ΤΡΟΠΙΣ V

TROPIS V

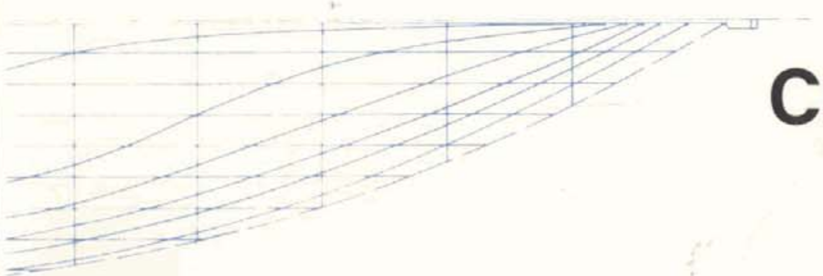
HELLENIC INSTITUTE
FOR THE PRESERVATION
OF NAUTICAL TRADITION

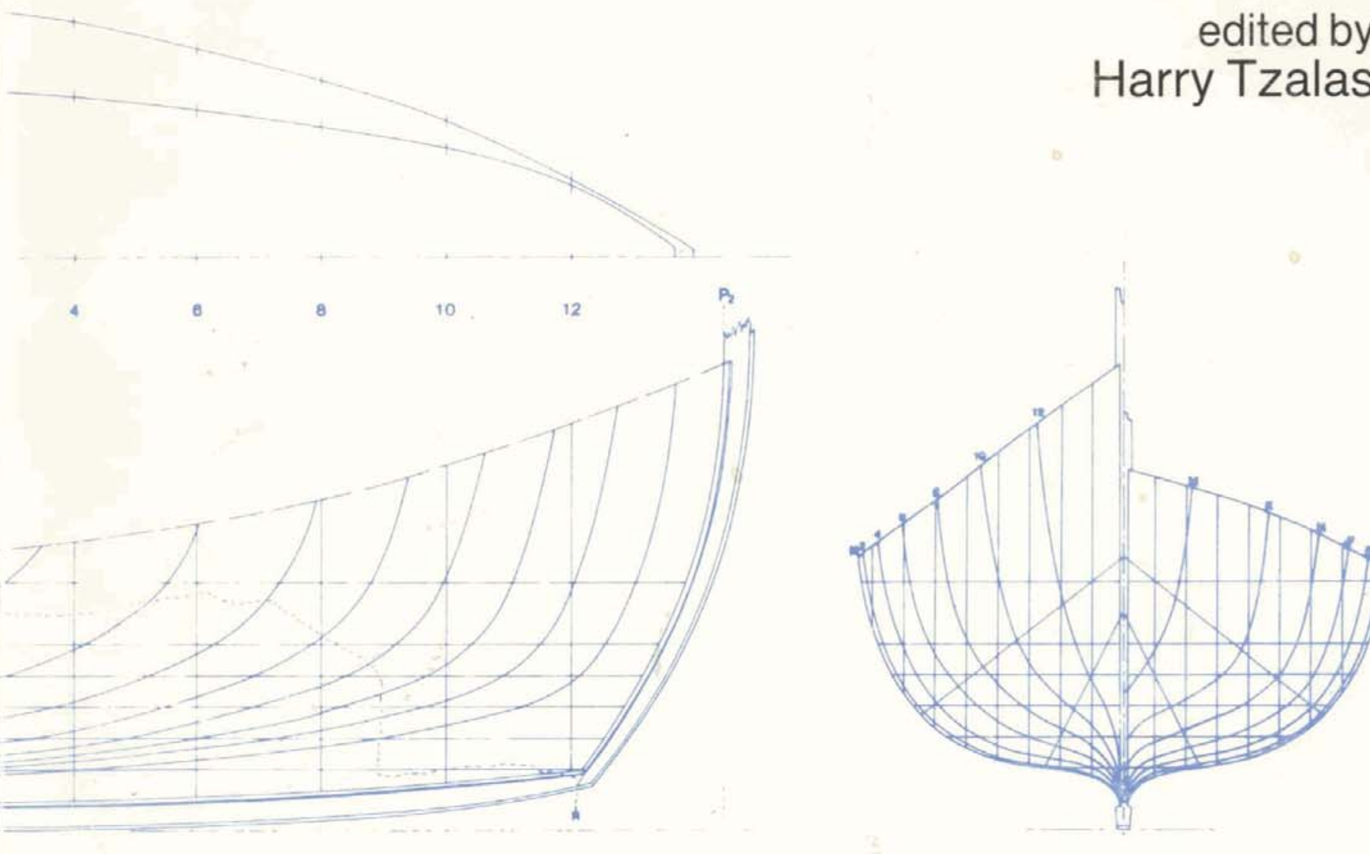
5th INTERNATIONAL SYMPOSIUM ON SHIP CONSTRUCTION IN ANTIQUITY

NAUPLIA 1993

proceedings

edited by
Harry Tzalas





ATHENS 1999

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OF NAUTICAL TRADITION

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NAUPLIA, 26, 27, 28 AUGUST 1993

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Cover: The lines of the Kyrenia ship by R. J. Steffy.

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EDITOR'S NOTES

In respect to the contributions made by Dr. Christopher Brandon, Dr. Elpida Hadjidaki, Prof. N.P. Pisarevskiy, Dr. Cemal Pulak, Miss Angeliki Simosi, Prof. B.J. Tsirkin and treir absense from these proceedings, the reader is kindly requested to note the following:

Dr. Christopher Brandon, Pringle Brandon Architects, 13 Sun St., London EC2M 2PS England, presented a paper with the title "Ship construction techniques used in the construction of King Herod's Harbour of Caesarea". This same communication was made at the International Symposium "La Thrace et les Sociétés Maritimes Anciennes" held at Sozopol in 1994 and published in *Thracia Pontica VI.1*, Sozopol (1994) under the title "Wooden caissons for hydraulic concrete at the harbour of Caesarea", pp. 45-68.

Dr. Elpida Hadjidaki, of the Department of Underwater Antiquities of Greece, made a presentation with the title "Excavation of a Classical shipwreck at Alonnisos (5th c. BC)." This has been published in *ENALIA Annual* IV, 1992, ed. 1996 pp. 37-45.

Prof. N.P. Pisarevskiy, University of Voromezh, Voromezh, Russia, made a verbal communication on "Ancient Greek ships in the Black Sea region". No text was sent to the editor.

Prof. Cemal Pulak, Institute of Nautical Archaeology, A&M University Texas, College Station, Texas, USA, presented his communication on "The Late Bronze Age shipwreck at Uluburun, after nine seasons of excavation on that site". At the sixth Symposium on Ship Construction in Antiquity of 1996, Dr. Pulak made a further contribution on this subject under the title: "The Uluburun shipwreck –an update". It was agreed that both presentations will be integrated in *TROPIS VI,* which is now being edited.

Miss Angeliki Simosi, of the Department of Underwater Antiquities of Greece, (Militou 10, 104 25 Athens, Greece), made a presentation with the title "Le port de guerre de Thassos"; this same communication was also presented at the International Symposium of Sozopol of 1994 and can be found in *Thracia Pontica VI.1*, Sozopol (1994) under the same title, pp. 271-286.

Prof. B. Juli Berkovitsch Tsirkin, of the Novgorodische Pedagogische Institut of St. Petersburg, Russia, made a communication in German with the title "Die früe Transmediterranische Tyrische seefahrten und der kult des Melqarts –The first transmediterranean voyages of the Phoenicians and the cult of Melqart". We have no abstract nor was the final text sent to the editor.

ΚΕΙΜΕΝΟ ΧΑΙΡΕΤΙΣΜΟΥ ΤΟΥ ΠΡΟΕΔΡΟΥ ΤΗΣ ΟΡΓΑΝΩΤΙΚΗΣ ΕΠΙΤΡΟΠΗΣ κ. ΧΑΡΗ ΤΖΑΛΑ ΓΙΑ ΤΟ 5ο ΣΥΜΠΟΣΙΟ

Κύριε Δήμαρχε της πόλης του Ναυπλίου, Κύριε Δήμαρχε της πόλης του Άργους, Κύριε Εκπρόσωπε της Υπουργού Πολιτισμού,

Φίλες και φίλοι,

Κυρίες και Κύριοι.

Μου δίνεται σήμερα η ευκαιρία για 5η φορά από το 1985 να καλωσορίσω τους συμμετέχοντες στο Διεθνές Συμπόσιο Αρχαίας Ναυπηγικής. Μετά τον Πειραιά, τους Δελφούς, το Παλαιό Φάληρο και την Αθήνα, ήρθε η σειρά αυτής της ωραίας παραλιακής πόλης της Αργολίδος, του Ναυπλίου, να φιλοξενήσει τις εργασίες της συναντήσεώς μας.

Με ξεχωριστή χαρά και συγκίνηση βλέπω στην αίθουσα αυτή παλιούς φίλους, λάτρεις του αρχαίου και παραδοσιακού πλοίου που ανελλιπώς, από την πρώτη συνάντηση που έγινε προ οκταετίας, ξανάρχονται κάθε 2 χρόνια προσφέροντας νέα στοιχεία με πρωτότυπες ανακοινώσεις.

Καλωσορίζω και τους νέους φίλους που συμμετέχουν για πρώτη φορά στο Συμπόσιό μας για να συμβά-

ADDRESS OF THE PRESIDENT OF THE ORGANIZING COMMITTEE MR. HARRY TZALAS FOR THE 5th SYMPOSIUM

Mr. Mayor of Nauplia, Mr. Mayor of Argos, Mr. representative of the Ministry of Culture,

Ladies and Gentlemen,

I have today the opportunity, for the 5th consequitive time since 1985, to welcome the participants to the International Symposium on Ship Construction in Antiquity.

After Piraeus, Delphi, the Old Phaleron and Athens, it is the turn of Nauplia, that beautiful coastal town of the Argolid, to host our encounter.

With great pleasure and emotion I see in this hall old good friends, lovers of the ancient and traditional ship who have been attending since our first encounter, presenting valuable communications.

I also welcome our new friends who participate for the first time in our Symposium and will bring their experience λουν και εκείνοι με τις δικές τους γνώσεις στο να γνωρίσουμε καλύτερα το αρχαίο πλοίο. Ευχαριστώ όλους σάς που παρευρεθήκατε σήμερα εδώ.

Η λεκάνη της Μεσογείου —κοιτίδα των μεγάλων πολιτισμών— χρωστά πάρα πολλά στην τέχνη του καραβομαραγκού και του ναυτικού. Το καράβι, που εμείς μελετάμε, ήταν το κύριο μέσο μεταφοράς ανθρώπων, υλικών και πολιτιστικών αγαθών.

Η ομολογουμένη επιτυχία που έχουν οι συναντήσεις μας δημιουργεί στους διοργανωτές αυξημένες ευθύνες. Όσο «μεγαλώνουμε» τόσο δυσκολεύουν τα οργανωτικά θέματα. Έχουμε ένα μεγάλο αριθμό ανακοινώσεων που θα ήταν υπερδιπλάσιος εάν αποδεχόμασταν και τις καθυστερημένες συμμετοχές πράγμα που δυστυχώς δεν μπορούσαμε να κάνουμε.

Στις 3 μέρες που θα διαρκέσουν οι εργασίες και πειθαρχώντας αυστηρά στο 20λεπτο ως ανώτατο όριο για κάθε ανακοίνωση, θα χωρέσουν με δυσκολία οι 60 ανακοινώσεις που έχει το πρόγραμμα. Με λυπεί το γεγονός ότι αρνηθήκαμε περίπου άλλες τόσες προτάσεις για πολύ σημαντικές ομιλίες.

Κάτι που πρέπει να μας απασχολήσει κατά την καταληκτήρια συνεδρίαση είναι η συνέχιση των Συναντήσεων αυτών. Αρκετά πράγματα με προβληματίζουν και θα ήθελα όλοι μαζί να διαμορφώσουμε το μέλλον των Συμποσίων αυτών.

that will improve our knowledge on the ancient ship. I thank you all for your presence.

The Mediterranean Basin, cradle of the Great Civilizations, owes a lot to the craft of shipwrights and ability of seamen. The ancient ship that is the subject of our studies was the main means for transporting men, materials and cultural wealth.

The acknowledged success of our encounters means for the organizers increased responsibilities: Expansion implies increased difficulties in our organization structure.

There is a great number of papers to be presented. This number would have been over double if we had accepted delayed participations; alas this was not possible.

The three days of our meeting and the 20 minutes allocated to each communication, will just suffice to contain the 55 papers included in the programme. I deeply regret that we had to discourage a great number of scholars who wanted to make interesting and important communications.

During the closing session we will have to discuss the future of our Symposia. There are several aspects of our conferences that have to be commonly agreed upon.

Για να συνεχιστούν οι συναντήσεις μας με το ίδιο κύρος, με την ίδια επιτυχία και για να είναι προσιτές σε όσο γίνεται περισσότερους επιστήμονες και φοιτητές θα πρέπει να ενισχυθεί η οργανωτική δομή. Αλλά θα μας δοθεί η ευκαιρία να μιλήσουμε για όλα αυτά αργότερα.

Μου μένει να ευχηθώ σε όλους ευχάριστη παραμονή και να κλείσω με τα λόγια της Δίδας Honor Frost που αναφέρονται στον πρόλογο του κειμένου της ανακοίνωσης της στο Α' Συμπόσιο: «Όπως με τις Διεθνείς Εκθέσεις, η επιτυχία των Συμποσίων μετριέται με των όγκο των εμπορευμάτων και των πληροφοριών που ανταλλάσονται αντίστοιχα».

Ελπίζω ότι εσείς που ήρθατε στη χώρα του Ξένιου Δία και στα μέρη του Ποσειδώνα από τρείς Ηπείρους και 16 διαφορετικές χώρες, μαζί με τους Έλληνες συναδέλφους σας θα καταθέσετε και θα αντλήσετε τις πληροφορίες εκείνες που θα μας κάνουν όλους σοφότερους στις γνώσεις μας για την ναυπήγηση και το ταξίδεμα των πλοίων των αρχαίων.

Τελειώνοντας πρέπει να εκφράσω τις θερμές ευχαριστίες στο Υπουργείο Πολιτισμού που βοήθησε υλικά και ηθικά την προσπάθειά μας. Ευχαριστώ επίσης τον Κο Ανδρέα Ποταμιάνο της Ηπειρωτικής Ατμοπλοΐας που ανελλιπώς από την πρώτη μας διοργάνωση μας συμπαραστέκεται.

In order to continue our meetings with the same success and to make them accessible to an ever increasing number of scientists and students, we have to improve the organizing structure. We will have the opportunity to discuss all this at a later stage of this conference.

Let me wish you all a pleasant stay and in concluding I will quote Miss Honor Frost's words in the introduction of her paper presented at our first Symposium: "As with Trade Fairs, the success of Symposia is measured by the volume of goods or information exchanged."

I hope that all of you who have come to the land of Xenios Zeus and in the seas of Poseidon, from three different continents and from 16 countries, jointly with your Greek colleagues you will make available but also gain information that will add significantly to our knowledge on the shipbuilding techniques and the sailing of ancient ships.

I must now express our warmest thanks to the Ministry of Culture for the sponsorship and moral support. I also thank Mr. Andreas Potamianos of Epirotiki Cruises who has been helping us since our very first conference.

Δεν πρέπει να παραλείψω να ευχαριστήσω και τα μέλη τόσο της Οργανωτικής όσο και της Εκτελεστικής Επιτροπής, που προσέφεραν άλλοι από κοντά, άλλοι από τις μακρινές χώρες που διαμένουν την ουσιαστική και ηθική βοήθεια που χρειαζόμαστε.

Τέλος χρωστάμε ένα ξεχωριστό ευχαριστώ στην γραμματέα του Συμποσίου Δίδα Κατερίνα Πουλή που εδώ και ένα χρόνο δούλεψε αδιάκοπα για την επιτυχία της Συναντήσεώς μας.

Last but not least, I must also express my gratitude to the members of the Organizing and Executive Committees who helped with their advice and gave their moral support so much appreciated as well as to our secretary Miss Catherine Poulis, who has for a full year worked hard for the success of this encounter.

THE ROMAN WRECK OF GRUM DE SAL (IBIZA, BALEARES)

The wreck of Grum de Sal was discovered in 1960, just near the Conejera island (Ibiza, Baleares) and two years later, in 1962, it was excavated by B. Vilar-Sancho and J.M. Mañá Angulo, director of the Archaeological Museum of Ibiza.

This excavation consisted in the recovery of some amphoras (Dressel 14b) but the hull was not studied.

In 1982 B. Martinez (Instituto de Conservación y Restauración de Bienes Culturales) and V. Galván (Consejo Superior de Investigaciones Cientificas), began to prospect Ibiza's coast in a National Plan of Coastal Documentation.

During those prospections they dived over the wreck and noticed the bad conditions of conservation and a strong expoliation.

Therefore, in 1991 and 1992 they decided to include in the works of this prospections the documentation of that interesting hull.

The rest of the hull is part of the bottom planking, the keel, several pillars, floor timbers, frames, and some unusual pieces which run in a longitudinal way, between the frames to separate two cargo spaces. One on the central part of the hull, over the keel, with an inside planking, and other whitout floor, separated by a bulkhead supported by the pillars.

During the last excavation in 1992, some fragments of amphoras appeared (Dressel 14b), piled up amphora covers, an inferior maxilar of a wild boar, several ruminant's molars, some fish vertebra and a pine cone.

With all these facts, we have formulated an hypothesis about the commercial route between Portugal and Rome, and about the structure of the hull divided in two perfectly separated areas.

Carlos León Amores
Centro Nacional de Investigaciones
Arqueologicas Submarinas (España).

EDITOR'S NOTE

Mr. Carlos León Amores made a verbal communication and the above is only an abstract.

CARVED SHIP GRAFFITI – AN ANCIENT RITUAL?

Ship graffiti in the interior of Greek churches exist almost to modern times. They are usually seen in areas which have not been replastered, namely on paintings, even on those of the most important personages of Christianity. In abandoned Greek villages near the coast, where churches are the lone remaining standing architectural elements, one can see religious icons with the engraved sea-going vessels of the period in which the church was in use. In Khora, in Aegina, for instance, numerous graffiti have been noted in the interior of a church, while only few were reported[1]. The habit of incising ships in areas of worship can be seen not only in the Greek islands, but in areas where Greeks prevailed in the past. Since the paintings are not refurbished as often as the walls, it is there that the graffiti can best be observed. This does not mean however that it is the only place where they were placed. On the outer walls at Khora, for instance, one can still discern some forms, possibly of ships, which are not clear due to the re-plastering. The columns in the Theseion, in Athens, which was used as a church in the Byzantine period, sport numerous incised graffiti of boats which can clearly be seen today[2].

The simplest way to describe this practice is to name it *ex-voto*, as we have done in the past[3]. After an inquisitive look at the word ex-voto it becomes clear that the term in the English language means a gift of thanks to a god, while the Latin term is wider and has the connotations of a vow. In order to explain the appearance of these incised and engraved ship graffiti we would like to adopt the Latin connotation and enlarge the concept even further. While stone anchors placed on walkways in a temple precinct, such as the ones in Kition in Cyprus, may be taken to mean that they were a gift to the cult, it is hard to assume that a scratched boat on a saint or on a holy personage means merely a gift. While in recent times a picture of a parishioner's mishap drawn or even photographed, was placed near or on the altar, it was usually accompanied by some gift to the priests. Thus the picture placed was not the *ex-voto*, but a modern form of thanks for deliverance. One however has to bear in mind that not all such graffiti are necessarily associated with cult. A bored sailor on a mission with time to spare might have placed his vessel on a rock for "eternity", much like travelers along desert routes, or the modern scratches of names on historical monuments or train seats. Delian houses and the Seljuk bath house in Miletus are good examples as are the fabulous boats drawn on the walls of an ancient water system in Athens[4].

Malta probably provides us with the earliest graffiti of boats[5]. While there is a whole fleet of boats on two elements associated with the megalith Temple, it is hard to date them with any precision. They could date as early as the 3rd Millennium BC, or later and for that matter they could also be the remains of a long standing tradition which encompasses different periods. It is the eastern Mediterranean which provides us with the next group of boat graffiti, near the coast in Israel and in Cyprus. The dating of the boats is based on stratigraphical data on the one hand and on comparative study on the other. These graffiti are dated to the last part of the Bronze Age, namely the 13th and possibly part of the 12th century BC. Some of the boats were previously published while others are being studied now[6].

The first to be found are a group of four analogous boats which were engraved on an altar unearthed in a stratigraphical excavation at Tel Akko, Israel. The stratum in which the altar was found is dated to the end of the 13th century BC. The graffiti was found on a portable altar which contained ash and 3 small stones. On one of the stones is a miniature boat of yet a different type. When these boats were discerned, they appeared to have been of a type which was unparalleled in the literature of the eastern Mediterranean. Of the four boats, one is noticeably larger and more detailed than the others. For our study at the time, the position of the rudders or steering oars and the attached tiller were of the utmost importance because they were obviously placed at the back of the boat, thus aiding in the identification of the forward and aft of these boats and others of their kind. The stem of these boats is accentuated as if the artist incised it deeper into the stone. There is an obvious inwardly curved triangular shape, which was coined by us as a "fan". The stem of the boats seems to have a triangular shape, but is not as inwardly curved and is narrower and higher than the stem.

While no such boats were reported when the Akko types first emerged, some unpublished examples had already been found previously. In the 1970s boats were spotted in Kition on Cyprus. They appeared both on the outer wall of Temple I and on the altar of Temple IV[7]. While two types of boats were found engraved on the wall, the majority of the boats from it and those on the altar were of the same and similar type of those from Akko. Area II, in which the boat representations were found, comprises the temple precinct including the remains of five temples, not all of which were active at the same time. The two temples under discussion, Temples I and IV, were not constructed in the earliest period, LCIIC (floor IV), but in LCIIIa (floor IIIa). The presence of ship representations at the Kition temple precinct should be of no surprise. Other signs of a seafaring cult exist in the area in the form of numerous stone anchors in use in the buildings or positioned with no obvious structural purpose, probably dedicated to the deities worshipped at Kition[8].

Temple I is the largest of the temples and lies on the highest bedrock spot in Area II. All four external walls of the temple incorporate ashlar masonry in their construction. The dating of this monumental reconstruction at the temple precinct supplies us with the *terminus post quem* for the ship representations which appear on the orthostatis of the external southern wall alongside a street leading to one of the entrances. These same monumental walls continued to be used in the subsequent periods which complicates our understanding of the latest possible date for the ship graffiti.

In temple IV, the ship representations appear on an altar which was in use during the habitation on Floor I. The altar, according to the excavators, was the only surviving addition to floor 1 in this temple. The remainder of the temple, despite the considerable alterations, was a continuation of the previous floors. The altar is constructed of a stone slab table resting on vertically placed stone slabs on all four sides. These slabs rest on or even cut through Floor II. Most of the slabs were damaged as was an ashlar block supporting the table inside the altar, possibly in secondary or tertiary use. The excavators suggested that the slabs might have originated in the earlier Floors IIIa-II[9]. The position of the ship representation would tend to support this observation. The southern face of the altar is constructed from two slabs, which were more than half covered when floor I existed. The table is placed about 40-50 meters above the floor, thus the two main ship representations which will be discussed below were barely visible when the floor was in use. As a matter of fact portions were covered by the edge of the hearth attached to the altar which encased a segment of the ship on the left slab. Under those circumstances, it would have been nearly impossible to engrave these ships and certainly senseless since they would be seen only by crouching or actually placing oneself on the floor. Indeed, on slab 5, the right slab on the southern face of the altar, yet another ship representation, well below the upper one, was noticed. There is a possibility that there was yet another ship under the representation of slab 4. The lower representations would thus be placed at least 30 or more below the surface of floor I and were not seen by the occupants of the temple during its use. Thus it seems improbable that these slabs were in their original positions. On the contrary, they were indeed in secondary use if not earlier. This partially contradicts previous publications in which the necessary documentation concerning the stratigraphy of the altar was not available[10].

We feel that these portrayals are not necessarily graffiti, but more akin to the Akko Altar. They *were* actual ship representations on an older altar in re-use, just as the excavators suggested. It is thus clear that it is impossible to give an exact date for these ships if one bases it on the altar itself. There is no doubt, however, that the ships predate Floor I and that they belong to earlier floors, possibly Floor IIIa, when such stone slabs and ashlars were used to construct the monumental temples.

The lengthy discussion on dating of the Temple I and the altar in Temple IV is indispensable since the majority of the ships represented on them are of the same or similar type to the ships represented on the Akko altar. The major distinction is in the complete absence of steering oars and tiller in any of the Kition boats and that is unlike the largest of the Akko boats which has both elements. It is thus necessary to equate the direction of the Kition boats with the largest Akko boat in mind. Thus we would like to take issue with Wachsmann who dated the altar of Temple IV to the 11th century. Obviously he did not study the stratigraphy as presented by Karageorghis and Demas. We would also like to point out that his alteration of the date interpreting the fan as a bird head, does not seem to have been carried out after a personal study of the boats. None of the boats has a "duck-head-like device" as Wachsmann would have liked to see[11]. There is yet another type of boat on the wall of Temple I at Kition, but it is of a completely different kind. While the majority are of the "round ship" type, the other is of the "long boat" type, possibly bearing a ram. There seems to be two of these boats, in a "caravan" arrangement.

The dating of the Akko boats and the possibility that the Kition boats transcends the end of the 13th and the beginning of the 12th can thus be established. The comparable type of boats plus the additional boats which are particular to each site is indeed of interest, especially for the period under discussion. In the last few years additional information has been gathered from yet a third and even a fourth site. The main site where graffiti of boats was noticed is Nahal Me'arot, the area surrounding the Carmel Mountain caves and the other area is in the cliffs of Nahal Oren, just a few kilometers north of the graffiti mentioned above. Both of these sites can be, in some way, connected to the site of Tel Nami, a peninsula and a coastal site which served as an international anchorage during the end of the 13th century and the beginning of the 12th[12].

When approaching Nami from the sea, mariners could use particular rocks along the Carmel Ridge as navigational signs to facilitate the safe anchorage of their vessels. The cavity of the Carmel Mountain Ridge caused by the flow of the Me'arot could have well been a landmark. The Ridge is less than four kms east of Nami and is readily discernible from the sea. The jaw-like crevice might have lent its sight to the ancient name of Nami already in the Middle Bronze IIa period[13]. In that area there is a rock which from afar looks much like the cone of a pyramid. Its almost flat northern face bears numerous incised boats of various forms and sizes. Other rocks in the general area sport many other boat carving: The most common form is the type which has been noticed in Akko and Kition.

Thus the area of Nami joins the other sites mentioned as sharing similar evidence of the engraved sea-going vessels.The similar "fan" type boat which we saw in Kition and Akko is further joined by new boat types. We do have to remark here that among the "fan" boats at least one bears a "crow's nest" while the others do not, much like the Kition Temple I display. The deepest incised boat is one which is facing north which has previously been published as part of a Neolithic rock carving assemblage[14]. Yet another type of vessel is represented by a small (12 cms from stem post ot stern) boat which obviously has a bird's head at least on one of its extremities. It also has a mast as well as furled sails. Its shape is very much like that represented by the Egyptians as the boat of the "Sea Peoples" on the Medinet Habu sea battle scene[15]. Only one of the extremities can be discerned. Unfortunately the other is not very clear, so we can not safely state whether this boat, is exactly like the ones on the walls of Medinet Habu which have two bird heads. This of course further verifies the dating we propose, which can be anywhere around 1200, since the battle took place during the reign of Ramses III. Birds can further be discerned in another boat, of which only its outline is extant and a mast on which a bird seems to be present. There is also a group of vessels in outline, facing west towards the sea, where only an extremity can be seen and it is noticeably everted, in a manner very reminiscent of a bird's head.

The Nahal Me'arot graffiti could well be compared to the Kition Temple I wall graffiti. They can not be directly assigned to the cult itself, as the boats on the altars in Kition Temple IV and Akko might be interpreted. They were put there either as a form of supplication by mariners before departure or as thanks to a higher power for safe coming. While not all graffiti can be assigned to those two, we feel that in these two cases, they can.

We cannot say to which of the sub-catagories mentioned above the ship graffiti at Nahal Oren can be placed. The ones which have hitherto been found, and we assume that more are waiting to be discovered, are placed in awe inspiring positions, but not necessarily in places which can be seen from the sea and thus were not used for navigational purposes. They were however placed at the two sides of what we see as a land trade route, used during the period under discussion to connect the sea, across the Carmel Ridge, to the valley and inland centers of trade. In this case as in the previous ones, the most common graffiti is of the "fan" type boat. There is however another type, this one with a clear bird head on one extremity and a possible bird on the mast or some form of standard. Unfortunately, in this case again it is hard to clearly ascertain the other side of the boat, although is seems that there is a straight post with no sign of a decoration.

Who then were the people who manned these diverse boats which seem to make their appearance in the end of the Late Bronze period? We have some documentation from ancient written sources, but they are few and far between. The source often quoted is the description of the naval battle between the Egyptians and the "Sea Peoples" which appears on the walls at Medinet Habu. Already in previous studies we have mentioned the fact that the written account of the battle ennumerates several groups of attackers, but places them in one type of a boat. The Egyptians on the other hand are described in the written source as having surprised the attackers with the aid of three types of boats. Only one Egyptian boat is depicted in the scene. Thus we can be certain that the Egyptian artist took liberties in the portrayal of the battle when presenting the Egyptian forces and he most likely took liberties in the characterisation of the attackers' vessel. Chances are that, much like the Egyptians, the "Sea Peoples", the coalition of attackers of the Egyptian territory, arrived in more than one boat type[16]. These attackers, at least one group of them, was not new to the Egyptian scene during Ramses III reign. From the long reign of Ramses II, well in the 13th century BC, we hear of a naval battle between the forces of the king and the Shardan, one group of these comprise those named as the "Sea People"[17].

We feel that the numerous types of boats which we have described and which we can attribute to the 13th-12th centuries BC, are boats of some of these peoples who have been described as "Sea Peoples". The name is usually associated with pirates and other negative connotations. We would like to propose that some of these groups were important part of the trade system already in the 14th century if not earlier. It was the predicaments of the period which motivated them to become the pirates of the last part of the 13th and the 12th century BC.

Nomads, or semi-nomads at times would serve as intermediaries, other times as bandits, caravan leaders or mercenaries and thus were the important link between the deserts, the sown lands and the established political systems[18]. Following E. Marx's model one could easily imagine that these same intermediaries converged closer to the settled areas to sell meat and milk products and satisfy their needs. Upon the first signs of weakness and eventually the demise of authorities, they slowly assume more agricultural elements in their economy and inhabit areas which were not settled. Likewise, it was intermediaries who carried out a large part of sea going transport and trade.

These intermediaries, who we would like to refer to as the "Nomads of the Sea" were the emmisaries of economic systems needing particular products. They were the ones braving the seas and establishing the daily routine of the trade which might not have been always along the shores. They probably came from areas which could not support a large population and thus they joined, as mercenaries, economic and otherwise, those who were most fortunate within a political system. One example would no doubt be the Cycladic sailors and the Minoan system, but these semi-Nomads of the sea could well have been from other parts of the Mediterranean and the coast of Turkey as well.

When the authorities showed signs of weakness and the systems could no longer supply the necessary economic safety, the intermediaries, our "Nomads of the Sea" had no recourse, but to revert to piracy and eventually settlement in areas which became known to them during their involvement in the trade[19]. The problems could have been not only socio-economic, but geomorphological ones as well. It was in this period that archaeologists working on coastal sites notice a change in sea level which would have affected those who were settled along the coasts or the islands greatly. It is probably these same sailors who were the prime movers of what we call "sailor's trade", small products, such as certain ceramics in antiquity and other goods which are being traded today, which are not an important part of the main cargo of the ship, but a personal addition to their trade[20].

The appearance of the boat graffiti in Cyprus and in Israel is but a part of this movement of mariners, who at times were the intermediaries and small traders and at other times pirates of mercenaries who were placed in certain areas by the authorities, or settled there when a vacuum played into their hands. The "sudden" appearance of these ancient remains will no doubt be augmented when more surveys and searches will be carried out, not only in areas close to the sea, but also along trade routes which were connected to the sea. The graffiti found thus far at Nahal Oren are placed along the route which could have served the ancients during the period of the end of the 13th century and a bit later, when the anchorage of Nami was in use. The route which probably supported the incense trade, connected the coast with Megiddo and further west to Beth Shan and on to the other side of the Jordan River[21]. These intermidiaries, whether we call them the Nomads or semi-nomads of the Sea met their land counterparts, the Nomads, or semi-nomads of the land who were intermediaries used for the procurement of goods for the consumers from the settled systems. With our present knowledge, we would not be surprised to find earlier ship graffiti in trade routes leading to sites such as Marsah Matruh or other anchorage sites in the eastern Mediterranean.

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NOTES

1. Caterina Delouca presented a talk on the graffiti in the church in the 4th International Symposium on Ship Construcion in Antiquity which took place in Athens in 1991. Her abstract "Les graffiti des navires des eglises byzantines et post-byzantines de l'ile de Egine: un example de méthodologie" appears in the publication of the Hellenic Institute for the Preservation of Nautical Tradition. The boats represented in the church are almost modern. Delouca might be right in calling them Byzantine and post Byzantine which encompasses a very long period, but she certainly was not exact.
2. 2. L. Basch "Graffiti naval Grecs", *Le Petite Perroquet* 22, 1978, pp. 41-46.
3. L. Basch and Michal Artzy, "Ship graffiti at Kition", in: V. Karageorghis and Martha Demas, *Kition V,* Nicosia 1986.
4. These boats were presented to the participants who braved the descent into the "Athens of the Underground" in the last Symposium of Ship Construction in Antiquity, 1991.
5. D. Woolner, "Graffiti of ships at Trxien, Malta", *Antiquity* XXXI 1957, pp. 60-67.
6. For previous studies see: Michal Artzy, "Unusual Late Bronze ship representations from Tel Akko" *Mariner's Mirror* 1984, pp. 59-64; L. Basch and Michal Artzy *op. cit.*; Michal Artzy "On boats and Sea Peoples", *Bulletin of the American School of Oriental Research* 1987, pp. 75-84.
7. Basch and Artzy *op. cit.*
8. Honor Frost "The Kition anchors" in: V. Karageorghis and Martha Demas, *Excavations at Kition V: The Pre-Phoenician Levels,* Nicosia 1986, p. 293.
9. V. Karageorghis and Martha Demas, *Excavations at Kition V: The Pre-Phoenician Levels,* Nicosia 1986, pp. 149-151.
10. Basch and Artzy *op. cit.* p. 323.
11. S. Wachsmann "Sea Peoples Ships" unpublished Ph.D thesis, Hebrew University 1989 pp. 161-163, Pl. 131.

12. Michal Artzy, "Fortress and settlement, anchorage system during the second millennium at Tel Nami?" in A. Raban & E. Linder (eds.): *Cities on the sea - Past and Present* Ist International Symposium on Harbours, Port Cities and Coastal Topography, Summaries, Haifa, Israel, September 22-29, 1986 (Haifa 1986) 14-17 *idem*, "Tel Nami" *Hadashot Archaeologiyot* 94 (1989) pp. 17-20; *idem.*, "Nami Land and Sea Project, 1985-1988" *Israeli Exploration Journal* 40 (1990) 73-76; *idem.*, "Pomegranate Scepters and Incense Stand with Pomegranates found in Priest's Grave" *Biblical Archaeology Review* XVI (1990) 48-51; *idem.*, "Conical Cups and Pumice, Aegean Cult at Tel Nami, Israel" in: R. Laffineur (ed.): *Thalassa, the Prehistoric Aegean and the Sea, Aegeum VII* (1991) University of Liege, pp. 203-206; *idem.*, "The Bronze Age Archorage Site of Tel Nami" *Qadmoniyot* 24 (1991) 31-38 (Hebrew); *idem.*, "Nami Land and Sea Project, 1989" *Israeli Exploration Journal* 41 (1991) 194-197; E. S. Marcus "Tel Nami, a Study of a Middle Bronze Period Coastal Settlement" unpublished MA thesis, Department of Maritime Civilizations, University of Haifa 1991; Michal Artzy, "Nami, un grand port à l'âge du Bronze" *Le Monde de la Bible* 76 (1992) 42-46; Michal Artzy and E. Marcus "The MBIIa Coastal Settlement at Tel Nami" *Michmanim* 5 (1991) 5*-16*; *idem.*, (1992) "Stratified Cypriote Pottery in MBIIa Context at Tel Nami", in: G.C. Ioannides (ed.) *Essays in Honour of Vassos Karageorghis*, Nicosia pp. 103-110; M. Kislev, Michal Artzy and E. Marcus "Import of Aegean Food Plant to MBIIa Coastal Site in Israel" *Levant* 25 (1993) pp. ; E. Marcus and Michal Artzy, "An MBIIa Scarab-seal Impressed 'Loomweigh' from Tel Nami" (to be published by *Israel Exploration Journal*); *idem.*, "Late Bronze Burial Practices at Tel Nami" in: I. Singer (ed.) *Papers in Honour of Prof. Yochanan Aharoni*, (in press); *idem.*, "Nami: a Second Millennium International Maritime Trading Center in the Mediterranean", in: S. Gitin (ed.) *Recent Discoveries in Israel: A View to the West*, Americal Institute of Archaeology Series (to be published); *idem.*, "Incense, Camels and Collar Rim Jars: Desert trade Routes and Maritime Outlets in the 2nd Millennium BC", *Oxford Journal of Archaeology* (to be published).
13. Michal Artzy, "Nami: A Second Millennium International Maritime Trading Center in the Mediterranean", in: S. Gitin (ed.), *Recent Discoveries in Israel: View to the West*, American Institute of Archaeology Series (to be published).
14. E. Wreschner, "Prehistoric Rock-Engravings in Nahal ha-Me'arot, Mound Carmel", *Israel Exploration Journal* 21 (1971) pp. 217-218.
15. H.H. Nelson *et al* "The Naval Battle Pictured at Medinet Habu", *Journal of Near Eastern Studies* 2, 1943, pp. 40-50 as well as S. Wachsmann "The Ships of the Sea Peoples", *International Journal of Nautical Archaeology* 10, 1981, pp. 187-220.
16. Michal Artzy, "Development of War/Fighting boats of the IInd Millennium BC in the Eastern Mediterranean", *Report of Department of Antiquities of Cyprus* 1988, pp. 181-186.
17. *ibid.* p. 184; Parts of the Tanis Stele, on which the battle was recorded, were combined, read, interpreted and published by the Belgian Egyptologist J. Yoyotte in: "Les stèles de Ramses II à Tanis", *Kêmi* 1949, pp. 58-74.
18. E. Marx (to be published) has dealt with the question of the pastoral nomads in the Arab Middle East. Although his study is of recent times, it can certainly be useful for historical periods.
19. A study on this subject is being carried out by the present author.
20. Michal Artzy, "Merchants and Merchantmen: On Ships and Shipping in the Late Bronze Age in the Levant", in: *Proceedings of the IInd International Congress for Cypriote Studies*, Nicosia, pp. 135-140.
21. Michal Artzy, "Incense, Camels and Collar Rim Jars: Desert Trade Routes and Maritime Outlets in the 2nd Millennium", submitted to: *Oxford Journal of Archaeology.*

LES REPRESENTATIONS NAVALES DE LA LAJA ALTA, EN ANDALOUSIE

Un ensemble important de peintures pariétales fut découvert en 1978, dans un abri sous roche situé dans l'arrière pays d'Algéciras, à environ 30 km de la côte (fig. 1). Les sujets peints sont de huit catégories: les principaux sont anthropomorphes, zoomorphes, en forme d'idoles, ancoriformes, auxquels s'ajoutent diverses représentations à sujet maritime, dont sept embarcations (plutôt que huit)[1], peut-être des ancres et un port fermé. Ces peintures venaient enrichir le patrimoine ibérique déjà très abondant et très ancien, et fournissaient avec la scène navale une série de motifs plus rarement attestés dans la Péninsule. Nous devons à C. Barroso Ruiz la publication de ces documents, suivie par la suite de plusieurs travaux effectués d'après les relevés de l'auteur, sans pour autant proposer l'étude plus détaillée qu'une telle trouvaille exigeait. L'examen de ces dessins a mis en outre en évidence quelques incertitudes dans le rendu de diverses parties des navires, ce qui nous a incité à refaire le chemin particulièrement difficile qui conduit à l'abri. Les observations faites, quinze ans après la découverte des peintures, souffrent évidemment du travail hostile du temps sur un support aussi fragile. Cependant, les vestiges conservés ont permis de réviser les identifications antérieures et par conséquent de réévaluer l'interprétation technique et historique proposées alors.[2]

Cadre géographique

Le nom du site vient de sa morphologie, Laja signifiant "pierre plate" et alta "haute", sur le côté de laquelle est creusé l'abri sous roche. Dans l'antiquité, le site était placé dans une zone très retirée des secteurs habités, au milieu d'une végétation d'arbres et d'arbustes très dense, à une altitude d'environ 350m. Les installations agricoles actuellement en activité dans les alentours montrent que la région est restée très à l'écart des noyaux urbains environnants, comme on peut le noter par l'archaïsme des installations liées à l'élevage du bétail.

Il faut compter, au départ de la route départementale, quelques 5 km de piste à la fois escarpée et accidentée, puis environ trois quart d'heure de marche à pied dans la colline jusqu'à la grotte. L'accès à l'abri est par conséquent, encore de nos jours, difficile, voire périlleux. Hormi le caractère un peu hostile de cette zone, il faut tout de même préciser qu'elle se trouve à proximité d'axes de circulation importants, entre les bras de deux rivières permettant la communication entre la côte et l'intérieur de la région gaditaine: le Guadaranque et un affluent du Guadiaro, l'un se jetant dans la baie d'Algéciras, l'autre à San Roque, sur la Costa del Sol.

L'abri sous roche est situé dans un affleurement de grés oligocènes dans lequel apparaissent fréquemment des escarpes parallèles où se forment de nombreux abris sous roches[3]. Les grottes sont par conséquent nombreuses dans la région mais elles ne sont généralement pas rattachées à des gisements archéologiques, comme le prouve l'absence de traces d'industrie lithique et de céramique dans ce secteur.

La Laja Alta est une grotte naturelle de 5 m sur 2m, n'ayant subi aucun aménagement antique. L'abri rassemble un total de trente quatre peintures. Les plus hautes sont les mieux conservées tandis que les autres sont très largement abimées par l'érosion éolienne et les précipitations. Aux dommages naturels il faut ajouter les déprédations humaines, nombreuses avant la récente mise en place de la grille de protection du site.

Technique:

Les représentations sont exécutées avec deux couleurs de peintures: le rouge, le plus largement employé, et le noir, les deux étant communément utilisés dans les représentations rupestres de la Péninsule Ibérique. Tous les bateaux sont peints en rouge. On a relevé seulement dans le cas d'une embarcation (fig. 5 B) l'usage des deux pigments, mais selon nous, la partie exécutée en noir ne fait pas partie du bateau[4]. Certains chercheurs retiennent que les peintures noires seraient antérieures aux rouges du fait qu'on observe en certains endroits la superposition du rouge sur le noir[5]. Pour d'autres, les pigments rouges et noir ont été utilisés simultanément puisqu'une figure exécutée avec les deux couleurs a été identifiée[6]. Seule une analyse chimique des pigments permettrait d'établir avec certitude à quelle période ils appartiennent réellement. Cependant, la composition de la paroi met bien en évidence un registre homogène, dans lequel se développe la scène navale, tandis que les autres motifs se retrouvent sur toute la hauteur et la largeur de l'abri, sans qu'aucune ordonnance entre les sujets peints ne puisse être observée. Cette absence de composition est propre aux représentations rupestres préhistoriques et protohistoriques. A la Laja Alta, se sont précisément les motifs disposés de façon anarchique qui sont peints en noir, ce qui nous autorise à les considérer comme antérieurs aux peintures exécutées en rouge.

Description des bateaux

L'observation des relevés publiés et de ceux que nous avons effectués en Avril 1993 (figures B) permet de faire une étude comparative de la structure des embarcations. L'objectif d'une telle démarche est de préciser chaque fois les éléments constitutifs de chaque navire, de contrôler la fidélité du rendu de ces pièces et de déterminer la catégorie de bateau représentée.

Bateau 1

Le navire mesure 17 cm (fig. 2). On distingue la quille et la préceinte, conservée sur toute la longueur du bateau. Dans la figure B, la ligne de pont se confond avec la préceinte, alors qu'elles sont clairement distinguées dans la figure A. Trois lignes obliques, tracées dans le sens opposé aux rames, relient le pont à la quille. Considérées par C. Barroso Ruiz comme les écoutilles[7], il s'agit plus vraisemblablement des couples du navire. Six rames apparaissent sous la quille (fig. 2 B). L'auteur distingue ensuite une partie verticale au-dessus de la proue qu'il interprète soit comme un chateau avant soit comme un mascaron[8]. Il apparaît qu'il s'agit en fait de la partie supérieure de la poupe, se recourbant assez haut en une sorte d'aplustre. Au contraire, la proue est moins élevée que le montre le dessin de C. Barroso Ruiz. L'excroissance située à gauche, en saillie par rapport à la coque ne peut pas être identifiée à la rame gouvernail puisqu'elle se trouve à la proue et non pas à la poupe, comme le proposait l'auteur. Il identifie deux voiles: la voile centrale supportée par un mât, et une autre, sans mât, placée sous l'arc formé par la proue. Il s'agit en fait d'une seule voile et de deux haubans, la ligne verticale, recourbée vers le haut restant sans identification.

Bateau 2

Le bateau mesure 29 cm (fig. 3). Il comporte la ligne de pont, la préceinte et la quille, aujourd'hui très mal conservés. On distinguait autrefois onze couples entre le pont et la préceinte et dix-sept entre la préceinte et la quille[9], dont deux ou trois seulement sont encore visibles. Sur les cinq rames de dimensions disproportionnées, munies de pales, et le gouvernail de même type, on ne voit plus que trois rames et une partie du gouvernail. La voile, autrefois apparente, était montée sur un mât équipé d'une vergue et maintenue par quatre haubans. La partie droite, identifiée à la proue, n'a pas été correctement observée puisqu'on voit, encore 15 ans après les premiers travaux, qu'il s'agit d'une volute haute fortement recourbée (fig. 3 B), comme on en verra en particulier dans le bateau suivant. Elle représente en réalité la poupe, ce qui remet en question l'interprétation de la rame située à l'extrémité gauche. En effet, il faut désormais la considérer comme une sixième rame et non plus comme une rame gouvernail.

Bateau 3

Le bateau mesure 24 cm (fig. 4). Ici, seuls la quille et le pont sont représentés, entre lesquels on dénombre dix couples[10]. Trois à cinq d'entre eux sont conservés (fig. 4 B). Cette embarcation ne possède ni rame ni gouvernail. Deux formes, aujourd'hui indistinctes, dans lesquelles ont été reconnues des ancres se trouvent sous la partie gauche du navire, ce qui signifierait que le bateau est ancré et que par conséquent les rames et la rame gouvernail ont été sortis de l'eau et déposés à l'intérieur du bateau. Ces peintures ne représentent cependant pas un type d'ancre connu. Comme dans le navire précédent, on reconnaît la poupe dans la partie droite recourbée en volute (fig. 4 B). Le gréement, semblable à celui du bateau précédent, comporte une vergue et quatre haubans. Le mât est surmonté d'une sorte de hune.

Bateau 4

Le bateau mesure 20 cm (fig. 5). Dans la figure A, la coque présente une quille parfaitement plate, le pont, deux couples et quatre rames. Mais, la ligne courbe extérieure de la poupe (fig. 5 B) semble se poursuivre vers le bas pour former la ligne de quille. Dans ce cas, il faudrait reconnaître dans les six traits obliques, interprétés jusqu'alors comme les rames, les couples du bateau. Un seul couple supérieur reste aujourd'hui apparent. Au lieu d'une structure simple du type pont et quille on aurait alors pont, préceinte et quille. La proue est assemblée à la quille par une étrave formant un angle obtus. Le retour de la proue que distinguait C. Barroso Ruiz semble être en réalité constitué par deux traits peints avec une peinture plus foncée, peut-être antérieurs à la représentation du bateau. Un navire à proue rectiligne est d'un type plutôt inattendu, tandis qu'une proue munie d'un angle rappellerait, par exemple, les bateaux de Tell Akko[11]. Dans la figure B, la hauteur de la proue est légèrement supérieure à celle de la poupe, ce qui constitue un problème technique important.

Bateau 5

Il mesure 35 cm (fig. 6). Entre le pont et la quille apparaissent quatre ou cinq couples (fig. 6 B) dont quatre se prolongent pour former quatre des sept rames[12]. La proue présente un éperon à trois dents. La poupe, basse et recourbée, est munie de quatre éléments perpendiculaires. Les deux éléments supérieurs rappellent un ferro de gondole ou des sortes de flammes alors que les deux autres sont certainement deux rames gouvernails. La voile est placée très à l'avant du bateau. Elle est montée sur une vergue, maintenue par deux haubans se rejoignant à la base du mât et peut-être par un troisième rattaché à l'extrémité de la proue. Il y a peu d'ambigüité dans l'identification des diverses parties de ce navire car le dessin est bien conservé. Toutefois on retrouve le même tracé confus à la poupe que dans le bateau n° 4, avec cette ligne interrompue en dessous de la ligne de quille.

Bateau 6

Le bateau mesure 26 cm (fig. 7). Il présente un tracé sensiblement différent des autres. Le pont et la quille sont reliés par deux couples (fig. 7 B). La partie gauche, peut-être la proue, comporte une forme élipsoïdale que C. Barroso Ruiz présente à titre d'hypothèse comme un éperon[13]. Le mât central, étayé par quatre haubans, est surmonté par une hune. Une autre interprétation propose de reconnaître dans les éléments qui constituent le gréement deux voiles triangulaires[14].

Bateau 7

Le bateau mesure 17 cm (fig. 9). On distingue le pont, une préceinte et la quille, maladroitement détachée de l'ensemble de la coque. La poupe et une partie de la proue sont conservées. Des couples au nombre de sept apparaissent entre le pont et la préceinte. Un élément vertical central peut être considéré comme le mât. Une voile, dont il ne reste plus de trace, a été autrefois identifiée à l'avant du bateau. De même, on a considéré jusqu'ici que la proue était la partie recourbée[15], ce qui semble peu convaincant d'après la description des six premiers bateaux. La hampe à peine marquée sur la gauche continue la ligne de pont pour former l'étrave, à la manière du navire no 4. Il ne possède ni rame ni gouvernail, ce qui s'explique peut-être par le fait qu'il soit placé à l'intérieur de la structure identifiée à un port et qu'étant amarré il n'a pas besoin de ses moyens de propulsion.

L'identification de cette structure à un port n'est pas aisée car on ne possède pas d'éléments de comparaison (fig. 8). De forme à peu près carrée, elle est surmontée en haut à droite par une sorte de pavillon rectangulaire placé sur une hampe. La partie inférieure gauche est ouverte mais on ne sait pas si cette ouverture est intentionnelle ou accidentelle car elle ne comporte pas les structures qui flanquent habituellement l'entrée d'un port telles que les tours des phares de signalisation. On peut cependant envisager que la peinture est soit inachevée soit effacée car le reste de la représentation rappelle la forme d'un port fermé, c'est-à-dire militaire, édifice rarement représenté, en particulier sur la rive occidentale de la Méditerranée. Bien que le bateau n° 7 ne présente pas l'armement d'un bateau de guerre, sa structure, en particulier la partie fortement recourbée, à droite, n'évoque pas un navire marchand mais plutôt une navire de guerre.

Structure des bateaux

Plusieurs incertitudes persistent, nous interdisant d'établir avec certitude la nature militaire ou marchande de ces embarcations. Mais certains points apparaissent clairement: d'après leur construction solide, où apparaît nettement la préceinte, les bateaux 1 et 2 sont sans doute des navires de commerce. Les autres présentent une charpente plus simple, ne laissant voir du navire que le pont et la quille, c'est-à-dire des bateaux légers, pouvant atteindre une vitesse de 7 à 8 nœuds, comme le requiert un bâtiment militaire. Le bateau n° 5 qui comporte sept rames et deux rames gouvernails est identifiable à un navire de guerre d'après sa structure allongée et surtout la forme en trident située à la proue représentant vraisemblablement son éperon. On aurait donc une flotte mixte, composée d'une majorité de bateaux de commerce et au moins un bateau de guerre. Mais ces peintures nous livrent une documentation hybride, souvent très détaillée mais parfois très schématique (fig. 7), dans laquelle il est difficile de reconnaître les éléments architecturaux du navire.

Interprétation de la scène

La paroi semble être séparée horizontalement en deux registres. La partie supérieure, occupant les trois-quarts de la grotte, rassemble presque tous les sujets représentés, à l'exception des bateaux, situés dans le quart inférieur de l'abri.

Le registre inférieur est lui même composé de trois parties. Les deux parties de droite et de gauche présentent chacune deux et quatre bateaux. En raison de l'orientation des rames, il semble que les navires de droite se dirigent vers la droite et les navires de gauche vers la gauche (fig. 1). La partie gauche comporte en outre une structure, identifiable à un port fermé, à l'intérieur duquel se trouve un quatrième bateau privé de rames et de voiles. La partie centrale est ornée d'un unique bateau, le seul à être isolé et sans rame ni gouvernail. Mais, contrairement au bateau n° 7 situé à l'intérieur de la structure quadrangulaire, il est représenté avec ce qui fut identifié à des ancres (fig. 4 A). Par conséquent, on serait en présence d'une scène très structurée qui se déroule à partir d'un port dans lequel est ancré un bateau et vers lequel se dirigent trois autres bateaux propulsés à la rame ou à la voile. Au large du port est ancré une embarcation et à droite s'éloignent deux bateaux de commerce propulsés à la voile et à la rame.

Plusieurs auteurs pensent que l'intérieur de la grotte a été suffisamment endommagé pour effacer complètement quelques peintures, ce qui entrave peut-être l'interprétation de la scène. Ils considèrent notamment qu'une structure semblable à celle qui a été identifiée à un port faisait pendant à celle qui est conservée en bas à gauche[16]. D'autres, au contraire, reconnaissent une seule et unique scène dans cette paroie peinte[17]. Ils pensent de ce fait que l'ensemble des motifs est contemporain et qu'ils ont été peints d'après un schéma symétrique que limiteraient, à droite et à gauche, les deux représentations antropomorphes armées d'un bouclier (fig. 1). L'interprétation générale serait par conséquent celle d'une scène belliqueuse. Je crois plutôt que l'abri sous roche a connu deux phases principales de fréquentation: la première au cours de laquelle a été peinte la scène supérieure et la seconde au cours de laquelle furent représentés les sept bateaux, utilisant l'espace de la grotte resté vierge. D'après leurs dimensions (entre 17 et 29 cm) et leur style, ils ont été peints par au moins deux personnes.

Datation:

Les autres thèmes représentés rappellent les décors de gravures typiques de la culture de Los Millares, datés des environs de 2500 av. J.-C.[18]. Certains motifs ont des parallèles dans le décor des idoles cylindriques du Bronze Ancien, tandis que d'autres, comme les figures ancoriformes et les personnages armés sont datables du début du premier millénaire[19]. Les chercheurs espagnols optent donc pour une datation autour du début du premier millénaire[20], hypothèse éminemment alléchante puisqu'elle permet de reconnaître dans les peintures de la Laja Alta l'arrivée des bateaux de Tarshis, à l'origine de la mythique Tartessos.

En l'absence de représentations navales de cette qualité en Espagne on est tenté de reconnaître la main d'un Méditerranéen plutôt que celle d'un indigène, sauf si la date haute est rejetée au profit d'une datation postérieure à l'arrivée des

Phéniciens dans la Péninsule, dans le courant de l'époque ibérique, par exemple. La question est donc de savoir si la scène maritime est l'œuvre d'un Phénicien. La grotte se situe à l'Ouest de la majeure partie des sites phéniciens d'Andalousie, sur la route qui conduit à Cadix. Elle est surtout placée à quelques dizaines de kilomètres du port antique de Karteia[21], aujourd'hui à l'intérieur des terres (près de San Roque), où du matériel du VIIe siècle a été trouvé, ce qui donnerait une certaine crédibilité à l'hypothèse phénicienne. Mais on aura noté les innombrables maladresses dans le rendu des embarcations ainsi que la différence d'échelle entre le "port" et les navires, ce qui rend la scène un peu irréelle et peu digne d'un navigateur phénicien. En outre, l'installation à bonne distance de la côte et l'isolement de la grotte par rapport aux habitats les plus proches, donnent au site un caractère propice à l'établissement d'un sanctuaire. Ces arguments sont davantage favorables à l'identification d'un lieu sacré, orné d'ex-votos et fréquenté depuis le deuxième millénaire, qu'à un site commémoratif où aurait été célébré l'arrivée, autour de 1100 av. J.-C., des premiers Phéniciens.

Le réexamen des peintures pariétales de la Laja Alta met en évidence une fréquentation de la grotte comme lieu sacré pendant plusieurs siècles, voire plusieurs millénaires. La dernière phase d'utilisation du sanctuaire a été probablement celle au cours de laquelle la scène navale a été peinte. Le caractère archaïque des peintures du registre supérieur permet de proposer que la grotte n'a pas été fréquentée en permanence et qu'un hiatus chronologique sépare ces premières peintures de la scène navale. La datation relative de cette dernière scène, par rapport aux peintures archaïques, la situe dans le courant de la période historique plutôt qu'à l'orée du premier millénaire av. J.-C. Le traitement des peintures, témoignant d'une observation réelle mais confuse des navires, fournit des éléments plutôt imprécis sur la datation du site d'après l'architecture navale. Aussi, la réalisation de cette peinture parietale peut difficilement être attribuée à la période qui précède les contacts avec le monde punique et le monde hellénique. Partant de là, on pourrait proposer de mettre cette scène en relation avec les événements liés aux deux guerres puniques, survenues durant le deuxième quart et le quatrième quart du IIIe siècle. Le caractère massif de la volute constituant la poupe de plusieurs des bateaux pourrait même nous rapprocher de l'époque romaine, ce qui situerait l'œuvre après la fondation de la colonie romaine de Karteia, en 171 avant notre ère[22].

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NOTES

1. Almagro Gorbea, 1987, 390.
2. Chaque navire a fait l'objet d'un relevé, illustré en grisé ici, tandis que les dessins en noir sont empruntés à la publication de C. Barroso Ruiz.
3. Corzo Sanchez, Giles Pacheco, 1978, 22.
4. Cf. *infra*, 4.
5. Barroso Ruiz, 1978, 3.
6. Corzo Sanchez, Giles Pacheco, 1978, 25.
7. Barroso Ruiz, 1980, 34.
8. Barroso Ruiz, 1980, 34 et Dams, 1984, 4.
9. Barroso Ruiz, 1980, 35.
10. *Id.*
11. Artzy, 1984.
12. Barroso Ruiz, 1980, 37.
13. *Id.*
14. Dams, 1984, 3.
15. Barroso Ruiz, 1980, 38.
16. Corzo Sanchez, Giles Pacheco, 1978, 29.
17. Corzo Sanchez, Giles Pacheco, 1978, 27.
18. Dams, 1984, 3.
19. Corzo Sanchez, Giles Pacheco, 1978, 26.
20. *Id.*
21. Corzo Sanchez, Giles Pacheco, 1978, 29.
22. Tite Live, 43, III, 4.

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ARTZY (M), Unusual Late Bronze Age ship representations from Tell Akko, *MM*, 69, 1984, 59-64.

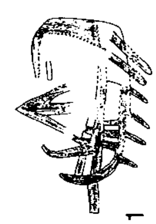
BARROSO RUIZ (C), Nuevas pinturas del abrigo "cueva de Laja Alta", *Jábega*, 24, 1978, 3-8.

—, Nuevas pinturas rupestres en Jímena de la Frontera (Cádiz): abrigo de Laja Alta, *Zephyrus*, XXX-XXXI, 1980, 23-42.

CORZO SANCHEZ (R), GILES PACHECO (F), El abrigo de la Laja Alta, *Boletín del Museo de Cádiz*, I, 1978, 17-35.

DAMS (L) et (M), Ships and boats depicted in the prehistoric rock-art of southern Spain, *Papers in Iberian archaeology*, BAR International Series 193 (I), 1984, 1-11.

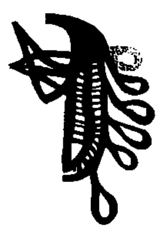
Fig. 1

bateau 1

Fig. 2A

Fig. 2B




bateau 2

Fig. 3A

Fig. 3B


bateau 3

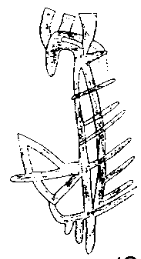
Fig. 4A

Fig. 4B


bateau 4

Fig. 5A

Fig. 5B

bateau 5

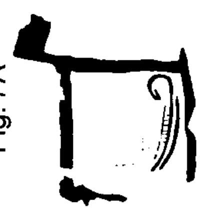
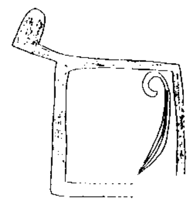
Fig. 6A

Fig. 6B


bateau 6

Fig. 7A

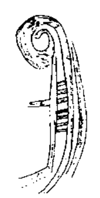
Fig. 7B

port

Fig. 9A

Fig. 8B



bateau 7

Fig. 9

LE RELIEF COPTE NO 9625 DES STAATLICHE MUSEEN DE BERLIN ET LE GOUVERNAIL D'ÉTAMBOT

Le gouvernail d'étambot: "autour de ce problème technique, une véritable guerre de religion!"[1]. A cette exclamation de P. Chaunu, j'ajouterai qu'aucune "religion" n'est acceptée sans réserve en cette matière par les auteurs qui en ont traité: tous, même séparés par des désaccords, se gardent d'un dogmatisme excessif, et j'espère faire preuve, ici, de la même prudence. Toutefois, afin de ne pas introduire dans le problème de l'invention et de la diffusion du gouvernail d'étambot des éléments inutiles ou sans pertinence, il me semble impératif de faire une nette distinction entre deux types de gouvernail unique situé à la poupe du navire. Certes, le navire de mer de l'Antiquité méditerranéenne n'a jamais connu qu'un seul type d'appareil de gouverne, composé de deux "rames", une de chaque bord, mais il est complètement erroné de l'opposer à un "gouverwail de poupe unique". En effet, il importe de faire une distinction entre le gouvernail axial et le gouvernail d'étambot proprement dit.

Ce dernier s'articule sur l'étambot au moyens de pentures, ferrures dont l'une est fixée sur l'étambot et présente une ouverture cylindrique, le fémelot, dans lequel s'engage l'aiguillot, partie mâle de la penture fixée sur le safran du gouvernail. Si le gouvernail d'étambot est toujours axial (ou en tout cas très proche de l'axe du navire[2]), le gouvernail axial n'exige en aucune façon d'être uni à l'étambot et peut même exister en l'absence d'étambot. L'évolution du gouvernail axial dans l'Antiquité peut être suivie de manière continue dans l'Egypte antique. Jusqu'à la 5e dynastie incluse, on ne voit que des rames-gouvernails latérales, en nombre variable. Mais dès la 6e dynastie (2345-2181 av. J.-C.) on voit brusquement apparaître le gouvernail unique, axial, qui traverse une petite plate-forme débordant la poupe[3]. Ce gouvernail axial se développe au Moyen Empire: il s'appuie, d'une part, sur le sommet de la poupe et de l'autre, sur un mâtereau[4]. Au Nouvel Empire survient une nouvelle étape de l'évolution: le mâtereau existe toujours, mais l'axe du gouvernail s'engage dans une encoche taillée dans le sommet de la poupe[5]. Il est évident que personne ne peut qualifier ces appareils de gouverne du nom de gouvernail d'étambot, tel que je l'ai défini.

Il est admis par de nombreux historiens, parfois avec hésitation, que les premiers témoignages iconographiques du gouvernail d'étambot apparaissent sur des bas-reliefs ornant les fonts baptismaux de Zedelgem (près de Bruges, en Belgique)[6] et de Winchester[7], vers 1180. Toutefois, si les navires à coque arrondie portant ces gouvernails sont des hulcs, il est possible que ce type de navire ait été dépourvu d'étambot véritable et le gouvernail, unique, aurait pu être fixé par des pentures aux bordages voisins de la poupe, légèrement à tribord de l'axe (cf. la note 2).

En revanche, il est certain que le type de navire appelé "cogue", qui fréquentait les mêmes eaux que la hulc, c'est-à-dire la Manche et la Mer du Nord, et avait, entre autres caractéristiques, un étambot rectiligne, apparaît dans l'iconographie de la première moitié du XIIIe siècle muni d'un véritable gouvernail d'étambot. Or il est certain que la cogue –et avec elle le gouvernail d'étambot?– apparaît en Méditerranée au plus tard en 1184 et qu'un siècle plus tard elle fut largement adoptée par les Vénitiens, les Catalans et les Gênois[8].

Qu'en était-il en Chine? J. Needham, le grand spécialiste de la civilisation chinoise et de ses technique, a fait à plusieurs reprises état d'un modèle de navire en terre cuite découvert à Kuangchow, daté du premier siècle de notre ère et montrant un gouvernail axial[9]. J. Needham, qui y voyait le premier exemple connu de gouvernail d'étambot, devait préciser: "L'invention du gouvernail d'étambot implique un paradoxe remarquable: elle a été l'oeuvre d'un peuple dont les navires avaient cette caractéristique de ne pas comporter d'étambot"[10], ajoutant: "la construction cloisonnée fournissait aux Chinois des membrures sensiblement verticales, auxquelles le safran d'un véritable gouvernail pouvait commodément venir se fixer, pas nécessairement sur la cloison postérieure, mais quelquefois, au contraire, une ou deux membrures en avant. Ce principe était valable pour les navires à voile, du plus petit au plus gros[11]. On peut l'appeler "l'étambot invisible"[12]. "Image hardie", commente P. Chaunu à propos de cet "étambot invisible"[13].

En fait, cette solution chinoise n'a jamais convenu qu'à l'architecture navale chinoise, si particulière, et si elle fonctionnait parfaitement, tant sur les fleuves qu'en mer, elle ne constituait qu'une variété du gouvernail axial, remarquablement sophistiquée.

Les conclusions que tirait J. Needham du modèle de Kuangchow étaient curieuses: il écrit: "quant à la transmission de cette technique (et il est sûr qu'il y a eu transmission), nous ne pouvons pas en dire grand'chose"[14], ce qui ne l'empêche pas d'ajouter, à titre d'hypothèse,: "il est possible que l'invention chinoise s'est répandue dans le monde islamique au Xe siècle"[15] et poursuivant comme s'il s'agissait d'une certitude: "mais le passage du monde musulman au Nord de l'Europe demeure au premier chef étonnante"[16]. Il serait d'autant plus étonnant qu'il s'agirait d'une diffusion vers le *Nord* de l'Europe, où l'on voit apparaître les premiers témoignages du gouvernail d'étambot véritable, totalement différent du "gouvernail d'étambot invisible", je dirais plutôt: "fantôme". Quant aux possibles intermédiaires arabes, j'y reviendrai dans la suite de cette communication. V. Christides a récemment cru pouvoir retrouver le "chaînon manquant" dans un très intéressant document: une stèle funéraire copte du 6e. s., trouvée à Meidoum (Egypte) (fig. 1 et 2), où il voit "a clearly defined axial stern rudder"[17], et il conclut de cette représentation: "since the Chinese had used a single stern rudder from at least the first century B.C., it is highly likely that the Arabs borrowed the invention from them and subsequently introduced it to Europe"[18].

Or l'auteur de la stèle de Meidoum n'avait nul besoin de s'inspirer du "gouvernail d'étambot invisible" chinois: le type de gouvernail axial qu'il a sculpté est purement égyptien.

Les représentations de navires en Egypte postérieures à la fin du Nouvel Empire sont extrêmement rares, mais il existe un document très important du règne du pharaon Piankhi (25e dynastie; règne de 747 à 716), mis en lumière par B. Landström[19]. On en trouvera ici un détail: fig. 3. Il est clair qu'ici le gouvernail, unique, traverse de part en part la haute poupe et l'on distingue le barreur. Il s'agit bien d'un gouvernail axial, mais nullement, on le voit bien, d'un gouvernail d'étambot, et il descend en ligne directe du gouvernail du Nouvel Empire qui reposait sur une encoche (cf. note 5). Ici, la mèche a été déplacée vers l'avant et au lieu de reposer sur une encoche, elle tourne dans un "puits" pratiqué dans la haute poupe. Ce dispositif rendait inutile le mâtereau de soutien et assurait au gouvernail axial une plus grande verticalité par rapport aux types de gouvernails axiaux égyptiens des époques précédentes.

On trouve les descendants directs du gouvernail axial des navires de Piankhi sur des graffiti coptes datant probablement du 7e s., trouvés à l'Osireion d'Abydos (fig. 4)[20]. Il résulte clairement du rapprochement de la fig. 2 avec la fig. 4 qu'il s'agit du même type de gouvernail, résutat d'une évolution locale qu'on peut suivre de manière ininterrompue depuis la 6e dynastie, c'est-à-dire pendant 2900 ans environ. Et ce gouvernail n'est pas un gouvernail d'étambot (il n'est d'ailleurs nullement démontré que l'Egypte antique ait connu l'étambot véritable).

Au reste, on comprendrait mal une transmission venue du monde arabe vers la Méditerranée, via la conquête de l'Egypte au 7e s., alors qu'il n'existe aucun témoignage écrit ou iconographique du gouvernail d'étambot en Méditerranée "avant l'introduction de la cogue en Méditerranée au XIVe siècle", écrivait J. H. Pryor en 1988[21].

Il est vrai que J. H. Pryor a, deux ans plus tard, nuancé son opinion à la suite de la publication d'une remarquable collection iconographique de navires arabes par D. Nicolle en 1989[22].

J.H. Pryor et S. Bellabarba relèvent, dans cette collection, cinq représentations de navires (associées à des constellations) nommés Argo, dans des manuscrits arabes évidemment apparentés, allant de 1009/10 à 1220/50, qui, selon eux, "show clearly defined sternpost rudders"[23].

Or un seul manuscrit de cette série montre de façon indiscutable un gouvernail d'étambot véritable, fixé par des ferrures[24]. Ce manuscrit, *Suwar al Kawakib* (Livre des étoiles fixes) de al Sufi, conservé au Musée de Topkapi, provient de Mardin (Irak) et date de 1134/35. Il est donc antérieur aux représentations de Zedelgem et de Winchester d'environ un demi-siècle[25]. Bien que cette image montre un gouvernail d'étambot de manière très schématique (aucune barre n'est indiquée), elle est indiscutable. Comme Mardin se trouve à mi-chemin entre le Tigre et l'Euphrate, artères vitales pour le commerce dans le Golfe Persique et l'Océan Indien, il est indéniable que le gouvernail d'étambot était connu dans ces eaux avant les premiers témoignages en Europe du Nord. On retrouve le gouvernail d'étambot dans deux illustrations du *Maqamat* de al Hariri, l'une provenant d'Irak (vers 1225-1235)[26], l'autre de Bagdad (datée de 1237)[27]. Toutefois, ces deux représentations montrent un gouvernail d'étambot accompagné de deux rames-gouvernails latérales, ce qui pourrait indiquer que ce nouveau gouvernail en était encore au stade expérimental[28]. Notons, enfin, qu'une copie du *Suwar al Kawakib* originaire de Sicile et datant de 1220/50[29] représente l'Argo de façon si maladroite qu'il est clair que l'auteur s'est inspiré d'un modèle auquel il n'a rien compris, quant au gouvernail.

Je concluerai, de ce bref examen

1. que le "gouvernail d'étambot invisible chinois" est étranger à la question de la diffusion du gouvernail d'étambot; tout au plus les inventeurs de celui-ci ont-il pu s'inspirer d'un gouvernail axial, mais s'il en existe en Chine et en Egypte, dont celui de Meidum, on ne perdra pas de vue qu'il en a existé, dans l'Antiquité, de nombreux exemples en Europe, parmi les bateaux fluviaux: la stèle de Blussus (1er s. ap. J.-C.) au Mittelrheinisches Landesmuseum de Mainz[30] n'est qu'un des nombreux exemples du gouvernail axial dans le monde romain[31], le plus troublant étant celui d'un autel dédié à la déesse Nehallenia, du 3e s. ap. J.-C., au Rijksmuseum van Oudheden de Leiden[32], tant il ressemble à un gouvernail d'étambot: pourquoi

les inventeurs du gouvernail d'étambot, s'ils se sont inspirés du gouvernail axial, auraient-ils cherché des exemples de ce dernier en Chine ou en Egypte, alors qu'il a existé en grand nombre en Europe?

2. qu'il existe entre la Manche et la Frise suffisamment d'éléments permettant de conclure qu'un gouvernail d'étambot y a été utilisé dès la fin du XIIe s., d'abord de manière plutôt gauche, puis, sur la cogue, de manière de plus en plus assurée;

3. que la cogue s'est répandue de manière étonnamment rapide en Méditerranée[33], ce qui ne signifie évidemment pas une diffusion immédiate sur tout le pourtour de celle-ci du gouvernail d'étambot: les rames-gouvernails latérales, utilisées depuis trois millénaires, se sont encore maintenues en Méditerranée pendant plusieurs siècles; on en trouve de nombreux exemples sur la fameuse vue en perspective de Venise en 1500 de Jacopo de Barbari;

4. qu'il est acquis qu'un gouvernail d'étambot a été utilisé dans le Golfe Persique et/ou dans l'Océan Indien dès le milieu du XIIe siècle; toutefois, jusqu'à présent, il n'existe aucune preuve que cette invention arabe a été diffusée en Méditerranée, alors que le "cocius" gênois de 1184[34] implique, à mon sens, la diffusion *probable* du gouvernail d'étambot à partir de la Mer du Nord ou de l'Atlantique;

5. qu'en tout état de cause, le relief de Meidum (fig. 1 et 2) est complètement étranger à la question de la diffusion du gouvernail d'étambot.

Post-scriptum

Je ne voudrais pas passer sous silence le manuscrit arabe *Ahsam al Taqasim fi Ma'rifat al-Aqalim* ("Les meilleures Divisions pour la Connaissance des Climats") de Abu Bakr al-Banna' al-Bashari al-Muqadassi, datant de 985 (Needham 1971:652), qui pourrait impliquer l'existence, en Mer Rouge, d'un vrai gouvernail d'étambot. Toutefois, s'il en est ainsi, ce gouvernail était commandé par un système de tire-veilles, et non par une barre. Ce système était encore très largement répandu sur les bateaux arabes d'une taille modeste au XIXe siècle, alors qu'il a toujours, à ma connaissance, été ignoré en Méditerranée - sauf sur de très petites embarcations importées d'Occident, telle la "gondola" introduite à Malte au XIXe siècle par les Britanniques (modèle au Musée Maritime de Malte).

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NOTES

1. Chaunu 1983: 279.
2. Pourquoi cette réserve? Parce que le gouvernail du bâtiment médiéval appelé "hulc" (voir plus loin) aurait été d'un type très particulier: Sleeswyk et Lehmann 1982: 282-3; toutefois, les problèmes posés par la "hulc" sont loin d'être totalement résolus et c'est à juste titre que B. Greenhill a pu parler de "the mysterious hulk" (Greenhill 1976: 283).
3. Landström 1970: 49 à 51, fig. 133 et 137 à 144.
4. *Ibid.* 82 et 83, fig. 246 à 252.
5. *Ibid.* 99, fig. 313 et 316.
6. Greenhill 1976: 86, fig. 40.
7. Excellente photographie dans: Phillips-Birt 1979: 141, fig. 122.
8. Il est important de préciser ici que la "cogue" mentionnée dans des documents notariaux gênois de 1184 et de 1190 sous le nom de "cocius" (Bellabarba 1988: 239, n. 35) n'était probablement pas le navire construit à clins et à fond plat qu'elle était en Mer du Nord (Bellabarba 1988: 236). L'apparition d'un nom de navire nouveau en Méditerranée, nom clairement dérivé d'un type nordique bien connu ne peut évidemment s'expliquer que par une caractéristique nouvelle (en Méditerranée) de ce type de navire nordique. Pour Bellabarba, cette caractéristique nouvelle est "peut-être" le gouvernail d'étambot (Bellabarba 1988: 236). Sur la diffusion de la cogue en Méditerranée, voir aussi: Sleeswyk et Lehmann, 1982: 288-289.
9. Photographies de ce modèle: Needham 1966: pl. 1 et 2 (entre les pp. 120 et 121); Needham 1971, pl. CD, fig. 963 et pl. CDI, fig. 964, 965; Christides 1992: 40, fig. 3.
10. Needham 1966: 123.
11. Ce qui est resté vrai pour les navires et bateaux chinois de toutes les époques.
12. Needham 1966: 124.
13. Chaunu 1983: 280.
14. Needham 1966: 122.
15. *Ibid.*: 123.
16. *Ibid.*
17. Christides 1992: 39 et 40, fig. 2.
18. *Ibid.* 39-40.
19. Landström 1970: 140, fig. 408. Ce relief décorait le temple de Mut à Karnak (il a été publié par Benson et Gourlay (1899), où il commémorait une expédition de Piankhi sur le Haut Nil. D'autres navires décoraient les parois de temple: ils sont tous semblables à celui publié par Landström et leur gouvernail axial est toujours identique à celui de la fig. 3.
20. Autres représentations de graffiti d'Abydos à gouvernail axial: Basch 1993: 41, fig. 8 à 11. Le gouvernail est toujours identique à celui de la fig. 4.
21. Pryor 1988: 60. Il ne tenait pas compte de l'article de S. Bellabarba (1988) démontrant que la cogue apparaissait en Méditerranée à la fin du XIIe s. (cf. note 8, *supra*).
22. Nicolle 1989.
23. Pryor et Bellabarba 1990: 107.
24. Nicolle 1989: 174, fig. 15 a.
25. *Ibid.*: 173 et 175.
26. *Ibid.*: 176, fig. 23.
27. *Ibid.*: 178, fig. 24 a.
28. Sleeswyk et Lehmann 1982: 300.
29. Nicolle 1989: 176, fig. 20 et 177.
30. Sleeswyk 1982.
31. Etudiés par Lehmann 1978.
32. Lehmann 1978: 97, fig. 1.
33. Cf. note 8 supra.
34. *Idem.*

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ILLUSTRATIONS

Fig. 1

Fig. 2

Fig. 3

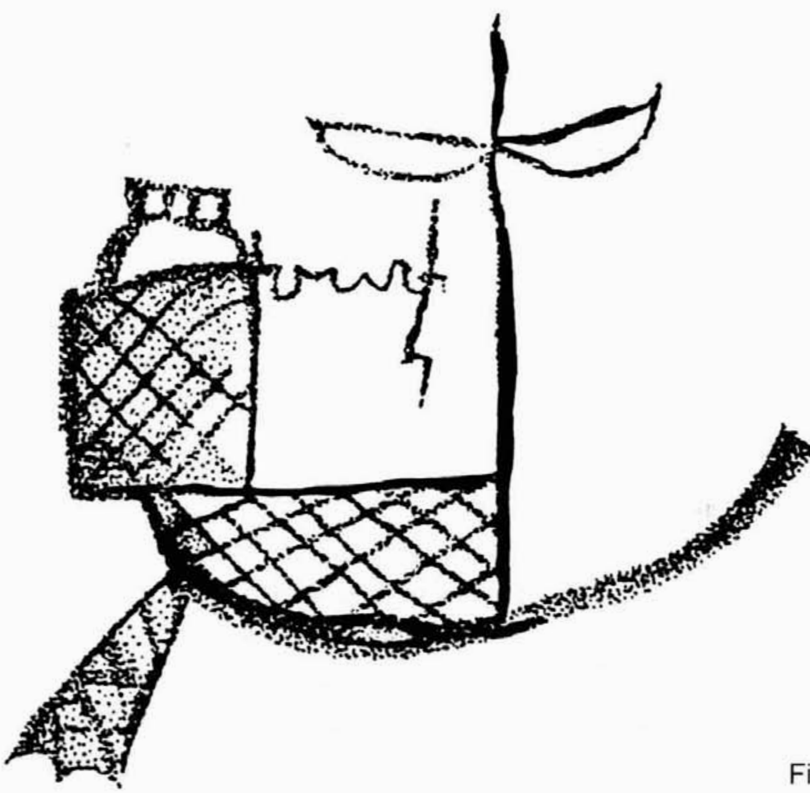

Fig. 4

FIBERS AND TEXTILES USED IN THE CONSTRUCTION OF THE SHIP'S HULLS

Papyrus was used in ancient ship construction, bundled to form rafts, and pressed or woven into mats and sails (fig.1). Plant fibers were used as sennit (fig.2) for plank reinforcement, and for ropes in rigging, nets, mooring, attaching anchors, and as a construction technique for strengthening the hull in hogging and sagging trusses (fig.3). Fibers were employed in sewing hull planks together, for instance, in Egypt (fig.4) and the Mediterranean such as in the Gela ship which is entirely sewn, and in the Ma'agan Micha'el ship, which was partially sewn.

But an aspect of ship construction little mentioned is the use of plant fibers, used either alone, in their natural state, or impregnated into tarry, viscous organic material, for the purpose of caulking. Caulking was used to protect the hull from worms, crustacea, and microorganisms which threatened the ship's seaworthiness and as protection from abrasion to the hull caused by the metal sheathing, when it existed, rubbing against the wood. It also protected against rotting which resulted from microorganisms or water penetrating between the sheathing and the wooden hull. Rot allowed even more rapid penetration by worms.

Literary sources such as Strabo and Pliny, tell us that fibers were hammered between strakes of the hull into the seams, providing a sealant as the wood swelled when placed in the water in ships in Northern Europe and Belgium. Fibers were, as well, placed on the inner surface of the hull (fig.5) and smeared over with the thicker substance, or put on the outer surface (fig.6) of the hull, with the metal sheathing on the outer surface. An interesting exception is the Roman shipwreck excavated at Madrague de Giens, (fig.7) where fabric (in photo marked as #1), is first placed between an inner and outer layer of wood planking and again (as #2 in photo), between the outer planking and the sheathing.

The natural fibers available, used for caulking were, esparto and halfa grasses, agave leaves, seaweed, papyrus, moss, and hair from goats or other animals, all of which were used as is. Wool was used, spun from sheep and camels hair, while other textiles were woven from cannabis (into hemp), flax (into linen), and later, from cotton. The use of these fibers has been reported and analyzed from a number of shipwrecks excavated in Egypt, the Mediterranean Sea, and Northern Europe (fig.8).

The reasons for using these fibers were the following:

- they were locally available, and therefore cheap;
- they were relatively easy to be worked;
- they were not soluble in sea water;
- they were fairly resistant to destruction by marine microorganisms;
- they served as a sealant between planks;
- some, such as seaweed, retained water making them a valuable source of moisture preventing the planks drying out when the boat was out of the water;
- they functioned as an anti-abrasive agent when placed between the metal sheathing and hull strakes.

For the purpose of interior and exterior caulking, there were a number of viscous organic substances used. In some ships the fibers or textiles were sometimes first soaked with the materials which were heated to soften them, and then applied to the surface of the wood. In others the fibers or cloth would be laid along the side (fig.9) with the thicker material, spread or painted over it.

