

Late Roman Rhine vessels from Mainz, Germany

Olaf Höckmann

Römisch-Germanisches Zentralmuseum, Ernst-Ludwig-Pl. 2, D-55116 Mainz, Germany

Some late Roman Rhine river craft were excavated in the winter of 1981–82 on a construction site in the city of Mainz, founded 2000 years ago by the elder Drusus as the two-legion fortress of Mogontiacum, later to become the capital of the province of Germania Superior. The hurried rescue excavation, directed by Dr G. Rupprecht, resulted in the wholesale removal of larger parts of five hulls still *in situ* on their gravel beds (Rupprecht, 1984: 11–24). They were cautiously dismantled, documented, and studied during the following years, under my supervision. Up to now the timbers have only been stored under water but they are now at last being treated. It is intended to put them on display as they were found in the new Museum of Ancient Shipping (Museum für antike Seefahrt), together with a full-scale reconstruction each of the two boat types represented.

The excavation site forms part of a Roman river port consisting of at least two basins, formed by wooden jetties jutting out from the Roman riverbank at a more or less right angles (Fig. 1) (Höckmann, 1986: 370 ff., figs 3,4). It

lies in front of the Late Roman city wall, right opposite one (of two) outlets of the largest tributary of the Rhine, namely the River Main. Taking into consideration that river ports of a 'basin' type seem to have some military (naval) connotation (Höckmann, 1986: 377 ff.; Petrović, 1991: 297) the Mainz site (named locally 'Brand' or 'Löhrstrasse') was probably chosen for stationing a flotilla of river warships which would be able to block the River Main outlet, only 700 m distant, against German boats at shortest notice, so protecting the provincial capital against surprise attacks. There exists scattered evidence of other Roman harbour installations of different types stretching along the bank of the Rhine for about 3 km (Höckmann, 1986: 375 ff., fig. 5). Naval shipsheds (*navalia*) are also mentioned in three inscriptions (Herz, 1985: 425; Höckmann, 1983: 425; 1986: 380). The *navalia* have not been found yet, but according to local topography they may, appropriately enough, be situated next to the Boat Museum, in its very subsoil. In the Middle Ages builders' yards were concentrated in this 'Vilzbach'

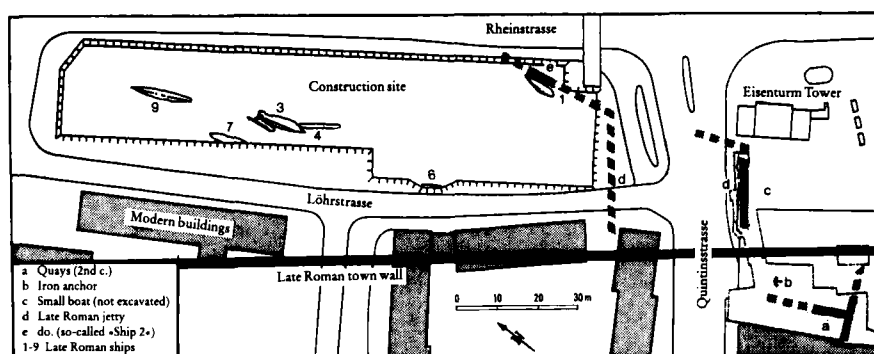


Figure 1. The river port at Mainz—'Brand' ('Löhrstrasse'). The original quay-and-jetty type harbour of the 2nd century seems to have been filled in for building the town wall (after AD 260). The jetties NE of the wall (above) are Late Roman.

quarter (Schwarz, 1929: 61). Mainz seems to have been a central harbour town, to be likened to Roman London. This finds its explanation not only in the River Main outlet but even more in the fact that it is situated midway on the navigable course of the Rhine from Bâle in Switzerland to the North Sea. Such a place would have been considered special for military and commercial shipping alike.

This is substantiated by hints at warship construction during the first two centuries AD^[1]. There can be no doubt it also went on in Late Roman times, although no naval yard site has been identified. However, this is not at all surprising, as building yards in antiquity were ephemeral, and archaeologically inconspicuous. The late E. Hollstein, the dendrochronology expert serving the Mainz excavation (Hollstein, 1984: 117), considered the 'Löhrstrasse' site to be a building yard. Woodworking tools were actually found (Witteyer, 1982), and innumerable oak wood shavings. Indeed, all the boats consist exclusively of oak, as do the London ones and the many prams of Zwammerdam type. But taking into consideration that 'Ships' 3 and 5 form parts of the same hull, separated lengthwise by hacking through the floor timbers next to the chine, and that 'Ship' 4 is not another vessel but a portside aft section of the side of a boat otherwise lost, neatly sawn out of the shell, there can hardly be any doubt that the site should be seen not as a builder's, but rather a breaker's, yard. The former naval port will probably have been so converted after the occupation of Mainz by the confederation of Vandals, Suebi and Alans in AD 406 (Höckmann, 1986: 414) that put an end, for some time at least, to Roman rule in this part of Germany. All the other hulls have been found not to be in working order either. All those elements which could easily be removed and used elsewhere (such as masts and rigging, anchors, thwarts, oars and rudders) were not present in any of the hulls. Moreover, on top of the Ship 4 section, apparently covered by at least 0.3 m of water, a fisherman had hidden his working gear (Höckmann, 1982a: 69).

