

POLYREMES FROM THE BATTLE OF ACTIUM SOME CONSTRUCTION DETAILS

During the past decade, our basic knowledge about ancient warships and the problems associated with ancient naval warfare has increased significantly because of two major developments. The first was the discovery, in 1980, of an intact bronze warship ram just south of Haifa (Fig. 1; Casson and Steffy, 1991). The second, was the successful completion of the *Olympias*, a full scale working model of a Classical trieres or “three” (Morrison and Coates, 1986 and 1989). I would like to discuss with you a third development that occurred during this same period - a discovery, really - that provides excellent data concerning the design, the size and perhaps even the function of polyremes (πολυήρεις), or super galleys, ships for which we have a notorious dearth of physical information. Specifically, this discovery provides us with reasonably accurate bow dimensions from the largest classes of warships that fought in the Battle of Actium.

Most everyone here knows that the Battle of Actium was the last great sea battle of antiquity. It was fought on September 2nd in 31 BC, off Cape Aktion at the entrance to the Ambracian Gulf (Fig. 2). Octavian, at the head of a Western fleet, decisively turned back an attempt by his rival Mark Antony to lead an Eastern fleet toward Italy. The battle is significant in naval terms because it marked the last time that large warships like “sixes”, “sevens”, “eights”, “nines”, and “tens” were used in significant numbers as ships of the line, something which had been a prominent feature of Hellenistic naval warfare. The sources unanimously explain that Antony, who had the advantage over Octavian in these large classes, lost the battle because his ships were too big and heavy to fight effectively against the smaller, faster and more manoeuvrable ships of the Western fleet (see Murray, 1989, 3). Antony’s large ships proved to be such a liability on September 2nd, we might well ask if their design and function were similar to vessels of the same class that had performed so well a few centuries before. Let us defer this question for a moment and consider, instead, a few events that followed soon after the battle.

Quite naturally, when Octavian realized that this battle was the pivotal event in his final rise to power, he built memorials to glorify his victory at Actium. On the site where his army camped, he founded a Victory City which he appropriately called Nikopolis (for the sources, see Murray, 1989, 4-5). To the south, on Cape

Aktion, he dedicated a massive “Greek-style” memorial (Murray, 1989, 115-16), a set of whole warships which included one from each class that had fought in the war (Strabo 7.7.6). The most important memorial he reserved for the site of his own camp, overlooking the sanctuary where the new Actian Games were held. A half-dozen ancient writers refer to this place and describe it as having some sort of open-air shrine and a display of warship rams (for a list of sources and discussion of the problems, see Murray, 1989, 9-12). Dedicated in 29 BC as the first official monument of the new city, it was clearly intended to be impressive - it was, after all, the official victory monument of the Victory City. Miraculously, the ruins of this memorial have survived, and preserve, in the face of a long retaining wall, the sockets which once held Octavian’s ram display (Figs. 3 and 4).

In 1980, the key needed to unlock the secrets of the sockets was pulled from the sea floor just south of Haifa by members of Haifa University’s Center for Maritime Studies. I did not see this impressive ram until 1983, but when I did, I recognized that its sectional shape would help to explain the function of the sockets at the Nikopolis memorial (Figs. 5 and 6). At the time, I even had hopes that the weapon might correspond in size to one of the preserved cuttings. In 1986, with the cooperation of the Athens Archaeological Society and Professor Photios Petsas, the site’s most recent excavator, I examined the details of the sockets, and recorded their dimensions and interior contours. I was not prepared for the wealth of information that I found. Even now, I am amazed by it. Let me show you a few of the details.

Once we had cut down the weeds in front of the retaining wall, we could see that 23 sockets still pierce the face of the wall (Fig. 7). The spacing of the sockets showed that originally there had been 33 to 35, but two have perished with the collapse of a 5 meter stretch of wall east of socket 18, and 8 to 10 have disappeared with a 15 meter stretch of wall east of socket E (for the evidence, see Murray, 1989, 55-57).

A quick glance at the sockets reveals that they are of different sizes and are generally arranged in a progression, large to small, from west to east or from left to right as you look at the wall (Figs. 8-10; for a complete presentation of the evidence, see Murray, 1989, 22-61). The rams were fit into their respective sockets in a very specific way, and this is where the most important information is preserved. A comparison of the Athlit ram’s casting (Fig. 5) with a well preserved socket like Number 13 (Fig. 10) shows what was involved. First, the timbers inside each ram were either trimmed back or removed to reveal the casting’s hollow interior (Fig.

11). Next, the ram's tailpiece was cut off, if any of them had one (and they probably did not). In this state, the ram was positioned next to the wall, which was constructed to the level of the second course blocks. At this point the masons prepared to carve the grooves of the sockets' bottoms in the blocks of the second course.

