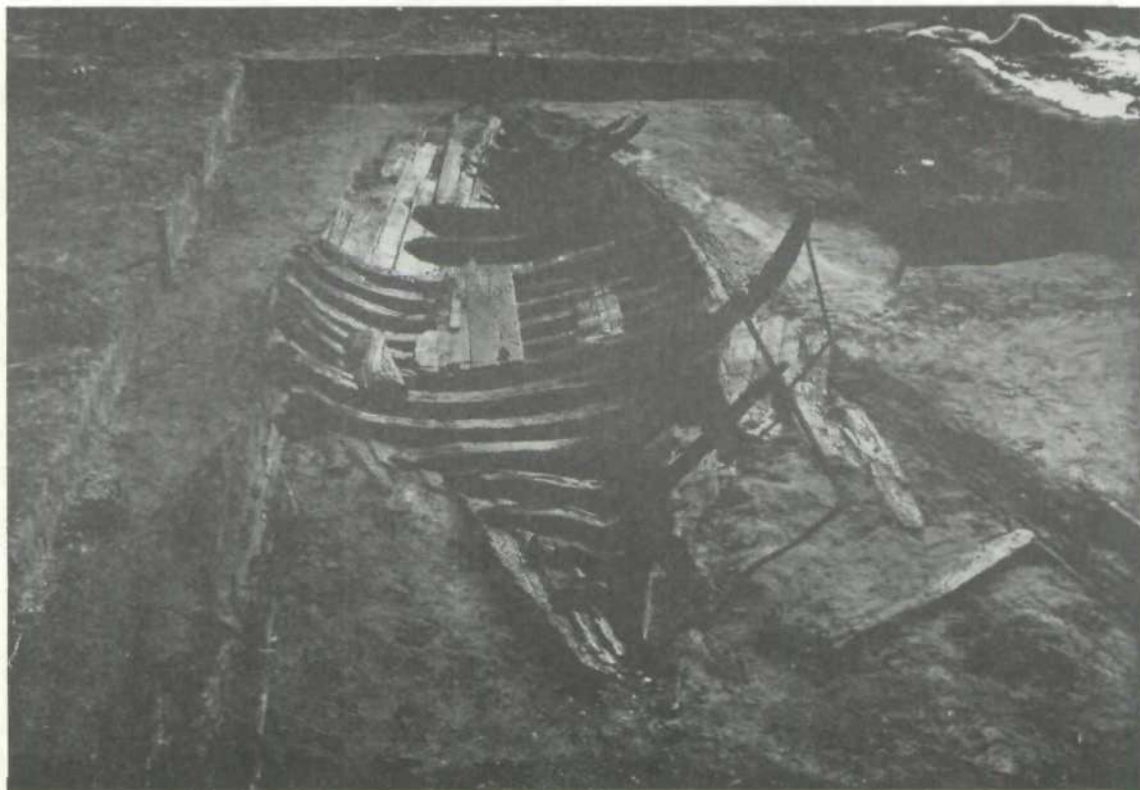
10. Excavation at lot NZ 42 in Flevoland

The vessel Noordoostpolder M 107 shows a transition between the chock of Flevoland NZ 42 and the maststep forming part of the keelson. The maststep is 1.8 m long and has a hole for the mast's heel in the widened part. On both sides of the maststep a chock has been placed on one of the ribs to give lateral support to the maststep.

Three vessels have a keelson with an integrated maststep: Flevoland OZ 43 and OZ 36 and Noordoostpolder A 57. The length of the keelson of OZ 43 is 8.0 m and of A 57 at least 10 m. In both vessels the mast-hole is cut in a widened part of the keelson. These are the only vessels similar in mast-construction to the Bremen cog and to the Kolding and Vejby cogs of Denmark (Crumlin-Pedersen, 1979).

The keelsons of M 107, OZ 36, OZ 43 and A 57 were notched to fit over the floor timbers, like the keelson of the Skuldelev 2 wreck (Crumlin-Pedersen 1967, 115).