The boats themselves have been published in a number of preliminary reports and not only in German (Höckmann, 1982a,b,c; 1983a,b; 1984; 1985: 142; 1986: 392 ff.; 1988; 1991a,b), so a short description here will suffice. As mentioned before, all hulls consist of oak; beech ceilings in

Ship 4 are the only exception (Hollstein, pers. comm.). The strakes, sawn to less than 25 mm thickness, are not connected to each other in the Mediterranean mortise-and-tenon fashion; they actually are far too thin for that. They are nailed to the frames instead. Since the whole construction is evidently aimed at as light a weight as was feasible, this kind of carvel construction should not perhaps be understood as 'Celtic' heritage, as in the case of the Blackfriars and New Guy's House boats from London, the Guernsey ship and the Zwammerdam type prams. They all feature strakes double the thickness of the Mainz ones, which would have offered themselves to mortise-and-tenon joinery: its absence in these cases may be taken to be a deliberate choice. At Mainz this seems not to be so, but has been imposed by the general light-weight style of construction. These are the reasons why the 'Mainz carvel' shipwrightry was initially interpreted as indicating frame-first construction. This interpretation is no longer valid (see below).

Strakes are fastened to frames by clenched iron nails of rectangular cross section (Höckmann, 1991b; Weiland & Bunge, 1991), as in all of the above-mentioned 'Celtic' boats. They thus had been thought to be an element of 'Celtic' stock. Since such iron nails were found in the wrecks of Gela in Sicily (Freschi, 1988) and Ma'agan Michael in Israel (Linder, 1989; Rosloff, 1989; for later evidence, see Frost *et al.*, 1976 [1981]: 132 ff.; Höckmann, 1983: 414 ff.) both dated about 500 BC, there will be reason for putting their 'Celtic' origin into doubt. Rather, this building technique seems to form a special strand of Mediterranean building tradition, and it now seems to be connected with Punic/Phoenician or Italic (Etruscan?) practice, rather than the Graeco-Roman one.

When the Mainz hulls were dismantled there appeared as well a number of round drilled holes which had been closed by wooden pegs. They were found on the keels as well as in the strakes, but hardly ever in frames. Most of them had originally been covered by frames, becoming visible only after the latter had been removed. This leaves no doubt that they played their part in a building phase prior to the insertion of the (final) frames. Until now there has appeared no better explanation than that the pegged round holes relate to a temporary fastening of the strakes to moulding frames, later removed and

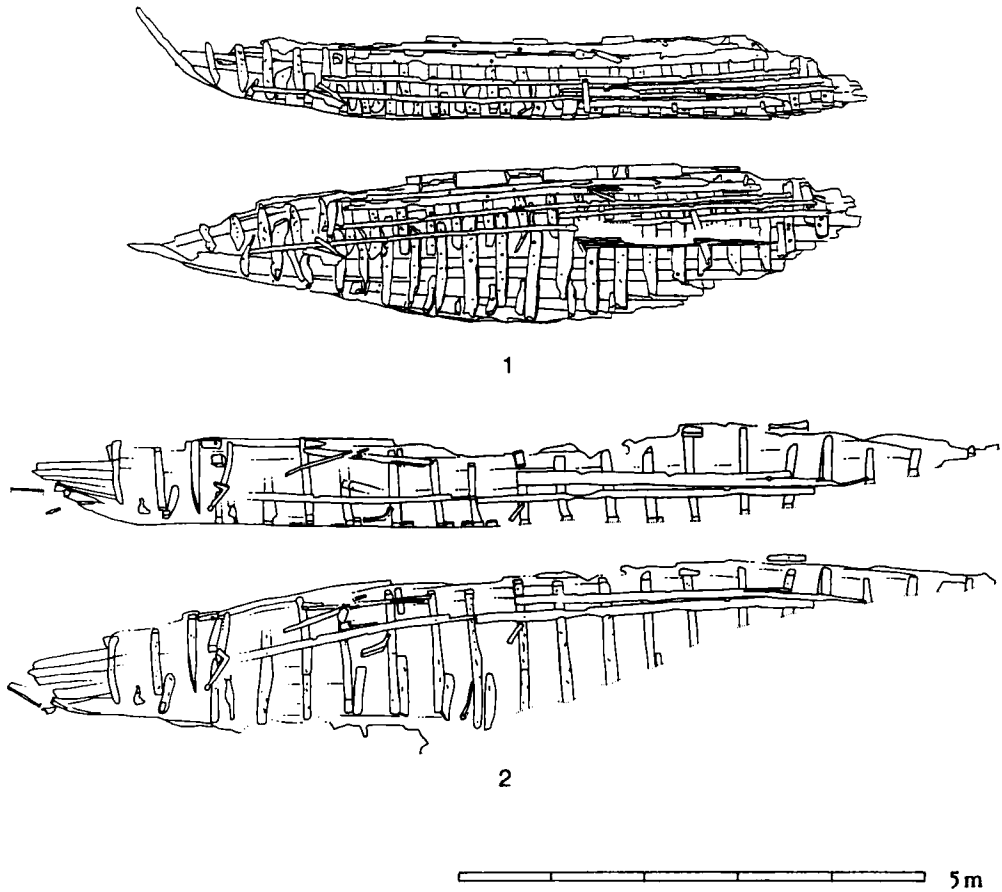


Figure 2. No. 1, Ship 1 (Type A); no. 2, Ship 7 (Type A). (Based on *in situ* photograms provided by W. Boehler.)

replaced by final frames. I now would suggest that the Mainz boats' construction began, as it were, by a 'moulding-frame-first' to create, and temporarily hold together, a plank shell which then could be treated in the same way as a Mediterranean-style mortise-and-tenon joined shell into which final frames were inserted, eventually replacing the original moulding frames (Höckmann, 1991a: 54).