Note that the ram's exterior width increases from front to back (cf. Fig. 5, top view and Fig. 11), and for this reason, the width of Section B is greater than that of Section A. Because the ram is inserted into the socket from the front side of the wall, the exterior width of the socket's groove (Fig. 8 at B) must be as wide as the exterior dimension of the ram at Section B. But since the bronze of the ram-casting flares inward from the trough ears toward the weapon's head (cf. Fig. 5 for the terms), the interior width of the socket's groove (which will be inside the ram-casting; Fig. 8 at A) must accommodate the interior dimensions of Section A. The width of the cut groove in each socket is defined by the difference between the exterior width of the casting at Section B and the interior width of the casting at Section A. Once these dimensions were transferred to wall, the lower portion of each socket was then cut into the appropriate blocks of the second course. The rams were then pushed back into place with their bottom plates and troughs sliding into the carved grooves in the second course.

Because the blocks of the third course were cut with backward flaring grooves (Fig. 12), they must have been cut away from the monument and then carefully maneuvered over the rams' cowls and down onto the top of the second course (see Murray, 1989, 57-59 for the details). This was done, presumably, to match the flare of the ram's cowls while reducing the width of the side grooves as much as possible. Even though such special care was taken to improve the "fit" of each ram in its socket, unsightly grooves must have remained visible to the left and right of each ram. It is likely, therefore, that the wall's surface was covered with a veneer of some sort to hide these grooves, and indeed, a few fragments of an appropriate veneer (thin slabs of gray-white marble, 0.011 m. thick) were found in scattered locations on the ram terrace next to the sockets.

We are now in a position to analyze the shapes and sizes of the sockets. Clearly the outlines of the sockets reveal that rams similar in shape to the Athlit example were mounted here. All the preserved sockets, however, are too large to accept a weapon as small as the Athlit ram (Fig. 13). Now ... what implications does this have for the design and function of the ships whose rams were displayed at Octavian's Campsite?

To answer this question, we must first determine the range of classes

displayed here. On this point, our evidence is clear. First of all, it is clear that we have here a δεκάτη, or tithe from the more that 300 rams that fell into Octavian's hands during the Actian War (for the evidence, see Murray, 1989, 137-41). Second, because of the special nature of this dedication - the official victory monument of the new Victory City - Octavian must have dedicated the most impressive display he was able to assemble; in other words, he would have displayed here the 33 largest rams that had fallen into his hands.

Now, what sizes were these? Again, the evidence is reasonably clear. Strabo (7.7.6) tells us that Octavian dedicated a set of complete warships at the nearby sanctuary of Apollo Aktios - one from each of the ten different classes that had fought in the war - a "one", a "two", a "three", and so forth up to a "ten". Unless Antony possessed only one "ten", and our sources imply otherwise, we are faced with the unavoidable conclusion that rams from "tens", "nines", "eights" and "sevens" (and perhaps from "sixes") were displayed on this monument. Since "sixes" and "sevens" were traditionally used by the Romans as flagships and viewed as being exceptionally large, I believe they offer a reasonable lower limit to the sizes displayed here.

Now, let us explore the implications of this likelihood. I have argued elsewhere that the Athlit ram comes from a "four" or a "five", and I still believe this to be the case (Murray, 1989, 95-114). I believe this for two major reasons: First, I am struck by the small size of the ram's timbers relative to the Nikopolis sockets (Fig. 13). Second, it is well known that the Romans suspended small rams from columns and walls as trophy monuments. Of the known rostral monuments built by the Romans with suspended rams, our evidence implies that rams from "threes" and from smaller vessels were included in the displays, but there was nothing from anything larger (see Murray, 1989, 110-13). Since I do not believe the Athlit ram could be suspended in this way, particularly from rostral columns depicted on coins of the period, I conclude that the Athlit ram must be larger than a "three".

Now, let us consider the timbers inside the ram. J.R. Steffy has recently published a full analysis of these timbers, and has demonstrated how the ram was carefully designed and constructed to deliver the blow of its ship as it absorbed and transferred the shock of the ramming maneuver to the structural timbers of the ship's hull (Casson and Steffy, 1991, 6-39). This was accomplished by the careful merging of the ship's bottom timbers - the keel, bottom planks and wales - into the ramming timber and thus, into the ship's "warhead". The heaviness of the wales and ramming timber are critical elements in the correct functioning of

this weapon, and for this reason, Steffy urges us to abandon the notion that warships built for ramming purposes were analogous to lightly constructed, modern rowing hulls. He calculates the weight of the Athlit hull as roughly one ton per meter of overall length and this is just for the hull (Casson and Steffy, 1991, 33). We might pause for a moment to consider the tremendous forces generated by a deliberate head-on collision between two 50 ton masses (a reasonable guess for the “fighting weight” of the Athlit ship) moving through the water at 7-8 knots. The moment of impact must have been frightening.