A totally different construction is shown in Flevoland NZ 43, which has a chock with a square hole fastened against the port-side, and indications of a similar chock on starboard-side (figure 11). For the moment we assume that we are indeed dealing here with mast-holes (Reinders 1982).

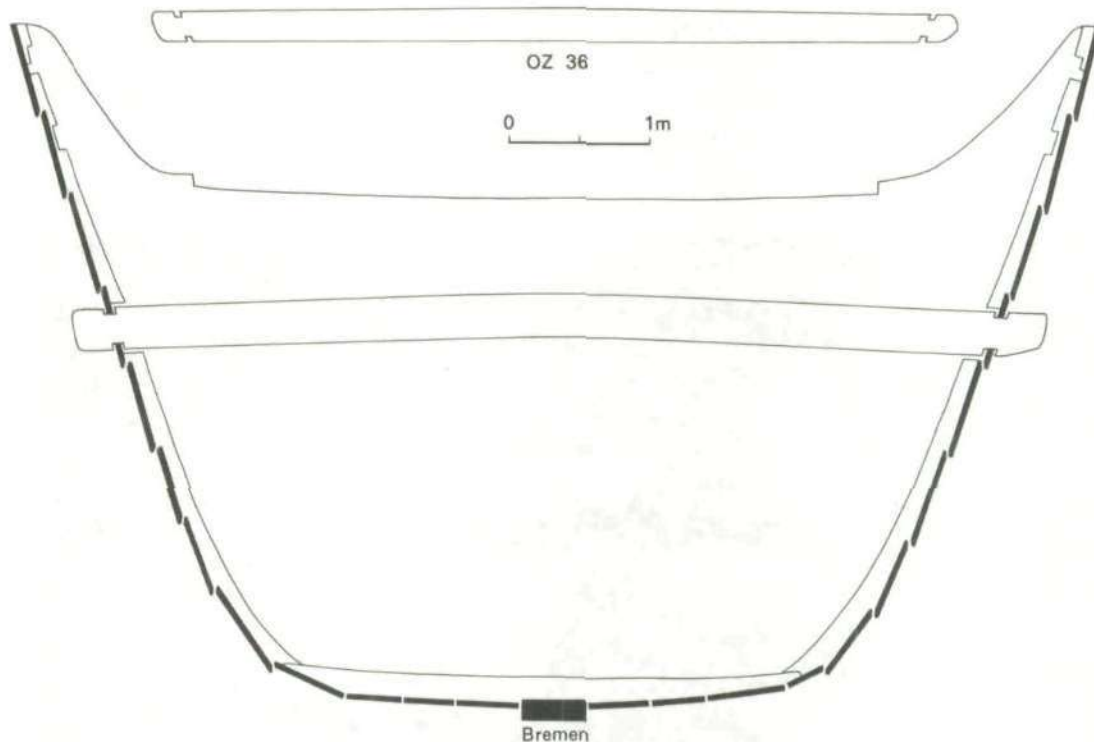


11. Excavation at lot NZ 43 in Flevoland

2.9. Cross-beams

A noticeable feature of the Bremen cog are the five heavy cross-beams protruding through the hull (figure 12). Cross-beams of this type do not occur exclusively in cogs: see for example the Mataro model in Rotterdam. In the IJsselmeerpolders, cross-beams have been found in Flevoland OZ 36, excavated in 1983. In Noordoostpolder Q 75 and Flevoland NZ 42 and N 5, no cross-beams nor any indication of them have been found.

Noordoostpolder M 107 is different in this respect. Figure 4 shows a cross-beam, fastened against the hull by means of knees. Two more cross-beams have been found in this ship, along with knee fragments. One of these beams had been situated near the mast and the other fore or aft. Flevoland OZ 43 also has cross-beams with knees (figure 5). Cross-beams protruding through the hull have not been found in this vessel, but there were two rectangular holes in corresponding strakes on port and starboard side at the spot where a cross-beam could have been situated.