There are conspicuous connections between the placings of the final frames and those of tracing lines neatly cut into the inboard sides of the keels. With few exceptions they make right angles with the centreline. There is no doubt that these tracings are to be connected with the placing of the final frames, but hardly ever is a frame neatly centred on one of the tracings. In a couple of cases the final placing differs so

much as to leave the tracings exposed; these cases were already noted during the excavation (Höckmann, 1982b: pl. 19, 3; 1983: pl. 86, 3).

Distances between the intersections of floors and keels, or of the tracings, repeatedly come intriguingly close to measurements in full Roman feet (0.296 m) or significant fractions of them, implying that 'measure guidance' (de Weerd, 1987b,c; 1988a: 210 ff.; b) might have been applied (Höckmann, 1991a: 57). This will be the subject of another paper in this journal.

Among the five hull sections found, no less than four may be attributed to a single type of ship, Type A, that is, an extremely sleek oared vessel, about 21 m long, propelled by 15 oarsmen a side, but also equipped for sailing (Figs 2, 3 and 6, no. 1). In one case, a mast-step of Blackfriars type (Fig. 4, no. 1) has been preserved. Tholes are

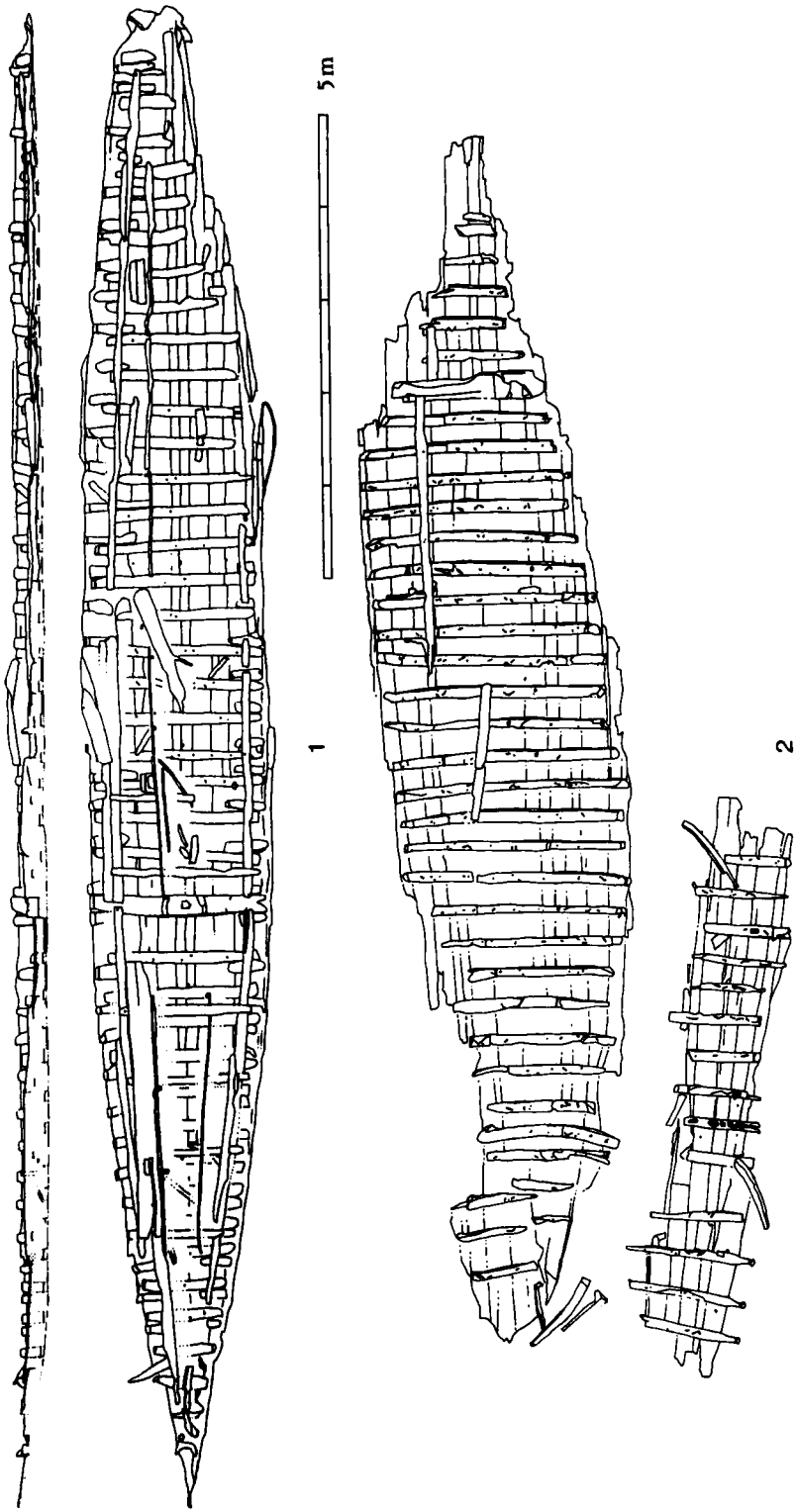


Figure 3. No. 1, Ship 9 (Type A); no. 2, Ship 3 (Type B). (Based on *in situ* photographs provided by W. Boehler.)

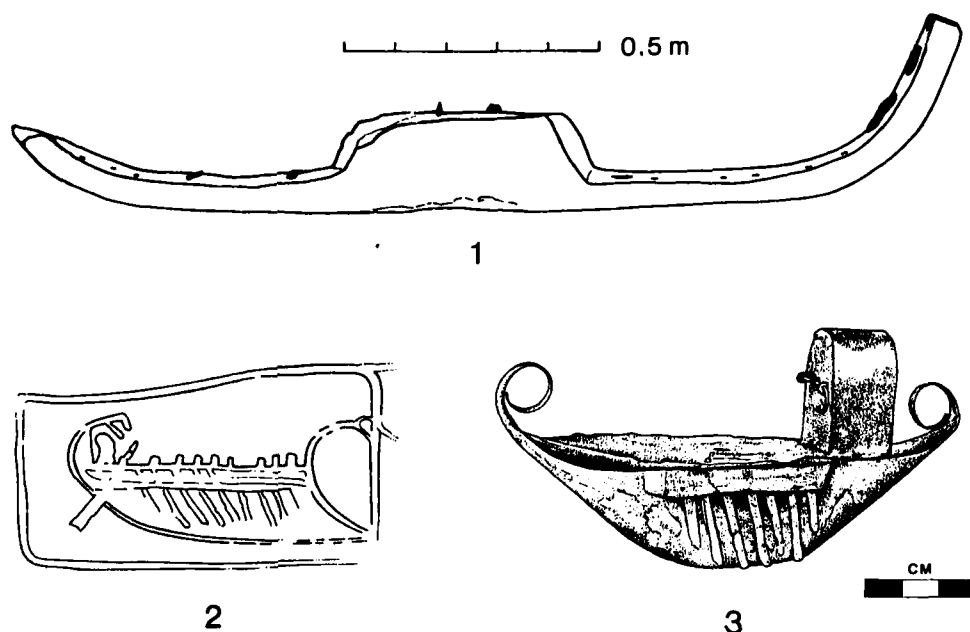


Figure 4. No. 1, mast-step of Ship 9, Mainz; no. 2, warship on a Late Roman brick-stamp from Mainz, signed by LEG XXII; no. 3, silver boat-model from the Late Roman hoard of Rethel, Ardennes, France. (Redrawn after Chew.)

arranged on the gunwale at a single level. There are no decks. The ships' sides are no higher than about 0.9–1 m, of which about 0.4 m is likely to have been immersed (see Dr Marsden's analysis, pp. 137–141). In Ship 1, traces have been preserved of what seems to be kind of a rack for holding shields^[2] or some other kind of cover for protecting the oarsmen against enemy missiles.