This information appears via publications of the various reports of shipwreck excavations in Table I (fig.10). In literary and historic sources as well as the shipwrecks, the nomenclature seems to be confused, since some of the terms have been used interchangeably. Today, with the use of the mass-spectrometer, the clarification can be complete and accurate, although the identification of fibers is still problematic.

The viscous, organic materials utilized, were either naturally occurring or man-made. Those that were naturally occurring were: bitumen or asphalt, pine resin and beeswax (sometimes used in a mixture with pitch). The man-made materials were tar and pitch, and these had to be distilled from wood.

In ancient times, asphalt or bitumen was found along the shores of the Dead Sea and the Jordan valley, in Mesopotamia and in India, along the Indus River. Sicily and Northern Greece, in the Mediterranean, were also part of the picture of asphalt and bitumen production (fig.11). They were expensive and used for medicinal purposes and mummification as well as water-proofing.

Early stories of caulking, come from the story of Noah's Ark and his Sumerian equivalent, Ur-Napishtim in the Gilgamesh epic (c. 2700 BCE) in the story of Moses' cradle, or that of his earlier counterpart, King Sargon, (c. 2300 BCE). All describe the use of asphalt. From our vantage point of today, we know that asphalt and bitumen were later found in Mexico and California, in the New World. But in ancient times the only tarry substance available to shipbuilders without access to the areas described in the map had to be produced by distilling wood (fig.12) which was most usually pine.

Caulking a hull was associated with, but not limited to the sheathing of the hull with metals, most commonly lead. Both processes, sheathing and caulking were used to protect and also strengthen the hull. For in addition to water proofing and antifouling, fibers and/or textiles, when used with the viscous organic material, added strength to the hull, as do most composite substances.

Instinct and experience were the only guides to the choice of materials used. The ancients perhaps didn't know it, and may not have had a term for it, but they were using what has come to be known as composites. Today they are mostly man-made. We know that among the benefits of using such composites, durability, flexibility and strength are the most important. The property of strengthening by fibers embedded in a solid matrix was referred to (in the Bible) in Ancient Egypt for making bricks stronger by adding straw. But when we talk about strength, we usually mean "tensile" strength, related to chemical bonding. Even when dry, these composites retain some amount of flexibility. An interesting point is that in Table II (fig.13), flax, or linen, is shown as having as much tensile strength as Titanium alloys, and certainly far more than many other materials, including most metals and wood.

Flexible caulking could accommodate shrinking and swelling of the planks and some hull movement without leaking much. However the addition of fibers into the viscous matrix, either as is or as woven cloth provided an interesting advantage to the caulking material. While not interfering with the flexibility of the thicker substance, fibers provided a stopping point for cracks that might occur in the caulking matrix (fig.14). In pottery making, adding straw to clay to prevent cracking, appeared as early as the 5th or 6th millenium, BCE. If, or when, there was a crack in the matrix (white material on photo) it could proceed through the material to the fiber and then would either stop or be diverted, in a scattered or random manner, depending whether it hit the fiber along its length, or at its edge, throughout a considerable length or volume of the material. The crack could continue and a great amount of time would pass before the composite could actually break up sufficiently to allow the elements in the sea to intrude on the hull.

In conclusion. We know where we find our ships. They become known by the name of the site where they were discovered and excavated. What we don't know is where they came from. Being able to identify without any doubt, the type and source of fiber used in the caulking may help. Through the use of mass-spectrometry, analysis of the materials used in caulking can now fingerprint the identity of the viscous organic materials used. It isn't too far off when we will be able to determine the geographical origin of that material, enabling us to know more about trade during ancient times and hopefully, telling us where our ships were built.

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ILLUSTRATIONS

Fig. 1 Electron microscopic blow-up of woven papyrus fibers —from HULL.

Fig. 2 Attachment of a reinforcing frame, being repaired with new ribs and sewn with sennits —from WHITE.

Fig. 3 Hogging trusses —from MCGRAIL.

Fig. 4 Internal view of the reassembled Cheops ship —from JOHNSTONE.

Fig. 5 From the Mahdia wreck; the caulking cloth on the inner surface of the hull —from DU PLAT TAYLOR.

Fig. 6 From the Sant Jordi wreck. The top figure shows the caulking on the outside of the hull, represented by the number 3 while in the bottom figure the number 7 points to the resinous material covering the interior surface —from COLL.

Fig. 7 The lightly colored areas numbered 1, between the two planks and also between the plank and the sheathing represents the fabric —from TCHERNIA & POMEY.

Fig. 8 The map shows the origin of the principal fibers used in ancient times —from BARBER.

Fig. 9 A photograph of a man alongside the Nemi boat, showing the fabric, caulking the sheathing —from UCELLI.

Fig. 10 Table I. A list of a few representative examples of shipwrecks with their respective caulking materials broken down into fibers used and viscous substances identified —EVE BLACK.

Fig. 11 Distribution map showing the main deposits to asphalt during the 3rd millenium, BCE —from ABRAHAM.

Fig. 12 Reconstruction of tar production —from EVANS and HERON.

Fig. 13 Table II. Some typical tensile strengths in pounds per square inch —from GORDON.

Fig. 14 Scanning election microscopic view of the cross cult of a piece of textile, the matrix appears as white, the longitudinal and cross cuts of fiber, as black —from HULL.

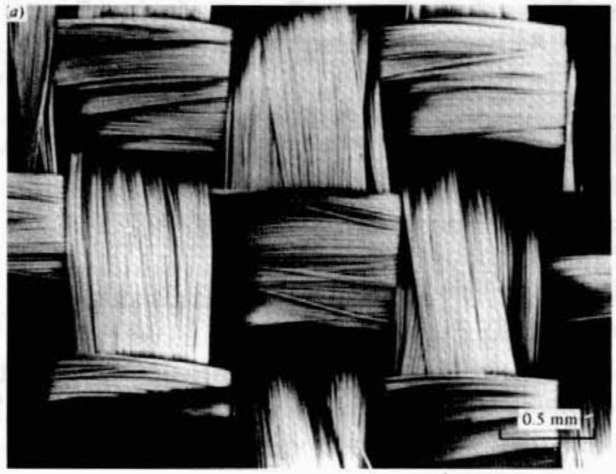


Fig. 1

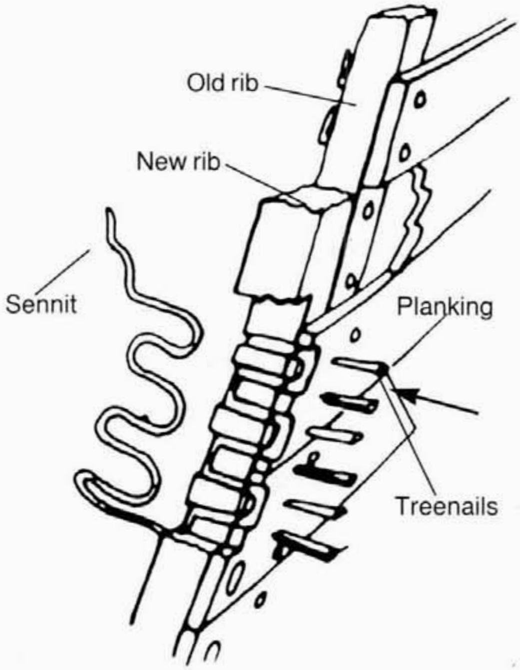


Fig. 2

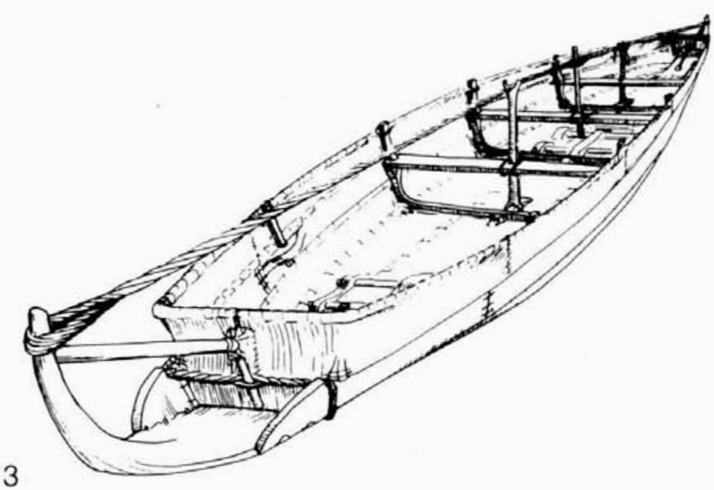


Fig. 3

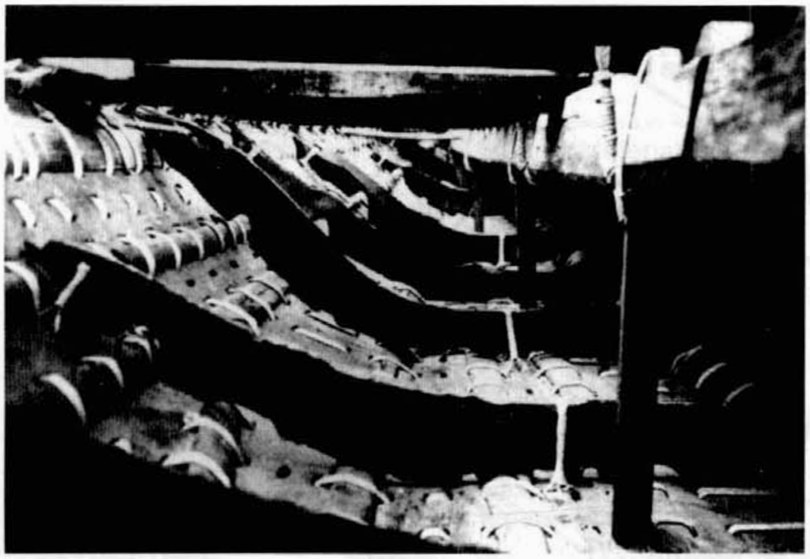


Fig. 4

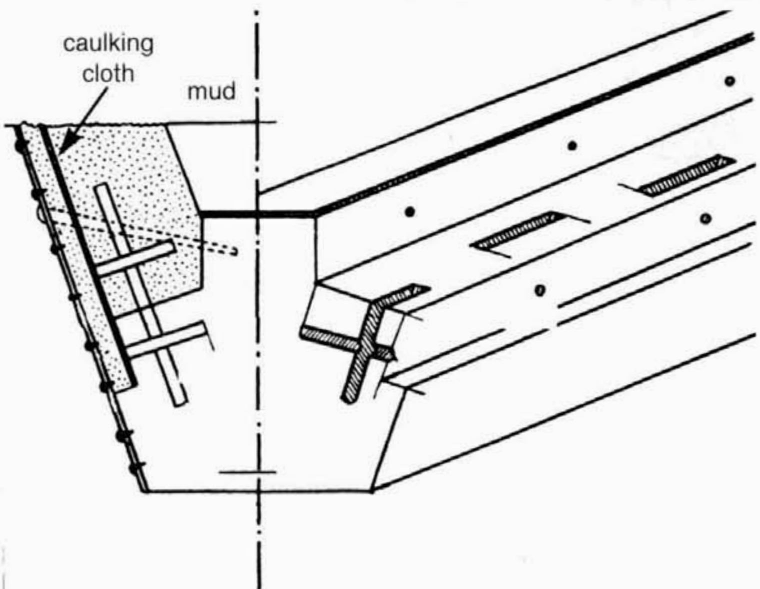
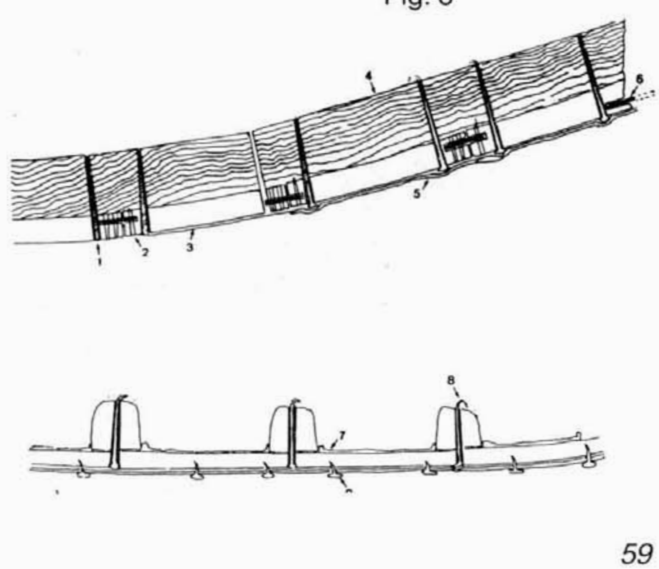


Fig. 5

Fig. 6



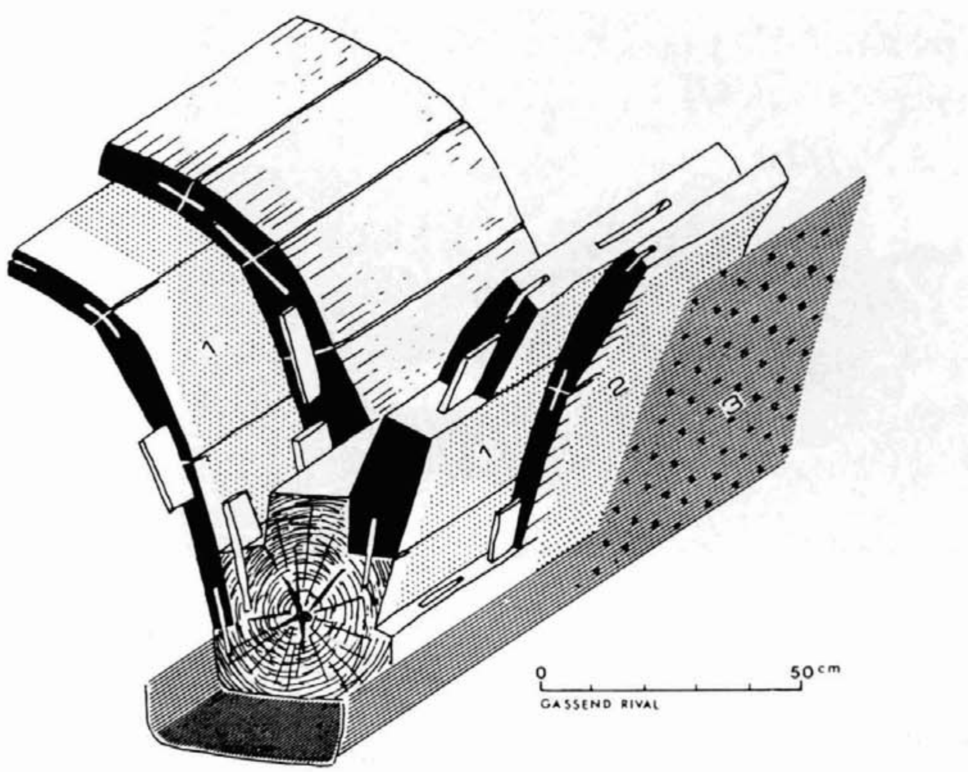

1
1
2
3
0
50 cm
GASSEND RIVAL

Fig. 7

Fig. 8


HEMP
Alps
Carpathians
FLAX
FLAX
Caucasus
Altai
ESPARTO
FLAX
FLAX
Zagros
HEMP
HEMP
SILK
Himalayas
COTTON
FLAX
WOOL

Shipwrecks found with fibrous material and viscous substances

Shipwreck	Fibrous Material	Viscous Organic Substances
Briggs Dugout (Phillips-Birt) 1100-700 BCE, No. England	Moss	?
Kyrenia (Katzev) 310-300 BCE, Med.	Agava or Hemp	Resinous Pitch
Serce Liman, (Pulak) 280-275 BCE, Med.	Cannabis or Wool	Black, Tarry
Punic Ship, Marsala (Frost) 241 BCE, Med.	Woven Fabric, possibly Hemp or wool	Resin
Grand Conglue (Benoit) 150-130 BCE, Med.	Cannabis (Hemp) or Flax (Linen)	Resin
Saint Jordi (Coll) 100-75 BCE, Med.	Plant	Resin or Pitch
Mahdia (du Plat-Taylor) 86-80 BCE, Med.	Woven Fabric	?
Albenga (Lamboglia) 80-60 BCE, Med.	Woven Fabric	?
Madrage de Giens (Tchernia) 75-60 BCE, Med.	Wool	Pitch
Nemi (Ucelli) 37-42 CE, Lake	Wool	Pitch, Resin or Bitumen
Kilkee Gurragh (Hornell) Roman-Modern, No. Europe	Canvas Calico, Flannel	Tar
New Guy's House (Marsden) Roman, No. Europe, River	Hazel Twigs and Roots	?
Palamos (Foerster Laures) Roman, Med.	Hair	?

Fig. 9

Fig. 10

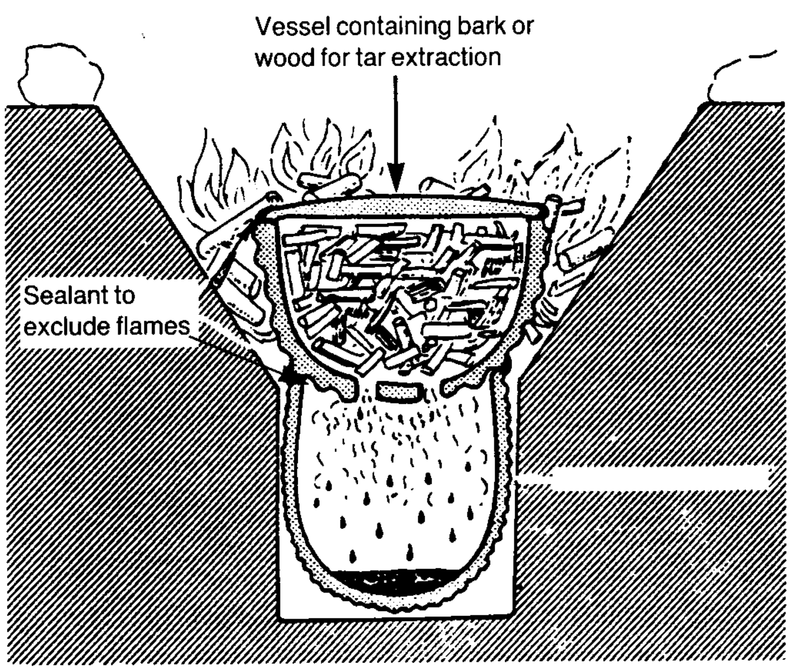

Vessel containing bark or wood for tar extraction
Sealant to exclude flames

Fig. 11

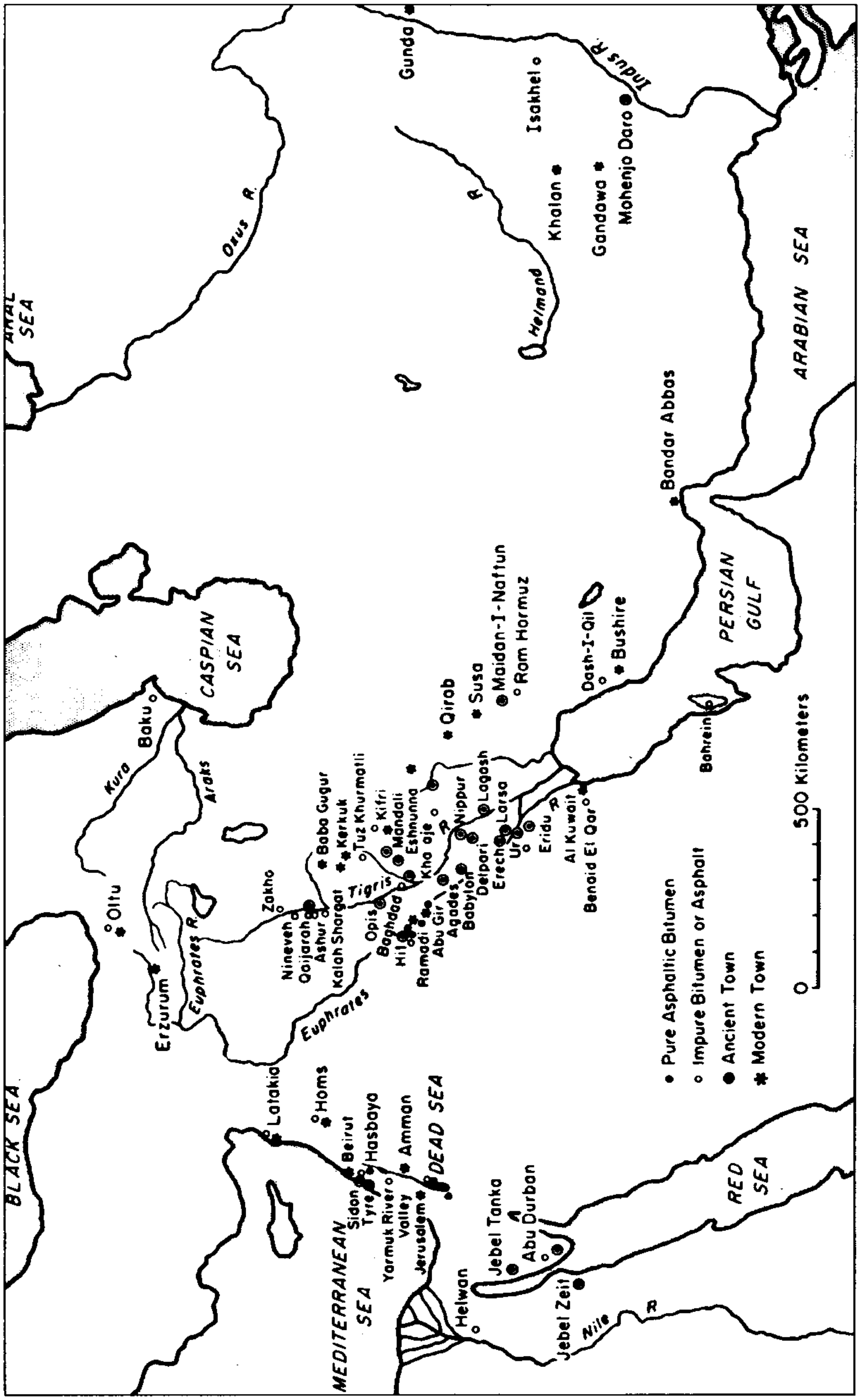

BLACK SEA
MEDITERRANEAN SEA
DEAD SEA
RED SEA
CASPIAN SEA
ARAL SEA
PERSIAN GULF
ARABIAN SEA
Nile R
Euphrates
Euphrates R.
Tigris
Kura
Araks
Oxus R.
Helmand R.
Indus R.
Latakia
Homs
Beirut
Hasbaya
Sidon
Tyre
Yarmuk River Valley
Amman
Jerusalem
Helwan
Jebel Tanka
Abu Durban
Jebel Zeit
Erzurum
Oltu
Baku
Zakho
Nineveh
Qaijarah
Ashur
Kalah Shargat
Baba Gugur
Kerkuk
Tuz Khurmatli
Kifri
Mandali
Eshnunna
Kha aje
Opis
Baghdad
Hit
Ramadi
Abu Gir
Agades
Babylon
Delpari
Erech
Ur
Eridu
Nippur
Larsa
Lagash
Al Kuwait
Benaid El Qar
Qirab
Susa
Maidan-I-Naftun
Ram Hormuz
Dash-I-Qil
Bushire
Bahrein
Bandar Abbas
Khalan
Gandawa
Mohenjo Daro
Isakhel
Gunda
• Pure Asphaltic Bitumen
○ Impure Bitumen or Asphalt
● Ancient Town
✱ Modern Town
0
500 Kilometers

Fig. 12

METALS	
Steels	
Steel piano wire (very brittle)	450,000
High tensile engineering steel	255,000
Commercial mild steel	60,000
Wrought iron	
Traditional	20,000-40,000
Cast iron	
Traditional	10,000-20,000
Modern	20,000-40,000
Other metals	
Aluminium	
cast, pure	10,000
alloys	20,000-80,000
Copper	20,000
Brasses	18,000-60,000
Magnesium alloys	30,000-40,000
Titanium alloys	100,000-200,000

NON-METALS	
Wood, spurce	
along grain	15,000
across grain	500
Glass (window or beer-mug)	5,000-25,000
Good ceramics	5,000-50,000
Ordinary brick	800
Cement and concrete	600
Flax	100,000
Cotton	50,000
Catgut	50,000
Silk	50,000
Spider's thread	35,000
Tendon	15,000
Hemp rope	12,000
Leather	6,000
Bone	20,000

Fig. 13

Fig. 14

DOUBLE SHIPSHEDS?

Some 6 miles (10 km) off the west coast of Rhodes, due west of the small port of Skala Kameirou, lies the island of Alimnia —in antiquity *Eulimna*. It is now uninhabited, the last inhabitants having retreated in the 1950s/1960s to the main island of Chalki to the south-west (and about 11 miles from Skala Kameirou).

While excavating a Neolithic settlement on the Kastro in June 1980, for the Ephorate of Prehistoric and Classical Antiquities of the Dodecanese, Mr Adamantios Sampson carried out a surface survey of the island, and found remains of shipsheds in two locations:

(1) on the south-east shore of the main enclosed bay of the island, Ag. Georgios;

(2) on the south shore of an inlet on the east coast of the island, Emporeio. He published a short account of his discovery, with a plan, in the *Deltion* for 1980, which appeared in 1988 (Fig. 1).[1]

On 25 August 1991, three days before our last Symposion, I was able to visit the island for a few hours, and presented some views of the site, with my initial reactions, at that Symposion.[2]

On 25-26 August 1992 I returned to the island, accompanied by Philippos Mazarakis, in order to check the measurements already made on the shore (but not in the water, for which we had no permit), and in particular to look for possible evidence of internal divisions within the shipsheds; for the initial reaction in 1991, during and after the Symposion, by our friends Lionel Casson and John Coates had been politely hostile to my suggestion of very wide "single" shipsheds for very wide ships.

At Emporeio Sampson had found remains of 11 shipsheds, and three more badly destroyed (but I could find no trace of these three on either visit, beyond no.

XI to the east) (Fig. 2). The slips are all cut into the bedrock, which is now very weathered, making precise measurements difficult. They are not spaced at completely regular intervals, but seem to have been cut taking account of the state of the bedrock (Figs. 3-4). Sampson rightly remarked that the *lengths* can be established in only a few cases; our measurements were even more conservative: 14-18m as compared with Sampson's 16-20 m.

The slips continue into the water, but it is difficult to say how far without precise underwater survey, for which I had no permit (Fig. 5). The easternmost slip at the seaward end (XI) seemed to continue for about 5m down to a depth of 0.65 m, and then more abruptly to a depth of 1.20-1.30 m, where it breaks off. Towards the western, inner end of the line, silting up seems to conceal, at least partly, the lower ends.

If we assume an underwater continuation of about 5 m, then we arrive at the conclusion of very short slips, especially if we take our lower figures rather than Sampson's, and particularly in relation to the considerable *widths*.

Our figures for the widths are less regular than Sampson's. He had put most into groups 8.50-8.70 m wide (E II-VI) or 9.50-9.80m wide (E VII, VIII, X, XI), with two wider ones: IX (10.80-11 m) and I (18.20 m). We cannot see such distinct groups, though four come between 8.50 m and 9 m (IV, V, X, XI) and five between 9.50 m and 10+m (III, VI-IX), with one slightly narrower at 8-8.40m (II) and one very wide at 18.20 m (I, as Sampson).

Sampson discussed the widths, but did not mention *gradients*. Determining gradient is not easy with such weathered rock and an earth fill in the upper part of the slips; but we are fairly confident in our measurement on the east side of E II: a fall of 1.34 m over 9.2 m or 1 in 7 (if we make an allowance for the earth fill). As for *heights*, the rock cuttings at Emporeio are much shallower than in the second group at Ag. Georgios. We obtained a secure measurement of 1.30 m at the back of E X (Fig. 6).

Nowhere is there any sign of any internal division of the slips; nor of any cuttings or settings around the edges of the slips.

At the inner, south-west corner of the bay there are walls which appear to be of good Hellenistic date close to the shore; Sampson found remains of houses and a kiln on the slope above, to the south, dating from the Hellenistic to Byzantine periods. He plausibly argues from the presence of an early Christian basilica and an early Roman burial near the shore, that by then the harbour structures were no longer in use as such.

No remains are visible on the north shore of the inlet. The Hellenistic and later fort at Kastro, high on the slopes to the north, is visible from the eastern half of the southern shore of Emporeio (Fig.7); from the western half of the southern shore the view is blocked by the ridge immediately above Emporeio to the north. The fort at Kastro must have served as a look-out station with a wide view of the eastern coast-line of Rhodes; the visual link with the two bays below would have been important, for signalling purposes (Fig. 8).

Without underwater survey we cannot give a final opinion, but it does not seem that we can assume a large relative rise in sea level since the Hellenistic period, with the possible result of erosion of the lower ends of the slipways, without reducing the original size of the bay to an impracticably narrow inlet. Therefore we cannot use this assumption to argue that the slips may have been much longer originally. But better information about the underwater contours of the bay could provide some clarification.

Sampson discovered a similar group of ten shipsheds on the south-east shore of the inner bay of the main harbour (Ag. Georgios: Figs. 9-10). This harbour is well protected from the prevailing winds (N, SE and SW) and from the currents which set from the open sea, from the south-west. It was used during the Second World War by the Italian navy as a base for small ships and seaplanes; remains of their accommodation buildings still stand on the shore close to the chapel of Ag. Minas, and also on the bay to the south-west (Fig. 11). There are also the remains of a rock-cut gun emplacement in the corner of one shipshed (V), with a tunnel and steps.

The chapel of Ag. Minas is built over the foundations of earlier structures, now lying just under water, on a short promontory. The remains on this promontory have not yet been studied, in order to determine what remains, if any, are ancient in date.

The shipsheds lie east of this low-lying promontory, between it and a short headland where walls lie just under water (0.20-0.40 m) and are now partly covered by an unfinished small modern jetty. Sampson had mentioned ashlar walls in the sea, "which must have been connected with the ancient harbour". The westernmost clearly defined shipshed lies some distance from the Ag. Minas promontory (Fig. 12); traces of ancient construction between do not look like shipsheds, and there is no slope behind.

Sampson's plan can serve as a provisional basis for study, thought no.I does not run so far inland as the plan indicates, and no.II runs much farther inland than no. III. Except at the south-west end the slips are cut into a steep hillside, part of which clearly proved too steep to be used (notably on both sides of no.VI: Fig. 13). One has the impression of much deeper cuttings, confirmed by measurement: 2 m at the back E corner of no. VII and back S corner of no. I; 2.5 m at the back of nos.V and VI (Fig. 14); and 3m at the back of no. IV. One also has the impression of steeper gradients than at Emporeio, but this is not so certain; the eye is naturally influenced by the steep slope of the rock strata. We obtained a fairly secure measurement of gradient on the north-east side of no. VI, with 3 points in line at places where the rock seemed to have been deliberately cut for a slip: a drop of 0.85 m over 6.3 m, approximately 1 in 7.4; this line would hit the water 3-4 m out from the present shoreline, and about 7 m from the lowest point measured (Fig. 15). Measurement along the north-east side of no.II produced a drop of 1.30 m over 6.90 m, approximately 1 in 5.3, but these figures are less certain.

As for the widths, Sampson found half to measure 9.60-9.90 m, and two more (II, V) 10.80-11 m. Our measurements produce a less tight grouping: they spread over the range 9-11 m. Two are clearly wider: we agree with Sampson that no. I is 13 m wide; for no. VI Sampson gives 13.20 m, whereas we propose 12+m (but the cutting for the slip clearly widens downwards).

Sampson wrote that none of the lengths could now be established, but he estimated ca.14 m to 20 m (no. VI). Again our figures are somewhat lower for the visible dry length; the underwater lengths are not known, and this is a main point to check in future work. There is no theoretical objection here, unlike Emporeio, to a long underwater projection of the slips, and the assumption of a relative rise in sea level; the remains on the Ag. Minas promontory indicate a small rise, but their date and character has not yet been established.

Sampson reported that pottery finds from this area are mainly Hellenistic, and argued that these shipsheds must belong to the same period as those at Emporeio. This is very probable, but not yet provable.

Neither in 1991 nor in 1992 did I find evidence within, or around the edges of, the shipsheds for (1) roofing; (2) external or internal walling; (3) installations such as capstans. It must, of course, be emphasized that the upper ends of the slips are covered with an earth or earth/stone fill, which makes it unlikely that (3) will be found without excavation; also that there was heavy undergrowth around the slips, especially at Emporeio.

As I said in 1991, a few days after my visit to the site, the most striking feature is the width of the slips, even if one allows for a possible working space on both sides of the ship when slipped. Almost all are too wide to have been intended simply to accommodate a single warship like a trireme with a beam of 5-6 m, but too narrow to have taken two—except for the very wide ones: ca.13m (AG I, VI: Figs. 11-14) and 18.20 m (E I: Fig. 4). These I accepted at once could well be "doubles", and E I even a "treble".[3] For the main groups I suggested that we had to consider the possibility that they were intended for "big ships" of the Hellenistic period, which may have been broader than we have allowed, over-influenced perhaps by our concentration on the classical trireme.

The problem remains, however, that they are awkwardly short, unless we can assume a much longer original dry length and large relative rise in sea level since antiquity (which, as we have seen, does not appear likely). Clearly, as Casson has suggested to me, the length:beam ratio may have been different in some Hellenistic warships from the classical trireme (and how sure can we be that the Hellenistic trireme was identical with the classical trireme?); but this does not seem enough to explain dry lengths of 16-20 m (+ 3-4 m) combined with widths of 8.50-11 m, even if we allow for working space around the slipped ships.

For this reason the comments which I received from Casson and Coates after the 1991 Symposion were strongly opposed to this idea, and strongly in favour of the alternative explanation: that all the shipsheds were "doubles" of the narrow shipshed type (4.20-4.40m) which I have defined in Rhodes and elsewhere.[4]

Casson commented: "No question, wide and short slipways are hard to explain. ...You seem to be faced with a ratio of less than 3:1—the ratio of a very stubby sailing ship; this eliminates even merchant galleys, to say nothing of war galleys... We know that some sailing ships were pulled up on land for the off-season (Horace, *Odes* 1.4.2), but those were probably the smaller craft, while the big ships spent the winter in inner basins (cf. *SSAW* 369 n. 32). If your slips are for sailing ships, they certainly would be unroofed; no need to keep a merchantman light and hence dry. But it does seem to me an unwarranted expense for a shipowner. Sailing ships have tough bottoms and keels; no reason a capstan can't just haul them up on even a shingly or rocky beach. ...Is it within the bounds of possibility to make all the wide ones double? That they were for hemiolias or even smaller warcraft? We haven't the foggiest notion of how big a hemiolia was—but the Ladby ship, a Danish man-of-war of ca. AD 1000, which was 20.6 m long and 2.9 m broad, had a dozen fighter-oarsmen per side and could even carry horses. Two such galleys, it seems to me, could fit into your slips. What do you say?".

I say that if we have to exclude the "big, wide ship", then we clearly seem to be dealing with double shipsheds for small ships such as hemiolias or trihemiolias, which we know that the Rhodians developed and used as guardships —and this is a particularly plausible explanation at Alimnia, the best port along the west coast of the island of Rhodes.

Coates commented: "Those slips ...would house pairs of 4m wide ships. ...My as yet only tentative design studies for two-level pentecontors and hemioliai (for 30 men and 20 oars) led to ships of about 4m breadth overall and lengths overall of about 20 m and 18 m respectively, which would be quite good fits for the present dry lengths of the slips. Triacontors would also have been about 4 m wide overall, quite tubby things with a length of about 16m. The wider slips could have accommodated three or even four ships (four on no. I at Emporeio)".

"The 5m length of slip under water to a depth of 0.65 m would be just about right for the light draft of the above ships, and I have for some time been wondering whether slips would not have ended [sc. at the lower end] in a short steeper bit to enable the sterns of loaded ships to make contact without damage in being moored at slips, before oarcrews, etc. were disembarked before slipping. ...It would ease the landing of the rising keel at the stern, causing it to suffer less damage if a sea should be running, and greatly help the start of hauling out...".[5]

"I would think that these slips could well have been made for such smaller warships. Their slope of 1 in 7 would be too great for triereis and ships of greater denomination, because just when the bow lifts on launching (or settles when being hauled up), in the case of a trieres on a 1 in 10 slip the forward lower oarports are about to flood, and I do not believe that *askomata* would be relied upon to stop flooding through those oarports which would be immersed if ships 37 to 40 m in length were housed on slips steeper than 1 in 10. The slips on Alimnia do not therefore seem to me to have had anything to do with the large Hellenistic ships".

If we accept the "double shipshed" idea, then we have to ask why they cut broad slips into the rock for *pairs* of ships rather than narrower slips to house single ships. One would have thought that the latter method was more economical in work of excavation and ease and cost of roofing.

Perhaps there was a tradition of roofing pairs of slips, which here prevailed over other considerations. At Piraeus, for example, the slips were roofed in pairs, probably with pitched roofs whose ridge sloped seawards; this seems to have been more a question of efficient use of timber and general questions of *super*structure rather than any "underlying" questions at ground (rock) level —except economy of space in a port with a shortage of shoreline, for example Piraeus, Syracuse, Carthage or possibly Rhodes city.

A *double*-span roof may well have been cheaper to build than two single spans plus the necessary intermediate support. At Piraeus the double roof *did* have intermediate support, so clearly it was not possible to obtain timber lengths to cover spans of 12 m or more; but perhaps for the shorter spans of most of the Alimnia slips we do not have to look for supports down the centre of the slip (whether piers/columns or a wall). The wider slips, however, must have had something.

When looking for parallels for "double shipsheds", one has in a sense the foundations excavated at Zea in 1885, and here certainly economy of space was a factor. There is in fact no reference to them as "double"; indeed, the only ancient description we have of shipshed roofs at Zea refers, oddly enough, to "the shipsheds with a common roof" in front of Philon's Naval Arsenal, which we now know to have been on the west side of the harbour; one could deduce, though without certainty, that they were a distinctive and perhaps unusual group, which may have been similar to Hurst and Gibson's reconstruction of the shipsheds at Carthage; no certain remains of shipsheds have been investigated on the west side of Zea. Elsewhere in Piraeus the shipsheds were in long continuous rows, but roofed in pairs.[6]

The best parallel is the pair of steep rock-cut slips for guardships on the inner side of the promontory at Sounion; they clearly had a single-span roof, probably in two descending parts each with a horizontal ridge. The two slips are each 2.60 m wide, with a shallow ledge on each side; their dry length is now ca. 18 m and the total visible length is over 21 m. The slips are cut deep into the rock (up to 1.25 m), and their gradient is steep (1 in 3.5). The rock-cut chamber is 20m long, 11.55 m wide and 3.9 m high at the back wall. No traces are now visible of any internal dividing walls/piers, so we have to assume that the roof must have spanned the entire chamber without any central support.

There is a pair of slips also at Thurii in southern Italy, but these were not necessarily roofed, and have a large free space (6 m on *either* side of 12 m) around what appear to be the settings for timbers in a cobble floor—a ship-building yard? The parallel is not so close.

At Oiniadai there is a group of five rock-cut shipsheds in a single chamber, 41m wide and 47m long (with a longer side wall), cut in the rock. The slip cuttings are 2.25m wide at the bottom and 3.25m wide at the top; the gradient is slightly less than 1 in 6. The form of roofing is not clear, but the five sheds do seem to have been separately roofed, since (unlike Piraeus) the rows of columns dividing them all had the same distance between columns (2.25m); the clear width between the rows is 6.75m, more than enough for a trireme, and a side chamber measures

5.60 m in width. Since the roof may well have swung up at the upper end, like the rock-cut slip below (to fit the after cut up), it may have been easier to have separate roofing. The back wall of the rock-cut chamber is ca. 11 m high, and the excavators deduced from projections on its face that the columns were about 7 m high, including capital; the gable was higher but was not measured by the excavators.

The only literary evidence which we have for double shipsheds is as follows:

(1) Diodorus' reference to Dionysius I (404 BC) building 160 shipsheds, "most of which took two ships".[7] This has often been interpreted (e.g. by Judeich and recently by Michael Clark) as meaning two ships one behind the other; but Lehmann-Hartleben already argued that they must have been like the Zea shipsheds.

(2) Plato's description of Atlantis (hardly geographically precise, and not necessarily a description of Syracuse): they cut the rock and made "hollow shipsheds, double inside, roofed with the very rock"; which does seem to imply that the ships were side by side.[8]

As regards the historical context for Alimnia, I am now convinced that this was a Rhodian naval station, established in the Hellenistic period when Rhodian naval power was at its height, in the best harbour on the west coast of Rhodes, to guard the south-eastern approaches into the Aegean and up to Rhodes from the south-west. The "double shipshed" interpretation, involving trihemioliae for example, certainly fits Rhodes better than does the "big ship" interpretation, since Rhodes specialised in smaller warships.

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NOTES

1. A. Sampson, *Deltion* 35 (1980) Chron. 561-3.
2. "New evidence for ancient ship dimensions", *Tropis* 4 (Athens, 1996); note 12 contains a full bibliography on Eulimna and Chalki, which is not repeated here. I am most grateful to the Ephor, Mr Papachristodoulou, for suggesting my initial visit, and supporting my application for a study permit in 1992; and to Mr Sampson for generously agreeing to my continuing work at the site.
3. The first shipshed in both rows is particularly wide —a point noted already by Sampson; I am still not sure whether there was any special significance in this.
4. Casson's letter of 6.6.92; Coates' letters of 11 and 15.4.92. For the narrow shipshed type see e.g. *Tropis* 3 (1989) 74, n. 5.
5. This point is developed by Coates in his paper at this Symposion.
6. For a full bibliography on the shipsheds described see D. J. Blackman in J. S. Morrison and R.T. Williams (eds.) *Greek Oared Ships* (1968) 181-6; in J. S. Morrison (ed.) *The Age of the Galley* (1995) 227-33. No information has yet been published about the recent excavation of the shipsheds at Oiniadai.
7. Diod. Sic. 14.42.5.
8. Plato, *Critias* 116 B.

ILLUSTRATIONS

Fig. 1	A. Sampson's plan of the shipsheds at Alimnia (reproduced with his permission from *Deltion* 35, Chron. 562, fig. 11.
Fig. 2	Emporio Bay: south shore from the east.
Fig. 3	Emporio: shipsheds VI (centre left) and V (centre right), viewed from the bay.
Fig. 4	Emporio: shipsheds III (left) to I (centre right), viewed from the bay.
Fig. 5	Emporio: shipshed VI, east side.
Fig. 6	Emporio: shipshed X, back wall of cutting.
Fig. 7	Emporio Bay and north shore from the south-east; in the distance (centre right), the Kastro.
Fig. 8	View of the Kastro from the (deserted) village at the head of Agios Georgios Bay.
Fig. 9	Agios Georgios Bay from the north.
Fig. 10	Agios Georgios: the shipsheds, viewed from the bay.
Fig. 11	Agios Georgios Bay: chapel of Agios Minas, submerged structures on the promontory, and derelict buildings of the Italian naval base.
Fig. 12	Agios Georgios: shipsheds II (left centre) and I (centre), viewed from the bay.
Fig. 13	Agios Georgios: shipsheds VI (left centre) to IV (right), viewed from the bay.
Fig. 14	Agios Georgios: shipsheds VI, north-east side.
Fig. 15	Agios Georgios: shipshed VI, back wall of cutting.

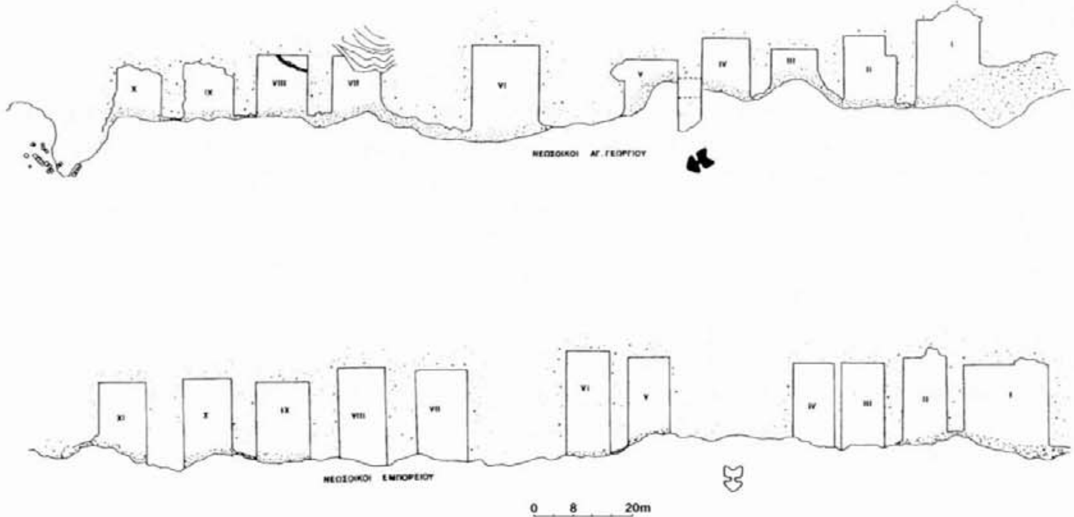

Fig. 1

Fig. 2

Fig. 3

Fig. 4

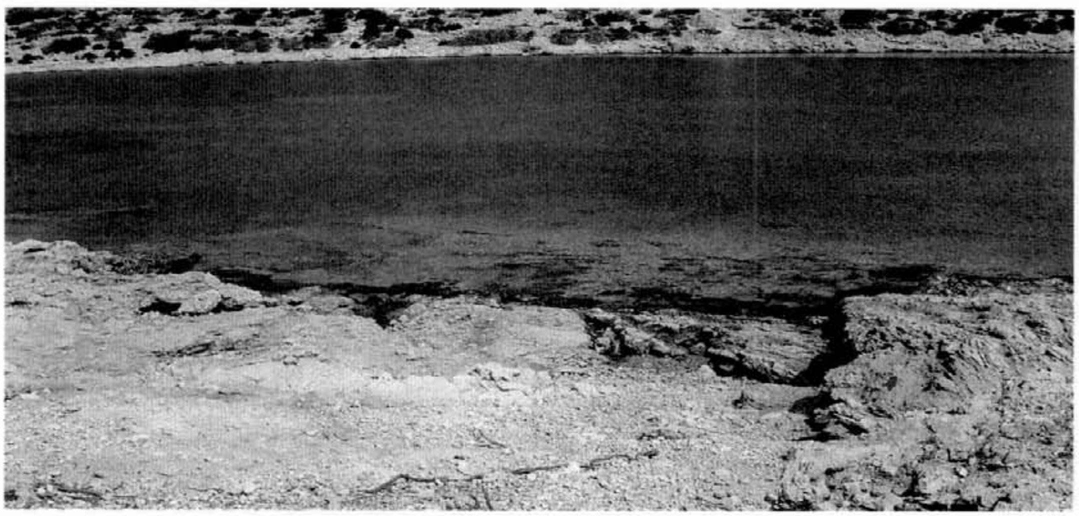

Fig. 5

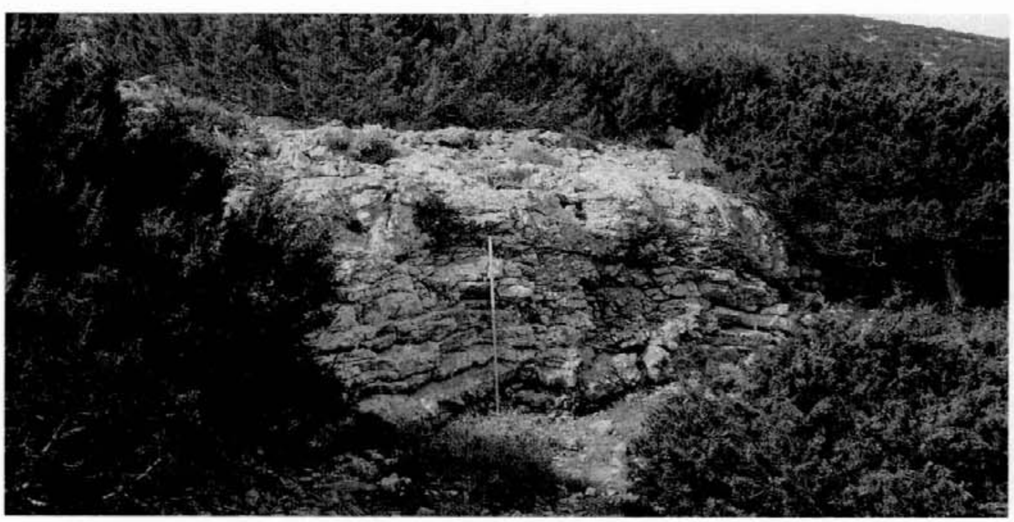

Fig. 6

Fig. 7

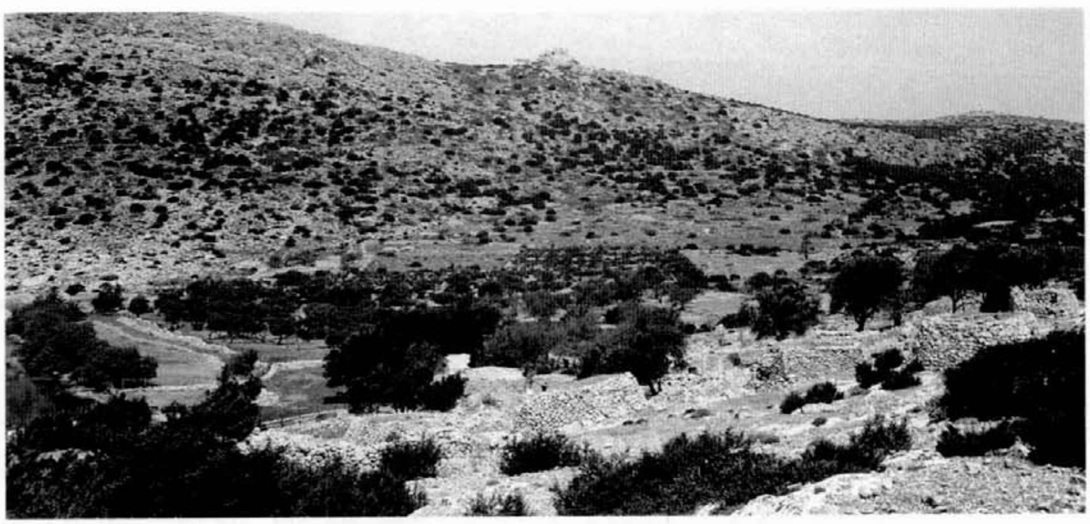

Fig. 8

Fig. 9

Fig. 10

Fig. 11

Fig. 12


Fig. 13


Fig. 14


Fig. 15

ΟΙ ΝΑΥΤΙΚΟΙ ΜΥΘΟΙ ΤΗΣ ΝΑΥΠΛΙΑΣ ΚΑΙ Η ΠΡΩΙΜΗ ΕΛΛΗΝΙΚΗ ΙΣΤΟΡΙΑ

Η θρησκεία και οι μύθοι που απορρέουν απ' αυτήν, είναι πιά γνωστό ότι συνδέεται με την οργάνωση της κοινωνίας που την παράγει, καθρεφτίζοντας συγχρόνως την ψυχοσύνθεση των μελών της κοινωνίας αυτής.

Η μελέτη των μύθων, που συνδέονται με τόπους όπως η ναυτική πόλη της Ναυπλίας, σε συνάρτηση με την μελέτη της πρώιμης ελληνικής ιστορίας, επιτρέπει, πιστεύω, την ερμηνεία του ιστορικού υποστρώματος των μύθων αυτών και, παράλληλα, την κατά προσέγγιση χρονολόγησή τους.[1]

Στην προϊστορική Ελλάδα της 2ης χιλιετίας π.Χ. η θρησκεία των θεών της φύσης, οι μεγάλες θεότητες της Γης, του Πολέμου και της βλάστησης και τα ιερά ζώα, (τα φίδια, οι ταύροι, κ.ά.), βρίσκονται σε αρμονία με την συγκεντρωτική εξουσία των μινωϊκών και των μυκηναϊκών βασιλείων και η λατρεία, φαίνεται, ότι ήταν απόλυτα ελεγχόμενη από τα βασιλικά ανάκτορα, μέσα στα οποία και στεγαζόταν. Τα λαμπρά μυκηναϊκά ανάκτορα με τις ισχυρές τους οχυρώσεις, ήταν όμως συγχρόνως και τα οικονομικά κέντρα των περιοχών τους, συγκεντρώνοντας μέσα στις εκτεταμένες αποθήκες τους την σοδειά και τον κινητό πλούτο και ανακατανέμοντάς τον, όπως διαπιστώνουμε από το αυστηρό γραφειοκρατικό σύστημα που ανέπτυξαν, (προβλ. πήλινες πινακίδες με την ελληνική γραμμική Γραφή Β΄).

Οι εμπορικές συναλλαγές και ανταλλαγές με την βοήθεια της ναυτιλίας, ήταν εκείνες που επέτρεψαν την δημιουργία ενός κοινού και εξελισσόμενου ρυθμού στα αγαθά του πολιτισμού και την εδραίωση του πολιτισμού αυτού σε όλη την ελλαδική περιοχή, στεριανή και νησιώτικη. Αλλά τα προϊόντα του μυκηναϊκού κόσμου ταξίδευαν και έξω από τον ελλαδικό χώρο και έτσι τα μυκηναϊκά π.χ. αγγεία της 14ης και 13ης εκατονταετίας π.Χ. αναγνωρίζονται στα κέντρα των συριακών ακτών, της Αιγύπτου και ακόμη σε περιοχές της Ιταλίας, όπου έφθαναν πιθανότατα αρχικά γεμισμένα με λάδι ή κρασί. Στα μυκηναϊκά κέντρα συγκεντρώνονταν αντίστοιχα πρώτες ύλες όπως μέταλλα, ιδίως ο απαραίτητος για την χαλκουργία κασσίτερος, και είδη πολυτέλειας, όπως το ήλεκτρο, το ελεφαντοστούν, κ.ά.

Σε αυτό τον ζωντανό και δημιουργικό κόσμο έπαιξαν κυρίαρχο ρόλο τα μεγάλα κέντρα της Αργολίδας, ο Μυκήνες, η Τίρυνθα, η Μιδέα, το Άργος. Ένα πυκνό οδικό δίκτυο ένωνε τις ακροπόλεις αυτές επιτρέποντας την γρήγορη και άνετη μετακίνηση ανθρώπων και αγαθών, ενώ παράλληλα στην περιοχή του Αργολικού κάμπου αναπτύχθηκε ένας σημαντικός αριθμός μικρότερων, εξαρτημένων πολισμάτων, από τα οποία ένα φαίνεται να ήταν η προϊστορική Ναυπλία.[2]

Παραμένει άγνωστο το όνομα που έφερε η θέση στα χρόνια αυτά, αλλά τα αρχαιολογικά ευρήματα μαρτυρούν για υπερπόντιες διασυνδέσεις, κυρίως με την Κρήτη.

Στο σημερινό ναυπλιακό προάστειο της Πρόνοιας και στους βόρειους πρόποδες του βραχώδους Παλαμηδιού ερευνήθηκαν ήδη από το 1878 εκτεταμένες συστάδες λαξευτών θαλαμοειδών τάφων (ανασκαφές Ι. Κονδάκη,[3] H.G. Lolling,[4] Β. Στάη,[5] Σ. Χαριτωνίδη[6], Ε. Δεϊλάκη[7]). Οι οικογενειακοί αυτοί τάφοι, που χρησιμοποιήθηκαν σε όλες τις περιόδους της Υστερο-ελλαδικής (Μυκηναϊκής) εποχής, μαρτυρούν την ύπαρξη στην περιοχή οικισμών (κωμών) και ίσως ακόμη οχυρωμένης μικρής ακρόπολης, που όμως δεν έχουν μέχρι στιγμής επισημανθεί.[8] Οι οικισμοί των Μυκηναϊκών χρόνων φαίνεται να ήταν στραμμένοι προς την ενδοχώρα και είναι αμφίβολο να κατοικήθηκε τότε η χερσόνησος, όπου η σημερινή πολιτεία. Η χερσόνησος είχε κατοικηθεί, όπως μαρτυρούν οι νεώτερες έρευνες στην Ακροναυπλία, στην νεολιθική εποχή, αλλά δεν υπάρχουν ευρήματα που να ανήκουν στα μυκηναϊκά χρόνια.[9]

Παρ' όλο που τα ευρήματα των τάφων είναι σήμερα μοιρασμένα ανάμεσα στο Εθνικό Αρχαιολογικό Μουσείο και το Μουσείο του Ναυπλίου και παραμένουν ακόμη στο σύνολό τους αδημοσίευτα, φανερώνουν την ύπαρξη σχετικού πλούτου, κοινωνικών διαστρωματώσεων και επαφών με τα μεγάλα κέντρα της Αργολίδας και της Κρήτης.

Χαρακτηριστικά είναι τα αγγεία (κρατήρες, ψευδόστομοι αμφορείς, κύπελλα κ.ά.), τα χρυσά κοσμήματα (ρόδακες), τα χάλκινα όπλα και τα πήλινα ειδώλια (γυναικών, αρμάτων και ζώων).[10]

Η παρουσία χάλκινων όπλων (κυρίως αιχμών λογχών) σε τάφους και η ταφή ίππου κοντά στον νεκρό ενός άλλου τάφου[11] υποδηλούν την ύπαρξη διακεκριμένων πολεμιστών, ενώ η σημαντική συλλογή χάλκινων εργαλείων σε τάφο των νεώτερων ανασκαφών[12] φανερώνει τον πλούτο του κατόχου (είτε ιατρού κατά την ανασκαφέα, είτε γυναίκας αρχοντικής οικογένειας).

Η εύρεση σε άλλον τάφο ενός καλαθόμορφου ρυτού με την διακόσμηση αιγάγρων[13]—παράδειγμα σχετικά σπάνιο, που παρόμοια (με άλλη διακόσμηση) έχουν βρεθεί στην Βάρκιζα της Αττικής και την Κνωσό— οδηγεί στην διαπίστωση μιάς ευρύτερης επικοινωνίας με την Κρήτη. Το ρυτό αυτό θεωρείται σήμερα κνωσιακής παραγωγής και προέλευσης χρονολογούμενο στην ΥΜΙΙ - ΙΙΙ Α2/πρώϊμη περίοδο (ca. 1425 - 1370/60 π.Χ.). Στην ίδια πρώϊμη εποχή ανήκει λίθινος λύχνος με ανάγλυφες σπείρες γύρω από το χείλος, που βρέθηκε σε φρεατοειδή τάφο[14] και μοιάζει με λύχνο που βρέθηκε στον βασιλικό τάφο των Ισοπάτων της Κνωσού.

Ακόμη αξιοσημείωτο είναι το κομψό πόδι καλυκόσχημου ποτηριού από πολύχρωμο φλεβωτό μάρμαρο που βρέθηκε στις παλαιές ανασκαφές (σήμερα στο Εθνικό Αρχαιολογικό Μουσείο).[15] Όμοιο ποτήρι λίθινο, ψηλό ακέραιο προέρχεται από το Ανάκτορο της Ζάκρου της Ανατ. Κρήτης.

Ενδιαφέρον είναι ότι εκτός από τις Μυκήνες και στο γειτονικό Άργος (σε τάφο της Δειράδας) έχει βρεθεί μεγάλος τρίωτος αμφορέας Ανακτορικού ρυθμού,[16] που χρονολογείται στην ίδια εποχή και είναι και αυτός κνωσιακής προέλευσης, γεγονός που επιβεβαιώνει την γενικώτερη επαφή της Αργολίδας με το κρητικό ανακτορικό κέντρο της θαλασσοκράτειρας Κνωσού στα χρόνια αυτά. Ίσως το μικρό λιμάνι της Ναυπλίας να ήταν η πύλη εισόδου των αγαθών αυτών από την Κρήτη στον μυκηναϊκό κόσμο της Αργολίδας.

Ο ακμαίος όμως αυτός μυκηναϊκός πολιτισμός και το ανακτορικό κοινωνικό-οικονομικό σύστημα, στα τέλη του 12ου αι. π.Χ. συρρικνώθηκε σταδιακά, αποδιοργανώθηκε και μέσα στον 11ο αι. π.Χ. κατέρρευσε οριστικά. Διασπάστηκε η συνοχή των βασιλείων, εγκαταλείφθηκαν τα ανάκτορα με τα λατρευτικά κέντρα και τις οχυρώσεις, όπως και οι οικισμοί γύρω από τις ακροπόλεις. Στην συνέχεια παρατηρούνται μέσα στον ελλαδικό χώρο σημαντικές αλλαγές στους τόπους και τρόπους οίκησης καθώς και στα ταφικά έθιμα, αλλαγές που φαίνεται να οφείλονται σε εκτεταμένες μετακινήσεις πληθυσμών, των παλαιών μυκηναϊκών αλλά και των νέων ομάδων ελληνικών φυλών, κρίνοντας από την συνέχιση της χρήσης της ελληνικής γλώσσας και την διασπορά της σε όλον τον ελλαδικό χώρο.[17]

Η νέα εποχή που ανατέλλει στον ελλαδικό χώρο χαρακτηρίζεται από την νέα, την διάσπαρτη πλέον, μορφή οίκησης, την πρωτεύουσα θέση της κτηνοτροφίας και από την πατριαρχική οργάνωση της οικογένειας, που αποκτά νέα έδρα, τον ανοχύρωτο «οίκο», και νέο αρχηγό, τον επικεφαλής της κάθε οικογένειας. Η εποχή αυτή ονομάζεται συμβατικά σήμερα από τους μελετητές «Πρώιμη εποχή του Σιδήρου» και καλύπτει χρονικά τον 10ο και τον 9ο αι. π.Χ. ενώ παλαιότερα ονομαζόταν, λανθασμένα, «Σκοτεινοί Χρόνοι» ή ελληνικός Μεσαίωνας. Χαρακτηριστικά της εποχής είναι επίσης η απουσία οχυρώσεων, η απουσία οργανωμένων οικήσεων (πόλεων), καθώς και η απουσία κοινοτικών νεκροταφείων και κοινών τόπων δημόσιας λατρείας.

Η λατρεία ετελείτο πλέον, φαίνεται, ανεξάρτητα μέσα σε κάθε «οίκο» από τα μέλη της κάθε οικογένειας. Παρατηρείται όμως και μια σαφής μεταλλαγή από την παλαιά, την μυκηναϊκή, θρησκεία: τις παλαιές θεότητες διαδέχεται τώρα μια θεολογία με αυστηρή πατριαρχική οργάνωση, όπου τον κύριο λόγο έχει ο «πατέρας των θεών», ο Δίας, και ακολουθούν οι άλλοι θεοί του θεσσαλικού Ολύμπου, σύμφωνα με την κωδικοποίηση της νεάς θρησκείας, που γνωρίζουμε από την «θεογονία» του Ησιόδου, του τέλους του 8ου αι. π.Χ. Είναι φανερό ότι η νέα θρησκεία ακολουθεί την πατριαρχική οργάνωση της κοινωνίας, που την παρήγαγε.

Από τα ταφικά έθιμα (καύση νεκρού, σχηματισμό τύμβου, ταφή αλόγων, κ.λ.π.) μπορούμε να διαγνώσουμε την αντίστοιχη εξέχουσα θέση που είχε μέσα στην πατριαρχική κοινωνία των ανθρώπων, ο αρχηγός του «οίκου», προσωπικότητα σημαντική μέσα στο γένος του. Οι πράξεις και τα ανδραγαθήματα του αρχηγού, του ήρωα, που εξασφάλιζαν την ευμάρεια και τον πλούτο του «οίκου», περιβάλλονταν με υπερφυσικές ιδιότητες που κρίνονταν άξιες να υμνηθούν από τους αοιδούς, είτε ακόμη εν ζωή, είτε μετά θάνατον γύρω από τον επιτάφιό του τύμβο. Από αυτές τις αρχηγητικές μορφές των πατριαρχικών κοινωνιών της πρώιμης Εποχής του Σιδήρου, προέρχονται οι «ήρωες», που υμνήθηκαν από τους αοιδούς της εποχής, αποτέλεσαν την βάση της προφορικής Επικής ποίησης και κληροδοτήθηκαν στις επόμενες γενιές.[18]

Χαρακτηριστικό πάντως της εποχής είναι επίσης η απουσία γραφής. Το συλλαβικό σύστημα (η γραμμική Γραφή Β΄) χάθηκε μέσα στην αναστάτωση που προκάλεσε η κατάρρευση του μυκηναϊκού κόσμου και δεν έχουμε μέχρι σήμερα στοιχεία για το ότι η ελληνική Πρώιμη Εποχή του Σιδήρου γνώριζε κάποια μορφή γραφής. Το γεγονός αυτό, φαίνεται, ότι υποβοήθησε την εδραίωση της προφορικής ποιητικής παράδοσης, που έλαβε την μορφή της επικής διήγησης με επίκεντρο τις ηρωϊκές, αρχηγικές μορφές της πατριαρχικής κοινωνίας της εποχής, προφανώς το «θεϊκό γένος των ηρώων», όπως μας περιγράφει αργότερα στην ωραία αλληγορία του ο Ησίοδος (*Έργα και Ημέρες*, στιχ. 156 κ.εξ.)

Οι ανασκαφές των τελευταίων δεκαετιών σε όλο τον ελλαδικό χώρο μας αποκαλύπτουν σταδιακά αλλά σταθερά τον χαρακτήρα της εποχής αυτής των δύο τουλάχιστον αιώνων (του 10ου και του 9ου π.Χ.), της πρώιμης Εποχής του Σιδήρου που κρίνοντας από τους ρυθμούς της αντίστοιχης κεραμεικής ονομάζεται συμβατικά επίσης «Πρωτογεωμετρική» και «πρώιμη Γεωμετρική». Ξεχωρίζουν ήδη οι περιοχές της Ευβοίας (Λευκαντί),[19] της Αττικής (Αθήνα), της Βοιωτίας (Θήβα) και της Αργολίδας (Άργος).

Τα μέχρι σήμερα ευρήματα από την περιοχή της Ναυπλίας μαρτυρούν την οίκηση του χώρου την εποχή αυτή, αλλά επιβεβαιώνουν και την εικόνα της περιορισμένης, φτωχικής και διάσπαρτης οίκησης. Στην περιοχή της Πρόνοιας ανασκάφηκε μικρός αριθμός κιβωτιόσχημων/κτιστών τάφων που υποδηλεί την ύπαρξη αντίστοιχου «οίκου» στην περιοχή.[20] Ανάμεσα στους τάφους αυτούς ξεχωρίζει ένας κτιστός[21] που θα ανήκε σε πολεμιστή, κρίνοντας από τα όπλα του (σιδερένιες αιχμές ακοντίου και δόρατος, σιδερένιο εγχειρίδιο και λίθινη ακόνη).

Στην περιοχή του προαστείου της Άρειας, η πρώιμη γεωμετρική κεραμεική που βρέθηκε, μαρτυρεί επίσης την ύπαρξη εκεί ενός ακόμη «οίκου».[22] Αντίθετα, οι έρευνες στην περιοχή της Ακροναυπλίας δεν έδωσαν κανένα στοιχείο που να επιτρέπει την υπόθεση ότι κατοικήθηκε τότε η περιοχή της χερσονήσου.

Από τα λιγοστά αυτά στοιχεία προκύπτει ότι οι νέοι κάτοικοι του χώρου συνέχισαν την οίκηση στις περιοχές της παλιάς μυκηναϊκής εγκατάστασης στραμμένοι προς την καλλιεργήσιμη γη της ενδοχώρας και απέχοντας από τα έργα της θάλασσας.

Η Εύβοια φαίνεται ότι υπήρξε την εποχή αυτή κυρίαρχη περιοχή, στην οποία εντάσσονταν και γειτονικά νησιά του Αιγαίου, όπως η Σκύρος, οι ανατολικές ακτές της Βοιωτίας, η νότια Θεσσαλία κ.ά. Τα κτερίσματα των τάφων του ευβοϊκού Λευκαντί, ιδίως τα μεταλλικά (φιάλες, πρόχοι κ.λ.π.), μαρτυρούν για επαφές και επικοινωνία και με την Ανατολή (την Κύπρο, τις συριακές και παλαιστινιακές ακτές και ίσως την Αίγυπτο), που επιβεβαιώνονται από την αντίστοιχη παρουσία εκεί ευβοϊκής κεραμεικής.[23] Είναι άγνωστο ποιός είχε την πρωτοβουλία, οι Φοίνικες ή οι Έλληνες, αλλά γίνεται φανερό, όσο προχωρούσε η εποχή, τουλάχιστον στον 9ο αι. π.Χ., ότι οι Ευβοείς άρχισαν να διασχίζουν τις θάλασσες, κοντινές και μακρινές, σπάζοντας την απομόνωση των πρώτων χρόνων της εποχής αυτής. Απτή απόδειξη αυτού του γεγονότος είναι οι παραστάσεις πλοίων που αρχίζουν να απεικονίζονται στα ευβοϊκά αγγεία κατά τα τέλη του 9ου αι. π.Χ.[24]

Στα χρόνια αυτά, όμως, παρατηρείται μια νέα σημαντική αλλαγή, που υπήρξε καθοριστική για την πορεία του ελληνικού κόσμου: γύρω στα 830/800 π.Χ. εμφανίζεται συγχρόνως, σε μεγάλη συχνότητα και έκταση, για πρώτη φορά, το φαινόμενο της σύμπτηξης οχυρωμένων μικρών οικισμών, που αντικαθιστούν τον τρόπο της διάσπαρτης οίκησης των μεμονωμένων ανοχύρωτων «οίκων» της πρώιμης Εποχής του Σιδήρου. Λόγοι άγνωστοι, ίσως πειρατείας, αλλά πιθανότερα βαθειών εσωτερικών ανακατατάξεων, έφεραν μετά από ζωή δύο αιώνων την κατάρρευση της πατριαρχικής πρώιμης κοινωνίας, που αρχίζει τώρα να αντικαθίσταται από την κοινή διαβίωση μέσα σε οργανωμένους οικισμούς, τους προάγγελους των ελληνικών πόλεων. Το ιστορικό αυτό φαινόμενο παρατηρείται στις ακτές της Μ. Ασίας, στα νησιά του Αιγαίου, στην Εύβοια, την Αττική, την Πελοπόννησο, την Θεσσαλία και αλλού και οδήγησε στην δημιουργία νέων θεσμών. Παράλληλα τώρα με την εσωτερική οργάνωση των νέων οχυρωμένων οικισμών παρατηρείται και το φαινόμενο της ίδρυσης κοινόχρηστων ιερών και τόπων λατρείας (τα τοπικά αλλά και τα μεγάλα πανελλήνια ιερά) και της ίδρυσης εκτεταμένων κοινοτικών νεκροταφείων.

Γοργά αναπτύσεται η ιδέα της κοινότητας της κάθε νέας μικρής πολιτείας, και οι κάτοικοι αποκτούν οντότητα, ως δήμος, συναθροιζόμενοι στην κεντρική πλατεία, την αγορά, για την λήψη των κοινού ενδιαφέροντος αποφάσεων. Την συσπείρωση της κοινότητας οριοθετεί και η κοινή αμυντική προσπάθεια, η προάσπιση των τειχών του οικισμού. Άξιο παρατήρησης πάντως είναι ότι οι περισσότεροι από τους νέους οχυρωμένους οικισμούς, είναι παραθαλάσσιοι, γεγονός που επέτρεψε την συνέχιση, με μεγαλύτερη μάλιστα ένταση, της ενασχόλησης των κατοίκων τους με τα έργα της θάλασσας. Η Χαλκίδα[25] και η Ερέτρια της Εύβοιας είναι χαρακτηριστικές περιπτώσεις των νέων αυτών οικισμών. Γενικά παρατηρείται αύξηση των κατοικημένων θέσεων και του αριθμού των τάφων, που μαρτυρούν με την σειρά τους, συνολική αύξηση του πληθυσμού στον ελλαδικό χώρο. Κυριαρχεί, η Υστερογεωμετρική κεραμεική και τα μεγάλα αττικά επιτύμβια αγγεία είναι μνημεία τεχνοτροπικής ισορροπίας και τεχνικής τελειότητας.

Ίσως σε αυτήν την εποχή, στα χρόνια γύρω στα 800 π.Χ., πρέπει να αποδοθεί και η ίδρυση του οικισμού της Ναυπλίας πάνω στην τριγωνική χερσόνησο που βρέχεται από την θάλασσα και από τις δύο πλευρές, από βόρεια και νότια. Η τοποθεσία ήταν κατάλληλη για την ίδρυση οχυρωμένου οικισμού στις πλαγιές της Ακροναυπλίας και την προστασία του από την πλευρά της ξηράς με ανάλογο οχυρωματικό έργο.[26] Πιθανόν ο νέος οικισμός να δημιουργήθηκε από «συνοικισμό» των διάσπαρτων κατοίκων της περιοχής, γεγονός που θα σήμαινε την οριστική εγκατάληψη των παλαιών πατριαρχικών «οίκων».

Τα νεκροταφεία του νέου οικισμού θα έκειντο έξω από αυτόν κατά την πάγια πια τακτική. Εκεί στην ανατολική επίπεδη έκταση επραγματοποιούντο οι καύσεις των νεκρών που συνοδεύονταν από νεκρόδειπνα και οι ενταφιασμοί σε πήλινους πίθους σε πυκνή διάταξη ή σε λάκκους μέσα στο χώμα, όπως έδειξαν οι παλαιότερες ανασκαφές του Σ. Χαριτωνίδη στην περιοχή του συνοικισμού Πρόνοια.[27]

Φτωχικά κτερίσματα των υστερο-γεωμετρικών χρόνων συνόδευαν τους νεκρούς αυτούς, παιδιά και ενήλικες (αγγεία, σιδερένιες περόνες κ.ά.).

Αξιοσημείωτο εύρημα μιάς πυράς των ανασκαφών αυτών ήταν ένας τριποδικός αμφορέας με διακόσμηση αλόγων και γεωμετρικών σχεδίων που αποδίδεται σε αργίτικο εργαστήριο του β΄ μισού του 8ου αι. π.Χ.[28]

Οι νέες, όμως, γενικά συνθήκες είχαν γοργά πολιτικές παρενέργειες σε ολόκληρο τον ελλαδικό χώρο και ως σοβαρότερη μπορεί να θεωρηθεί το φαινόμενο του αποικισμού: Ομάδες πολιτών άρχισαν να εγκαταλείπουν τις μικρές πολιτείες για αναζήτηση καλύτερης τύχης σε νέους τόπους. Πρωτοπόρα και στις νέες συνθήκες η Εύβοια, θεωρείται ότι πρώτη έστειλε αποικίες προς τα δυτικά: Αρχικά η Ερέτρια στην Κέρκυρα, (γύρω στα 760 π.Χ.) και στην συνέχεια στις Πιθηκούσσες στην Ιταλία. Ακολούθησε η Χαλκίδα και κατόπιν άλλες πόλεις της μητροπολιτικής, της μικρασιατικής (Μίλητος) και της νησιωτικής Ελλάδας. Το Έπος και ιδίως η Οδύσσεια, απηχεί αυτές τις νέες αλλαγές και η περιγραφή της πόλης των Φαιάκων στην Κέρκυρα αντιστοιχεί με μια τυπική ελληνική ναυτική πόλη της εποχής του 8ου αι. π.Χ.[29] Χαρακτηριστικά από την επαφή των Ερετριέων με τη θάλασσα και τα πλοία (ναυς) είναι και τα ονόματα των ηρώων τους: Ναυσίθοος - Ναυσικά και Ναύστολος.[30]

Στα χρόνια, πάντως, των μεγάλων αλλαγών του τέλους του 9ου αι. π.Χ. μπορεί να τοποθετηθεί και μια άλλη μεγάλη κατάκτηση, η ελληνική γραφή και η εισαγωγή του αλφαβήτου. Οι αρχαιότερες, μέχρι σήμερα, ελληνικές επιγραφές προέρχονται από την ευβοϊκή αποικία των Πιθηκουσσών, είναι χαραγμένες σε αγγεία και μπορούν να χρονολογηθούν στα 750-725 π.Χ. Είτε ως τόπος προέλευσης της νέας κατάκτησης θεωρηθεί η Φοινίκη είτε η Αραμαία, γεγονός παραμένει ότι η πρωτοβουλία φαίνεται να υπήρξε ευβοϊκή και σημαίνει επαφές των Ελλήνων με αυτές τις μακρινές περιοχές της Ανατολής, μέσω των θαλασσινών επικοινωνιών.[31]

Τα στοιχεία όλα αυτά μας δείχνουν ότι, μετά από μία μακριά περίοδο, που αντιστοιχεί στην «πρώιμη Εποχή του Σιδήρου» (δηλαδή από τα τέλη του 11ου αι. μέχρι τα μέσα περίπου του 9ου αι. π.Χ.) και που οι επαφές των ελληνικών κοινωνιών με τις μακρινές χώρες ήσαν περιορισμένες και οι πρωτοβουλίες πιθανόν δεν ανήκαν σε αυτές αλλά στους Φοίνικες ποντοπόρους[32], από τα τέλη του 9ου αι. π.Χ. παρατηρείται μια έντονη στροφή των Ελλήνων προς την θάλασσα. Ασφαλώς οι νέες συνθήκες με τις οργανωμένες νέες οχυρές, μικρές πολιτείες ευνόησαν αυτήν την κίνηση που τόσο γλαφυρά περιγράφεται στο Έπος και ιδίως στην *Οδύσσεια*: η πάλη του ανθρώπου με τη θάλασσα, οι θαλασσινοί κίνδυνοι, τα θαλασσινά τέρατα (πραγματικά και φανταστικά), η δίψα του κέρδους και της περιπέτειας, αποδίδονται με τον πιό άμεσο τρόπο.

Αλλά εκτός από τα διασωθέντα, είχαν συντεθεί και άλλα έπη, όπως οι *Νόστοι*, η *Ιλίου Πέρσις*, τα *Κύπρια* και άλλα, που περιέγραφαν ανάλογα θέματα. Από αυτά τα Έπη σώθηκαν ορισμένα μόνο σπαράγματα αλλά ανάμεσα σε αυτά δίδονται πληροφορίες για τους θαλασσινούς ήρωες της Ναυπλίας, της ωραίας πόλης του Αργολικού κόλπου: του ήρωα Ναυπλίου και του γυιού του Παλαμήδη.[33] Η παραθαλάσσια αργολική πόλη και οι ήρωες της συνδέονται με τις ευβοϊκές πόλεις και τους μύθους της και τούτο ίσως μαρτυρεί μια ενσυνείδητη προσπάθεια από μέρους των Ναυπλιέων απόκτησης κύρους, λόγω της ήδη εδραιωμένης φήμης της ναυτικής ικανότητας των Ευβοέων.

Η αρχαία αργολική πόλη έφερε το όνομα Ναυπλία[34] και ιδρύθηκε με πιθανότητα στα χρόνια γύρω στα 800 π.Χ. μέσα στο νέο πνεύμα της εποχής και ίσως με την ενίσχυση Ευβοέων. Τούτο διαφαίνεται και από τις λατρείες που επεκράτησαν στην Ναυπλία των ιστορικών χρόνων και μαρτυρούν ευβοϊκές επιρροές.

Ιδιαίτερη ήταν η λατρεία του θεού της θάλασσας Ποσειδώνα, μιάς θεότητας άρρηκτα συνδεδεμένης με την Εύβοια και υπήρχε στα ιστορικά χρόνια στην πόλη της Ναυπλίας ιερό του θεού.[35] Ο θεός μέσω του ήρωα Ναυπλίου εθεωρείτο και γενάρχης της πόλης.

Η κυρίαρχη θέση του θεού Ποσειδώνα στην πρώιμη ναυτική πολιτεία της Ναυπλίας διαφαίνεται και από την συμμετοχή της πόλης κατά τον 7ο αι. π.Χ. σε αμφικτυονία σχετική με το ιερό του Ποσειδώνα στην Καλαυρία (του Πόρου). Παρά την περιορισμένη θρησκευτική σημασία που φαίνεται να είχε αρχικά η ένωση αυτή των επτά πόλεων του Αργολικού και Σαρωνικού κόλπου (Ερμιόνη —Επίδαυρος, Αίγινα, Αθήνα, Πρασιαί, Ναυπλία και Ορχομενός), η ευρύτερη πολιτική σημασία της δεν πρέπει να υποτιμηθεί.[36] Τούτο προκύπτει και από το γεγονός ότι το Άργος, ύστερα από την κατάκτηση, καταστροφή και υποταγή της Ναυπλίας στα τέλη του 7ου αι. π.Χ., επεδίωξε και πήρε την θέση της νικημένης πόλης στην Αμφικτυονία.[37] Η Αμφικτυονία της Καλαυρίας ίσως ιδρύθηκε κατά απομίμηση της Αμφικτυονίας της Ανθήλης στον βορρά και υποκρύπτει μια αντιπαλότητα προς αυτήν. Πάντως η πρώιμη αυτή συνένωση ναυτικών πόλεων αποτελεί μία από τις πρώτες προσπάθειες των νέων μικρών ελληνικών πόλεων να συνενώσουν τις δυνάμεις τους για την επίτευξη ενός κοινού σκοπού.

Εκτός όμως από το όνομα της νέας πολιτείας και την πολιούχο θεότητα, άξια, επίσης να μνημονευθεί είναι η ονομασία της ιερής πηγής «Κάναθος» της Ναυπλίας, που θυμίζει τον σημαντικό λόφο «Κάνηθο» και τον ομώνυμο ήρωα της Χαλκίδας.[38]

Ο ήρωας Ναύπλιος επίσης συνδέεται με την Εύβοια, υπήρξε γυιός του Ποσειδώνα, θεού της θάλασσας, και της δαναΐδας Αμυμώνης και απέκτησε τρεις γυιούς: Τον Παλαμήδη, τον Οιάκα (=το *πηδάλιο*) και τον Ναυσιμέδοντα. Ο δεσμός με τον Ποσειδώνα και τα ονόματα του Ναυπλίου και του Ναυσιμέδοντα, επιβεβαιώνουν, πιστεύω την σύνδεση της νέας αργολικής πόλης με την θαλασσοκράτειρα Εύβοια.

Ο Ναύπλιος περιγράφεται[39], όμως, με μελανά χρώματα ως προς τα έργα του: περισσότερο πειρατής, παραπλανούσε τους θαλασσινούς ταξιδιώτες με ψεύτικα νυχτερινά σήματα, πυρσούς, ώστε στην συνέχεια να λεηλατεί τα ναυαγισμένα πλοία τους. Αυτό έκανε και στα ελληνικά καράβια στο ευβοϊκό ακρωτήρι του Καφηρέα, όταν αυτά επέστρεφαν από την Τροία, για να εκδικηθεί έτσι για τον άδικο χαμό του γυιού του Παλαμίδη. Είχε ήδη ταξιδεύσει στην Τροία, αλλά μάταια, γιατί ο Αγαμέμνονας δεν του έδωσε την ικανοποίηση που ζητούσε. Γνωστός, όπως φαίνεται για τα ταξίδια του σε μακρινούς τόπους, του ανατέθηκε σε ορισμένες περιπτώσεις και να πωλήσει ως σκλάβους, γυναίκες.