12. Cross-section of the Bremen cog and cross-beam of Flevoland OZ 36

Cross-beams and keelson were elements of the transverse and longitudinal stiffening. Most vessels discussed in this report had floor timbers, or V-shaped timbers at the sharp ends and one or two futtocks as transverse framing (figure 1, 2, 3). These timbers were joined by a scarf, but not fastened to each other. Besides plank keel and keelson, stringers were used as longitudinal members, their number depending on the size of the vessel. In this report we have only paid attention to the cross-beams and the construction of the maststep; the longitudinal reinforcement and the transverse framing will be discussed in the excavation reports of the ships in question.

The preceding paragraphs demonstrate that the IJsselmeerpolders-vessels and the Bremen cog have quite a number of characteristics in common. It is true that there exist differences in maststep and cross-beams, but it might well be that these are determined by the ship's dimensions or function. On grounds of their common characteristics, we think it is justified to consider the IJsselmeerpolders-ships and the Bremen cog as belonging to the same shipbuilding tradition.

3. Dimensions

Having discussed the constructional characteristics in the preceding chapter, we will now focus on ship's dimensions. In the first instance we base our comparison on the dimensions of those elements which are known for all vessels: the length and width of the bottom.

The IJsselmeerpolders-wrecks and the Bremen cog have a bottom length of 8.5 - 9 m, of 12 - 13 m and of 15 - 16 m. The corresponding width is respectively 1.70 m, 2.70 m and 3.60 m; the width of the middle group is somewhat variable. The measurements of the width have been taken where possible near the mast.

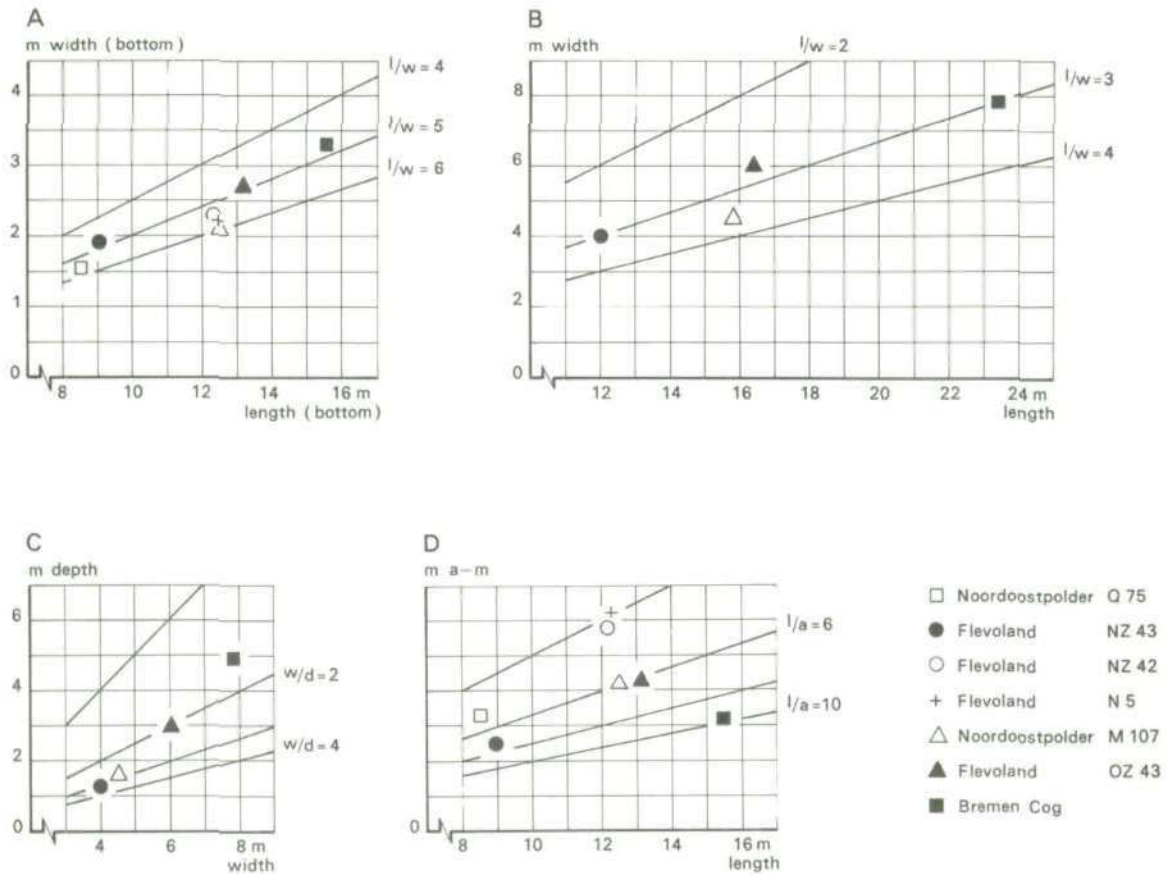
The overall length and the beam are known for few ships only. The beam of Flevoland NZ 43 is 4 m, of Noordoostpolder M 107 about 4.50 m, of Flevoland OZ 43 about 6 m and of the Bremen cog 7.80 m. In these four ships the beam is about twice the width of the bottom. At the moment there are two shipfinds in the IJsselmeerpolders-area about which only little is known: Noordoostpolder A 57, which has a bottom width near the mast of 3.80 m - about the same as in the Bremen cog - and Flevoland OZ 36, which has a cross-beam of 5.75 m. This is less than the length of the cross-beam near the maststep of the Bremen cog, which is in addition more heavily built (figure 12).