Although the proportions and measurements of all four hulls seem to be uniform, there are some individual features in their cross-sections and frame construction. They all have a flat bottom and a round chine of varying radius, and sides slightly rounded in cross section (Fig. 5, no. 1) or straight, as seems to have been the case in Ship 9 (Fig. 5, nos 2 and 3). A similar cross-section recurs on the Byzantine ship from Serçe Limani in Turkey (Steffy, 1991: 3 ff., figs 4 ff.). Their keels differ insofar as Ships 1, 4 and 7 have keel planks only 5 cm thick and 20 cm wide, whereas that of Ship 9, of the same width, is 9 cm thick, of trapezoidal cross section with rounded outboard edges (Fig. 5, nos 2 and 3). A central drain for the even distribution of the bilge water, which allows bailing at one spot, is cut into the inboard surface

of them all, with three V-shaped notches each in the lower sides of the floor timbers of Ship 3 augmenting its function (Fig. 5, no. 5). de Weerd (1988a: 300) and Arnold (1992: 71) relate the latter to a building tradition of sewn boats, as were common in the Adriatic from the 3rd century BC onwards, at least (Jurišić, 1983; Bonino, 1990: 35). The famous Late 'Celtic' or Early Roman pram from Ljubljana (Laibach) in Slovenia, being the earliest predecessor known of the Zwammerdam-type prams north of the Alps (Ellmers, 1971: 1, fig. 2; 1983: 158 f., figs 7.4, 7.6; de Weerd, 1988a: 299 ff., Arnold, 1992: 71), may serve as a perfect example of this Adriatic, i.e., non-'Celtic' kind of construction which might have been introduced to the Rhine area by the Romans (de Weerd, 1987a; 1988a: 284 ff.). It seems that the notches survived the original sewing technique for centuries after having been found to serve a useful role quite different from their original one.