Ο γυιός του Παλαμήδης, παρά το άδοξο τέλος του στην Τροία, ήταν γνωστός για την σοφία του. Θεωρήθηκε εφευρέτης («πρώτος ευρετής») πολλών χρήσιμων πραγμάτων, κατά την χαρακτηριστική στους Έλληνες επιμονή να αποδίδουν σε συγκεκριμένα άτομα κάθε ανθρώπινη επινόηση. Έτσι στον Παλαμήδη αποδίδεται η εφεύρεση των σχεδίων μαχών και στρατιωτικών παρατάξεων, των φάρων, και της ίδιας της ναυτιλίας, των μέτρων, σταθμών και αριθμών καθώς και η επινόηση της διαίρεσης του χρόνου σε μήνες, ημέρες και ώρες.

Ακόμη του αποδίδεται η μετατροπή φοινικικών στοιχείων σε γράμματα του ελληνικού αλφαβήτου και η εφεύρεση διαφόρων τυχερών παιχνιδιών, δηλαδή των κύβων και των πεσσών.

Είναι ενδιαφέρον όμως να παρατηρήσει κανείς ότι τα περισσότερα από τα αναφερόμενα εφευρήματα είναι ανατολικής πρέλευσης: ο μην, η μνα (με την υποδιαίρεση του 60), το αλφάβητο, οι κύβοι. Θαλασσινός ταξιδιώτης, λοιπόν, και ο Παλαμήδης στην Ανατολή, εκτός από τα ταξίδια του στην Ιθάκη, να συναντήσει τον Οδυσσέα, και στην κοινή εκστρατεία στην Τροία. Άλλος μύθος τον ταξιδεύει και στην Κύπρο, όπου συνάντησε τον βασιλιά του νησιού Κινύρα. Το σημαντικότερο όμως επίτευγμά του θεωρείται η εισαγωγή της γραφής στην Ελλάδα με την μετατροπή των φοινικικών στοιχείων, αν και η σύγχρονη έρευνα δεν μπορεί να ομονοήσει ως προς την χρονική περίοδο που συντελέστηκε το γεγονός αυτό.

Η ανάμνηση του Παλαμήδη έμεινε ζωντανή και στον 5ο αι. π.Χ. και ο γνωστός ζωγράφος Πολύγνωτος τον απεικόνισε ανάμεσα σε άλλους ήρωες στην μεγάλη τοιχογραφία του κοσμούσε την Λέσχη των Κνιδίων στους Δελφούς. Ο περιηγητής του 2ου αι. π.Χ. ο Παυσανίας (X, 31, 2), που περιγράφει την σκηνή, αναφέρει ότι ο ήρωας παρουσιάζεται να παίζει ζάρια στον Άδη. Με τα ζάρια του Παλαμήδη συνδέεται και ναός της Τύχης στο Άργος, που σωζόταν ακόμη στα χρόνια του Παυσανία (ΙΙ, 20, 3). Πάνω σε ένα μεγάλο πήλινο ζάρι (πεσσό) του Εθνικού Αρχαιολογικού Μουσείου των αρχών του 7ου αι. π.Χ. ίσως σώζεται ζωγραφισμένη η μορφή του ήρωα, όπως υποθέτει η μελετήτρια του αρχαίου, η Σέμνη Καρούζου.[40] Τον αδικοσκοτωμένο Παλαμήδη μνημονεύει ακόμη στην Απολογία του ο Σωκράτης (XXXII), ενώ ίσως στα χρόνια αυτά δημιουργήθηκε και αγαλματικός τύπος του ήρωα, όπως προτείνει πρόσφατα ο αρχαιολόγος Γεώργιος Δεσπίνης.[41]

Ο Ναύπλιος και ο Παλαμήδης με τα έργα που τους αποδίδονται ταιριάζουν καλά μέσα στο πνεύμα της εποχής του τέλους του 9ου αι. των αρχών του 8ου αι. π.Χ. οπόταν φαίνεται ότι δημιουργήθηκαν και υμνήθηκαν οι μυθικές αυτές μορφές.

Ο Ναύπλιος ταιριάζει στα χρόνια της πειρατείας του 9ου αι., ενώ ο Παλαμήδης χαρακτηρίζει την δημιουργική δραστηριότητα του 8ου αι. π.Χ. Συνδεδεμένοι και οι δύο με τα έργα της θάλασσας, ανήκουν στους χρόνους της έντονης στροφής των ελληνικών κοινωνιών προς την θάλασσα και των επαφών με την Ανατολή και όχι στους παλαιότερους χρόνους, εκείνους της κτηνοτροφικής κοινωνίας των πατριαρχικών «οίκων» ή των μυκηναϊκών βασιλείων.

Η άμεση επαφή των πρώιμων, ναυτικών πόλεων με τα θαλασσινά έργα και την θαλασσινή ζωή γέννησε τις ηρωικές, ναυτικές μορφές, σαν τον Ναύπλιο και τον Παλαμήδη, που τα έργα τους (μέσα από τις αρχικές μεμονωμένες ραψωδίες) καταγράφηκαν στα τέλη του 8ου αι. στα κωδικοποιημένα Έπη και από εκεί πέρασαν —κληρονομιά πολύτιμη— στην ελληνική γραμματολογία. Οι μεγάλοι δραματουργοί, ο Αισχύλος, ο Σοφοκλής και ο Ευριπίδης, χρησιμοποίησαν τους μύθους του Ναυπλίου και του Παλαμήδη σε τραγωδίες τους, δυστυχώς σήμερα χαμένες, εξυμνώντας έτσι, ίσως και αθελά τους, την δημιουργική πρώιμη εποχή της στροφής των μικρών ελληνικών πόλεων προς την θάλασσα με μια πρωτόφαντη δίψα για ζωή και επιθυμία κατάκτησης την γνώσης.

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34. Οι ονομασίες «Ναύπλιον» και «Ακροναυπλία» είναι των νεωτέρων χρόνων και δεν απαντούν στην αρχαιότητα.
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38. Για Κάναθο Ναυπλίας: Παυσανίας, *Κορινθιακά*, 38, 2-3. Για Κάνηθο Χαλκίδας: Π.Γ. Καλλιγάς, Η Πρώϊμη Αρχαία Χαλκίδα, *Ανθρωπολογικά και Αρχαιολογικά Χρονικά* (1988/89), 96 σημ. 18.
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SUMMARY

NAUTICAL MYTHS OF NAUPLIA AND EARLY GREEK HISTORY

This paper examines the dating of the origin and development of the ancient myths of the hero Nauplius and his son Palamedes, who were associated with the maritime city of Nauplia in the Argolid.

The period of the theocratic Mycenaean kingdoms (15th-12th c. B.C.) does not seem to fit the evidence, unlike the patriarchal age of the seagoing Euboeans in the 10th-9th c. (Protogeometric period) and the resurgent Hellenic society of the 8th c. (Geometric period). The first ancestor, Nauplius the navigator, is assigned to the Hellenic maritime world of the 9th century B.C., while his son Palamedes, the "inventor" of the Greek alphabet and other essentials of civilization, most probably belongs to the extremely creative 8th century.

Peter G. Calligas

HOW CHINESE NAVAL TECHNOLOGY PASSED TO THE MEDITERRANEAN VIA THE ARABS: ONCE AGAIN THE SINGLE RUDDER

In a recent article I cautiously advanced the view that the single rudder could have been invented by the Chinese and transmitted via the Arabs to the Mediterranean[1]. At that time I emphasized the sparse evidence in my possession, hoping to supplement my initial hypothesis with further concrete arguments. At the Fifth International Conference on Ancient Ship Construction which took place in Nauplion in August 1993, Lucien Basch flatly denied any such possibility. Although Basch has done an admirable job of collecting and classifying valuable iconographic material on navigation[2], it would, nevertheless, be unwise to draw any conclusions based solely on iconography.

In order to investigate the possible invention of the single rudder in China and its transmission to the Mediterranean one has to take into consideration the historical reality of the time, as well as the literary sources and the iconographic evidence.

The Chinese language and sources do not fall within the scope or expertise of the present author; nevertheless, after a thorough examination of the secondary sources (Chinese sources in translation) and the archaeological findings, I have collected enough evidence to venture a reliable conclusion. J. Dars's book on Chinese navigation makes extensive use of the Chinese sources and substantially advanced our knowledge of this field[3], although the fundamental works by F. Hirth and J. Needham remain indispensable[4]. Moreover, some important studies on Chinese navigation and trade which were not used by Dars must be taken into consideration, as for example those of Lin Huadog, D.H. Keith, Zhang Jun-Yan and others to be mentioned below.

Shipbuilding and ocean sailing in China date to prehistoric times[5]. As early as the fourth century B.C. the king of Yue possessed such a large number of warships that he offered 300 of them as a present to the state of Wei[6]. The development of mathematics, geography, astronomy and cartography subsequently contributed to the rapid growth of Chinese nautical technology[7].

Although the literary descriptions of ships in Chinese sources are imprecise and no nautical treatises exist from the early Chinese period[8], artistic evidence and especially findings from shipwreck excavations have allowed us to form a more or less realistic understanding of Chinese ships[9]. By the eleventh century Chinese ships were flat-bottomed and of different sizes. The typical vessel was gigantic with numerous masts, square-sterned and often equipped with an axial rudder, which was occasionally fenestrated.

The single stern rudder was an important invention whose contribution to nautical technology has been variously evaluated. Its impact on navigation has been exaggerated by Lefèbre des Noëttes and underestimated by L. Casson, while M. Reddé has expressed a somewhat balanced view[10]. Because the single stern rudder appears more than in one form, some misunderstandings have arisen regarding its invention and transmission. Lefèbre des Noëttes, despite his book's shortcomings, made an interesting classification of the various types of stern rudder which replaced the use of the huge double oars which were previously the only means of steering.

It should be noticed that one form of the single stern rudder, labelled by L. des Noëttes as "gouvernail axial à pivot", was unknown to the Graeco-Roman world but did exist in Pharaonic Egypt. Perhaps the axial rudder depicted in a Coptic textile (4th c. A.D.) reflects this Egyptian tradition (Fig. 1)[11].

Though divergent views exist concerning the rudder, there is one common point of agreement: the only rudders in the Graeco-Roman world were lateral, one on each side of the ship[12]. The helmsman stood high on the poop deck to operate the steering oars. It is generally believed that the stern rudder was adopted by Mediterranean shipping due to the influence of Atlantic maritime technology in the early fourteenth century[13].

Lefèbre des Noëttes presents a large variety of stern rudders, among which the strangest is that handled by a helmsman mounted on a stair. The completion of the technology of the stern rudder, according to his view, was the development of what he calls "gouvernail moderne à charnier". He describes it as "solidement fixé au moyen d'une forte charnière en fer sur l'étambot ou partie retroussée de la quille, muni d'une pole ou safran d'une ampleur en rapport avec la tonnage du navire, aisement maniable à l'aide de la barre ... "[14] Lefèbre des Noëttes dates the introduction of this stern rudder to the Mediterranean region to the year 1342, but the iconographic evidence points to a different conclusion: one such rudder is clearly depicted on a miniature showing an Arab merchant ship of 1237 (Fig. 2). It is, therefore, highly plausible that the Arab navigators borrowed this invention from the Chinese, who were using such sophisticated single rudders a few centuries earlier.

The Chinese from early times had a great variety of rudders, as is confirmed by all the relevant sources. The Chinese scholar Zhang Zunyan remarked, on the basis of Chinese literary evidence, that the Chinese were using the axial stern rudder by at least the first century B.C.[15] I have reached similar conclusions on the basis of the Chinese iconographic evidence. An axial stern rudder appears in a ceramic model, 22 inches long, found in a second century A.D. Chinese tomb (Fig. 3). Axial rudders, in a typical example, appear on a relief at Angkor-Thom, Cambodia, dated ca. 1185, but they also had fenestrated rudders hanging well below the keel[16], and other varieties. J. Dars has shown that the more advanced type of rudder, which he calls "le gouvernail à safran compensé", corresponding to Lefèbre's "gouvernail moderne à charnier", did exist at least during the Sung dynasty (A.D. 960-1279: Northern Sung, 960-1127; see figs. 4a, 4b)[17].

The existence of sophisticated types of rudders in China leads one to the examination of their introduction to the Red Sea and the Mediterranean. There is no doubt that as early as pre-Islamic times a long-distance, trans Asian trade route connected China with the Red Sea and the Persian Gulf and from there to the Mediterranean. Numerous works have been written about trade links between the Graeco-Roman world and China.[18] That China and Byzantium already had close trade relations at the time of the Tang dynasty (937-975) is well known.[19] However, a number of problems concerning navigation between these two worlds are still open to question. One of them is the perennial problem, which I have discussed elsewhere[20] of the origin of the transporting ships; were these mainly Chinese, Indian, Arabic, or Graeco-Roman?

This question is addressed by H. Frost in a trenchant review of the book Rome and India, recently published.[21] Frost correctly does not accept L. Casson's view that the "Arabian ships were not strong enough and their rig not fitted for the blustery blasts of the south-west monsoon. But the ships of Roman Egypt on both counts..." Frost acidly remarks. "This is surprising, because (no rigging having been excavated) the statistical preponderance of Roman wrecks in the Mediterranean is often attributed to their general clumsiness".[22]

Another question which has been posed is whether any naval technology could be transmitted from the Red Sea to the Mediterranean. There is no doubt that the construction of ships and the know-how of navigation was different between these two seas. Nevertheless, no Chinese walls separated them as suggested by S. Arenson, whose misunderstanding has been caused by the lack of any knowledge of the relevant literary sources.[23] Unfortunately, most of the relevant Greek sources have not been translated or even properly edited.[24] The most important is the Martyrium of Arethas (6th c. A.D.), whose edition was announced by Ms. M. Detoraki in the Sixth International Symposium on Ship Construction in Antiquity.

Maritime trade relations between the Arab-Islamic world and China were considerably more dynamic. Between the ninth and fourteenth centuries we notice that there was strong encouragement by the provincial and local Chinese authorities to invest in foreign trade.[25] Moreover, the Fatimids, who dominated in the Near East from 909 to 1171, supported active commercial ties between India and China and the Red Sea and the Persian Gulf.[26] Of special interest is the description of the various types of Chinese ships by the fourteenth-century Arab writer Ibn Battutah. He reports that soldiers embarked on every big Chinese ship and that some of them were in charge of launching liquid fire.[27] In fact, the Chinese used many types of "Greek fire", which were transmitted to the Arabs, in particular at the time of the Fatimids.[28]

It is, therefore, impossible to accept the view that the Arabs closed their eyes to the sophisticated Chinese ships that crossed the Indian Ocean alongside their own, and waited until the crusades to adopt the invention of the single rudder from the West.

Conclusions

To conclude, we must first clarify the meaning of the single rudder. There are various types of single rudders, from the simple axial rudder to the various more sophisticated types mentioned above.

We can assume with reasonable certainty that the Chinese, who first invented the primitive type of stern rudder and proceeded to develop a number of other types, passed this invention on to the Arabs, who first used it in their ships in the Red Sea and the Indian Ocean. Later they used it in their Mediterranean ships, from which the Byzantines copied it. The stern rudder as seen in the Hariri ship is the Arab type as it was developed from the Chinese.

The Arabs developed the stern rudder before it was ever used by the Western Europeans. On the other hand, as I now believe, the Westerners developed independently the advanced type of stern rudder which was indispensable for their sailing in the Atlantic Ocean.

The present author has previously written two articles on the same topic:

a. "The Transmission of Chinese Maritime Technology by the Arabs to Europe: Greek Fire (Liquid Fire), the Single Rudder, Barrels", *The American Neptune* 52 (1992) 38-45.

b. "New Light on the Transmission of Chinese Naval Technology to the Mediterranean World: the Single Rudder", *Mediterranean Historical Review* 10 (1995), 64-70.

This is the third and last article on this topic.

After this article was sent to the printer, a new book was published by Laurence V. Mott (*The Development of the Rudder: A Technological Tale* College Station, 1997) which was unavailable to me.

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NOTES

1. V. Christides, "The Transmission of Chinese Maritime Technology by the Arabs to Europe; Greek Fire (Liquid Fire), the Single Stern Rudder, Barrels", *The American Neptune* 52 (Winter 1992), 38-45.
2. L. Basch, *Le musée imaginaire de la marine antique* (Athens 1987).
3. J. Dars, *La marine chinoise de Xe siècle au XIVe siècle* (Paris 1992).
4. F. Hirth and W.W. Rockhill, *Chao Ju-kua, His Work on the Chinese and Arab Trade in the XIIth and XIIIth Centuries, Entitled "Chu Fan Chih"* (St. Petersbourg 1911). See also J. Needham, "Science and Civilisation in China" in *Civil Engineering and Nautics* IV3 (Cambridge 1971).
5. Lin Huadong, "A Study on the Origin of Sail in China", *Maritime Study* 2 (1986), Iff. (in Chinese, translated into English by Chen Wenjuan).
6. Ibid., 4.
7. See also Lo Jung Pang, "The Emergency of China as a Sea-Power during the Late Sung and Early Ming Periods", *Far Eastern Quarterly* 144 (1955), 489-504; D. Twitchett, (ed.), *The Cambridge History of China* 3 (1979).
8. For the late, after the 16th century Chinese treatises, see Dars, *La marine Chinoise*, p. 20 ff.
9. See for example R. Brown, "Preliminary Report of the Kho Kram Sunken Ship", *Oriental Art* 214 (1975), 356-370; Wen Wu Editorial Committee, "Sung Dynasty".
10. Lefèbre des Noëttes. *De la marine antique à la marine moderne. La révolution du gouvernail* (Paris, 1935); L. Casson. *Ships and Seamanship in the Ancient World* (Princeton 1973) p. 224, n. I; M. Reddé, *Mare nostrum* (Rome 1986), pp. 80ff.

11. L. Basch "Navires et bateaux coptes: état des questions en 1991", *Graeco Arabica* 5 (1993). Fig. 28.
12. Casson, *Ships* pp. 224ff. J. Thurneyssen "Another View of the Ancient Rudder", *The International Journal of Nautical Archaeology and Underwater Exploration*, 9 (1980), 3. L. Th. Lehmann, "The Mystery of the Graeco-Roman Steering Oar". *International Journal of Nautical Archaeology and Underwater Exploration*, 7 (1978), 95-9.
13. A.R. Lewis and T.J. Runyan *European Naval and Maritime History*, 300-1500 (Bloomington IN, 1985), pp. 74-5.
14. Lefèbre des Noëttes, *De la marine antique*, p. 106.
15. Zhang Zunyan, *Relations on the Sea between China and West Asia* (Peking 1986), p. 13 (in Chinese). I would like to thank Mr. Zhang Hushan for the English translation of parts of this book.
16. D.H. Keith and C.J. Buys, "New Light on Medieval Chinese Seagoing Ship Construction", *The International Journal of Nautical Archaeology and Underwater Exploration* 102 (1981), 123.
17. J. Dars, *La marine chinoise*, p. 125-126: "Le gouvernail à safran compensé, relevable par un oâble, est fortement assujetti par des puissants aussières maintenant la mèche".
18. Zhang Jun-yan, "Relations between China and the Arabs in Early Times", *The Journal of Oman Studies* 61 (1983), 99-109. See also other references in my article "The Transmission of Chinese Maritime Technology", p. 40 and the relevant notes, to which we can add I.S.A. Huzzaggin, *Arabia and the Far East their Commercial and Cultural Relations in Greco-Roman and Irano-Arabian Times* (Cairo, 1942); Chen Zhi-Qiang, "Preliminary Report of the Chinese Sources about the Byzantine State", *Βυζαντιακά* 12 (1992), 249-258; M. Kordosis, "Από την Κίνα στο Βυζάντιο. Οι κινεζικές πηγές" in *Η Επικοινωνία στο Βυζάντιο* in N.G. Moschonas, (Athens 1993), 551-564.
19. D. Twitchett, *Financial Administration under the T'ang Dynasty*, 2nd ed., (Cambridge, 1970).
20. V. Christides, "New Light on Navigation and Naval Warfare in the Eastern Mediterranean, the Red Sea and the Indian Ocean (6th-14th centuries A.D.)", *Nubica* 31 (1994), 31 ff.
21. V. Begley and R. Daniel de Puma (eds.), *Rome and India: the Ancient Sea Trade* (Madison, 1991).
22. H. Frost, review of Rome and India, in *Mariner's Mirror* 803 (1994), 354-6.
23. S. Arenson, "The Mystery of the Oriental Warship", *Tropis* 4 (1996), 21-28.
24. A brief presentation of all relevant sources was offered by the present author at the *Seventh Colloquium: From Jahilliya to Islam* (Jerusalem, July 28 August 1, 1996).
25. Zhang Junyan, *Relations*, pp. 48 ff.
26. B. Lewis, "Fatimids and the Route to India", Iktisat (Istanbul University) (1950), 355-66; Y. Lev, *State and Society in Fatimid Egypt* (Leiden, 1991), pp. 105 ff.
27. C. Defrémery and B.R. Sanguinetti, *Voyages d'Ibn Batoutah*, vol. 4 (Paris, 1922), p. 92: "There are among them (the fighters) archers and those equipped with shields and those who launch the naft". Here Ibn Battuta does not use the typical term for the launchers of fire who in Arabic sources are usually called naffatun. See also V. Christides, "Two Parallel Naval Guides of the Tenth Century: Qudama's Document and Leo IV's Naumachica: A Study on Byzantine and Moslem Preparedness". *Graeco-Arabica* 1 (1982), 86.
28. Christides, s.v. "Naft", *Encyclopaedia of Islam*, 2nd edn. (1992), p. 885.

ILLUSTRATIONS

Fig. 1 A ship depicted on a Coptic textile. 4th c. A.D. Axial stern rudder. L. Basch, "Navires te bateaux coptes: état des questions en 1991", *Graeco-Arabica* 5 (1993), fig. 28.

Fig. 2 The Harīrī ship of the Red Sea. Ar. MS 5847, Bibliothèque nationale, Paris. Simplified sketch by D. Nicolle in "Shipping in Islamic Art: Seventh through Sixteenth Century AD", *The American Neptune,* 49, 3 (1989), Fig. 24a.

Fig. 3 Ceramic model of a Chinese ship, 22 inches long, with protruding axial stern rudder, 2nd century A.D. Th. H. Flaherry et al., (eds.), *China's Buried Kingdoms* (Alexandria, VA, 1993), p. 130.

Figs. 4a, 4b Chinese single rudder. Sung Dynasty (A.D. 960-1279; Nothern Sung. 960-1127). Simplified sketches by P. Angelidis from J. Dars, *La marine chinoise du Xe au XVIe siècle* (Paris, 1992), p. 124.

Fig. 1

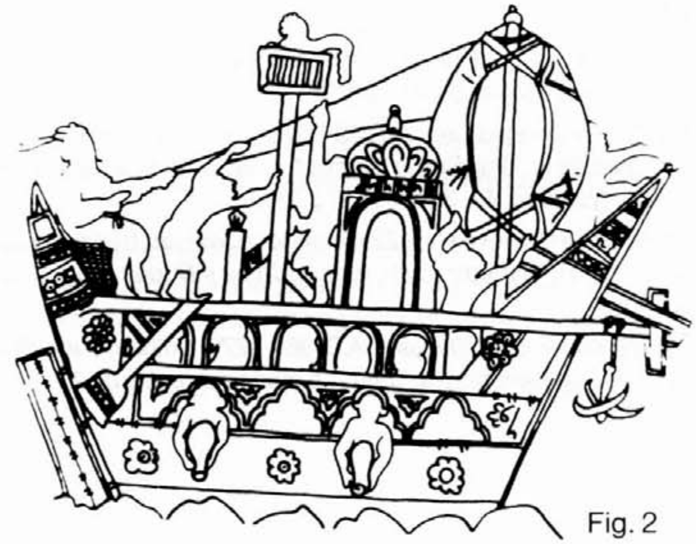

Fig. 2

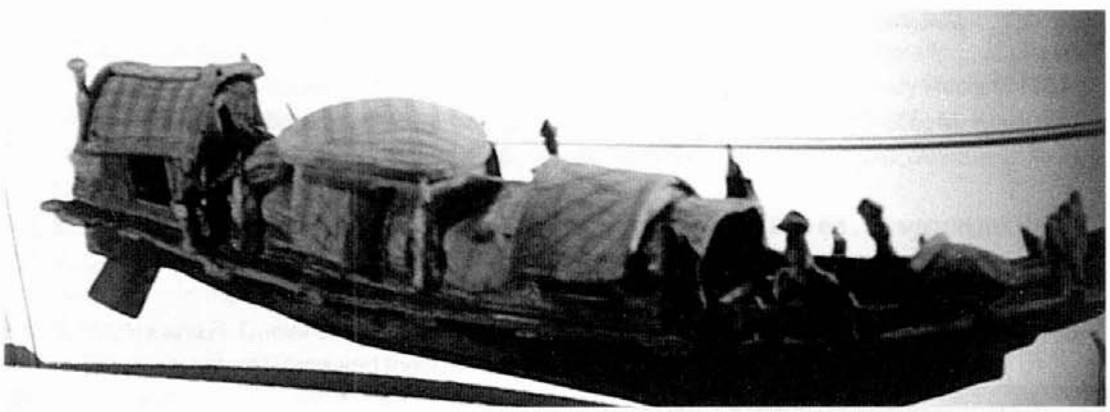

Fig. 3

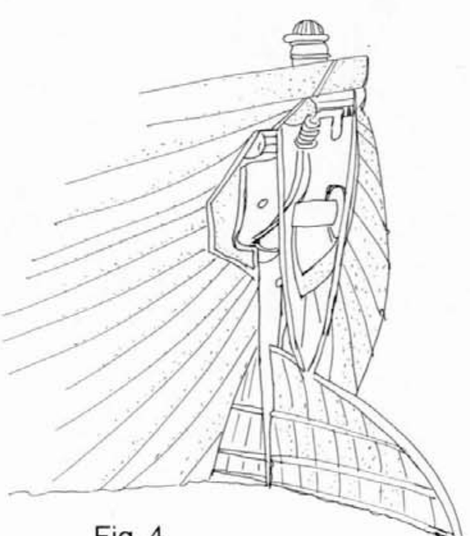

Fig. 4

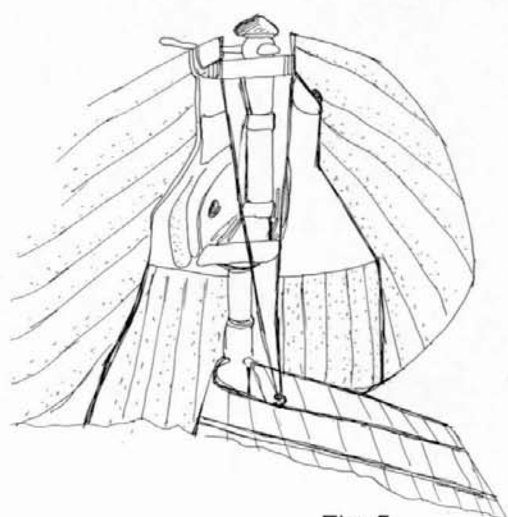

Fig. 5

TRAJETS MARITIMES FICTIFS ET RÉELS DANS L'ODYSSÉE

A côté du périple d'Ulysse, on rencontre, dans l'Odyssée, les récits de nombreux autres voyages maritimes. Les plus importants en sont le voyage de Télémaque à Pylos et à Sparte, le retour de Ménélas à Sparte, le voyage du bateau d'Ajax le Locrien, ainsi que les trajets maritimes que racontent Eumée à Ulysse lorsqu'il l'acueille chez lui et Ulysse à Eumée et à Penelope avant de leur révéler son identité.

A partir des données du texte concernant les bateaux sur lesquels naviguent ces personnages, les details techniques fournis par les récits, la durée et la nature de ces trajets, on essaie d'isoler, dans la mesure du possible, le noyau réel (ou réaliste) de ces voyages, le dissocier du contexte imaginaire qui les encadre

Menélaos Christopoulos

EDITOR'S NOTE

Mr. Menélaos Christopoulos made a verbal communication and the above is only an abstract.

LONG SHIPS, SLIPWAYS AND BEACHES

The American poet Longfellow wrote, of a ship's launch: -

Then the Master,
With a gesture of command,
Waved his hand;
And at the word,
Loud and sudden there was heard,
All around them and below,
The sound of hammers, blow on blow,
Knocking away the shores and spurs.

And see! she stirs!
She starts, –she moves, –she seems to feel
The thrill of life along her keel,
And, spurning with her foot the ground,
With one exulting, joyous bound,
She leaps into the ocean's arms! (The Building of the Ship)

On the other hand, a naval architect cautions us:

"Thoughout the construction of a ship, no operation is likely to cause the builder more anxiety, or to result in more serious consequences, than a major launch failure".
(From Richardson - The Launching of Ships)

Though naturally, and perhaps kindly, forgotten, those failures have taken their toll throughout history, ancient and modern. They should not be forgotten in considering how ancient slipways may have worked.

It is hoped that this paper may help to bring to light, if only in outline, some practicalities of launching ships and of the reverse, slipping them, that is, hauling ships out of the water up slipways. It is hoped that it may also stimulate the making of the customary modern launching calculations as a means of developing soundly based deductions in interpreting the remains of slipways and in particular about their necessary timber furniture and the methods of handling ships upon them. The author is much indebted to Henry Hurst and David Blackman for information about slips and also to the latter for undertaking to present the paper to this Symposium.

Ancient slipways on the shores of the Mediterranean have provided evidence about the dimensions of the types of ship for which they were built. These were almost always long ships. Round ships were not only hauled out of the water more rarely, but needed, being short, less in the way of precautions to prevent straining. Slipways were usually covered by a roof to protect ships' timbers from the sun and the clear breadth between pillars gives us a firm upper limit for the overall breadth of the ships housed in the shed. It is unlikely that the span of the roof was made any greater than necessary, so the overall breadth of the ship in question may be taken to be the clear space between pillars less twice a working clearance of, say, 5 to 10 cm or about 4 Athenian inches.

Being open-ended to the sea, slips define ship length more loosely than their breadth. In sheltered places, bows could protrude over the water so long as they were accessible for repair work. In exposed positions it would have been necessary for rams to be about a clear metre above water level to avoid damage and even bodily displacement of the ship in severe on-shore storms. In the case of the trieres and higher denominations of warships, that would call for the tips of rams to be at about the water's edge. The cost of slips and sheds would have caused them to be, as a rule, no longer or higher than necessary, as well as no broader, and means would have been found to haul sterns close up to any walls or other obstructions at the tops of slips.

Ancient Mediterranean ships being, with few exceptions, small and not flat-bottomed, it may be supposed that there could be differences between ancient and modern practices with slipways. Physical principles however must be the same. The ship has to be supposed and made to slide or roll on the slip and to enter and leave the water in a controlled way without damage. Methods of support may be supposed, until proved otherwise, to have been much the same as today, greased timber groundways secured to the stone slipway itself, either a single groundway under the keel or, as is more usual nowadays with flat-bottomed vessels, a pair of them under each bilge, with longitudinal cradles, sliding on the groundways, to hold the ship upright. Where ships slid on their own keels and a single groundway, they would also have needed some form of support on either side. Those supports would have had to slide with the ship on lighter groundways which we may term bilgeways, and the supports would have had to be abreast the point about which the ship hinged from her floating trim to the gradient of the slip and vice versa. They perform some of the functions of the modern poppets and may be so termed here. Their mechanics are critical. Transverse cradles, sliding on two or more groundways, could also have been employed. In this case the ship would hinge about the cradle furthest from the water, and that cradle would serve as a poppet also in providing lateral and vertical support until the ship was afloat.

In launching and hauling out long ships, being both slender and sharp-bottomed, their handlers would have had to avoid a number of hazards, everpresent. In antiquity their avoidance would have been achieved by keeping to practices which were successsful and established for each type of ship. They may be summarised (for ships launched bow first):

1. Downward ripping of the bow over the bottom end of the groundway(s).
2. Overloading the bottom of the hull, due to tipping.
3. Overloading the hull at the hinge-point when the bow lifts off the groundway(s).
4. Instability on the slip and when afloat, partly or fully.
5. Excessive speed into the water.
6. Excessive bending of the hull.
7. Flooding through openings near the bow.
8. Insufficient depth of water over the end(s) of groundway(s).
9. Sticking on the slip.

Nowadays the equilibrium of a ship being launched is calculated at a number of points in her travel down into the water. Typical results are shown in Figure 1. The calculations, like many in naval architecture, are quite lengthy but fairly standardised. There are now, no doubt, computer programmes to help. Guesswork is no substitute for these calculations.

Hazard (1), tipping, is prevented by checking that the moment of buoyancy about the end of the groundways is, at all points of ship travel, greater than the moment of the ship's weight. The difference, the anti-tipping moment, is marked A in Figure 1, and it must be large enough to avoid hazard (2). No hull of an ancient long warship would have withstood being supported at one point amidships without severe strain (and consequent leakiness afloat), or actually breaking in two.

The next hazard (3), arises when the bow lifts off the slip, at a point marked C in Figure 1, when the ship is supported partly by buoyancy and partly by a concentrated force at the after cut-up (ACU) of the keel (that is where the keel starts to rise to the stern), or at any sliding cradle supporting the after end of the ship. The size of that force is indicated by D in the Figure. The ship, cradle if any, and groundway must all be strong enough to carry that force, which builds up shortly before bow lift and then diminishes progressively to zero when the ship is fully afloat.

The next hazard (4) is instability. One way or another, all ships out of the water (rectangular boxes only excepted) have to be held laterally to stop them falling over sideways. That support is needed until the ship is afloat, or at least very nearly so. As already mentioned, it has therefore to be provided at the point about which the ship hinges as she rises bow first to float off the slip. What happens to these supports, travelling with the ship and sliding on some form of bilgeway on each side of the slip, has to be considered carefully. Their failure would wreck the ship and probably the shipshed too.

When the ship is afloat, usually unloaded, she must of course also be stable, which light (unloaded) ships usually are, but not always, and capsize upon launch is the ultimate embarrassment for any naval architect! Figure 2 shows a relatively recent such capsize.

Depending upon circumstances, a ship can enter the water quite fast (up to 30 kph) if sliding on timber ways well greased by modern techniques (hazard 5), so one has to have a thought about how far she might travel across a harbour, for instance. The converse hazard (9), is sticking on the slip, usually owing to poor greasing, too small a declivity, or both. Nowadays building slips tend to slope at about 1 in 18 or 20, while the actual groundways upon which the ship slides, which are built before launch and to which the ship's weight is transferred shortly beforehand, slope at about 1 in 15 or 16. In ancient slips the ground ways and their stone base may have had the same slope, or they may not. That needs to be borne in mind, particularly in the cases of slips with small declivities, built, for instance, on gently sloping ground. It is however most probable that timber groundways near and below water would be low and possibly temporary on account of the cost of maintaining timber structure in sea water where, in the Mediterranean it would be attacked energetically by shipworms, as well as, if in an exposed place, by storms.

Hazard (6) is excessive bending of the hull when the bow lifts. This can be too great in long and slender wooden ships unless the hinge-point is sufficiently far forward from the stern. Ancient warships were most probably slid on their keels on slipways and therefore hinged about their ACUs, which for that reason could not generally have been as far aft as in the Marsala ships. Long cut-ups aft would in any case be convenient for mooring to beaches and would have greatly improved manoeuvrability, very important in warships fighting by ram. One wonders whether the Marsala ships, which may have been some kind of fleet supply vessels, were not launched sideways, as illustrated in Figure 3. In *Olympias*, the ACU is far enough forward to cause no undue hull bending on a slipway.

Hazard (7) is flooding of the hull through, in particular, the foremost lower oarports. This is just avoided in *Olympias* at her point of maximum bow immersion just before bow lift from a slope of 1 in 10, as in Piraeus. This hazard could, of course, be prevented by blanking off the oarports for slipping and launching. Askomata could however scarcely be relied upon in case the ship stuck at bow lift when water would have to be kept out for hours or even days while the ship was freed.

Insufficient depth of water over the bottom end of the ways, hazard no. 8 in the list, would cause the ship to drop off the end as she floated free. The ACU might then bump on the bottom. In hauling out in those circumstances, the ACU would not land on the end of the ways, but would have to be dragged up over it and the ship would run the risk of becoming unstable before supports could be put in place. The minimum depth at the end of ways to avoid instability can, for any particular configuration and condition of ship, be calculated: indeed it would have to be, to substantiate the association of a particular type of ship with a minimum safe depth at the end of the ways.

To illustrate some of the factors affecting long ships on slips, it may be useful to consider the proven and existing trieres reconstruction on a Piraeus slipway. Launching calculations have been carried out for this ship and slip combination, and they have shown that the hazard of tipping and excessive bending depends very much on the length of the ways under water. It is most unfortunate that particular measurement was never made when some of those slips were measured in the 1880s, or since.

On hull bending, to keep the bending moment in launching or slipping below an acceptable 50 tonne-metres hogging, the stone slipway, if the timber groundway were 0.25 metre thick (for example), must extend at least 3.6 metres at the slope of 1 in 10 beyond the point where it enters the water. If it ended there, as it must, the anti-tipping moment would be only about 10 tonne-metres. However, tipping and bending are not the only considerations affecting way end immersion. The draft of *Olympias*, weighing 23 tonnes (when light and empty), is 0.85 metres whereas the depth of water over the end of the top surface of such a groundway would be only 0.11 m. As the slope of the ACU is quite gentle, it would be possible for a team of men to haul the ship up and over the end of the groundway, lifting her at that point 0.74 m. in the process. The force up the slip needed would rise from zero to about 2.3 tonnes, requiring 60 men pulling in heaves of 40 kg each, but only provided that the ship slid on well greased timber. If she was hauled up on wet timber 3½ times the force would be needed and there would not be enough space for the more than 200 men required.

However, the main difficulty would be that the ship would fall over before the ACU has reached the slipway. Lateral supports must therefore have been rigged in place before the ship leaned over and there must have been some slipway extending far enough into the water to place them and to slide upon. They must also be able to slide with the ship as she moves up the slipway. It is the author's opinion that groundways, both for the keel and for the supports on each side of the ship, must have ended underwater at a depth of no less than about half the light draft of a trieres, i.e. 0.43 m. If groundways were 0.25m. thick, then the end of the stone slip would have been at least 0.68 m. below the water. If the slope underwater was 1 in 10, that immersion requires an underwater length of stone slip of about 7 metres.

No one would ever want to build or cut more stone underwater than is absolutely necessary, and the underwater length of slips could have been reduced by increasing the gradient near their ends to say 1 in 5, which would match the slope of the rising stern keel of a trieres. The top of the timber groundways would follow the steeper slipway, which need then extend only about 5 m. underwater. It would however be much easier to handle the side supports, or a cradle is such were employed, into place on grandways while the ship was fully afloat, but that would require a greater underwater length, of about 10 metres.

The stability of a trieres when light is ample.

The force needed to haul *Olympias* up a 1 in 10 slipway on greased timber ways with an assumed coefficient of friction of 0.20 would have risen, as the ship progressively left the water, from zero to about 7 tonnes. Smaller coefficients than 0.2 can be achieved, but considering that keels would have been wet and that the coefficient of friction between wet timber surfaces is high (0.68 is quoted), 0.20 is suggested as a realistic figure representing likely ordinary practice in antiquity. On these assumptions, a force of only 2.3 tonnes would have been sufficient to haul a trieres down a Piraeus slip, though she may have taken a larger force to start her after a long period in the shed when the grease on ways and keel would have dried somewhat or been squeezed out.

Assuming that men could pull 50kg in heaves, given good footholds (on crosstimbers on the slip), 140 men could pull a trieres up the slip after clearing the water. These men could be arranged to pull on a rope on each side of the ship in teams of 35 pairs. The teams would then be no longer than the ship and so could pull her close up to the back wall. To do their work clear of the ship, they would have to be next to the pillars and so the space beside the stone slips would have had to be boarded over, with footholds. The teams would have had to be clear of the lateral supports, or poppets, on each side of the ACU as they slid on their own timber ways at each edge of the stone slip. The need for such subsidiary but essential ways would explain the uniformity of the edges of stone slipways. Poppets, or any other lateral support, would have to be at the ACU of the ship because that is the point about wich the ship hinges when the bow end settles on to or lifts off the ways.

Poppets would have been rigged for slipping and cast off for launching when the ship was fully afloat (or so nearly so) and stable without them. While it is possible that lateral support was provided by cradle, that does seem a somewhat less likely method. First, cradles are more cumbersome than poppets to handle. Second, they must pass under the keel if placed at or forward of the ACU to limit bending stresses on the hull, when by raising the keel to make room, the slip must be longer underwater and the shed higher: those disadvantages could have been avoided if the stern cradle was placed aft of the ACU, and loosely, so that the ship slid on the keel at the ACU as before, but then the hull would have to wedged up in the cradle as the bow settled on the ways. The subsidiary ways would still be needed for the corners of the cradle to slide upon. In launching it would have been absolutely essential to keep the cradle loose as the ship's bow rose on its buoyancy, unless it and the hull was made strong enough to take the full force at the hinge-point, about half the ship's launch weight. Worked like that, cradles would increase hull bending at bow lift.

It would be most informative to carry out, very carefully of course, some experiments with *Olympias* in handling her on a slipway in a manner available to the ancients. This has been suggested by Blackman (Tropis 2, 1987) and it remains a worthwhile experiment to make.

The use of rollers on established slipways is thought unlikely because though they would greatly reduce frictional forces they would occupy additional height (timber groundways would still be necessary), lengthening the slip underwater. Further, the ship would have to be held at all times from rolling down the slip which would be almost inevitably disastrous one way or another. To keep roller loading to satisfactory limits there would have to be say 40 or so of them of diameter 0.25m: they would need detailed attention as the ship moved on them. Handling the ship would be more complicated and the number of men needed would not accord so well with inscriptions.

Passing on to other slips, further points emerge. At Sounion (figure 4), the gradient is steep, 1 in 3.5, and the dry length is about 26m with a further 6m in the water (Kenny, BSA, 1947). The steep gradient raises the hazard of flooding at bow lift but it seems likely that a ship 20m or so long could avoid that trouble. To avoid damage by waves in onshore gales at this exposed position, the bow of the ship would have had to be about 3.5m up the slip from the water's edge. If the ship lay in the trough as shown in Figure 4, the ram (if any) would be at about the level of the main sloping floor.

These slips could have accommodated ships such as two-level pentecontors whose cross-section is suggested in the Figure with supporting groundways of timber. On the previous assumptions about friction of greased timber, such a ship could be expected to have entered the water at first at about 1.5 knots and would have been traveling about twice as fast when her bow lifted. One may suppose that the purpose of the steep slope was to enable the ships to go into the water fast enough to give the crews time to run out their oars and start pulling them clear before the worst navigable on-shore wind could push them back on to the rocks. In that case, oars must have been stowed aboard ready to run out and they could not therefore have been as long as the clear breadth inside the shed, about 4.7m. That makes it doubtful if they were two-man oars which are unlikely to have been less than 4.8m long. So hemioliai are unlikely to have been housed at Sounion.

The purpose of the cuttings in the rock may have been two-fold, to minimise excavation of rock, and to avoid the need for portable lateral hull supports, which would have been difficult to cast off and recover after a free launch. The weight of the ships on the slips would surely however have been taken on their keels, as suggested in Figure 4, the bilgeways only providing lateral support, and having a working clearance with the hull. That would lead to the necessity for a certain geometry of hull around and aft of the ACU to keep the side support being just that and no more as the hull hinged at bow lift. That calls for investigation in detail. It is less likely that the ships slid on the bilgeways alone, because that would require specially reinforced hull structure and external bilgekeels to mate with their groundways to keep the ships straight and central while in motion.

If, as is likely, the ships were let go to run down these slips freely, they would have had to be launched fully manned in the manner of recent lifeboats stationed on rock-bound coasts (in Britain at least). Return however would only have been possible in clement conditions to allow disembarkation and backing on to the ways without bumping and being damaged before being hauled up.

An unmanned 50-oared ship would have weighed about 5 tonnes, and needed a force rising to 2.3 tonnes to pull her up these slips on greased timber. About 65 men, heaving at say 35kg each (not 50kg in view of the slope) could do the job and there would just be room for them on each side of the ship. The need for any winch, suggested by the bronze wheel found at these slipways, is not therefore clear. It would not have been possible, as a simple calculation would show, for the ships here to have been carried bodily up the slips.

The cuttings for the keels gave minimum though decidedly cramped access for the essential work of attending to the ships' bottom planking, i.e. for stopping, caulking and coating. That access would explain the size of the central trench, though it is scarcely occupied by the keels themselves. Even so caulkers and painters would have had to crawl on hands and knees to move about, and work on their backs on the side shelves of the cuttings, inconveniences which have been timeless in ship work.

If the foregoing is correct, the keel would have been about 0.4m below the slip floor. A ledge on the south side of the pair of slipways is reported to be 3.6m above the floor at the top of the slips, indicating a height of roof timbers above keel of about 4 metres at that point. That fits a conjectural design of two-level 50-oared ship nicely.

One must presume that the Sounion slips were configured to need the least excavation of rock on a difficult site to provide for the safe keeping and maintenance of some essential ships. Did the keel cuttings, 0.7m deep, besides avoiding further excavation, keep the height of the roof below some limit? Or did they reduce the necessary underwater length of the main slip floor? The present underwater length is reported to be about 6m, which, at a slope of 1 in 3.5 is remarkably, even implausibly, generous because the bottom end of the keel ground way would be about a metre below the present waterlevel while the fully loaded draft of the ships would have been only about 0.7m. Has the sea level at Sunion risen by 0.3m?

Slips on the island of Alimia, off Rhodes, have been described by Blackman at this Symposium. Here the slopes are about 1 in 7 to 8 and they extend at those slopes down to a depth of 0.65m below water, and then more steeply to 1.2 to 1.3m. If their present dry lengths of 16 to 21m are the same as they were originally, they seem to have been built for ships with about 7 to 12 oar rooms. Such ships would have had light drafts of about 0.5m, less by 0.6m than the depth of the ends of the ways, allowing for timber groundways, say, 0.15m thick. The steeper ends of the slips are significant. It is reasonable to suppose that their purpose was to provide a landing for the ACUs of ships while being prepared (and supported laterally) for hauling out. Slips would surely not be continued under water any further than was necessary to provide for controlled landings. The present depths suggest either that the sea level here has risen by 0.6m, or that it has risen more and the slips were somehow for bigger ships, with a lot of timber structure to support groundways extending seawards from the present shoreline. That possibility must however be regarded as rather remote because it calls for secure and presumably fairly permanent timber structure built into the sea. The more likely, if less exciting, hypothesis is that the ships here were of 11 to 16 oar rooms and between 4 and 4.5m in overall beam, on the assumption that the sea level has risen by 0.6m or so.

The wider slipways on Alimnia do not fit the likely overall breadths of tetrereis (4s) which would have been about 5m, or 6m if boxed, nor those of 5s at about 7m. They are both too narrow to fit economically into the widest slips (11m). The lengths of both of these types raise the doubts already outlined.

The slips at Carthage have different slopes along their lengths. In some, the first 24m from the water is at 1 in 20, followed by about 10m at about 1 in 6 with a slightly concave profile, approximately fitting that of the rising stern given to the trieres reconstruction *Olympias*. In other slips there, it seems that there is evidence of a slope of 1 in 12 for the first 13m or so, then 1 in 20 for the next 11m, before the 10m steeper part at the top of the slipway, leading at that level to the landward access to the slips. If the groundways built on such slips followed the two lower slopes, travelled by the ships' keels, the ships would have had to be supported on two cradles to keep their keels clear of the point where the slopes met. It is inconceivable that long ships would have been made to tip over such points in moving up or down the slips, for the reason already given in connection with the trieres. Alternatively, the groundways of these slips may have been built up so that they had a constant slope over the whole length on which keels slid (except possibly for a metre or two at the underwater end). The original profile of the land could have made such a scheme the most economical.

At Carthage, unlike Sounion and Alimnia, there is a shortage of water over the ends of the slips, which have been drawn only 0.3m below water and with moreover a sharp drop into deep water. That does not seem a practicable arrangement. Light drafts of 35 to 40 metre long warships would have ranged from 0.85 to 1.0m, so slip ends would surely have been 1.2 to 1.4m below water, to allow some thickness for groundways, and to provide a landing for the ACUs of ships. Could the sea have risen a metre or more here? If that were so, cradles would not have been necessary, the slope of groundways could have continued at 1 in 20, or a little steeper, but at a constant slope where in contact with keels, with an increased gradient underwater at the bottom end, as suggested above, to provide the necessary landing on groundways ending 0.85 to 1.0m below water with the minumum amount of underwater length of slip.

If the dimensions, weights and hull forms of ships which might have been houses at Carthage could be suggested, even if only tentatively, the next step should be to carry out launching calculations to seek practicable slopes and shapes of groundways and necessary sealevels more accurately. The stone slips and presently understood sealevels are not sufficient to enable practicable solutions to the design and operation of these slipways to be found.

Warships were also hauled out of the water on to beaches, usually for drying out (before stopping, recaulking and recoating their bottoms), and sometimes for the winter. Some have thought that triereis and smaller ships were hauled out daily on passage, but the weights, forces and general conditions involved make such a practice most improbable. Nevertheless, drying out the hulls of warships was a common enough operation to make the procedure in all probability routine and established.

The effort needed to pull a heavy weight up a slope on greased timber is so much less than to do it directly on stones, or to lift it bodily (or to combine the two actions) that it must be virtually certain that greased timbers were used. The figures in favour of greased timber are so compelling that that belief can be held even though the required timbers are not recognisably included in the inventories for triereis. It is unlikely that oars, being selected timber and shaved down to be as light as possible for fast rowing, would normally have been used as sleepers under the keel.

It is also unlikely that long ships were hauled up slopes greater than about 1 in 10. However most Mediterranean beaches are, and presumably have been for some time, steeper than that, more like 1 in 5. Before hauling out a long ship, it would therefore have been necessary to excavate a slipway through the bank formed by the beach (Figure 5). A slope of 1 in 10 could alternatively have been found at some acute angle to the shoreline, but that course would have generated more problems than it solved. Each ship would need a greater length of beach, be more exposed to wave damage and a beached fleet would have a longer perimeter to defend if that were necessary.

Laid on and secured to stout poles set, as sleepers, across the slipway in the beach, portable lengths of greased planks, with bolsters to form a guiding groundway for the keel, could be a sufficient support for a ship. As on a permanent slipway, the ship would also have to be prevented from falling over sideways. Instead of properly aligned bilgeways, on a beach it is suggested that a more makeshift scheme was likely: when the ship was moved, oarhandles were stuck through lower oarports, to protrude far enough at shoulder height to serve as handles for a steadying crew, while two or four parties of men handled portable shores to prevent the hull from taking charge and falling over too far. The majority of the ship's company would have manned two long ropes to haul the ship out. Certainly the whole complement would have been needed.

It is unlikely that long ships would have been hauled out leaning over on one bilge, first because that would risk hull and particularly plank strain, wear and leakage, and second because a lot of the bottom planking would then be inaccessible for the very purpose of hauling out - to stop, caulk and coat the bottom. The upright position ashore also accords with the description by Homer (Il. II 153 and I 485-6) in which a ship is supported, after hauling out, by piles of stones in a trench on the beach. A trench was also dug by the Argonauts to receive the Argo on a beach (See Blackman, Tropis 3, 1989).

An alternative method for moving a ship on a beach is by rollers, employed today under small or flat-bottomed boats in many parts of the world. Typically, poles are laid along the route for the ship and rollers work between them and the ship. With sharp-bottomed ships, such as ancient Mediterranean warships, weighing (in the cases of 3s, 4s and 5s) from 20 to 50 tonnes light, complications arise. Many rollers would be needed to prevent crushing of timber and they would need much guidance, being in practice only roughly cylindrical. The ship would have to be constrained at all times from running back, and then immediately falling over. All in all, use of rollers is not an attractive hypothesis on beaches any more than it is on permanent slipways.

Hauling out and launching triereis are discussed in more detail in the latest trieres project report, entitled *The Trireme Project.*

This summary discussion of handling ancient long ships on slipways emphasises the importance of the submerged parts of the slips, hitherto rather neglected, and of the lateral support, needed by all such ships at all times and in all positions on slips, unless nearly fully afloat. It draws attention to the possibility that timber groundways, which must have been virtually ubiquitous on stone, need not have had the same gradient as the stone slips upon which they were built. It indicates the value of calculations and experiments in advancing understanding of the mechanics of hauling out and launching ancient ships and hence of the ships and slips themselves.

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ILLUSTRATIONS

Fig. 1	Typical Launching Curves.
Fig. 2	A capsize upon launch.
Fig. 3	Side-launching.
Fig. 4	Section of a Slipway at Sounion, with a conjectural Section of a Two-level Pentecontor.
Fig. 5	Conjectural Beach Slipway.

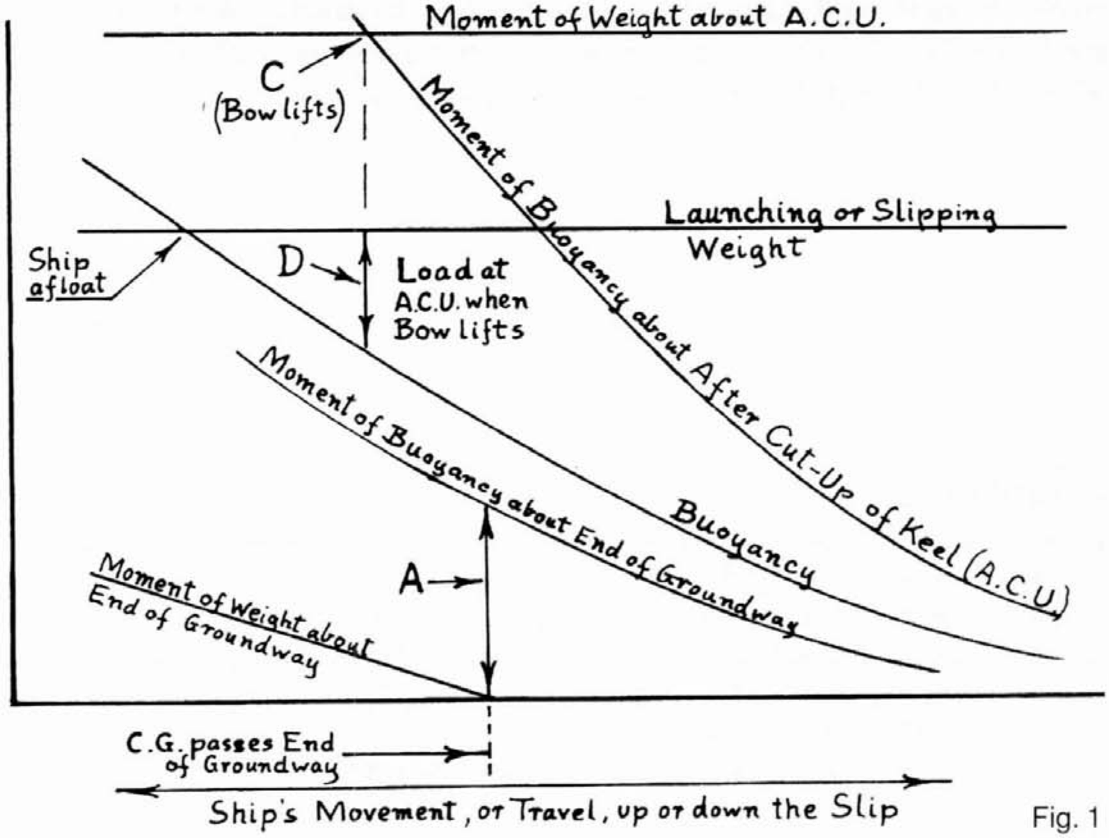
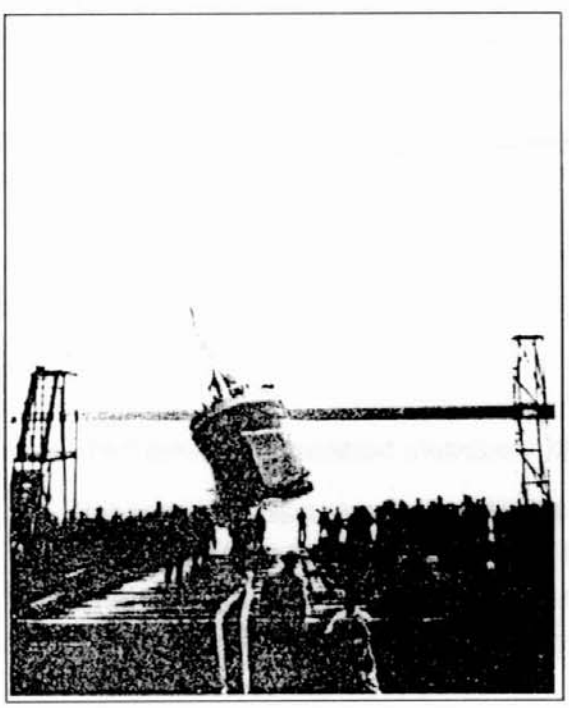
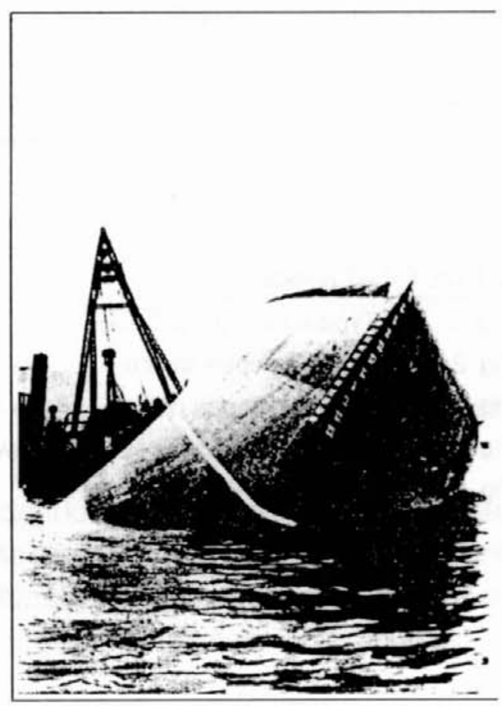

Moment of Weight about A.C.U.
C (Bow lifts)
Moment of Buoyancy about After Cut-Up of Keel (A.C.U.)
Launching or Slipping Weight
Ship afloat
D
Load at A.C.U. when Bow lifts
Moment of Buoyancy about End of Groundway
Buoyancy
A
Moment of Weight about End of Groundway
C.G. passes End of Groundway
Ship's Movement, or Travel, up or down the Slip

Fig. 1

Fig. 2





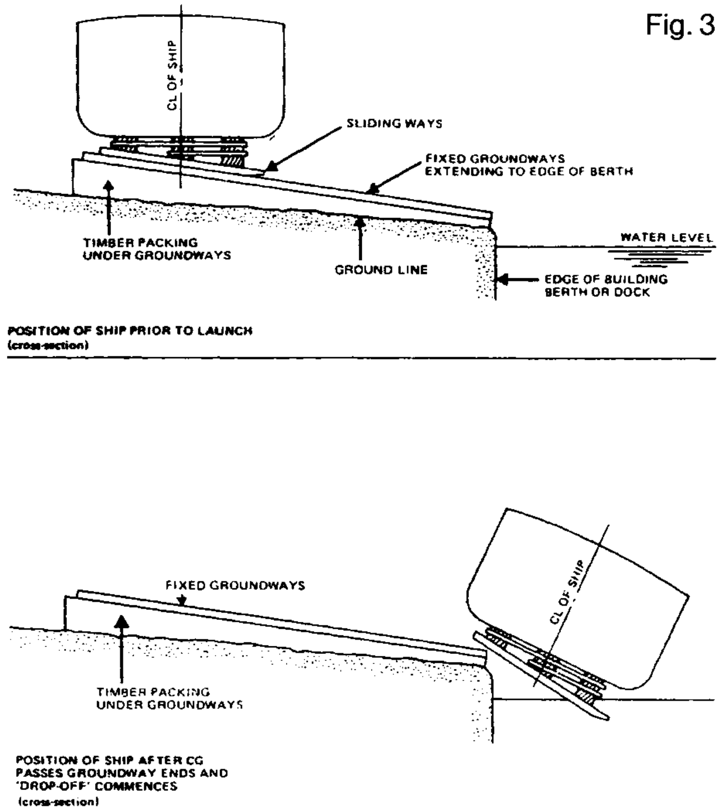

CL OF SHIP
SLIDING WAYS
FIXED GROUNDWAYS
EXTENDING TO EDGE OF BERTH
TIMBER PACKING
UNDER GROUNDWAYS
GROUND LINE
WATER LEVEL
EDGE OF BUILDING
BERTH OR DOCK
POSITION OF SHIP PRIOR TO LAUNCH
(cross-section)
FIXED GROUNDWAYS
CL OF SHIP
TIMBER PACKING
UNDER GROUNDWAYS
POSITION OF SHIP AFTER CG
PASSES GROUNDWAY ENDS AND
'DROP-OFF' COMMENCES
(cross-section)

Fig. 3

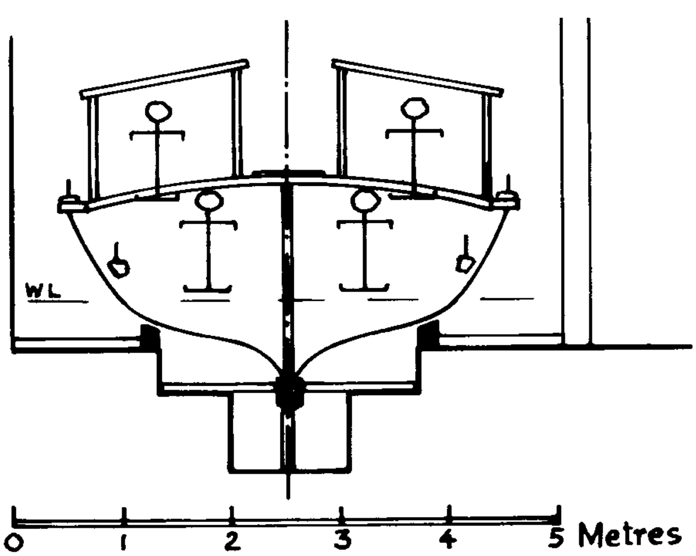

WL
0
1
2
3
4
5 Metres

Fig. 4

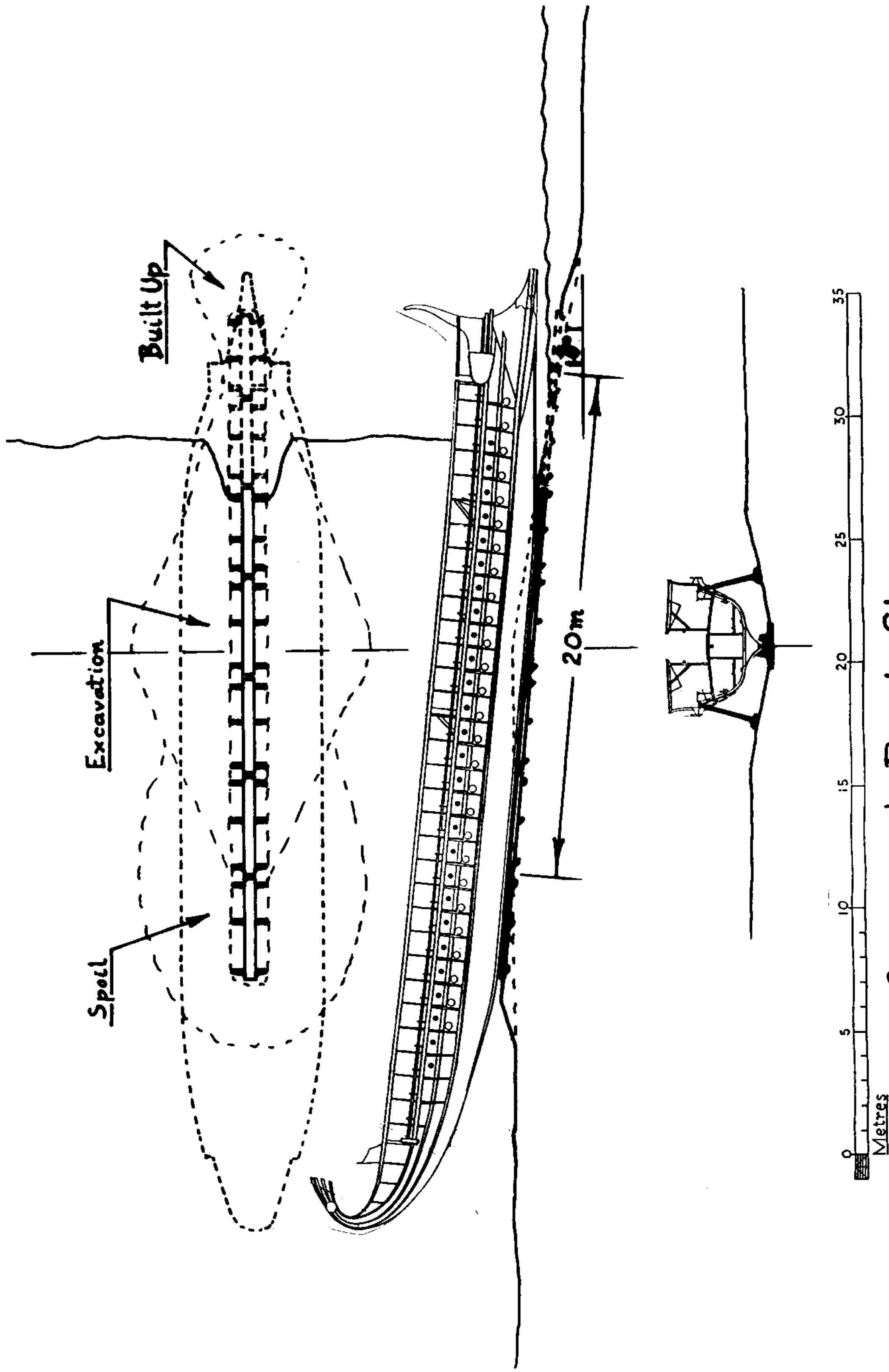

Built Up
Excavation
Spoil
20m
Conjectural Beach Slipway
Metres
0
5
10
15
20
25
30
35

Fig. 5

REPRESENTATIONS OF SEA-BATTLES ON MYCENAEAN SHERDS FROM KYNOS

It is the third time I am taking part in this Symposium, all three times with papers concerning finds from Kynos in East Lokris[1] so that I am afraid I am becoming boring. But the good "Lord" of Kynos plays games with us archaeologists and reveals every year so much material, enough to excite the interest and keep the suspense high.

To remind you of the various steps in filling in this pazzle, I am referring below to the way we obtained the representations I am going to discuss.

During the campaign of 1987 we found a piece of a pictorial krater of LH IIIC period. I call it the first ship, to distinguish it from the next ones. In 1988 we found four joining piecces of another krater and two extra pieces of the same vase. Both vases were presented during the IIIrd Symposium in 1989[2]. Much discussion had arisen then about these two pieces and the conclusion was that at last we had in front of us two real warships of the Late Bronze Age, whose characteristics show a direct relation to the geometric warships, which followed them. We suspected that naval warfare was not unknown to the Mycenaeans. Meanwhile the excavation was going on and the next surprise was the joining piece of the first krater, which gave us the whole of the ship represented on it, namely the missing stern and the helmsman[3].

Moreover another piece from a third krater was revealed (Fig. 1), but still unfortunately fragmentary, on which we can distinguish the mast of a ship at the top of which two brails are hanging from a double ring. The horizontal line under the rings is to my opinion the yard of the sail and the hanging semicicles, like festoons, are obviously representing a brailed-up sail. At the right end a fighting warrior with a body shield of "Hetitic" type[4] is drawn, standing on a plattform. Although the execution of the scene is very schematic, like a caricature, it is sure that the scene is almost identical to the warrior on plattform on the second ship and perhaps inspired by it.

Apart from the fact that we have again another fighting scene on ship the most interesting element of this sherd is the presence of the yard and the brailed sail, to my knowledge for the first time appearing on Mycenaean pictorial vases.

As time went by and the excavation on Kynos progressed, in 1991 some more pieces of the second krater came to light and in 1992 another very interesting sherd from a different, fifth, krater.

On this last sherd (Fig. 2) the angle of the keel and the stem of a ship can be seen on the left side while on the right end of the sherd the steering-oar of another ship is easily recognizable. A peculiar thing like a club, which obviously belongs to the same ship to which the steering-oar was also attached, makes it difficult to conclude what part of the ship it represents. It is tempting to identify it as an immovable second steering-oar, a device not totally unknown during Late Bronze Age[5]. Similar steering-oars are found not only on the Late Bronze Age ships' representations but also onProtogeometric ones. On the other hand its downwards direction excludes the possibility to identify it as an extention of the keel[6] or as an "εφολκαίον"[7]. Between the two ships a corpse of a man in the sea is pictured. There is no doubt that he lies in the sea since above him a fish is swimming and it is known that the Mycenaean artists rendered usually the scenery in such a way. The two reserved discs with dot on the bust of the dead in my opinion imply that the dead is unarmed and not that the corpse belongs to a woman. The dead surely is a fallen warrior, victim of a sea-battle.

The similarity of the composition to that on a fragment from a Geometric krater in Louvre is astonishing[8].

The above conclusion poses another great problem concerning the character of these scenes; are they mythical or historical or events the every day life that is portrayed? The discussion of this problem lies beyond the scope of this Symposium.

The new joining pieces of the second krater show beyond any doubt that we are dealing with two ships moving against each other (Fig. 3). On both of them two warriors are standing on a platform projecting their shields for protection and they are ready to throw their spear. We thought previouslythe top of the prow belonged to the left ship[9] which it does not join; the piece however comes from the same vase and belongs to a third ship. Both ships are almost identical. Only two secondary details diferentiate the one from the other; the absence of the semicircles on the bulwark of the left ship and the thin vertical lines which fill two of the open spaces of its platform. If these constuctions on the foredeck of the ships are platforms or cabines[10] it is difficult to decide, although the placing of the feet of the warriors not on top of them but in the middle in a stepping position could imply a staircase. The line behind the warrior on the left ship should be the forestay.

That the ships are oaring against each other shown by the oars which have opposite direction, though what I have interpreted as oar-men[11] in both ships have the same posture and direction. In other words the oar-men of the ship on the left are oaring facing the stern, a way of oaring cosnidered as normal[12], while the oar-men of the opposing ship are oaring facing the prow.

The rendering of the oars the way they are pictured on this scene serves to balance the composition, too, a proof of the high qualification of the artist who painted it.

It is obvious from the presence of the fishes between the ships that the action takes place at sea.

The dimensions of this krater should be very imposing and it should be one of the biggest of its kind. That means that on the missing part some more ships are represented and this fact can be counted as sure because we already have the top end of the prow of a third ship[13].

All the above described pieces come from four different vases. Some more sherds found in Kynos's excavation, more fragmentary and for the moment not worth discussing, prove that there existed still more vases –all kraters– with similar decoration and topics. So the number of scenes of naval warfare from the Mycenaean period has been increased and we are permitted to draw the conclusion that during this period such events like naval battles took place in the Aegean. To my knowledge it is the first time that we have such an obvious proof and scenes of seaconflict from the Mycenaean period which, moreover, also represend the oldest depiction of such an enterprise in the Aegean area.

Many scholars suspected that such events took place at that time and they tried to support their opinion with debatable arguments[14]. Now, however, since we have recognised warships among the representations,and not only the ones from Kynos, one wonders what their usefullness was if not for war at sea.

The above conclusion has been debated[15] mainly because Homer does not mention any sea-battles. The Homeric poems,however, reflect the importance of the ship and the descriptions of ships take almost the same space as those of charriots.

Homer mentions twice in the *Iliad* the "ναύμαχα ξυστά"[16], long spears kept on board as ready-to-fight weapons[17]. The word "ναύμαχον" is composed by the word ναυς=ship and the word μάχη=battle. The same words compose the Greek word ναυμαχία=sea-battle. These ναύμαχα have been recognized and the identification, widely accepted, not only onGeometric warship representations[18] but also on earlier ones as for example on the famous miniature fresco of Santorini[19] means that they were already known from as early as the 15th century b.C.What other use, then, could these ναύμαχα have unless as weapons for sea-battles.

It is accepted by all scholars that charriotcombats were, so to say, a specialty of the Late Bronze Age society a fact that is reflected in Homeric poetry where many such instances between Trojans and Achaeans are described. Charriot representations are not rare in Mycenaean art. Charriots, charrioteers and passengers are pictured very often and on different items such as funerary stelai, wall paintings, seals and vases. It is surprising to a scientist, however, to find that among all relevant representations there does not exist even one undoubted example of a combat between charriots.

A remark of Kirk in his well-known article[20] regarding representations on Geometric vases that "complicated subjects like charriots or ships must have presented many difficulties to the artist [...] especially where the artist has attempted to distinguish different planes" can be applied in the case of representations of sea-battles during the Late Bronze Age.The fact that Homer does not refer to sea-battles does not mean that such events did not happen but that the aim of the Trojan War was other than a victory at sea. The goal of the Trojan expedition was the seizure of land and cities and the capture of the enemy's troops.

The aim of the wars in the Late Bronze Age should have determined the kind of tactics used. The tactics at sea was the same as in land-battles[21], that is to kill the enemies by throwing the spear or shooting with arrows not ramming the ships[22]. This seems to be the case of the Kynos representations.

The attitude of the warriors on the Kynos kraters is the same as that of warriors fighting from charriots or in combat on land. The ships had the same function as the charriots[23]. In other words worriors at that period tried to prevent the enemy from landing; just as they tried to prevent them from proceeding on land.

According to the above conclusion, then, the action depicted on the Kynos kraters should have taken place not in the open sea but near the coast, still however at sea as one can assume from the presence of the fishes*.

All the above described vases represent different stages of sea-battles.

On the second krater the ships are approaching and the warriors are ready to strike at the enemies with the spear. The attitude of the warriors, grasping a long spear with their raised left hand, leaves no doubt about their purpose. Whether this long spear is a "ναύμαχον" is difficult to decide. The warriors as well as the

* Editor's note:
The author wants to stress that this refers to a sea battle, as in homeric texts some fights take place on shores where shipx are beached.

helmsman are all helmetted and this fact supports the opinion that all persons on board were soldiers and seamen simultaneously. The warships of the Late Bronze Age were of small draught so that they could not carry many persons, that is enough soldiers and the necessary crew.

The ships are not represented as confronting but as moving parallely, a logical maneuvre. In this scene the artist tried to give perspective to the representation and that was done by drawing the one ship a little higher than the other, with a bit smaller dimensions. Even the warrior on the plattform is shorter. Another detail strengthens the impession of perspective and this is the rendering of the oars. The oars of the better preserved ship are shorter because they fall into the painted band below, which borders the scene. On the other hand, the oars of the opposing ship are pictured in their full length. This device gives the impression that the ship on the right is closer to the observer.

On the first krater, the action on board implies a second stage in a sea-battle, namely the enemy is already on board and the fight is taking place on on the ship itself. Obviously after approaching, an assault of the soldiers followed and the defenders of the attacked ship tried to resist, fighting with their arms in exactly the same way as if they would have done on land. This operation, too, takes place at sea since the helmsman is still at his post.

The end of a sea-battle is signated by the scene of the dead man at sea on the fourth sherd.

Based on the above described representations one can support with certainty that sea-battles took place in the Late Bronze Age Greece too, as it happened in the Near East.

The above conclusion poses, however, another question which has to do with the problem of the existence or absence of a deck on the warships of the period. Great controversies on the topicexist among specialists, either archaeologists or shipbuilders. Some believe that there existed a deck or a kind of deck on the warships[24], others do not agree with this opinion[25]. Both partiesbase their theories mostly on the representations of ships of the Minoan or the Mycenaean period as well as of the Geometric period as they are pictured on the well known vases of Dipylon style. The Kynos examples, however, show beyond any doubt that the warriors are standing on a deck. It would not be possible for them to fight from the hull of the ship, among banks for the oarsmen, mast, sail and other provisions. Only the helmsman stands somewhere deeper and this supports the theory that along both sides of the ships ran side decks, joining bow and stern[26], which were supported on struts or stanchions, also used as thole-pins. These sidedecks were fighting platforms and at the same time protected the rowers. This is the case with the second krater, which moreover shows that the heads of the rowers were protected by a high bulwark, which ran along the sides of the ship and was supported by vertical struts. That the zone under the deck was really a bulwark is proved by another sherd of a fifth krater (Fig. 4). The scene on this sherd is very fragmentary but one can recognise that part of a ship is pictured. The feet of a warrior are easily recognizable on a deck under which a wide bulwark exists. The decoration on it, a common one on Mycenaean vases used to fill decorative bands[27], helped to determine the zone with semicircles under deck of the second krater as a bulwark. At a distance below the bulwark the low hull of the ship is pictured. On this part eleven oars are distinguishable which extends from above the gunwale downwards beyond the keel.

The presence of the bulwark on these two last ship allow us to suspect that the kind of warship described as "cataphract"[28] was already invented during the Late Bronze Age, a development otherwise attributed to a later evolution.

Taking into consideration all war ship representations available from the Bronze Age through the Geometric period we can agree that some ships were obviously undecked, others had certainly a deck. So it seems, rather that both types of warships existed at the same time, decked and undecked, and that perhaps they had different functions; the decked ones to fight upon and the undecked to transport troops, these last ones being totally different from merchantships.

Having discussed the undoubted fact that naval warfare was not unknown in Late Bronze Age Greece, as the Kynos vases prove, it remains to consider the historicity of these representations.

In fact nothing is known either from the literary sources or from tradition regarding major sea-battles during that period in the Aegean. On the contrary there is plenty of evidence for such activities in the Near East[29].

Although Homer does not mention any such affair there are enough descriptions in the Homeric poems of raids of islands or coastal areas and of piratical activities. On the other hand the episode of Telemachos and the suitors suggests a kind of naval conflict or at least the preparation for such an enterprise[30].

We learn from Thucydides[31] that the Minoans cleared of the Aegean of pirates, and establishing the so called "Minoan Thalassocracy". Many scholars also speak about a kind of Mycenaean Thalassocracy later[32]. In what other way could this "thalassocracy" be achieved if not by naval warfare?

From the tablets of Linear B from Pylos we learn that they eagerly prepared the protection of their coasts from enemy attack or raid by organizing a war fleet[33].

Local raids or anti-piratical operations would not have been uncommon events during the Late Bronze Age in the Aegean area and especially in the 12th cent. B.C., after the collapse of the Mycenaean palatial centers and the diffusion of the central political power to smaller centers of the Mycenaean provinces, such as may be the case with Kynos.

It seems, then, that the vases of Kynos reflect such activities, the town having obviously suffered by or taken part in such enterprises.

Kynos was the main port of the East Lokrians, a Greek tribe, who as late as the Peloponnesian War in late 5th cent. B.C. were engaged with piratical activities as Thucydides again informs us.

Piracy during the Late Bronze Age was not a totally dishonest occupation as one can deduce from Homer[34]. We can then conclude that similar events could inspire the local artists and naturally their products were appreciated by their clients, whose taste might have dictated this kind of decoration.

The warriors and the ships that take part in these battles, as pictured on Kynos kraters, seem to be of the same nationality since there is no difference between the opposing groups either regarding arms or ships' equipment and appearance. We can then assume that such representations were inspired by some local historical events or myths about conflicts between neighbouring tribes, but in any case Greek tribes, and not invasions of foreign enemies from abroad, outside the Mycenaean world.

The fact that a type of activity, like sea-battles, does not occur in the epic tradition, is not a certain criterion that such activity did not take plece, since only part of the oral tradition has survived. Minor enterprises or historical events or deeds of local heroes would have passed into the tradition of different tribes and these fed the repertoire of the artists and their workshops.

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NOTES

1. For information about the topography and the excavation of the site s. F. Dakoronia, "Warships on sherds of LH IIIC kraters from Kynos", *TROPIS* II, 1987, 117, footnotes 1 & 2.
2. Loc. cit. (supra 1).
3. Fanouria Dakoronia, Kynos.........Fleet, *TROPIS* IV, 1991 (1996), 162, fig. 9.
4. Heide Borchhardt, Fruehe griechische Schildformen, in *Kriegswesen*, Arch.Hom.Bd.I, E, 15-17.
5. S. Marinatos, "La Marine Creto-mycenienne", *BCH* 57, 1933, 200, Pl. XIII No 14-15. Sh. Wachsmann, The ships of the Sea-Peoples, *IJNA* 1981, 211.
6. Marinatos, loc. cit. (supra 6) 215.
7. S. Marinatos, Seewesen, Das Schiffsfresko von Thera, Arch.Hom.Bd.I, G, 1974, 147.
8. Gudrun Ahlberg, *Fighting on land and sea in Greek Geometric Art*, 1971, 26, fig. 25.
9. Dakoronia loc. cit. (supra 1).
10. On the various interpretations of similar structures see Dakoronia, loc. cit. (supra 1), 118 with selected refferences.
11. Dakoronia, loc. cit. (supra 1), 119.
12. Marinatos, loc. cit. (supra 6) 189.
13. Dakoronia, loc. cit. (supra 1), 120, fig. 3.
14. Marinatos, loc. cit. (supra 5), 218; Wachsmann, loc. cit. (supra 5), 187-188; and others.
15. Cl. Laviosa, La Marina Micenea, *ASAtene*, XLVII-XLVIII, 1969-1970, 8 footnote 5.
16. Homer, *Iliad*, O, 388-9, 677.
17. Marinatos, loc. cit. (supra 7), 148. D. Gray, Seewesen, Arch. Hom.Bd.I,G 126. G. Kirk, "Ships on Geometric vases", *BSA* 44, 1949, 132.
18. Ahlberg loc. cit. (supra 8), 11. Mervyn Popham, An early Euboean ship, *OJA*, VI, 3, 1987, 358.
19. Marinatos, loc. cit. (supra 7), Taf. XV.
20. G. Kirk, "Ships on Geometric vases", *BSA* 44, 1949, 123.
21. See for example in E. Vermeule-V. Karageorghis, *Mycenaean Pictorial Vase Painting*, 1982, 217, No X37 and No X38, where soldiers shooting with their spears have exactly the same attitude as the warriors on the Kynos second krater.
22. Paul F. Johnston, *Ship and Boat Models in Ancient Greece*, 1985, 16.
23. Gray, loc. cit. (supra 17), 131.
24. Wachsmann, loc. cit. (supra 5), 196; Kirk, loc. cit. (supra 20), 117, 127; Marinatos, loc. cit. (supra 5), 220.
25. Laviosa, loc. cit. (supra 15). K. Δαβάρας, "Μινωικό κηριοφόρο πλοιάριο Συλλογής Μητσοτάκη", *AE* 1984, 64. Fik Meijer, *A History of Seafaring in the Classical World*, 1986, 19.
26. Kirk, loc. cit. (supra 20), 129.
27. P. Mountjoy, "Mycenaean Decorated Pottery", *SIMA* LXXIII, 1986, 157-159.
28. Kirk, loc. cit. (supra 20), 137.
29. Gray, loc. cit. (supra 17), 123, 124; C. Laviosa, loc. cit. (supra 15), 8, footnote 5.
30. Homer, *Odyssy*, δ, 669-672, 778-786, 842-847.
31. Thucydides I, 4 & I, 8.
32. F. Meijer, loc. cit. (supra 21), 6.
33. M. Ventris-J. Chadwick, *Documents in Mycenaean Greek*, 1956, 183. J. L. Perpilloux, La tablette PY AN 724 et la flotte pylienne, *Minos* IX, 2, 1968, 210.
34. Gray, loc. cit. (supra 17), 129. F. Meijer, loc. cit. (supra 21), 12.