Another element enabling us to get an idea of the dimensions of these ships is the length of the keelson. In Flevoland OZ 43 this is 8 m and in the Bremen cog about 11 m. Unfortunately, not the entire length of the keelson of Noordoostpolder A 57 has been recovered; it is estimated to have been about 11 - 12 m.

Figure 13A gives the length/width ratio of the bottom of the IJsselmeerpolders-ships and the Bremen cog. Three ships have a length of about 4.5 - 5 times their width: NZ 43, OZ 43 and the Bremen cog. Of these three ships and Noordoostpolder M 107 the overall length, the width near the mast and the height of the sides are known as well, resulting in a length/width ratio of 3 (figure 13B). The width/depth ratio varies from 1.5 to 4 (figure 13C). In the remaining ships, the length/width ratio of the bottom is between 5 and 6.

Concerning the position of the mast, Crumlin-Pedersen (1979) compared the Danish cog-finds with the Bremen cog. Figures 13D and 14 compare the IJsselmeerpolders-ships with the Bremen cog. Figure 14 represents the bottom length as well as the length of the maststep and the position of the mast. The mast of the Bremen cog is placed near amidships whereas the mast of NZ 42 is situated at less than 1/4 from the stem.

Apparently, there are considerable differences in shape among the vessels and in the position of the mast. Crumlin-Pedersen (1979 and 1983), considering the Kollerup, Kolding, Vejby and Bremen cogs, argued that the mast changed from a position near the bow to near amidships, and the maststep from a heavy frame to a longitudinal keelson. However, date and construction of, for instance, Flevoland OZ 43 and N 5 show the contrary, so the differences possibly originate from the vessels' function and rigging: vessels with a sprit-sail built to sail calm inland waters, vessels used on the Waddenzee and vessels with a square sail for use on the open sea like the Bremen cog? We do not intend to pay further attention to these complex problems in this report; first all available