Frames consist of central floor timbers and lateral futtocks, arranged towards the extremities with an overlap of 0.2–0.3 m, in Ships 1, 4 and 9 (Fig. 5, no. 3). There is no direct connection

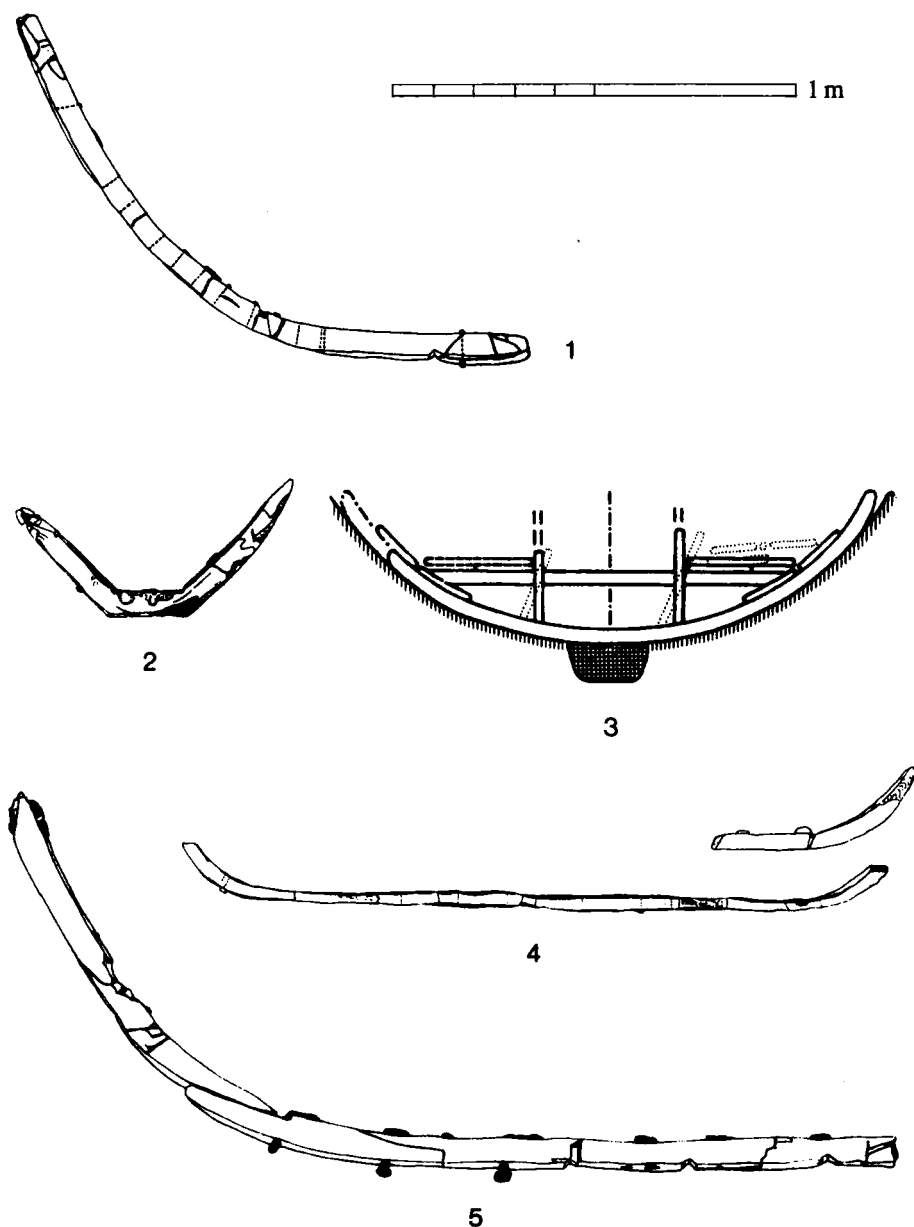


Figure 5. No. 1, half-frame A 16, Ship 7; no. 2, frame F 13, Ship 9; no. 3, Frame F 8, Ship 9, with sides of 'cargo compartment' (dotted *in situ* position) and supporting beam; no. 4, floor timber and foot of starboard futtock of frame A 1, Ship 9; no. 5, frame A 6, Ship 3, with three limber holes. All seen from aft. (No. 3 based on field drawing, the others based on laboratory drawings.)

between them. The construction may be likened to the paired half-frames of the Zwammerdam-type prams but for the angular chine of the latter. Ship 7, similar to the above-mentioned boats in

her measurements and shape, features pairs of half-frames instead, overlapping for most of the flat bottom (Fig. 5, no. 1). As opposed to this, the frames in Ship 3 of Type B (Fig. 5, no. 5) are

formed by components scarfed together in so flimsy a manner (the same nails serving to hold the parts together, and to fasten them to the strakes) that skeleton-first construction may safely be called inconceivable; a different procedure must be reckoned with.

In Ship 9 a mast-step of the Blackfriars type was preserved (Fig. 4, no. 1). The square depression for the mastfoot is somewhat inclined forward. Since this is normal with lateen masts, such a rig may be considered (see below).