With this in mind, let us now consider the bows of the Actian warships. I present below in Table 1 a series of dimensions that will allow a meaningful comparison between the Athlit ram and the Actian rams once held by the sockets. The first two columns present the dimensions corresponding to the exterior of the ram-castings at the point where the wales enter the ram. The measurements have been taken from the interior back surfaces of the sockets in an attempt to recover as closely as possible the original height of ram’s trough, and indirectly, the height of the port and starboard wales.

The third column on the handout represents my attempt to place a dimension on the width of the ramming timber and wales. I found, after examining all the sockets and their cores (the uncarved central section of each socket that corresponds to the timbers inside each ram), that there was no way to be certain precisely where the wales stopped and the ramming timbers began (compare the timbers of Fig. 6 with the central “core” in Fig. 10). As a result, I combined these timbers into a unit which, for lack of a specific term, I call “the wale and ramming timber unit”. In the Athlit ram, this unit represents the exterior width of the weapon from ear tip to ear tip (Fig. 5). The massiveness of this unit should correspond directly to each ship’s ability to withstand the shock of the ramming maneuver.

DIMENSIONS FROM SOCKETS.

Note: The Athlit ram's casting has a thickness of approx. 0.01 m.; all measurements are in meters and include the thickness of the ram-casting.

<i>SOCKET #</i>	<i>STARBOARD WALE HEIGHT (=height of ram's trough)</i>	<i>PORT WALE HEIGHT (= height of ram's trough)</i>	<i>WALE & RAMMING TIMBER UNIT THICKNESS (= ear tip to ear tip)</i>
1	NA	0.55	1.38?
2	NA	0.58	1.50
3	NA	0.44	1.29
4	0.48	0.53	1.52
5	NA	0.63	1.23
6	0.58	0.53	1.31
7	NA	0.33	1.19
8	0.42	0.37	1.19
9	0.40	0.37	1.25
10	0.42	0.44	1.15
11	0.42	0.44	1.12
12	0.34	0.33	1.10
13	0.38	0.36	1.03
14	0.35	0.36	1.03
15	0.42	0.46	1.00
16	NA	NA	0.85? (from traces)
17	NA	NA	1.12? (estimated)
18	NA	NA	NA
A	NA	0.38	0.98
B	0.40	0.43	1.10
C	0.40	0.34	1.17
D	0.41	0.48	1.02
E	NA	NA	1.03? (estimated)
<i>Athlit ram</i>	0.24	0.24	0.76

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At this point, we can make some meaningful observations. Note that the height of the Athlit ram's trough, at 24 cm., is dwarfed by the troughs that once sat in the sockets at Octavian's Campite Memorial. The smallest examples (7, 12 and C, are still 10 cm. higher, while the largest example (5) is almost 40 cm. higher. This general impression is reinforced by the wale and ramming timber unit which, in the smallest examples (13, 14, 15, A and D) are 25cm. wider; in the largest examples (2 and 4), the unit is fully twice as wide as that in the Athlit ram.

What can we make of this? First and foremost, these massive timbers must be associated with functional ramming bows which could generate and withstand incredible amounts of energy and shock. Remember, following Steffy's analysis of the Athlit ram, the more massive the timbers in the bow, the more resistant the bow would be to damage in head-on collisions with other vessels. I think we can reasonably conclude that Antony's largest ships were designed to have an offensive ramming capability. I mention this only because it has been suggested recently that these rams may not have been functional weapons at all (Basch, 1990, 368). Secondly, I believe that these bows correspond perfectly with the surviving descriptions of Hellenistic super galleys in action. In authors like Diodorus, Polybius, Livy and Appian, we find that "sixes", "sevens", "eights" and "tens" employed their rams to great effect in the prow-to-prow ramming maneuvers that opened the naval battles of the late fourth to early second centuries B.C.

This is not the time or place to examine these texts in detail (I will do this elsewhere), but a few general observations are necessary in order to demonstrate the validity of my point. In 306 BC, for example, a sea battle was fought between Ptolemy I and Demetrius Poliorcetes off Cyprus. Diodorus (20.51.2-4) preserves a vivid description of the ramming maneuvers carried out by these big ships. He says that trumpets sounded the charge as both forces raised the battle cry and rowed toward each other. While still at a distance, πετροβόλοι threw stones, archers discharged their arrows, and javelin throwers launched their weapons. When the ships got close to contact, the oarsmen were urged to increase their stroke, as the deck forces crouched down and braced themselves for the impact of the collision. Some ships met prow-prow; others swerved at the last moment, shearing alongside one another snapping off oars. If two ships collided and the first blow was unsuccessful, they would draw back for another charge, while the soldiers on board resumed their volleys of stones, arrows and javelins. Diodorus explains that Demetrius defeated Ptolemy's right wing, and although Ptolemy had defeated Demetrius' left, he withdrew his forces because he was unable to match the *weight* of his opponent's attack (cf. 20.52.3: θεωρήσας ... ἔτι δὲ τοῦς

περὶ τὸν Δημήτριον μετὰ βάρους ἐπιφερομένους ἀπέπλευσεν εἰς Κίτιον).