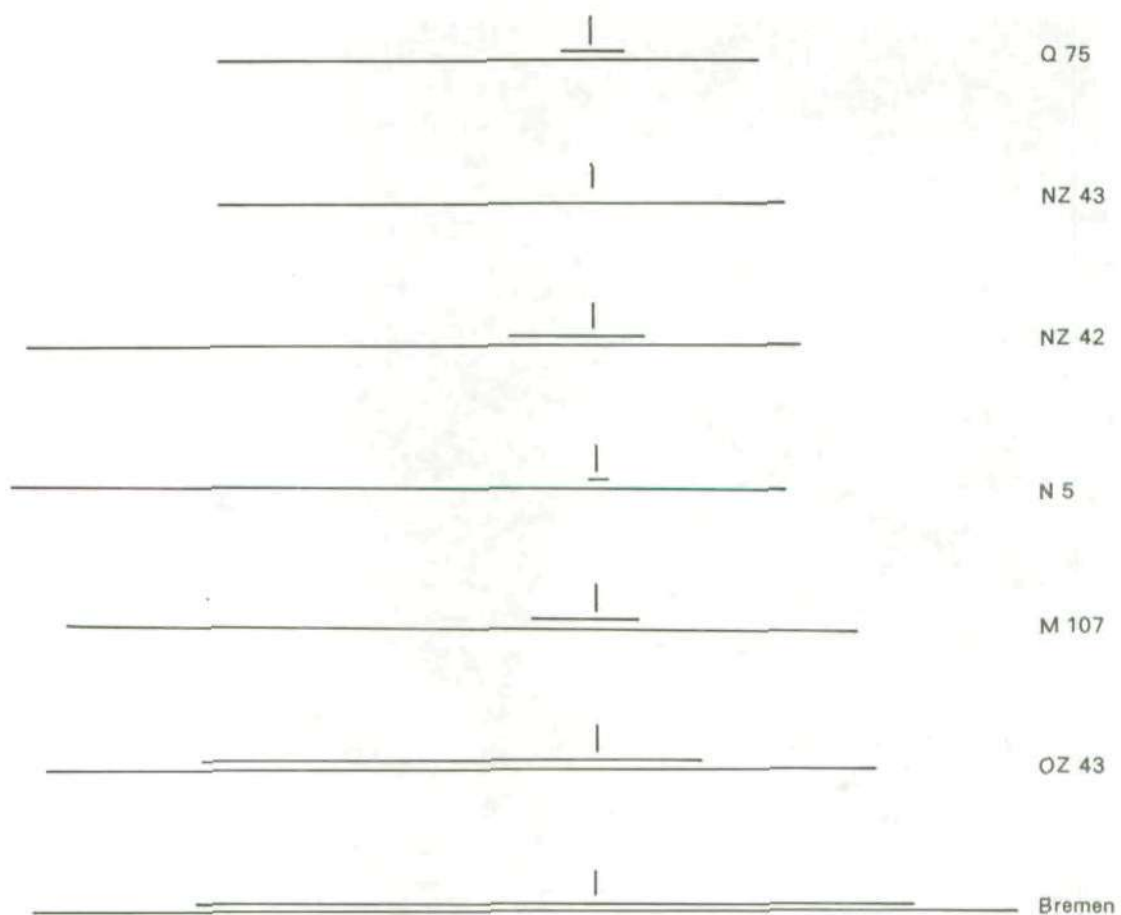


13. A. length/width ratio (bottom)
 B. length/width ratio
 C. width/depth ratio
 D. ratio between length and the distance amidships to maststep