Contemporaneous pictures of river warships on brick stamps from Mainz, signed by Legio XXII (not the Rhine fleet—*classis Germanica*, until now only known from the Lower Rhine) indicate bow silhouettes reminiscent of ramming prows (Fig. 4, no. 2). However, in the only case where a bow section was found, on Ship 9, it may unequivocally be stated that there cannot have been anything like a stempost. This hardly leaves any alternative to a box-like bow structure, probably looking like the brick-stamp boats in outline but structurally held together by two lateral fashion timbers rather than by a central stempost. Similar square bows are shown on Trajan's column in Rome^[3]. There is no hint whatsoever of a metal ram—there would hardly have been need for one when we consider that their German enemies had at their disposal vessels hardly larger than dugouts. For upsetting them a wooden 'ram' would have been more suitable than a metal one, always prone to getting hooked into its target.

Stern-posts there were, as shown by the Type A Ship 1 and 7 (Fig. 2, nos 1 and 2) as well as by Ship 3 of Type B (Fig. 3, no. 2). They inconspicuously ended at gunwale level, so offering a sight totally different from the towering *aplustria* of Mediterranean warships. Some Late Roman pictures of Rhenish warships, however, seem to indicate that high ornamental timbers were placed within the hulls (Höckmann, 1982b: 237; 1983a: 407 f., 426, pl. 92, 1–3), which in the end might have been hard to distinguish from a Mediterranean *aplustre* proper. Separate *aplustria* placed forward of the stern-posts are distinctly shown on the Danube warships on Trajan's column, already mentioned for their square bows. The Mainz boats, probably *lusoriae* (see below), surely contain prominent constructional features of earlier river *liburnae*, as Trajan's Danube boats are thought to be

(Basch, 1975: 215; Bounegru, 1987: 177 f.), as are earlier Roman Rhine warships (Bollini, 1977: 108, 111; Höckmann, 1986: 391). It is hard to find out the difference essential for distinguishing both types. Since *lusoriae* are first mentioned in Egypt as oared cargo boats (Casson, 1986: 333 f., 340), the crucially new feature of their Rhine warship version may have been the narrow 'cargo box' (see below).

The rudders, one at each side, were held in place by a transverse beam (*threnus*) about 2.1 m forward of the extremity. Its outer ends were supported by intricate constructions made up of curved timbers (Höckmann, 1991a: 56, fig. 1, no. 4) nailed to the outer side of the hull.

In view of their lightweight construction, their sleek lines and their propulsion by considerable numbers of oarsmen, there can hardly be any doubt that the Type A vessels were warships. The fact that they form 80% of the Mainz finds entitles us to interpret them as a kind of standard type. This conforms to Ammianus Marcellinus' testimony; when describing 4th-century warfare on the Rhine he always mentions one type of warship, namely the (*navis*) *lusoria*^[4]. Type A seems to be identical with this very *lusoria*. There is further support for this. In one incident during Julian's campaigns on the upper Rhine, near Mainz, the *lusoriae* perform a night landing on the enemy bank carrying not only the landing force of soldiers but also a good stock of palisade poles. There would have been a kind of hold for so cumbersome a load. Such a cargo compartment actually exists in all of the Type A hulls—a very narrow 'box' (German 'Kasten') with vertical sides (Fig. 5, no. 3) running almost from stem to stern though interrupted by the maststep (Höckmann, 1983: 409 f., fig. 3(b), pl. 86, 2). It seems to have been meant for stowing not only palisade poles but small amounts of other kinds of cargo as well. On the bottom of Ship 9 were found remains of a charcoal load, and some peculiar depressions on the inboard side of the keels of Ships 1 and 7 may eventually be connected with transport of limited numbers of amphoras. The ships thus would have been suited for supplying small garrisons such as those of the Roman watch-towers on the enemy banks of the Rhine and Danube (Höckmann, 1986: 382 ff., 397 ff., 399 ff.) acting as advanced outposts of the west bank forts where the warships were stationed for exacting permanent