Fig. 1

Fig. 2

Fig. 3

Fig. 4

"PEREME KUTUGU" FROM INEBOLU: THE LAST "SHELL FIRST" CONSTRUCTION SURVIVED IN THE BLACK SEA

After the conquest of Constantinople by the Ottomans and their domination in the Eastern Mediterranean and the Black Sea, only the ships of the Ottoman Empire were allowed to pass the Bosporus and enter the Black Sea. This blockade lasted from 1592[1] until the treaties of Kiucuk-Kainartzi (1774) and Ainali-Kavak (1779) which were at the end of the Ottoman-Russian War.

The modernizations which occurred gradually in the private shipyards of the Mediterranean especially in the 18th century had probably a limited effect on the local shipyards of the Black Sea, due to the prohibition of entrance for the foreign ships and to the absence of any competition for faster or bigger vessels. The small local vessels which were connecting the capital of the Ottoman Empire with the Black Sea's ports were of special types which were sailing merely in the Black Sea. These vessels had been built by local craftsmen who continue to practice the old shipbuilding tradition of the area.

Only after 1783[2], when the Bosporus opened up to the foreign ships, new types of vessels were introduced in the area. The Black Sea was possibly the area where ancient types of boats and shipbuilding techniques lasted longer than in any other place of the Mediterranean. Thanks to the isolation of the maritime activities in the Black Sea, for about three centuries, the area seems very interesting to the scholars of the history of shipbuilding and this is the reason why the project "The evolution of wooden shipbuilding in Eastern Mediterranean during the 18th and 19th centuries" was extended to include the Black Sea.

On June 1992 during a field work of the project along the Black Sea cost of Turkey, we visited Inebolu (Inepolis) in Paphlagonia, where we found an old vessel near the shore, protected under a kiosk.

She has an unusual and very old way of structure and she is probably the last survivor of a local old type of vessel. The craft has a completely different structure than the rest of the boats of today in the area. She is a flat bottom and double ended vessel and she is built, surprisingly, by a "shell-first" technique. On her starboard side is written MILLI MÜCADELE ZAFERI AMILLERINDEN "Gazi Inebolu", which means "The Inebolu veterans helped the war for independence to succeed".

Her L.O.A. is 8.80 m., the middle beam on the gunwale is 1.92 m. and the external height on the middle of the hull is 0.90 m. She is very narrow with her L.O.A. 4.5 times her middle beam and she seems similar to some old types of passengers boats in Bosporus. According to the local people the name of this type of boat is "pereme". But the name "pereme" seams to apply to different types of passengers vessels[3]. "Pereme" comes from the Greek word "περνώ" which means pass, or "πέρασμα", which means passing point. In fact there are completely different types of boats in the Aegean Sea under the names "πέραμα" (perama), "περαματάκι" (peramataki) and "περαματαριά" (peramataria)[4].

Later, we found an old boatbuilder in the village Konuşma, near Inebolu, Mr. Şaban Evyapan (90 years old), who gave us further information on this vessel. Mr. Evyapan said that they called this type of vessel "Inebolu Kütügü" or "Kütük Kayiği" or "Taş Kayiği". He said that they were building usually these vessels on 10 to 11 m. L.O.A. and the longest that he remembered had 14 m. L.O.A. He mentioned that the vessel which is survived today in Inebolu was built in the first years of the 20th century.

According to his description, first they built the shell (kaplama) of the whole boat and later they inserted few reinforcing frames.

The bottom of the vessel consists of five pieces. Two narrow planks (bele or belleme) are attached on the two sides of the middle keel-plank (tekne). These three pieces are jointed by means of mortise and cylindrical tenons (kavela) and they form the flat bottom of the vessel. Two side keels (nal) are nailed later on the external surface of the two side planks (bele or belleme) and make the structure of the bottom strong enough to avoid the damages from the bumps of the vessel during beaching.

When they completed the bottom of the vessel they continued with the upper-planking of the hull. First they bent each plank separately to form its shape, according to its potential location on the hull. Bending the planks was performed by fastening each plank on the one side and heating the rest of the plank by a flame. Pressing the other side of the plank by means of a stone they curved it gently until they form the necessary shape. When the plank reached the final shape they cooled it to stabilize its shape. On the plank which was ready to be placed on the vessel, they cut small grooves on its inner surface. The planks were connected to each other by curved nails, which were passing through these grooves. The length of these nails was 8 to 10 cm. and the horizontal distance between them varied from 25 to 30 cm.

They built the boat on both sides and they tested her symmetry only by the rule of thumb using a rope, which was placed along the axis of the boat.

The first three streaks (başlik) above the structure of the bottom consists of one piece plank. The forth streak consists of four pieces and the fifth streak consists of three pieces. On the top of the fifth streak there are other pieces of planks which do not form a complete streak. Most of these planks have a wedge-like shape and they are placed near the bow and the stern of the vessel. These wedge-like planks are placed to form the extremely pronounced sear of the tops of the two sides.

All the planks are connected with their lower ones by curved nails and the joint between two planks of the same streak have a bevel angle to the perpendicular. On the top of each side of the boat they placed another piece of timber like a gunwale (kûpaste or tekparça). This timber consists of one piece from bow to stern.

The cross section of the keel plank is 13x30 cm. on the middle of the boat. The thickness of the planks is reduced gradually from 13 cm. on the bottom of the vessel to 6 cm. on the top of her hull. The vessel does not have a deck and only three benches (katna) are connecting the two sides of the hull. They are placed between the forth and the fifth streak of the hull and they are extended 4 cm. on the outside surface of both sides of the hull. These extensions were covered in the past by another piece of wood (usturmaça) placed like a wooden strip on the sides of the hull.

The planks of the two sides of the hull are met on the bow and the stern forming two vertical seams from the keel-plank to the top of the bow and the stern. These two seams are covered by false posts like a stern and a stem post. Each one of these timbers has a single rabbet inside where the vertical seam of the planks on the bow and on the stern are accommodated.

The vessel has twelve simple ribs (posta) to support the structure of the hull. These ribs consist of three pieces, which are overlapping and nailed to each other and according to the description of Mr. Şaban Evyapan, are inserted in the vessel when the shell structure was completed. The ribs and the planks are nailed by nails which are driven from outside to inside. All the nails between the planks and the ribs or between two pieces of the same rib are clench to secure their position.

There are three more structural elements which we like to mention: the position of the mast, which did not survive, is 50 cm. fore of the middle of the vessel. A cut on the eighth floor timber and an other on the second bench indicates that the mast was raked forward. The original tiller of the vessel did not survive, but we know that it was very sharply curved and wide. Finally on the two sides of the hull and near the stern there are two icon rings for pulling the vessel out of the water.

The shell-first structure of the vessel is obviously unique for the Black Sea and the Mediterranean today. This is not however the first time in which this kind of boat is studied. E. F. Pâris in his monumental publication of "Souvenirs de Marine"[5] includes the plans of the "Caboteur a livarde d'Ineboli" (1878) which is a vessel with a very similar structure. He mentions the dimensions of the biggest of these vessels which are :

L.O.A. = 18m., L.O.K. = 9.10m., M.B. = 4.30m. and M.D. = 2.05m.

He gives a detailed description of the rigging of the vessel and many information on her structure, which seems reasonably similar to the one which is survived in Inebolu.

There are however some differences between the structure of these two vessels. The tenons in E. F. Pâris' description are chisel bezels instead of cylindrical shape as they were described by the old boatbuilder from Inebolu. In the sketch of E.F. Pâris there are only five floor timber inside the vessel and there is not futtocks at all, instead of the twelve completed ribs in the survived vessel. The sheer-line of the gunwale is more pronounced in the E. F. Pâris sketch than in the survived boat, but both vessels have the wedge-like planks on the bow and the stern area. The most relevant however new information from E. F. Pâris is the small cramps which are connecting the neighboring planks on the external surface of the vessel. These small cramps were replaced the external caulking and the seams were caulked only on the inside surface of the vessel, which is rather unorthodox, These small cramps had 11 cm. length and they were placed along the seams and the butts of the planking every 25 cm. We found no indications of this kind of small cramps in the survived vessel of Inebolu and possibly they were used only on the biggest vessels which were built by this technique. The rigging of the vessel consists of a spritsail, two square topsails, a staysail and two jibs, all suspended from a pole-mast. With these two sources on the Inebolu type of vessel we have now enough information to describe the last possibly survived shell-first technique in the area of the Mediterranean and the Black Sea.

E. F. Pâris suggests that this technique was transferred from the Indian coats to this area during the Genovese period of the silk routes or even as early as the

Roman times. The time however when he suggested this hypothesis there were no enough archaeological evidence on the shell-first shipbuilding techniques in the Mediterranean. Today it is difficult to reject the hypothesis that this technique was derived from the early Byzantine shell-first techniques of shipbuilding. Moreover there are indications that this technique was survived as well in other places of the Black Sea during the Ottoman period.

One of these indications comes from some carved figures of ships in the St. Stefan church of Nesebar in Bulgaria (the old Messimvria) dated from the early 18th century[6]. On these figures we can notice the same arrangement with the wedge-like planks on the bow and the stern area. This kind of planks was unusual to be applied on the traditional skeleton-first structure, which was the common technique in the rest of the Black Sea and the Mediterranean. So the ships represented on these figures might had similar structure like the Inebolu's vessel.

Another indication comes from the zone of Ostrov in Danupe. During our visit to the Archaeological Museum in Costanta we took the permission to study some pieces of timber from an unfinished excavation of a shipwreck by Dr. Cristian Crăciunoiu. In most of these planks we can see the same kind of small cramps for connecting their edges, like in the description by E. F. Pâris. Caulking as well, seems to be applied in the seams from the other side of the small cramps, but there is no evidence of curved nails and only sporadically some tree-nails are appeared. According to Dr. Cristian Crăciunoiu the wreck was from the 18th c. but he explained that on the same place there were wooden pieces of more than one vessel.

So, indications of the same kind of technique do exist on other places of the Black Sea, and the Inebolu vessel is the last survived example of an old tradition which was practiced in some places of the Black Sea, until the 18th and 19th centuries.

We know that a significant part of the maritime activities (shipping and shipbuilding) in the Black Sea was carried out by the native Greeks until the second decade of the 20th century. Inebolu was not an exception of this situation. According to Mr. Şaban Evyapan, the "Inebolu Kütügü" or "Kütük Kayiĉi" or "Taş Kayiĉi" was mainly built by the native Greek boatbuilders until their expulsion to Greece in 1922.

Thus the proposition that this unique shell-first technique in the Black Sea was survived and applied by the native Greek people following their old tradition from the early Byzantine times is a possible hypothesis.

We believe that the Inebolu technique of boatbuilding can provide valuable information for the study of the ancient shipbuilding in the Black Sea and the last survived example of this technique should be preserved like a unique monument of the maritime cultural heritage of Inebolu.

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NOTES

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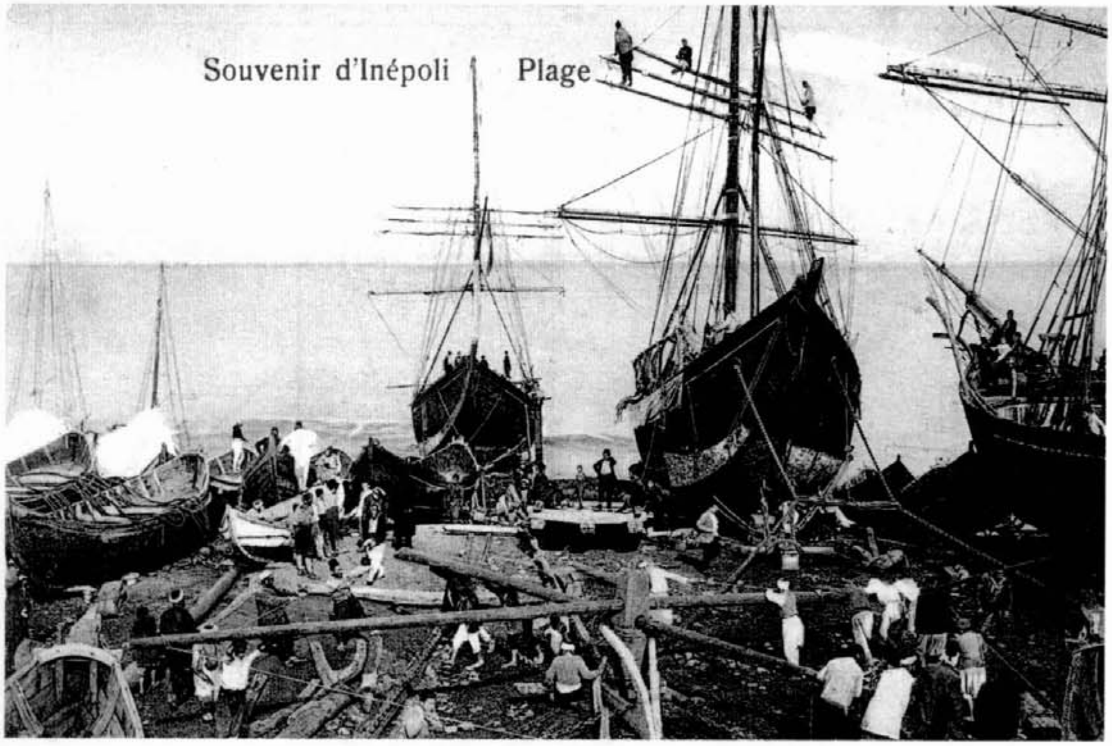
Souvenir d'Inépoli
Plage

Fig. 1

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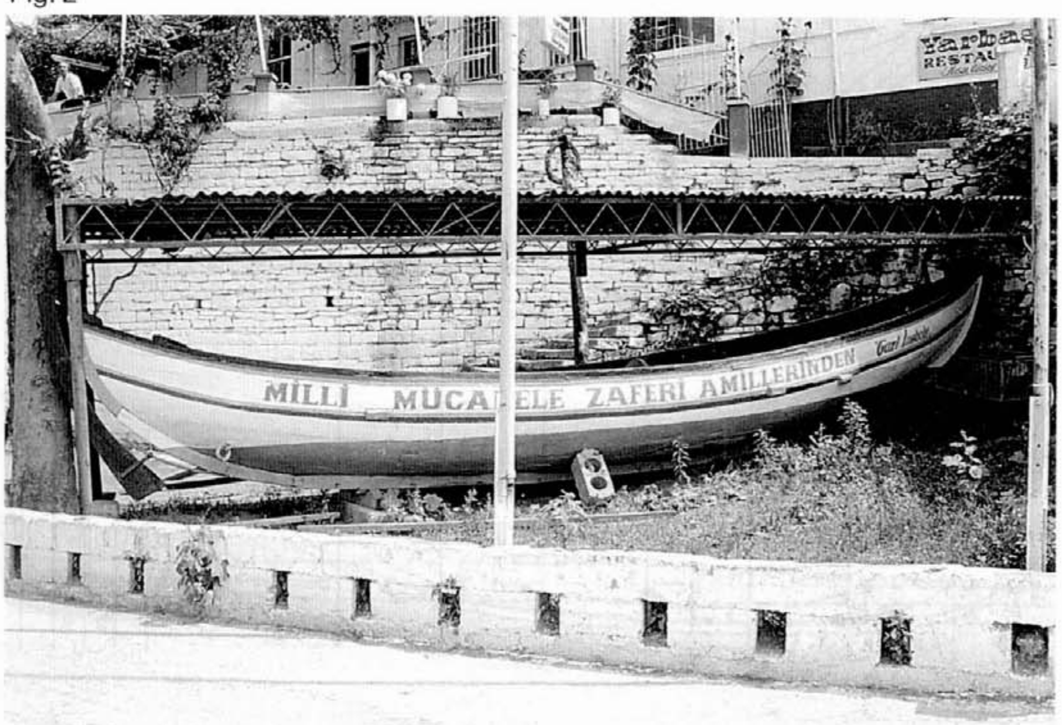
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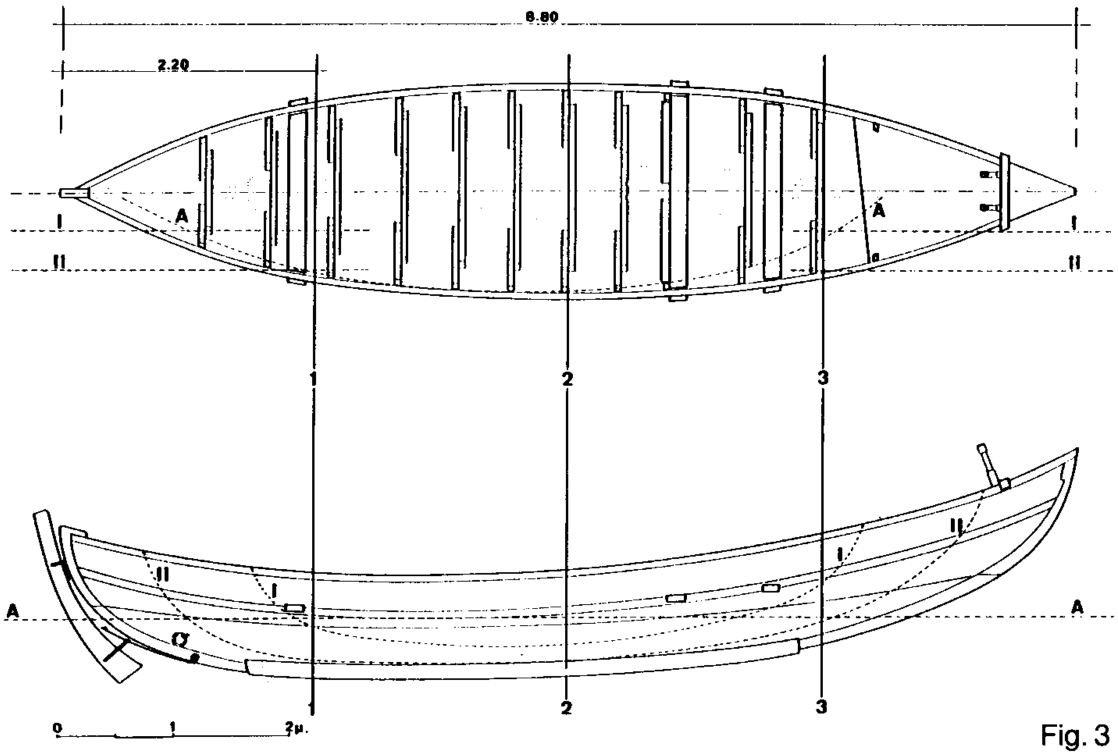

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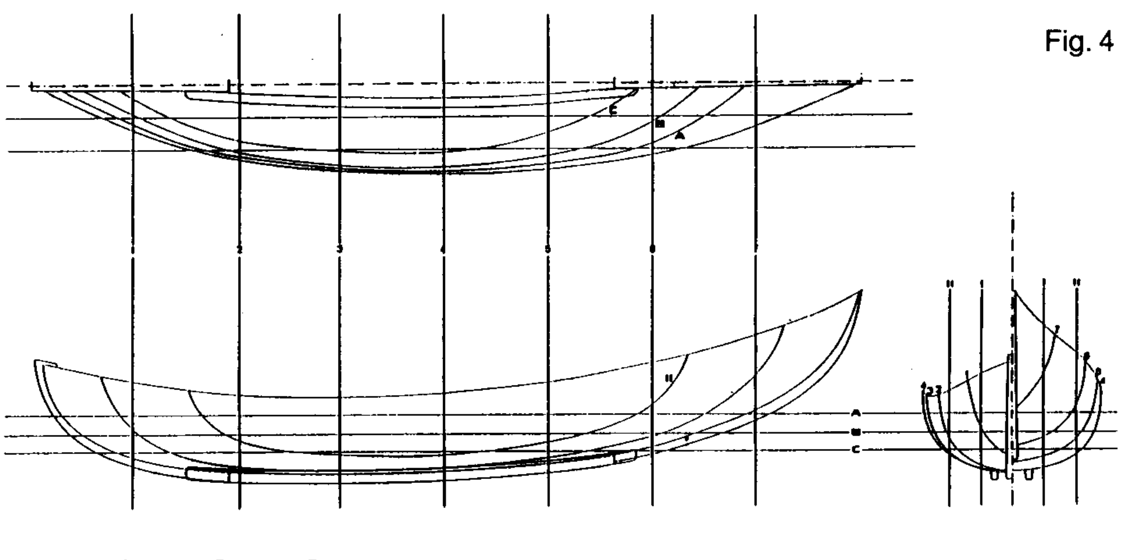

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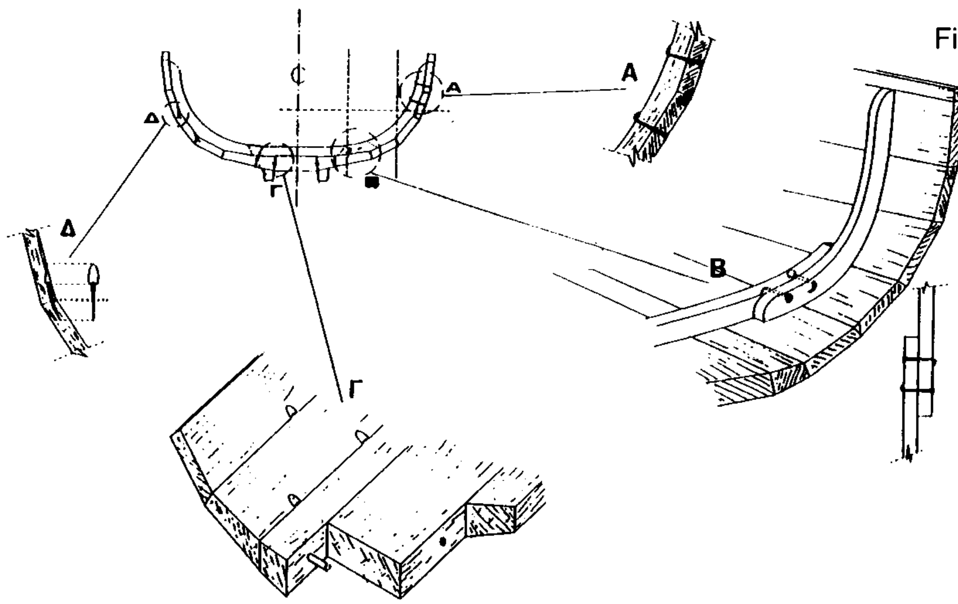

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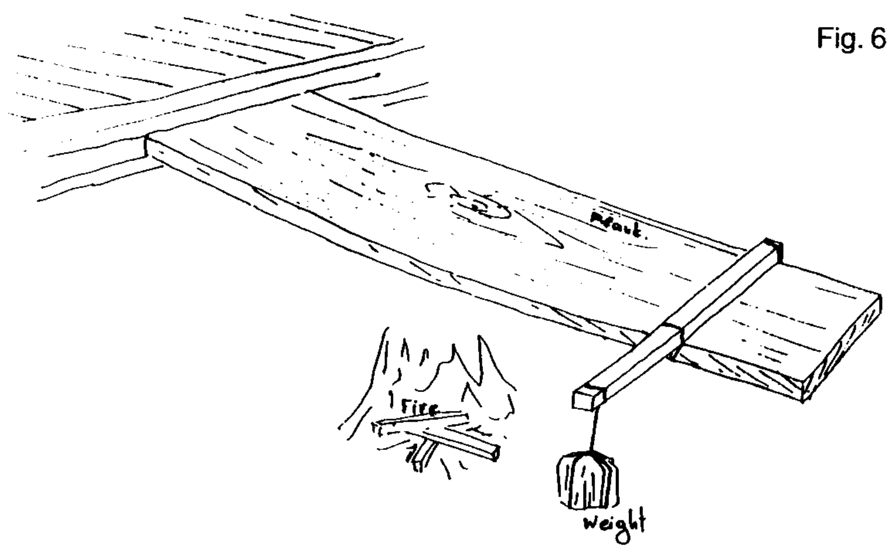

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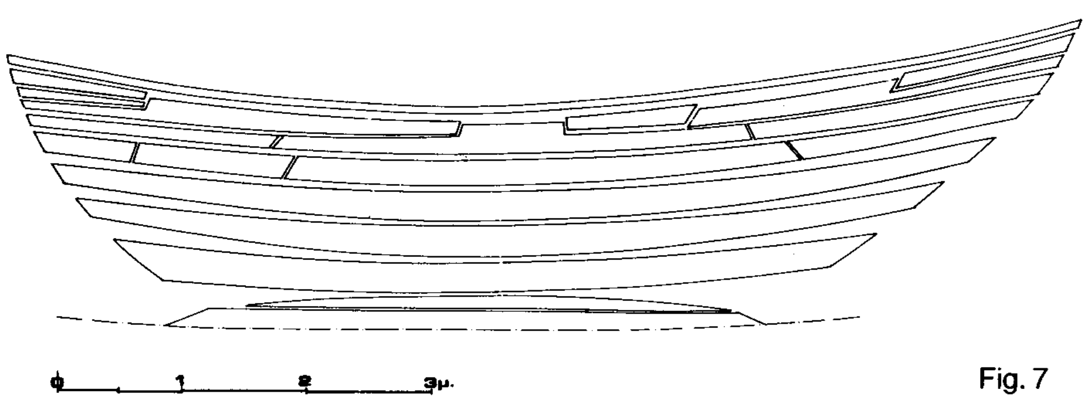

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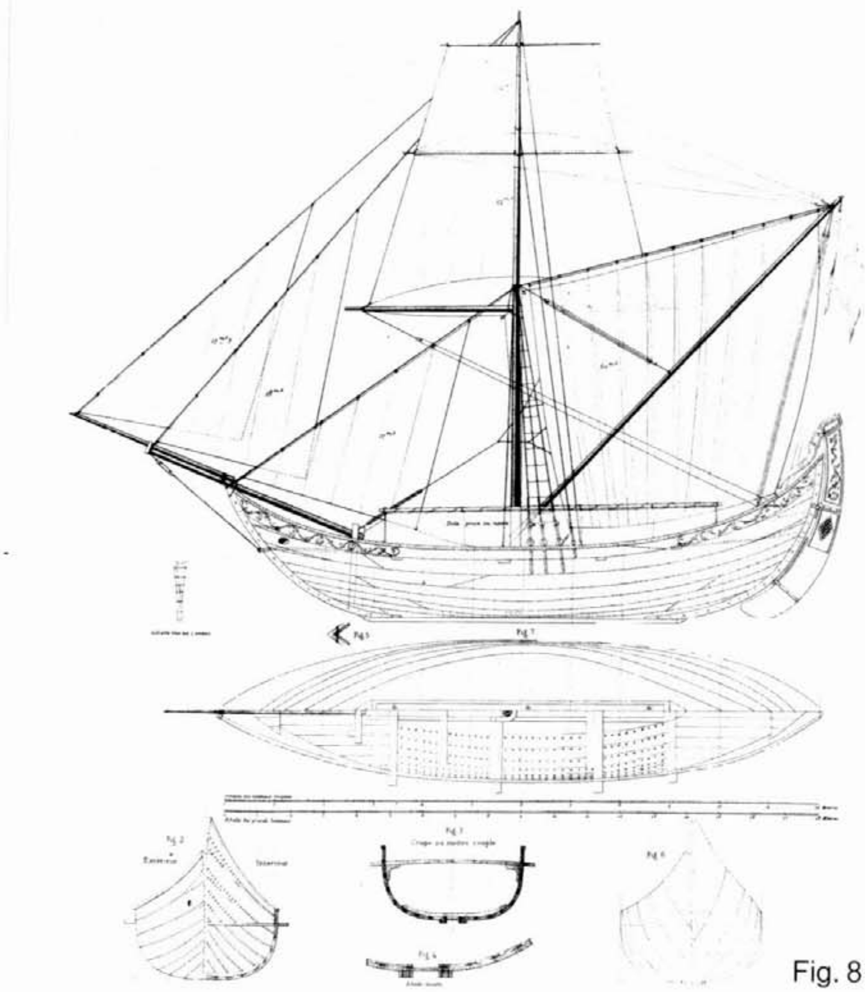

Fig. 8

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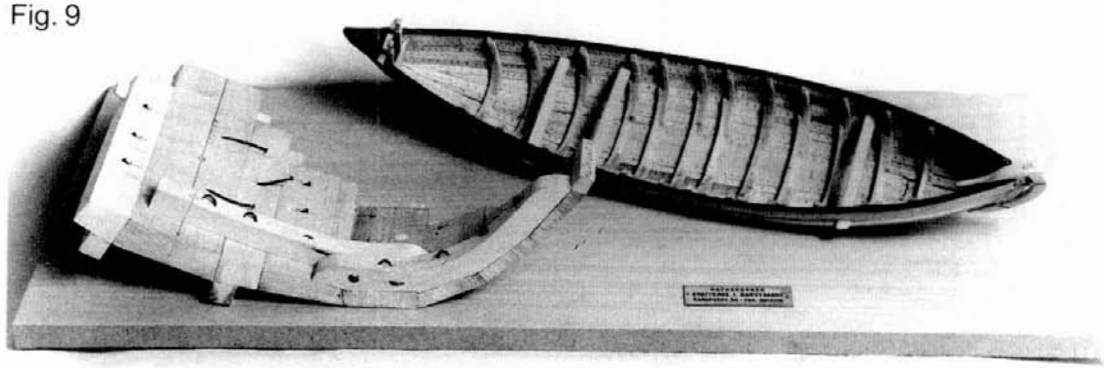

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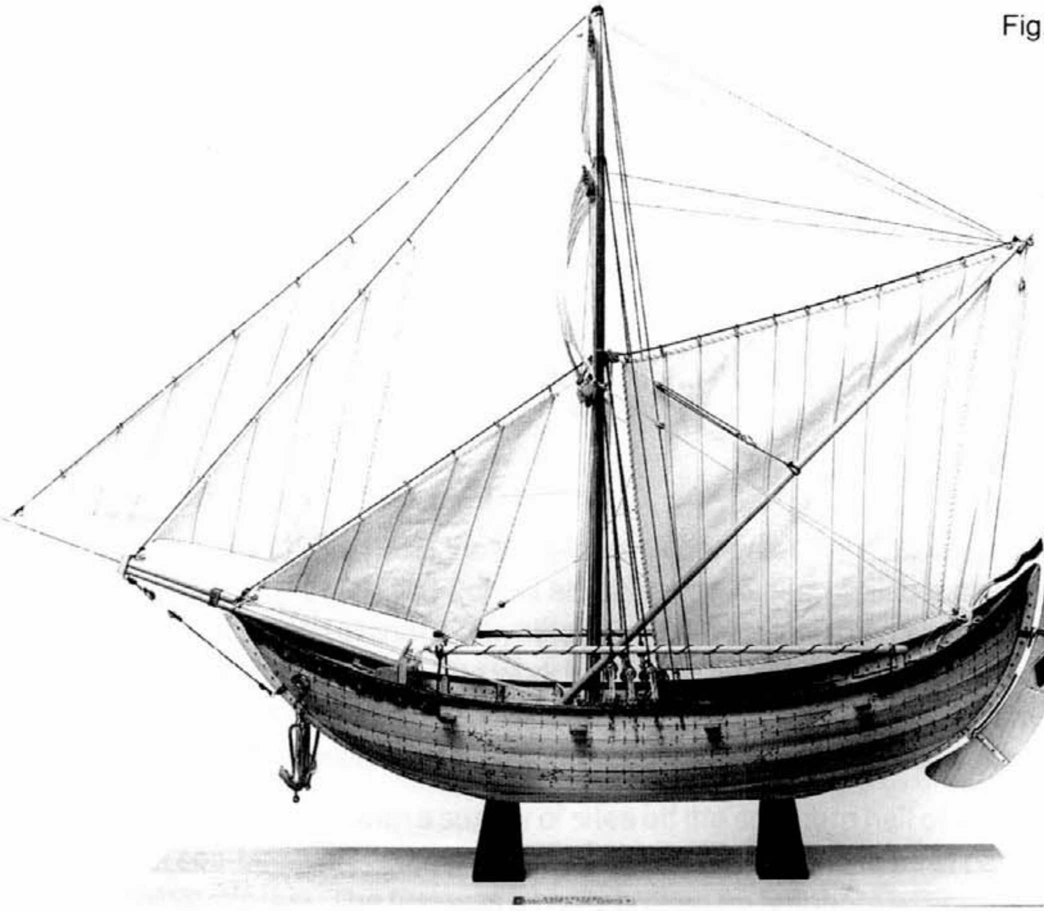

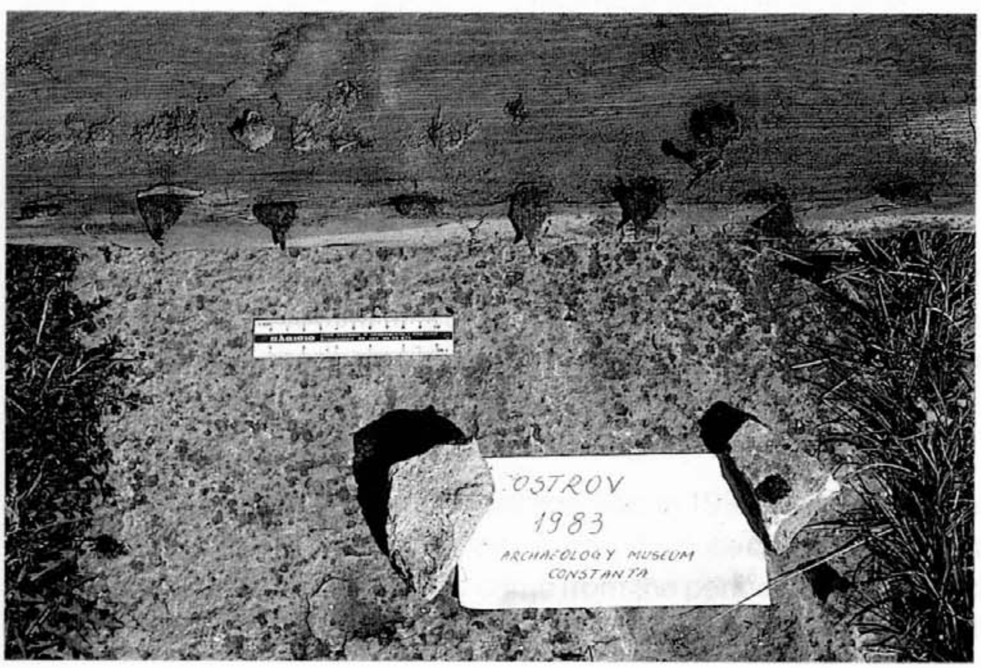

Fig. 11

A WRECK BESIDE THE SIGNALLO REEF OUTSIDE THE MAIN PORT OF ZAKYNTHOS (ZANTE), GREECE

Discovery of wreck and 1990 survey

For four years (1990-1993) the Ephoria of Underwater Antiquities of Greece, Oxford University and the British School at Athens have been collaborating on an underwater project off the Island of Zakynthos (Zante) in the Ionian Archipelago to the west of the Greek Peloponnese. The work is directed by Katerina Delaportas of the Ephoria and Mensun Bound, Triton Fellow in Maritime Archaeology at Oxford and Director of Oxford University MARE, the University's maritime archaeological unit.

Work began in 1990 with a survey of sites off the southern half of the island. Ten areas of sea-bed were examined; of these two were found to be of particular archaeological interest. The first was a badly broken up amphora wreck from the late Archaic or Classical period on a reef near Pelouzo Island in Leganas Bay. The second was a wreck of post-Byzantine date, situated in soft silts, in just 10 meters of water, beside the Signallo or Dimitris Reef, one kilometre out to sea from the main port of Zakynthos. The site was found in 1980 after bomb-disposal divers from the Greek Navy detonated an unexploded aerial bomb from World War II which had been found by divers on the surface of the sea-bed.

A local resident afterwards examined the blast area and found a wreck emerging from the bottom of the resulting crater. He alerted the authorities and a team from the Ephoria was dispatched to examine the site. The remains were photographed (figs. 1+2) and a number of surface finds were recovered. These consisted mainly of stone cannonballs and broken pottery.

When we visited the wreck a decade later in 1990, the crater was still intact, but the exposed timbers had much deteriorated. Because of its obvious archaeological interest, and because it evidently came from the period of Venetian occupation, it was decided to carry out a full survey and partial excavation of the site.

Remote Sensing Survey

Work on the site commenced in August 1991 with a remote-sensing survey of the wreck and its surrounds including the reef. The principal aims of the survey were to detect any buried material outside the wreck and to produce topographical maps of the setting by gathering precise XYZ-type data, which could be converted into Digital Ground Models (DGM's) by computer.

Position-fixing was achieved by using the Motorola Miniranger II system. Beacons were established on the roofs of buildings that were in line-sight of the survey vessel (fig. 3). These emitted a continuous signal which was picked up by the master-unit on the vessel's mast.

The principal item of equipment used to produce the topographical map, of DGM, of the reef and the site, was the sub-bottom profiler which is featured in figure 4. Figure 5 shows one of the resulting DGM's. The flattened top of the reef is clearly visible. The depression in the foreground represents the bomb crater in which is situated the wreck.

A magnetometer (fig. 6 & 7) was used with equally interesting results. A magnetometer display is featured in figure 8. The reader must remember that he or she is not looking at a 3-dimensional representation as in figure 5; this, by contrast, is a computer generated graphic display of the earth's magnetic field. For instance, the trough one sees is not the trough of the bomb-crater; rather it reflects the effects on the earth's magnetic field caused by concealed ferrous objects within the hull and which are represented by the peaks. The peaks are very likely directly above the object.

Predisturbance survey

The second part of the 1991 season consisted of a predisturbance survey, after which a trench was opened which ran perpendicularly across the west side of the hull (fig. 9).

Work ended abruptly, when, towards the end of the season, another unexploded bomb from World War II was found (fig. 10) which required a further visit from the underwater bomb-disposal unit of the Greek Navy.

1992 and 1993 seasons

Excavation continued in 1992 using the tug featured in figures 11 and 12 as the team's working vessel and diving platform. During this season the 1991 trench was extended inboard and taken down to a depth of 25 to 35 cm. During the 1993 campaign, two small trenches, each 1.5x1.5 metres were opened on the inboard side of the hull (figs. 15+16). Both trenches contained a complex of ruptured timbers which slowed progress considerably. Half the timbers revealed were from the vessel's primary structure; all had been displaced and the majority had also been cleanly snapped or otherwise ruptured. All four trenches have thus revealed evidence of massive violence. It is possible that the vessel sat on the reef for several days breaking apart, but the more obvious source of the violence is the 1980 explosion. From the size and depth of the crater, its impact on the vessel must have been considerable.

With regard to the hull two factors are particularly notable. First, the excellent state of preservation of the fabric of the wood; and second, despite the violence observed above, the vessel has retained a 3-dimensional form within the ocean floor. Evidently the vessel sank quickly into the soft sea-bed where the structure, and its organic contents, were protected from borers and other wood-consuming marine parasites.

The hull

The form of the hull was more or less clear from the start. The ends of 33 frames along with attached lengths of exterior cladding had been exposed by the explosion. Furthermore, the manner in which the sides converged (see fig. 9), together with the way in which the frames are raked and their lozenge-shaped sections (exactly as found in cant timbers), confirm that the visible structure is from either the bow of the stern of the vessel.

The frames that are visible in figures 1, 2 & 9 have an average section of 12x14 cm. The strakes average 19x5.5 cm. In other words she is a fairly heavily timbered vessel. All the metal fastenings that have so far been seen are of iron and survive only as void concretions. At several points it was possible to identify treenails. So far there has been no evidence of sheathing, nor has it been possible to determine how she was caulked. She was, however, paved inside and out with a thin, evenly-applied coating of pitch. No ceiling has been seen, and because we have not yet reached her lower hull we cannot comment on her bottom assembly.

From the little so far seen, the impression is given of a vessel, which although expertly joined, has been built with an eye to economy. The trimming and finishing is adequate to good—but no more. There are no frills and no concessions to the eye.

Everything appears to have been basic and functional in the manner of an unselfconscious working vessel.

The Finds

The range of finds has so far been fairly narrow. With the exception of a delicate glass finial there has been no evidence of luxury goods or other finery on board.

From the ship itself came a series of small, squared, copper alloy, holed objects (averaging 45 X 45 cm). At first it was thought that they might be roves, but as work progressed and it became apparent that there were far fewer of these than first thought, we began to think of them as coaks, or bearings from blocks (fig. 18). Parallels have come from the Girona, the Trinidad Valencera, El Gran Griffon, two of the Padre Island wrecks, the Molassis Reef Wreck and the late Yassi Ada wreck, all of which have been dated to the 16th century. Clearly there are not many that have come from Mediterranean sites, but then of course, few Mediterranean wrecks of this period have received serious archaeological attention and publication.

Ordnance

Seven pieces of stone shot of 86 to 101 mm diameter were recovered (fig. 19). At this stage we cannot be certain if they were cargo or part of the vessel's defensive capability. The range of stone-types within the group, however, would suggest they were a working assemblage rather than a laded consignment. The magnetometer survey indicated the presence of large magnetically charged items within the ship; evidently these could be guns.

Stone cannonballs have been found on a number of Medieval and early post-Medieval wrecks. For instance, the Relitto del Vetro, and the Relitti del Isola dei Cavoli in Italian waters; the Villefranche wreck off the south of France, the 16th century Studland Bay wreck off the south of England and the Liefde Swan in Scandinavia. By the end of the 15th century most production of stone cannon balls in Western Europe had ceased in favour of cheaper, better and faster methods involving iron. However, production in stone did continue well into the 16th century but on a rapidly diminishing basis.

Mention should also be made of a leaden sphere that was found in 1991 and which almost certainly came from bar-shot, similar to what has been found on the Elizabethan wreck off Alderney in the Channel Islands, and wrecks off Natal and the Seychelles, all of which are, again, from the 16th century.

While on the subject of weaponry mention should also be made of a single piece of lead shot of 9.0 to 9.6 mm diameter, which was found during the 1993 season.

The most unexpected feature of the site has been the large quantity of hazel nuts that the vessel was carrying (fig. 20). Everywhere one sees hazel nuts, the vast majority of which are as fresh in appearance as the day the vessel sank. At two points, along the outboard side, the seabed is made up almost entirely of compacted hazel nuts. Two of the hazels had been neatly holed by rodents (teeth marks still visible) and their nuts extracted (fig. 21).

Numerous pottery fragments have also come from the wreck. Unfortunately, these have all been badly fragmented by the 1980 explosion and the high-energy nature of the site. Some were contamination (fig. 22). They have not yet been examined by a pottery specialist of the period, but we can say that they represent a wide range of forms and fabrics and that they are almost all tableware.

Of particular interest are over forty badly deteriorated coins, the great majority of which were recovered from one small area on the west side of the hull (figs. 23 & 24). Metallurgical studies and chemical analysis carried out on a selection of them by the chemical laboratories of the National Museum in Athens show that the metal of the coins contained an average of 75% silver. The lesser elements consisted mainly of copper and lead.

Several pieces of raw glass cullet were also found and as mentioned earlier, an ornate clear-glass finial (fig. 25).

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ILLUSTRATIONS

Fig. 1

Fig. 2

Fig. 3

Fig. 4

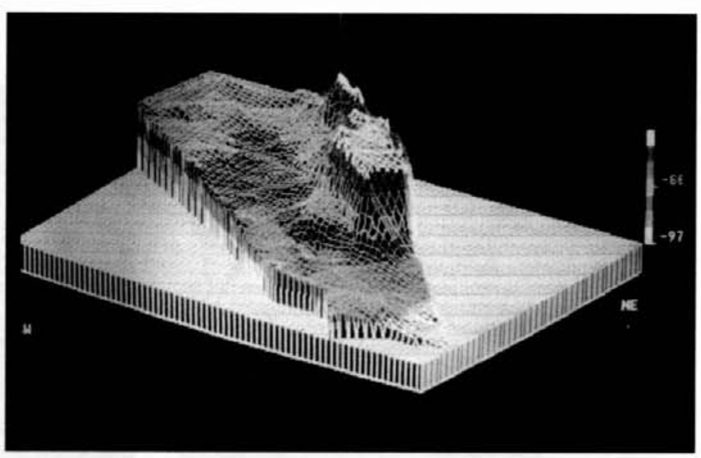
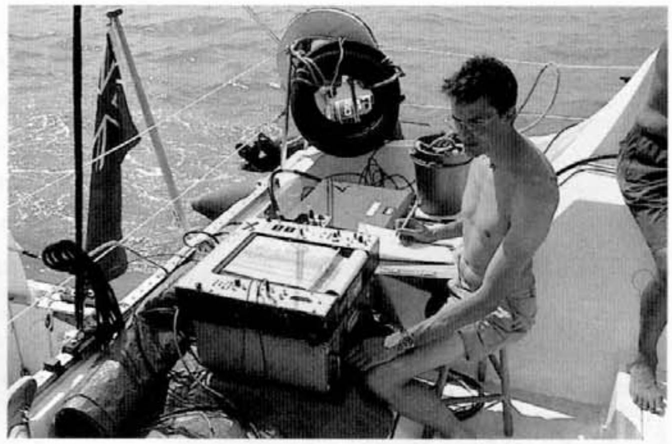


Fig. 5

Fig. 6



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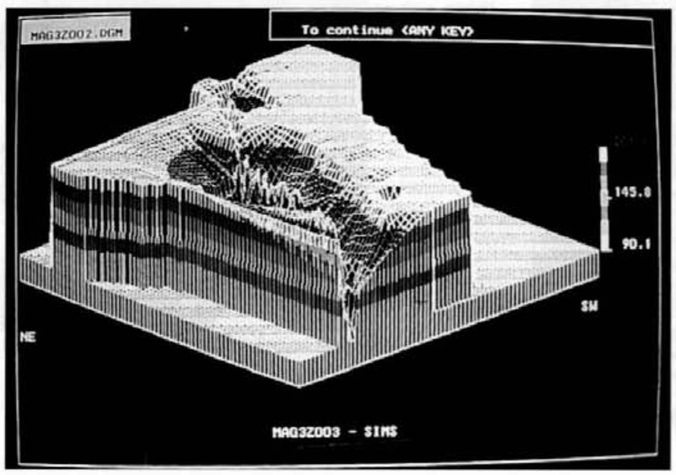

Fig. 8

Fig. 9

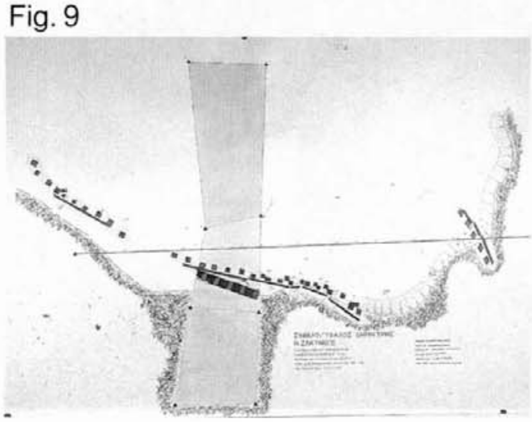

Fig. 10

Fig. 11

Fig. 12

Fig. 13

Fig. 14

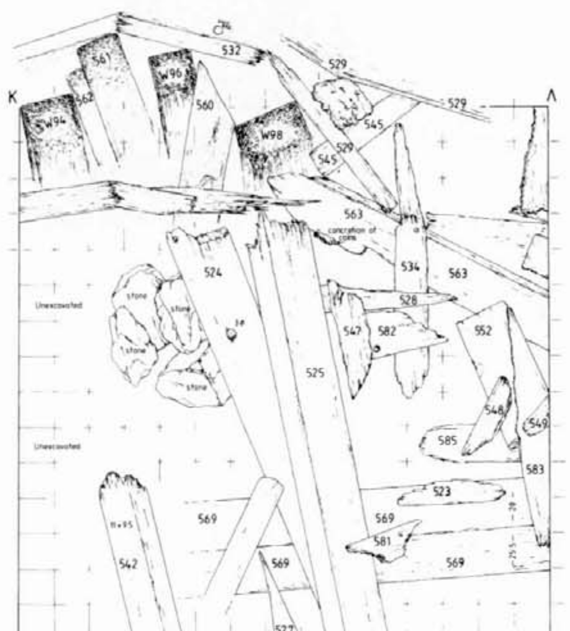

Fig. 15

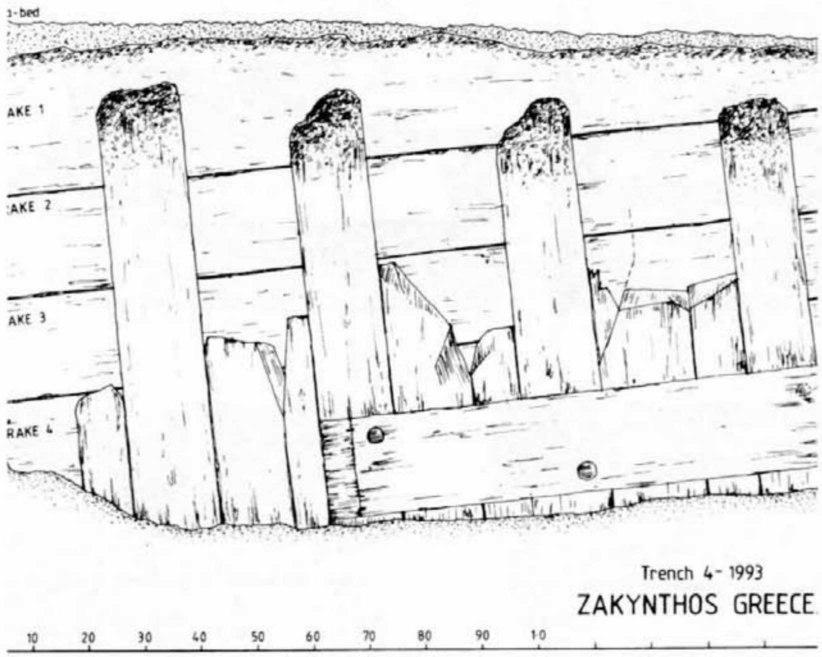

Fig. 16

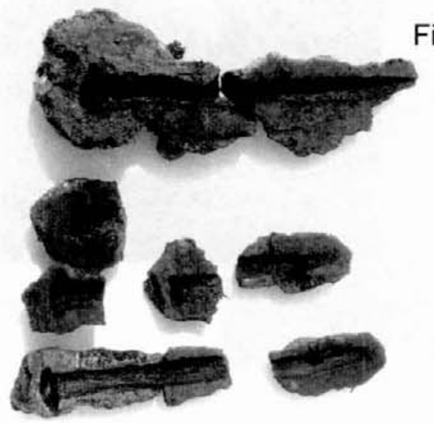

Fig. 17

Fig. 18

Fig. 19

Fig. 20

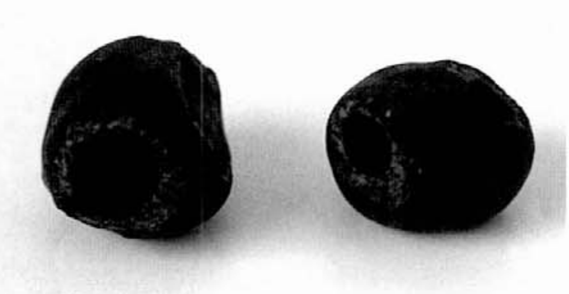

Fig. 21

Fig. 22

Fig. 23

Fig. 25

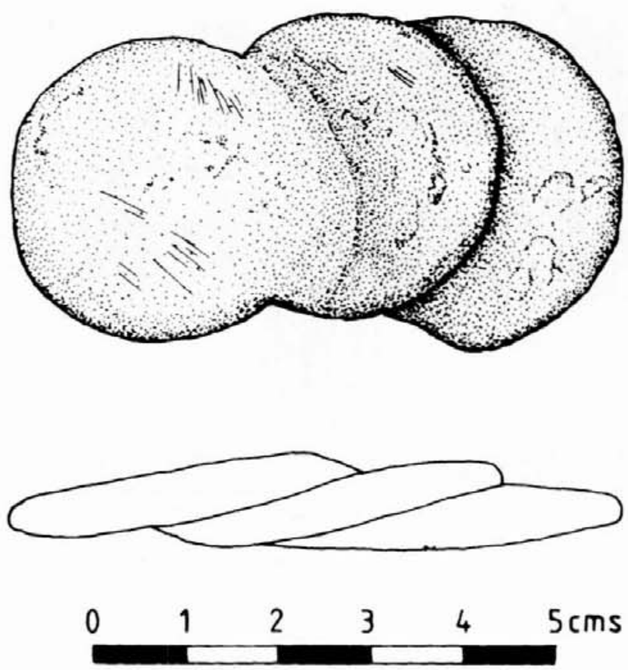

Fig. 24

THE REED RAFT OF S. TORPES (SINES) - PORTUGAL

In August 1974 the Author had managed to document a reed (cannabis) raft that the fishermen of S. Torpes used to attain the rocks and in small fisheries alongside the coast.

Its typology seems close to one of the models of Cabras (Sardinia) and to the smallest type of Lixus (Morocco): it has a long ogival shape and a structure consisting of 2 fusiform peripherical bundles connected by a platform (also made of canes/reeds).

While such analogies apparently confirm the hypothesis of Nougier on the navigations in the Mediterranean since about the IXth millennium B.C. in full Neolithic, they lend on undeniable interest to this craft, although it has not yet been possible to obtain in Portugal any information on the datation in this case. This is a completely different type of raft from the ones that were in use alongside the Portuguese northwestern coast in the gathering of sea weeds.

However, and just like the papyrella (Corfu), this reference will become a very important one for those who study the Mediterranean-Atlantic cultural connections during Antiquity.

† Octavio Lixa Filgueiras

EDITOR'S NOTE

The late Professor Octavio Lixa Filgueiras made a verbal communication but unfortunately he did not have the time to send, as he always did in the past, the written text with the relative iconography. So we reproduce the abstract. Professor Octavio Lixa Filgueiras was a fervent supporter of our Symposia and had participated in all the five first encounters on Ship Construction in Antiquity with scholarly papers profusely illustrated. His work shed light on the traditional sea-crafts of Portugal, their relation to ancient boats and the maritime connections between the Mediterranean and the Atlantic during antiquity.

The absence of Octavio Lixa Filgueiras was noted with sorrow by the participants of the Sixth Symposium of 1996 held in Lamia, we all misted the presence of the soft-spoken, kind and smiling professor who had become a member of the family of boat-lovers. He will be remembered at our future meetings and his presence will be perpetuated through his rich contribution to the bibliography of ancient and traditional sea and river crafts.

GILGAMESH AND THE SEA

Although the Epic of Gilgamesh was "published" on clay tablets and written in languages belonging to inland, or riverine civilizations, it nevertheless contains maritime references that are sufficiently specific to suggest some first-hand knowledge of more than one sea: the Persian Gulf, the Red Sea and perhaps the Mediterranean as well. Some fragments of text come from third millennium Sumer, others from the 13th century BC Mediterranean town of Ugarit, but the most complete version is known through 8th and 4th century Babylonian copies. Entire passages, as well as certain key-words are missing from all the known tablets, but since excavation continues throughout the region, there is still hope of filling some of these gaps.

As a diver, three episodes have always struck me as familiar. Besides the crossing of open water in a boat, they relate: to stone anchors[1]; the technique of "petra-diving", and also to "coral trees" which, because they never die, have been valued for their symbolism by the peoples of the Mediterranean and Arabian seas.

Popular translations of the Epic (of which there are many) in attempting to give it coherence and stress its poetry, gloss-over missing passages and uncertain words. Epigraphical problems must, however, be faced when examining specific points. I am therefore deeply grateful to Prof. W.G. Lambert for answering my questions as to the validity of such translations as "sea", "ocean", "waters", "perfume", "rose" etc. and for explaining much else besides. I do not claim his agreement with the points I am about to make, and any mistakes that may have crept into this paper are mine.

In the Epic, the maritime episodes take place after Gilgamesh Prince of Uruk (on the Euphrates, near the Persian Gulf), is reminded of his own mortality by the death of his friend Enkidu. He therefore sets out to find the secret of rejuvenation, which is known by the Noah-like sage Utnapishtim (a version of the flood story is recounted). To reach the sage, Gilgamesh had to cross a particular sea, and the only man who knew how to navigate it was the sage's own boatman, whom Gilgamesh eventually finds working in a forest. But at this point there is a break in the text.

When it resumes, difficulties appear to have arisen about "the things of stone" (which Gilgamesh himself seems to have destroyed). Without these stones it would be dangerous even to embark, nevertheless Gilgamesh and the boatman take the risk. Trouble starts when they loose their punt-poles, but Gilgamesh improvises a sail. On arrival, the sage sacks his disloyal boatman, and only reluctantly divulges the secret of rejuvenation. He tells Gilgamesh to pluck a thorny plant from the bottom of the sea, then eat of it once he starts growing old. Gilgamesh (still accompanied by the sacked boatman) duly collects the plant and makes for Uruk, but on the way, while resting by a pool, a serpent steals the plant, leaving Gilgamesh sadder and wiser, resolving to assume his duties as King of Uruk.

The three marine references will be examined. The translation used throught is by Alexander Heidel (*The Gilgamesh Epic*, The University of Chicago Press, 1963). References to tablet, column and line are given in figures; uncertainties are indicated typographically, using the following conventions:

( ) = not in the original, but a likely meaning.

(?) = meaning uncertain.

[ ] = restorations in the cuneiform text.

..... = damaged therefore unintelligable.

1. The "things of stone"

Anchors are essential on all boats crossing open waters; they are, however, inessential on river-boats, because river-boats can tie up to a river's bank. This explains why there is a hieroglyph for "mooring-post" in the Nileotic *Book of the Dead*, while no Ancient Egytpian hieroglyph represents an anchor. Mesopotamian languages also lack a word for anchor, so the description: a "thing of stone" is a logical substitute at the period in question. In the Hittite version of the Epic this becomes "stone images", another reasonable description, for as Zvoronos was the first to point out, certain stone anchors take on the meaning of "baetyl"[2], or the temporary dwelling of a diety: literally *Beit El* (the house of the great god) as in the Biblical story of Jacob who, after laying his head upon a stone, names the place "Bethel".

All anchors carry some degree of symbolic significance, because human lives depend on their hold whenever winds drive sea-going craft towards rocks.

Archaeologically, this is borne out by the contexts in which Bronze Age stone anchors are excavated on land. Votive anchors were offered in various sacred contexts including Temples (eg. at Byblos fig. 1, Ugarit and Kition in the Mediterranean, and the Barbar Temples of Bahrain in the Gulf[3]). In the Christian religion the anchor remains the emblem of hope. Technical improvements which diminish danger, lessen the degree of dependence on anchors, hence their degree of symbolism. But as the press all too often reminds us, even the replacement of sails by engines does not remove the perils of the sea: tankers are still dashed onto coasts.

In the Gilgamesh text, the "things of stone" belonging to Utnapishtim's private boat are first mentioned by a woman who lived by the sea. She tells Gilgamesh that the only person who can take him across to the shore to where the sage lives, is the sage's own boatmen, adding that the boatman had the essential equipment:

"With him are the stone images (?)..."

(X, i, 29).

(here, the translator notes that "images" is the Hittite equivalent for the Assyrian "things of stone").

Gilgamesh finds the boatman, Urshanabi who is refered to as the vessel's "master" (Tablet X (iv, 16). But while looking for him, the Hero is described as holding his hatchet and dagger with which he destroys something. Then comes a gap in all the texts, so the name of whatever was destroyed is missing, but later on, when the boatman says he cannot take Gilgamesh to his master, he explains his reason as follows:

"Thy hands O Gilgamesh have prevented (the crossing by sea);
(For) thou hast destroyed the stone images, (?) ...
The stone images (?) are destroyed ..."

(X, iii, 15 & 16)

Still later, it is the sage himself who makes the final reference to the "things", or "images" of stone. While looking out to sea, he is surprised and vexed to see his own boat sailing towards him without his permission and without its stones, but with a stranger on board. He asks himself two questions:

Why are the stone images(?) destroyed?
And why does one who is not its master ride (upon it)?"

When the boat arrives and Utnapishtim sacks his irresponsable boatman, the latter attaches himself to Gilgamesh.

It must be pointed out that the Hittite and Assyrian texts clearly mean that the stones actually *propelled* Utanapishtim's boat. Nevertheless this may represent an understandable misunderstanding on the part of scribes who had never seen the sea, when they were confronted by a statement that something made of stone was so essential that a boat could not move without it. They could easily have assumed that the stones themselves must somehow have been responsible for the boat's movement. Only the discovery of tablets bearing this particular passage, written in a language used by seafarers could settle the matter.

2. The Boat

There is little information about the types of craft likely to have been involved (Fig. 2); some recently discovered seals from "Failaka/Dilmun" on the Gulf[4] bear sketchy representations of vessels with mast and sail. The Epic is equally sketchy, for it gives only two clues to the nature of the boat on which Gilgamesh journeyed for 15 days, across a Sea so "poisonous" that to touch its water was to die. The first reference shows that the boat was punted, it follows that once a pole became dripping-wet it could not be touched again, consequently the boatman, Urshanabi, had to calculate the number of thrusts needed to cross the Sea —and he underestimated. In the forest, he had told Gilgamesh to cut wood and make poles. As in modern Babylonia, these were to have bitumen on their upper ends, and some kind of plate or socked on their lower ends:

> *"Take the hatchet in (thy hand), O Gilgamesh.*
> *Go down to the forest and (cut one hundred and twenty)*
> *punting-poles, each sixty cubits (in length).*
> *Put bitumen and plates (?) (onto them) and bring (them to me).*
> (X, iii, 37-42)

During the crossing, the supply of poles ran out, so Gilgamesh had to improvise another form of propulsion:

> *"he ungirded his loins .. (...)*
> *Gilgamesh pulled off his clothes (...)*
> *With his hands he raised the mast (?).*
> (X, iv, 9-11)

The existence of a mast and consequently of a mast-step is implied, but the wording is ambiguous; Gilgamesh may have used his own body as mast.

3. The Diver's Stone

References to the technique of "petra-diving" are clearer: after Utnapishtim had told Gilgamesh about the magic plant, his instructions about how to pick it leave no doubt that Gilgamesh had to dive for it:

> *"If thy hands will obtain this plant (thou wilt find new life).*
> *When Gilgamesh heard this he opened (........)*
> *He tied heavy stones (to his feet)*
> *They pulled him down into the deep, (and he saw the plant).*
> *He took the plant, (though) it pr(icked his hands)*
> *He cut the heavy stones (from his feet)*
> *And the (.........) threw him onto its shore"*
>
> (XI, 270-276)

In Pritchard's *Anthology of Near Eastern Texts*[5] the second line becomes:

> *"No sooner had Gilgamesh heard this, than he opened the wa(ter-pipe)"*

It has been suggested that the concept of gushing water related to the submarine springs in the Persian Gulf, identified elsewhere in the Epic as "Apsu" (discussed below). The use of "shore" is rather puzzling, because a diver's return to the surface is vertical rather than oblique. But shore is the correct rendering of *kibru* (elsewhere translated as "sea's edge"); if so the implication is that the Hero is carried along by a gush of water, instead of being pulled back up to a boat.

Stones looking very much like common 20 kg. anchors are still used by divers who gather sponges, pearls etc. from the seabed (Fig. 3). The human body being bouyant, the function of a diving-stone is to save a man's breath, firstly by sinking him quickly and secondly by pulling him quickly back to the surface by the rope attached to the stone. A diver would otherwise waste time and energy swimming down to the bottom then struggling back to the surface carrying something heavy. Some Lebanese sponge-divers personalized their stones by inscribing them with appropriate thoughts: "We are God's and we return to him" (Moslem) and "I put my faith in God's keeping" (Christian)[6]. If, like Gilgamesh, a man makes a one-off, non-routine dive, he naturally improvises by tying rope to any suitable rock, or to a bag filled with pebbles. At Arwad in Northern Syria I have seen sponge-divers jump in holding a diving-stone in their arms, leaving their tender to play out its rope. Underwater, while putting sponges into their bag, they keep the rope in the crook of their left elbow until their breath runs out, then they jerk it, as a signal to their tender to haul them back to the boat. I believe that pearl divers in the Gulf slip a foot into a loop in the rope tied round their diving-stones, but I have never heard of a diver having to cut the rope attaching him to his stone as Gilgamesh is said to have done (but here again, the original text is not specific about the *cutting*).

4. Black Coral; the "Plant with a Thorn"

The plant for which Gilgamesh dived is described by Utnapishtrim as follows:

Gilgamesh I will reveal (unto thee) a hidden thing,
Namely a (secret of the Gods I will) tell thee;
There is a plant like a thorn (....).
Like a rose (?) its thorn(s) will pr(ick thy hands).

(XI, 266-269).

"Black coral" (which is a false coral) has thorns; like true coral it looks like a plant although, in fact, both species are colonies of animals. The true corals, *Madreporaria*, are stoney; those used in jewellery, which range from red to pink are tree-shaped and grow upside down from overhanging rocks, or the roofs of caves. With the exception of one white variety from Japan, this jewellery coral is found only in the Mediterranean.

"Black coral" of the philum *Coelnterata*, class *Anthozoa* and order *Antipatharia* also looks like a tree, but it grows upright from rocks to a height of as much as 2m (Fig. 4). Its structure is horny and, while living, it has the pliability of green-wood. Besides having thorns, it is covered by a reptilian kind of skin which, by memisis, would account for its being attractive to serpents. This skin which is sticky and slightly poisonous, stinks like putrescent garlick when brought to the surface, so it is certainly "antipathetic" to humans, but according to the Epic, not to a certain serpent.

The distribution of *Antipatharia* gives an interesting archaeological clue to ancient trade routes and to the territory crossed by Gilgamesh. Although found in most parts of the world, this coral requires very specific conditions of reduced light, cool temperature and a flow of clean, but nutritious, plancton-bearing currents. Consequently it flourishes in the Red Sea at depths of 45-50m. or more, whereas the hot, sandy conditions of the shallow Persian Gulf (hardly 50 m at deepest) would stifle it. Conversely, the pearls which flourish in Gulf conditions, cannot live in the Red Sea (a point to which I shall revert).

The ancient symbolism of these "trees which never die" (they are sometimes found in Roman burials) survives in Southern Italy, where Naples is still to jewellery coral what Antwerp is to diamonds. Until recently, Sicilian families brought out their corals to deck wet-nurses until a baby was weaned; babies had coral rattles; the phalic *"corno rosso"* still remains such a popular talisman that it is now copied in plastic.

In the Muslim world, black coral from the Red Sea is made into the prayer-beads sold to pilgrims in Mecca and thence diffused throughout Islam (Fig. 5). When local fishermen saw *Antipatharia* on Cousteau's vessel, the "Calypso" during its Red Sea cruise, they asked permission to come aboard to touch it, which they did reverently with their foreheads. They explained that it was dangerous to pick and that the petra divers who did so shaved off all their bodily hair so as not to be caught up in the branches while struggling to prise from the rock a "trunk" which could be as thick as an arm. The depths at which they could work are astonishing. Although they are now exceeded by record-breaking sportsmen who reach over 100 m while holding their breath. Picking Mediterranean jewellery coral is easy by comparison, for one tap disloges its brittle "stem". I spent much time picking a "tree" of black coral near Aqaba (fig. 4), but this did not matter to me, since I was wearing an aqualung.

The nature of the "tree" which Gilgamesh picked is conveyed in the description of how he lost it on his way back to Uruk:

"Gilgamesh saw a pool with cold water;
He descended into it and bathed in the water;
A serpent perceived the fragrance of the plant;
It came up (from the water) and snatched the plant,
Sloughing its skin on its return.
Then Gilgamesh sat down and wept."

(XI, 285-290)

Incidentally, the snake's sloughing after contact with the rejuvenating plant may not only give a legendary connection with skin-shedding, but the serpent's renewal of its skin may also account for the snake in the symbol of the medical profession: the caduceus.

According to Prof. Lambert the word "odour" is more accurate than "fragrance". The combination of smell with thorns in the poem does, however, seem to have suggested to translators some kind of mythical, submarine rose-bush. On land, palaeobotanical identifications are commonly used in archaeological research, but in marine research they are not. E. During-Caspers, an archaeologist familiar with the Gulf, is an exception[7]. She does propose that Gilgamesh's "magic plant" was *Antipatharia*, and supports this with a scholarly bibliography going back to the 18th century. The result is more interesting as a history of marine biology, than as an up-to-date reflection of habitants and of other aspects of earth (and sea) sciences which petroleum research has stimulated in the Gulf.

Very briefly: her suggestion is that *Antipatharia* might grow near Bahrein despite the warm and sandy nature of the sea there, because of the existence of submarine springs (submarine springs being usually cool in most seas). She then identifies the Babylonian word *Apsu* (in its sense of "gushing freshwater") with the missing word in the discription of Gilgamesh's dive:

"And he opened the ..."

(a gap which some translators fill with the word "water-pipe"). What makes During-Casper's hypothesis implausible, is that unlike most submarine springs, those near Bahrein are hot. According to oil-company geologists this is because the melting snows of the Zagros, Nejed and Hejas Mountains, which gather at the great depth of 20.000 feet below the bottom of the Gulf, have been heated by the temperature of the earth's core, before welling up through geological fissures into the Sea. Furthermore, divers working in the area do not report that they have seen black coral[8].

Conclusion

Marine archaeology being essentially multi-disciplinary, produces questions which stimulate further research within many specialities. In the Epic of Gilgamesh, if anchors, diver's stones and black coral are recognisable, their identification implies wider geographical issues connected with the Hero's journeyings which cover high mountains, forests (usually translated as "of cedars"), deserts, rivers and seas all separated from each other by distances expressed in days. The picture relfects a degree of cosmopolitism in the "Golden" Bronze Age, wherein international contacts have yet to be equated with the nautical possibilities of the period.

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NOTES

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8. I am indebted to Dr. Wak Kani for personally communicating geological information about the Persian Gulf and for checking the possible presence of "black coral" in the region of Bahrein by questioning Oil Company divers. I am grateful to Dr. G. Patterson of the British Museum of Natural History for answering my questions as to the nature and distribution of *Antipatheria*, and also thank my collegue Carol Greene for his descriptions of the area which he came to know as a working engineer.

ILLUSTRATIONS

Fig. 1 A votive anchor among the obelisks in the "Temple of the Obelisks" at Byblos (Lebanon). Photo Honor Frost.

2. Some craft of the period:
   a. Cylinder seal, Uruk c. 3200 BC (after *MIMA*, Lucien Basch fig. 108).
   b. Ugarit 13th century BC sealing (*Ugaritica* IV, fig. 114).
   c. 9th century Assyrian, tribute from Tyre to Shalamanaeser, from the Balawat Doors in the British Museum, after R.D. Barnett, *Assyrian Sculpture*, fig. 40, Toronto (1975).
   d. Aramean tribesmen in a reed-boat on the marches pursued by Sennacherib's 704-681) Assyrian soldiers (after R.D. Barnett, *Assyrian Sculpture*, fig. 70, Toronto (1975).

3. A diver from the Island of Arwad (Northern Syria) with the stone anchor used to carry him to the bottom. Photo Honor Frost.

4. A black coral tree growing at a depth of over 40m in the Red Sea, East of Aqaba (Jordan). Photo Honor Frost.

5. Two prayer-beads and a stop from an antique, Moslem, black coral chaplet, and a section through a recently cut branch of black coral showing the concentric structure (which needs to be held together by silver pins). Photo R.A. Gardener.

Fig. 1

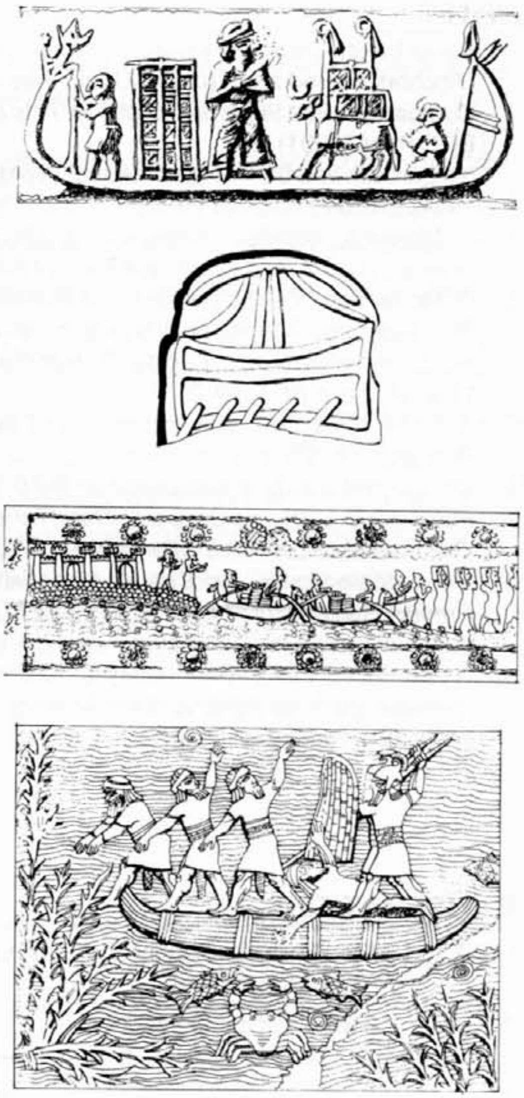

Fig. 2a-2d

Fig. 3

Fig. 4

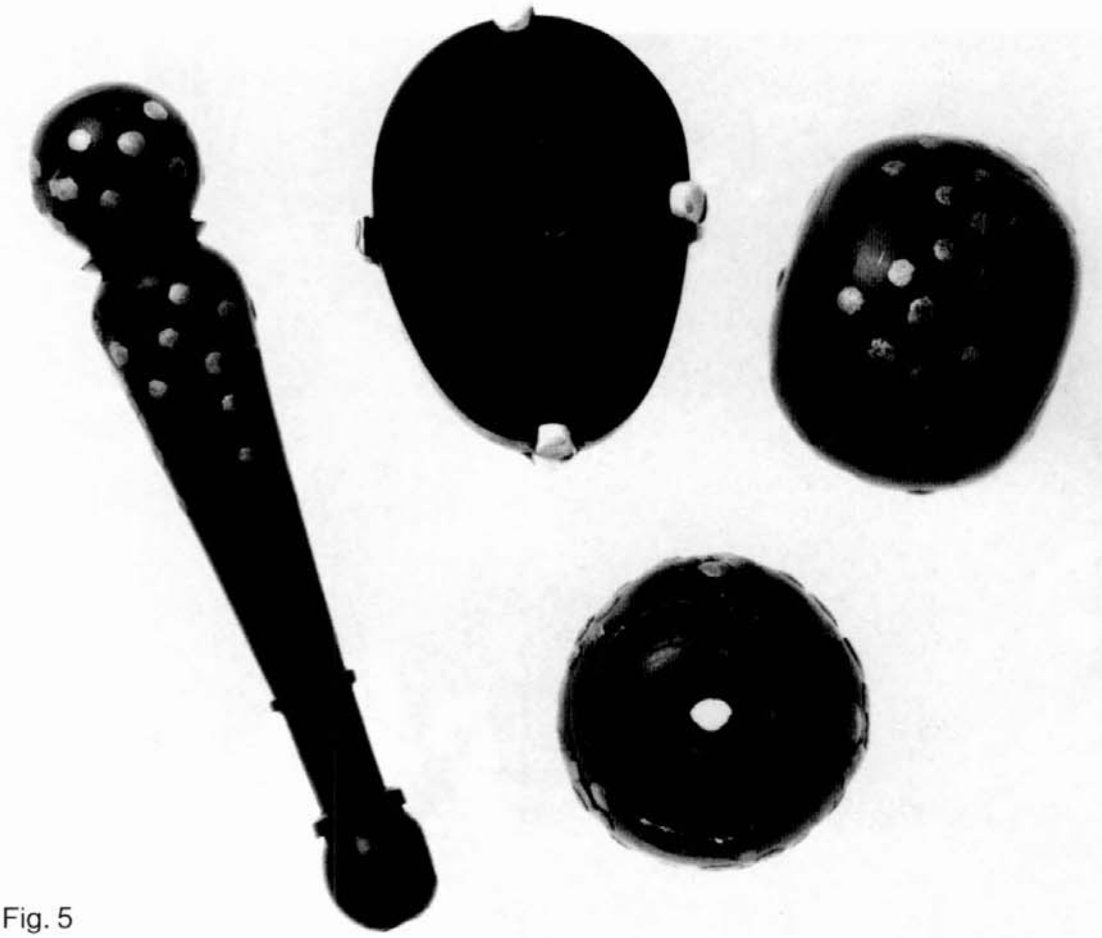

Fig. 5

SHIP FITTINGS AND DEVICES USED BY ANCIENT MARINERS: FINDS FROM UNDERWATER SURVEYS OFF THE ISRAELI COAST

INTRODUCTION

Intensive maritime activity along the Levantine coast, over a period of 4000 years, has left an abundance of archaeological finds on the sea floor. Unique physical conditions prevalent in the Israeli coastline, have enabled excellent preservation of shipwrecks, cargoes, harbour installations and anchorage sites. Man's interference in the pattern of coastal sedimentation (mainly sand-quarrying, erection of harbours, breakwaters, etc.) has resulted in the exposure of wide areas and archaeological sites on the seafloor (Galili *et. al* 1993; Galili & Sharvit 1994).

Underwater surveys carried out in recent decades have recovered large amounts of artefacts and ancient sites from various periods. The newly recovered material contributes to our understanding of ancient navigation, commerce, economy, and interrelations between coastal civilizations.

Ship fittings and maritime devices recently recovered, provide information about daily practices, technologies and skills of ancient mariners.

DEVICES

Lead Braziers

One of the problems seafarers had to deal with in antiquity, was using fire for cooking and heating aboard wooden ships, without endangering the vessel. The discovery of fire-blackened everyday dishes at the stern of certain shipwrecks seems to support the idea that these ships had kitchens (Rouge 1981: 40; Casson 1974: 154). Various types of braziers were probably used for this purpose on-board sea-going ships.

Eleven braziers made of terra-cotta and two made of lead were raised in sponge fisher's nets off Bodrom coast, Turkey (Leonard 1973: 21-25). A single stone brazier was found by Bulgarian archaeologist divers in Sozopol, off the Black sea coast (B. Dimitrov Per. comm.).

Thirteen lead braziers have so far been recovered off the Mediterranean coast of Israel, scattered at depths of 3 to 5 m, together with other artefacts originating from shipwrecks. Six of the braziers were found off the northern Carmel coast, south of Haifa, two in the north bay of Atlit, two off the Gaza strip coast, one off Ashkelon coast, one off Yavneh-Yam coast (Galili & Sharvit 1991: 116-118) and one off Akko coast (Fig. 1). Following is a general description and discussion regarding some of the lead braziers found off the Israeli coast.

The braziers are generally shaped like a hollow shoe, forming a closed container with a cylindrical opening (chimney), for pouring in water. The upper external part of the brazier is formed like a rectangular firebowl in which the fire was lit, using solid fuel (Fig. 2). The upper-side of the brazier has three supports for cooking pots. Some of the supports are shaped as astragals (Fig. 3) or shells (Fig. 2, 7). Some of the chimneys are decorated with various motives, such as: lion portrayals and amphora depiction's (Fig. 4, 4a), grape vines (leaves, twigs and fruit), rosettes and rope-like motives (Fig. 2, 5). It should be noted that some of the decorations that appear on lead braziers strongly resemble those that appear on lead coffins. A lead coffin that has been found at Caesarea, bears a composition of lions, amphorae and a grape-vine motive (leaves, fruit and twigs).

The stove bottoms are usually flat, although two have a circular raised base (the braziers from Yavneh-Yam and Galim river). A 5 mm strip of lead, bent in an "S" or "zig-zag" shape, was sometimes placed or soldered inside the hollow space between the two bottoms of the firebowl (Fig. 2c).

The braziers were fabricated with lead sheets (1 to 3 mm thick) soldered together. Decorated chimneys were first cast into a mold, then formed into a cylinder and afterward, soldered to the main basin. The supports were usually made of solid pieces of cast lead that were soldered onto the brazier.

Two types of lead braziers have been identified so far:

1. Braziers with a horseshoe shaped firebowl, with three solid lead cooking pot supports, soldered onto three points on its narrow top side, and a protruding flat tray. The firebowl is accessible from three sides of the tray. Eleven of the braziers belong to this category (Figs. 2, 3, 4, 5).

2. Braziers with a concave firebowl, the edges of the bowl are raised in three places forming supports for cooking pots. A section of the right side of the bowl is "missing" creating an opening, that allows access for stoking the fire. Two braziers belong to this category: one from north bay of Atlit, and one from the Carmel coast south of Haifa (Fig. 6).

An interesting question arises: were the braziers, that were recovered from the sea, used for cooking on-board vessels, or were they part of cargos?

The braziers found in Turkey do not bear traces of usage, hence they may have comprised part of a cargo. It has been suggested, however, that at least some of them were used as stoves for cooking on ships (Leonard 1973: 21).

Some of the lead braziers found off the Israeli coast bear traces of burning. Moreover, examination of the archaeological finds reveals that each shipwreck assemblage included only one brazier. Thus, it seems most likely that the lead braziers discussed here, were used for cooking on ships, and were not part of the ships cargo.

Lead braziers have been recovered from the sea floor, but not one has been so far reported at land sites. Does this fact alone indicate that they were solely used on ships? On land, lead must have been re-melted and re-used many times, while goods from wrecked ships were not available for secondary use. Perhaps this is the reason that lead braziers have only been found at sea.

It seems that the lead braziers had some advantages over the clay ones for use on-board ships: 1. They did not break. 2. They were easily repaired (the Kfar Galim brazier has a lead patch in its firebowl). 3. They were heavy and stable. 4. They could be manufactured in every workshop, without requiring complicated technologies. 5. Lead was a malleable metal, easily hammered into shape. 6. Lead sheets were very useful on ships for various purposes (such as lead sheathing of the ship's hulls) and therefore readily available.

Due to the fact that all the lead braziers were recovered from the seafloor, and considering their advantages for use aboard ships, we suggest that the lead brazier was indeed a maritime device.

It has been suggested that lead braziers were lit with wood rather than with charcoal because wood burns at *ca.* 200°C, which is lower than the melting point of lead (Leonard 1973: 24). Charcoal is easy to store and carry, and seems ideal to use on ships where space is limited. It is easier than wood to control and it burns with less smoke, thus can be used below deck. To this day villagers around the

Mediterranean use charcoal for indoor cooking and heating, but can charcoal be used in lead braziers?

The lead brazier seems to be a very sophisticated device, that enabled cooking on-board ships. Developing such a device required a lot of imagination and understanding of thermo-dynamics. The device worked on the principle of a modern cooling system in an internal combustion engine. The temperature in the combustion chamber of the engine is relatively high (*ca.* 1500°centigrade). However, the water in the double sided walls disperses the heat and prevents the melting of the cylinders and pistons, that are made in some cases of aluminum that melts at *ca.* 658A Centigrade. Before lighting fire in the brazier's firebowl, water was poured through the chimney into the hollow container. Lead melts at *ca.* 327°centigrade, but the presence of water inside the double walls of the brazier prevents a temperature rise above 100 degrees Centigrade. The lead strip that was placed inside the hollow bottom of the basin (see above), prevented the collapse of the firebowl. If the firebowl floor had collapsed and touched the bottom floor of the brazier, water would not have reached underneath the firebowl. Such an event would have caused a meltdown of the firebowl. In the cooling system of an engine, water is circulated by a pump, and the radiator serves as a heat-exchanger that releases heat into the air. In the lead brazier, however, water circulated naturally (heat-induced circulation), due to temperature differences in the water container. The external surface of the brazier served as a heat exchanger that released heat to the air. Additional heat was released from the chimney by evaporating water.