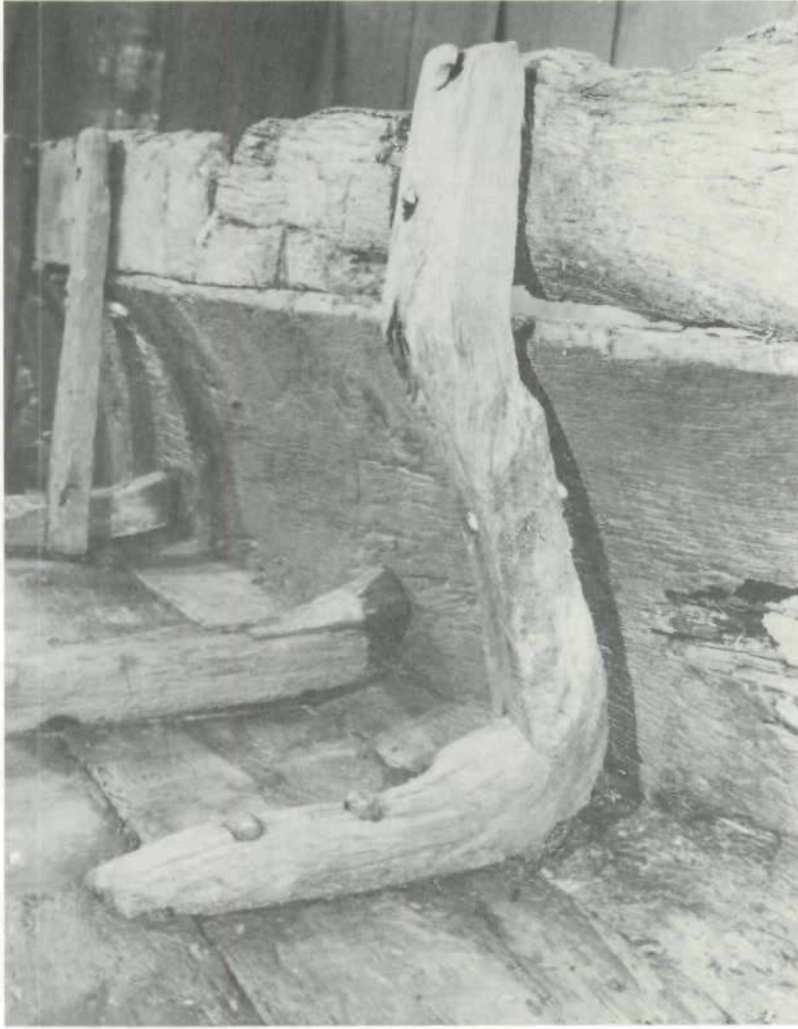
data need to be worked out and the datings of the IJsselmeerpolders-vessels need to be ascertained.

In the preceding pages, the term 'cog' has been used in the first place to stress the similarities in construction of the ships in question. Compared with the Bremen cog, the IJsselmeerpolders-vessels are small. It remains to be seen therefore, whether they deserve the name cog. Further investigation of written sources may give the decisive answer to this question.

Although it is somewhat precarious to estimate the dimensions of vessels depicted on seals, we suppose that in some cases they appear to be small vessels. The smallest IJsselmeerpolders-ships could be related for instance with the ship on the Genemuiden seal (Ewe, 1972) which is sharp fore and aft and has a flat bottom, a straight stem and stern with a stern rudder and low sides. The medium-sized ships may be related with the Kuinre seal. Illustrations of a cog with a heavy stem and stern beam as depicted on the Stralsund seal are not found on the seals of Dutch towns. The vessel depicted on the Harderwijk seal, which has a narrow beam against the stem, can be regarded as a predecessor of these ships. The illustration is comparable with the ship found at lot OZ 43.



14. Position of the mast



15. log vessel found near Mijnerswijk

4. Other medieval ship finds

In this publication, several characteristics have been discussed of a shipbuilding tradition of which the biggest representative is undoubtedly the cog. In the Netherlands, remnants of medieval vessels which do not belong to this tradition have been found as well. In most cases, the results of investigations into these ships have not yet been published, so that we will confine ourselves to a selection of ship-types, each with a brief description.

4.1. Log boats

Two vessels have been found in the city of Utrecht; the first one in 1930 (Ellmers 1972, 292) and the second one in 1974 (Hoekstra, 1975). Both vessels are composed of a dug out and expanded log as bottom, with on each side an extension of two planks connected by half a log (Reinders, 1979). The ship excavated in 1930 is dated to the 8th century and the other one to the 12th century. On grounds of their shape they have been called hulk. We have the impression that, as far as dating and naming are concerned, the matter isn't closed yet.