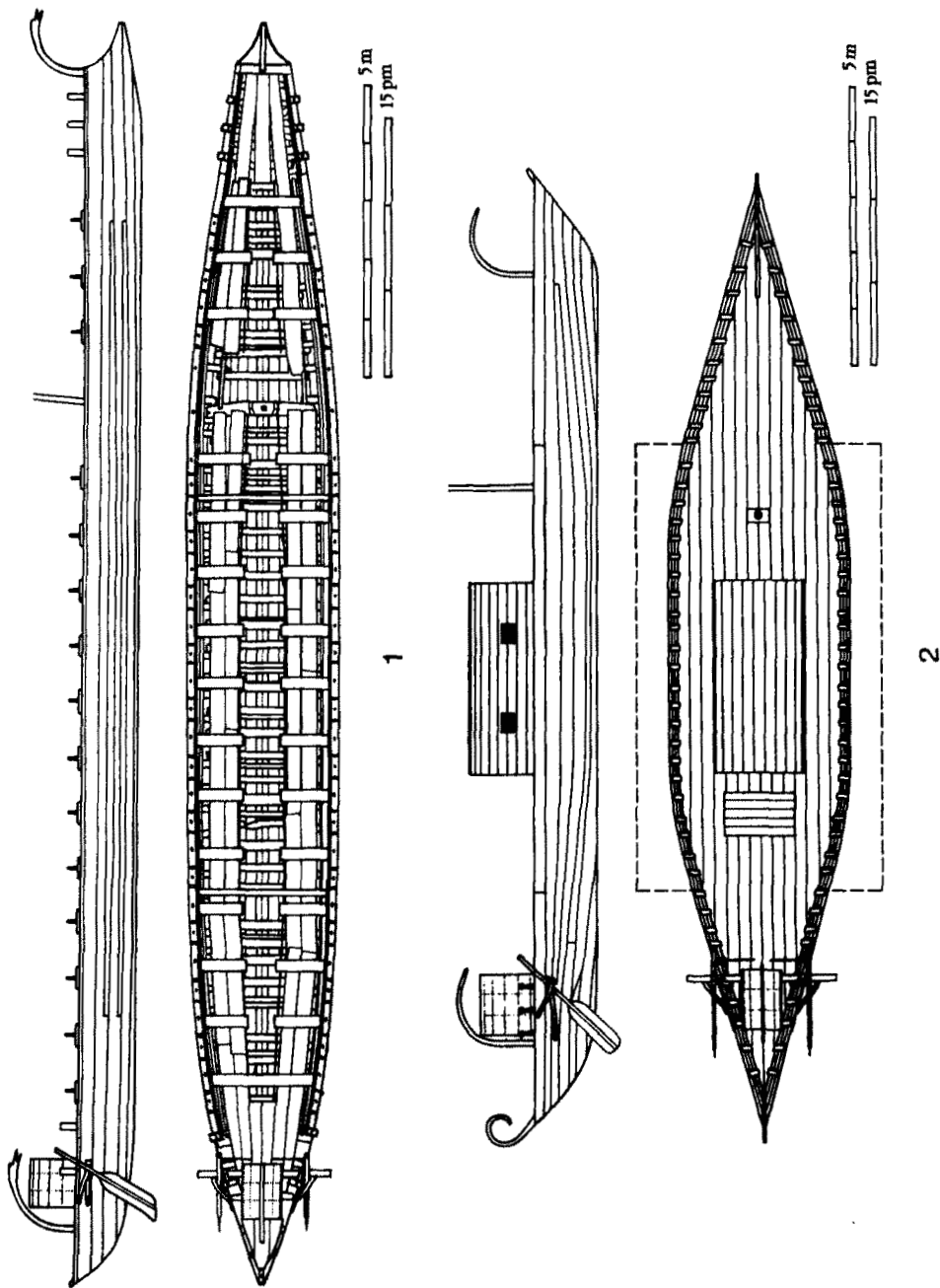


Figure 6. Reconstruction of a Type A lusoria, based on Ship 9; no. 2, reconstruction of a Type B iudiciaria/cubiculata, based on Ship 3. There will have been some type of outrigger, not indicated in the drawing.

control of the river. If need arose, the vessels had the means to fight enemy boats. The Mainz finds numbers 1, 4, 7 and 9 may thus be taken to be *lusoriae*, light and highly versatile warships of advanced design which may have been responsible for the Rhine (and Danube) frontier having protected the Empire for more than a century in spite of constant pressure by the German foe.

Type B, represented by Ship 3 (plus its starboard section, first separately numbered 'Ship 5'), differs widely from this. Ship 3 is shorter, wider, and less streamlined (Fig. 3, no. 2). Due to the advanced stage of dismantling internal features are hard to identify, but there can be no doubt that there were never thwarts for seated rowers. Since the ship is far too lightly built and not voluminous enough for a cargo boat, it may have been a (*navis*) *cubiculata*, also known by the Greek term of *thalamegos/gus*: a vessel equipped with a cabin (*cubiculum/thalamos*) for accommodating state officials during inspection trips^[5]. This type is first known from Hellenistic and Roman Egypt—another hint that nautical traditions of this country were transferred to the Rhine by the Romans. In support of this the Cologne tombstone of Horus Pabeci filius *proreta Alexandrinus* (CIL XIII 8322) may be named, an Egyptian rowing master—a Navy officer—who had served in the Rhine Fleet.

A silver model from the hoard of Rethel in France (Frézouls, 1983; Chew, 1988; Baratte, 1989) shows that the *cubiculata* type was known north of the Alps in Late Roman times (Fig. 4, no. 3), and in the early 5th century the *lex de lusoriis Danuvii* calls for the annual construction of ten *lusoriae* and four *naves iudiciariae*—literally 'judges' ships' (Kienast, 1966: 148 ff.; Höckmann, 1982c: 44). There can hardly be any doubt this is only a more specific term instead of a general one for *cubiculata/thalamegos*. If Ship 3 had been such a state vessel it would make sense that she was found in the naval port, together with the four *lusoriae*, despite not being a warship herself. Such a situation may also be inferred from a Cologne inscription of an army soldier who served as a 'boatman of the governor' (Galsterer, 1987: 86, no. 3).