Heat produced by the burnt charcoal dispersed into three directions: 1. Heating the cooking pot. 2. Loss of heat to the atmosphere. 3. Heating the lead brazier (Fig. 8). Unlike firewood stoves, heating and cooking with charcoal in lead braziers, required no chimney for releasing the smoke.

An actual experiment was carried out with the brazier from Galim river inlet (Fig. 3). The brazier was filled with water, and charcoal was placed into the firebowl and lit. The charcoal burned for twenty-five minutes, during which an egg was fried in a pan (Fig. 9).This trial experiment, strengthens our assumption that charcoal could have been used in lead braziers.

The presence of cooking pot supports on chimneys of clay braziers shows that in addition to the main firebowl, the chimney also served for cooking or heating food (Leonard 1973:24). The chimney in lead braziers, however, served as an opening for pouring in water, as an outlet for the release of pressure and vapors, and as a means for supervising the water level in the brazier. Temperature in the chimney of lead braziers did not rise above 100 (, therefore could not be used for cooking or warming food. This is probably the reason why we have not found cooking pot supports on chimneys of lead braziers.

During the Hellenistic and Roman periods lead was a very common and cheap metal (Hocker 1995: 201-202). Preliminary observation of Hellenistic and Roman lead ingots, and other lead products around the Mediterranean basin, suggests that lead was produced as a by-product of the silver industry (Tylecote & Merkel 1985: 10, 11; Marechal 1985: 30, 31; S. Shalev Per. comm.). The abundance and low price of lead may have contributed to the extensive use of this metal for manufacturing lead braziers.

So far, not one lead brazier has been found in a Byzantine shipwreck context. During the late Roman period there was a significant reduction in lead usage. Lead sheathing was no longer used for ships (Hocker 1995: 201), and anchors previously made of lead gave way to anchors made of iron. Hocker suggests that lead ceased to be used due to lack of economic profitability and rising costs of labour. It is probable that lead braziers ceased to be used as a part of this wide-spread phenomenon (1995: 203).

A set of Wooden Splicing tools

A hoard of metal and wooden artefacts was discovered at a depth of 2.5 m and ca. 70 m offshore in the north bay of Atlit. The artefacts were found stuck together in a concrete lump of sand and metal oxide. After the lump was carefully taken apart, the following items were identified: A bronze figurine of a women, bronze chain of a scale, a decorated bronze standard bearing a Greek inscription (Ulman & Galili 1994), and a set of four wooden tools (Fig. 10). This last group included four perfectly preserved tools made of wood identified as oak (Liphshitz Per. comm.):

a) **Knife handle** with iron traces on one edge. It is decorated with incised parallel circles, and has cavities at each end (Fig 10/A). Similar handles were found in the Ma'agan Michael wreck dated to the 4th century BC (Linder and Rosloff 1995: 281).

b) **Wooden spike** with a knob handle and a long point with two perforations, one near the handle and one near the end of the point. (Fig 10/B)

c) **Wooden spike** with a long handle and short point, with one perforation (Fig 10/C).

d) **Marline spike** that was used to separate strands of rope for splicing (Fig 10/D). It is similar to the one found in the Punic shipwreck at Lilybaeum (Marsala, Sicily) (Frost & Vari 1976: 91).

Almost identical wooden spikes are used today by fishermen and seamen (Fig. 11). Perforated spikes were probably used for splicing thin rope to a thick main rope.

The hoard and the wooden tools are dated to the 4th century AD by the style of the bronze figurine and the Greek inscription on the bronze standard (Ulman & Galili 1994).

Lead Sounding-weights

The sounding-weight was a simple device used to determine depth and type of sediment on the seafloor. This information was vital for captains, when navigating in unknown waters. By using this method they could determine whether the sea bottom was deep enough for sailing or suitable for anchoring. Sounding-weights were also used by fishermen, and sponge divers searching for areas rich in marine life.

Herodotus who lived in the first half of the 5th century BC described a method for sampling the seabed: "For the nature of the land of Egypt is this: First, as you sail towards it and are still a day's run from land, if you cast the sounding-weight you will bring up mud and the depth will be eleven fathoms. This shows that the alluvium from the land extends out this far" (Herodotus 2.5.28).

Tens of sounding-weights have so far been recovered from the Israeli coast. Most of them were found in shallow waters, at depths ranging from 3 to 5 m, and 70 to 200 meters from the coastline. The majority originated from shipwrecks and can be associated with archaeological assemblages. In most cases, however, artifacts from more than one shipwreck were found scattered together on the seafloor, thus it was possible to date the sounding-weights accurately, only when they were found in the context of a single shipwreck's cargo. Following is a description of eleven sounding-weights discovered in the Carmel coast region (between Haifa and Caesarea) (Table 1).

The sounding-leads are not uniform in shape, various types have been found: bell-shaped, conical, cylindrical, spherical or polygonal. In terms of functionality, sounding-weights can be divided into two main groups: a) Devices used for measuring depths (Fig. 12: # 1, 6, 7-10). b) Devices used for sampling sediments and for measuring depths (Fig. 12: # 2-5, 11).

Two interesting sounding-weights were found in a Byzantine assemblage, discovered south of Haifa. One is made of white marble-stone (Fig. 12: # 7), and the other is made of lead with a hexagonal cross-section (Fig. 12: # 6). Another one similar to no. 6 above, was found off the Caesarea coast (Fig. 12: # 10).

Two methods were used to attach rope to the weights: 1. A bronze or iron loop was fixed into the mold before pouring in the molten lead (Fig. 12: # 3, 9, 11). 2. Perforations were made in the weights during the casting process, or hammered with a pointed instrument after they had been cast (Fig. 12: # 4, 10).

The sounding-weight served two purposes: 1. It determined water depths by measuring the length of rope that reached the sea bottom. 2. It was used for sampling sediments on the seafloor by placing tallow into the bottom cavity of the sounding-weight and examining the sediments that had stuck to it.

Different methods were devised to enhance adhesion and prevent the tallow from falling out: 1. The opening of the depression was narrowed by folding the rim inwards (Fig. 12 : # 2). 2. The depression was divided into four smaller segments by cross-shaped partitions with bulges (Fig. 12: # 5). 3. Nails were driven through the outer side of the base into the cavity (Fig. 12: # 3, 11). 4. Nails were driven from the bottom of the weights into the cavity Fig. 12: # 4).

Until the late 1960's, sounding-weights were the only method applied by Israeli coastal fishermen for determining depths and sampling sediments, since the echo-sounder was expensive and unavailable. Sounding-weights are still occasionally used by coastal fishermen today, or stored on-board sea vessels as an emergency device. Fishermen from Akko, Jaffa and Gaza use sounding-leads (termed "*Scandil*" in Arabic), that bear remarkable resemblance to their ancient prototypes, and are manufactured in a similar fashion. The tallow used by traditional fishermen until recently, was made by cooking a sheep's tail in boiling water and collecting the fat floating on the surface. Nowadays, however, most fishermen use more easily available materials such as soap or grease instead of animal fat.

FITTINGS

Duck-shaped Fairleader

The bronze artefact was found between Haifa and Atlit off the Kfar Galim coast. The fairleader was used as a towing hook or as one of the fairleaders in the rigging system (Fig. 13). The fitting was probably attached to the gunwale, with the purpose of altering the pulling direction of a rope, while simultaneously maintaining its linear movement ability (acting like a pulley). The main disadvantage of this fairleader was that ropes eroded rapidly due to the intensive friction with the metal. On the other hand, it was simple (had no movable parts), easy to operate and required no maintenance. The fairleader from Kfar Galim is a duck-shaped bronze artefact. Its flat body has two spread-out wings and a tail folded downward at a right angle. It has four nail perforations: one through each wing, one through the middle of the flat body, and one at the end of the folded tail. The hook is formed like a duck's head pointing backwards. The fairleader is cast in one piece and has a massive and aesthetic design. The folded tail, indicates that it was attached to a right angled corner of a plank, possibly to the gunwale (Fig. 14). The inner curve of the neck shows clear signs of friction, indicating that the fairleader was attached to a vessel that had been wrecked close to the coastline. Two of the bronze nails stuck into the perforations, strengthen this assumption. The shape of the nails and a number of wooden anchors found in the same area (Galili *et. al* 1993; Galili 1994), date the fairleader to the Roman period.

The use of decorated fittings on warships was widespread throughout the Roman and Hellenistic periods (Casson 1994: 140). Decorated fittings were also found on Roman barges from lake Nemi (Ucelli 1950: 255).

The duck-head motive was widely used on ships in the Mediterranean (Rouge 1975: 39; Wachsmann 1996).

Twelve similar duck-shaped bronze artefacts were found on a warship wrecked near Capo Rasocolmo (Messina), that was dated to 36 Yrs. BC Another duck-shaped bronze artefact was found by Luc Long on the Apollonia wreck in the harbour of Cirene, Libia (Freschi Per. comm.; Superintendency of Messina).

It is likely that duck-shaped bronze fairleaders were commonly used on warships, but we can not exclude the possibility that they were also used on merchant ships.

Ring-shaped Fairleader

A bronze artefact used as a fairleader or for tying ropes. It appears that such fittings were fixed to the ship's gunwale, starboard, mast or boom (Casson 1973: 232-233), and were constituents of the rigging. The artefact consists of a thick bronze ring ending in a flat wedge split in the middle. A flat disc, with a rectangular perforation in its center, is fastened between the ring and wedge (Fig. 15). In order to attach the fitting to a wooden plank, it was necessary to carve a deep rectangular groove into the wood. Following this, the disc was placed above the opening of the groove and the wedge was pushed into the groove. A thick nail was then driven into the middle of the wedge from the side of the plank, widening it within the wood and fixing it together with the disc firmly in place (Fig. 16). Another possible procedure for fixing the fitting to the wood was to attach the disc to the fairleader in advance, by widening the slit with a pointed pin (fixing ring and disc together). Following this the fitting was pushed into the groove and locked with a nail. Two ring-shaped fairleaders were recovered from the southern coast of Haifa together with a multitude of nails, a bronze scale, a number of silver Dinars and lead sheets. Judging by the context, the artefact probably originated from a Roman ship that had been wrecked in the region.

CONCLUSION

Many of the simple artefacts that were used by mariners in antiquity are still being used today. Sounding-weights and splicing tools have remained quite the same for more than 2000 years. In antiquity it was common to decorate fittings, anchors and other devices used on sea vessels. In the modern industrial society these devices are mass produced on a commercial basis, and are designed to fulfill practical uses only. Apart from individual fishermen and certain traditional societies, it is rare to find such attention to detail and decoration of implements.

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ILLUSTRATIONS

Fig. 1 Relief copte du 6e. s., provenant de Meidum. Staatliche Museen, Berlin no 9625.

Fig. 2 Détail de la fig. 1: le gouvernail axial.

Fig. 3 Navire de Piankhi (747-716 av. J.-C.), relief de Mut à Karnak. D'après Benson et Gourlay 1899: pl. 1.

Fig. 4 Graffiti d'Abydos, datant probablement du 7e s. D'après Cervicek 1974: fig. 55.

Table 1: Lead Sounding-weights from the Carmel coast region

No.	Find Description	I.A.A.* cat. nos.	Site	Depth measurement	Sediment Sampling	Weight in kgs.	Notes
1	Spheric-shaped	96-1337	Haifa south	+		2	
2	Conic-shaped, decorated with spiral ridges	96-1336	Haifa south	+	+	6.2	Depression in its base. Perforation for tying rope.
3	Bell-shaped	96-1334	Haifa south	+	+	14.9	Bronze loop for tying rope.Depression at its base with nail holes.
4	Bell-shaped	96-1335	Haifa south	+	+	5.5	Perforation for rope made after casting. Depression with nail holes. Similar weight was found south of Haifa (Oleson 1988: 27-40).
5	Bell-shaped, bearing	96-1338	Haifa south	+	+	12.2	Concave depression with a cross shaped partition with small bulges (Oleson 1994: 29-34).
6	Hexagonal-shaped	96-1332	Haifa south	+		3.1	Found in the context of Byzantine wreck together with no. 7.
7	Cylindrical-shaped, made of marble stone	96-1333	Haifa south	+		4.9	Probably an imitation of lead weights. Found together with no. 6.
8	Bell-shaped	96-1329	Caesarea	+		8.4	Found encrusted together with no. 9 in the context of a Byzantine ship from the 6th century BC.
9	Bell-shaped	96-1330	Caesarea	+		8.4	Found together with no.8.
10	Bell-shaped	96-1330	Caesarea	+		8.4	Perforation with square cross section made after casting
11	Cone-shaped	96-1328	Megadim (between Haifa and Atlit)	+	+		Found in the context of a Hellenistic wreck from the end of the 2nd cent. BC On its top there are remnants of an iron loop. Depression with nail holes.

* Israel Antiquities Authoritiesa

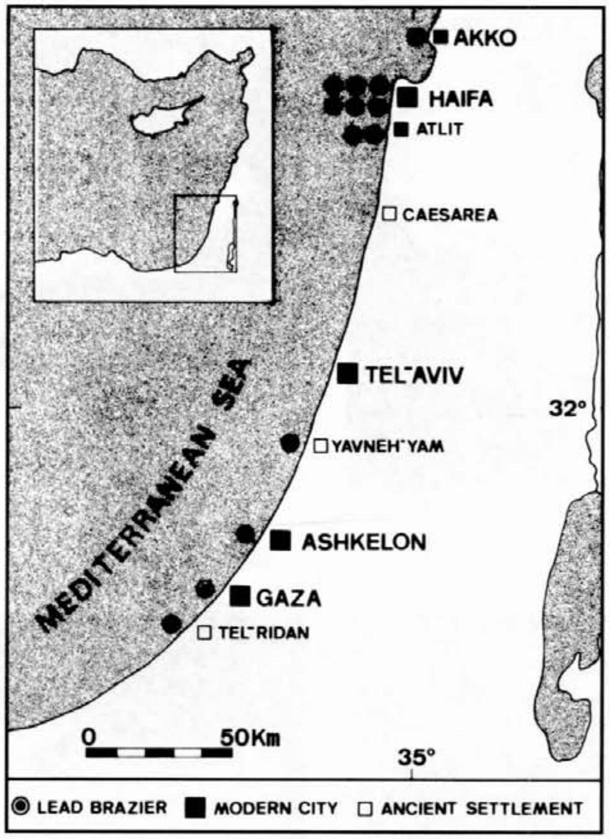
AKKO
HAIFA
ATLIT
CAESAREA
TEL-AVIV
32°
MEDITERRANEAN SEA
YAVNEH-YAM
ASHKELON
GAZA
TEL-RIDAN
0
50Km
35°
LEAD BRAZIER
MODERN CITY
ANCIENT SETTLEMENT

Fig. 1

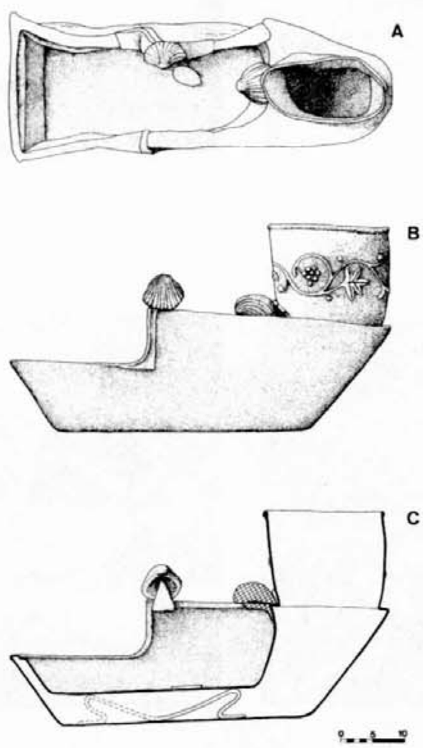
A
B
C

Fig. 2

Fig. 4

Fig. 3

Fig. 4a

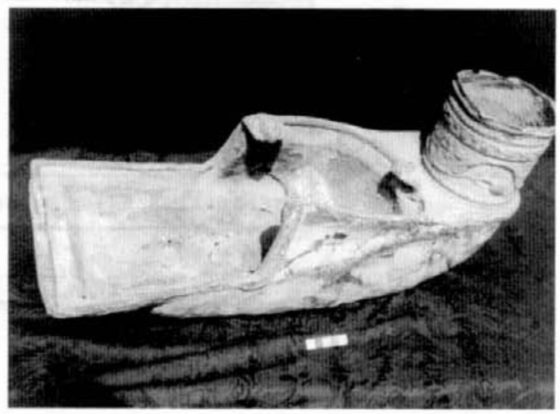

Fig. 5

Fig. 6

Fig. 7

Principle of the Thermo-dynamic System and Water Circulation in a lead brazier

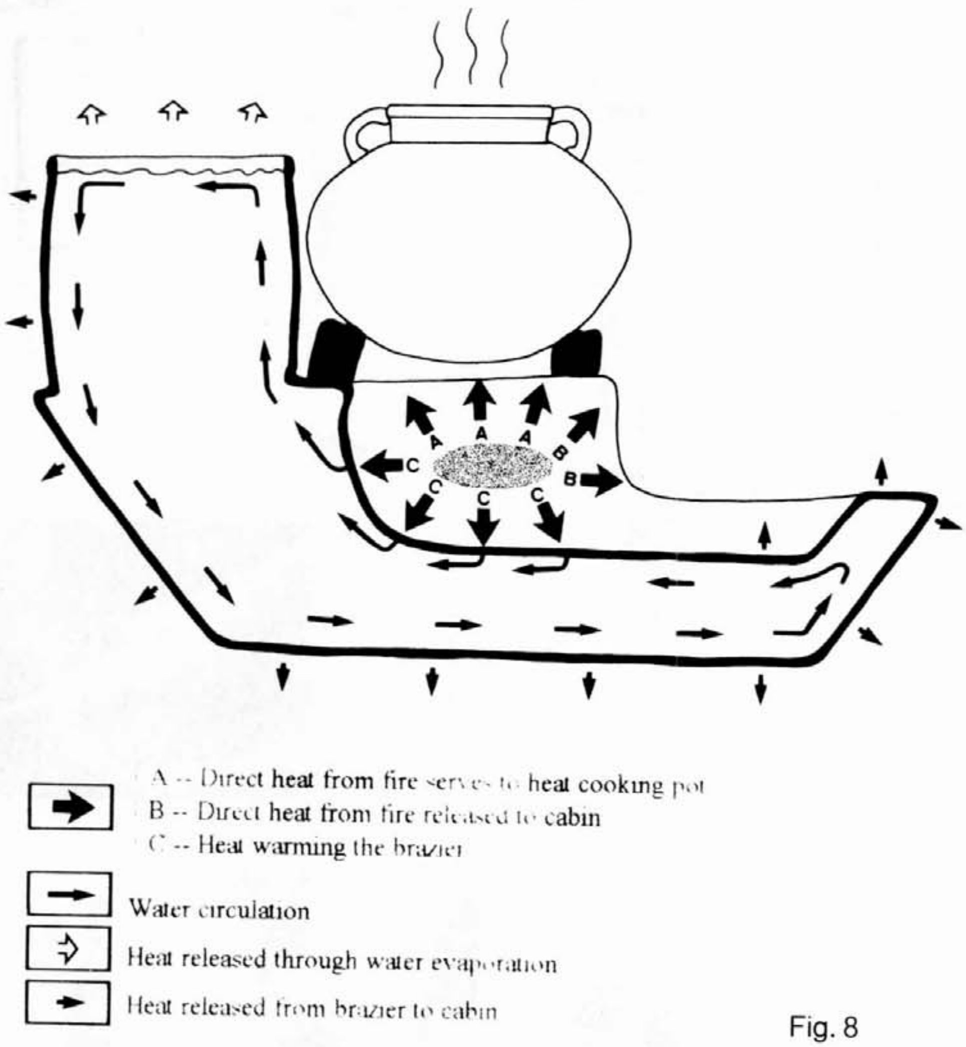

Fig. 8

Fig. 9

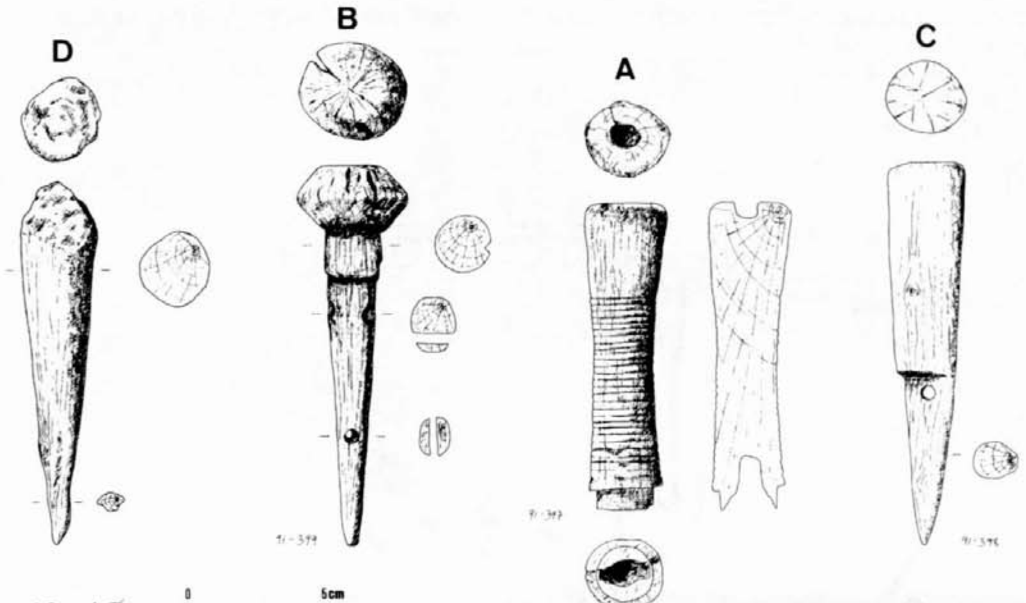

Fig. 10

Fig. 11

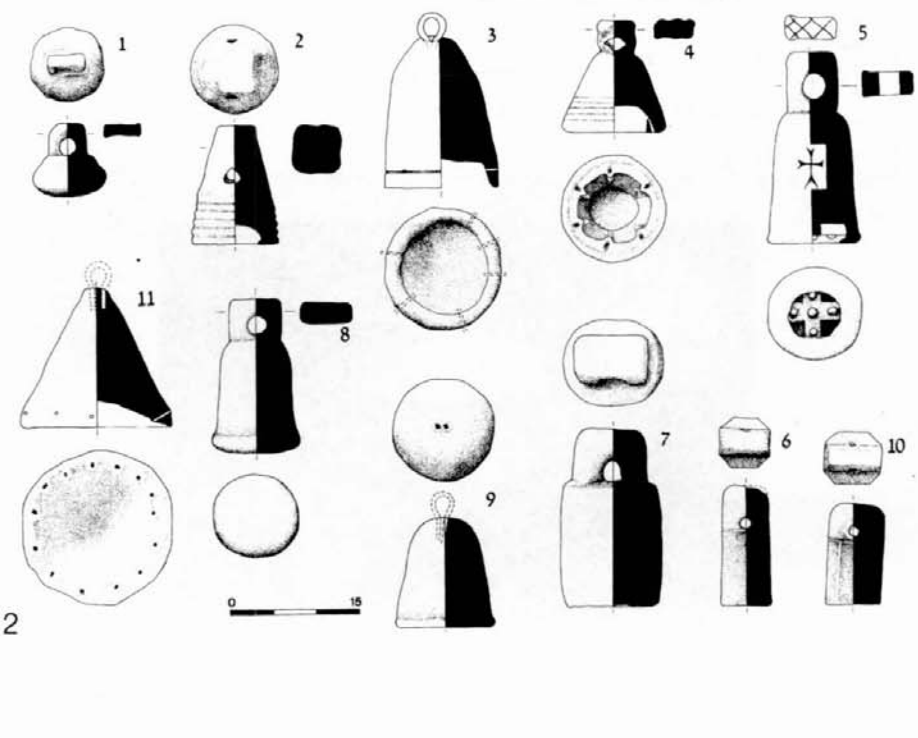

Fig. 12

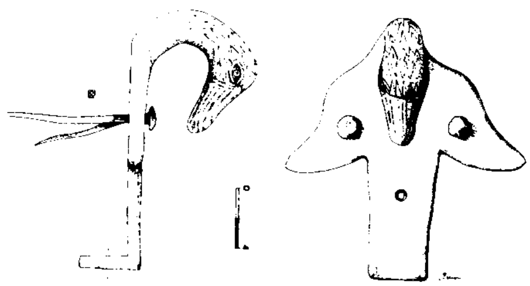

Fig. 13

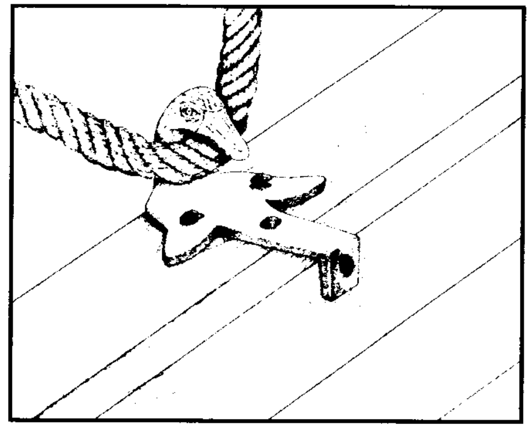

Fig. 14

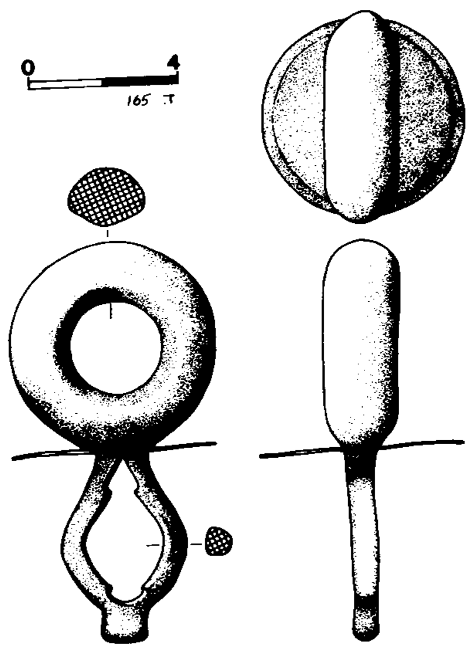

Fig. 15

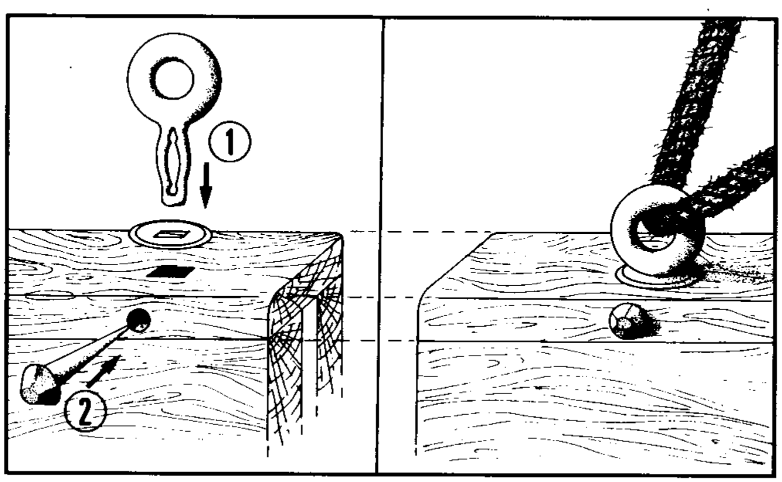

Fig. 16

THE RUDDER

THE USE AND DEVELOPMENT OF STEERING DEVICES IN ANCIENT BOATS

It should better be called a steering device because the word "rudder" is a recent appellation. The name is an English word and implies, as does the French, *gouvernail*, and Spanish *timon*, and other western world names, a center line-hinged flat structured surface. One that can be controlled from the ship or boat to change its angle to the fore and aft orientation, or the ship's directional movement. These are words that describe the steering device used today or for nautical history during only the last seven or eight centuries.

The steering device, whatever its shape or its name or its location on the watercraft, is a directional tool as we recognize it and it has been around for more than five millennia. That is about as ancient as we can see evidence of its existence. We can reasonably speculate that such a device originated when early humans floated their first log rafts. It probably suggested itself when one of the would-be seamen dragged his foot in the water behind the small raft. And then, of course, when he learned to paddle the craft for some destination, the paddle also became a steering device as well as a means of propulsion.

In the winter of 1988-87 an archaeologist named Michael Hoffman led an expedition in Egypt into the Nile Valley to a location near the first capital of the original Egyptian civilization named Nekhen. There on a sandstone outcrop about 100 feet by 12 feet they discovered among the petroglyphs an unmistakable painted image of an oared boat with a shelter cabin, five oarsmen and a large steering oar on the side at the stern. While this is not the first or only clearly interpretable iconography from prehistory, it is typical of those from such ancient sources and earlier. While this one has been dated at near 3.000 B.C., there are earlier ones, but none quite so sophisticated and clearly stated. This one is simple, with only five human figures holding oars and standing on deck aft of a deckhouse, with an unquestionable passenger's profile within the enclosure and a long steering oar on the stern. This steering oar is longer than any of the oars for rowing and it has a wider blade. It is clearly a steering oar, typically used in many configurations, for more than four and a half millennia before a rudder was hinged to the stern post of a boat. The steering oar on this boat on the stone outcrop at Hierakonpolis, nar ancient Nekhen, was also attached to the boat in some sort of socket or bearing post. It also has the angled pole from its top which today would be recognized as a "tiller", cana del timon in Spain, or barre in France. Such a rudder connection is still in use. The connecting rod to the head of the rudder provides the mechanical advantage of a lever to overcome the hydrodynamic force of the water over the rudder blade —a very early invention, as old as or older than watercraft.

The steering device, if it is a true steering oar with rotational as well as lateral freedom using an oar lock, thole or some resting surface on the boat's side, is the oldest form. It is also a most versatile form of steering, but at the same time, for extensive cruising, the most tiring for the helmsman. Consequently, the next step of development, to relieve the helmsman of this tiresome task as well as to adding greater steering force, was obviously to increase the number of steering oars. This development is really not a very inventive thing. It makes no more of the steering mechanism itself. It is early evident in the fresco of boats from the Akrotiri find at Thera. In this case one of the large boats in the procession is under sail, where the others of the flotilla are being paddled, each with a single helmsman using a long steering oar. The boat under sail has two helmsmen, each with his own steering oar. This is, rather obviously, because of the need of greater hydrodynamic force to keep the vessel on the wind without rounding up. This fresco is dated at early half of the second millennium, BCE.

There also appears in Egyptian wall reliefs and other iconography multiple steering oar use. This seems to occur earliest in the representations of vessels of the Third Dynasty, approximately 2750 BCE. Although there are many very primitive drawings from the pre-dynastic period, one from the Gerzian period c. 4500 BCE indicates a large boat of at least 20 oars (or paddles) per side and three steering oars. Interestingly enough, a painting on a large ceramic pot of this period but only a little late (according to the archaeologist) is a very much clearer representatin of a boat with sail. This painting is certainly not of the first sailing craft, but until an older painting of such is discovered this is the earliest. But unhappily, the artist was more of a potter than he was a sailor, because he omitted a steering device. It should be a required detail to confirm these early representations of sail.

Clearly the early Egyptians on the Nile recognized the need of more power in their steering systems, as they were adding a third and fourth or more helmsmen —until at last they recognized the advantage of the tiller.

As implied in the previous paragraphs, the larger Egyptian vessels on the Nile needed more than a single helmsman. While these boats had a relatively short waterline and long overhangs, the helmsman naturally relied on lateral movement of the steering oar blades. There is little evidence in the iconography to suggest that the steering oars were held very strongly if at all to the vessel's hull and allowed much free movement.

By the Fifth Dynasty, Egyptian watercraft began to show more sail area. Also, the steering oars are showing rope slings to hold them to position. In many cases the helmsmen show the left arms wrapped around the upper length of the oar. This all suggest very strongly that the oars are now used in an axial rotation for steering —a much easier and more efficient use. This also suggests that the oar has become a primitive rudder turning about its axis. For a sailing craft, this sort of steering and helmsmanship is most natural and desirable.

There is yet to be a further refinement here on the Egyptian boats. But there seems to be no further significant technology in steering well into the Sixth Dynasty or even throughout the Old Kingdom from 2500 to 2100 BCE. The boats themselves seemed to be going through an age of experimentation in structure. A period where they were no longer built of hewn and sculptured planks, keelless and shaped toward extreme rocker configuration. They were built with distinctive bottoms essentially flat with sides that joined along a chine. The sides were flared out and strengthened with transverse frames.

The mast for supporting a large single square sail was a heavy bipod structure. It was held by many backstays against the wind in the sail and put a single forestay to keep it in place and to raise and lower it. This sort of craft was still steered by two or three helmsmen as described above. But there is also seen in some of the obviously more heavy and working craft of near the end of the Sixth Dynasty, tha the steering oar is moved to the stern. It is attached to a vertical post where it is held in position by lashings and now has a steering rod extended down from its high rising top. This long-forgotten technique first identified as pre-dynastic has either been reinvented or misidentified by archaeologists of the early Nekhen find. At any rate, the sailing technology now displays a form of stern mounted rudder with tiller, in the later years of the Sixth Dynasty.

During these Dynasties of the Old Kingdom and part of the Intermediate period the advances in ship building technique were remarkable. It was during these few centuries that the vessel's owners were seeking out sea routes and building the first seagoing hulls. The hulls became sharper on the ends and less heavy, with more interior framing. But in all of this progressive technology there was little if any exploitation of the stern mounted steering device —at least in the available iconography. There is strikingly apparent in all of the larger vessels pictured the well known hogging truss attached to girdles around and under the bow and stern. Rowing instead of paddling had become standard propulsion together with large square sails, all developed during the end of the Old Kingdom. There is very little to be said for lack of evidence during the Intermediate period. The Middle Kingdom opened with the reuniting of the Upper and Lower, or North and South, and the more prosperous Dynasty wit Kings named Sesostris, Ammund and Amnemket, and after a passage of several hundred dark years before them they presided over a reconstruction. The boat and watercraft structures as well seemed to be rethought. During this Middle Kingdom scarfed planking, rounded bottom hulls and stern mounted steering oars are seen on the traveling ships. These steering devices are mounted on the centerline timber which is grooved to hold the shaft of the long bladed rudder-oar which rises inboard to the car post where the tiller rod is attached. Below this stands the helmsman on a small flat platform. The mast is no longer a bipod but a single tapered and circular spar. It is a heavy trunk apparently from the elaborate stepping frame on a heavy transverse beam which allows it to be lowered toward the stern and held in a crotched post above the deck.

As the Middle Kingdom advanced into the second millennium BCE the sophistication of the river vessels and the larger king's ships became diversified.

Early in the late Middle Kingdom, perhaps just before the beginning of the second millennium BCE, there were burial ship models that show another development of steering devices. Essentially there were heavy gallows-like supports on the after deck that support two steering oars, one to port and one to starboard. These double steering oars introduced a new factor into the ancient seamanship. Why did they decide that two steering oars, on opposite sides, were better than two in tandem? It suggests that when under sail with tandem steering, perhaps there was interference between the helmsmen. It also suggests more efficient steering when the sail is braced up on the wind that the windward side oar is lifted out of the water. Or it is possible that one helmsman will handle both tillers and the crew effectiveness is increased. An any rate, this was an innovative development that was to become popular throughout the Mediterranean and prevail for at least two millennia.

To the north of Egypt in and among the islands of the Aegean there was a growing realm of sea oriented people. The Minoans, centered on Crete with their cutlure spread at least through the islands of the Cyclades, became a dominant sea power. This power was first exercised in supression of piracy to protect their sea commerce. We have today very scarce evidence in iconography of their sea-craft, but there is the splendid fresco from Akrotiri on Thera. This shows a procession of their ships reflecting the style that apparently was the state of the art from Egypt's watercraft of the beginning of the second millennium BCE. The Minoans were using in this exceptional fresco, as mentioned at the outset of this discussion, single helmsmen, except when under sail there were two in tandem. This is logical and typical, and the date must be no later than about 1760 BCE. It is quite probable that the Minoan seamen, followed soon by their successors, the Mycenians, adopted more substantial twin (port and starboard) steering devices.

Unhappily we can only speculate on steering devices for the next thousand years. The Egyptians throughout the remaining dynasties of the New Kingdom and the late period of the first millennium seemed content with the status quo of their ship construction. They were occupied with their border problems, neighboring wars, and political failures. The growing technology was always toward the north and west. For development of the ship and steering devices we must go with the flow. To Greece after the Mycenians, all the way to the Classic days —alas, we do not know that sort of ship Ulysses sailed. But we have some knowledge from archaeology of the bronze age ships and later.

The Kyrenia ship of the Fourth Century BCE was undoubtedly a twin "rudder" ship under sail alone. Its replica, KYRENIA II, has been sailed as such. The tiller was by then fastened to the rudder head and projected horizontally inboard.

The ships of classic Greece, like the coastwise trading ship found near Kyrenia and contemporary with them, carried twin side rudders. This included both the merchant trading ships as well as their warships. This is clearly shown in nearly all of the iconography. It is typical in that well known vase painting (Fig. 117, Casson 1971).

The larger warships, i.e. Triremes, of the Athenian navy in the Fifth Century BCE, made these side rudders in elaborate and prominent configurations. They were held to the side of the ship on a projecting swivel post allowing movement axially as well as radially allowing the rudder to be raised from the water without detaching it. The tiller at the rudder head passed inboard to the helmsman or to each helmsman, depending on the size of the vessel.

This sort of rudder design carried over to the Roman ship construction and prevailed throughout the Roman empire.

It is not clear in the western history of ships exactly how long the side rudder was continued in use. The northern European ship building practices closely following the early Norse styles and carried side rudders —but on a single side, naming the side in the early English-Saxon language "steerboard" or now, as it is called starboard. As for all normally right handed humans the right side or controlling side for a single steering oar had been in use for uncounted millennia. But with the Vikings it became the name.

As trade grew between counties and trade routes lengthened, ships began to grow in size. The old side steering oar for a sailing vessel or an oared galley proved a troublesome piece of gear. Vulnerable on the side to the sea and the nearness of piers and in moorings with proximity of other ships, it was doomed. It cannot be said where or when a permanent stern post attached rudder made its appearance, but in the mid-13th century iconography it is noticeable. It probably also changed the stern form of ships because it essentially was easier to fit and to use if the stern post was a straight timber.

The rudder-steering device operates in the water as an air foil in the air. When turned at an angle to the stream of water, it creates a force on both its surfaces whose net component is transverse to the course of the ship. This is the turning force. This force can be of different magnitudes according to the ship's speed, the angle of the rudder, and the shape of the rudder. The shape of the rudder is a factor that the helmsman has no control over, but historically it is interesting to compare.

A long oar-shaped rudder blade is more efficient than a broad, shallow blade rudder. The vertical dimension of a rudder (its depth) divided by its horizontal dimention (fore and aft) is called the "aspect ratio". A high aspect ration, other things being equal, is more efficient than a low aspect ration. This is similar to an aircraft wing —the long narrow wing common on all but military planes is highly efficient and provides more lift for its area than others. The ancient oar blade steering devices were this sort of shape, but in their very early usage in the Egyptian Nile craft they were used much like oars, to turn the stern laterally by pulling laterally on the steering oar.

The use of a steering oar later in Egypt and the Aegean was to turn it axially about the oar shaft. This was less tiring than the other method, requiring fewer helmsmen.

For long passages with the more efficient steering oar attached to the side of the ship the movement of the oar's blade through the water was further eased with less drag for the ship by grooves on each side of the trailing edge. There is no evidence that this was done in the early classical Mediterranean ships nor the Egyptian's, but it was done by the Norse in the end of the First century, A.D.

It has been traditional on many wooden sailing vessels of the 18th through the 20th centuries. The workings of such trailing edge groove are not of superstition or witchcraft. The explanation is simply hydrodynamics or aerodynamics if seen on aircraft as "spoilers". These grooves contribute to extending smooth fluid flow, called laminar flow, before it breaks down into turbulence.

Other than these small sometime sophisticated improvements on a rudder blade, there has been little basic change in this mechanism as a steering device for some five thousand years.

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ILLUSTRATIONS


Fig. 1


Fig. 2


Fig. 3


Fig. 4

LES NAVIRES GEANTS HELLENISTIQUES
(Etude à partir du "Monument des Taureaux" à Delos et des "Navires de Nemi")

Nous regrettons de n'avoir aucun vestige archéologique des flottes géantes hellénistiques comme nous en avons pour les flottes classiques grâce auc cales-abris (qui ont, entre autres, permis la reconstruction de l'*Olympias*) et pour les flottes de la République romaine (qui allaient de la trirème à la "10") grâce au "Trophée d'Actium" et au travail de W. Murray.

Pourtant nous savons que la "16" de Demetrios fut conservée par Persée et envoyée à Rome après sa capture et on peut suivre sa trace pendant 150 ans. De même la "18", sans doute l'*Isthmia* dédiée à Apollon à Delos par Antigone Gonatas était encore visible au 2ème siècle après J.C. et Pausanias rapporte qu'on disait d'elle qu'"il y avait neuf hommes jusqu'au pont supérieur". Si l'on en croit Lucien Basch, certaines galéasses d'Espagne avaient neuf hommes par rame, ce qui est plausible pour la grande galéasse de l'Armada, la Réale de France en avait bien sept. Le navire de Delos devait donc être une "birème" avec deux étages de neuf rameurs sur chaque rame, ce qui aurait donné en tout un millier d'hommes, chiffre raisonnable pour un navire exceptionnel.

Par ailleurs le premier navire antique (et le seul navire copié d'un navire de guerre), découvert bien avant celui de Marsala, avec l'avantage évident que représentait un navire trouvé en eau douce, fut le navire à éperon dit Nemi I, du nom du lac près de Rome où il fut retrouvé en vidant en partie ses eaux, dans les années Trente, en compagnie d'un second navire géant, Nemi II. Sa taille était de 70m sur 20. Ces deux navires sont attribués à Caligula qui organisa de grandioses naumachies sur le lac. Le premier navire devait servir à aborder le second sans néamoins le briser en deux de son éperon, comme on le voit dans la fresque d'Herculanum, pour s'y livrer aux amusements impériaux. La mégalomanie faisait aussi partie des fantasmes de Caligula et, s'il a reconstitué une super-galère (Nemi I), ce n'était pas pour qu'elle fût une barge lacustre comme le second, sensé lui servir de proie. Où aurait-il eu donc l'idée et le désir de trouver une modèle illustre sinon en copiant la "18" qui se trouvait à Delos, entretenue comme un temple voué à Apollon même si on avait oublié les Antigonides au 2ème siècle ap JC.

Cette "18" ne pouvait se situer à Delos que perpendiculairement au portique d'Antigone Gonatas. Il n'était nullement un ponton, mais représenté en toute majesté. Qu'on pense à ce que représente pour les Anglais le *Victory* qui a une valeur quasi religieuse comme pouvait l'avoir l'*Isthmia*. Pour en revenir à ce navire, il existe justement dans l'espace du Portique d'Antigone un Bâtiment appelé "Monument des Taureaux", de 67x9m environ contenant une auge de 45x4.5m. Dès 1910, Tarn, le grand spécialiste du monde hellénistique, y voyait un berceau pour le navire d'Antigone mais des hypothèses récent ont voulu y loger une trirème sacrée athénienne.

Nous allons tenter d'expliquer pourquoi cette thèse (cf Coupry in Bulletin de Correspondance Hellénique de l'Ecole Francais d'Athènes, *BCH*, 1973) est fausse pour trois raisons:

- Du point de vue épigraphique, ce sont des "agrès" de trière et non une trière que citent les Inventaires —des prêtes de Delos— à partir de 344 av JC.
- Du point de vue architectural, la date la plus haute admise est 300. Marcadé la remonte à 330-315. Il s'appuie uniquement sur le caractère attique qu'il trouve à la frise guerrière trouvée à l'arrière du Monument. Nous l'avons retrouvée dans les réserves du musée et identifiée pour permettre son classement. Ce fut déjà un exploit grâce aux photos de Marcadé d'en reconstituer partiellement le thème, vu son état d'effacement; en faire une analyse stylistique relèverait de la magie ...
- Du point de vue de la situation politique, les "Taureaux" sont un très important monument dans l'ensemble du sanctuaire et Athènes n'avait surement pas envie de faire une telle provocation ni envers les Déliens (après l'incident de 345), ni durant le règne d'Alexandre le Grand. Enfin, argument décisif, Athènes, après Alexandre, n'avait aucun moyen de construire un tel monument et d'y installer une trière après le desastre d'Amorgos en 322. Les "agrès de trière" cités pourraient par contre bien être les agrès de la vraie trière envoyée à Delos tous les quatre ans par Athènes lors des Delia. Ces agrès sont cités dans l'"Hymne à Delos" de Callimaque:

"Depuis les fils de Kekrops envoient à Phoibos les agrès sacrés toujours existant de cet ancien navire de theores".

Donc on a voulu, avec raison, dans ce grand monument, mettre l'Isthmia de Gonatas. D'abord Couchoud et Svoronos (1921) disent, parlant du Portique et des Taureaux "Les deux monuments font partie du même ensemble". C'est on ne peut plus vrai mais leur essai de restitution du Monument est on en peut plus fantaisiste: on y voit une trière dans l'auge de marbre et la poupe d'une autre trière, posée sur un socle de forme triangulaire, sous un lanterneau. La contradiction éclate quand on remplace la "18" de Gonatas par une grosse trière. Revenons donc plutôt à des choses sérieuses.

Homolle, quand il découvrit le Monument en 1884, déclara: *Pas une seule pierre de forme régulière et pouvant provenir des murs n'a été retrouvé.* Pour la bonne raison, à notre avis, qui'il ne devait pas y en avoir. Je sais bien qu'on pourra rétorquer que la plupart des marbres de Délos ont été pillés, mais le pronaos des Taureaux est resté alors qu'on ne voit aucune trace de construction de murs. Quant aux "belles tuiles" que décrit Homolle, elles ont disparu sauf les faitages soigneusement rangés de part et d'autre du Monument. Vu leur nombre, ils ne pouvaient qu'aider à couvrir le pronaos de huit colonnes et le thalamos à l'autre extrémité.

Quant à la *cella*, c'etait le bateau lui même à l'air libre sur toute sa largeur (environ 16m), les deux entrémités du sanctuaire abritant la proue et la poupe. Georges Roux (BCH 1981) n'a pas osé aller assez loin pour concevoir un temple sans murs, ce qui pourtant expliquerait bien ses hypothèses. Demetrios commença, écrit-il, le bâtiment pour y abriter sa "7" amirale (le Monument aurait alors suffi à la contenir puiqu'on peut estimer une "7" à 42m de long —selon John Warry— l'auge de 45m sur 4,5m lui aurait été un bon berceau); mais il n'eut pas le temps de l'y mettre. Gonatas acheva l'ouvrage mais pour son bateau bien plus grand (la "18"), d'où les deux éperons cités dans le pronaos par les Inventaires.

L'ensemble de grosses pierres qui se trouve à l'arrière a intrigué G. Roux car il était de facture grossière et différent de l'ensemble. Une étude plus approfondie a permis de voir qu'elles avaient été surajoutées sur le dallage de marbre déjà posé qu'elles avaient même brisé à cerains endroits. Cet ensemble a la forme d'un triangle dont on aurait coupé la pointe et il devait s'élever progressivement pour que vienne s'y poser la poupe de l'immense navire. On nous dira que cela ne s'est jamais vu, mais à bateau exceptionnel, temple exceptionnel. L'hypothèse est hardie mais les divers degrés du berceau que forme le Monument correspondent aux lignes d'eau de Nemi I en comptant qu'il dépasserait beaucoup son socle en largeur. A partir du bateau de Nemi, nous avons reconstitué graphiquement ce que pourrait avoir été l'Isthmia; il suffirait qu'elle soit un peu plus petite (60x16m au lieu de 70x20m) et plus tonturée pour y tenir (les architectes romains ont pu simplifier la structure pour un navire de lac —tout en le faissant plus grand car Caligula voulait quelque chose de plus grandiose que le plus grand bateau connu).

Néanmoins, les architectes navals italiens, après la sortie de l'eau des navires, ont fait des essais en bassin de la maquette de Nemi I qui s'est avéré très marin.

Pour la "18" si elle se trouvait dans les Taureaux, de coté ouest elle jouxterait exactement les monuments construits à cet endroit, et le large espace libre du côté est aurait permis aux pélerins de l'admirer parfaitement.

Si l'on admet que les Taureaux étaient le socle du temple qu'était le navire, d'autre part que ce dernier a inspiré Caligula —car il y a longtemps que l'on avait oublié la construction des hyper-galères hellénistiques— nous avons enfin des vestiges de ce que pouvaient être les flottes géantes hellénistiques.

Est-il plus aisé de mettre l'*Isthmia* dans l'espace vide à l'Est des Taureaux comme le préconice Lucien Basch? Trois raisons semblent s'y opposer:

- Les pélerins n'auraient pas eu une vue avec un recul suffisant pour un si grand navire
- On ne voit pas quels étais en bois auraient pu le soutenir des siècles durant
- Si l'*Isthmia*, comme il l'indique, a plus de 70m, comment peut-on imaginer des navires de taille supérieure comme la "20" et les deux "30" de la flotte Lagide. Ce dernier navire derait avoir une centaine de mètres. Il est donc raisonnable de donner à la "18" une taille plus "modeste" comme celle du bateau de Nemi;
- Enfin quid du "Monument des Taureaux" s'il ne contenait pas une "3" athénienne? Après Ipsos (301), c'est à Delos même que ceux ci ont humilie Demetrios. Un monument athénien n'était-il pas inacceptable, par la suite, dans l'aire du sanctuaire antigonide et son magnifique Portique?

Les navires de Nemi furent incendiés par les Allemands lors de la bataille de Rome; il reste le splendide musée restauré où ont été placées des maquettes malheureusement au 1/1000ème qui n'évoquent en rien leur caractère grandiose. Les autres éléments survivants sont dispersés dans divers musées du Latium ce qui appauvrit encore ce musée; on peut rêver d'une reconstitution grandeur nature qui n'aurait pas été hors de prix...

Le Monument des Taureaux, seul indice tangible "en creux" d'un navire hellénistique n'est pas valorisé par les chercheurs, même quand ils vont très loin comme récemment Georges Roux. Et pourtant ils ont la bénédiction d'Homolle, car je ne sache pas que l'on ait écrit comme lui, à propos de tout autre bâtiment antique que, comme nous le citions au début "pas une seule pierre de forme régulière pouvant provenir des murs n'a été retrouvée..." En outre, il est le seul monument majeur de Délos auquel n'a pas encore été consacré un facicule de la somme qu'est l'"Exploration archéologique de Delos" (33 volumes à ce jour).

Réhabiliter Nemi I comme navire de guerre et les Taureaux comme le berceau de la "18" nous donnerait des bribes d'éléments sur ces gigantesques flottes hellénistiques dont nous ne savons quasiment rien.

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ILLUSTRATIONS

Fig. 1 Un des bateaux de Nemi à sa Sortie des eaux du lac (Suritendance archeologique du Latium).

Fig. 2 Le Monument des Taureaux à Delos. On voit au fond les grosses pierres qui devaient supporter la poupe (photographie de l'auteur).

Fig. 3 Plan de l'aire du Portique des Antigonides à Delos:
29. Le Portique.
24. Le Monument des Taureaux avec le bateau géant l'inscrirant dedans.

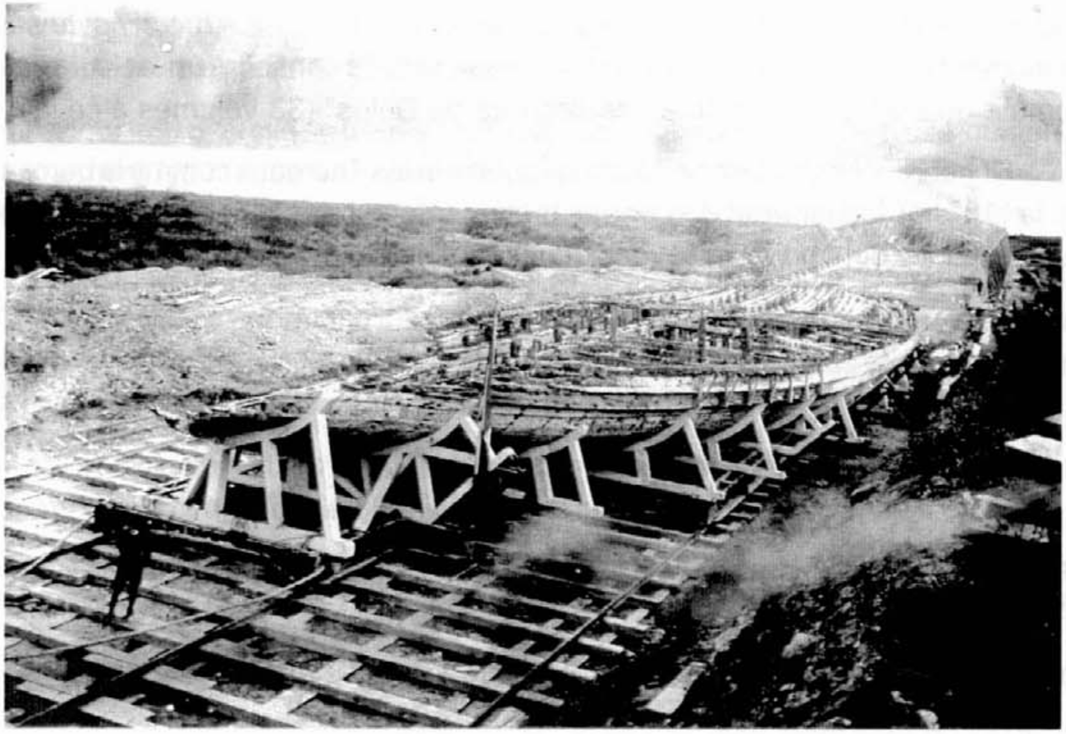

Fig. 1

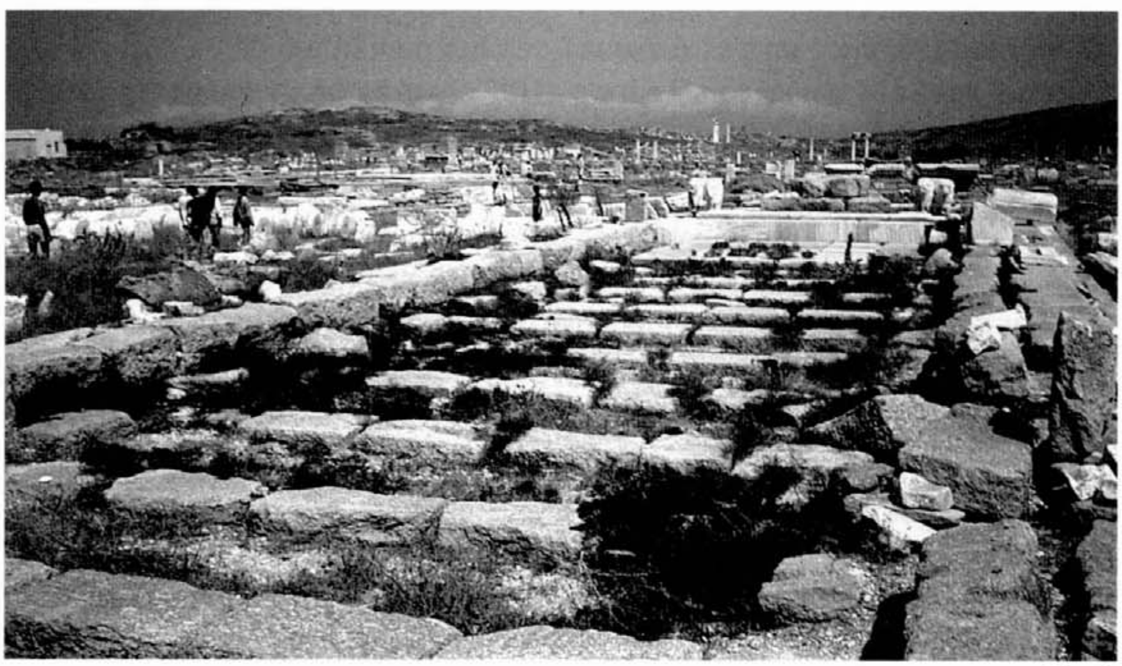

Fig. 2

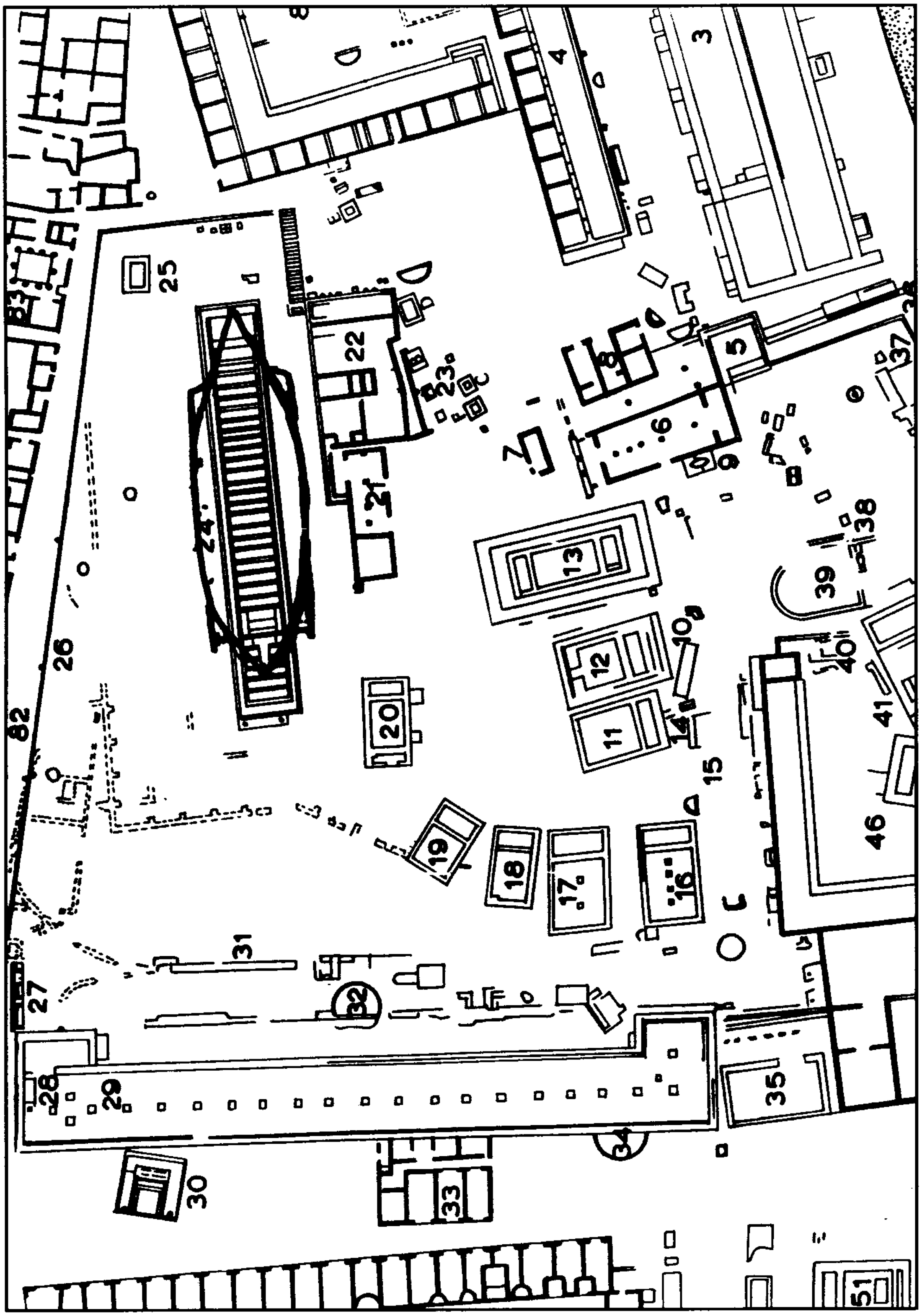

Fig. 3

KEELS, KEELPLANKS, AND THE DEVELOPMENT OF BACKBONE TIMBERS IN THE BRONZE AGE

The development of a "true" keel is traditional seen as a major innovation in many shipbuilding traditions, and is normally associated with benefits to hull strength and sailing performance. As older view even held that stepping a centerline mast and sailing were essentially impossible without a keel. Despite its importance and a common intuitive appreciation of its merits, it is difficult to define precisely what makes a keel a keel, and how it differs from a keelplank, hog, or other centerline timber. Many vessels get along perfectly well without keels, and some shipbuilders never take full advantage of the keel's potential.

This paper attempts to define more clearly the diagnostic characteristics of the keel and explore its development in Bronze Age Mediterranean shipbuilding. It is suggested that the primary definition of the keel is structural, as a centerline timber that contributes significantly to overall hull strength and stiffness, and that contributions to sailing performance are not diagnostic but an optional, secondary function. It is further suggested that Mediterranean shipwrights had developed a workable proto-keel by the Late Bronze Age, but had not yet realized all of its benefits or worked out how best to incorporate it into a shell-based method of construction. Indeed, it was not until Roman times that the keel was fully integrated into the structure of the ship.

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EDITOR'S NOTE

Dr. Frederick Hocker made a verbal communication and the above is only an abstract.

MARITIME MOBILITY IN THE PREHISTORIC AEGEAN[1]

"Settlements in the early agricultural stage have to be self-sufficient as far as food was concerned because they could not rely on seaborn traffic to supplement their own resources... The introduction of metal (in the Bronze Age) changed this..."

(Johnstone 1988: 67)

These sentences, first published in 1980 and reprinted eight years later, reflect a point of view about the early prehistory of Greece and the Aegean that is no longer tenable. Present evidence, though still meager, does not allow us to assume any longer the uncertainty and infrequency of seafaring in the Neolithic period ("early agricultural stage") or the self-sufficient isolation of Neolithic villages in Greece. Indeed, it is now quite clear that maritime trade/exchange, sometimes carried out over considerable distances, came to be reasonably well established during the Neolithic. Food may well have been exchanged (Perlès 1992:119), and it is clear from the early Neolithic colonization of islands such as Crete and Cyprus that quantities of seed grain and livestock were transported by sea. It is now necessary, in short, to accept the social and economic environment of the Neolithic period in Greece as rather more complex than implied in the above quotation and to recognize that considerable fundamental knowledge about seafaring and nautical technology must have been available to the inhabitants of the Aegean well before the invention of copper and bronze tools.

It will be the aim of this paper to demonstrate this by summarizing the evidence bearing upon the problem of maritime mobility in prehistoric Greece and to outline the development of seafaring in the Aegean from the earliest times through the end of the Neolithic period. *NB.* The reader should be aware that all dates are given in *uncalibrated* radiocarbon years b.p. (before present).

Palaeolithic/Late Pleistocene 10.000 b.p.[2]

This was a time of considerable movement on the mainland of Greece, where gradually accumulating evidence shows that a number of small human groups were engaged in a mobile subsistence economy of rather wide-ranging seasonal hunting and gathering. That this mobility even extended to the sea is also now beginning to become quite clear. There is reason to believe that the island of Kefallinia, separated from the western Greek mainland by at least 20 km of open sea (Van Andel 1989), had already been visited by Middle Palaeolithic seafarers some 40,000 years ago or more.[3] The island of Cyprus now seems to have been first colonized by human groups more than 10,000 years ago (Simmons and Reese 1993).[4] Neither of these islands could have been settled without the aid of some kind of sea-going transport.

Another site —Franchthi Cave on the Argolid coast of southern Greece— has revealed indirect evidence of maritime activity at about the same time as Cyprus was first settled (10-11,000 b.p.). Most striking certainly has been the discovery of a handful of artifacts made from the distinctive volcanic glass known as obsidian (Perlès 1987). Since we know that this raw material came from the Cycladic island of Melos (Renfrew and Aspinall 1990), it is clear that it could not have reached Franchthi without having traversed at least a modest stretch of open sea. This is the earliest appearance of obsidian artifacts in the Aegean Basin and, at least for the present, the only such occurrence at a Palaeolithic site in Greece.

The Indiana University excavations at Franchthi Cave have also produced the first indications of marine fishing in contexts contemporaneous to those with early obsidian. Among the species caught, eel, sea bream, and gray mullet are most common, suggesting a shallow-water lagoon fishery (Rose 1987). The site seems to have been located some 3 km from the shore at this time (Van Andel and Sutton 1987: figure 16), yet the inhabitants of the cave had also begun to collect quantities of marine mollusks among which *Patella* (limpet) was the most characteristic species (Shackleton 1988). Another indication of the mobility of these early foragers is the appearance of marine shells in Upper Palaeolithic contexts at the remote Klithi Cave in the rugged interior of Epirus (Bailey 1992). It is clear, then, that by the end of the Palaeolithic (ca. 10,000 b.p.) the prehistoric inhabitants of Greece had begun to exploit the sea and its resources in a variety of ways and their overall subsistence strategy included a marine component for the first time.

Distances between landfalls in the Aegean and Ionian Seas have never been great by comparison with other areas of early navigation such as the Pacific (cf.

Lewis 1975). Indeed, from what is known about Palaeolithic shorelines and sea level in Greece, it seems that these early maritime activities were largely confined to the near offshore zone and relatively insignificant distances of open sea. It has been suggested, for example, that a voyage to Melos in the later Palaeolithic could have been accomplished by crossing no more than 15 km of open sea (Van Andel and Shackleton 1982). Even with simple paddled floats or rafts, it is likely that such crossings could have been carried out in daylight and never out of sight of land. Obsidian was almost certainly not the reason for such voyages, given the small quantity of raw material brought to light in the Franchthi excavations (Perlès 1987). It must have been acquired in the course of another activity, possibly fishing, but more likely, I suspect, through adventure or exploration of their environment by these pioneering mariners.

There is no direct evidence about the precise nature of Palaeolithic sea transport in the Aegean, and we can only speculate about the appearance of the watercraft within the technological constraints of the time. Simple log, hide-float, or bundle rafts (McGrail 1981, 1988), presumably propelled by wooden paddles, seem to be reasonable possibilities. Beyond that we can not go at this time. In any event, it is at least now clear that, by the end of the Palaeolithic period in Greece, there was considerable familiarity with the sea. It was certainly not a case of mare incoquitum. As Cherry has recently observed (1990: 193), "Any lingering reticence in allowing hunter-gatherers considerable competence in seafaring must now be set aside ..." Further exploration of the sea would surely depend on their need to exploit the resources of that environment and their technological capability to satisfy that need.

Mesolithic/Early Holocene (ca. 10,000 - ca. 8,000 b.p.)[5]

We know even less about the archaeology of the Greek Mesolithic than that of the preceding period (s). While there are suggestions of activity at three or four other sites (Perles 1990a), nearly all of our present information about this period comes again from Franchthi Cave in the Argolid. Accordingly, it seems that the situation in the earlier Mesolithic differs little from that described above: a mobile subsistence economy based on hunting and gathering of various wild resources including fish and marine mollusks. Melian obsidian was still being acquired in very small quantities, and its procurement seems to have been no more than an incidental activity.

These conditions seem to have changed rather dramatically about 9,000 b.p., near the end of the rapid postglacial rise of sea level (Van Andel 1989). Most striking perhaps is the abrupt appearance in substantial quantities of the bones of large tuna, at least some of which reached weights of up to 200 kg (Payne 1973, 1975). In addition, the remains of grouper and barracuda are new. These species suggest the exploitation of a more fully marine environment than to those of earlier times (Rose 1987). Given the relative abundance of these remains, it is clear that marine fishing came to be a much more important activity than ever before at Franchthi Cave.

At the same time, Melian obsidian began to play a more prominent role in the lithics industry at Franchthi (Perlès 1990a). Yet, though it is both numerically (300 pieces) and proportionately (ca. 3% on average) more visible than before, obsidian tools were still a relatively minor component of the overall lithics assemblage. Perles" (1990a) detailed analysis of the industry indicates that the artifacts were manufactured locally and the raw material was imported in unprepared nodules. Again, its acquisition seems to have been secondary to some other activity.

That that activity may have been deep-sea fishing has long been suggested by the striking correlation between the stratigraphic distribution of tuna vertebrae and obsidian artifacts at Franchthi (e.g., Jacobsen and Van Horn 1974).[6] But, since we cannot as yet say how or where the fish were caught, it is difficult to determine the extent to which rafts or boats were utilized in the practice. It is, of course, quite possible that several fishing techniques were employed.[7] One possibility, suggested in fact by traditional fishing practices in the Argolid (Bintliff 1977, Guest-Papamanoli pers. comm.), is that of the shallow-water fishery correlated with seasonal tuna runs. Large boats may not have been required, and the other equipment might have included nets, traps or weirs (of wood, reeds or, as in the Argolid today, undressed stone), spears, or simple clubs —none of which, while technologically feasible, has yet been securely identified in the archaeological record at Franchthi. It has been suggested that tuna were captured by such a practice at Neolithic Saliagos in the Cyclades (Evans and Renfrew 1968). If, on the other hand, Van Andel is correct in reconstructing the optimal fishing grounds for large tuna in the waters of the Aegean east of Euboea or Andros (Van Andel and Sutton 1987) and therefore assuming "fairly distant fishing voyages as early as the middle (sic) Mesolithic" (Van Andel and Runnels 1988), we might expect that reasonably substantial boats would have been required—at least to transport the catch to settlements as far away as Franchthi. At this point, however, we can only be certain that some form of water transport was in use in the Aegean at this time and, given the post-Pleistocene rise of sea level, greater distances had to be negotiated at sea (Van Andel and Shackleton 1982).

We again have no direct evidence about the nature of these early seacraft. Yet, in light of the then-available technology, one can hypothesize that bundle rafts or relatively simple boats of reeds were available for use (Jacobsen 1976, Johnstone 1988). Indeed, it may be significant that microwear analysis has shown that reeds were the principal material worked with stone tools (of flint, not obsidian) at Mesolithic Franchthi (Vaughan 1990). Therefore something approximating the modern *papirella* (e.g., Tzalas 1989) seems a reasonable candidate for the Mesolithic craft.[8] Paddled reed rafts of this kind would surely have been adequate for the relatively modest crossings and cargoes (principally obsidian?) required at this time.

It may then be concluded that the later Mesolithic period in Greece witnessed a significantly increased awareness of the sea and its resources. This is indicated not only by the excavated remains at the (as yet) few certified sites but by the coastal orientation of those sites as well (Perlès 1990a). While there is no unequivocal evidence of human habitation in the Cycladic islands (including Melos) at this time (Cherry 1979: 25-32), it is at least clear that the archipelago had become familiar to Mesolithic mariners —perhaps even from both sides of the Aegean Basin. Similar exploratory crossings may well have been undertaken in the waters of the Adriatic off the northwestern coast of Greece. Van Andel and Runnels (1989) have seen the early procurement of Melian obsidian as a rudimentary ("fetch and carry") trade that was to develop more fully in the Neolithic period. The cumulative impression conveyed by this evidence, meager as it still is, is that the ninth millennium (b.p.) represents a pivotal time in the prehistory of Aegean seafaring.

Neolithic (ca. 8,000 - ca. 5,000 b.p.)[9]

That which defines and most distinguishes the Neolithic from preceding periods in Greece is the arrival of the first agriculturalists (farmers and herders) from the Near East, perhaps via Anatolia. While the precise circumstances bearing upon the onset of a fully agricultural economy in Greece remain to be understood,[10] one preliminary conclusion seems inescapable: at least some of the plant and animal domesticates introduced about 8,000 years ago (viz., sheep, goats, wheats), as well as presumably the accompanying human agents of change, must have reached Greece by sea.

Perhaps the clearest indication of maritime movement at this time (ca. 8,000 b.p.) was the first peopling of the island of Crete. There is no evidence of prior human habitation on the island (Strasser 1992).

The earliest occupation of Crete has recently become the subject of detailed reevaluation, and the implications for early seafaring are of considerable interest.[11] Beyond the newcomers themselves, none of the new plants and animals were indigenous to Crete: sheep, goat, pig, cattle, bread wheat, and probably barley. Accordingly, in order to establish a successful and enduring settlement of the sort for which we have evidence at Knossos, several individuals of all species were required. It has been conservatively estimated (Broodbank and Strasser 1991, Strasser 1992) that, in view of the magnitude of the undertaking implied by the numbers (and weight) of humans, animals, provisions for both, and seed grain involved, the colonization of Crete required a flotilla of some ten or more substantial vessels each carrying a ton or two of cargo; and, given the constraints of time and weather conditions, the initial expedition would likely have set out en masse rather than in a series of smaller to-and-fro ferrying operations. It is clear that such an endeavor could not have been accomplished without considerable planning and familiarity with the marine environment, and it is unlikely that simple reed-bundle rafts would have been adequate for an undertaking of this magnitude. Broodbank and Strasser (1991) are surely correct in concluding, "Although building on Mesolithic exploration, Neolithic island colonization involved a conceptual shift from Mesolithic usage of the sea, and also a distinct shift in the design of seacraft."

The advent of the earliest farming communities in Cyprus at about the same time may have taken place under similar conditions as Crete, but the details are less clear. An argument can be made (Cherry 1990) for at least two waves of Neolithic settlement of island after the pioneering landfall at Akrotiri/ Aetokremnos in the late Pleistocene. Like-wise, the initial colonization of the Aegean islands (including the Sporades and the islands off the Anatolian coast) occurred in several episodes during the Neolithic, that of Cyclades beginning with the settlement of Saliagos in the seventh millennium b.p (Cherry 1990). All of this suggests considerable maritime traffic in the Aegean and the East Mediterranean throughout the Neolithic period.

Once established in Crete, the Greek mainland, and elsewhere, these early farmers settled down in villages devoted in large measure to an economy based on plant and animal husbandry. Yet their contacts with the sea, whether direct or indirect, continued —of not, in fact, increased— as the Neolithic went forward.

Fishing still played a role in the economy of coastal settlements such as Franchthi and Saliagos, but the importance of large tuna seems less than it was in the later Mesolithic (Payne 1975, Rose 1987). The first appearance of fishhooks (of bone) points to innovations in procurement practices, but it seems that they continued to be conducted largely in the waters of the near offshore zone (Rose 1987). Therefore, while marine fishing seems to have been widely practiced, it is unlikely that watercraft requirements for it changed markedly from earlier times.

The Neolithic period witnessed an expansion of settlement and population throughout Greece and the Balkans, a concomitant of which was the development of inter-regional and long-distance trade. Neolithic trade and exchange is a complex subject that is only beginning to be understood (Jacobsen 1979; Perlès 1989, 1990, 1992; Runnels and Van Andel 1988; Van Andel and Runnels 1988). It involved a wide variety of goods - perishable and non-perishable, utilitarian and "prestige" —and was carried out at distances of up to hundreds of kilometers, both by land and by sea. Obviously, it is only the maritime trade that concerns us here.

Several items of exchange clearly point to seaborne trade: obsidian from the islands of Melos and Yiali, Aiginetan andesite (for millstones), Naxian emery, and probably "island" marble (for vessels and figurines). But it is the Melian obsidian about which we know most in terms of production and distribution. The use of Melian obsidian became increasingly abundant and widespread as the Neolithic progressed, reaching, at many sites, virtually 100% of the raw material for chipped stone tools by the end of the period.

Perlès (1989, 1990) has recently argued —and, I believe, persuasively— that Melian obsidian was procured and distributed in different ways during the course of the Neolithic. In the earlier phases (ninth and eighth millenniums b.p.), she sees the trade in the hands of a limited number of "itinerant specialists", probably from the mainland since Melos and the other Cycladic islands were still uninhabited, who procured the raw material, prepared it into easily transportable cores, and distributed it to settlements of selected staging points ("emporia", Van Andel and Runnels [1988]) throughout Greece. Who these traders were is, of course, an interesting but unanswerable question at present. Nor can we say whether or not other commodities — some (e.g., andesite) rather weighty— were traded independently of obsidian. Yet it does seem likely that, given the limited number of trading specialists and the increasing consumer demand for the raw material, the (annual?) cargoes would have required vessels more substantial and seaworthy than the (hypothetical) reed-bundle raft of the Mesolithic.

While specialised trade may have persisted to a limited degree in the later Neolithic (seventh and sixth millenniums b.p), Perlès (1989, 1990, 1992) sees the earlier monopoly breaking down at that time. Melos and most of the other islands were now inhabited, and obsidian was found in much abundance throughout the

Aegean Basin. Therefore Perles (see also Torrence 1986) proposes that the Melian sources became more accessible to all and the direct procurement of the raw material in (larger ?) unworked nodules became the dominant practice. This suggests that, by the end of the Neolithic, sea traffic in the Aegean had increased dramatically and navigational knowledge and skills were shared by more people than ever more.[3]

Given what is known now about Aegean trade and island colonization in the Neolithic, what can we say about the nature of the seacraft utilized in those activities? Until recently, very little attention had been given to this subject by scholars interested in ship construction or shipping in ancient Greece (e.g., Casson 1991, Jonhston 1985)—largely, one assumes, because of the rarity of marine representations in Aegean art prior to the Bronze Age. While the non-representational (non-figurative) character of pre-Bronze Age in the Aegean clearly does present a problem, there is an accumulating body of evidence that justifies addressing the question afresh.[13]

Marangou (1991, 1994) has recently shown that representations of boats are not entirely alien to the Neolithic art of southeastern Europe. Of the several examples of probable terracotta boat models assembled by her, one from Thessaly in northern Greece stands out as being of particular interest (Marangou 1991: Pls. IV, VIIb-c, VIII, IX). The unique Tsangli model has been dated on ceramic grounds to the Middle Neolithic (i.e., late eighth or seventh millennium b.p.) and thus becomes the earliest representation of a boat in the Aegean. While it may be dangerous to make detailed inferences about construction practices from small (and probably symbolic) objects of this type, one has to be struck by the surprisingly early keel-like member (photo-keel?) and attendant implications of plank construction. The model reveals no evidence of a mast (sail) and, if a reliable reflection of a real boat, was presumably propelled by paddles or oars (Marangou 1991). Unlike most of the other models, which may have been best suited to islands waters, the Tsangli boat appears to be quite seaworthy.[14]

The keeled (and planked?)[15] Tsangli boat may have evolved from an earlier Neolithic "platform" or "freighter" raft of the type proposed by Kapitän (1990). The latter would have been constructed of split timbers lashed together and, if not caulked, would not have had a watertight hull. The platform (deck) would have permitted the transporation of cargo that did not tolerate exposure to seawater; it would also have facilitated the shipping of living cargo, human or animal. It is not unreasonable to suggest, therefore, that the colonizers of Crete and the first farmers in Greece reached the Aegean in seacraft similar to this (Kapitän 1990: see especially Figs. 8.4-5).

The Tsangli model reveals no evidence of mast or sail, but should we conclude that the sail did not exist in Neolithic Greece? I do not believe so (Kapitän 1990).[16] The sail is first attested in Egypt and perhaps Mesopotamia in the sixth millenium b.p. (Casson 1991), already before the end of the Greek Neolithic, and it would not be surprising to me if it were found to be present in the Aegean by that time as well. Sails can be made of a variety of materials (McGrail 1987),[17] but the apperance of spinning and weaving equipment by the later Neolithic at least (e.g., Jacobsen 1973) makes the creation and use of fabric sails at that time quite feasible. The sail would have increased the speed of the Neolithic trading vessels on long-distance voyages (Kapitän 1990), but one wonders if in fact the difficult return trip from Melos to the mainland have served as one of the magor incentives for the invention of the sail in Aegean (cf. Cherry 1990).

One can rather easily imagine, then, the existence of rudimentary sailing vessels plying the Aegean well before the end of the Neolithic period. Such vessels would have been of lashed (or sewn) plank construction and propelled by a single square sail (McGrail 1988), probably supplemented by paddles or oars (cf. Marangou 1990) —in short, a boat perhaps not far different from that deduced by McGrail (1983) for prehistoric crossings of the English Channel. This does not mean, of course, that simpler craft such as the reed-bundle raft ceased to be used for fishing, small-scale coastal ferrying, or other traditional maritime tasks.

Finally, it seems inevitable, as Kapitän (1990) has already implied, that the growth of maritime trade and the advent of more substantial and sophisticated wooden boats during the Neolithic would have led to the appearance of specialists in "watercraft carpentry" and the emergence of coastal communities (i.e., individuals or groups living in those communities) specializing in boat building. Such settlements would probably have had a long dependence on fishing, and some may have come to be important trading stations ("emporia").[18] This may be yet another example of maritime specialization in the Aegean Neolithic and serves to draw attention to the probable interrelationship among fishermen, traders, shippers, and boatwrights. One might ask, in conclusion, if Neolithic boat-building establishments would be recognizable in the archaeological record.

Summary and Conclusions

I have attempted in this brief presentation to demonstrate the long history of seafaring in the Aegean world and the not insignificant maritime achievements of the early prehistoric inhabitants of Greece prior to the more fully documented conditions of later prehistory and the historical period. The evidence from the earlier periods is admittedly scanty, but I do not believe that we should be deterred from our pursuit by the absence of Neolithic (or earlier) wrecks and the near silence of the art sources. I simply can not conceive of Greece and its islands, given their location and historical dependency upon the sea, not having developed a very early intimacy with their marine environment and the means to achieve some measure of mastery over it. To think otherwise seems naive and parochial, especially when viewed from the perspective of other areas of early navigation such as Australia and Oceania.

The picture that emerges from this overview of Aegean seafaring is one of modest beginnings. The late glacial and early postglacial "testing of the waters" by mobile hunting-gathering groups from the mainland must have been initially tentative, probing, and exploratory. Rising sea level and an attendant shrinking of the resource base on land before the end of the Pleistocene would have contributed to the hastening of this process (cf. Van Andel and Sutton 1987), and it would not be long before more frequent and purposeful voyages were undertaken.

By the ninth millennium b.p., after thousands of years of interacting with their maritime environment, the later Mesolithic inhabitants of Greece must have amassed a fund of experience and knowledge about navigation and other nautical matters. They had begun to exploit the resources of the deep and sow the seeds of an exchange network that would take full root in the subsequent Neolithic period. The impression given by the limited remains known at present is that their (homebase?) settlements were very much oriented to and dependent upon the sea.

The arrival of the first farmers in the Aegean, colonization of the Aegean islands, and the development of maritime trade and exchange around 8,000 b.p. and thereafter imply a need for more substantial and sophisticated water transport. I believe that the need was met, and despite the lack of direct evidence to support it, the indirect evidence is sufficient to show that water transport technology was not a limiting factor (cf. Cherry 1985) in the development of trade or any other maritime activity in the Neolithic period. Indeed, the existence of that technology must have facilitated the increased maritime mobility that marked the Neolithic cultures of the Aegean. If that is so, I would submit that more telling strides in mastering the Aegean were made before, rather than after, the invention of metal tools in the Bronze Age.