Occasionally, when there was sufficient room, or when the chaos of battle forced ships into unexpected awkward positions, large classes like “eights” or “tens” also delivered broadside blows, although the results were not always what one might expect. A good example can be found in Polybius’ account of the conflict between Philip V and Attalus of Pergamon in 201 BC (16.3-9). The battle began when Attalus’ royal ship attacked an “eight” bow-on and sank it with one blow; the size of the attacking vessel is not given, but it must have been considerable enough to hope for success in a head-on encounter with an “eight”. Philip’s flagship, a “ten”, caught a swift trihemiolia with a broadside blow, but got wedged under the vessel’s thranite bench of oars and was unable to disengage (16.3.4). Stuck like this, the “ten” was put out of action by two “fives” who attacked her hull from both sides. We see from this example that ships of the line, like “fives”, could be effective against much larger ships if these vessels lost their momentum or were hindered in some way from attacking their enemies in the prow.

Although on one known occasion a Rhodian “four” sank a Syrian “seven” with a blow of the ram, the Rhodians clearly preferred to avoid the head-on attacks of these larger classes because they expected that their own lighter bows would not survive the impact. For this reason, they began to affix fire pots to their bows on long poles. At the Battle of Myonessus in 190 BC, when Rhodian “fours” took on the larger classes of the Syrian fleet, Livy (37.30.2.31.1) tells us that the Syrians held back from attacking the Rhodian prows for fear of this fire spilling into their bows. I find it very revealing that the Rhodians, in “fours”, feared for the safety of their bows when facing opponents who used “sixes” and “sevens”.

Now, let us return to where we began, namely, to the Battle of Actium in 31 BC. Dio Cassius (50.23.1-3) informs us that Antony purposefully built large ships in order to oppose Octavian. He says further that Antony built his vessels to carry lofty towers and large numbers of men, so that it would be as if his men were fighting from fortresses, not ships. I have long suspected that this explanation of Antony’s general strategy is inadequate, and until now, we had no way to challenge the statements of the surviving accounts. I believe, however, that the Actian prows show that Dio and others following the battle misunderstood Antony’s general strategy and based their conclusions on what happened at the end of the war when Antony was unable to take advantage of his superior fleet.

If Antony had truly wished to maximize his advantage by using “sevens”, “eights”, “nines” and “tens” in the final battle, then he should have engaged in

prow-to-prow ramming in order to drive back the line of Octavian's fleet. As the final naval battle approached, however, Antony's main concern was to withdraw from his camp inside the Ambracian gulf with as much of his naval force as possible. When he formed his battle line on the morning of September 2nd, he told the pilots of his fleet to anchor their boats at the mouth of the Strait and to maintain their order (Plut. *Ant.* 65.2-3). This passive opening strategy confirmed what deserters had told Octavian about Antony's intentions (Dio 50.23.3, 30.3-4) and doomed him to a complete defeat. When Antony chose to avoid a prow-to-prow opening attack, he also chose to ignore the advantage of his largest vessels.

Dio actually tells us this, although he puts it in a speech delivered by Octavian before the battle begins. Normally we tend to discount such speeches as Dio's creations, but this time, I feel he has based his version on a similar speech presented by Octavian in his own Memoirs. In other words, I believe that Dio's speech reflects Octavian's personal assessment of the battle (for Dio's reliance on a tradition going back to Octavian's Memoirs, see Murray, 1989, 143-51). Listen to what he says (Dio 50.29.1-4): "And surely you must not think that the size of their vessels or the thickness of their timbers is a match for our valor ... If their ships remain in the same place, as if fastened there, it will be possible for us to rip them open with our rams; it will be possible too to damage them with our engines from a distance, and also possible to burn them to the water's edge with incendiary missiles; and if they do venture to stir from their place, they will not overtake anyone by pursuing nor escape by fleeing, since they are so heavy that they are entirely too inert to inflict any damage, and so huge that they are exceptionally liable to suffer it".

Although the surviving battle descriptions are not particularly detailed, (Dio 50.31.4-6; Plut. *Ant.* 65.3-66.1; Orosius 6.19.10), they are unanimous in stating that Antony's ships never gained enough momentum to do any damage and lay exposed to attack by Octavian's vessels. We have seen that, in such circumstances, two "fives" are more than a match for a "ten". While the men on the decks of Antony's super galleys discharged their projectiles and fought off boarding attempts, Octavian's vessels worked in twos and threes to attack these ships and eventually put the big ones out of action. Elsewhere, the battle was fought between ships of roughly the same size, except that Octavian outnumbered his foe by more than 2 to 1. When it came time to glorify the battle, Octavian chose to emphasize the glorious attack of his "small" ships on Antony's super galleys (Murray, 1989, 131-51). He collected the rams from the largest of these ships and had them displayed at his campsite. And because the wall has survived on which they were mounted, we can finally appreciate the massiveness of the bows on these large classes of

warship.