The tentative reconstruction of Ship 3 (Fig. 6, no. 2) leans on the Rethel model, clearly showing a number of oars below the lower edge of an

appurtenance which might be taken to represent a Mediterranean-style oarbox in a vessel propelled by seated rowers. Ship 3, however, had no thwarts and is not beamy enough to place seated oarsmen by the side of the presumed cabin which could not have been narrower than about 1.5 m. A plank with traces of tholes placed further apart than in the Type A *lusoria* (numbered as 'Ship 8') was found unattached right between the two halves of Ship 3. Our view now is that it should be taken to have belonged to this vessel, forming a kind of outrigger. Together with the Rethel evidence, this might imply that there actually were rowers, however, not (warship-style) seated but rather standing ones. A Roman relief from Cologne^[6] shows that this style of rowing was known on the Rhine in vessels for which speed did not matter. The Cologne one seems to be a cargo boat. The outrigger is not indicated in Fig. 6, no. 2 since the poor preservation of the hull leaves open too many questions still unsolved about its construction.

It should be mentioned that in Ship 3, one half of a floor-timber-type mast-step was found. The square depression for the mastfoot, however, is in too poor a state of preservation to indicate if the mast had been placed upright (implying a square rig) or leaning forward, as seems to be implied by the forward angle of the mast-step in Ship 9, understood to indicate a lateen rig for the *lusoria* type. This kind of rig was already known in the Roman Imperial era (Casson, 1986: 243 ff.; Höckmann, 1983: 409, 420), and would have been useful indeed for the everyday commitments of the frontier guard boats. However, an oared vessel shown in the 'Oceanus' mosaic at Bad Kreuznach, near Mainz, dated not too much earlier than the Mainz boats (Höckmann, 1982b: fig. 1; c: fig. 1; 1983: pl. 86.4), has not a lateen rig but a high and rather narrow, square sail.

It was mentioned above that the conception of the emerging Mainz 'Museum für antike Schifffahrt' includes the presentation of full-size reconstructions of both types of vessels found. Some time ago Dr Peter Marsden asked me for data of my *lusoria* reconstruction for a computer analysis. He recently sent his results, and kindly agreed to present his findings here (pp. 137–141). Let me close by expressing my sincere thanks to him for his most interesting contribution.

Notes

- [1] The most important bit of evidence is formed by a mid-1st century AD grave stele of a shipwright from Mainz—Weisenau, showing a complete warship in a fairly detailed manner (to be published by its finder, G. Rupprecht; presented in a public lecture at Mainz, 6 October 1983). For major shipbuilding activities under Septimius Severus, see Herz, 1985. Generally also: Starr, 1941: 148; von Petrikovits, 1963: 29; Bollini, 1977: 108; Frenz, 1982: 78; Ellmers, 1983: 509 ff; Höckmann, 1986: 390.
- [2] Round shields seem to be indicated on a few of Postumus' countless warship coins, minted at Cologne in AD 260 (Bastien, 1967: pl. LIX, 373 n, s, v, w). Such shields are clearly shown on an aureus of Constantius Chlorus (Höckmann, 1983: pl. 92, 9), but they appear to be held by standing soldiers. Earlier, round shields are neatly arrayed on the gunwale of a Danube ship with an armed soldier at the helm on the Marcus Aurelius column at Rome (Petersen *et al.*, 1896: pl. 8); their careful arrangement differs radically from the shields (and other arms) heaped into two small boats on waggons (pl. 120), implying that they form part of the ship's regular equipment. Many Postumus coins (e.g., Höckmann, 1983: pl. 92, 3) show something like a 'raised gunwale' which seems probably to be a protective (leather ?) screen.
- [3] For such box-like bows see: Lehmann-Hartleben, 1926: pl. 38, nos 80, 82; 39, no. 86; Basch & Frost, 1975: 213 ff.; 212, fig. 18; 216, fig. 26; Bonino, 1975: 17, fig. 6 C; Viereck, 1975, 76; 297 Bild 39; Höckmann, 1984: 320, pl. 38; 1986: 395, pl. 51.4, 52.2; 1991: 58, 55 fig. 3.1.
- [4] Ammianus Marcellinus 17, 3.3; 18, 2, 12. It is uncertain if his 'medium-size fast ships' [17, 1.4] mean the same type. For the *lusoria* see Kienast, 1966: 137, 148 ff.; Höckmann, 1982b: 243; c: 40; 1983a, 432 ff.; 1986, 381, 392 ff., 406; 1991a: 59. Viereck's (1975: 75 ff) reconstruction as small boats with a complement of seven to eight men differs widely from the Mainz finds.
- [5] Frézouls 1983, 362 fig. 9 c; Höckmann 1986, 400; Chew 1988, 102 ff.; fig. 65–74; Baratte 1989, 172 no. 147; Höckmann, 1991, 62; 53 fig. 2, 6. As to *cubiculatae* in general: Kienast, 1966: 148; Casson, 1971: 341 ff.; Viereck, 1975: 76; 136; Höckmann, 1982b: 240, c: 44, 1991, 62.
- [6] Neu, 1982; 1989: 342 ff., figs. 136–140; Bechert, 1982: 183, fig. 230; Höckmann, 1985: 137, fig. 111; Arnold, 1992: 85, fig. e.

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