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NOTES

1. I wish to thank the following for their thoughtful comments in the preparation of this paper, both during and after the Nauplion meetings: Mr. Gerhard Kapitän, Dr. Christine Marangou, Mr. Harry Tzalas, and Dr Yannis Vichos.
2. Useful recent accounts of the Palaeolithic period in Greece are Kourtessi-Philippakis 1986, Perlès 1987, and Bailey 1992.
3. The absolute date of these remains has yet to be firmly established. See, e.g., Bailey 1992: 12.
4. While "Palaeolithic" may not be an appropriate descriptor for the "Akrotiri phase" (cf. Cherry 1990: 153), the Akrotiri (Aetokremnos) site does at least date to the Late Pleistocene.
5. The term "Mesolithic" is now generally accepted as a descriptor for the early post-glacial (post-Pleistocene), pre-agricultural settlements of Greece. The most up-to-date overview of the few known remains can be found in Perlès 1990a.
6. While the evidence clearly no longer supports the linkage between tuna fishing and the discovery or first use of obsidian, it still seems to hold for the first significant exploitation of the raw material at Upper Mesolithic Franchthi.
7. The equipment and methods of capture would surely have depended upon the size and behavior of the species involved. With large species such as tuna, some type of watercraft must have been required (Biagi et al. 1984). On Mesolithic fishing, see, e.g., Clark 1952: 84ff.; Bintliff 1977: 240-245; Rose 1987; Powell 1992.
8. If rafts and boats are to be distinguished by their watertightness or use of waterproofing (McGrail 1981), Tzalas has stressed (pers. comm. 1993) that, while water may bubble through the cracks in the reed bundles, the papirella does not need a sealer because of its "unsinkable" construction. Incidentally, the reed from which the modern papirellas are made has been identified (M. Sheehan pers. comm. 1990) as *Scirpus lacustris*, not *Phraqmites* (contra Johnstone 1988: 60).
9. The Greek Neolithic is a long and archaeologically much better known period than those which preceded it. Lack of space and the limited scope of this paper do not permit, for the part, a consideration of the Neolithic by sub-periods. For a slightly dated overview of the Neolithic of Greece, see Theocharis 1973.
10. For a recent assessment of the origins of agriculture in Greece and the Near East, see Hansen 1991.
11. In addition to the studies of Broodband and Strasser (1991) and Strasser (1992), I am advised that a large and comprehensive treatment of early Crete is now in preparation: *The Pleistocene and Holocene Fauna of Crete and its First Settlers*, edited by David S. Reese. I thank Dr. Reese for sharing the proposed contents of this work with me.
12. The problem of shared knowledge and skills may not be so simple. Perlès (1992: 145) acknowledges that now everyone could have been a competent sailor, given the "specialist know-how" required to navigate in the Aegean. Likewise, Lewis (1975: 17) notes, "We have evidence from widely separated parts of Oceania that navigational lore was usually restricted to a few and often considered secret..." I have noted similar attitudes among Greek fishermen today. It may be that, while the procurement of Melian obsidian was opened up in the later Neolithic, the shipping of the raw material was still in the hands of a limited (but increased?) number of "specialists".
13. It would be unwise to let the presence or absence of a particular phenomenon in ancient art, determine our investigation of that phenomenon. Such, for me, would be an unfortunate example of archaeological positivism. A case in point: if we were to confirm our investigation to preserved boat models, we might well conclude that sails did not exist on Late Bronze Age boats in the Aegean (cf. Johnston 1985). Therefore the rarity or absence of marine motifs in pre-Bronze Age art in Greece may be a function of the conceptual basis of that art rather than of reality.
14. There is little else to look to for help in visualizing Aegean Neolithic boats. I know of no representations of boats in Neolithic vase painting, which is not surprising in view of the linear,

geometric character of that decorative medium. Hood has reported, however, a fragmentary sherd (#307) from Chios with relief decoration "suggestive of three figures upright in a boat" (Hood 1981: 60-61 and Pl. 8). I thank Yannis Vychos for this reference.

15. The earliest known planked boat in the eastern Mediterranean is the famous vessel of Cheops of the Egyptian Old Kingdom (McGrail 1988), chronologically equivalent to the Aegean Early Bronze Age. Yet we need not assume that simple planking could not have been produced before the advent of metal tools (Case 1969, McGrail 1988). The first appearance of stone axes and adzes in the Neolithic allowed for the use of wooden planks in both floor and wall construction at a number of sites in northern Greece and the neighboring Balkans. Wooden planking has been reported at Servia (Ridley and Wardle 1979) and Sesklo (Kotsakis pers. comm. 1993) in northern Greece as well as at a half dozen sites across the border in Yugoslavia and Bulgaria. The availability of suitable timber would have been an important consideration in boat construction. Could the forest clearance that began in the Neolithic in central and northern Greece (Van Andel and Runnels 1988) be a reflection of, *inter alia*, the increasing need for naval timber?
16. The sail is not represented in Aegean art until the Middle Bronze Age (Marangou 1990), but see the cautionary remarks in note 13 (*supra*).
17. We cannot of course rule out the possibility that the early reed-bundle rafts had reed sails, as some ancient sources record (McGrail 1987: 163).
18. We might expect that, at least at the outset, these centers would have benn located near the best sources of timber. Yet one of the few remaining caique-building centers in Greece today —the village of Kiladha near Franchthi Cave— cautions otherwise. All of its timber is imported, thus indicating that other factors contribute to a village"s importance as a boat-building center.

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SOME ASPECTS OF LEAD SHEATHING IN ANCIENT SHIP CONSTRUCTION

This paper deals with the archaeological evidence for lead sheathing of ships in the Mediterranean from the 6th century B.C. to the 5th century A.D. The term "lead sheathing" refers to a thin layer of lead that was affixed to the outer surface of wooden-hulled ships. The lead was attached with small copper tacks with large heads. During the period of time that lead sheathing was used, two thirds of all ships were covered in this manner.[1]

60 shipwrecks of this category have been identified, of which 50 were lead sheathed. On the others, lead patches were used for repair. A few dozen pieces of lead sheathing were found separately, with no remains of ships nearby. Bits of copper sheathing were also discovered on several hulls. The wreck sites were located all around the Mediterranean.

The analyzed information:

Time frame distribution:

Lead sheathing appears from the mid-4th century B.C.[2] through the 2nd century A.D.[3] The use of lead sheathing reached its peak during two specific periods: The first extended from the end of the 4th century B.C. to the beginning of the 3rd century B.C. The second, and the main period, lasted from the middle of the 2nd century B.C., until the middle of the 1st century A.D. (Fig. no.1).

Ships were not found with lead sheathing, earlier than the 4th century B.C., or later than the second century A.D. Lead patches were found throughout the entire period mentioned, that is to say from the 6th century B.C. to the 5th century A.D. Actually, patches have been used until today. The parches served to repair the hull or the lead sheathing itself.

Size of the plates;

Generally the plates were 1 meter square, but this is an average because there were those that reached 1.7 to 2 meters (Nemi[4], Kyrenia[5]). On the other hand there were those which were less than half a meter (St. Jordi[6]). The thickness of the plates ranged from between 0.9 to 2.5 mm. In 50 percent of the cases the thickness was 1 mm (Fig. no. 2).

Placement;

Lead sheathing was placed on the underside of the ship from the keel continuing upward to the 1st or 2nd strake above the water-line. Only 2 of 13 examples were reported to have lead sheathing up to the gunwale. (Kyrenia[7], Punta Scaletta[8]). These sheets of lead were overlapped so that the water would *flow smoothly over them, from the bow to the stern.*

Woven Textile;

Pieces of woven textile, soaked in an oily, water repellant material, were inserted between the wooden planks of the hull and the lead. It should be noted that textiles were found, pressed between the wood and the lead, in only about 25% of the cases where lead sheathing was discovered. One of the reasons could be due to the poor state of preservation of the fibers.

The Tacks;

The lead was attached to the ship's hull by means of numerous small tacks. Usually the tacks were of copper. Their heads had an average diameter of slightly under 2cm. and their length an average of just over 2cm. There is a correlation between the length of the tacks and the diameter of their heads. The tacks of the sheathing created a diagonal or pentagonal pattern on the surface of the lead with an average distance between then of about 7 cm. (Fig. no. 3).

Discussion and Conclusions;

The main question is, what was the reason for the use of lead sheathing? Did it serve the stability of the ship, as a modern keel does today? In my opinion we are talking about a technical improvement that required an investment of material, labour and maintenance. But its advantage was that it provided a number of good solutions as well. It was a physical barrier against the teredo and the crustacea and since the lead is poisonous, it served as antifouling as well. At the same time it improved the sealing of the ship and its stability. It is important to emphasise that the problem of sealing the ship was solved mainly in the method of construction —shell first. Consequently the lead sheathing was not necessary as a basic sealant, but it aided in the sailing. This is true as well of the lead based paint that was used on the ship's hull which served as an antifoulant. According to results received from a computer model, the lead sheathing improved the stability of the ship as well. So, it can be said that lead sheathing served the following purposes, in the order of importance: a barrier against the teredo and antifouling, a better sealant, and improvement in ship stability. A further preliminary idea is suggested, concerning lead sheathing;

a. There is a numerical connection between the displacement of a ship and its length. This relationship has been mentioned for example by Casson[9], Charlin and others[10].

Let's call this relationship, F1:

Displacement (m3) = F1(length of vessel (m)).

b. There is, as well, a mathematical connection between the thickness of the hull planks and the length of the ship. This relationship is dealt with by Michael Fitzgerald in his work on the ship from Caesarea[11]. This is confirmed by this study as well. We will call the relationship between the length of the ship and the thickness of the planks, F2:

Length of vessel (m) = F2 (Thickness of hull planks (cm))

c. In this research a connection was found with a height correlation (above 95%) between the length of the tacks of the sheathing and the thickness of the hull planks. As has been already stated there is a connection between the length of the tacks and the diameter of their heads. Therefore there is a mathematical-statistical connection, as well, between the diameter of the heads of the tacks and the thickness of the planks. It should be stated that this connection is correct only for ships with one layer of planks. However, if we are speaking about ships with two layers of planks, the relationship is correct only concerning the thickness of the exterior layer. We will call this connection F3.

Thickness of planks (cm) = F3 (Length of tacks (cm))

or = F3* (Diameter of tacks heads (cm))

If we summarize all this we see that there is a mathematical-statistical connection between the length of the tacks (and the diameter of their heads) and the ship displacement. That means that a specific function F, exists, which describes the relationship between the tacks and the size of the ship.

F = F1 (F2 (F3))

Displacement (m3) = F (Length of tacks of lead sheathing (cm))

or

= F* (Diameter of heads of tacks (cm)).

But, a word of caution, this is a preliminary idea, that needs further investigation. All the functions described, exist with a correlation above 90% and they are results of linear regression, but when they are done 3 times its level of correlation can be lower. Additional information about lead sheathing is needed and welcomed so that we will be able to continue the research and confirm or negate the last idea raised.[12]

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The National Center and Museum of Spain in Cartagena. The D.R.A.S.M. in Marseille France. Center Camille Jullian in the University of Aix-en-Provence. The museums in Marsala, Camarina, Lipari and Albenga and the institute in Borbighera. I.N.A. in Bodrum and in Texas, Mr. Harry Tzalas in Greece. The Israel Antiquities Authority and the Center for Maritime Studies of the University of Haifa, Israel.

ILLUSTRATIONS

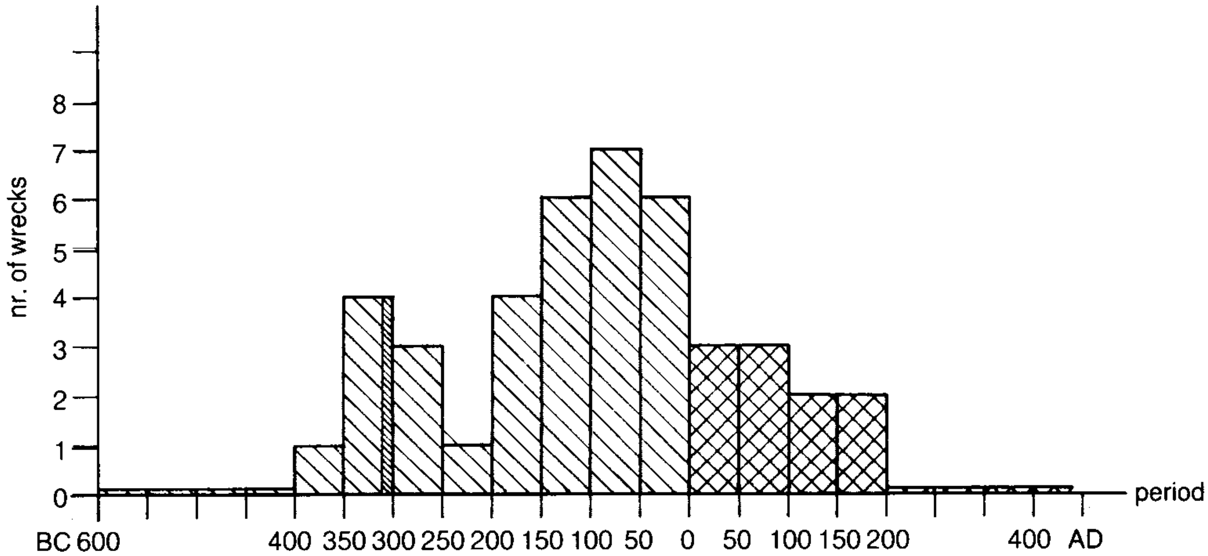

Fig. 1

	Minimum	Maximum	Average	Comments
Sizes of the sheets	0.25m	2m	1mx1m	
Thickness of the sheets	0.9mm	2.5mm	1.27mm	50% 1mm

Fig. 2

	Minimum	Maximum	Average	Comments
Length of the tacks	1.	5.5	2.33	corrected average 1.96
Diameter of the heads	1.05	4.5	1.94	corrected average 1.79
Distance between tacks	3.	15.	6.88	

Fig. 3

WHAT WAS THE EARLY BRONZE AGE SHIP WRECKED AT DOKOS?

During the excavation of the 3rd millenium BC underwater site at Dokos no remains from a sea-craft were found.[1] Some researchers concluded from this that the pottery and obsidian lying between stones were not from a sea transport, but from the nearby land settlement. There were found, however, two not very heavy disc-shaped stone anchors, each having a biconical hole for the attachment of the rope. These anchors which correspond well to the period and the use in question lay not far from the underwater site in positions west of it, suggesting that during calm weather a small sea-craft had been moored with them and to the rocky shore, exactly in the way as should have to be done there for the loading and unloading of goods, since no other possibility of approach exists.[2]

A small landship, if it really had happened, does not exclude the existence of a pottery and obsidian cargo lost from a water craft. A possible explanation is that the cargo fell into the sea from a raft. An unexpected strong squall from the west, the direction from which the narrow bay with the site is unsheltered, may have pushed the craft quite abruptly against the rocky shore with the consequence that it capsized, or at least, that it heeled heavily and lost the cargo or an essential part of it. A raft would not have sunk, but would have continued to float, and this would be in accordance with the evidence that no wooden remains exist on the site.[3]

In the paper which I presented in 1989 to the 3rd Symposium in Athens I referred to a passage in Pliny (*Nat.Hist.* 7.57.15) according to which rafts were used on the Aegean in prehistory (Kapitän, 1993:).[4] Until now there is no archaeological find to tell us how these rafts were made, but pictorial evidence shows, in different ways and representations which are much in accordance with each other, the appearance of what could well have been a seagoing craft on the Aegean during the 3rd millenium BC. This evidence consists of twelve incised figures on so-called frying pans from Syros, one more on a potsherd from Orchomenos, two hammered graffiti on stones from Naxos and a clay model from Palaikastro, Crete. All these representations were for the first time collected by Lucien Basch and compared to each other as one and the same type of water craft (Basch, 1987:78 ff.).

The interpretations which have been proposed for these representations are not discussed here, but I list the main features which we can recognize in all or almost all of them.

At one end there is a rather high post which is somewhat inclined outward. From the Palaikastro model we learn that it is affixed on the pointed end of the craft. The frying pan figures all show a fish which is attached to a kind of stick on top of the post and set with its head foremost. The fish is not shown on the other representations.

In the clay model the other end of the craft is broad and rounded, while in the frying pan figures as well as in the hammered graffiti this part is shown as being more or less raised. In all representations, except for the incomplete picture on the potsherd, this end is provided with a projecting part. One of the hammered graffiti (Basch, 1987: fig. 169) shows a man stepping with his left foot on it, while an animal can be seen aboard. Thus the projection may well be a gangway.

Moreover, both the frying pan figures and the hammered graffiti show a bend at the bottom line of the craft which seems to protrude somewhat downward. The bend is closer to the end with the projection than to that with the post. The bend is not shown in the clay model, since this had to rest steadily and therefore has an entirely flat bottom. The same is true of ancient Egyptian water craft models, though many of them represent a craft which actually had —as we know— not a flat, but a rounded bottom.

On the other hand, the Palaikastro model shows an additional feature which could not be made visible in the incised and hammered pictures, because these are to be understood as profiles of the sides in which the feature in question is invisible. Inside the "hull" of the clay model there are two crosswise running structures, approximately in the central part of the craft. These look like thwarts, but have round cross sections, and therefore they are likely to be cross bars which strengthen and stiffen the craft structure.

Finally, from the clay model we learn that this craft was a kind of a hull-shaped construction. Its more or less vertical side walls show this clearly. If nevertheless this craft might have been a log raft, then it must have been side-sheltered, similar to Indian boat-kattumaram, which are locally called *teppa* and are used for fishing in the coastal waters of the Bay of Bengal, in parts of Andhra Pradesh and Orissa *(Fig. 1)*.

For this reason the raft-shaped reconstruction which I here propose for the sea-craft that lost its cargo at Dokos, began with a study of these Indian boat-kattumaram. I have examined all the details which can be gathered from what has been published on them (Hornell, 1970:67, pl. XII; Menon, 1980:4 f., 11 ff; Anon., 1984: fig. 2; Mohapatra, 1986: 1, 11 fi., 19; Wiebeck, 1987:64, Abb. 35-37). The results of this study are a scale drawing *(Fig. 2)* and a model in size 1:10 of a 5-log *teppa* from Uppada, Andhra Pradesh *(Figs. 3-4)*. When beached after returning from fishing, these *teppa*, like other log rafts, are usually dismantled in order to allow the timbers to dry for re-establishing their full buoyancy. The dismantled 5-log *teppa* falls into three pieces, one of which is the central log. Both outer logs remain pegged to the adjoining log, together with the shelter board or washstrake which is stitched to the outer edge. The three prow-piece timbers are also permanently affixed by means of metal bolts, one prow piece onto each dismantled part. The reassembling with ropes is quickly done by lashing the logs near the raft ends. In addition, there are two cross-beam-like laths to be fastened across the shelter boards, one on the fore end portion and the other at the stern.[5]

From this preparatory study I learned much about the systems and techniques applied in these *teppa* and in various other related Indian log rafts, of which many thousands are still in use for fishing on the Indian Ocean.

In the proposed reconstruction of a 3rd millenium BC Cycladic sea-craft as a side-sheltered log rafts this know-how is basically employed, not slavishly imitated. The following description refers to the scale drawing of the conjectured reconstruction *(Fig. 5)* and to a schematic model of it in size 1:10 *(Figs. 6-7)* which was built for experimentation and demonstration.[6]

The raft consists of seven floating logs and five more which are raised like prow pieces of Indian log rafts. Both groups of logs are joined to each other by means of scarfs above a bend in the raft's bottom line. The seven floating logs taper towards the end with the post, with the exception of the longest centre log. This is turned around in such a way that its largest end is below the post in order to make possible a solid attachment of the post in a sufficiently large and deep mortise. This arrangement of the centre log is unattested in ethnographic rafts, but known from Bronze Age plank boats, such as Ferriby 1 and 2 (Wright, 1990: figs, 4.2-4.4). On the proposed Cycladic raft it is the opportune solution for the erection of a rather high and massive post at the pointed end.

The five logs of the second group taper towards the opposite raft end which is slightly raised, according to what the figures on the frying pans and the hammered graffiti show. In plan these logs are shaped to form a rounded end as in the Palaikastro model. From this end the central log of the group projects and forms the conjectured gangway, which on sea during navigation would also have served as toilet facility.

How use was made of structures at the stern end for physical necessity, can be gathered from pictures dating to later periods (Basch, 1987: figs 566 and 563, cf. also p. 127 section "Marinatos"). According to this interpretation the raft would have approached the shore with its broad stern end ahead. This is slightly raised in order to pass easier through an eventual surf girdle and to touch a rocky shore with the gangway at a convenient height (cf. Fig. 6).[7]

At sea, the raft would have been paddled with its pointed fore end ahead. Accordingly, the fish affixed on top of the post shown in the frying pan pictures would have faced forward. In the paper presented in 1989 I had already interpreted the post as a lookout (Kapitän, 1993:). The stability which is required for this use, is provided by the raft's broad stern end half, and the lookout is slightly inclined forward for reasons of counterbalance. The fish looking out from the post may be a pictorial analogy for the use of the post as lookout for fishing[8] and at the same time as magic, by which the affixed fish would find the shoal of its equals in the sea. Perhaps the frying pan pictures relate to a version of this sea-craft used for tuna fishing with net.[9]

In that early period a lookout was also useful for navigating on the open sea, and man would have applied it as soon as he was able to set up a suitable post. The peak of an island may be visible to a person standing a meter or so higher up over the raft logs, but is still hidden under the horizon to eyes at a lower point. A crewman, at first stepping on the step of the post at shelter height, would easily climb up on top of the lookout, where he could stand straight by holding fast to the prolongation stick. This is set in a mortise and an adjusted flute cutting at the inner side of the post, and is lashed to the post with cords.

The assemblage of the raft is made with three rope lashings around flute cuttings in the logs. Two embrace both groups of logs at the stern end over the scarfs and the third clasps the three logs at the pointed fore end. In addition, there are two stiffening cross bars over the central part. These rest in cuttings on top of short vertical wooden boards which are affixed to the outer logs by means of treenails.[10] The first cross bar could have served to prop a short mast which is kept in a mast step mortised in the centre log. In this way the crew would have profited at least froms stern winds by hoisting some kind of a simple square sail.

Like other log rafts, the conjectured Cycladic raft when beached would be dismantled from time to time for the already mentioned reason. Then it falls into two groups of three parts each. The outer log of each group and side remains pegged to the next adjoining log, like on the *teppa*. Here, however, the connections consist of short horizontal treenails rigidly affixed in rould mortises. Such treenails are also applied between the long centre log and the next inner logs, as well as under the centre log for the permanent fastening of a keel-like timber. Apart from adding to buoyancy this timber strengthens the raft structure, protects its underside and the lashing ropes and facilitates beaching over rollers.

The sides of the logs to be dismantled are likewise provided with some short of round treenails and corresponding horizontal mortises. These serve to pre-establish the joining positions and for this reason the diameter of the mortises is larger than that of the treenails so that they can separate easily.[11]

All raft structures over water level and especially those on deck are ballast; hence their weight has to be kept to a minimum. The sheltering sides of the conjectured Cycladic raft would have been made from light material, though strong enough for the purpose in question. As a rule, prehistoric man would have navigated with these rafts only in fair weather conditions. As soon as the sea became too rough, the crew would have beached the raft on the nearest shore. The side shelter had to prevent objects on board to be could easily washed off by the swell, and it had to protect the crew against splashes, especially the paddlers who squatted on one knee along the sides.

The side shelter may have consisted of panels of wicker-work woven from withies,[12] and these could have been made fairly impermeable by fastening on them inside, plaitings of reed or palm leaves or of other plants.[13] The wicker-work should have been sufficiently resistent and flexible at the same time. The sizes of the panels had to be made according to the requirements of paddling, that is to say, the panels could not be higher than 0.40-0.45 m; otherwise they would hinder the movements of the paddler's arms. Their lengths, however, had to be at least 0.70m according to the minimum distance between the squatting paddlers. The panels would be lashed to both pairs of vertical boards, and in between these and the raft ends, to short vertical posts. These are mortised at corresponding intervals near the outer edges of the raft.[14]

At this point the following aspects and questions have still to de discussed: the possible sizes of these rafts, their loading capacities and their crews of paddlers.

A version of 8.4 m in overall-length, as presented in the scale drawing of *Fig. 5* and in the model *(Figs. 6-7)* seems to have space for ten of twelve paddlers. Its calculated buoyancy, however, is only about 750 kg, since the weight of the structures over water level and on board —the raised stern end with gangway, lookout post, supporting vertical boards and cross bars, side shelter posts and panels and the sailing equipment— has also to be taken into account. From experiments with the model it results that the loading capacity that can be used is even somewhat less than 50% of the buoyancy, i.e. 350 kg at the most. When overloaded, the raft risks heeling and capsizing. This means, the 8.4 m-version without cargo can be paddled at best by five or six men, or might be used by four (or perhaps five) fishermen and their net fishing gear. In this case the weight of the catch has also to taken into account.[15]

Suppose the model presented here were of a size 1:13 (instead of 1:10), then the overall-length of the raft would be almost 11m and the width about 2 m. In this case, the loading capacity would be twice as great as that of the 8.4 m-version. That is to say, with the 11m-raft a crew of four of five could transport a cargo of about 400 kg—which is certainly not very much! At the same time the construction would have already reached its possible maximum width, if not actually surpassed, since the maximum thickness of the logs that could be shaped depended on the available trees.

The maximum overall-length that may be realized from the longest available trees by applying the proposed raft design is about 14m. The centre log of a raft of this size measures approximately 11.6m in length, but the raft's width would not be more than that of the 11m version mentioned before, perhaps only 1.9m. The loading capacity of such a 14 m-raft suffices for a crew of seven and some 800kg of cargo. This would be still a modest transport.

The loading capacity could be increased by setting two layers of floating logs. The result of this, however, is not doubling, but an increase of about 80%, resulting from favoured by the fact that the weight of the structures on board remains unvaried.

From experimenting with a small and rather schematic simulation model in size 1:20 of an 11.1m version (o.a.-length), in which both layers of floating logs are imitated in one of double width, the loading capacity is about 1300 kg. This means a crew of five could transport with this raft a cargo of about 1 t. On a 14 m-raft with two layers of logs a crew of seven may transport about 1.5 t.

Were rafts built with two layers of floating logs? As to ethnographic evidence there are bamboo rafts which even consist of several layers of bamboo sticks; they serve to transport heavy loads, e.g. of sand lifted from the river bed.[16] Also ambatch rafts with more than one layer or branches are known (Hornell, 1970:pls. VII f.); but there is no present-day log raft having two layers of floating timbers.[17] The reason for this is that nowadays log rafts are exclusively used in small-scale fisheries. The large trees which are available in the tropics for making log rafts are in each case big enough for one-layer rafts.

When reference is made to the subtropical regions of the Mediterranean and to prehistoric log rafts used for transport, the situation seems to have been different. There is probably a hint of this in Homer; he narrates in the *Odyssey* (V, 244) that Odysseus built a raft from twenty trees, though he had to use it only for himself. According to the rules of log raft construction, the great majority of the logs shaped from such a large number of trunks would have been for the floating structures, while only some timber would have served for structures on board. Therefore it is rather likely that Odysseus' raft had two layers of floating logs, and this would have been indispensable if the available trees were comparatively thin.

The passage of the *Odyssey* may demonstrate that in Homer's time there was still a living tradition of how log rafts had to be made and that they had to be built from a not too small number of trees in order to obtain a sufficient loading capacity.

The craft depicted on the frying pans from Syros suggests that versions existed with up to 26 paddlers a side (Basch, 1987: 84 and fig. 168A). A log raft of the design proposed here had to be about 24.5 m in overall-length and with two layers of floating logs in order to carry altogether 52 paddlers and a few other crewmen.[18]

Theoretically this is possible. Two floating layers provide a more compact construction which may resist some swell, even if the raft is so long. The required additional logs can be joined length-wise by means of scarfs in varying positions. However, such long versions, if they really were constructed, would have hardly been of practical use because of their cumbersomeness in turning manoeuvres. They might have been employed in ceremonies, like the one shown in the Akrotiri painting (Basch, 1987:117, fig.232) and for racing.

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NOTES

1. I refer to the publications by the Hellenic Institute of Marine Archaeology (H.I.M.A.), especially to that by Papathanassopoulos *et al.*, 1992, as well as to my own observations on occasion of a visit ot the site during the excavation campaign in Sept. 1991.This paper is dedicated to H.I.M.A. in gratitude for the hospitality on the site and for the information which was most generously granted to me on all aspects of this underwater excavation.
2. The relatively light weight of both anchors —each weighs about 25 kg— makes it very likely that they belonged to a sea-craft, whose small loading capacity meant that it could not carry much heavier ones. In an agitated sea these anchors would not suffice. In this case the craft would have to be beached; at Dokos this could probably have been done on the small stony shore at the inner end of the bay, about 220 m east-south-east from the wreck site.
3. The same is true for an Early Bronze Age cargo in the sea at Lipari, Aeolian Islands, dating to about 2000 BC (Ciabatti. 1978: 28, and 1985; Bernabò Brea, 1978: 40, and 1985: 30 f).
4. Reference to this passage has been made by Ernst Assmann in his study on the raft of the *Odyssey* (Assmann, 1904: 13 f.), August Koester in a chapter on Scandinavian rock carvings (Koester, 1934: 126), and Lucien Basch in his *Musée imaginaire* (Basch, 1987: 76).
5. Large *teppa* are rigged with a sail similar to a trapezoidal boom lug, but arranged like a crane sprit (cf. Doran, 1981:40 ff.). The crew may lower one or two centreboards. Short oars are used for rowing or paddling.
6. Structures and sails of both models *(Figs. 3-4 and 6-7)* were built at Syracuse bq order of Salvatore Patania, whose brother Andrea Patania kindly assisted gratuitously with his great experience and knowledge in nautical matters and calculations.
7. On Dokos the rocky shore close to the underwater site presents exactly the conditions for landing with a slightly raised gangway, as is applied on the conjectured log raft.
8. Lookouts for fishing are still in use on various fishing craft in the world, e.g. very high ones on the swordfish vessels in the Strait of Messina, lower ones on Chinese vessels around Taiwan (von Brandt, 1984: 56 ff.). I myself saw small lookout constructions on fishing boats at Sozopol, Bulgaria, but cf. especially the lookout post of an obsolete fishing boat in the Strait of Messina (von Brandt, 1984: fig. 67).
9. I have here in mind a net fishing method similar to that practised by shore seining, but carried through in open waters by casting large-meshed nets from two or more fishing craft which encircle a shoal of big tuna fish (cf. Kapitän, 1992: 123 and fig. 10).
10. The shelter boards or washstrakes of the *teppa* being only stitched to the edges of the outer logs *(Fig.2)* are stiffened inside by means of supporting rods. This device is dispensed with on the conjectured Cycladic log raft, because here the supporting boards are mortised in the outer logs.
11. A corresponding arrangement for pre-establishing the joining positions of the logs is shown in a drawing of a 5-log *teppa* (Menon, 1980: fig.on p.13)
12. Remains of withies were recently found in the Bronze Age shipwreck at Ulu Burun; they seem to have been used in the fence-work of the ship (Pulak *et al.*, 1992:11, fig.12). The find is compared with the fence-work of Syrian ships depicted on an Egyptian wall painting in the New Kingdom tomb of Kenamun (*ibid*: 21, fig.13). In this context the wicker-work fencing with withies reported in the *Odyssey* (V, 257) is also mentioned.
13. In tropical countries plaitings made from coco palm leaves which are cut lengthwise in two halves, after having at first been soaked and then dried again, are largely used for various kinds of shelter, e.g. in the walls of huts. On certain sailing *oru* outrigger canoes in Sri Lanka such plaitings are set on top of the washstrake at the windward side as shelter from splashes. In the Mediterranean area plaitings from rushes (*Juncus*) may have been used for corresponding purposes.
14. The small panels for the model were made from leaf rudiments of a *Liliacaee* plant which resembles *Yucca*, but has prickly leaf edges, *Dasylirion serratifolia*. When the dry leaves of

such a plant which had died in the author's garden, fell off from the stem, the leaf rudiments appeared and turned out to be just of the needed size. They are bent and therefore had at first to be soaked in water for about two weeks and then to be dried under pressure below bricks. Each panel was made from two flattened pieces glued together which then were again compressed, using clothes-pegs and bricks. Only the round panel under the lookout post did not require previous soaking. The laborious work of producing the panels and of stitching them together and to the model was done by the author himself.

15. The weight of the crewmen here calculated is 60 kg. for one man, corresponding to that of present-day men in their twenties whose height is not more than 1.65m. Prehistoric Mediterranean men were probably neither taller nor heavier. For fishing in coastal waters the sailing equipment would be dispensed with together the wicker-work panels which would be rather hindering. Small fishing craft was probably not provided with them or only with a low side shelter. On the hammered graffiti of a small craft with two men standing aboard (Basch, 1987: fig. 152) only the lower parts of the men's legs are hidden, either behind a low side shelter or an outer log set slightly higher (cf. Kapitän, 1993: fig.).
16. Such bamboo rafts were recorded in photographs by the author in Sri Lanka on the Maha Oya, north of Negombo, Gampaha District.
17. An early 10th century drawing in the National Maritime Museum shows a sailed and paddled Polynesian log raft at Gambier Island, Tuomoto Archipelago, engaged in the transport of at least twenty people. Six floating logs of the raft are visible and do not seem to be particularly big. Judging from some men standing upright, the central logs of the raft would not be longer than 8-9m, while those at the sides are shorter. The weight of this large number of passengers suggests the existence of a second layer of logs which, however, is not recognizable in the picture (Rudolph, 1974:111, fig.78; Johnstone, 1980, 233, fig.16.13). Other explanations may be that the logs were of a very light wood such as balsa, or that the artist did not show the true proportions between passengers and raft. The latter, however, would be quite unusual for the period in which the drawing was made.
18. In my opinion it is very doubtful, if a dugout of the width and length required for 52 paddlers could have been built in the Aegean from any tree available.

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ILLUSTRATIONS

Fig. 1

Fig. 2

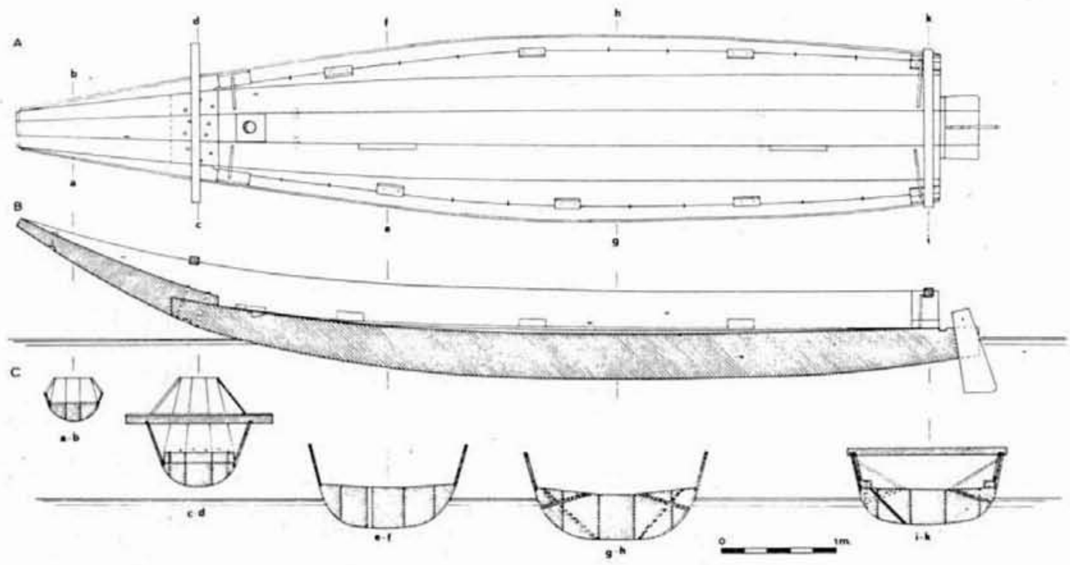


Fig. 3

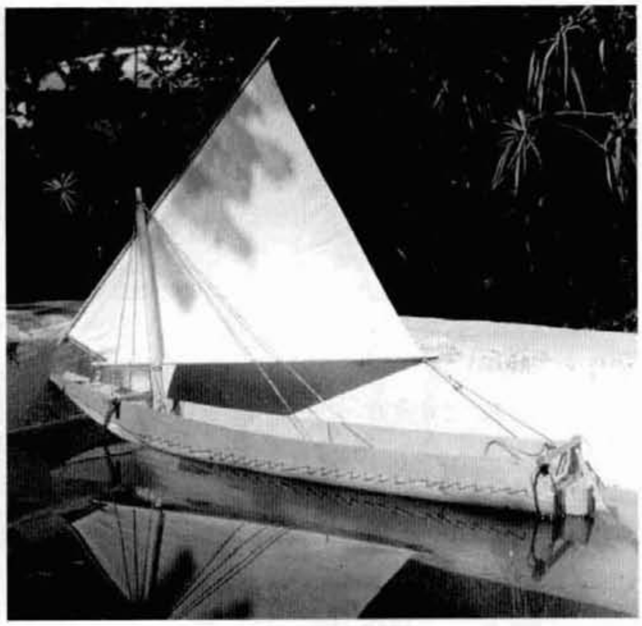


Fig. 4

Fig. 5

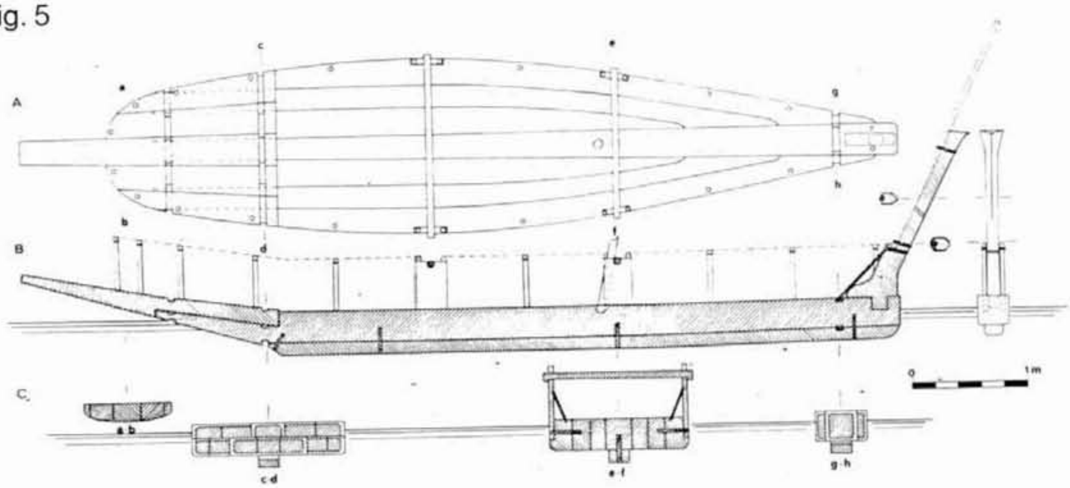


Fig. 6

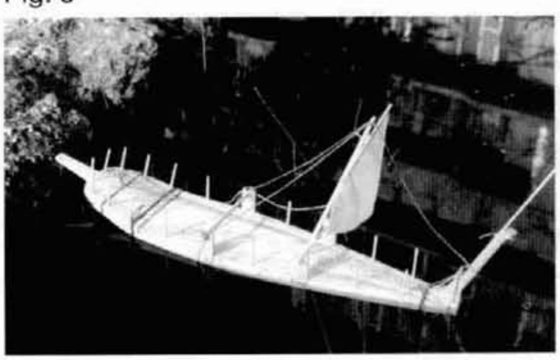
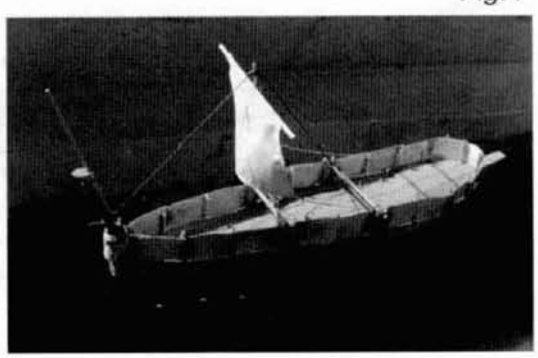


Fig. 7



UNDERWATER SURVEYING IN THE ISLAND OF ZAKYNTHOS, GREECE

1. FIELDWORK

During the first excavation period in 1991, the delimitation of the archaeological zone was carried out, in order to define the probable area of the wreck, including at the same moment all the visible objects on the seabed. To mark the ten points of the perimeter, white plexiglass labels with black numbering were used, in order to be visible by ordinary light to the eye. Next a line was set out on the central part of the delimited area, connecting three reference points A, B, Γ. This line was used as base for the measurements. The whole site was, then, divided in six sectors S1 to S6. The directors of the excavation Katerina Delaporta and Mensun Bound, chose the first archaeological trench to be dug, which was designated as Y, Φ, X, Ψ, Z, Ω and their positions determined with tape measurements.

During 1992, the initial trench extended and was created the second trench Y, Ω, H, Θ (Fig. 1).

For recording the positions of the numerous finds during the two years of work, a great number of tape measurements have been taken, using in addition to the reference points A and B, and all the eight points defining the trenches (Fig. 2, 3).

In summer 1992, the directors of the excavation, decided to apply photogrammetry as a survey method parallel to the traditional one. This was the first attempt to use photogrammetry underwater in Greece in the field of archaeology, based on the theoretical considerations and using modern computer controlled high precision photogrammetic instruments.

For the photogammetric part of the project, responsible was Mr. D. Karadaidis, a specialist in Photogrammetry, head of the Photogrammetry division at Ministry for Macedonia and Thrace, V. Koniordos, the architect of the excavation and Sergio Garbari, underwater photographer of the Italian Ministry of Culture.

A number of highly specialised computer programs had been developed in order to meet the particular demands of the underwater photogrammetry, which are slightly but decisively different to those on land.

First of all, an iron square frame was constructed, 1.5x1.5 m. A number of parallel lines were realised by thin strings, and have been placed in between the two extreme edges of the frame. This frame photographed underwater from two different distances.

The same repeated on land for comparison purposes. The reason for this procedure was to calculate the lens distortions according to the Plumb Line method. Its principal is based on the truism that strait lines in object space must appear as such in the photograph. Any deviation is attributed to lens distortions. Having calculated the distortions at two different focusing distances, is possible to calculate the distortions at any other distance, using a specific formula. These data served as input for the subsequent computer programs.

The fact that, it was not possible to cover the whole area of interest with just a pair of photographs, a number of overlapping photos had to be taken, forming a strip. The overlap was fixed at about 80%.

In order to connect all the photos in a unit and to relate the contents of single ones, we need the so called tie or pass points. These are points appearing on at least two photos. Their realisation performed by placing on seabed, numbered plexiglass tags, 15x15 cm, with a cross in the center and secured from possible displacement by bronze pins, 40 cm long.

After that, the actual photography started. A Nikonos V, underwater camera with 28 mm Nikkor lens has been used.

Apart from the usual considerations of lighting, depth of field, and buyoancy, it must be ensured that during photography the proper overlap, in this case 80%, can be obtained as well as conditions for stereoscopic viewing. The placed tie points provided good guidance for the determination of the planimetric position of the exposure stations, which controls the amount of overlap. The distance from bottom, being about 4 meters due to the fact of low visibility in the site, obliged us to increase the number of tie points. Although, the additional requirements for field work, were the measurement of a distance between two tie points in order to fix the scale, a number of distances and depths have been taken, for checking purposes.

2. DATA PROCESSING

The first step in data processing is the measurement of the photo coordinates of the tie points. The measurements have been performed in the analytical photogrammetric plotter, PLANICOMP P3 ZEISS with PHOCUS software. The measuring accuracy of this instrument is about 5 microns, (1 mm=1000 microns) (Fig. 4, 5).

After that, the measured coordinates are input to the especially developed computer programs in order to determine the coordinates of the tie points in a ground coordinate system, the distortion parameters and the focal length.

The mathematical model used is the well known collinearity conditions with additional parameters, formulating the symmetric radial and decentering distortions and corrections to focal length. The adjustment was based on the least squares principal and the wrong observations were screened out by the "danish method" of error detection.

It must be emphasized that failure to include the above mentioned parameters and correction terms, which vary according to environmental conditions (salinity, pressure, temperature of water) and focusing distance of the lens, results in a deformed model and wrong conclusions.

So, methods using measurements from underwater photographs without any model correction provisions, lead undoubted to unrealistic output.

Finally, after the introduction of the proper data in the computer the actual mapping started. During this, as a guidance for photointerpretation, served a plan produced from underwater measurements, by C. Fitton, M. Bound and V. Koniordos.

3. CONCLUDING REMARKS

Of course, photogrammetry is not a panacea, but when applied, "transfers" the underwater situation into the tranquille office environment, where measurements and analysis can be carried out. So, things that could have been overlooked or missed on the seabed, can be reexamined and/or added.

The wealth of information conveyed in a photograph provides a permanent exploitable record, in which metric and interpretative data can be retrieved any time after the underwater situation has changed.

In conclusion: The use of photogrammetry is not an economic method for recording every find; but is an extremely time-saving and cost-efficient method of accurately determining the disposition of the major features and their precise planimetric distances from the control points. It is also a quick and easy way to verify tape measurement positions which as all field archaeologist know, are vulnerable to error.

V. Koniordos,
C. Fitton, Mensun Bound and
D. Karadaidis

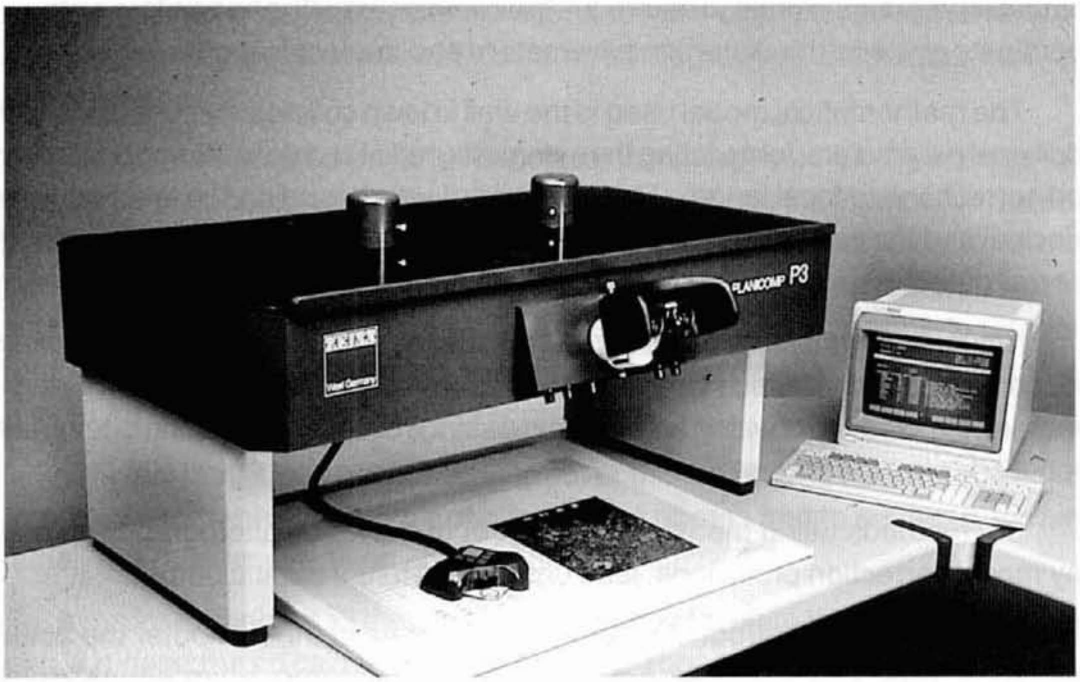


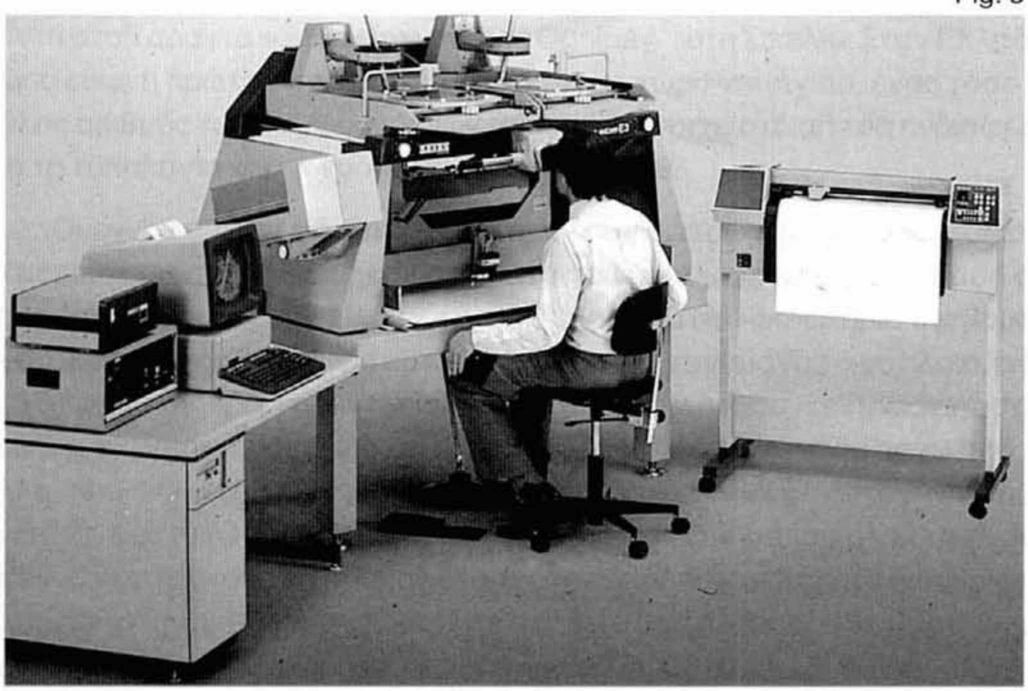
Fig. 1

Fig. 2

Fig. 3

Fig. 4

Fig. 5



ΣΥΝΟΛΟ ΠΥΡΑΜΙΔΟΕΙΔΩΝ ΑΓΚΥΡΩΝ ΑΠΟ ΤΟ ΝΑΥΑΓΙΟ ΤΗΣ ΑΝΤΙΔΡΑΓΟΝΕΡΑΣ ΣΤΑ ΚΥΘΗΡΑ

Από το 1993 το Ινστιτούτο Εναλίων Αρχαιολογικών Ερευνών[1], έχει συμπεριλάβει στο ερευνητικό του πρόγραμμα την υποβρύχια ανασκαφική έρευνα ενός ναυαγίου του τέλους του 4ου π.Χ. αιώνα, που είχε εντοπισθεί στη διάρκεια αναγνωριστικής έρευνας στις νοτιοανατολικές ακτές των Κυθήρων. Το ναυάγιο βρίσκεται σε μικρό βάθος, από 12 έως 19μ., στη βορειοανατολική βραχώδη ακτή της νησίδας Αντιδραγονέρας (φωτ. 1), σε απόσταση μισού περίπου μιλίου από τις ανατολικές ακτές των Κυθήρων.

Στο χώρο εντοπίσθηκε ένα σύνολο εννέα λιθίνων πυραμιδοειδών αγκυρών (φωτ. 2), του γνωστού τύπου, του οποίου δεκατρείς είχαν ανελκυσθεί κατά την εκβάθυνση του λιμανιού της Ζέας, μία κατά την εκβάθυνση του λιμανιού του Βόλου, τρείς έχουν βρεθεί στο ναυάγιο La Madonnina[2] στη νότια Ιταλία κοντά στο Τάραντα και μία στο ναυάγιο Ognina 4[3], στη Σικελία. Στον Ελλαδικό χώρο είναι η πρώτη φορά που εντοπίζεται σε χώρο ναυαγίου, ένας τόσο μεγάλος αριθμός των συγκεκριμένων αγκυρών, στοιχείο ιδιαίτερα ενδιαφέρον για τη τυπολογία και τη χρονολόγηση του τύπου.

Οι εννέα άγκυρες δεν εντοπίσθηκαν συγκεντρωμένες στο ίδιο σημείο. Τέσσερις από αυτές βρέθηκαν στο μυχό του όρμου σε μικρή απόσταση από την ακτή, ενώ οι πέντε υπόλοιπες βρέθηκαν κοντά στο ακρωτήριο της βορειοανατολικής ακτής. Στο χώρο αυτό θα πρέπει να είχε ναυαγήσει το πλοίο, αφού στη διάρκεια της έρευνας εντοπίσθηκαν οι μεγαλύτερες συγκεντρώσεις οστράκων αγγείων και κεραμεικής και οι δύο άγκυρες πεσμένες η μία πάνω από την άλλη, που φαίνεται αδύνατον να είχαν αγκυροβοληθεί με αυτόν τον τρόπο (φωτ. 2). Δυστυχώς όμως δεν εντοπίσθηκε κάποιο τμήμα του πλοίου και αυτό οφείλεται είτε στο ότι το πλοίο καταστράφηκε ολοσχερώς κατά διάρκεια του ναυαγίου στην ακτή της νησίδας, είτε στο ότι ο βραχώδης βυθός της περιοχής δεν επέτρεψε την διατήρηση ενός έστω τμήματός του.

Το ναυάγιο χρονολογείται στο δεύτερο μισό του 4ου π.Χ. αιώνα ή στις αρχές του 3ου, κατά μία πρώτη εκτίμηση της κεραμεικής που έχει ανελκυσθεί μέχρι σήμερα. Στην περιοχή δεν βρέθηκαν μεγάλες ποσότητες οξυπύθμενων αμφορέων μεταφοράς, όπως συμβαίνει συνήθως στα ναυάγια των εμπορικών πλοίων αλλά κυρίως χρηστικά αγγεία, που δεν μπορούν να χαρακτηριστούν εμπορεύσιμα και μάλλον πρέπει να συνδεθούν με τα χρηστικά αγγεία, που θα χρησιμοποιούσε για τις ανάγκες του το πλήρωμα (φωτ. 3). Στα λίγα αγγεία μεταφοράς που ανελκύσθηκαν περιλαμβάνονται τουλάχιστον δύο μεγάλοι αποθηκευτικοί πίθοι και περίπου δεκαπέντε οξυπύθμενοι αμφορείς. Είναι γεγονός ότι ακόμα και εάν είχε συλληθεί το ναυάγιο κατά την αρχαιότητα ή και τη σύγχρονη εποχή, θα είχαν εντοπισθεί στην περιοχή αρκετοί οξυπύθμενοι αμφορείς ή άλλα αγγεία μεταφοράς που θα καταστράφηκαν στη διάρκεια του ναυαγίου. Είναι λοιπόν πιθανό το πλοίο που ναυάγησε στο χώρο αυτό να μετέφερε φθαρτά κυρίως υλικά, τα οποία όπως είναι φυσικό δεν διατηρήθηκαν[4].

Στα δύο άλλα ναυάγια, στα οποία είχαν εντοπισθεί παρόμοιες άγκυρες, βρέθηκαν στο ένα τρείς (La Madonnina) και στο άλλο μία άγκυρα (Ognina 4). Στο ερώτημα εάν στην Αντιδραγονέρα είχαν αγκυροβολίσει περισσότερα του ενός πλοία, και ένα από αυτά για κάποια αιτία ναυάγησε, δεν είμαστε σε θέση να απαντήσουμε. Η περίπτωση του μόνιμου αγκυροβόλιου στην περιοχή θα πρέπει πάντως να αποκλεισθεί, αφού ο όρμος είναι ιδιαίτερα εκτεθειμένος στο συχνό βόρειο άνεμο της περιοχής και κυρίως γιατί η αποβίβαση στη νησίδα είναι σχεδόν αδύνατη από την βόρεια ακτή της. Στη περίπτωση που ήταν ένα το πλοίο, που βρέθηκε στο χώρο αυτό, θα μπορούσε, λόγω κακοκαιρίας, να είχε αγκυροβολήσει με τις τέσσερις άγκυρες που βρέθηκαν στο μυχό του όρμου, που σημειωτέον είναι και οι μικρότερες σε μέγεθος, και στη συνέχεια να ναυάγησε προς το βορειοανατολικό ακρωτήριο του όρμου, χωρίς να καταφέρει να χρησιμοποιήσει τις υπόλοιπες άγκυρες. Μία άλλη εκδοχή είναι να δέχθηκε το πλοίο επίθεση, πιθανώς πειρατών, κάτι ιδιαίτερα συχνό την περίοδο αυτή, και φυσικά αφού λεηλάτησαν το πλοίο το κατέστρεψαν. Μία τέτοια πράξη θα δικαιολογούσε και τον μικρό αριθμό κινητών ευρημάτων στο ναυάγιο και φυσικά ότι δεν εντοπίσθηκε έστω και ένα μικρό τμήμα του πλοίου.

Από το σύνολο των εννέα αγκυρών τέσσερις έχουν ήδη ανελκυσθεί και μεταφερθεί για φύλαξη στο Αρχαιολογικό Μουσείο Χώρας Κυθήρων. Οι άγκυρες αν και παρουσιάζουν ορισμένα κοινά χαρακτηριστικά δεν παύουν να έχουν και ορισμένες διαφορές μεταξύ τους. Κατ'αρχήν το σχήμα τους είναι κατά κανόνα κόλουρης πυραμίδας με παραλληλόγραμμη βάση και με οξείες ακμές, που σε ορισμένες είναι περισσότερο στρογγυλεμένες (φωτ. 4), ενώ μόνο μία άγκυρα είναι απιόσχημη. Έχουν όλες μία οριζόντια κυλινδρική οπή σε μικρή απόσταση από τη στενή βάση της πυραμίδας η οποία ενώνεται κάθετα στο πάχος της άγκυρας με μία άλλη κάθετη οπή. Η κάθετη αυτή οπή σε όλες τις άγκυρες είναι γεμάτη με μόλυβδο (φωτ. 5). Ο μόλυβδος φέρει ανάλογα μία ή δύο οπές, οι οποίες θα πρέπει να συγκρατούσαν ένα αντικείμενο, πιθανώς ένα κρίκο, που θα χρησίμευε για την πρόσδεση και την καθέλκυση της άγκυρας. Παρατηρήθηκε ότι οι οριζόντιες οπές των αγκυρών δεν έφεραν ίχνη φθοράς και μάλλον δεν θα πρέπει να περνούσε μέσα από αυτές σχοινί. Ο ακριβής τρόπος πρόσδεσης των αγκυρών και φυσικά καθέλκυσης μας διαφεύγει, αν και θα πρέπει να γινόταν με ένα συνδυασμό ενός ξύλου, που θα περνούσε μέσα από την οριζόντια οπή και του κρίκου που συγκρατούνταν από το μόλυβδο της κάθετης οπής. Από τους υπολογισμούς που έγιναν ανάλογα με τις διαστάσεις των αγκυρών φαίνεται ότι το βάρος τους κυμαίνεται από 150 κιλά για την μικρότερη έως 500 κιλά περίπου για την μεγαλύτερη άγκυρα.

Η πετρολογική ανάλυση των δειγμάτων και των εννέα αγκυρών, έδειξε ότι όλες προέρχονται από το ίδιο ηφαιστιακό πέτρωμα, ρυόλιθου έως δακίτη, με πιθανή προέλευση την Αίγινα ή το ακρωτήριο των Μεθάνων. Από το ίδιο πέτρωμα φαίνεται ότι έχουν κατασκευασθεί και οι άγκυρες, που βρέθηκαν κατά την εκβάθυνση του λιμανιού της Ζέας. Ακόμα στο χώρο του ναυαγίου βρέθηκαν και αρκετές στρογγυλεμένες κροκάλες, που πιθανόν προέρχονται από το έρμα του πλοίου. Αν και δεν έχουν ακόμα γίνει αναλύσεις του πετρώματος των κροκαλών φαίνεται ότι το πέτρωμά τους είναι ίδιο με αυτό των αγκυρών.

Πρέπει ακόμα να αναφερθεί ότι και τα τρία ναυάγια, στα οποία έχουν εντοπισθεί παρόμοιου τύπου άγκυρες έχουν πολλά κοινά χαρακτηριστικά. Χρονολογούνται όλα στο τέλος του 4ου π.Χ. αιώνα, έχουν όλα βρεθεί σε μικρό σχετικά βάθος και είχαν όλα μικρό σχετικά φορτίο. Ίσως τα κοινά αυτά στοιχεία να είναι τυχαία, όμως προκαλεί αίσθηση ότι και τα τρία ναυάγια, που είχαν άγκυρες αυτού του τύπου, παρουσιάζουν τόσες ομοιότητες.

Η ανακάλυψη του ναυαγίου της Αντιδραγονέρας επιβεβαιώνει τη διαχρονική χρήση του συγκεκριμένου τύπου άγκυρας από τα αρχαία πλοία. Ήδη είναι γνωστό από άλλα ναυάγια, όπως για παράδειγμα το ναυάγιο εμπορικού πλοίου στην Αλόννησο, που χρονολογείται στο 5ο π.Χ. αιώνα[5], ότι ο τύπος της άγκυρας με λίθινο στύπο βρίσκεται ήδη σε χρήση. Όμως αν και είχε ήδη εμφανισθεί, πριν από σχεδόν ένα αιώνα, ο νέος αυτός τύπος άγκυρας, ένας θεωρητικά παλαιότερος βρισκόνταν ακόμα σε χρήση. Αυτό θα πρέπει να ενταχθεί, κατά τη γνώμη μας, στο πνεύμα οικονομίας των ναυτικών, κάτι που τους χαρακτηρίζει ακόμα και σήμερα, αφού σε πολλά σύγχρονα πλοία, αν και έχουν στη διάθεσή τους νεότερους τύπους αγκυρών, χρησιμοποιούν ακόμα παλαιότερους.

Η ανασκαφή του ναυαγίου της Αντιδραγονέρας δεν έχει ακόμα ολοκληρωθεί και κυρίως δεν έχει ολοκληρωθεί η μελέτη των κινητών ευρημάτων και της κεραμεικής του ναυαγίου. Στα πρακτικά του 6ου Συνεδρίου, που θα δημοσιευτούν μελλοντικά θα δοθούν περισσότερα στοιχεία για το ναυάγιο της Αντιδραγονέρας, αφού στο Συνέδριο αυτό έγινε και η πρώτη ανακοίνωση του ευρήματος.

Δημήτρης Κουρκουμέλης
Στασινού 10
11635 Αθήνα

ΣΗΜΕΙΩΣΕΙΣ

1. Τα πρώτα αποτελέσματα της έρευνας έχουν δημοσιευθεί στο περιοδικό του Ι.ΕΝ.Α.Ε. *ΕΝΑΛΙΑ* IV, 1/2, 1992 (έκδοση 1995) και *ΕΝΑΛΙΑ* V, 1/2, 1993 (έκδοση 1997).
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ΦΩΤΟΓΡΑΦΙΕΣ

Φωτ. 1 Η νησίδα Αντιδραγονέρα στα δυτικά. (φωτ. Ν. Τσούχλος)

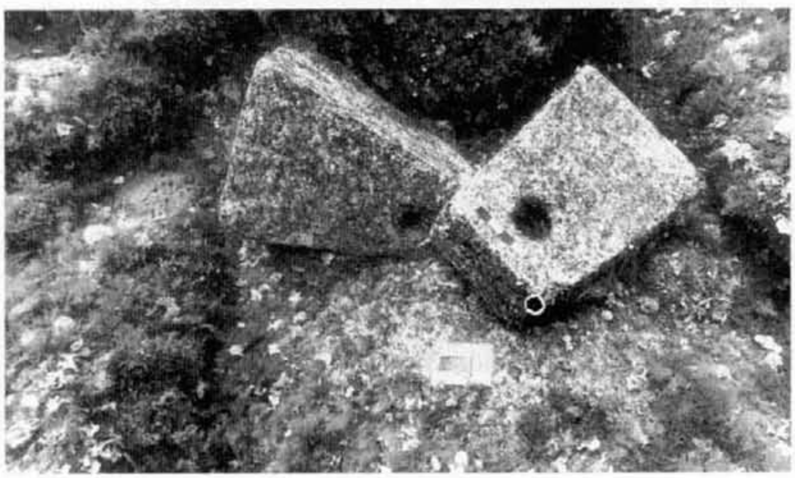
Φωτ. 2 Λίθινες πυραμιδοειδείς άγκυρες από το χώρο του ναυαγίου. (φωτ. Ν. Τσούχλος)

Φωτ. 3 Κεραμεική από το ναυάγιο. (φωτ. Ν. Τσούχλος)

Φωτ. 4 Λίθινη άγκυρα από το ναυάγιο. (φωτ. Ν. Τσούχλος)

Φωτ. 5 Λεπτομέρεια των οπών στο μόλυβδο λίθινης άγκυρας του ναυαγίου. (φωτ. Ν. Τσούχλος)

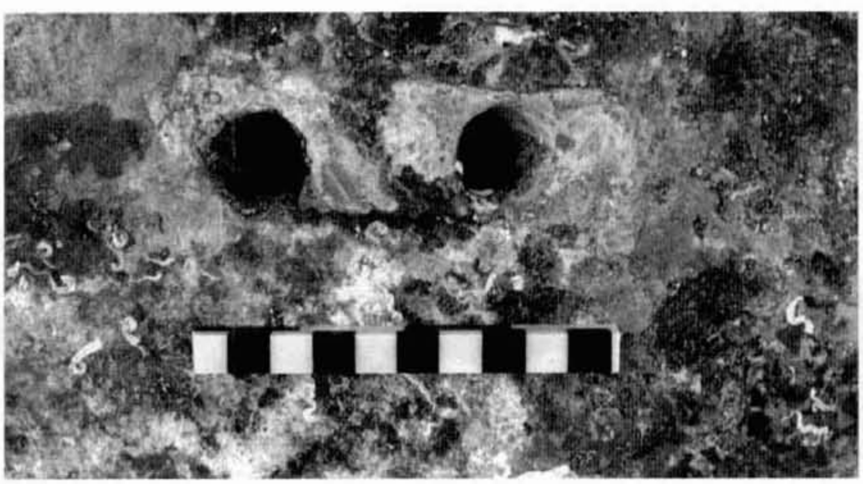
Φωτ. 1



Φωτ. 2

Φωτ. 3

Φωτ. 4



Φωτ. 5

HIGH STERNS ON BRONZE AGE SHIPS:
THE REASONS AND THE REASONING

A problem that has consistently haunted discussions on ancient ships, particularly these based on miniatures executed on seals, ring-stones and small ceramic containers that do not allow the depiction of much detail, is the question which is the bow and which the stern of the illustrated item? (e.g. Casson 1971: 41, n. 3, Johnstone 1973: 7-8 for full bibliography). Identifying bow and stern in Aegean Bronze Age ship representations constitutes the central issue to which all other iconographical problems are related. When the steering oar is shown, the question is quickly settled since a ship can be efficiently steered only from the stern. But most times there is not even a suggestion of a steering mechanism, so that the question must be answered by other means.

Often the only other means available is the relative height of the bow and the stern, the implication being that if it could be established that the stern stood always higher than the bow, or vice versa, then simple comparison of the height of a ship's both ends could readily determine which is what.

Although this discussion has been going on for a long time, and the determination of what stands higher looms like an awkward problem as it will be shown below, the reasons for a high stern have scarsely been examined, except as a sort of end-product of a sharply curving keel line, resulting from the sternward concentration of hull volume. Only most modern sailing craft show a similar concentration of volume aft, and a few even a sharply curving keel line, without any need for a high stern. A modern high prow has at least one obvious use: it helps ride the waves without undue swamping of the decks or of the interior of the hull where no decks are present. But what is the purpose of a high, if not a higher, stern in ancient ships, such as these depicted in most large ships of the Theran miniature marine fresco for example? What does this do for a good ship that has been built for speed and can be moved by both wind and oars?

The suggestion has been advanced by Avner Raban and apparently widely accepted, that the purpose of a high stern in Bronze Age ships was to facilitate sailing stern first down navigable rivers, too narrow to permit the ship to be turned around:

> *"Most of the Mediterranean river beds are extremely narrow; even when they are flooded with water their width almost never exceeds 10 to 20 m. In such rivers it is nearly impossible for sailing vessels to turn around, and ships must therefore be prepared to sail stern first. This situation necessitates the development of alternate-ended vessels—that is to say, ships whose prow and stern can perform either function"*
> (Raban 1984: 16)

Presumably, this means that travelling upriver or against the current might have been accomplished via wind and sail, but since the ship could not be turned around, a high stern was necessary for sailing stern first downriver or with the current.

Perhaps the above suggestion may be acceptable to scholars. But among professional mariners and sailors (that is, people who use sailing vessels to travel on water) any captain, irrespective of the chronological period of his active service, who would use wind and sail to go up *or* down rivers too narrow to permit the ship to turn around, represents a danger to public safety and should be immediately locked up. Although the reasons are perfectly clear to professional mariners and sailors, they may be less so to the academy and therefore some explanations may be in order here.

As it appears from the excavation reports of the two Bronze Age shipwrecks found in the waters off southern Turkey, both came to grief while sailing in relatively narrow channels; the Cape Gelidonya ship between the northern and largest islet of the Besadalar island group, the Ulu Burun ship while sailing in Akar Bogazi, the channel between Ic Adak island and Sicak Yarimadasi peninsula (Bass 1967; 1986). But "narrow" is a relative term. The passage between the islets of the Besadalar group is at least half a nautical mile wide (0,9 km), while that between Ic Adak and Sicak Yarimadasi may be a little more. Yet this combination of winds, currents and narrow channels proved too much for these two ships and probably many others.

To understand the nature of the problem, it is important to quickly examine several factors that affect sailing in narrow places. And first of all, the process of turning around a sailing vessel in a narrow passage and in the presence of a current. The easient and safest way of doing so is by anchoring the stern, and allowing the current to turn the ship around, perhaps at the same time controlling the rate of turning by other anchors from the bow or via ropes held by the crew on the river bank, if the current is strong or treacherous at that point. If this could not be accomplished because the river was too narrow, then assuming the length of a Bronze Age merchantman to have been 25 meters, the previous suggestion presumes that the navigable width of the river must have been somewhat less than that.

A second point to consider, is the importance of a keel for controlling the movement of a sailing vessel. The embryonic keels, if any, of Bronze Age ships did not allow the use of side winds because the resistance offered by such keels was not sufficient to prevent the ship from sliding sideways. This is one of the main reasons for the large keels of modern sailing vessels, and the principal mechanism for allowing a vessel to move forward when the wind blows from the side. Neither the position of the mast, nor the appropriate sails and rigging could cause a vessel to advance under a side wind, unless a substantial keel prevents the ship from sliding in the direction of the wind. It must be obvious then, that in a river too narrow to turn a 25-meter ship around, the slightest shift in the wind would have caused a Bronze Age vessel to collide with the river bank, since the distance between ship and bank could hardly exceed 10 meters. This distance would be covered in just a few seconds under the influence of a buffeting sidewind, no time at all for the crew to try and prevent the ship from running aground, or smashing into the rocks of the river bank.

The use of a rudder in combination with a sail would not prevent the ship from turning towards the river bank under a sidewind either. The rudder would prevent the stern of the ship from moving in the direction of the wind, while the sail would cause the ship to move with the wind. This will inevitably cause the ship to turn towards the river bank.

A third point is the danger of narrow passages. Constricted passages are extremely difficult to negotiate under sails even with today's sailing vessels, despite substantial keels, the ability to sail into the wind, and wheel-assisted rudders. Passages of equivalent widths as narrow rivers (say 20-25 meters), are usually the entrances of harbors catering to sailing vessels usually known as marinas, having more or less the same width. In the case of many of the major marinas of the Mediterranean, entering the port under sail is strictly prohibited under penalty of a heavy fine. Such marinas are entered under internal-combustion-engine propulsion at low throtle, oar-power, or failing both by being carefully towed by another boat. The reason is not because a modern sailing vessel cannot negotiate such a narrow passage, but simply because a basic understanding of sailing and elementary caution pronounce such a passage as too dangerous and risky for a vessel under sails, and even though the narrow part is only a few meters long and can be negotiated in only a few seconds.

A fourth point is the nature of river currents. As it is discussed above both the Cape Gelidonya and Ulu Burun shipwrecks have perished in relatively narrow passages of changing currents, which in combination with strong winds render such places particularly treacherous. But a narrow river is infinitely more treacherous for a sailing vessel, irrespective of the direction of travel. The reasons are obvious. Such a river is an *extremely* narrow passage often comprising many bends; it is narrow either throughout or for a good part of its length rather than for a relatively short distance; and although the direction of the current does not change, its velocity may change any number of times, since it is far more dependent on underwater topography, (that is the active river-bed), than sea currents. Thus a relatively weak current along a straight stretch of a river may become several times stronger around a tight bend, when the whole water volume may be concentrated across a narrow section of the river-bed on the outside part of the bend.

In view of all the above, is it any wonder that no sane captain could have possibly sailed a loaded merchantman up or down a river too narrow to turn his ship around? In fact, the only way a merchantman could have safely travelled up such narrow rivers is by oars or by being pulled simultaneously from both banks. The voyage down-river might have been even more complex, depending on the number and nature of its turns. But it is a certainty that in a great many instances, some external restraining control such as guiding ropes from the banks must have been necessary.

Indeed, the suggestion of sailing down navigable rivers too narrow to turn the ship around is rather surprising, in view of the currency among present-day historians of Herodotus' passage on the "baris", because of its generic relationship with the *br* of Ugaritic texts (Linder 1970: 211) and its equivalent in the Egyptian sources (Erman & Grapow 1926: 465). Writes the ancient historian:

> *"These vessels cannot sail up the river without a good leading wind, but have to be towed from the banks; and for going downstream with the current they are handled as follows: each vessel is equipped with a raft made of tamarisk wood with a rush mat fastened on top of it, and a stone with a hole through it weighing some four hundred weight; the raft and the stone are made fast to the vessel with ropes, fore and aft respectively, so that the raft is carried rapidly forward by the current and pulls the baris, as these boats are called, while the stone dragging along the bottom astern, acts as a check and gives her steerage-way" (II, 96).*

This in a river as wide as the Nile and in the 5th century BC.

In the end, and irrespective of the difficulties of sailing up or down narrow rivers, why should the leading end of a ship travelling *with* the current be high? What does a high stern do in such circumstances that makes height indispensable? The obvious answer is, nothing at all. There is no reason whatever for a high stern, necessitated by a ship sailing stern first down a river too narrow to permit its being turned around. Besides, any inquiry addressed to a professional mariner or sailor, is bound to quickly lay to rest any suggestion of sailing merchantmen up or down rivers too narrow to turn the ship around. But if this is so, then what was the reason for the indisputable high stern of at least some Bronze Age sea-going vessels?

Obviously, the purpose was not to help partially beach the ship sternward as has been suggested (Johnstone 1973:10). This is the function of the upward curving keel line. A high stern makes no difference to beaching, and if anything, it makes for more awkward the discharge of men, equipment and supplies or the corresponding replenishment. The purpose could not be either to prevent boarding by pirates or a foreign ship's crew, since such boarding could be easily accomplished over the gunwales, which were much lower than both bow and stern. The purpose *could* be to allow the helmsman a clear lateral and frontal view, but this could be equally accomplished by a platform on the aft deck, since the helmsman has also the advantage of his own height, say at least 1.5 meters above the platform. In other words, none of these reasons justify or quite explain a high stern in sea-going vessels.

But a high stern is certainly justified for the same reasons as a high bow: to avoid undue swamping by the waves, this time coming not from fore but aft. Since the position of the mast well forward and the lack of a substantial keel made aft winds a necessity for all but modern sailing ships, a high stern had to serve the same purpose as a high bow. In other words, as the ship moved under wind power, the waves caused by the aft winds overtook the ship, which could not possibly sail as fast as the waves. If the stern did not stand high up, the ship was swamped. This happens even today with the most modern sailing vessels when the wind blows from astern. But with a modern sailing ship there is a choice. She can be turned progressively into the wind until swamping ceases, then compensate for the change of direction by judicious tacking. Ancient ships had no such choice. When moving under wind power, they had to have high sterns to avoid being swamped by waves coming from astern. By contrast, when they moved against the wind under human propulsion, they had to have high prows to prevent swamping by waves coming from afore.

It is important to realize the difference of the effect of swamping in the case of a fully decked, and an undecked or only partly decked ship. Fully decked ships, ancient or modern, can easily neutralize the effect of swamping by allowing the water to escape through appropriate holes in the side planks just above the deck. For ancient ships without decks and before the invention of the bilge pump (Foerster Laures 1989, 91ff.), swamping represented not only a lot of back-breaking labor to rid the ship of water, frequent drenching of the crew exposed to wind and wave, possibly destruction of consumable or perishable goods, etc., but also the danger of sinking as a result, particularly if the vessel was loaded with supplies and equipment such as heavey anchors, or carried some form of cargo. Therefore, high prows and sterns could not have been a stylistic design feature of these sea-going ships, but an absolute necessity: high prows for moving under oars against the wind, high sterns for moving under sails with the wind.

But in this case, one has to wonder what was the point of a high prow and stern in Egyptian and Mesopotamian ships, which travelled only in rivers, lakes or marshes according to at least some expert opinions. Was the high prow and stern of Khufu's ships a mere stylistic feature, blindly copied from Syrian or even Aegean ships of the third millennium? Or did these Egyptian flat-bottomed ships brave the sea for commerce with Syro-Palestine? It is a difficult question to answer, but a probable reply is, neither one nor the other. It could very well be that the first river boats made certainly from papyrus reeds, served as models for the later wooden ones. Therefore, this shape probably evolved out of the local reed boat tradition. For it is hard to imagine what else would have caused the bow of Khufu's ships to stand about 8 meters above the water-line (Johnstone 1980:71). The part behind the prow of Khufu's ship is so long and narrow that it could have hardly served as anything, except as a temporary platform for fishing perhaps. But this similarity may also be seen in Mesopotamia. Thus a silver model boat some 60 centimeters long found in A-bar-gi's tomb in Ur by Sir Leonard Woolley, is identical to the reed boats used today on the marshes of the Lower Euphrates (Daniel 1967:197-8).

This, however, and to come back to that central iconographical issue, does not help answer the question which stood higher, the bow or the stern. The nature of the problem may be seen by Gillmer's "stripping" of the large ships in the Thera Fresco, shown with full regalia and in full parade dress as it were, disguising its basic profile. Writes Gillmer: "Strip off the decorations visually—the flower garlands, bow-extended [-ing?] antennae, paper-like butterflies, stern-draped animals and perceive the ship! The form is clear" (1989:130).

The basic form certainly is. What is not clear is how one decides where the bow ends and the bowsprit or bow-extending antennae begin. Gillmer's stripping has left the stern a little higher than the bow; but it is not difficult to imagine that someone else might have chosen differently. A high stern has a great deal to recommend it, of course, if the ship spent most of its time under sail. But can one say with centainty that this was always the case? And in particular, what purpose would have been served by an always higher stern (or prow)?

Considering that ships with both a higher prow and a higher stern are known from the Bronze Age, one wonders why is it necessary that one of them should be always higher than the other. Modern archaeological convenience was probably not a pressing point with Bronze Age shipwrights. And modern caiques in the Aegean, from fully to partly decked and sometimes with only a token deck, navigating in the same waters and under similar conditions, moving at similar speeds as Bronze Age ships but with internal combustion power, do not feel the need for either a higher bow or a higher stern. Shouldn't one first prove perhaps, the necessity for such one-sidedness, before embarking on a search for the missing truth?

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WHEN WERE THE LAST VERTICAL MULTIREMES?

According to the Greek historian Zosimos, who probably lived in the late 5th century, the last battle in which triremes figured, was fought in 323 A.D. (Zosimos, II, 22, 1-4). The author says explicitly that triremes have not been built since. He mentions another seafight in 400 (V, 20-22) in which λιβέρναι had been used. This name can hardly be anything but the Greek version of liburnae, that were the principal vessels in the Roman navy since Augustus. They probably were (vertical) biremes (Appianus, X, 1, 13).

Around 900 the Byzantine emperor Leon VI wrote his *Taktika*, the 19th book of which deals with naval matters. The standard name of a warship is then: Δρόμων.

Leon VI clearly says that on each side there are 2 rows, each of 25 oarsmen, one row above and one below. Decks are only fore and aft, the men sit on beams on 2 levels, (XIX, 8). Alas, the emperor gave no measurements, but he was the first (insofar we know) to mention the γαλέα, qualified as Νονήρης (XIX, 10 & 82).

No measurements either, nor the names δρόμων and γαλέα are given by a 10th century Greek manuscript, known as *Anon BPBB*. It is anonymous, but written at the behest of one Basilios, "gentleman of the bedchamber" under several emperors. The author enumerates the parts of a ship without regard to dimensions or shape, a.o. he says; the covering-boards (κατάστεγα) on either side on the ship's walls are called deck (κατάστρωμα, θρᾶνος (no exact translation known) and planking (σανιδώματα) (*anon. BPBB* II, 7). This is not very clear, and the whole passage is a rehash of Pollux' *Onomastikon* (I, 87) written in the 2nd century A.D. There the θρᾶνος lies around the deck, which sounds very modern, but a wholly-decked ancient multireme seems improbable. Anon. has from Pollux too that on the θρᾶνος the θρανῖται row (and that the marines stand there), and underneath the ζύγιοι, seated on the ζυγά (beams), but then he says, that there are θαλάμιοι *if there is a 3rd row!* Pollux did not mention θαλάμιοι at all, except, without comment, in I 120, among the people you need for a naval battle.

Also Anon's own is the following description: The σανὶς (strake? planking?), through which the oars stick out, is called θυρεόν (that which has ports?)... What is on top of the tholes is called ἐπισκαλμίς (II, 12)... Over this εἰρεσία (row or oars) lies a περίτονον (wale), then a θυρεόν again, where the higher row of oars is. On top of everything is the "ἐπηγκενίς, the above-mentioned καταπατητόν", from there rises the καστέλλωμα (railing), from which the marines hang their shields.

Now καταπατητόν meaning "being trod on" and the fighting men making a "bulwark" there, seems to indicate that here we are on the θρᾶνος, but identifying the ἐπηγκενίς (which in the Odysseia V, 254, looks like meaning gunwale) with it, looks strange, as this gangway must have been horizontal and rather wide. It wouldn't do to put it right on top of a row of oars and oarsmen, so may be the ἐπηγκενίς was a piece separating θυρεόν and θρᾶνος, but this, like the sketch here reproduced, is pure speculation.

Another question is, did Anon. write about a theoretical ship, perhaps inspired by a nostalgia for things classical? The fact that he quotes Homer and begins his treatise with a short hexametric poem, as well as his dependance on Pollux, point that way. Was he writting about a ship existing in his own time? Perhaps, he uses nautical terms we do not find in earlier literature, but sometimes in modern Greek. A possible indication is too, that he uses the word ἄφλαστον in the plural. This is the name for the ornamental, forward curved prolongation of the sternpost. In medieval representations of ships we often see 2 upcurving pieces, one on either side of the poop. Whether these are the prolongations of wales or of outriggers is not clear (Mott, 1990, p. 102 and fig. 3).

From the 12th century we find the curious story of a vertical bireme at the siege of Acco, retrieved by Morrison & Coates (1986.p.10).