In conclusion, I believe there can be little doubt that the Actian bows were intended to terminate in functional rams and that their massive design was derived from a need to survive the tremendous shocks of prow-to-prow ramming with other large units. I also believe that these first century bows fully fit the requirements of such vessels as described in conflicts during the late fourth, third and second centuries and, therefore, can be used to assess the polyreme as a frontal ramming machine. These vessels proved ineffective at Actium because their commanders either chose to follow, or, more likely, were forced to follow a plan that ignored the advantages of their design. In the years after Actium when Octavian faced no rivals who could afford to challenge his navy in prow-to-prow ramming, these large units were superfluous, and because they were expensive to maintain, they were decommissioned and never replaced. Thanks to Octavian's Campsite Memorial and the Athlit ram, we can once again marvel at the massive bows on these late Hellenistic super galleys.

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For the sake of brevity, I make frequent reference to my book (listed below) where the reader can find a more complete discussion of the problems involved and the relevant literature.

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ILLUSTRATIONS

1. The Athlit ram as it appears in the foyer of the National Maritime Museum (Haifa, Israel).
2. Map of Cape Actium area.
3. Octavian's Campsite Memorial: south retaining wall

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4. Octavian's Campsite Memorial: restored view (hypothetical) from the SE.
5. The Athlit ram: top and side views.
6. The Athlit ram: Section at A (cf. Fig. 5 for location of the Section).
7. Octavian's Campsite Memorial: site plan.
8. Octavian's Campsite Memorial: socket 4.
9. Octavian's Campsite Memorial: socket 8.
10. Octavian's Campsite Memorial: socket 13.
11. The Athlit ram: view of its interior with all the timbers removed.
12. Octavian's Campsite Memorial: socket 8 (note that the angles of the grooves in the third course, marked "3", are not perpendicular to the front face of the wall).
13. Comparative sizes of sockets 4, 8, and 13, plus a hypothetical