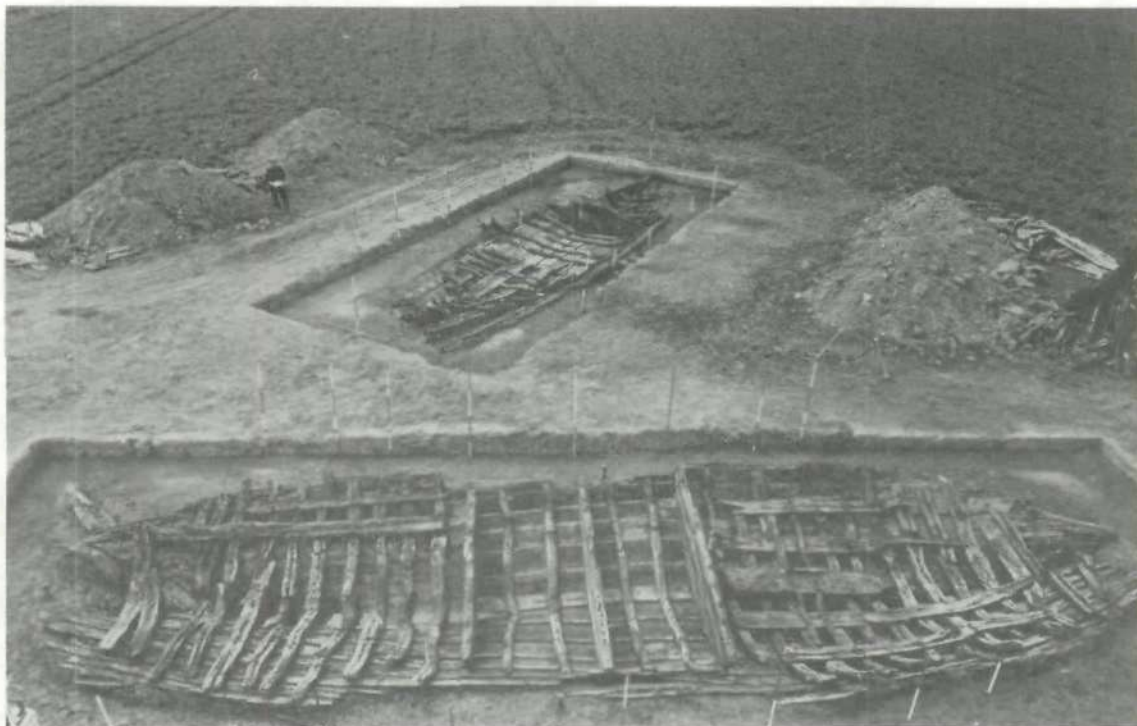
Another log vessel from the Rhine area was found in 1976 near Meinerswijk (Arnhem). It was one of three ships found in a sandpit. A fragment of 6 m was recovered, the rest of the vessel lies in the sandpit under water, covered with sand. An attempt will be made to recover the remaining fragments as well. The vessel consisted of two equal halves of a log, split along its longitudinal axis. After hollowing, the two halves served as sides. Three planks were inserted between these elements and two were fixed at the top of the sides. Bottom and sides were fastened to the floor timbers and side frames by trenails. The forward end consisted of three planks with an elevation of 55 degrees (Reinders, 1984).

It is clear that these log vessels belong to a different shipbuilding tradition from the cogs. They have, however, one element in common: the Meinerswijk boat had a caulking, consisting of moss, lath and sintels. This caulking method has also been found in other late medieval craft or fragments of boats, excavated along the rivers Rhine, Maas and IJssel.

4.2. 'Waterschepen'

About ten vessels of this type have been excavated in the IJsselmeerpolders. The 'waterschip' was a fishing vessel that occurs in written sources for the first time in the 14th century. At the end of the Middle Ages, the function of the 'waterschip' was to transport fish. In the 16th and 17th centuries it was used as a fishingboat and in the 18th century as a tug-boat, assisting large ships to pass Pampus, a shallow east of Amsterdam. After the Noordhollandskanaal was opened in 1823, the 'waterschepen' became disused and gradually disappeared from the Zuiderzee.

In 1978 and 1982, we had the opportunity to examine three late-medieval 'waterschepen', found in Flevoland at lots MZ 22 and NZ 74 (figure 16). They had overlapping planking of bottom and sides, fastened to each other with twice bent nails. Considering the shape and construction of these vessels, there is no essential difference between the late me-



16. Excavation of two 'waterschepen' at lot NZ 74 in Flevoland

dieval vessels and the ship models of the 19th century 'waterschip', with the exception of the hull: from the 16th century onwards the planking is flush-laid (Reinders, 1982).