In Lawrence Mott's paper, we have quoted, we see Catalonian representation of ships from the 13th century showing these "wings" as they are generally called, on vertical biremes. So we expect these ships to have been called δρόμονες especially as this name was by then known everywhere in Europe, even in Scandinavia. But on his page 109 Mr. Mott quotes all the ship-names, found in the Catalan chronicles of the period; the word galley is in evidence in several forms, but "dromon" is lacking. Around the year 1290, we learn from several sources, galleys are given a 3rd oarsman per "bench", in Venice as well as in the western Mediterranean (Sanudo, 1611, LII, pars IV, c.V-XI. Muntaner, 1973.II.p.236. Le Templier de Tyr, 1887. pp.273-274).

This is generally considered to be the change from the galley "a sensile" with 2 oarsmen per bench to that with 3, for both of which we have pictorial evidence, but from a later period. So one may well ask, was it so? (Mott, 1990.p.110), and we may ask the mirror question: who thought of flattening the oared vessel, when and where?

Around 1500 the vertical multireme was practically a myth and the cause of phantastic theories and heated controversies. But while these were going, a monster was launched on lake Starnberg in Bavaria (Schober, 1982.pp.23-80. figs. 6, 10, 11, 12, 17, 19 and 20) and stayed afloat for almost a century. A lot of things are known about her, down to the price of the nails, but nobody but painters noticed her rowing system and scholars never realized, that a vertical bireme was in their midst.

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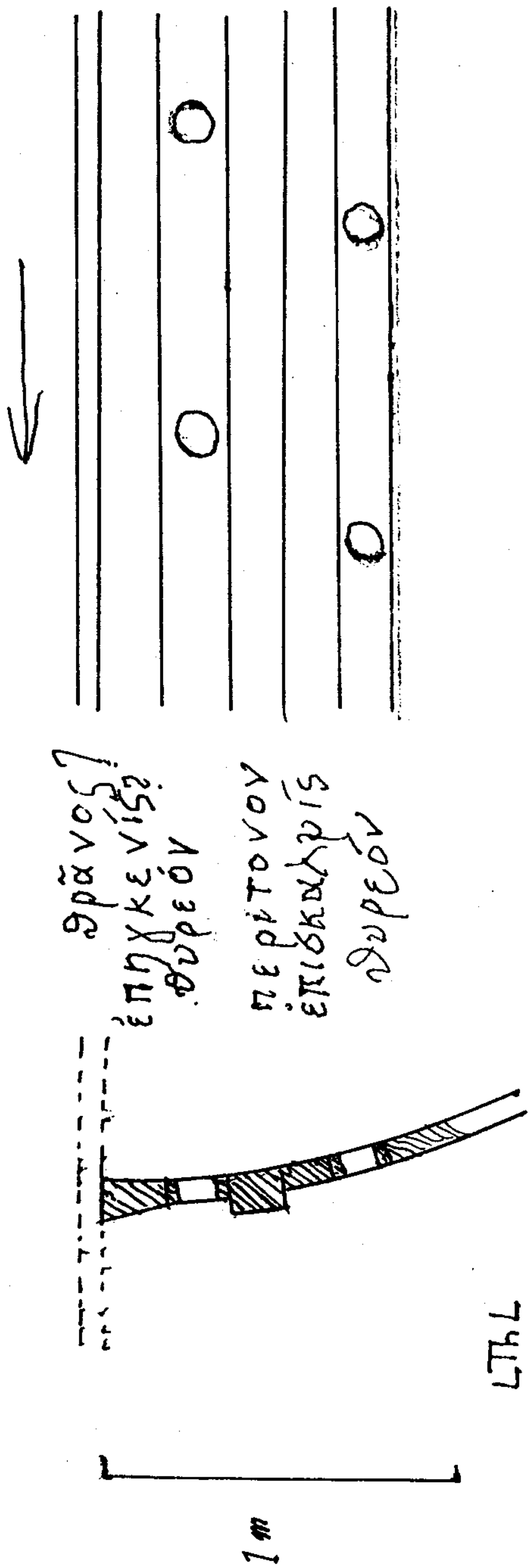

Fig. 1

THE AREA OF THE ANCIENT CLOSED PORT OF THASOS
(A preliminary report)

Being mariners and tradesmen, the Parian colonists created at the island of Thasos early in the Archaic period a strong naval and mercantile fleet[1]; as a result, the construction of port facilities to provide shelter for their ships must have become imperative[2] (Fig. 1).

The ancient geographer Scylax informs us that Thasos, the most important Parian colony, had two harbors: "Thasos an island and city and harbors two whereof one closed"[3].

The naval harbor of Thasos, despite repairs effected in subsequent periods, retains most of its original form to this day and can accommodate small craft and fishing vessels[4].

The re-use of the same site since the archaic period (as the latest archaeological evidence demonstrates), creates without doubt a very complicated archaeological site.

The reason for this presentation is to provide a synthesis of the new features that came to light after almost 10 years[5] of excavation in an attempt to reconstruct the plan of the harbor.

All the information regarding the results of the excavations are already published in different archaeological journals[6]. In this article only features that are related to the harbor construction shall be considered.

A) South side of the Port (Fig. 1, area A, Fig. 2)

Among these features, perhaps the most impressive is the huge construction out of deep green schist stones and marble that was found outside the port on its western side.

Originally, the strange construction which lies under the present sea level, had been considered to be an archaic port mainly because of the dating of joints that were employed to connect the upper line of marble stones (which stood above sea level).

Such opinion published more than once[7], cannot be satisfactory, mainly because of the shape of the structure which does not provide any shelter from the prevailing winds, and its style as harbour construction. The chronology of this structure can be based only on the pottery that was excavated (dated to the IV century BC[8]), because no other objects were found and the shapes of the metallic joints at the upper blocks were also used even later.

According to its construction technique (Fig. 3 a, b), the huge structure on the southern side of the port can be considered as a platform to pull the boats out of the sea. The whole structure presents a slight inclination. Together with other factors, such as holes on the surface of the stones similar to those used for cranes, the inclination strengthens the interpretation of the construction as a platform used for dragging ships ashore.

Another interesting feature that was briefly presented in Athens in 1991 were the schist stones (Fig. 4) with a profile similar to those of the "boat monument" in Samothrace[9]. They were found during the works for the laying of the foundations of a modern building SW of the port near the area where the impressive underwater construction was found.

The existence of the stone base of a ship (or "boat monument") in the area strengths the hypothesis that the structure was used generally as a platform (*εξέδρα*[10]?). A similar construction is described by M.G. Perrot at the beginning of mole between the two harbors[11]. This platform is no more visible, but a rough sketch appears at Perrot's general plan of the city. A similar construction could be this one at SW mole of the military harbor. Its position near the temple of the *Θεά Σωτείρα*[12] gives as more elements about the existence of a similar monument in Thasos and the adoration of the Goddess by the mariners.

B) South East side of the port (Fig. 1, area B)

In this area in 1983, some unusual elements were discovered during dredging operations. A certain number of marble blocks were found with one or two square cuts on the side (Fig. 5 a, 5 b and 5 c). The proposed explanation of these blocks was that they were used as the foundation for *νεώρεια* for dragging the ships ashore.

A reconstruction of their shape could be similar to those found at Kos[13] (Fig. 6). The blocks were used in parallel lines and wooden beams were inserted in the cuts. On this structure the boats were dragged out of the water. The side of the port where they were found[14] and also the existence of similar structures in Kos allow for the possibility such an interpretation.

C) North side of the Port (Fig. 1, area C)

At the north side of the port, the city wall turned to the Southwest and finished after 50 m. At the turn point, as well as at the end, the wall was fortified by two circular towers (Fig. 7). At this point the city walls end in the sea. The next addition is dated later on, probably after the Late Roman period[15].

In the area between the coast and circular tower III, some new walls were found during dredging operations[16]. According to the drawing (Fig. 7, walls a-a, β-β, γ-γ), their orientation is parallel and vertical to the modern mole which is built over the ancient city wall. Although at first sight the two walls a-a and b-b seem quite parallel and can be interpreted as walls of shipsheds, their construction technique, the distance betweenthem, their different dating[17] and the absent of the characteristic inclination[18] (Fig. 8, 9), make such an interpretation difficult. Certainly they belong to buildings for port facilities but their exact function still remains unknown. The first one (a-a) according to its construction looks more like an "anterisma" which is intended to keep in place an accumulation of sand etc., so creating a platform. The second one (b-b)[19], is certainly the *στερεοβάτης* of a wall. Careful examination of its upper surface demonstrates the existence of *"μοχλοβόθρια"* for the construction of a wall above it with well squared blocks. According to the above observations these walls cannot be of the same building might have been whatever its function.

D) The entrance of the Port (Fig. 1, area D)

Despite the indications given by early nineteenth century travellers[20] of the existence of two more towers at the extension of the modern breakwater later the round tower IV (fig. 7), there is no archaeological evidence for such constructions but not even for the continuation of the mole after round tower IV[21].

However in the foundations of the red beacon a square construction was found with big stone blocks connected with metallic joints (Fig. 10).

A construction, considered a square tower, was referred by J.Baker-Penoyre, who mentioned that not only round but also square towers were found at the port of Thasos[22].

The existence of the sealed joint with lead provides evidence that at least the upper blocks of the small construction were above water.

Consequently the sea level during the classical period could be considered at roughly -1.5m below the present level (Fig. 11, plan). The existence of five courses of stones in some parts of the city walls below the actual sea level leads to the same conclusion[23].

This square construction (tower?) divides the entrance of the port in two. The existence of two entrances, one to the NNW and one to the N was probably a handicap for the security of the boats. Studying the predominant winds of the port, we notice that the strongest winds are those from the NNE side (Fig. 12). This means that, at first sight, the harbor was exposed to the North and the shelter provided was not good enough. The existence in that area of an underwater construction made of stone rubble (plan, A/F), may indicate the existence of a breakwater, the function of which was to provide shelter for this entrance of the port from the prevailing North winds[24]. This, in conjunction with the two towers III and IV, could provide protection of the entrance from enemy fleets[25].

Similar constructions have been discovered elsewhere, as at the harbor of Aigina[26]. With the rise of the sea level the breakwater became useless and thus later on, probably during the Middle Ages, this part of the entrance of the port was closed[27].

Conclusions

After this brief presentation of the most important features of the closed-military harbor, an attempt to reconstruct its form during the IVth century would place it among those harbors described by Vitruvius and very well represented in the first editions of his work during the renaissance. The harbor of Thasos represents an application of a standard pattern of a port composed of city walls which were also used as breakwaters and with its entrance divided in two by the little island-tower in the middle.

The ordinary facilities on the port were at the right and the left side of the harbor where the foundations of different construction techniques were found. This is also referred to by Perrot who at the beginning of the twentieth century state that the area housed port facilities.

I would like to conclude this preliminary report by saying that the new features that came to light after the previous years of excavation give us a lot of information about this important harbor, but also raise new questions for which the already excavated areas do not provide definite information.

The new topographical details of the area of the ancient harbor of Thasos radically change our knowledge of that harbor (Fig. 13).

Old debates like the one about the inscription with the regulations that concerned the berthing places of different sized vessels and the sanctions applied, must now be reconsidered[28].

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NOTES

1. Herodotus, VI, 46: «Οι γάρ δή Θάσιοι[...] προσόδον εουσέων μεγαλίων εχρέωντο τοίσοι χρήμασι νέας τε ναυπηγευμένοι μακράς και τείχος ισχυρότερον περιβαλλόμενοι».
2. An underwater excavation in Paros-Paroikia which provide some information about harbor installations in Paros took place in 1982 by the Ephoreia Enalion Archaiotiton (EEA) in collaboration with the Pennsylvania University. For further information see. G. Papathanassopoulos and D. Schilardi 1982, Underwater survey of Paros, IJNA 1981,10.2:133-144.
3. Σκύλαξ, *Περίπλους, 67,* «Θάσος νήσος και πόλις, και λιμένες δύο τούτων ο είς κλειστός».
4. Also in J. Baker-Penoyre, *JHS*, XXIX (1909).
5. The excavation of the port of Thasos started from the E E A. in 1980. Later on a "synergaseia" was formed with the French Archaeological school of Athens (E.F.A.).
6. N. Lianos, Ενάλιες Έρευνες στο Λιμάνι της Θάσου 1980-1984, in «Αρχαιολογικά Ανάλεκτα εξ Αθηνών», XVIII (1985), Athens 1988. Yearly reports of the "synergaseia" were published in the AAA, XVIII, 1985, p. 120-121, AAA, XVIII,1985, p. 129-134, AAA, XX, 1987, p. 75-92, Αναστήλωση, Συντήρηση, Προστασία Μνημείων, 2, 1987, σελ. 73-77, and BCH: 111, II, 1987, p. 622-626, BCH: 1988, 112, 2, pp. 736-742, BCH: 1989, 113, II, pp. 734-740, *IJNA* 1989, 18, 1, pp. 52-56, BCH: 1990, 114, II, pp. 881-887, BCH: 1991, 115, II, pp. 712-720, BCH: 1992, 116, II, pp. 721-726, BCH: 1993, 117, II., by A. Archontidou, J. Y. Empereur and A. Simossi. (A.A., J.Y.E., A.S.). The drawings of the excavation were made by the author in collaboration with T. Kozelj. Drawings n. 3a, 3b were done by P. Abazopoulos. The photographs were taken by the author.
7. A.A., Αναστήλωση-Συντήρηση-Προστασία, τ. B, 1987, pp. 73-77, AA., JYE, AS, *IJNA*, 1989, 18, 1, pp. 52-56, *AAA*, 1985, pp. 129-134, passim.
8. Idem.
9. A short presentation by L. Basch took place at the previous conference in Athens 1991. The final publication by McCredie has not yet appeared.

10. According to an inscription published by J. Pouilloux (BCH 71-72, 1947-48) the round tower II and an «εξέδρα» were constructed with the sponsorship of Ηρακλεόδωρος. Although the term «εξέδρα» is generally understood as a base (cf. R. Ginoves, Dictionnaire methodique de l' architecture grecque et romain), its vicinity with Tower II could be considered as the platform discovered during the underwater survey.
11. M.G. Perrot, Memoire sur l'île de Thasos, Paris 1864, p. 78, "sur une sorte de plate-forme ou d'elargissement du quai, qui forme un rectangle dallé de larges plaques de marbre..."
12. BCH 68-69, 1944-45.
13. Χάρις Καλιγά, Α.Δ., τ. 42 (1987), Χρονικά 632-635.
14. Again from G. Perrot, op. cit., and his rough but extremely usuful plan (p. 74) we can see small "quais" along the coastline and the inscription "Quais avec cules". Because these features were discovered during dredging operations, their exact position is unknown, so their reconstruction is impossible.
    Further excavation in this area will certainly give more information's about the port facilities.
15. BCH, 113 (1989), passim.
16. I personally supervised the cleaning of this part of the port by the local authorities. The cleaning was stopped as soon as the wall b-b was discovered. No other wall was found in the middle distance.
17. JYE, AS, BCH-CXV 1991, BCH-CXVI-1992.
18. See also BCH, CXIV-1990, 881, 883 (fig. 2) and p. 885 (fig. 6).
19. That was misinterpreted as a mole (*BCH*, CXVI-1992, p. 721 and fig. 1).
20. G. Perrot, op. cit., p. 77 and the plan pl.II., Von A. Conze, *Reise auf der Inseln den Thrakischen Meeres*, Hannover 1860, p. 14; C. Fredrich, *A.M.*, 33,1908, pp. 217-223;
    A. Bon, Les ruines antiques dans l'ile de Thasos..., Paris 1930, passim.
21. J.Y.E.-A.S., *BCH*, CXIII-1989, p. 734.
22. J.FF.Baker-Penoyre, Thasos.., *J.H.S.*, XXIX (1909).
23. For example at the SW side of the port, close to the round tower II (IJNA, (1989), 18.1, fig. 11.
24. Unfortunately, no excavation took place in this area.
25. The lack of any sherds or other man-made objects on this construction, strengths the supposition that the whole construction was underwater and thus not in use.
26. N. Lianos, reported to the Ephoreia Enalion Archaiotiton, 16/9/87.
27. J.Y.E, A.S., *BCH*, CXIV-1990, p. 881.
28. M. Launey, Inscriptions de Thasos, *BCH*, LVII-1933, pp. 394-410.

ILLUSTRATIONS

Fig. 1	General plan of the port of Thasos, N. Lianos-T. Kozelj.
Fig. 2	General view of the "platform" at the South side of the port.
Figs. 3a, b	Plan and section of the platform in area A.
Fig. 4	Schist stone with a characteristic profile at the upper part for the positioning of a boat keel.
Figs. 5a, b	Blocks of marble with a square cut on the top side.
Fig. 6	Kos plan of the shipsheds.
Fig. 7	Northeast part of the port with the round towers III & IV, N. Lianos-T. Kozelj, 1:500.
Fig. 8	Section at the a-a wall.
Fig. 9	Section at the b-b wall.
Fig. 10	Stone block connected with metallic joints.
Fig. 11	Plan and section of the underwater structures at the entrance of the port.
Fig. 12	Study of the predominant winds at the port of Thassos.

Fig. 1

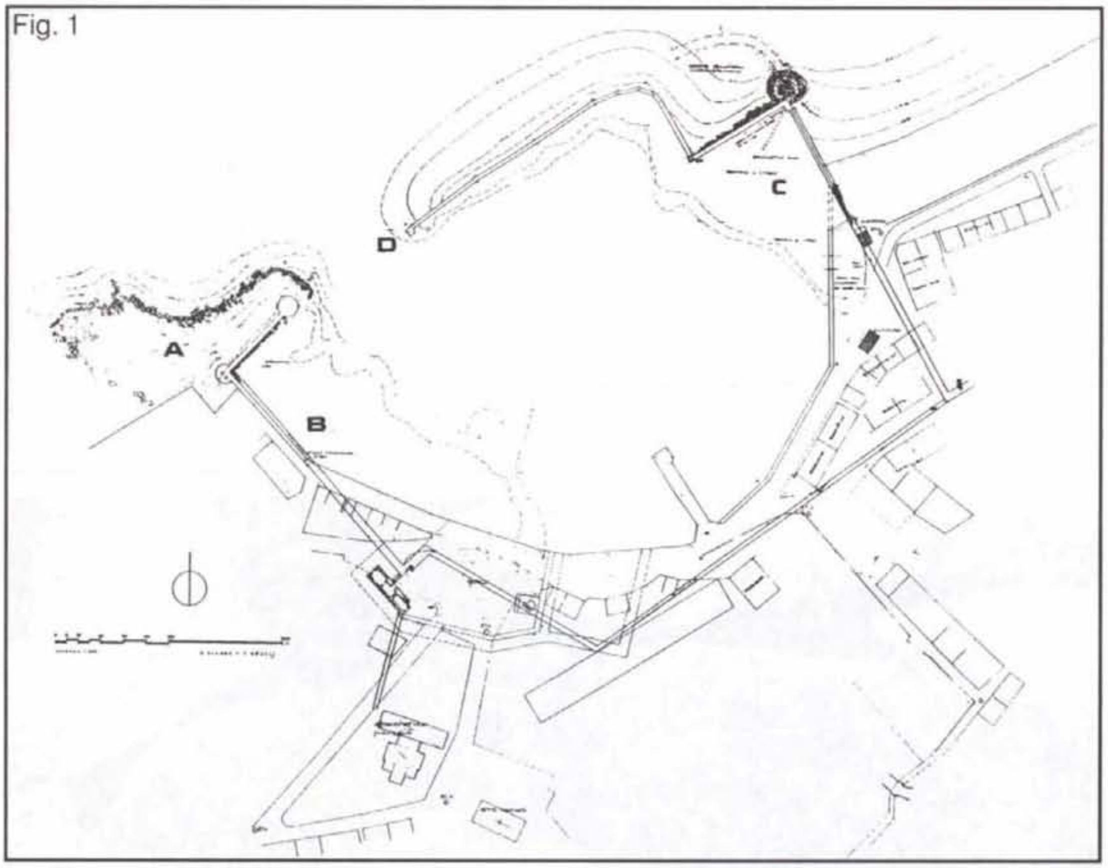
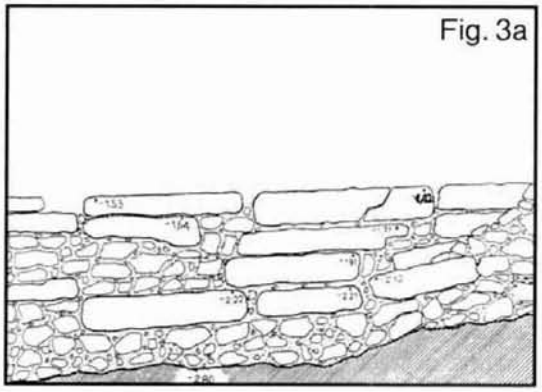


Fig. 2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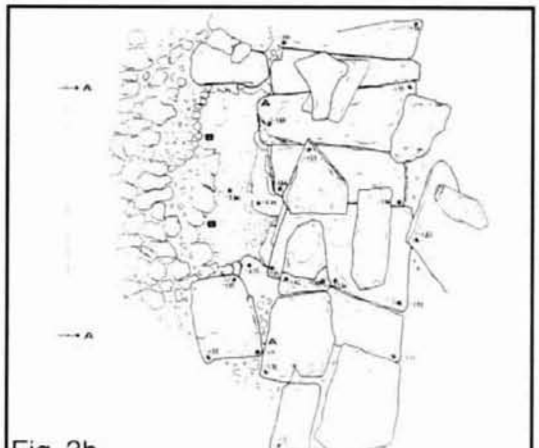
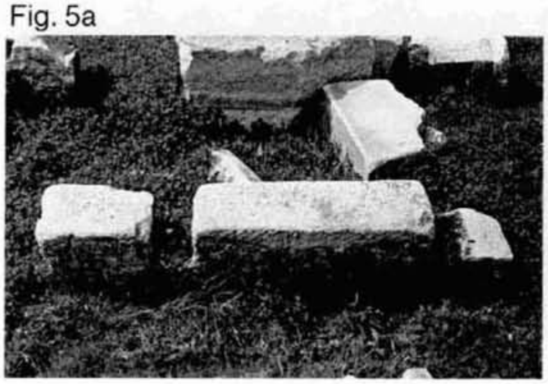


Fig. 3b

Fig. 4


Fig. 5a


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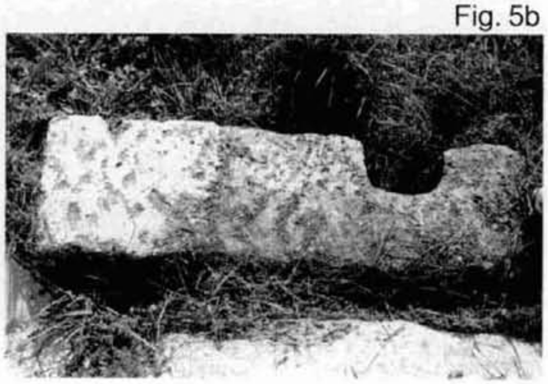


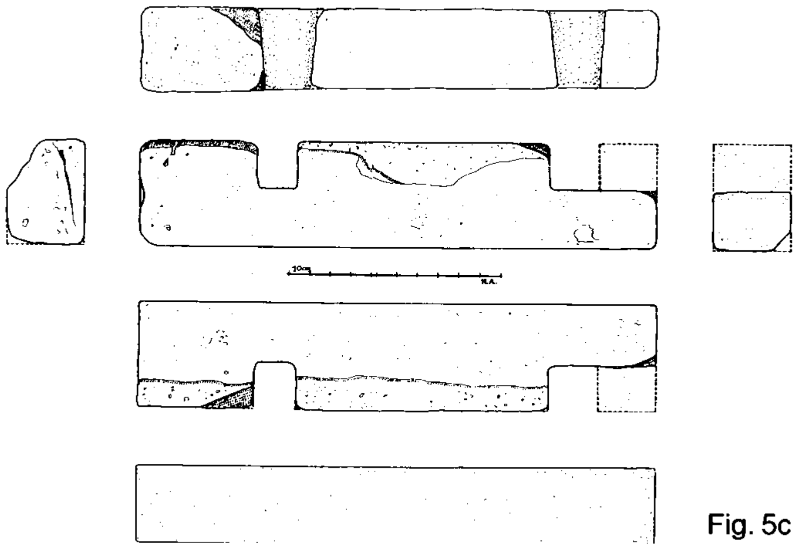
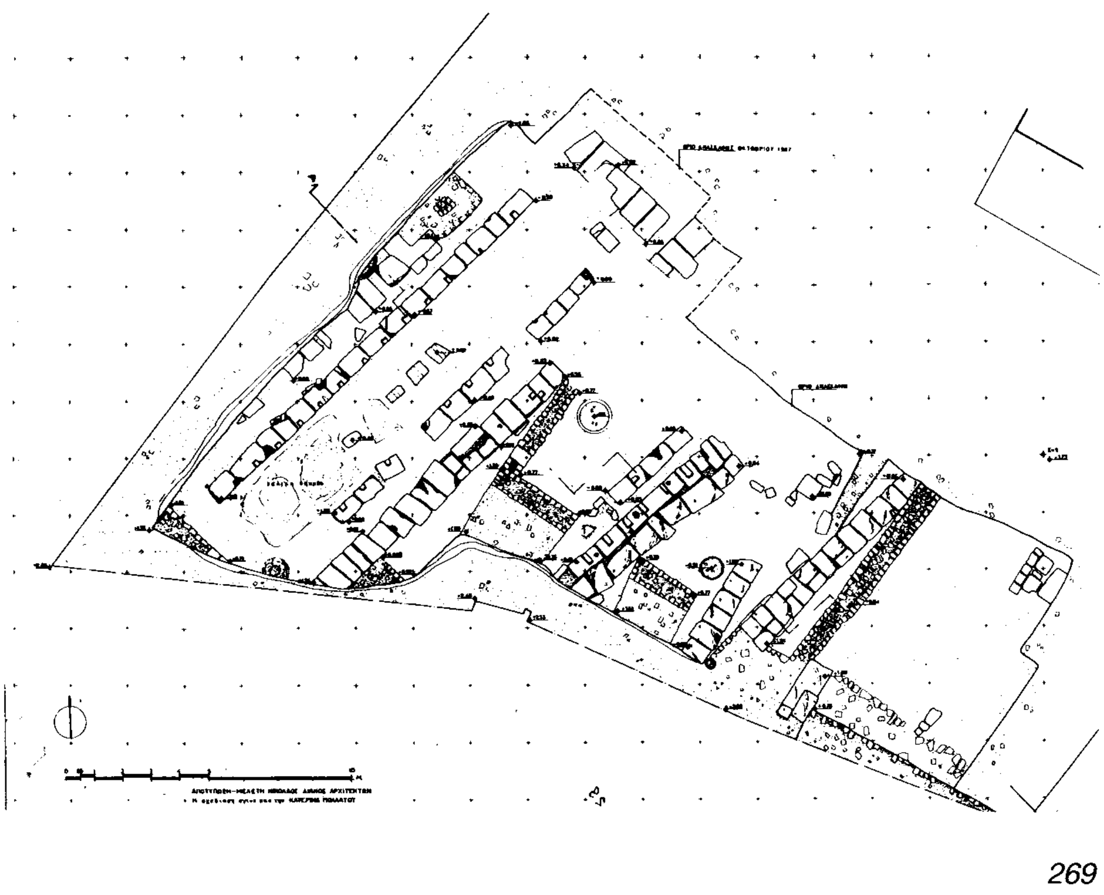


Fig. 5c

Fig. 6



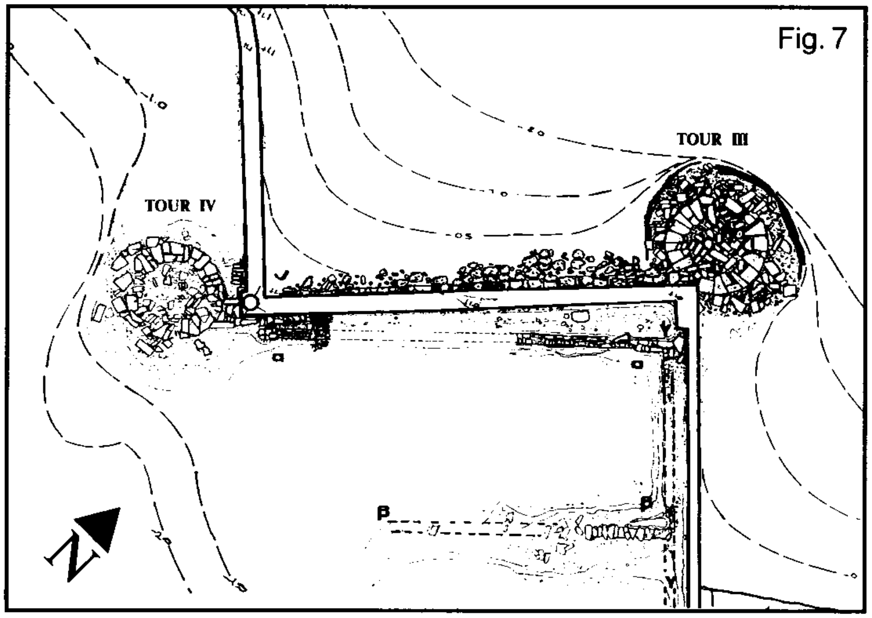
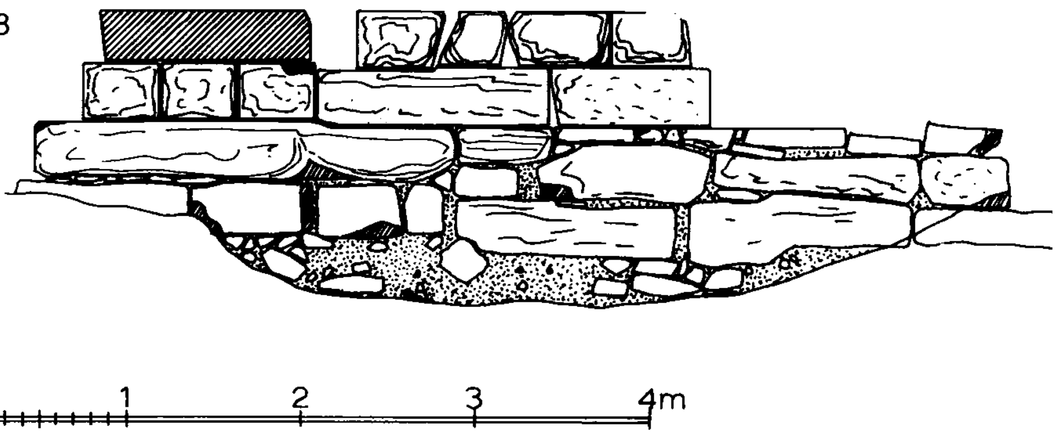


Fig. 7

Fig. 8



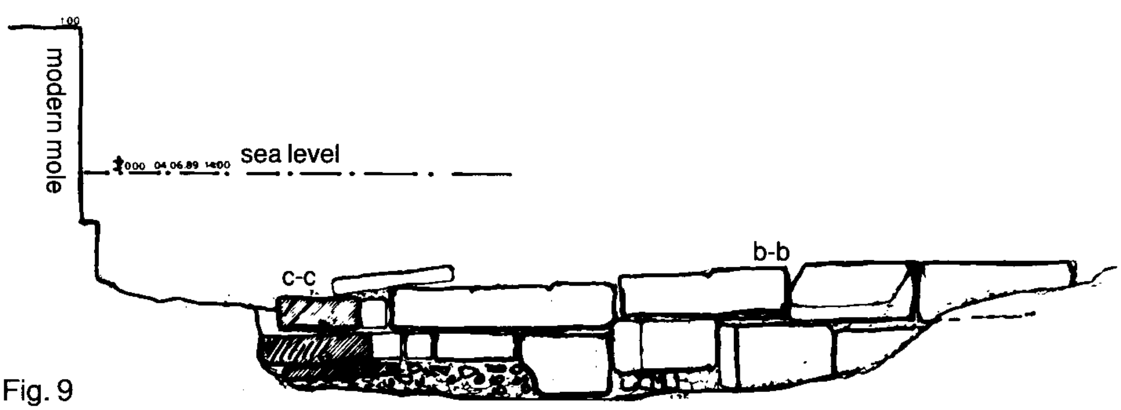


Fig. 9

Fig. 10

Fig. 11

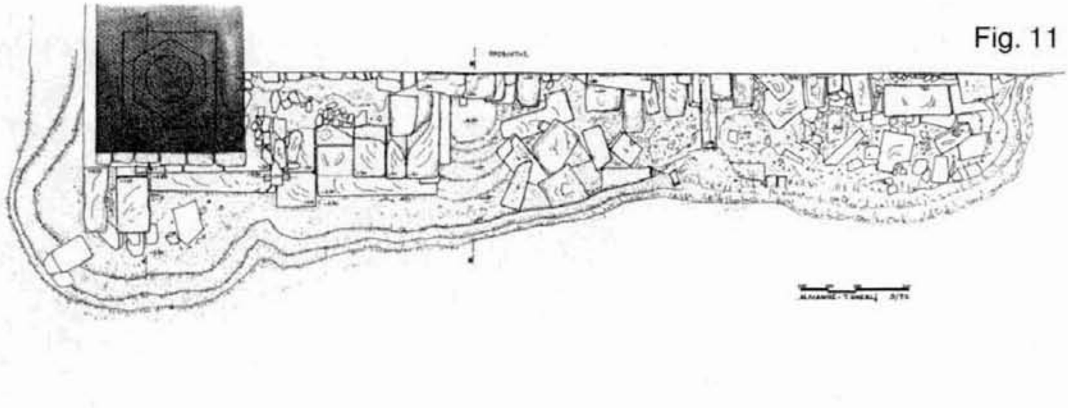


Fig. 12

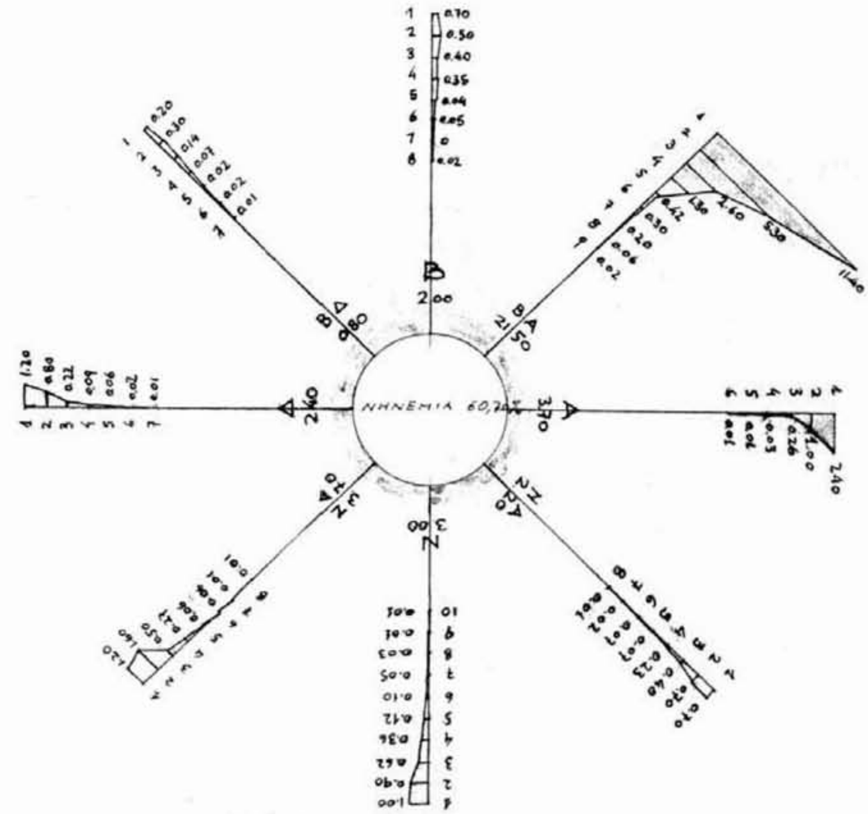


Fig. 13

SHIP ARCHAELOGY TOWARDS THE FUTURE. SOME CONCEPTUAL AND ORGANIZATIONAL OBSERVATIONS

With Albenga and the Grand Congloue, organized and scientifically orientated research in ship archaeology had its beginnings. Half a century later, the balance of credit is indisputable, now being acknowledged as an integral. There are however certain areas which require our immediate attention, others which should be considered as items for further development schemes.

a. Deviation from the dominant trend of dealing with isolated accidental discoveries of shipwrecks to systematic search and survey at designated areas of maritime archaeological-historical significance. Implementation of advanced search and survey technologies. Encouragement of simultaneous land and sea excavations while counting on the increasing number of shallow water sites.

b. Special attention to be given to the academization of the discipline in large, by introducing into the curriculum of Institutes of Higher Learning a formal study program leading to a graduate degree.

c. International coordination in the planning and timing of conferences, symposia and workshops, stressing thematic and regional uniqueness, to avoid conflicts and duplications.

d. Establishing a data base for ongoing research with a periodical publication of abstracts in 3-4 major language groups, to overcome present "compartmentalization".

e. Arousing public awareness in every country to the urgent need of preserving the Maritime Cultural Heritage - with the Hellenic Institute serving as an example.

All the above requires a statuary change of our biennial symposium by widening the scope of themes beyond the present stress on the history and technology of ships. It requires an organizational set up to follow up international collaboration and the application of some of the above proposal during the intermediate period between the general meetings. The prestigious position which this symposium acquired in the past decade, justifies the undertaking of a leading role in the initiation of future trends of development.

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EDITOR'S NOTE

Dr. Elisha Linder made a verbal communication and the above is only an abstract.

EVIDENCE ABOUT A NEOLITHIC DUGOUT (DHISPILIO, KASTORIA) (Preliminary Report)

Evidence about neolithic water-craft in Greece has been up to now restricted to indirect clues[1]: ethnological comparisons, such as the *papyrella* experiment[2] (for the pre-neolithic), long-distance relationships[3] —meaning overseas supplies or exchanges- and micrographic representations, that is, clay boat models[4]. The above, combined with the near presence of water —lake, river or sea—, as well as with the discovery of fishbones or water-bird bones, fishing gear or water-fowl hunting gear and with the technological possibility of wood-working on the sites, have led to the justified assumption that not only the coastal, but some at least of the inland neolithic inhabitants have had very early the opportunity of making and using some kind of simple water-craft, more precisely dugouts[5].

A recent discovery adds now its testimony about actual neolithic vessels. The evidence comes from the lake of Kastoria (Orestiada), in north-western Greek Macedonia, more precisely from the excavations conducted since last year (1992) by Georges Hourmouziadis, professor of prehistoric archaeology at the University of Thessaloniki, who has already presented the find briefly at the Macedonia and Thrace Congress last February in Thessaloniki[6].

The village of Dhispilio is situated 7 km to the south of the city of Kastoria, near the lake-shore. Till recent times, communication with Kastoria was preferably made by boat -this was also done between Kastoria and the village of Mavrovo (Mavrohori)[7], these two crossings of the lake being the shortest (1400 m between Mavrovo and Kastoria), the shore being also easily accessible there[8] (figs. 1, 4).

The lake of Kastoria covers an area of approximately 30 square kilometers and has a maximum depth of 8,5m. It is surrounded by alluvial and karstic water-bearing formations and is situated at about 610-620 m above sea level. The topography of the lake site on the south is almost horizontal, these areas being seasonally overflowed with water[9].

The partly submerged settlement site by the village of Dhispilio has already been identified by Keramopoullos in the '30's[10]. Nikolaos Moutsopoulos, professor of architecture at the University of Thessaloniki has conducted researches in the area since the sixties and published a sketch of the site (fig. 5), including all the posts that could be seen at the time above water level[11]. As a matter of fact, local inhabitants have always observed the posts when the water level lowers and they have all of them since some generations collected stone tools; some of them can be seen in the collection kept at the Κοινότητα (District Council) of Dhispilio.

The area where the excavation is taking place (fig. 2) is called Νησί (island) and it used to be an island, which has in recent times been artificially joined to the shore. The area is surrounded on the south by a later stone wall (fig. 5)[12].

It has been last season's (July 1992) great surprise when, on the last day of the excavation period, an intriguing fissure appeared in trench Δ2α. It has been progressively investigated, scraped and sprinkled with water with the result seen in fig. 6. The feature has been identified as a boat gunwale (in outline). It was photographed and then quickly covered again with earth, waiting for better days, that is, for a specialist in wood/boat conservation.

The find belongs to stratum 3 of the trench, 1 being the surface stratum. The latter contained mixed bronze age and neolithic sherds, as well as two net weights. Between strata 1 and 2 a layer (1-2cm) of lake sediments was covering the greater part of the trench. The following stratum, no 2, contained Late Neolithic flint blades and pottery sherds of Late Neolithic date (preceding classical Dhimini), mostly black-topped and black burnished[13]. The same pottery has since been found in corresponding strata of other trenches, and is still found at least in three lower strata, including that corresponding to the stratum of the boat and the two strata below.

The feature is 3,30 m long, 0,80 m wide at a distance of about 0,50 m from the rectilinear stern, the latter being 0,60 to 0,70 m wide. What seems to be a trapezoidal projection of the bow is only about 0,12 m wide[14].

Some other features seem to be related, such as one circular and two indefinite patches of red clay, a ring of ashes on port side, or a white, hard circle inside. Four small post-holes can also be seen on starboard side, touching the outline.

It is most striking, that actually, in the same area, near the village of Dhispilio, a traditional type of small craft is used exclusively for fishing, more precisely for net-fishing (figs. 7, 9 and 10), while the well-known καράβι (karavi)[15] of the lake of Kastoria is bigger, is found more frequently, and is used also for transport (there are actually 200 καράβια and 30 simple boats)[16]. This very simple flat-bottomed (πλάβα) plank boat is still made of pine, chestnut or elm[17], it is paddled with a λουπάτκα (loupatka) and is called μονόξυλο or μανόξυλο (monoxylo or manoxylo)[18]. If you ask local fishermen, including the last constructor of both karavia and monoxyla, Ioannis Kallinikos, who learned this skill from his father, about the reason why they call it monoxylo, they answer that it is because it used to be made of one piece of wood.

These monoxyla have previously been used by Turks and Greeks, professional or amateur fishermen for fishing in such shallow lake areas[19]. They are still used now. This is the only type of boat which can be used among the reeds of the shallow waters near Dispilio (figs. 7, 9 and 10). On the contrary, the Kastoria fishermen exclusively used and are still using karavia. The average length of the present-day monoxyla is approximately 3,5 m and their width, up to 1 m at the stern and 0,60 m at the bow.

When the workmen saw the dugout outline and the post holes and circular features, they immediately made the connection with the παλούκια (paloukia), posts used today to moor the monoxyla by means of a καδένα or chain (figs. 7 and 10). Usually paloukia serve to moor two boats, one on either side, and frequently you can even have rows of boats (fig. 10). They also spoke about fishing devices, small posts used to secure certain types of fishing nets.

If we go back to the neolithic and the indirect archaeological evidence, we can see some asymmetrical dugout models with a rather pointed bow and a straight stern (LN, Osikovo, Bulgaria)[20], sometimes with a possible fitted transom(?), or at least, an internal separation, such as the Tsangli boat model (fig. 8).

The excavation at Dhispilio produced several fishing net weights (oval shaped, with two engraved incisions, crossed at right angles), bone needles and possible bone hooks, as well as fish bones, stone axes and large post holes. I can't see that we need further proof about the existence in neolithic times of boat fishing at Dhispilio. It is only hoped that it will be possible to obtain proper treatment for this find and thus the maximum possible information about this aspect of neolithic life by the lake of Kastoria[21].

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NOTES

1. Cf. T. W. JACOBSEN, *Maritime mobility in the prehistoric Aegean*, this volume, pp. 00-00. I am grateful to prof. Jacobsen for kindly providing a copy of his paper before publication.
2. H. TZALAS 1989.
3. See for instance: C. RENFREW 1972; T.JACOBSEN 1976; C. PERLES 1979, 1983, 1989.
4. C. MARANGOU 1991a, *idem* 1991b and 1992, esp. pp. 40 and 165.
5. C. MARANGOU 1991a.
6. HOURMOUZIADIS 1993; cf. *idem*, Μάθημα στα πλαίσια του Ελεύθερου Πανεπιστημίου, Εταιρεία Μακεδονικών Σπουδών, Thessaloniki, December 1992 and *idem*, paper "Kathimerini", 10.1.1993. I am most grateful to him for permission to present the find in this symposium, as well as for kindly providing the photograph of fig. 6.
7. P. TSOLAKIS 1992, fig. 1.
8. P. VAPHEIADIS 1983.
9. P. VAPHEIADIS 1983.
10. KERAMOPOULLOS 1932 and 1938.
11. S. MARINATOS 1968; N. MOUTSOPOULOS 1973/74.
12. N. MOUTSOPOULOS 1973/74.
13. Cf. H. HAUPTMANN 1981.
14. Measurements taken after a sketch of the find (excavation notebook, sketch no 1, trench Δ2α, stratum 3, 24.7.1992, scale 1:25).
15. ZATTAS 1988, TSOLAKIS 1992.
16. P. TSOLAKIS 1992.
17. Oral communication by I. KALLINIKOS, to whom I am most grateful for very helpful information concerning the monoxyla.
18. P. TSAMISIS 1949; P. TSOLAKIS 1992 and oral communications by local fishermen.
19. P. TSAMISIS 1949; P. TSOLAKIS 1992.
20. LE PREMIER OR, p. 91, no 74; cf. FREY 1991, fig. on p. 197.
21. Before the printing of these proceedings, professor Hourmouziadis published the book *Dispilio (Kastoria), the prehistoric lakeside settlement*, Codex, Thessaloniki 1996. The dugout outline is presented there in fig.12, p. 43.

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ILLUSTRATIONS

Fig. 1	View of the site (the trees in the centre of the coast) across the lake, from the north (from Kastoria) (August 1993).
Fig. 2	View to the north (towards the lake) from the excavation trenches (October 1992).
Fig. 3	View of the site (trees and small church to the right) across the water, from the west (August 1993).
Fig. 4	The lake of Kastoria and the boat crossings (after P. TSOLAKIS 1992, fig. 1).
Fig. 5	Sketch of the site at Nísí (after N. MOUTSOPOULOS 1973/4, fig. 9).
Fig. 6	The trench Δ2α at the end of the excavation period (1992) and the dugout outline (slide kindly provided by professor G. Hourmouziadis).
Fig. 7	Monoxylo moored at Dhispilio, some meters away from the excavation (August 1993).
Fig. 8	Middle Neolithic (?) boat model from Tsangli.
Figs. 9-10	Monoxyla moored at Dhispilio (August 1993).

Fig. 1

Fig. 2

Fig. 3

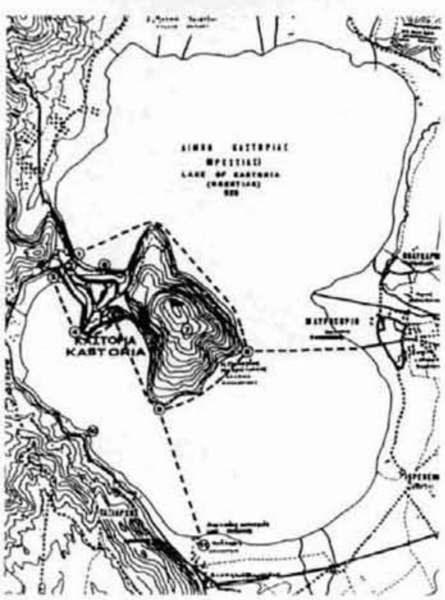

Fig. 4

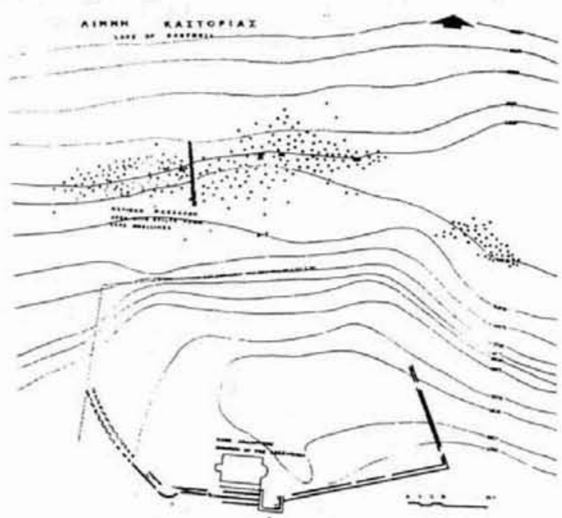

Fig. 5


Fig. 6


Fig. 7


Fig. 9


Fig. 8


Fig. 10

UNDERWATER ARCHAEOLOGY AND ANCIENT HISTORY: EVIDENCE AND QUESTIONS

Over the last two decades the social and economic history of the ancient world has benefited from increased scholarly attention. Since 1973, when Finley published his epoch-making *The Ancient Economy*, many historians have challenged his notion of a primitive economy[1]. This is not the place to discuss the various positions in this debate. I would like to focus here on the contribution of underwater archaeology to a much debated point: the international maritime trade.

I am not the first -and I shall not be the last- to argue that we should try to see the data provided by excavations under water against a wider background. It suffices here to refer to Anthony Parker's magisterial catalogue: *Ancient Shipwrecks of the Mediterranean and the Roman Provinces* (1992) in which both the historian and the archaeologist will find much relevant data presented in a wider context[2].

Everyone will agree that we can only say something sensible about economic backgrounds if we have sufficient data at our disposal. Underwater archaeology therefore has less to say about Greek than about Roman commerce, since most excavations took place in the eastern Mediterranean, and concerned mainly Roman vessels of the period 200 BC. to 300 AD.

The four case studies which I shall discuss here stem from this period. I hope to demonstrate that in some respects shipwrecks have confirmed, and even added to, the results of other historical studies. In other cases, however, they contradict the claims of research based on literary and other archaeological sources, and sometimes they can even force us to reconsider traditional historical wisdom. I am aware that my case studies do not carry equal weight. Many more wrecks can be dated to the last century of the Roman republic and the first century of the Roman principate than to the third century AD, when the empire was in decline[3]. Remarks about wrecks from the heyday of the Roman empire have therefore more validity than comments on wrecks from the period of crisis. Since wrecks are, in my opinion, very suitable controls for other historical and archaeological data, I shall risk speaking prematurely in order to discuss them.

My first example is a very well known one in which the *amphorae* found in shipwrecks confirm the traditional picture. We know from literary sources that Italian agriculture changed considerably from the second century BC. onwards, as a result of a massive reallocation of land, capital and labour, and of the emergence of a new market[4]. The second Punic war had wrought havoc, and many farms had been left by their owners. Where the original owners were unknown, these farms came under public ownership. The same happened to the land of Roman allies who had collaborated with the enemy. Roman conquests in the Mediterranean world provided capital in the form of booty, and labour in the form of slaves. Finally, the urbanization of Italy, which was the result of the flight of farmers from the countryside and of voluntary or forced immigration from the provinces, created a new market.

Wealthy Romans were the new owners of agricultural land which they organised as large capital-intensive farms. Although we would perhaps expect otherwise in view of the growing urbanization, their major product was not wheat. The ranches in southern Italy were dedicated to animal husbandry; the farms of Latium, Campania and Etruria concentrated on profitable cash crops wine and olives[5]. The wheat needed to feed the growing urban populations was more and more frequently imported from the provinces: first from Sicily, later from Sardinia and Corsica, and from the mid-second century, from North Africa as well. *Amphorae* finds allow us to trace the growth of viticulture in Latium, Campania and Etruria, as well as the export of wine to the western provinces. Fortunately, the typology of amphorae, the foundations of which were laid in 1879 by the German archaeologist Heinrich Dressel, and which was later further refined by Beltran, Pélichet and Kapitän, still serves us well if we want to assign a date and a place of origin to Roman *amphorae*[6].

Before the mid second century BC. when Italian viticulture started to flourish, wine was mostly transported in Graeco-Italian *amphorae*. From the mid second century BC, these relatively small, fairly thin, pear-shaped *amphorae* were replaced by wine *amphorae* of the more robust elongated Dressel 1 type, which was particularly suited to long and intensive use. The introduction of this type of *amphora* can be related to the growing market for wine. The urbanization of Italy provided a strong home market for Italian wine producers. Ordinary people —the autochtonous city dwellers and the immigrants from the Italian countryside, as well as the urban slaves—

drank ordinary wines, but the elite savoured the *grands crus*, the fine wines from the *Ager Caecubus* and the *Ager Falernus*. The new provinces, in particular Spain and Gallia Narbonensis, also offered excellent market opportunities for Roman traders[7].

Roman Dressel 1 *amphorae* have been found spread over almost all of Gaul and Spain. Maritime finds emphatically support this picture. We can follow the growth of Italian wine export better through the wrecks along the coasts of north-western Italy and southern France, than in the Gallic settlements. A shipwreck is a kind of time capsule: we find a wreck as it was when it sank, the cargo unmixed with objects from other periods. We could call each wreck a “miniature Pompeii”.

There is a marked increase in the frequency of wrecks dating from the century after 150 BC[8]. The shipwrecks are not alone in increasing, the number of *amphorae* per wreck also increases very significant. The oldest of two shipwrecks, found near the little island of Grand-Congloué, dates from about 200 BC; it appears to have carried only a few dozen Graeco-Italian *amphorae*. The wreck of Chrétienne-C, between Saint-Raphael and Cannes, which dates from the second quarter of the second century BC, carried some 500 Graeco-Italian *amphorae*[9]. These numbers are insignificant compared to the numbers of Dressel 1 *amphorae* which were transported after the mid-second century BC. The second wreck from Grand-Congloué, from about 100 BC, was loaded with 1.700 Dressel 1 *amphorae*. The wreck of La Madrague de Giens, from about 70-60 BC, transported 7.000 *amphorae*, and the Albenga wreck, from about 80 BC, between 10.000 and 13.000 amphorae —figures which point at a huge export, and at ships with a cargo capacity of between 350 and 450 tons[10].

In my second case study I would like to show how shipwrecks can help us where other sources do not allow us to reach a conclusion. In the first and second centuries of our era Spain was a major supplier of olive oil and *garum*, a type of fish-sauce which was not only popular in Roman kitchens, but also used for medicinal purposes. The growing political influence of Spanish aristocrats in Rome may have been an important factor in this success story. It had already started to develop in the days of Julius Caesar, when the first Spaniards were accepted into the senate. The Spanish connection became considerably more important during the years from Claudius to Nero. Spanish exports to Rome kept abreast of this development, as is shown by the large numbers of Spanish *amphorae* in the shipwrecks of the first and second centuries AD, and of Spanish sherds in the various layers of the *Terme del Nuotatore* ("the baths of the swimmer") in Ostia, and the Monte *Testaccio* in Rome[11].

There is some controversy about the exports of olive oil and *garum* from Spain. Baetica, in Spain, became the most important exporter of both products.

The question is, however, which of the two was more frequently imported into Rome? It is commonly held that this was olive oil, but this view is not confirmed by the sherds of the Spanish oil amphorae from the *Terme del Nuotatore* in Ostia. Dressel 20 oil *amphorae* from Baetica are much less frequent in the older Flavian layers than the *garum amhorae* Dressel 7-13, which also come from Baetica[12]. (See Panella's table)[13]. However, the finds from the *Monte Testaccio*, close to the place where the seagoing ships and river vessels were unloaded, present a different picture. This material is almost completely composed of oil *amphorae* from Baetica.

Can underwater archaeology be helpful here in the future? I think it can. There is hardly any literary evidence for the Spanish trade in *garum*, but the numerous finds of Dressel 7-13 *garum amphorae* accompanying oil and wine *amphorae* in Spanish wrecks, compensate for this lack of information[14]. Pascual Guasch, who has investigated 57 wrecks from Baetica, counted more *garum amphorae* of the Dressel 7-13 type than oil amphorae of the Dressel 20 type. In his view, the trade in *garum* must have been larger than the trade in olive oil[15].

My third case study concerns North Africa's share in the maritime trade with Rome from the second to the fourth century AD. It shows how careful we must be if we want to place the finds from shipwrecks in a wider context. It is well known that from the beginning of the second century AD. North African oil and *garum* production increasd strongly. By the end of the second century, North Africa surpassed Spain in this respect[16]. If we have a look at the pie-charts concerning imports into Ostia, based on data compiled by Panella and Whittaker[17], we can see that imports from North Africa increase strongly. Under Hadrian 17% of all sherds come from North Africa. Under Antoninus Pius this figure has increased to 25% and under the Severan emperors to 45%. In the fourth century it even reaches 57%. This could not have been suspected from the excavated shipwrecks. It could be objected of course, that there have been few excavations along the coasts of North Africa. But ships that went to Rome from the eastern parts of North Africa had to sail past Sicily and along the Italian coast; ships that came from the western parts of Africa, either crossed directly to the Balearii Islands Sardinia and Corsica, or kept close to the Spanish and French coasts. These are hardly areas which have been ignored by underwater archaeologists! And yet Tortorella, whose study of North African wrecks covers all those found before 1981, counted with reference to a period of 300 years, no more than 21 wrecks which contained North African *amphorae*[18]. This would seem to point to a low export from these regions. During the last ten years, this situation has changed slightly. Parker's catalogue mentions many more wrecks carrying African *amphorae*, but they are still less numerous than may be expected on the basis of the available data from the excavations in Ostia. The discrepancy between the African *amphorae* in Ostia and the African *amphorae* in Mediterranean shipwrecks remains.

Finally, I would like to discuss a case, in which the finds of *amphorae* and wrecks may one day force us to reconsider received historical views: the supposed crisis of the third century AD. The invasions and the economic and monetary recession of the third century AD. plunged the Roman Empire into a deep political and economical crisis. Nearly all the provinces were affected, and Spain was probably no exception. The decision by Septimius Severus, at the beginning of the third century to place Spanish oil export under state control is commonly regarded as a major factor in Spain's decline[19]. Free export declined sharply, as we can tell from Ostia's imports of Spanish oil which dropped from 24% under Antoninus Pius, to a mere 8% in the third century (See the graph for the growth of imports from North Africa). Normally it is believed that the exportation of Spanish oil decreased so strongly in the third century that by the 250s it had all but disappeared[20]. The invasions of the Franks and other Germanic tribes,and the destruction that these caused only dealt, in the views of these historians, the final blow. However, research on the island of Cabrera, near Mallorca, has shown that we have some reason to doubt this scenario. One of the wrecks which was found there, the Cabrera III wreck, which can be dated to 257 AD. on the basis of a picture of the emperor Valerian, contained oil *amphorae* of Dressel types 20 and 23[21]. It seems likely, therefore, that during the late 250s the export of Spanish oil continued as before. Moreover, in spite of the measures of Septimius Severus, the organization and financing of this export trade do not seem to have changed a great deal since the mid second century AD. So, at least, the excavators argue, on the basis of 765 sesterces which were abroad the ship when it sank in 257 AD. In their view it is possible that the crisis of the third century manifested itself more clearly in other regions of the Roman Empire, mainly in the East. After all, the Roman Empire was not a conglomerate of interdependent markets. Spain was not bypassed by the crisis, but it was hit later, probably only after 265 AD[22].

It would be very useful to investigate other shipwrecks from the chaotic days of the mid third century against this background. Many historians would be eager to know the results and the status of underwater archaeology among them would thereby be raised considerably.

I have now reached the end of my paper. I hope that I have made clear to you that in the near future investigation of wrecks will have much to offer historians.

Much will depend on the historians, who will have to formulate the right questions to archaeologists to use in their research. But as much will depend on archaeologists, who must be prepared to refer in their excavation reports to wider questions. If we can succeed in this, I, for one, would not be surprised if studies of ancient wrecks were to receive more attention from historians than has hitherto been the case.

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NOTES

1. M.I. Finley, *The Ancient Economy*, London 1985², see for the variations in the views of "modernist's" and "primitivists" J.W. Pleket, "Wirtschaft" in: Wirtschaft unf Gesellschaft des Imperium Romanum (Part I of W. Fischer (ed.), Handbuch der Europäischen Wirtschafts-und Sozialgeschichte, Stuttgart 1990, 31-55).
2. A.J. Parker, *Ancient Shipwrecks of the Mediterranean and the Roman Provinces*, Oxford 1992; cf. P.A. Gianfrotta-P. Pomey, *Archeologia subacquea*, Milan 1980; K. MucKelroy (ed.), *Archaeology under Water. An Atlas of the Worlds Submerged Sites*, New York-London 1980; P. Throckmorton (ed.), *History from the Sea. Shipwrecks and Archaeology*, London 1987.
3. Cf. Parker, *o.c.* (note 2), 549 amd 5-9.
4. See especially P.W. de Neeve, *Peasants in Peril. Location and Economy in Italy in the Second Century BC*, Amsterdam 1984.
5. Cf. W. Jongman, *The Economy and Society of Pompeii*, Amsterdam 1988, 140.
6. See for a short survey of the development of amphora-studies J.M. Schuring, "Studies on Roman Amphorae I-II", *BABesch* LIX.2 (1984), 137-147; D.P.S. Peacock-D.E. Williams, *Amphorae and the Roman Economy. An Introductory Guide*, London-New York 1986. Another very instructive text is *Amphores romaines et l'histoire économique. Dix ans de recherches*, Rome 1989.
7. The growth of viticulture in Italy is extensively treated by A. Tchernia, *Le vin de l'Italie romaine. Essai d'histoire économique d'après les amphores*, Rome 1986.
8. Cf. Parker, *o.c.* (note 2), 551, fig. 5.
9. I follow Gianfrotta-Pomey, o.c. (note 2), 151-153.
10. See for the wreck of Grand-Congloué, E.L. Will. "The Sestius amphoras: a reappraisal", *Journal of Field Archaeology* VI.3 (1979), 339-350; see for the wreck of La Madrague de Giens, A. Tchernia-P. Pomey, *L'épave romaine de la Madrague de Giens (Var.)*, supplement à Gallia 1978; the wreck of Albenga is described by N. Lamboglia, "La nave romana di Albenga", *Rivista di Studi Liguri* XVIII, part 3 and 4.
11. See for the *Terme del Nuotatore* the publications of C. Panella in: Ostia. Terme del Nuotatore I (Rome 1968), 97-116; II (Rome 1970), 102-156; III (Rome 1973), 480-633; see for the *Monte Testaccio*, E. Rodriguez-Almeida, Il *Monte Testaccio*, Rome 1984; see also J.M. Blazquez, "The latest work on the export of Baetican olive oil to Rome and the army", *Greece & Rome* xxxix.2 (1992), 173-188.

12. See Panella (note 11), esp. *Ostia* II, 125-126.
13. This table comes from C. Panella, "La distribuzione e i mercati" in A. Giardina-A. Schiavone (eds.). *Società romana e produzione schiavistica. Merci, mercati e scambi nel Mediterraneo*, Rome-Bari 1981, 68-69, and is based on her publications named in note 11.
14. See R.L. Curtis, *Garum and Salsamenta. Production and Commerce in Materia Medica*, Leiden 1991, 59-61.
15. R. Pascual Guasch, "La evolucion de las exportaciones béticas durante el Imperio", in M. Blazquez-Martinez (ed.), Produccion y comercio del aceite en la antigüedad. Primer Congreso Internacional. Madrid 1980, 233-242; cf. Curtis *o.c.* (note 14), 59-71.
16. Curtis, *o.c.* (note 14), 60; 64-71.
17. Panella *o.c.* (note 11) and C.R. Whittaker, "Trade and the aristocracy in the Roman empire", *Opus* IV (1985), 9-75, spec. 51.
18. S. Tortorella, "Ceramica di produzione africana e rinvenimenti archeologici sottomarini della media e tarda età imperiale", *MEFRA* XCIII (1981), 335-380.
19. Rodriguez-Almeida, *o.c.* (note 11), 212-222; cf. Blazquez, *o.c.* (note 11), 184.
20. Cf. Blazquez, *o.c.* (note 11), 177-179.
21. J.P. Bost, M. Campo, D. Colls, V. Guerrero, F. Mayet, *L'épave Cabrera III (Majorque)*, Paris 1992.
22. Bost (a.o.), *o.c.* (note 21), 207-210.

ILLUSTRATIONS

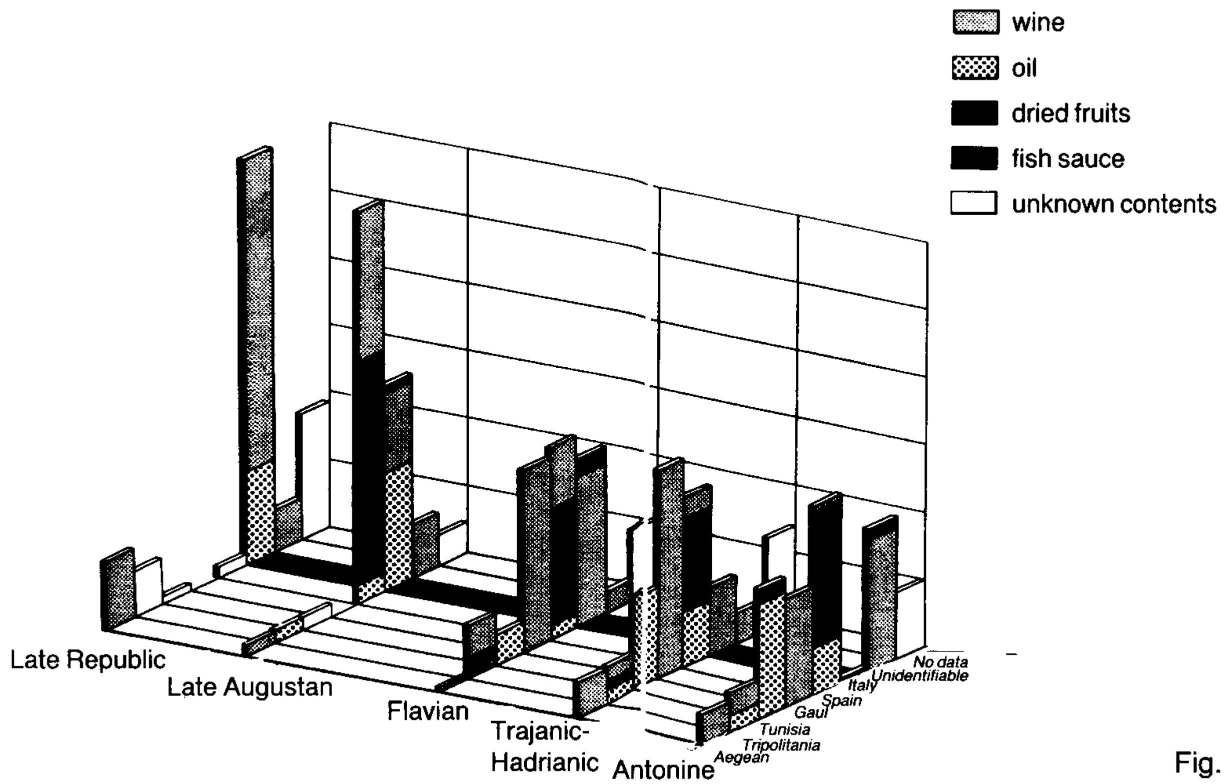
wine
oil
dried fruits
fish sauce
unknown contents
Late Republic
Late Augustan
Flavian
Trajanic-Hadrianic
Antonine
No data
Unidentifiable
Italy
Spain
Gaul
Tunisia
Tripolitania
Aegean

Fig. 1

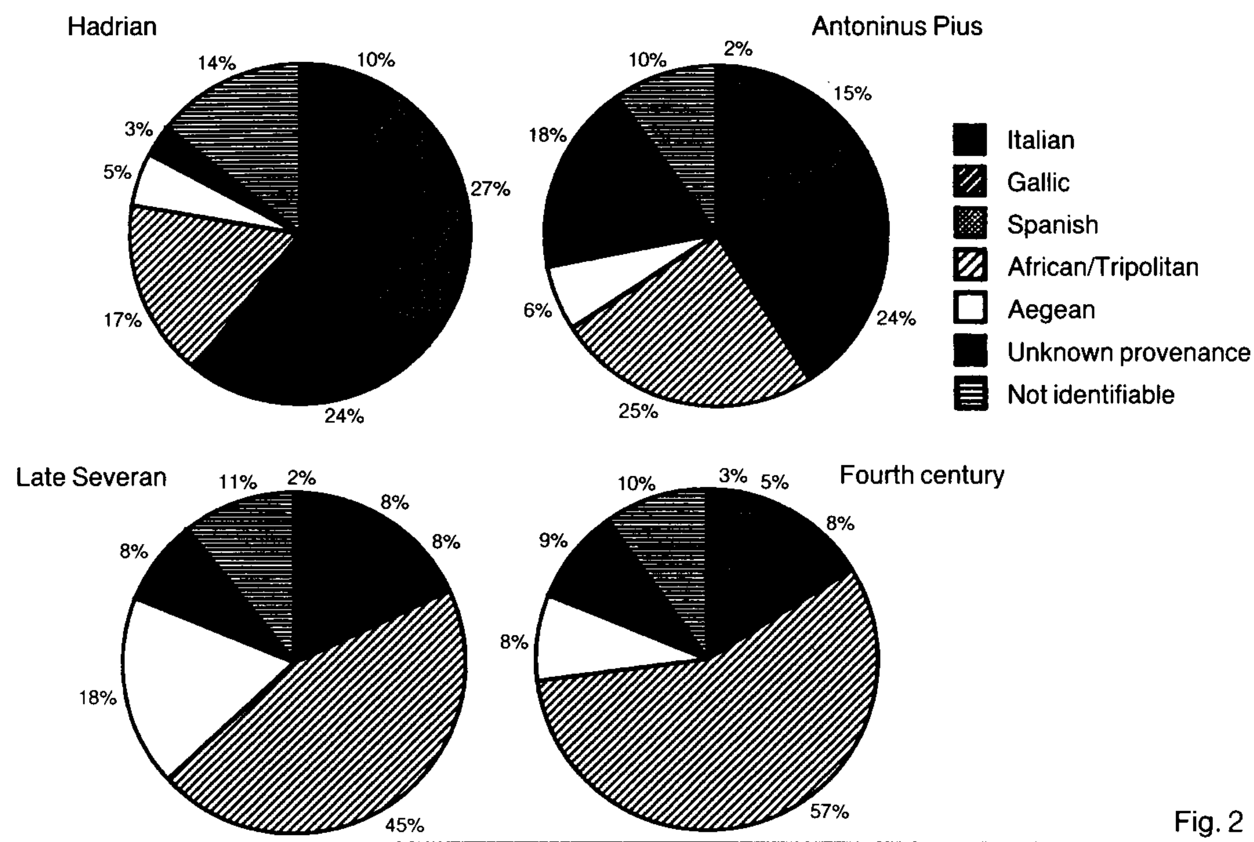
Hadrian
14%
10%
3%
5%
27%
17%
24%
Antoninus Pius
10%
2%
15%
18%
6%
24%
25%
Italian
Gallic
Spanish
African/Tripolitan
Aegean
Unknown provenance
Not identifiable
Late Severan
11%
2%
8%
8%
8%
18%
45%
Fourth century
10%
3%
5%
8%
9%
8%
57%

Fig. 2

THE TETRERES (QUADRIREME OF FOUR)

1. HISTORY

Aristotle is quoted by the elder Pliny (*NH)* as having attributed the invention of the four to the Carthaginians. There is some rather uncertain evidence for the four's presence in the fleet that Dionysios II inherited from his father in 368 BC. Dionysios would certainly have been aware and have copied any invention made by his naval competitors. A Carthaginian connexion might equally have been responsible for a more likely first historical appearance of the four in Alexander's siege of Tyre in 332 BC., both in his own fleet (Curtius 4.3.13) largely derived from his Phoenician allies and among the Tyrian ships. Two years later (330-329 BC.) eighteen fours are recorded in the Athenian naval inventories (*IG* 2^2 1627 24), but their introduction there could have been three years earlier since no lists for those years survive. The number of fours in the Athenian navy had by 325/4 BC. increased to 50; and when Alexander reached Thapsakos in 324 BC the fleet of threes, fours and fives he had ordered, some brought overland from Phoenicia, were waiting for him. The growing popularity of fours is shown immediately after the death of Alexander when the Athenian assembly voted, in a burst of nostalgic jingoism, to form an alliance to regain the mastery of the Aegean with a fleet which was to include 200 fours. But the dream faded at the defeat of Amorgos.

Naval supremacy in the Aegean was achieved by Antigonos in 315/4 BC. with a Grand Fleet or 240 warships in which of the 113 heavier types 90 were fours. But Antigonos's son Demetrios, who in 306 BC. was given the naval command in the invasion of Cyprus as a preliminary to the conquest of Egypt, did not share the naval preferences of Athens and of his father. His invasion fleet contained 53 of "the heavier, troop carrying, warships" which with additions in the final battle were 7 sevens (Phoenician), 10 sixes, probably 45 fives, and only 30 (Athenian) fours, whereas the fleet of his opponent Ptolemy contained "nothing larger than a five or smaller than a four". Since in the description of the battle the disadvantage is emphasised at which Ptolemy stood with ships lower in the water than Demetrios's, it is likely that in his fleet fours were in the majority.

In the invasion of Egypt that followed there were no major naval engagements. The only heavier ships mentioned were fives and fours; and it was noted that when the fleet was struck by a northerly gale the fours were driven to the dangerous moorings at Raphia, whereas the more powerful fives were able continue to Kasion (where in fact they were not much better off).

Fours seem to have been discredited in these two campaigns as to both their fighting and their sea-keeping qualities. The subsequent struggle for naval supremacy among the greater naval powers in the eastern and western Mediterranean was fought out by heavier warships from fives upwards. Fours were used by the Romans and Carthaginians but not in the line of battle. The Rhodians retained a preference for the four, and in 47 BC Julius Caesar found himself faced by an Egyptian fleet which was largely of fours. Sextus Pompeius in Sicily met Octavius's heavier fleet of fives and above with a fleet in which his own flagship, a six, was apparently the only ship heavier than a four.

II. ICONOGRAPHY

For modern enquirers the four is unique among ancient oared warships in one respect. A contemporary representation of her, the *Alba Fucens* graffito, dated 1stC BC-1stC AD, survives, labelled with her type name in latinised *Greek navis tetreris longa* (Fig. 1). This accident means that the process of discovering the oar-system and other practical details of the four, unlike the same process in the case of the other warship types, begins with the iconographical evidence to which the epigraphical and literary evidence is subordinate.

The graffito shows a long, low, warship with a deck but no bulwark, a ram and no visible oarbox or oarports. The stern also finishes without the normal upcurving aphlaston. The absence of the bulwark, oarbox and oarports, and aphlaston does not necessarily mean that the ship depicted did not have them, since the sketch is very rough and unfinished, and the ship's side is quite blank except for the course in lattice-work below the line of the deck and some indication of wales. The graffito has one great virtue, the ship is shown without the distortion of exaggerated human figures.

Apart from the prow the most striking, and at first sight most puzzling, feature is the criss-cross latticework course, which looks at first sight like a bulwark, although bulwarks of this pattern do not occur. It may be explained by reference to two monuments, the Palazzo Spada relief which is regarded as a Roman copy of a Hellenistic original, the *Praeneste* relief of the last half of the 1stC BC., and to a coin minted by Octavian at *Lugdunum* 40-37 BC. Three other monuments may give support, the Orange Arch relief 1stC AD or before, the *Aula Isiaca* fresco 1st-2ndC AD, and the Trajan's Column relief AD 113. In the first three cases all but one show criss-cross latticework and all three show a bulwark above the latticework.

The Palazzo Spada relief (Fig. 2) shows a warship's. On the deck there is a bulwark and tower and outboard of the bulwark a *parodos.* The latter forms the top surface of a structure in the top section of which is a criss-cross latticework cource and in the bottom section two rows of oars en échelon. The *Praeneste* relief (Fig. 3) shows a ship which similary has a deck on which there is a bulwark and tower and outboard of the bulwark a *parodos* (on which soldiers are standing). The *parodos* again is the top surface of a structure in the top section of which there is a course of louvres with a different pattern of latticework. Beneath the cource of louvres two rows of oars emerge en echelon, one through and one below the structure. The Octavian coin (Fig. 4) shows a warship's prow. On the foredeck and continuing onto the maindeck there is a post and rail bulwark. Below the maindeck and aft; of the eye and *parasemon* a course of criss-cross latticework runs aft of the same pattern as that on the graffito and the Palazzo Spada relief. Latticework courses of the same criss- cross pattern run from bow to stern above the oarsystem in ships depicted in whole or part on the Orange Arch (Fig. 5), the *Aula Isiaca* fresco (Fig. 6) and Trajan's column (Fig. 7) but in the last two cases the introduction of enormously exaggerated human figures within the ship, the function of the latticework screen has been entirely disguised.

The following conclusion is to be drawn from these monuments and coins. In the Athenian navy removable screens of hair or leather were used in battle to protect from missiles the open side of the three, divided into "rooms" by the deck stanchions and thus above the *parexeiresia.* When missile attack became a more serious hazard a permanent course of (usually) latticework units divided by the deckstanchions was devised as permanent framework for the screens put up in battle. It is this latticework course divided into units by the stanchions which the artist of the graffito sketched, leaving out both the bulwark and towers which usually (but not always) made the deck a fortress, and as well the oarsystem below.

THE OAR-SYSTEM OF THE FOUR

The identification of the graffito's criss-cross latticework course of 22 units as a louver provides a useful dimension. If the interscalmium (distance between the tholes determining the oarsman's room by the Attic/Roman cubit) is 2X444=888m then the length of the latticework course is 19.54m. A rough estimate of the height of the deck above water may be gained from Livy 20.25 . 2-8: where the decksoldiers of two Carthaginian fours were unable to board a higher Roman five "so long as the supply of missiles (on the five) held out". The difference in height is not likely to have been less than 0.5m.

At Aktion the (approximate) height of Antony's ships from fives to tens (or nines) is said to have been "10 feet" nearly 2.96m, above the water. The height of a three (*Olympias*) was calculated to be 2.6m, and the five would have been a little higher at 2.96. J.F. Coates calculates the height of the four to have been 2.2m, which fits Livy's story well. The ratio of the height above water, at 2.2m, to the length of the latticework course, at 19.54m, is 1:8.88 and that is very close to the ratio between the height above water of the graffito ship and the length of the latticework course there, which is 1:8. The artist's eye has got the proportions just about right.

There is a clue to the number of oars in an Athenian four. An inscription of 325/4 BC. (*IG* 2^2 1629) gives a valuation of a four's set of oars (*tarros* a word which excludes spares) at 665 dr. Andokides at the end of the 5th century gives a price for a rough-hewn oar spar as 5 dr. The *tarros* of a three, rough-hewn, would have cost 850 dr, the *tarros* finished well over 1000 dr. The oars of a four must accordingly have been fewer.

Since the four's tarros of 325/4 BC must have cost a whole number of obols for each oar and there must have been an even number of oars (the same number for each side). The largest even number of oars in the right range which as a divisor of 665 produces a whole number of obols (57=9dr 3 obols) is 70, 35 oars a side. Since, as we shall show, the four's oars were double-manned and consequently more substantial 91/2 dr. is a suitable value.

If the number of levels of oars in a five was three, Livy's story above suggests that the four being lower had fewer than three levels. A more precise clue is provided by Appian describing an incident in the battle of Mylae (36 BC.). Dio and Appian both describe Octavian's ships under Agrippa as heavy slow, of deep draught and manned by many deck-soldiers, while Sextus's ships under Papias were smaller, light, fast and of shallow draught. Neither historian names them by the type except in the case of Sextus's flagship which was appropriately a six. Octavian's fleet contained at least fives and sixes. He had earlier (Appian 5.95) lost one six in a storm and six heavy ships altogether.

At Mylai (Appian 5,106) Agrippa led the heavy ships at the centre'. Though smaller and lighter Papias's ships neverheless like Octavian's had towers at bow and stern. The decks of Papias's ships were lower than the decks of Agrippa's since latter "threw *missiles* from a height to ships of lower level". Pompey was not at Mylai but with his fleet (and flagship) at Messana waiting the outcome of the battle. When battle was joined, Agrippa, on his flagship, probably a five, attacked Papians's ship and "smashed into it at the *epotis*. The ship threw off the men in the towers and began to take in a great deal of water. Of the oarsmen the *thalamioi* were all trapped but the other of the two categories (*hoi heteroi*) broke through the deck and swam away". The passage makes it clear that in Papias's ship there were two level of oarsmen the *thalamioi* (lower) and the *zygioi* (higher). It is inconceivable that Papias's should have had as a flagship a liburnian, the other type of two level warship, but with oars single-manned. His ship must then have been a four with two levels of double-manned oars.

The oarsystem of the graffito ship now becomes clear. With two levels of oars like Papias's ship, it would, if it was like the 5th century four, have thirty five oars and seventy oarsmen, two to each oar, on both sides, 140 oasmen on all.

The ship depicted on the *Praeneste* relief is a warship, probably Egyptian, with massive oars at two levels en échelon, one worked through an oarbox and another through an oarport beneath it, twenty- five a side, 50 oars and 100 oarsmen. Above the oarbox is a course of louvers (so recognised by Casson in SSAW) and on the upper surface of it a *parodos*. The main deck has a tower forward and a high bulwark behind which stand armed men. Her prow unusually is without a foredeck. She is a contemporary of the ship of the graffito, and recognised as a four. If she is a four, she adds details of the oar arrangement to the characteristics of the type, but it seems that her fewer oars and oarsmen are the result of the sculptor packing a great deal of detail into a small space. As a result although the detail is realistic the proportions are not. The ratio of height to length is 1:2.

THE FOUR'S QUALITIES

The question which finally requires an answer is what were the virtues of the four which recommended her so strongly to the Athenians of 322, to Antigonos a few years later, to Ptolemy, to the Rhodians and Egyptians, and to the Romans as a reconnaissance ship.

In the first place she was classed at the outset as one of the heavier ships which with a broad beam could carry many decksoldiers, yet was light and fast. She seemed to combine satisfaction of the requirements of the new naval tactics with qualities needed for the older. Her low profile offered less windage and thus easier rowing in adverse contitions, but in battle with the ships of higher decks it proved her undoing.

Double manning meant that only half the crew needed to be experienced oarsmen, the other half needed only muscle. She was, or could be, very fast under sail (Cicero, *Verrines* 5.89). As the flagship of the Roman fleet commander in Sicily in 73-71 BC., she seemed like a floating city (*urbis instar*) to the pirates with their long boats, but "under sail she had an incredible turn of speed". This was propably the quality which recommended her as reconnaissance vessel to the Roman fleets of fives.