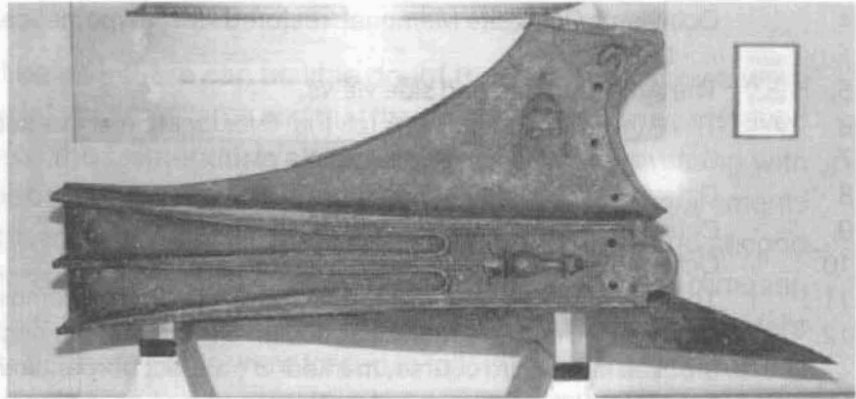


Fig. 1

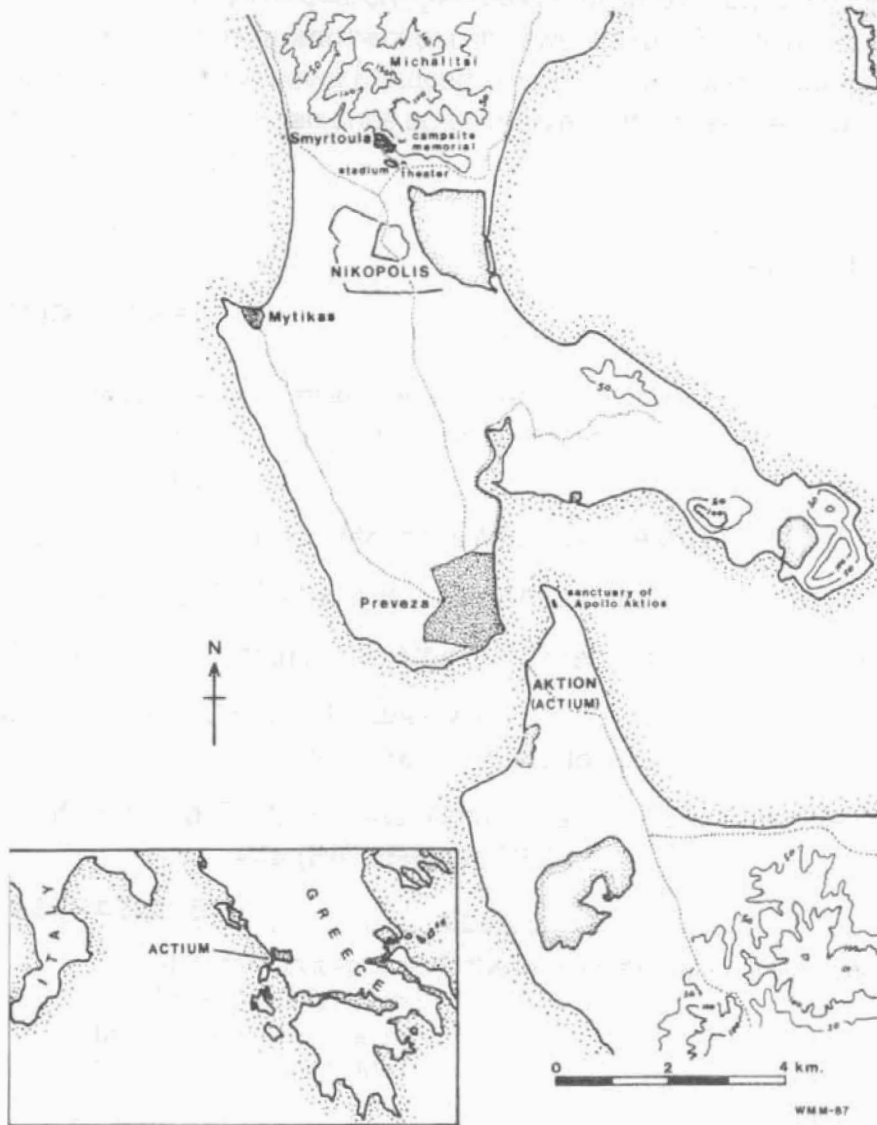


Fig. 2

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Fig. 3

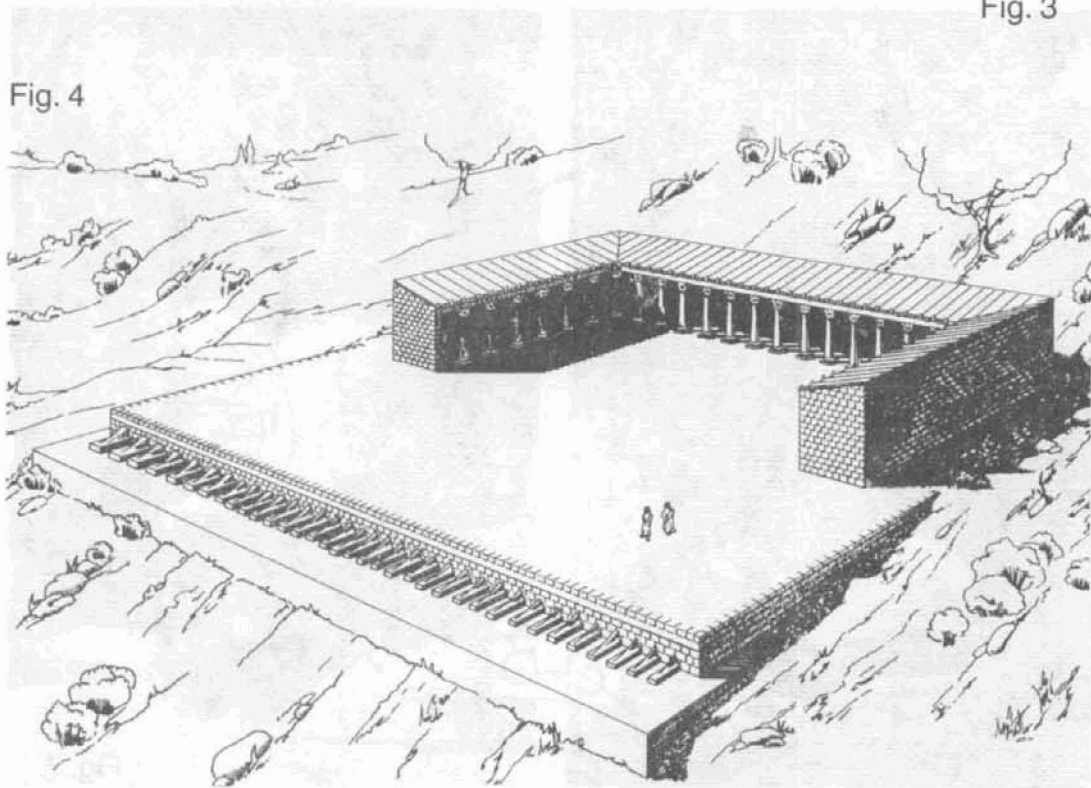


Fig. 4