Compared with the cog tradition, there is resemblance concerning the twice bent nails to fasten the overlapping planks, but instead of the flush laid bottom planking of the cogs, all the bottom and side planks of the medieval 'waterschepen' were overlapping.

4.3. 'Punter'-like craft

The 'punter' is one of the best known representatives of recent local craft in the Netherlands. It is a simple vessel without keel or plank keel. The bottom, consisting of three planks, slants upwards fore and aft, so that no stealers are needed. The sides are composed of one plank with in some cases a wash-strake sloping inward. The vessel has a straight raking stem and stern. The 'punter' is used as a multi-purpose craft on inland waters.

At different locations in the Netherlands, small vessels have been found which are similar to the modern 'punter' in many respects, although there are differences too. Examples are the boats investigated near Meinerswijk (Reinders, 1983) and Hellendoorn (Vlierman, 1981). Similar boats have been found in the IJsselmeerpolders as well; they have been investigated but the results have not yet been published. The number of planks of bottom and sides in these ships is variable. None of these boats has been dated with certainty, but they are thought to be late medieval vessels.

These small vessels without keel or plank keel were obviously meant for use on inland waters. They show no relationship to the cogs, though some of them had a caulking of moss, lath and sintels.

4.4. *Clinker-built cargo vessels*

We have noted that bottom and sides of the late-medieval 'waterschip' were completely clinker-built. The planks are fastened with twice bent nails. In the IJsselmeerpolders, only two medieval ships have been found with overlapping planks fastened with rove and rivet. The results of these excavations have not yet been published. These vessels have a strikingly large number of narrow overlapping planks.

Rove and rivet, and overlapping planking of both bottom and sides set these vessels apart from the cogs. Besides, stem and stern posts were placed at the ends of the keel.

This short survey is by no means complete. Vessels have been found which do not fit into any one of the categories mentioned above; for example two totally different ships with a flat bottom, hard chined, have been found at lots B 55 and K 73 in Flevoland (Reinders, 1980).



17. Excavation at lot OZ 36 in Flevoland

Summary

In the IJsselmeerpolders, medieval vessels or fragments have been found which in construction resemble the Bremen cog. Preparatory to the investigation in 1983 of a cog at lot OZ 36 (figure 17), all data gathered from previous excavations, showing cog-like characteristics, have been studied. A comparison was made of the following elements:

- plank keel,
- hooks and posts of stem and stern,
- strakes of bottom and sides,
- fastening of bottom and side planking to stem and stern,
- fastening of the overlapping planks,
- caulking method,
- scarfs,
- construction of the maststep,
- cross-beams.

With the exception of the last two elements, the vessels show great resemblances, which leads us to assume that they belong to one and the same shipbuilding tradition.

As to the dimensions, the differences between the ships are considerable, which raises the question whether the name 'cog' is applicable to all the ships concerned. It is possible that the differences in dimensions, shape, and position of the maststep, are related with the differences in function and rigging.

In this stage of the investigations it is not yet clear whether the differences between the vessels can be explained from the development of the cog during the 13th and 14th centuries. First we need to have more certainty about the dating of the IJsselmeerpolders-ships.

Yet other types of late-medieval vessels have been found in the Netherlands which in construction and shape differ from the cogs, such as logboats, 'waterschepen', 'punter'-like vessels and clinker built cargo vessels.

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Appendix 1.

Appendix 1. Provisional dating of the cog-like vessels, mentioned in this report

Shipwreck	1250	1300	1350	1400	Remarks
Flevoland OZ 43		┌───┐			Sherds
Noordoostpolder Q 75		┌───┐			Soil survey
Noordoostpolder A 57		┌─────────┐			Sherds
Flevoland N 5			┌───┐		Pottery
Flevoland OZ 36			┌─────────┐		Sherds, coin
Flevoland NZ 42				┌─────────┐	Sherds, shoe
Noordoostpolder M 107				┌───┐	Pottery
Bremen Cog					Tree ring samples*
Noordoostpolder R 1					no artefacts
Flevoland NZ 43					no artefacts

*Liese 1965