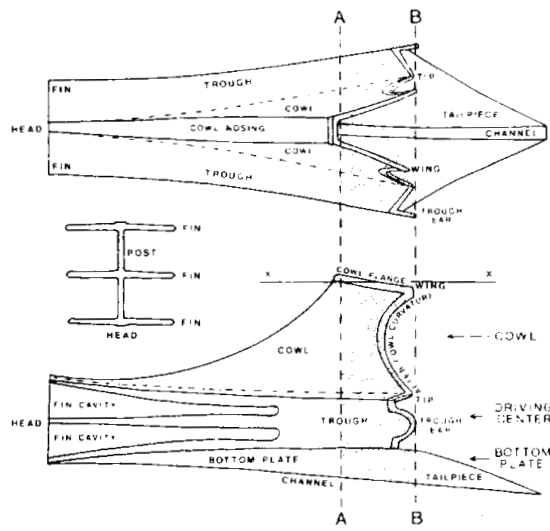


Fig. 5

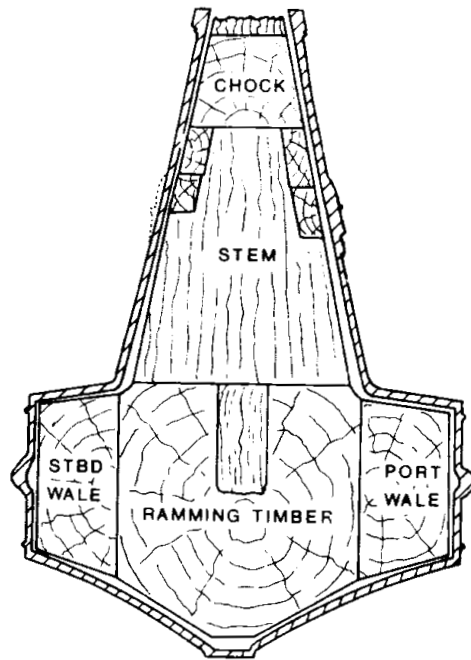


Fig. 6

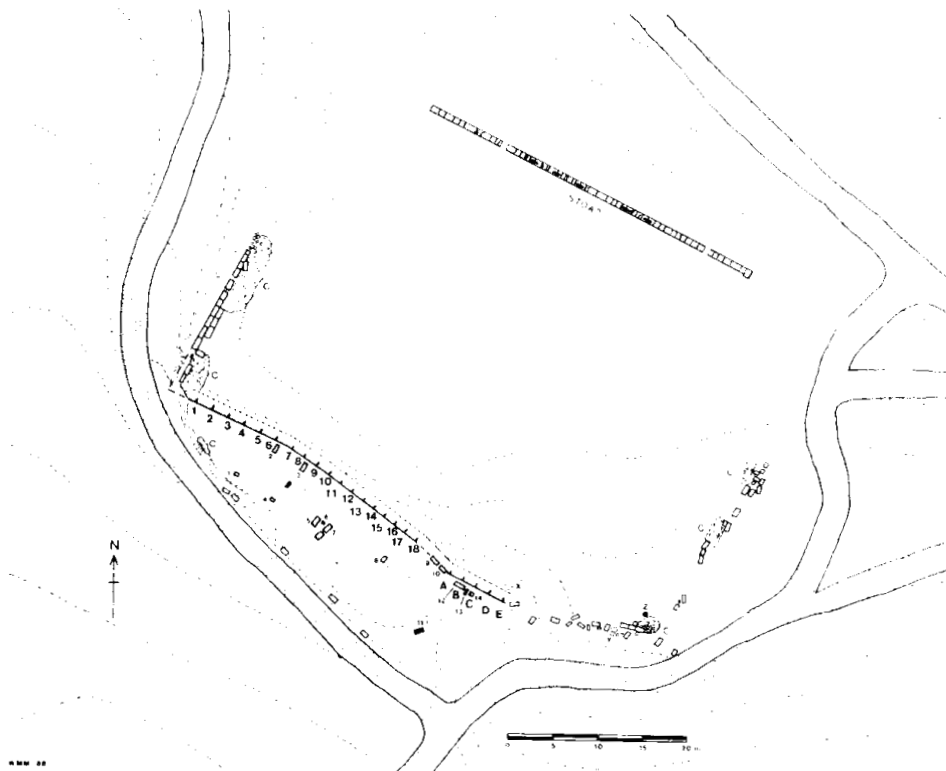


Fig. 7

POLYREMES FROM THE BATTLE OF ACTIUM
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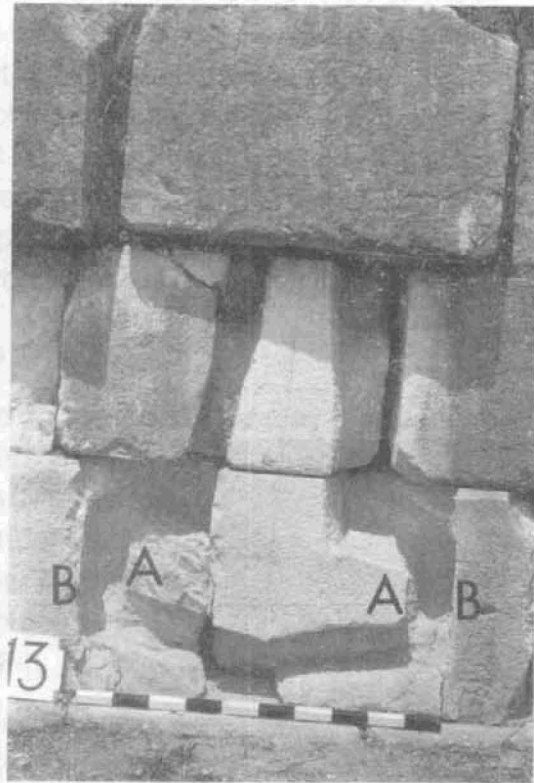


Fig. 8

Fig. 9



Fig. 10



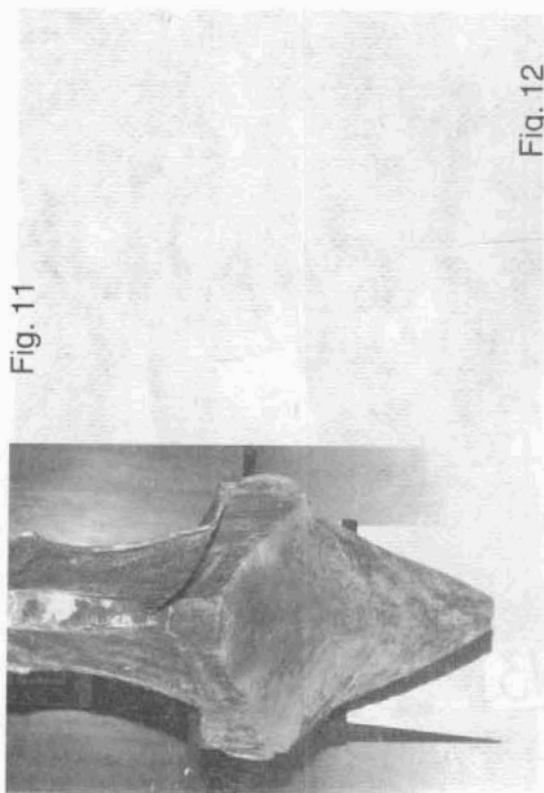


Fig. 11



Fig. 12

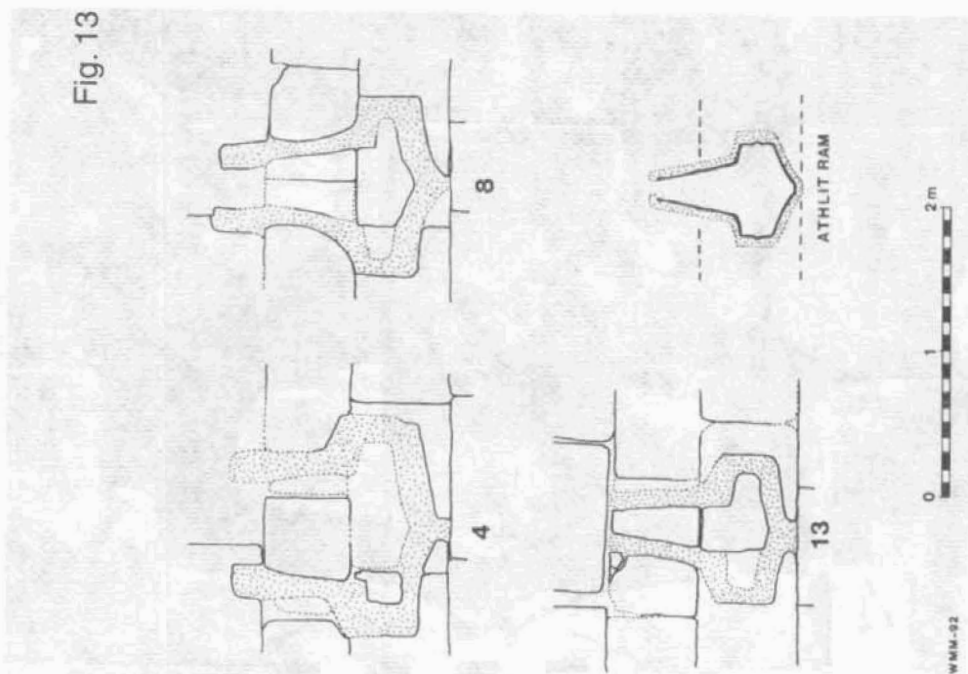


Fig. 13