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Fig. 1

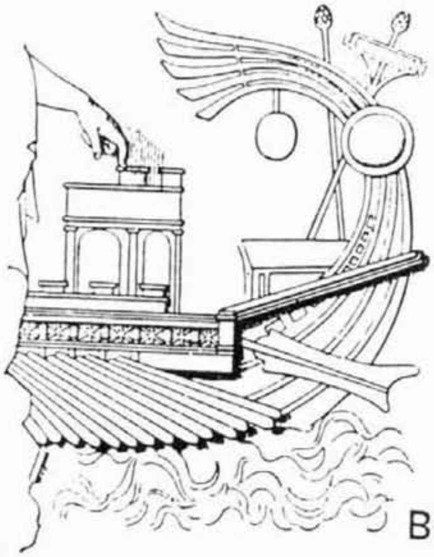


Fig. 2

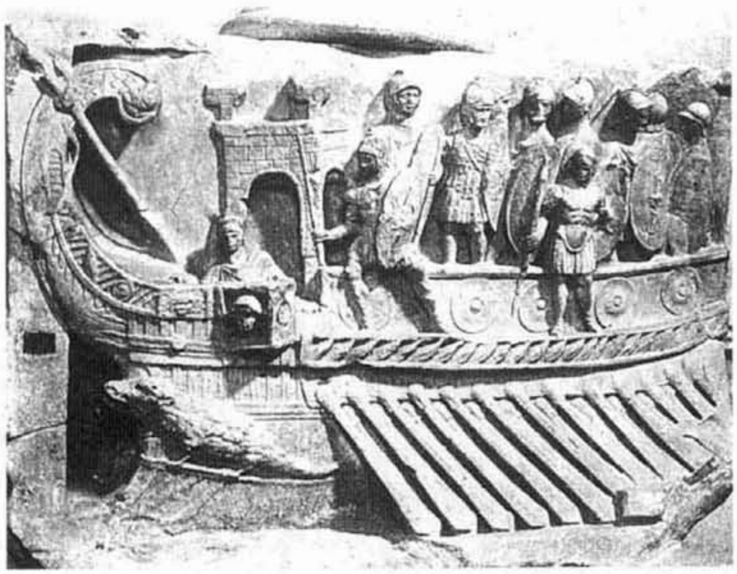


Fig. 3

Fig. 4

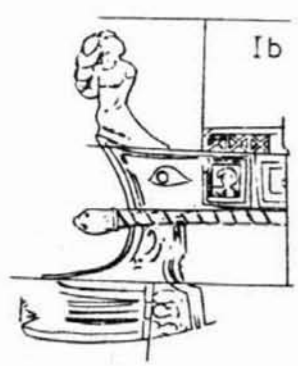
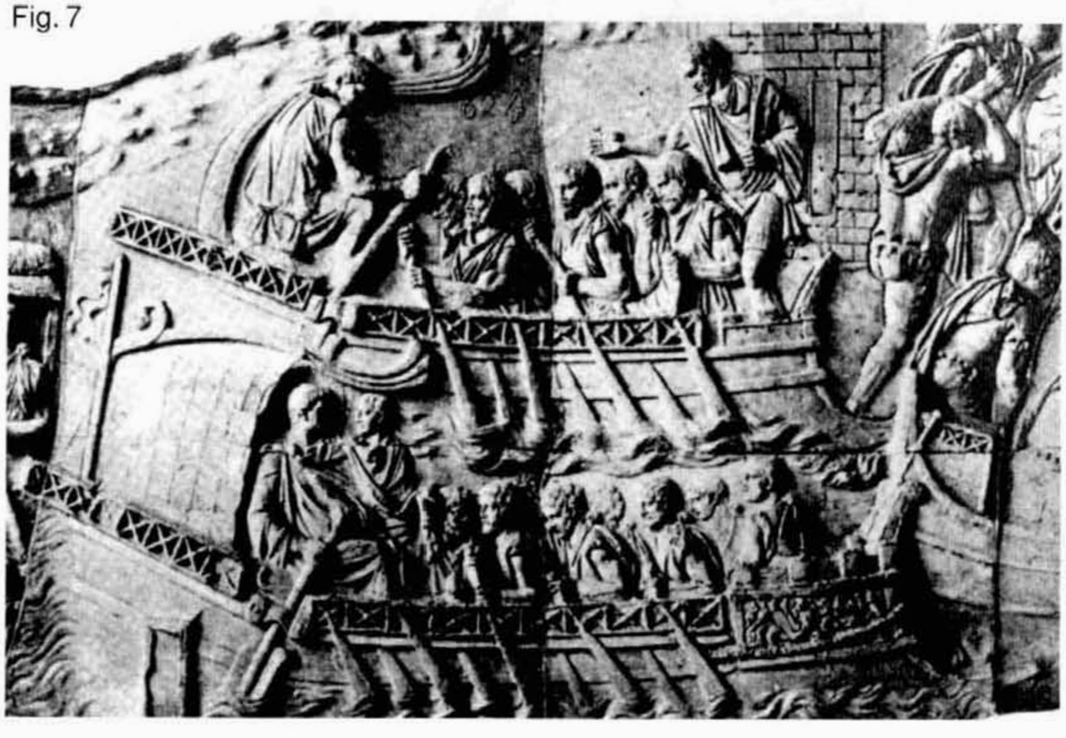


Fig. 5

Fig. 6

Fig. 7



POLYEREIS AND THE ROLE OF THE RAM IN HELLENISTIC NAVAL WARFARE

Throughout the 5th century B.C. Greek naval warfare was dominated by the trieres, or "three" a maneuverable warship used most effectively by the Athenian navy as a floating missile. From the descriptions of Thucydides, we see that naval battles were won or lost according to the seaworthiness of the vessels, the training of the crews and the skill of the helmsmen and pilots[1].

During the next few centuries, naval warfare experienced dramatic changes. Warships much larger than the 3 were introduced into the major navies and a different style of fighting developed to take advantage of these new larger and more solid vessels, termed "polyereis" in this paper for the sake of convenience[2]. Strictly speaking, the term signifies all classes larger that the 3, but in this discussion, I will be concerned mainly with classes larger than the *penteres* or 5. This is because I believe that 4s and 5s had specific roles that were more akin to the 3 than to the 6 and, thus, I prefer to exclude them from what I will call mid-sized and large polyereis-that is, the 6s 7s, 8s and so forth.

In the past most of the discussions about these mid-sized large polyereis focused on the different oarsystems that defined each class, and, gave the class its name —the *hexeres, hepteres, dekeres, triskaidekeres* and so on. Their use in battle was never much debated, I suppose, because their purpose seemed so self-evident. Most scholars agreed with W.W. Tarn that these ships were bigger, slower and less maneuverable than their smaller cousins, and that their offensive punch was determined mainly by the numerous marines and ballistic weaponry that they carried on their wide fighting deck[3].

Tarn's clearest expression of his views can be found in his famous work on Hellenistic naval warfare, written in 1930 (Tarn, 1930, 144):

Given a fighting galley, there were two ways in which you could use it to attack the enemy; the weapon might be the ship itself, or the troops on board. The first method meant ramming, and then speed and skill in manoeuvre were all-important, so as to take the enemy in flank; the second meant grappling and boarding, in which speed and skill mattered much less.

An admiral, or a naval power, had to decide what the dominant tactic would be - ramming, or boarding and fighting it out with marines - and then select the appropriate ships to fulfill this task.

If I took a vote right now, I would bet that most everyone who cared to express an opinion would agree that Mr. Tarn was basically correct. Some well known scholars who are present today have written as much. Lucien Basch wrote a few years ago in his *Le Musée Imaginaire*, that polyereis were "certainly not developed for combat with the ram", and that after a catapult barrage, battles between these big ships were decided by boarding parties[4].

John Morrison wrote in his *Athenian Trireme* (Morrison and Coates, 1986, 48) that:

> Hellenistic concepts of naval fighting seem to have arisen from ship-borne catapults and from men in full armour, archers and javelin men, and the importance placed on them. The Macedonians and Romans were content to see naval actions as opportunities for men in full armour to fight it out on deck and they saw to it that ships would be built to bring such fighting about.

I, too, shared these views until a few years ago when I first recognized the bow dimensions of 10s, 9s, 8s, 7s and, perhaps, 6s at a memorial built by Octavian at Nikopolis to commemorate the Actian War (Murray and Petsas, 1989). These dimensions revealed to me that the Actian polyereis were more than heavy platforms for troops and catapults. The Actian bows were made of massive timbers which supported gigantic bronze rams that were much too big and much too costly to be non-functional bow ornaments[5].

In the next few pages, I would like to demonstrate that these big ships effectively used their rams in battle, and that they were much more than heavy platforms for catapults and boarding parties of marines. To be sure, the 8s, 9s and 10s were not maneuverable enough to mimic the ramming tactics of the triremes, but they were never intended to fulfill this function. Their rams were used in head-on, prow-to-prow collisions with the enemy. Other, smaller units, were placed next ot the mid-sized and big polyereis in the battle line to protect their flanks, and to block enemy ships from sailing through to the rear of the line where they could do serious damage to the steering oars.

We are fortunate to possess four detailed battle accounts from the Hellenistic period that clearly describe mid-sized polyereis in action - 6s, 7s, 8s, 9s and 10s. I have listed these battles, their sources and the combatants in Table 1. The battles occurred in 306 BC at Cyprian Salamis, at Chios in 201 BC, near Myonessus in Ionia in 190 BC, and in this same year, off Side in the Pamphilian Gulf.

The accounts are complex and detailed and require a lengthy commentary best reserved for a separate article. Since we do not have time to review each account in detail now, let me point your attention to some important data - first, the numbers of ships captured as a result of boarding compared to the numbers of ships destroyed by ramming. These numbers are important indicators of how each battle was really fought. If the standard views about polyereis and their fleets are correct, we should expect to find more ships listed as captured than as disabled or destroyed by ramming. But this is not the case.

Table 1

Evidence for the use of mid-sized polyereis in battle

Battle of Salamis (306 BC)
MAIN SOURCE: Diodorus 20.49-52
COMBATANTS: Demetrius Poliorcetes vs. Ptolemy I
CASUALTIES:
Ptolemy lost 100 supply ships and 8.000 soldiers and 40 warships (with crews) by capture: 80 warships were destroyed (by ramming) and were towed, full of sea water, to the camp before the city (52.6).
Demetrius had 20 ships destroyed by ramming, but all of these were refitted and returned to service.

The Battle of Chios (201 BC)
MAIN SOURCE: Polybius 16.2-8
COMBATANTS: Philip V vs. Attalus of Pergamon and the Rhodians
CASUALTIES: There are reasons to doubt the validity of the numbers that are recorded by Polybius. The Rhodian losses, for example, are far too light and reflect Rhodian sources (Cf. Walbank, II, 1957-79, 509-510). The proportions are nevertheless interesting because they were accepted by Polybius as believable.

Philip's losses to Attalus by sinking: 10, 9, 8 (cf. 16.3.2), 7, 6, ten 5s and 4s *(kataphraktoi)*, three *trihemioliai*; 25 lemboi with crews; by capture: 8? (cf. 3.8-11), although it is possible that the ship was abandoned after Attalus' flagship and been captured —but this 8 was clearly boarded.
Philip's losses to the Rhodians by sinking: ten *kataphraktoi*, 40 *lemboi*; by capture: two 4s and seven *lemboi*. NB that the Rhodians purposefully sank some of the ships that they were unable to tow away (Polyb. 16.6.13).
Attalus' losses to Philip by sinking: one *trihemiolia*, two 5s; by capture: two 4s and the Royal Ship.
Rhodian losses to Philip by sinking: two 5s, one 3; by capture: none.
Men killed: Attalus, 70; Rhodians, 60; Philip, 3.000 soldiers and 6.000 sailors.
Men captured: Macedonians and allied forces, 2.000; Attalus and the Rhodians, 700.

The Battle off Side (190 BC)

MAIN SOURCE: Livy 37.23-24 (cf. also Zonaras 9.10)
COMBATANTS: The Rhodians vs. the Syrian fleet of Antiochus III, supported by Hannibal.
CASUALTIES: The Syrians were able to recover and tow off a large number of disabled ships because the Rhodians had apparently not boarded the ships they had disabled. The Rhodians sank a 7, and towed it away with difficulty after the battle (Livy 37.24.9).

The Battle of Myonessus (190 BC)

MAIN SOURCE: Livy 37.29-30 and Appian *Syr.* 27.
COMBATANTS: The Roman praetor L. Aemilius Regillus (helped by the Rhodians) vs. Polyxenidas, the admiral for Antiochus III.
CASUALTIES: The Syrians lost 42 ships; 29 were burned or sunk and 13 were captured (Livy 37.30.7-8). Two Roman vessels were destroyed (*fractae sunt*); several were damaged (*vulneratae*). One Rhodian vessel was captured (30.9).

Observations on Table 1

1. At the Battle of Salamis in 306, Ptolemy lost 120 warships to the polyereis of Demetrius Poliorcetes. Forty were captured along with their crews by boarding, while 80 were destroyed by ramming.

2. At Chios in 201, Philip V lost 103 warships to Attalus and the Rhodians; ten by capture, 93 by ramming.
3. At Myonessus in 190, Antiochus III lost 42 warships to the Romans and Rhodians; 29 by ramming and by burning, 13 by capture.
4. Near Side in 190, most all of the Syrian ships that were disabled were rammed and not boarded. We know this because the Syrians were able to recover their ships at the battle's conclusion when the Rhodians retreated.

In all, the ratio of ships destroyed by ramming to ships taken by boarding is 202 to 63, more than 3 to 1. Perhaps the explanation is that the Rhodians were involved in three of the four victories, and they were not known to board their enemies. So... let's look at *their* losses since they were fighting against Macedonians — well-known as boarders according to Tarn. In all three battles, the Rhodians lost but one ship to capture, while they lost at least three to ramming attacks. Ramming, therefore, seems to have been the preferred method of destroying one's enemy. I did not say that it was the ONLY method —I said that it was the preferred method.

How can this be so? —particularly when respectable authors like Polybius and Livy repeatedly assert that the valor of the marines was particularly instrumental in a victory. The answer is simple: Polybius and Livy identified with the officer classes and were, in general, more concerned with the heroics of individuals, not the collective accomplishments of a nameless oarcrew. Accounts of individual engagements make it quite clear that the marines provided our historians with much of the battle's specific details. And for this reason, the accounts are full of exploits by individual marines, or of individual commanders who participated in the deck fighting. At Chios, for example, we learn the exploits of Attalus, Deinokrates, Dionysiodoros, Autolykos, Theophiliskos and Philostratos —all involved in deck fighting. When we read that the marines on a particular vessel are destroyed, we rarely discover the fate of the oarcrews. They were members of the non-literary class and since they were not the intended audience of these accounts, Polybius and Livy did not routinely focus on their accomplishments, or their fates.

The effect of these narrative details is subtle, and leaves the reader with the impression that most conflicts were resolved by the marines in deck fighting. The raw casualty totals tell a different story, however. Here is a clear example: At Myonessus where *more than twice as many ships were destroyed by ramming as by capture*, Livy concludes: "...as usual, the valor of the marines had the greatest effect in the battle"[6].

Do not misunderstand me. I am not trying to assert that the marines were useless, or that polyereis did not serve as large platforms for catapults. They most certainly did. This much is clear from numerous battle descriptions. I simply believe that when a sea battle was fought, the primary concern of the marines and catapult crews was to kill as many deck personnel on their opponents' ships as possible, either from a distance, or from the deck of their own ship, in hopes that they might thus avoid being struck by their enemies' weapons. In almost every case where we possess sufficient details of the battle to form an opinion of the tactics involved, the primary offensive weapon used by polyereis was their ram. And when boarding occurs, it was often an act of desperation when the boarding ship was fatally damaged or when it was seriously threatened and hemmed in against the hulls of their enemy.

Furthermore, the notion that a catapult barrage could **routinely** knock a 3 or 4 out of action is simply unsupported by our surviving evidence. Philo of Byzantium (writing in the third century BC) reveals that fatal blows might be inflicted on boats by stone throwers, but only when the conditions were just right. For example, he writes that small craft like rowboats and *lemboi* were vulnerable when attempting to force their way into a heavily fortified harbor. Crowded against the boom across the harbor's entrance, they might be hit by stone throwers, or destroyed by falling "lead amphoras" attached to long booms suspended over the water[7]. These specific conditions imply that stone throwers were *not* usually lethal against warships except when used at close range against light vessels that were somehow hindered from moving and thus easier to hit.

Because one did not routinely expect a catapult barrage to destroy an enemy's ships, a more direct attack was apparently required. Significantly, most recorded battles began with the frontal attack of one fleet against another, where success depended on the ships' most reliable weapons—their rams[8]. This maneuver, which I call a prow-to-prow charge, is most clearly described for us by Diodorus when he narrates the Battle of Salamis, fought off Cyprus in 306 BC. Prior to engaging, the two hostile fleets lined up opposite one another in a line-abreast formation. At a prearranged signal, the vessels of each line began their charge by steering toward the line of bows in the opposite line, moving their own line forward in unison like an infantry phalanx. As the two lines approached one another, the catapults, archers and javelin men launched their weapons. Initially, these projectiles served mainly to distract and discomfit the marines on the enemy's vessels, but when the ships drew near to one another, the blows struck with deadly force. Fearful though this fire must have been, we never hear that it seriously disabled a warship. It wounded and killed enemy deck personnel, but it did not stop the vessel from completing its charge. The critical moment arrived when a ship collided with its opponent's bow —either at the ram or catheads. Smaller vessels often tried to avoid collisions with larger units by slipping past the sides of their enemy —the well known *diekplous*—and the large units had a screen of smaller support ships arrayed beside them to prevent this from happening.

When the ships were at close range, the marines and machines worked ferociously, and their skill and tenacity determined whether the oarcrew could back away unhindered to make another strike with the ram. In this regard, the deck personnel were critical to the operation of the ship. But the casualty figures make it clear that serious destruction was brought about more often by strikes of the ram or collisions at the catheads.

We see from an episode described by Polybius at Chios (Polyb. 16.6) what strategy was employed by an attacking ship that had successfully holed its opponent. The attacker would back off to a safe position, if possible, and let the attacked ship slowly sink to the waterline. If no one intervened, the attacker could then reapproach the swamped vessel to damage it further by ramming or the attacker could kill the survivors by spear thrusts and weapons fire. At this point, other ships might well approach to screen the struck ship and to force the attacker to retreat. This would merely postpone the fate of the struck ship until the battle's conclusion when it would be recovered by "friends" or collected as the spoils of victory, depending on who won.

In this brief paper, I have tried to demonstrate that the use of polyereis in battle is more complex than has previously been explained and that it routinely involved ramming tactics. I also believe that the emphasis of ramming helps to explain the reasons behind the introduction and later evolution of these larger units. To appreciate what happened, we must go back to the years of the Peloponnesian War when the Corinthians and Syracusans struggled to find a way to counter the Athenians' superior ship handling skills. Their solution was to engineer a superior boat, by bracing and strengthening the catheads of their triremes, with which they challenged the Athenian 3s in prow-to-prow ramming contests (cf. Thuc. 7.34.5 and 7.36.2-6). The effectiveness of their new design and the stunning annihilation of the Athenian fleet at Syracuse in 413 deeply influenced the Syracusans, who were among the first to adopt the 4, whose bow, on my theory, would have been routinely capable of crushing the bow of a 3. In the years following the Peloponnesian War, when it became increasingly difficult to find an adequate number of experienced oarcrews, this principel determined the direction of new ship designs.

If I am correct, the frontal ramming factor explains the speed with which new and bigger polyereis were introduced in the fourth and third century fleets of the Hellenistic kings. The intention of each king was to produce ships that were larger and heavier at the bows than his enemy's largest units. These ships were so strong at the bows that their use was urged, in the third century, to collapse stretches of city walls built in the sea[9].

If I am right, then, the driving force behind the competition to build ever larger ships was the prow-to-prow charge. Catapults, fighting towers, archers, slingers and javelin throwers were all used in various ways to destroy an enemy's marines from a safe distance, particularly once an opponent had been disabled by a ram strike. As the ships became bigger and less maneuverable, the infantry men also became increasingly important as protectors to ward off attacks from desperate marines whose own ships were fatally damaged. These boarding forays and the defense against them were dramatic, heroic and noteworthy to those who chronicled these battles, but they were never intended to comprise a ship's *primary* offense. This was performed by the massive bow timbers, heavy bronze rams and nameless oarcrews who drove head-on into one another's battle lines. The time has now come, I believe, to revise the views of W. W. Tarn on this matter.

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NOTES

1. See Morrison and Coates (1986) for an excellent treatment of the Athenian trieres during the Classical Period (fifth and fourth centuries BC). I will refer to the different classes by their arabic numerals, and not spell out the words with letters. A "three" will be referred to as a 3, a "four" as a 4, and so forth.
2. Πολυήρης (or "many fitted") is a term borrowed from late antiquity to define large vessels from classes larger than 3s. Although our knowledge of these vessels is far from complete, Casson (1971, 97-140) provides a concise account of what we know about these vessels. A large amount of relevant iconographical evidence has been conveniently collected and discussed by L. Basch (1987, 337-94).
3. The most strident (and seriously flawed) expression of this view can be found in Foley and Soedel (1981), especially on pp. 154, 157 and 160.
4. Basch, 1987, 345: "Quelle pouvait être la raison d'être de ces hypergalères? Certainement pas le combat à l'éperon. Ces immenses bâtiments étaient surtout destinées à servir de supports à des catapultes, probablement de plus en plus lourdes et nombreuses... Après une "préperation d'artillerie", la décision devait être remportée par l'abordage: à cet effet, la même eikosore était généreusement pourvue de grappins de fer ou de plomb". This same view can

be seen behind the following observations of F. Meijer (1986, 133-34): "the heavier the ships and the greater the numbers of unskilled rowers, the greater the changes in naval tactics. ...High platforms were fitted on the ships and on them there was room for a great many soldiers, armaments, ballistic machines and catapults. Thus, although ramming tactics such as the old *diekplous* and *periplous* were still employed, boarding tactics became more and more important".

5. I make this statement in response to the observations of H. Frost and L. Basch that the Actian rams were simply too big for effective use (Basch, 1990, 368), and that they may have been bow ornaments "as useless to [their ships] as the vestigial appendix to the human body" (Frost, 1990, 80). For a description of the timbers' massive dimensions, see my article in *Tropis IV* (Murray, 1996, pp. 335-350).
6. Livy 37.30.6: *Plurimum tamen, quae solet, militum virtus in bello valuit.* On the overstated reliance of the ancients on boarding, see the careful remarks by H. Wallinga at the beginning of his book on the Roman boarding-bridge (Wallinga, 1956).
7. Philo *Poliorketika* 3.56: καὶ ἐπὶ τοῦ στόματος [καὶ ἐφ'] ἑκατέρωθεν ἐφεστάτω πετροβόλος εἰκοσαμναῖος, ἵνα ὅταν βιάζωνται τῶν μικρῶν τινες εἰς τὸν λιμένα, ἐμπρησθῶσιν ἢ περὶ τοὺς ἐμβόλους περιπαγεῖσαι διαφθαρῶσι -ν η- καταποντισθῶσιν τυπτόμεναι τοῖς τε μολιβοῖς ἀμφορεῦσι καὶ τοῖς πετροβόλοις. "Let 9 kilo (=20 mnai) stone throwers be placed on each side of the harbor mouth, so that if small boats attempt to force their way into the port, they might be set on fire, or destroyed when they are stuck on the rams —fixed to a boom running across he harbor mouth—, or sunk by lead amphoras and hits from the stone throwers".
8. The prow-to-prow charge opened the battles at Salamis in 306 BC (Diod. 20.51.1-3), Chios in 201 (Polyb. 16.4.7), Side and Myonessus in 190 (Livy 37.24.2 and 30.3-5), and Mylae and Naulochus in 36 (Appian BC 5. 106, and 119). Antony hoped to use the charge at Actium in 31, except that Octavian's men were told to stay clear of Antony's prows (Plut. Ant. 65.4). On this battle, see Murray (1993), which is in Dutch. An English version of this article, titled "A New Perspective on the Battle of Actium", will appear soon in the Proceedings of the 11th Naval History Symposium held at the US Naval Academy (Annapolis, Maryland) in October 1993.
9. Philo *Poliorketika* 4.29: Ποιητέον δ' ἐστὶν καὶ ἐμβολὰς εἰς τὰ μεταπύργια τῷ ἀχρειοτάτω τῶν μεγάλων σκαφῶν, ἐὰν ᾖ τόπος αγχιβαθὴς καὶ προβλῆτας ἔχων κατὰ τὸ τεῖχος καὶ ταύτῃ ἀσθενὲς καὶ ἁλώσιμον, ἐὰν πέσῃ. "With your leaste serviceable big vessels, make ramming attacks on the curtains between the towers, if there is a place with deep water inlets next to the wall, where the wall is weak and can be captured if it should collapse".

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ANCIENT SHIPPING ROUTES: THE ARCHAEOLOGICAL EVIDENCE

The conditions of the Mediterranean, at least in summer, suggest that navigation even of primitive or small ships would be free from danger. On the contrary, ancient literature, with references to the fear of being shipwrecked, and the large number of wreck sites still being discovered in all parts of the Mediterranean, indicate that there were sufficient dangers to cause ships to be lost frequently. Some dangers are geographical (lack of navigation marks or of natural havens, currents or reefs hidden or disguised, etc.) while others are accidental (fire, sudden storms, unsuitable ship design or inadequate quality of gear, human error, etc.). In most cases ships were not wrecked deliberately, though a significant number of recorded shipwrecks are of old hulks, abandoned in a backwater, or of a ship which, running before a storm, is allowed to drive on to a sandy beach in order to save the people on board. If we consider the distribution of recorded ancient shipwrecks, after allowing for different rates of discovery or publication, it is clear that factors such as the geographical dangers just now referred to will have a relationship to the routes on which ships frequently sailed, but the other, accidental, dangers, may not. From the point of view of ship construction, it is worth asking whether there is any evidence from archaeology that ships of one period or another, or of a particular size or style of construction, were especially liable to be overwhelmed by heavy seas or capsized by storm winds. Perhaps more rewarding is to consider the relationship of individual shipwrecks, both to predictable (geographical) hazards, and also to other cargoes of the same kind: the result is a clearer idea of the complex factors involved in the loss of ships in antiquity.

Antony J. Parker.

EDITOR'S NOTE

Dr. Antony J. Parker made a verbal communication and the above is only an abstract.

ΔΥΟ ΠΑΡΑΣΤΑΣΕΙΣ ΠΛΟΙΩΝ ΣΤΑ ΜΟΥΣΕΙΑ ΕΠΙΔΑΥΡΟΥ ΚΑΙ ΝΑΥΠΛΙΟΥ*

Στα Μουσεία Επιδαύρου και Ναυπλίου υπάρχουν δύο επιτύμβιες στήλες με παραστάσεις πλοίων που παρουσιάζουμε στη συνέχεια.

1. Παράσταση πλοίου σε επιτύμβια στήλη Μουσείου Επιδαύρου αρ. 1137 (φωτ.1. σχ. 1)

Μουσείο Επιδαύρου, αρ. κατ. 1137. Επιτύμβια αετωματική στήλη απο λευκό ασβεστόλιθο, θραυσμένη στη δεξιά πλευρά και το μεγαλύτερο κάτω τμήμα, έχει ύψος σωζ. 23 εκ., πλάτος σωζ. 25 εκ., πάχος 12 εκ. Η κεντρική αετωματική απόληξη έχει θραυσθεί, ενώ περιμετρικά φέρει μικρές αποκρούσεις και απολεπίσματα.

Στη βάση του αετώματος υπάρχει κανόνας και κυμάτιο, που συνεχίζεται και στον αριστερό σωζόμενο κρόταφο της στήλης. Κάτω από το αέτωμα υπάρχει ταινία πλάτους 4,3 εκ. η οποία φέρει επιγραφή που σώζεται αποσπασματικά και αναγράφει το όνομα του νεκρού: *Αδειμά[ντου]*[1], ύψος γραμμάτων 2 εκ., απόσταση γραμμάτων 2 εκ., δημοσιευμένη στο corpus IG IV 2 , 738.

Η επιγραφή χρονολογείται στο τέλος του 4ου-αρχές 3ου π.Χ. αι. Το όνομα *Αδείμαντος* σημαίνει άφοβος, ατρόμητος θα λέγαμε σήμερα και ήταν σύνηθες στην αρχαιότητα[2].

Η επιτύμβια στήλη βρέθηκε στις αρχές του αιώνα (1905) απο τον Παν. Καββαδία και προφανώς προέρχεται απο την περιοχή των νεκροταφείων του Ιερού Ασκληπιού στην Επίδαυρο[3].

Κάτω από την επιγραφή υπάρχει αβαθές ορθογώνιο πλαίσιο, βάθους 3 χιλιοστών περίπου, πλάτους σωζ. 17,5 εκ., ύψους σωζ. 12 εκ. εντός του οποίου εικονίζεται σε πολύ πρόστυπο ανάγλυφο το εμπόσθιο τμήμα πολεμικού πλοίου προς τα δεξιά. Από την παράσταση του πλοίου δεν σώζεται το κατώτερο τμήμα του και η εμπρόσθια απόληξη του εμβόλου.

Η παράσταση απεικονίζει με σαφήνεια τα βασικά περιγράμματα του εμπρόσθιου τμήματος του πολεμικού πλοίου με την πλώρη υπερυψωμένη σε σχήμα ανοικτού S. Ανάλογα παραδείγματα πολεμικών πλοίων με υπερυψωμένη πρώρα (πλώρη) ενδεικτικά αναφέρουμε τις παραστάσεις:

α) Στην επιτύμβια στήλη του Δαμοκλείδη, του Εθνικού Αρχαιολογικού Μουσείου αρ. 752 στην Αθήνα,[4] που χρονολογείται στα 380-370 π.Χ.

β) Στην επιτύμβια στήλη του Δημητρίου[5], στη γλυπτοθήκη του Μονάχου, απο την περιοχή Παντέρμα ανατολικά της Κυζίκου, του τελευταίου τετάρτου του 5ου π.Χ. αι.

γ) Στην επιτύμβια στήλη της Πέλλας[6] με ανάλογη παράσταση εμπρόσθιου τμήματος πολεμικού πλοίου του α΄ μισού του 3ου π.Χ. (φωτ., αρ. 2).

δ) Στην ενδιαφέρουσα ανάγλυφη παράσταση τριήρους σε βοιωτικό ψηφισματικό ανάγλυφο του α΄ μισού του 3ου π.Χ.αι. στο Museum of Fine Arts της Βοστώνης[7].

Πάνω από το οριζόντιο περίγραμμα του κυρίως σκάφους στην στήλη της Επιδαύρου, σε ύψος 1,8 εκ., υπάρχει οριζόντια ανάγλυφη γραμμή, η οποία προφανώς υποδηλώνει τὸ κατάστρωμα του πολεμικού πλοίου που αποτελεί βασικό χαρακτηριστικό στοιχείο για τις τριήρεις[8], πάνω στο οποίο μάχονταν οι οπλίτες, οι επονομαζόμενοι επιβάτες[9].

Μεταξύ του καταστρώματος και του κυρίως σκάφους του πολεμικού πλοίου της Επιδαύρου (φωτ. 1, σχ. 1) υπάρχει ανάγλυφη πλάγια, σιγμοειδής γραμμή που ενώνει το κυρίως σκάφος με το κατάστρωμα.

Η σπάνια αυτή καμπυλωτή γραμμή υποδηλώνει προφανώς ένα από τα πολλά καμπυλωτά εξωτερικά υποστηρίγματα[10] του καταστρώματος της τριήρους, το οποίο αποδίδεται πλάγια για λόγους προοπτικής. Τα υποστηρίγματα του καταστρώματος των τριήρων στα ανάγλυφα εικονίζονται ελαφρώς καμπύλα, όπως στο γνωστό αναθηματικό ανάγλυφο τριήρους στο Μουσείο της Ακρόπολης των Αθηνών,[11] γνωστό ως ανάγλυφο Lenorman, του τέλους του 5ου π.Χ. αι.

Επίσης σε άλλο τμήμα αναθηματικού αναγλύφου από την Ακρόπολη[12] αρ. 13533 του 4ου π.Χ. αι. και άλλα[13].

Αλλά η χαρακτηριστικότερη λεπτομέρεια έντονα καμπυλωτών υποστηριγμάτων (stanchions) του καταστρώματος τριήρους με προοπτική απόδοση ανάλογη με εκείνη της στήλης της Επιδαύρου εικονίζεται σε ερυθρόμορφο αττικό κρατήρα της συλλογής Jatta του Ruvo της νότιας Ιταλίας, του τέλους 5ου-αρχές 4ου αι., με παράσταση από τον αργοναυτικό κύκλο, όπου εικονίζεται λεπτομερώς η πρύμνη τριήρους.[14] Είναι προφανές ότι το πρόστυπο ανάγλυφο του πολεμικού πλοίου της επιτύμβιας στήλης της Επιδαύρου ήταν τριήρης και θα αποδίδονταν με ζωγραφική απόδοση και άλλα υποστηρίγματα του καταστρώματος και επιμέρους λεπτομέρειες.

Το εμπρόσθιο τμήμα (πρώρα) πολεμικών πλοίων εκτός από τις περιπτώσεις που αναφέραμε εικονίζεται συχνά σε παραστάσεις νομισμάτων, του Δημητρίου Πολιορκητή,[15] της Κίου, της Κύπρου, της Φασήλιδος, της Καρίας, της Λευκάδος,[16] των Μαγνήτων[17] καθώς και σε πήλινο σφράγισμα και νόμισμα της Δημητριάδος και των Φθιώτιδων Θηβών[18].

Ο κατά τα άλλα άγνωστος *Αδείμαντος* πιθανότατα ήταν ένας επιβάτης (οπλίτης) σε τριήρη και πολύ πιθανόν έχασε τη ζωή του στη θάλασσα.

Η μικρή επιτύμβια ακρωτηριασμένη στήλη του Μουσείου της Επιδαύρου μας μαρτυράει για την ύπαρξη του κατά τα άλλα άγνωστου *Αδειμάντου.*

2. Παράσταση πλοίου σε επιτύμβια στήλη αρ. 2060 του Μουσείου Ναυπλίου (σχ. 2, φωτ. 3, 4).

Η επιτύμβια στήλη αρ. 2060 του Μουσείου Ναυπλίου διατηρείται ολόκληρη, είναι μαρμάρινη, ύψους 74 εκ., πλ. 34 εκ., παχ. 9,5 εκ. Στις ακμές φέρει μικρές αποκρούσεις. Η εμπρόσθια επιφάνεια της στήλης δεν είναι πλήρως λειασμένη, ο αριστερός κρόταφος είναι κομμένος με πριόνι, ενώ ο δεξιός φέρει εμφανή τα ίχνη του εργαλείου επεξεργασίας. Στην εμπρόσθια και οπίσθια χοντρικά επεξεργασμένη πλευρά φέρει ίχνη ασβεστοκονιάματος από υστερώτερη χρήση της στήλης. Στο κεντρικό τμήμα της στήλης υπάρχει ορθογώνιο πλαίσιο, ύψους 28 εκ., πλάτους 22,5 εκ. και βάθους 3-3,5 εκ., εντός του οποίου εικονίζεται κατ' ενώπιον ιματιοφόρος ανδρική μορφή, ύψους 28 εκ., η οποία εσωτερικά φέρει χιτώνα, το δεξιό χέρι επί του στήθους και το αριστερό προς τα κάτω[19]. Το πρόσωπο, σιαγόνι, στόμα, μύτη, μάτια, είναι έντονα θραυσμένο, ενώ η κόμη αποδίδεται με κοντούς βοστρύχους (φωτ. 3).

Αμέσως πάνω από το ορθογώνιο πλαίσιο η επιτύμβια στήλη φέρει επιγραφή σε ταινία πλάτους 3 εκατοστών: *Μηνόφιλε χρηστέ χαίρε.* Ύψος γραμμάτων 2,5 εκ., απόσταση γραμμάτων 2-4 χιλιοστά. Η επιγραφή από το σχήμα των γραμμάτων χρονολογείται στον 2ο αι. μ.Χ. Το όνομα Μηνόφιλος είναι σύνηθες.[20] Η επιγραφή έχει δημοσιευθεί στο IG IV αρ. 400, όπου αναφέρεται ότι η στήλη βρισκόταν στην οικία Θ. Ρέντη στην Κόρινθο μαζί με άλλες αρχαιότητες, τις οποίες αργότερα οι κληρονόμοι του δώρησαν στο Μουσείο Αρχαίας Κορίνθου. Η στήλη δωρήθηκε στο Μουσείο Ναυπλίου μαζί με μία άλλη επιτύμβια στήλη από τον ξενοδόχο Ναυπλίου Νικόλαο Κόντο, όπως αναφέρει ο Αλέξανδρος Φιλαδελφεύς.[21] Σύμφωνα με τα παραπάνω η στήλη προέρχεται από την Κόρινθο και ο εικονιζόμενος Μηνόφιλος ήταν προφανώς Κορίνθιος ναυτικός, ιδιοκτήτης εμπορικού πλοίου, που εικονίζεται στο άνω τμήμα της στήλης. Η στήλη έχει δημοσιευθεί πρόσφατα από την Γ. Παναγιωτάτου-Χαραλάμπους[22] χωρίς να εξετάζεται η παράσταση του πλοίου. Στο ανώτερο ορθογώνιο τμήμα της στήλης διαστάσεων 17x34 εκ. εικονίζεται παράσταση εμπορικού πλοίου προς τα δεξιά, η οποία εικονίζεται με ευκρίνεια σε πολύ πρόστυπο ανάγλυφο, ενώ τα ξάρτια αποδίδονται εγχάρακτα και επί μέρους λεπτομέρειες με χρώμα, ίχνη του οποίου διατηρούνται με σαφήνεια. Η επιφάνεια του πλοίου είναι αδρή, προφανώς για την καλύτερη στερέωση της έγχρωμης διακόσμησης του πλοίου. Η δεξιά ακμή της στήλης δίπλα από την πλώρη έχει απολεπισθεί.

Η πρώρα του πλοίου ανεβαίνει σχεδόν κατακόρυφα προς τα πάνω και καταλήγει σε οξυκόρυφη απόληξη, ενώ η πρύμνη ανεβαίνει καμπυλωτά και η απόληξή της, το άφλαστον, έχει το σχήμα λαιμού και κεφαλής υδρόβιου πουλιού, πιθανότατα χήνας, που στρέφεται καμπυλωτά προς τα κάτω και δίνει στο πλοίο φυσική ζωντάνια υδρόβιου πουλιού που κολυμπάει στη θάλασσα. Η διαμόρφωση αυτή της πρύμνης ήταν συνήθης στα εμπορικά πλοία και στα αρχαία και ρωμαϊκά χρόνια ονομαζόταν από το σχήμα της χηνίσκος[23] και συνήθως ήταν επιχρυσωμένη. Ο χηνίσκος του πλοίου της στήλης αρ. 2060 του Μουσείου Ναυπλίου φέρει εμφανή τα ίχνη λευκού σωζόμενου χρώματος.

Το πηδάλιο στην πρύμνη εικονίζεται λοξά προς τα πίσω με πλατιά πτερύγια, που φέρουν περιμετρικά εμφανή ίχνη λευκού χρώματος, ενώ το στέλεχος φέρει κατά διαστήματα οριζόντιες διακοσμητικές γραμμές. Στο πάνω μέρος του πηδαλίου εικονίζεται οριζόντια ο οίακας (δοιάκι) με το οποίο ο κυβερνήτης κατευθύνει το πηδάλιο.[24] Στην άλλη πλευρά το πλοίο έφερε και άλλο πηδάλιο, το οποίο δεν εικονίζεται.

Στο μέσον του σκάφους υψώνεται κατακόρυφα ο ιστός (το κατάρτι) που προφανώς ήταν κορμός δένδρου, ο οποίος σταδιακά προς τα πάνω γίνεται λεπτότερος. Πάνω από το πλοίο σχηματίζεται εγχάρακτα ένα τρίγωνο σε πλάγια θέση με κορυφή την απόληξη του ιστού, η βάση του οποίου αρχίζει πάνω από την πρύμνη και καταλήγει λοξά στο μέσον της πρώρας. Η μεγάλη πλάγια εγχάρακτη γραμμή της βάσης του τριγώνου προφανώς υποδηλώνει την κεραία του πλοίου, ενώ οι δύο πλάγιες πλευρές υποδηλώνουν τους ιμάντες, τα σχοινιά με τα οποία ήταν δεμένη η κεραία του πλοίου.[25] Όλη η επιφάνεια πάνω από το πλοίο μέχρι την κεραία και τους ιμάντες φέρει οκτώ (8) εγχάρακτες λοξές παράλληλες γραμμές προς τα αριστερά, που διασταυρώνονται με πέντε (5) λοξές εγχάρακτες κυματιστές γραμμές προς τα δεξιά. Οι γραμμές αυτές προφανώς υποδηλώνουν τα σχοινιά[26] που συγκρατούν τα πανιά (τα ιστία) του πλοίου. Τα πανιά προφανώς υποδηλώνονταν με χρώμα που δεν σώζεται. Η πλάγια θέση της κεραίας του πλοίου αλλά και των σχοινιών (με τα πανιά) σε σχέση με τον άξονα του πλοίου δίνουν την εντύπωση ότι το πλοίο ταξιδεύει.

Οι απολήξεις της πρύμνης, χηνίσκος, και της πλώρης, φέρουν σαφή τα υπολείμματα λευκού χρώματος, ήσαν δηλαδή διακοσμημένες με χρώμα, ενώ από την πρύμνη μέχρι την πλώρη και σε απόσταση 2 εκ. χαμηλότερα από το άνω περίγραμμα του σκάφους είναι εμφανής η ελαφρώς καμπυλωτή, σωζόμενη, λευκή γραμμή, πάχους 4-6 χιλιοστών, κάθετα στην οποία κατά αραιά διαστήματα υπάρχουν πέντε (5) λευκές χοντρές γραμμές. Η ζωγραφική αυτή σωζόμενη λευκή διακόσμηση προφανώς υποδηλώνει βασική χαρακτηριστική λεπτομέρεια του πλοίου, ενώ οι πέντε (5) κάθετες γραμμές υποδηλώνουν τους σκαλμούς του πλοίου στους οποίους προσαρμόζονταν τα κουπιά, τα οποία από τις υπάρχουσες ενδείξεις φαίνεται ότι δεν απεικονίζονταν στην παράσταση αυτή του πλοίου.

Συνήθως τα εμπορικά πλοία εκτός από τα πανιά είχαν και λίγα κουπιά τα οποία χρησιμοποιούσαν κατά περίπτωση. Το εικονιζόμενο πλοίο ήταν προφανώς πεντάσκαλμο. Χαμηλά στην πλώρη του καραβιού υπάρχει μεγάλο οκτάκτινο αστέρι, το οποίο φέρει υπολείμματα λευκού χρώματος. Το αστέρι αυτό αποτελεί το επίσημα ή παράσημο[27] του πλοίου, το οποίο έφερε και στις δύο πλευρές της πρώρας και ήταν το σύμβολο των Διοσκούρων[28] που ήταν προστάτες των ναυτικών.

Είναι αξιοσημείωτο όπως αναφέρεται στις Πράξεις των Αποστόλων, κεφάλαιο 28, 11, ότι ο Απόστολος Παύλος ταξίδευσε με πλοίο που έφερε παράσημο των Διοσκούρων.[29]

Το άστρο, σύμβολο των Διοσκούρων, εικονίζεται επίσης ως επίσημα σε πρώρα τριήρους πάνω σε νομίσματα της Σινώπης (306-290) και της Κίου[30] 330-302 π.Χ. Ο τύπος αυτός του ελαφρού εμπορικού πλοίου που ανήκε στο *Μηνόφιλο* φαίνεται πολύ πιθανόν ότι πρόκειται για το γνωστό τύπο του, από τις γραπτές πηγές, γνωστού κέλητος,[31] το οποίο ήταν ταχύπλοο, έφερε μέτριο φορτίο, είχε λίγα κουπιά και ίσια πλώρη. Η παράσταση του πλοίου χαρακτηρίζεται από την ακρίβεια της εκτέλεσης, την καλλιτεχνική ευαισθησία του γλύπτη, την απόδοση των βασικών λεπτομερειών και την επιτυχημένη προσαρμογή στο άνω τμήμα της επιτύμβιας στήλης.

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1. Το όνομα του νεκρού στο I. G. IV_2, 738 συμπληρώνεται σε ονομαστική πτώση: Ἀδείμα[ντος], αλλά είναι πιθανότερο το όνομα να ήταν σε γενική πτώση.
2. P. M. Fraser-E. Mattheus, A Lexicon of Greek Personal Names, Vol. I Oxford 1987 και M. J. Osborne-S. B. Byrne, A Lexicon of Greek Personal Names, Vol. II Oxford 1994, στο λήμμα Αδείμαντος.
3. Π. Καββαδία, Το Ιερόν του Ασκληπιού εν Επιδαύρῳ, Αθήνησιν 1900, 172-4.
4. A. Conze, Die Attischen Grabrerliefs IV, 1900, αρ. 623.
   Σ. Καρούζου, Ἐθνικόν Ἀρχαιολογικόν Μουσείον, Συλλογή Γλυπτών, Αθήναι 1967, 83-84, αρ. 752.
   A. Delivorrias, Greece and the Sea, Amsterdam 1987, 83-84 αρ. 752.
5. B. Vierneisel-Schlörb, Katalog der skulpturen, München 1988, B. III, 59-64, πίν. 24.
6. Ph. Petsas, Pella, Alexander the Great's capital, Institute for Balkan Studies, Thessaloniki 1978, 69, Fig. 8.
   Η στήλη αυτή διαστ. 0,995x0,43x0,19 μ. φέρει την επιγραφή: Μάκαρτος Δήλιος.
   Η παράσταση αυτή του πολεμικού πλοίου δεν έχει γίνει γνωστή στους ερευνητές από όσο γνωρίζουμε.
7. Corn. C. Vermeule III-M. B. Comstock, Sculpture in Stone and Bronze in the Museum of Fine Arts, Boston 1988, 27-28, Fig. 16.
   Με το ανάγλυφο αυτό θα ασχοληθούμε διεξοδικά σε άλλο χώρο.
8. Γενικά για τις τριήρεις, το κατάστρωμα, κλπ.
   L. Casson, Ships and Seamanship in the ancient world, Princeton 1973, 77 κ.ε.
   Είναι γνωστόν ότι ο Κίμων γύρω στα 467 π.Χ. κατασκεύασε πλατύτερες τριήρεις με μεγαλύτερο κατάστρωμα για να δέχονται περισσότερες οπλίτες και να είναι περισσότερο αξιόμαχες. Πλουτ. Κίμων 12, 2.
9. Είναι ενδεικτικό ότι πριν από τις μετατροπές που έκανε ο Κίμων στις τριήρεις όπως προκύπτει από το γνωστό ψήφισμα του Θεμιστοκλή, σε κάθε τριήρη, στα 480 π.Χ., επέβαιναν δέκα επιβάτες. *Hesperia* 29, 1960, 198-223, SEG 18 (1962), 56, 245.
   J. Morisson-R. Williams, Greek oared ships 900-322 BC, Cambridge 1968, 122-127.
10. Morisson-Williams ο.π. 170 κ.ε. Fig. 4-8 Pl. 23-25.
11. L. Beschi, ASA 31-32, 1969-70, 117 κ.ε. Fig. 8
    Morisson-Williams ο.π. 9, Fig. 24.
    L. Basch, Le musée imaginaire de la marine antique, Athénes 1987, 279 κ.ε.
    Delivorrias ο.π. 31-34.
    J. S. Morisson-S. F. Coates, The Athenian Trireme, Cambridge 1986, 140, Fig. 36.
12. Ταξιδεύοντας με το πλοίο της Κυρήνειας στο χρόνο και στο Μύθο, Εθνικό Αρχαιολογικό Μουσείο, Αθήνα 1987, αρ. 61.
13. ο.π. σημ. 5, 7.
14. J. Beazley, ARV 1338 I, Paralipomena 481.
    E. Simon, Die griechischen Vasen, 1976, Fig. 230-1.
    Morisson-Williams ο.π. 173 κ.ε. Pl. 26α, όπου και άλλες ανάλογες παραστάσεις.
    Basch, ο.π. 271, Fig. 576.
15. P. Franke-M. Hirmer, Die Griechische Münze, 1964, 118, Nr. 574, Taf. 174.
16. Basch ο.π. 272 κ.ε.
17. Ταξιδεύοντας με το πλοίο της Κυρήνειας, ο.π. αρ. 67, 68.
18. A. Fürtwängler-U. Kron, Das Siegel der Stadt Demetrias, A. M. 93, 1978, 133-160, Taf. 45-46.
19. Παραστάσεις ιματιοφόρων ανδρών είναι συνήθεις στη ρωμαϊκή εποχή.
    M. Bieber, Ancient copies, New York 1977, 129-140.
20. Ο.π. σημ. 2, στο λήμμα Μηνόφιλος.

21. Α.Ε. 1917, 108.
22. Γ. Παναγιωτάτου-Χαραλάμπους, «Ελληνικές επιτύμβιες στήλες με θέμα τη χειρωνακτική εργασία κατά τους ρωμαϊκούς χρόνους», *Αρχαιογνωσία* τ. 5, 1987-88, 31-54, ειδικ. σελ. 44, πίν. 10β.
    Για παραστάσεις ναυτικών σελ. 38-40.
23. Casson ο.π. 347-8, Fig. 139, 147, 149, 150, 151, 156, 181.
    S. Wachsmann, Bird-head devices on Mediterannean ships, TROPIS IV, Athens 1996, 539-558.
24. Παραστάσεις πλοίων στις οποίες εικονίζεται το πηδάλιο και ο οίακας: Casson ο.π. 224-8, Fig. 129, 131, 147, 177, 179.
    Επίσης στις επιτύμβιες στήλες: α) Μουσείου Μυτιλήνης αρ. 3202 του 2ου αι. μ.Χ. και β) Μουσείου Πειραιά του 1ου αι. μ.Χ., εικονίζονται ναυτικοί με πηδάλιο, Παναγιωτάτου-Χαραλάμπους ο.π. 38, 40.
25. Για τον ιστό και την κεραία των πλοίων, Casson, ο.π. 231-2.
26. Casson, ο.π. 233, Fig. 143, 145, 149, 154, 156.
27. Για τα επίσημα των πλοίων, Casson ο.π. 344 κ.ε.
28. RE λήμμα Διόσκουροι, LIMC λήμμα Dioscuri, όπως είναι γνωστόν εκτός από το άστρον σύμβολα των Διοσκούρων είναι ο πίλος, τα δόκανα και οι αμφορείς. Ν. Παπαχατζής, Παυσανίου Ελλάδος Περιήγησις, Κορινθιακά και Λακωνικά, Αθήνα, 1976, 348-9, εικ. 364-5, όπου και σχέδιο αναθηματικού αναγλύφου στους Διοσκούρους του *Αργενίδα* με παράσταση πλοίου. Επίσης σε επιτύμβια στήλη με παράσταση ναυτικού, του Μουσείου της Θεσσαλονίκης αρ. 9447, του 2ου αι. μ.Χ. εικονίζοντας οι Διόσκουροι. Παναγιωτάτου-Χαραλάμπους ο.π. 42, πίν. 9δ.
29. Πράξεις Αποστόλ. 28, 11 «ἐν πλοίῳ... Αλεξανδρινῷ παρασήμῳ Διοσκούροις».
30. Basch ο.π. 275, 299, 387 (Fig. 583, 634, 808).
31. Casson, ο.π. 160-2 Fig. 137, 139, όπου στη σημείωση 18 αναφέρεται και σε «κέλητας πεντασκάλμους» προφανώς παρόμοια πλοία με το πλοίο της επιτύμβιας στήλης του Μουσείου Ναυπλίου αρ. 2060.

ΣΧΕΔΙΑ & ΦΩΤΟΓΡΑΦΙΕΣ

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Φωτ. 2	Επιτύμβια στήλη Μουσείου Πέλλας με παράσταση πολεμικού πλοίου.
Φωτ. 3	Επιτύμβια στήλη Μουσείου Ναυπλίου με παράσταση εμπορικού πλοίου.
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ABSTRACT

TWO SHIP-REPRESENTATIONS AT THE MUSEUMS OF EPIDAURUS AND NAUPLIA

This communication deals with two gravestones bearing representations showing ships.

1. In the Museum of Epidaurus a gravestone (Cat. no 1137) dated from the end of the IVth c. - early IIIrd c. B.C. bears the name of the dead: ΑΔΕΙΜΑ[ντου] (I.G. IV2, 738) and shows, in relief, the representation of the foreward part (stern) of a warship (Fig. 1, Photograph 1).
2. In the Museum of Nauplia there is a gravestone (Cat. no. 2060) dated from the IInd c. A.D. with the representation of a male figure and a merchant ship. The inscription reads: ΜΗΝΟΦΙΛΕ ΧΡΗCΤΕ ΧΑΙΡΕ (I.G. IV, 400). (Fig. 2, photographs 3 and 4).

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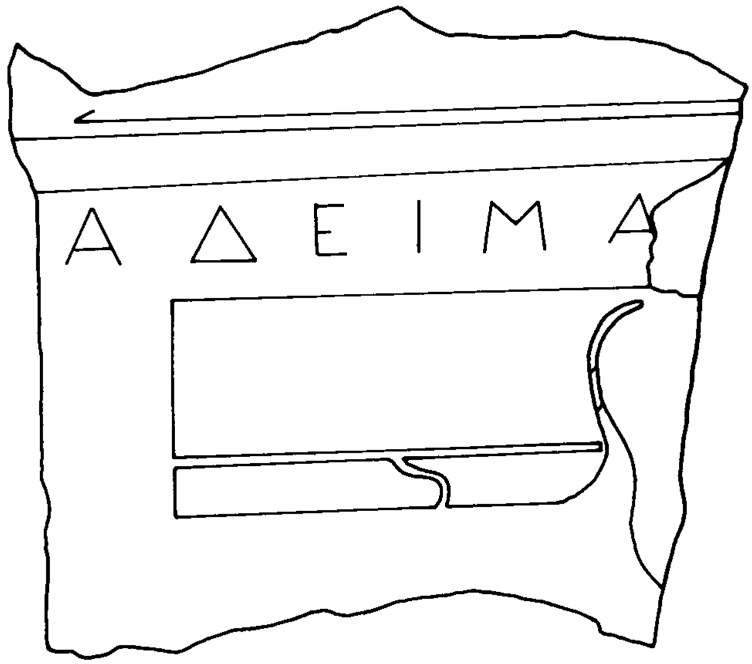
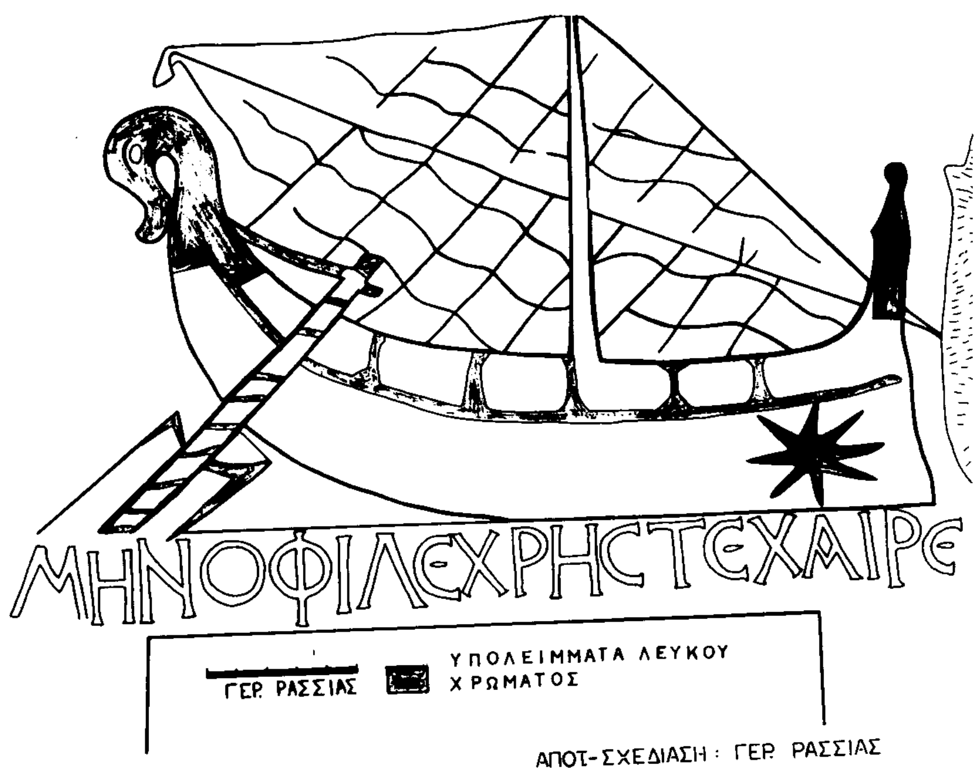


Σχέδιο 1



Σχέδιο 2

Φωτ. 1

Φωτ. 3

Φωτ. 2

Φωτ. 4

LES ÉPAVES ROMAINES DE LA PLACE JULES-VERNE A MARSEILLE: DES BATEAUX DRAGUES?

Les fouilles de sauvetage menées en 1992 et 1993 à l'emplacement de la place Jules-Verne à Marseille, à proximité immédiate du Vieux-Port, ont mis en évidence une partie du rivage antique avec ses installations portuaires: entrepôts à *dolia*, cales de halage, quais, appontements sur pilotis[1]... Comme on pouvait s'y attendre, la fouille a aussi livré plusieurs épaves antiques situées dans les sédiments du bassin portuaire[2]. Parmi celles-ci, l'un des ensembles les plus remarquables est constitué par trois épaves romaines abandonnées au cours des Ier et IIe s. ap. J.-C. qui appartiennent à un même type de navire à ce jour totalement inédit.

Deux d'entre elles, les *épaves* 3 et 4, situées côte à côte perpendiculairement au rivage, semblent avoir été volontairement coulées, au cours de la première moitié du IIe s., après avoir été désarmées pour servir de fondation à des appontements en bois (Fig. 1). En revanche, la troisième, l'*épave* 5, fut simplement abandonnée au Ier s.de notre ère.

L'*épave* 3, la mieux conservée, est préservée de façon homogène sur 12 m de longueur, d'une extrémité à l'autre de la quille, et sur 4 m de largeur. Les vestiges correspondent au fond de carène du navire d'origine dont les extrémités, avec les pièces d'étrave et d'étambot, les flancs et les superstructures ont disparus. Néanmoins, les formes du fond de carène sont assez bien conservées avec l'amorce de la courbure des flancs et de la fermeture de la coque vers les extrémités. L'ensemble correspond à un navire à fond plat dont les murailles se relèvent très rapidement. La construction paraît particulièrement solide. Le bordé, simple (épaisseur 3 cm), est assemblé par tenons et mortaises et la membrure, constituée de varangues alternées avec des demi-couples, se caractérise par son fort échantillonnage (16x12 cm). D'importantes serres latérales (ép. 3-4 cm; larg. 35-40 cm) viennent renforcer longitudinalement l'ensemble de la structure (Fig. 2).

Mais la caractéristique la plus remarquable est le présence au centre du navire d'un puits rectangulaire mesurant environ 2,60 m de longueur sur 0,50 m de largeur. Ouvert sur la mer, ce puits vient interrompre la structure des fonds (quille, bordé, membrure). Il est délimité transversalement par deux fortes varangues brochées à la quille et longitudinalement par deux longerons latéraux. Plusieurs autres particularités semblent être en relation avec la présence de ce puits. Ainsi, de chaque côté, les serres latérales portent de nombreuses traces d'encastrement. D'autre part, un soin particulier a été apporté à l'étanchéité de la coque, notamment autour du puits, où l'on note la présence d'une très épaisse couche de brai et de bitume de 3 à 4 cm d'épaisseur. Enfin, le bordé présente de nombreuses traces de réparations qui sont essentiellement situées à la hauteur de la courbure des flancs et au niveau de l'emplacement du puits. Ces réparations ont été effectuées d'une façon très rudimentaire par simple clouage sur les membrures de nouveaux éléments de bordé venant se substituer aux parties défectueuses. Elles contrastent ainsi avec l'assemblage soigné par tenons et mortaises du reste du bordé d'origine. On peut restituer à l'ensemble du navire d'origine une longueur d'environ 16 m et une largeur de l'ordre de 5.

La seconde *épave*, l'*épave* 4, est constituée par un fragment de carène de même type que la précédente conservée sur environ 5 m de longueur et 3 m de largeur. Le fragment correspond à la partie comprise entre une extrémité de la coque, qui a conservé un élément de la pièce d'étrave ou d'étambot avec son assemblage sur la quille, et le puits central dont l'amorce est visible. Le reste, non conservé, semble avoir été volontairement arraché lors de l'abandon. Les dimensions du bateau d'origine paraissent identiques à celles du navire précédent l'intérêt de ce fragment réside dans le bon état de la structure dépourvue de réparation, dans les formes bien conservées de l'extrémité de la carène et dans la présence de marques de charpentier sur certaines varangues. Ces dernières, tracées au charbon sur le flanc des pièces, correspondent à des marques d'assemblage qui servaient à indiquer l'emplacement relatif des varangues par rapport à la quille.

La troisième *épave*, l'*épave* 5, toujours du même type que les précédentes caractérisé par un puits central, est conservée sur environ 8 m de longueur et 3,50 m de largeur. Ses dimensions d'origine étaient semblables aux deux autres, mais les vestiges en sont plus altérés et la carène est très déformée (Fig. 3). L'épave possède, néanmois, un certain nombre de caractéristiques intéressantes. Ainsi, parmi les nombreuses réparations observées sur l'ensemble de la coque, les plus importantes ont été effectuées sur la structure même de la base du puits dont les deux longerons latéraux ont été changés. Ces réparations complexes ont été effectuées soigneusement à l'aide de tenons courbes prenant place dans des mortaises ouvertes à l'intérieur de la coque. En revanche, les autres réparations intéressant des éléments de bordé ont été réalisées de la même façon rudimentaire que sur l'*épave* 3. Mais surtout, cette épave 5 offre de nouvelles pièces appartenant à la structure haute de puits central, non conservées sur les deux autres épaves, qui permettent ainsi de compléter la structure à l'intérieur du navire. Au-dessus de la base du puits et sur tout son pourtour, était en effet disposées une première rangée de planches implantées à près de 45° vers l'extérieure (Fig. 4). D'après les traces d'assemblage observées sur leur tranche, une seconde rangée de planches venait prendre place au-dessus de la précédente, mais cette fois verticalement. Il est vraisemblable que d'autres rangées montaient ainsi jusqu'au niveau du pont du navire en formant une caisse intérieure évasée à la base.

L'existence de tels navires antiques dotés d'un puits central, ouvert sur la mer et surmonté d'une caisse intérieure, était jusqu'à présent totalement inconnue. Ce caractère inédit leur confère un intérêt particulier et la question se pose de savoir qu'elle pouvait être la fonction de ce puits et l'usage de ces navires d'un type inhabituel. Selon l'ensemble de leurs caractéristiques (fond plat, forte membrure, étanchéité importante, nombreuses réparations), nous sommes, très certainement, en présence de navires de travail et, compte tenu du contexte, de bateaux de servitude portuaire. Le puits servirait alors à mettre en oeuvre un mécanisme particulier. L'hypothèse la plus vraisemblable est de restituer un système de drague à godets entrainé par une roue selon le principe des machines hydrauliques romaines ou encore des pompes à chapelet qui sont bien attestée sur de nombreuses épaves. Dans ce cas, la roue d'entrainement serait située dans la partie haute du navire et supportée par une sorte d'échafaudage venant s'implanter dans les fonds et notamment sur les serres qui portent de nombreuses traces d'encastrement. Le chapelet de godets passerait alors à travers le puits jusqu'au fond à curer et la caisse intérieure protègerait la cale des déjections afin d'éviter qu'elle ne se remplisse. De tels bateaux dragues sont précisemment attestés à Marseille durant la Renaissance ainsi qu'en témoigne une gravure de Braun de 1572 qui montre, dans le bassin du Vieux Port une "machine à curer" constituée par un bateau équipé d'un portique et d'une grande roue axiale entrainant à l'évidence le mécanisme de la drague (Fig. 5).

Outre les caractéristiques de la structure même des bateaux et les nombreuses réparations situées dans les fonds et sur les flancs, qui indiquent qu'ils ont été soumis à des efforts et à des chocs répétés guères surprenant pour des navires de servitude portuaire, plusieurs arguments viennent renforcer cette hypothèse.

Tout d'abord, il convient de signaler la découverte, à côte des *épaves* 3 et 4, d'une roue crantée en bois appartenant manifestement à un système d'engrenage qui peut fort vraisemblablement provenir du mécanisme d'entrainement de la drague d'un de ces bateaux (Fig. 6). Mais surtout, les fouilles elles-mêmes établissent avec certitude qu'une grande partie du port à fait l'objet au Ier siècle ap. J.-C. d'importants travaux de dragage qui ont conduit, sur une hauteur d'environ 2 m, à l'enlèvement des sédiments marins et des couches archéologiques correspondantes[3]. De tels travaux d'une grande ampleur ont dû obligatoirement nécessiter des moyens important dont les trois épaves de "bateaux dragues", précisément en activité au cours de Ier siècle ap. J.C., seraient le témoignage.

Ainsi, ces trois épaves inédites témoignent non seulement d'un nouveau type de navire jusqu'alors totalement inconnu dans l'Antiquité, mais elles mettent aussi en évidence l'importance des moyens mis en oeuvre pour l'entretien des plans d'eau des ports antiques. Une telle activité n'était guère soupçonnée à Marseille que l'on croyait sur le déclin au Ier siècle ap. J.-C. en raison de sa défaite contre Jules César lors de la Guerre Civile.

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NOTES

1. Hesnard 1994. Les fouilles, conduites par le Service régional de l'Archéologie de Provence-Alpes-Côtes d'Azur avec le concours de la Ville de Marseille, ont été placées sous la direction de Mme Antoinette Hesnard (CNRS, Centre Camille Jullian). J'ai moi-même assumé, dans ce cadre, la responsabilité de la fouille et de l'étude des épaves.
2. Pomey 1995.
3. Hesnard, Pasqualini, Pomey 1994, p. 114; Hesnard 1994, p. 198, Fig. 2-2.

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HESNARD, A., PASZUALINI, M., POMEY, P., 1994, Marseille, place Jules-Verne, *Bilan scientifique de la région Provence-Alpes-Côtes d'Azur*, Service régional de l'Archéologie, DRAC-PACA, Aix-en-Provence, p. 110-115.

POMEY, P. 1995, Les épaves grecques et romaines de la place Jules-Verne à Marseille, *Comptes Rendus de l'Académie des Inscriptions et Belles-Lettres*, avril-juin, à paraître.

ILLUSTRATIONS

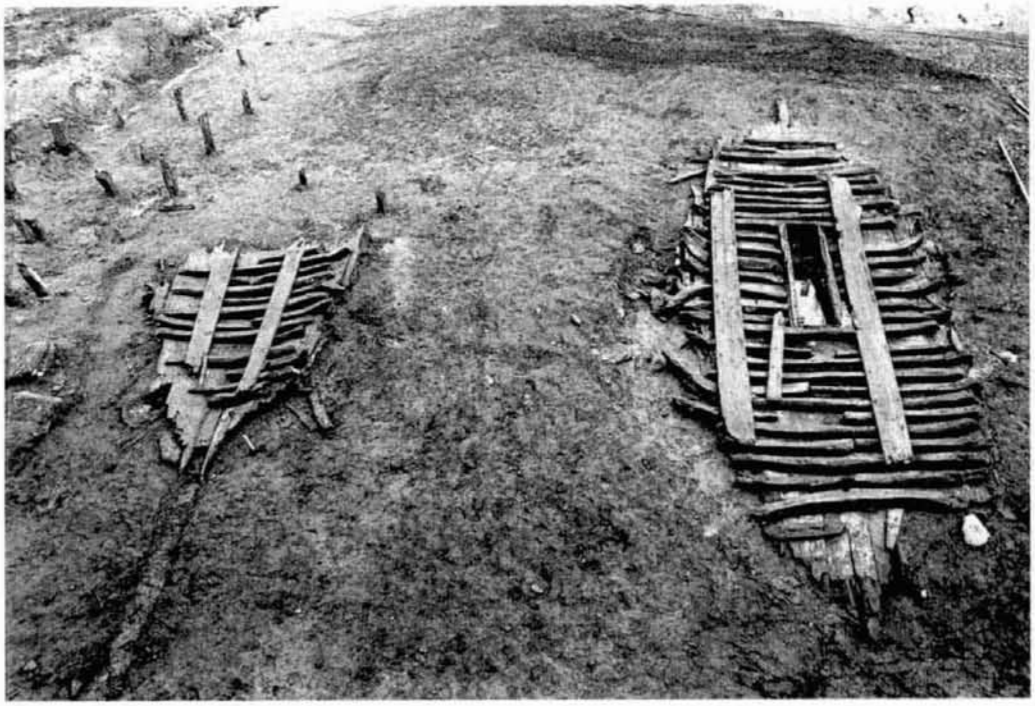

Fig. 1

Fig. 2

Fig. 3

Fig. 4

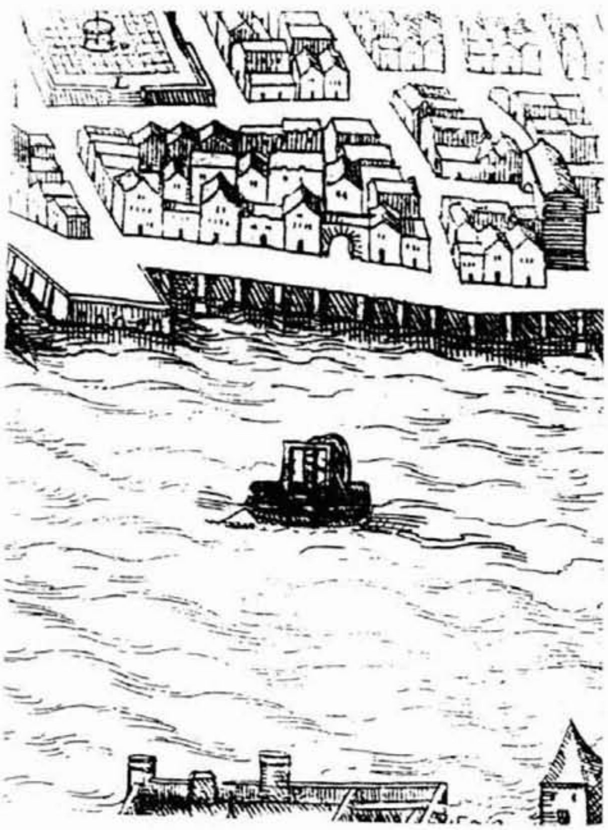

Fig. 5

Fig. 6

THE ANCIENT STONE ANCHORS FROM THE BULGARIAN BLACK SEA COAST

Bulgaria's museums at the Black Sea coast dispose today of one of the largest *collections of stone anchors, stone and lead stocks in the world*—over 300 samples altogether.[1] This considerable quantity shows no doubt that there has existed a very well developed navigation along this coast in ancient times.

I will consider in my present work merely the problems brought up by the stone anchors with holes. The total number of these anchors is beyond 150. This quantity is however not definitive for there are still many samples on the sea-bottom which increase the collection of the coastal museums every year.

This type of anchor represents a well or roughly shaped flat stone in which there are crosswise bored one, two, three, or very seldom—four holes. In these holes there are crosswise bored one, two, three, or very seldom—four holes. In these holes there were driven in wooden stakes, whose sharpened ends were hung, driven or dug into the stony or sandy sea-bottom. The anchors' weight varies from a few tons to a few hundreds of kilograms. The weight depended of course on the size of the vessel.

1. The stone anchors with holes were discovered in close proximity of the following settlements and localities along the Bulgarian Black Sea coast, and here they are enumerated from north to south:

- Sabla (town)	- 4 anchors at a depth of 1 to 3m
- Yailata (locality)	- 2 anchors at a depth of 10-14 m
	- 2 "anchors dug" into the shore of a high stone terrace
- Rusalka (locality)	- 1 anchor on the shore (on the beach strip)
- Kaliakra (cape)	- 39 anchors at a depth of 4 to 10m
- Kavarna (town)	- 2 anchors at a depth of 2 m
	- 2 anchors on the shore (on the beach strip)

- Nesebar (town)	- 13 anchors at a depth of 8 to 12m 10 anchors at a depth of 14 to 20m
- Pomorie (town)	- 2 anchors at a depth between 6 and 8 m
- Sozopol (town)	- 44 anchors at a depth from 6 to10m 10 anchors at a depth from 14 to 18 m
- Kolokita (a locality near Raiski Zaliv)	- 2 anchors at a depth of 12-15m.
- St. Demetrios (cape) at the mouth of the Ropotamo river	- 7 anchors at a depth of 15 -22m
- Maslen nos (cape)	- 10 anchors at a depth 17-19m
- Urdoviza (peninsula), near the village of Kiten	- 6 anchors at a depth of 5-11m.

I would like to observe that the piling up of stone all over the sea-bottom is separate from the anchorages of the stone and lead stocks. The anchorages for the ships with stone anchors are near the shore. They are safe and relatively well-protected from the dangerous winds. The anchorage for the vessels with stone and lead stocks of the wooden anchors are exposed to all kinds of winds. This refers to the aquatories in the proximity of the cape points, or to more distant (from the shore) and relatively open waters. This inference[2] is not a new one. It is derived from the site of finding of the anchors and of the stocks: this indicates that the ships with stone anchors sailed onto the gulfs and laid aboard at the very coast. This was possible only in cases with row-ships. Unlike them the ships with wooden anchors (which had either stone or lead stocks) were obliged to drop anchor in open places relatively far from the wharf —from the shore. They proceeded in this way because they were sail-ships. It was necessary for them to drop anchor in such a place where they would have been able to get out of in case of any kind of wind. These places were the aquatories along the capes.

Hence stone anchors were possessed by one type of ships —the row-ships (or the rowing sail-ships with a single sail), whereas the stone and the lead stocks were possessed by another type of ships —the sail-ships (ship with sails).

2. When the stone anchors at the Bulgarian Black Sea-bottom were found, the so much expected dating archaeological context was not available. During the latest years however the underwater archaeological excavations of sunken settlements[3],

that have been undertaken near Urdoviza and Sozopol, introduced a certain new aspect. Namely —the excavated settlements dated back to the Early Bronze Age (the end of the IVth- IIIrd millennium BC) proved to lie under the former archorages separated by a 1-2m thick sand layer. In other words, at the time stone anchors were used by ships still sailing (functioning) at sea, the settlements from the end of the IVth and the 3rd millennium. BC, previously referred to, were already at the bottom of the sea.

The depth, at which anchors over those buried (from the end of the IVth and the IIIrd millennium BC) are discovered, varies for each of the samples in Sozopol and Urdoviza within the limits of today's 4-5m 10-11m isobaths. At the end of the IVth and during the IIIrd millennium BC the settlements between these present, above- mentioned isobaths were obviously on dry land, not far off, or on the very sea coast. The reason for the abandonment of these settlements and for their sinking under water, at the beginning of the IInd millennium BC was the fact that the sea-level of the Black Sea[4] had considerably risen. By the way, a similar phenomenon with a settlement from the Early Bronze Age has been observed along the eastern coast of the Ionian Sea, —in Akarnania, the settlement near Platiyali Astakos[5], where undertaken underwater archaeological excavations at a depth of 5 m. were undertaken. That is, the phenomenon related to the rising of the sea-level is not isolated: it rather covers the Balkan Peninsula both from the east and from the west.

Hence, if we consider the problem of the places along the Bulgarian Black Sea coast, where stone anchors were found at depths between 4-5 and 10-11m. we shall obtain the following results: Group I - among the previously enumerated 12 sites there are 6 which suit this condition. They dispose, the greatest number of anchors (approximately 100): The second group includes 6 sites with anchors discovered at a greater depth (nearly 40 samples altogether). To the third group belong 4 sites whose anchors have been found on the shore, or in shallow places of a depth up to 3 m. This is in fact the least numerous group (10 anchors in all).

It seems most logical to refer to the first group, which is obviously the most numerous one, dated to the IInd millennium BC, the period after the rising of the sea-level. It is possible that the second group of anchors, discovered at a greater depth (so far up to 22 m), marked samples from an earlier period than those from group I; anchors which might have been used by ships of the same settlements from the end of the IVth and from the IIIrd millennium BC, that sank at the beginning of the IInd millennium BC It is possible that the third group —the smallest one, may be from a later period, i.e. after the beginning and towards the middle of the Ist millennium BC

It seems to be particularly important that the greatest number of stone anchors from the Bulgarian Black Sea coast have been discovered between the 4-5 and 10-11m isobaths, beneath which there have been discovered settlements from the Late Chalcolithic at Sozopol, and from the Early Bronze Age at Sozopol, at the creek of the mouth of the Ropotamo river and at Urdoviza. Consequently we may admit that a certain great part of the stone anchors (by far more than the half — nearly two thirds of the whole collection), as the finds from Sozopol and Urdoviza clearly indicate, has been most actively used after the end of the IIIrd and the beninning of the IInd millennium BC

Regardless of the previously mentioned we cannot categorically state that different depths of discovering anchors indicate different epochs of their usage too. As regards the dating of the anchors we need more evidence, not only from the field of geomorphology, but from archaeology and from the ancient written sources as well.

3. The stone anchors from the Eastern Mediterranean are dated to the IIIrd-IInd millennium BC[6]; the greatest part of the authors, however, are inclined to accept the period between the 16th and the 12th-10th c. BC[7]

It is known from of archaeology[8] that row -ships with one simple sail belong to the ships of the Creto-Mycennean civilization of the IInd millennium BC They had a rectangular sail, the main motive power being the number of the oarsmen. These types of ships were used both for trade (traffic) and for war. It is considered that their anchors were stone-made.

There is also archaeological data from Bulgarian landsites,[9] of row-vessels from the IInd millennium BC These are models and representations of solar boats discovered in certain Thracian necropoles from the Late Bronze Age, or from the IInd half of the IInd millennium BC

The metal ingots in the form of a spread ox or sheep hide from the Eastern Mediterranean were dated back to the Late Bronze Age (16th-12th c. BC). Samples of this type were found along the Bulgarian Black Sea coast.[10] One of them weighs 1,5 kgs, and consists of gold, silver and copper—it was discovered under the water-level, on the sea-bottom, in the area of the stone anchors from Kaliakra. The other one, from the Cerkovo village, Bourgas region, consists of copper and weighs approximately 26 kgs. On the copper ingot from the Cerkovo village, as well as on an anchor from Sozopol and on an anchor from Sabla there is a cross-shaped representation. The “cross” was a sign used in many writing systems all over the Aegean —for instance Linear A and B from the IInd millennium BC, or the Carian writing from the 1st millennium BC The "cross" is however a solar symbol, too, that has been traditionally represented on samples of the local ceramics in Thrace during the Neolithic, the Chalcolithic and the whole Bronze Age. Hence the "crosses" on the copper ingot and on the two stone anchors are most probably dated to the second half of the IInd millennium BC

The anchors of the ships in Homer's epos are made of stone too.[11] Homer used the term *εὐνή* for them, in contrast to the classic *ἄγκυρα*. The ships in Homer's epos have a universal function —like the Creto-Mycenaean ones— they were used for piracy, for war and/or for trade. They were row-vessels with a jingle square sail and they sailed during the second half of the IInd millennium BC up to the 8th c. BC Homer designates this type of ships everywhere by the term *νήος*. In the "Odyssey" however the idea of another type of ship —a cargo-ship with a wide bottom *φορτίς* is mentioned, although merely as a comparison[12].

The specialized cargo-ship was a sail-ship and it appeared, according to the researches,[13] firstly at the beginning of the Ist millennium BC along the western Asia Minor coast, as well as along the western coast of the Black Sea, and later in Crete (9th c.), as well as along the coast of Continental Greece (8th c.). The new type of ship, the sail-vessel, is to be linked with the new type of anchor as well —the wooden, two-horned (or one-horned) anchor with heavy stock. This stock is in my opinion initially made of stone, and in the period from the 8th-7th c. BC up to the 4th c. BC it was step-wise replaced by a lead stock.

Thus the new type of sail-ship took away the trading functions of the old, multi-funtional row-ship, and it gradually became useless and "out-of-fashion" in the new Age. The stone anchors became out-dated too, and so they were used only rarely. This inference is confirmed by an exception from the Bulgarian anchor collection. It represents a stone anchor from Sozopol, on which there is an inscription in ancient Greek, dated back according to the epigraphic peculiarities, to the 6th-5th c. BC[14]. The inscription reads ΝΗΑΣΚΟΥ and has the meaning of ΝΗΑΣΚΟΣ in the genitive case, i.e. the anchor is a possession of ΝΗΑΣΚΟΣ. The 6th and the 5th c. BC represented a period, during which —as mentioned above— as a rule wooden, horned anchors with a stone or lead stock were used. This fact gives us reason to admit that the anchor with the inscription may be several centuries older than the very inscription on it. There is however no reliable evidence. It seems more likely that the anchor might have served a private ship from the 6th-5th c. BC. Its usage however appears to be an exception to the above-mentioned rule, which was valid for the period.

In conclusion, the period in which the stone anchors from today's Bulgarian Black Sea coast were used, was previous to the age of the usage of wooden anchors with stocks, i.e. at the beginning of the 1st millennium BC, and these anchors' usage was particularly active from the 8th-7th c. BC onwards. Consequently, the period of domination of the ships, which had left on the sea-floor the greatest part of their stone anchors, was the second half of the IInd millennium BC. And in the centuries previous to the VIIIth c. BC, both the old stone anchors for the universal rowing-and-sailing ships, and the wooden anchors for cargo-ships with a sail were simultaneously used. After the 7th c. of the 1st millennium BC the stone anchors proved to be an exception.

Thus as regards the functioning and the dating of the stone anchors from the Bulgarian Black Sea coast, we may summarize as follows:

- First: they served row-ships;
- Second: a great part of them (more than a half) were used after the sinking of the settlements from the IIIrd millennium BC, i.e. they were used in the IInd millennium BC and then mainly during its second half:
- Third: stone anchors were used in the first centuries of the Ist millennium BC, too, parallel to the new wooden, two-pronged anchors. After the 8th-7th c. BC, by the middle of the millennium, the stone anchors were quite rarely seen.
- Fourth: it is quite probable, that parts of the stone anchors may have been used in the IVth and in the IIIrd millennium BC; there is, however, no direct evidence in this respect.

In concluding, I would like to add that the petrographic surveys of the stone anchors have proved[15] that 90% of them are made of sedimentary rocks from the Bulgarian Black Sea coast; the areas of their workshops were indicated too. The other 10% of the stone anchors proved to be made of magma and metamorphous rocks of an unknown foreign origin. This indisputable scientific fact shows that the local stone anchors from the Bulgarian Black Sea shore have served local Thracian row-ships, first and foremost during the second half of the IInd millennium BC, and partly at the beginning of the Ist millennium BC. Thus today they prove to be an impressive representative part of the Thracians' maritime culture during the Late Bronze and the Early Iron Ages.

We have just to search for these ships sunk under the waves of the Black Sea, to excavate and to study them in the same way as our colleagues did with the sunken ships from the IInd millennium BC near the Cape Gelidonia and Kas at the Eastern Mediterranean coast.

(Translated into English by Sophia Tarnina)

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THE INNOVATION OF THE COMPOSITE ANCHOR AND THE NAVAL WARFARE OF THE BRONZE AGE

The introduction of the composite, stone and wood anchors, beside - and eventually instead of the former weight anchors, was a revolutionary innovation. For the first time in the maritime history ships could be attached to the sea bed and safely moored afloat. By adding wooden stakes that were inserted through twin holes at the wider part of a flat stone slab, one would be able to achieve proper holding for a rather large vessel without having to use oversized and uncomfortably heavy anchors. Composite anchors were by far less bulky, lighter and easier to be stowed and handled than the former type. A careful, inquisitive survey of the earliest occurrence of this new type from securely dated archaeological context - both in secondary use on land, or on the seafloor, indicated that this new type of anchor was introduced in the Aegean and in the Levant not earlier than toward the end of the 14th century B.C.E. Even such a date might be considered too early for the use of this type of anchors by merchantmen. It is suggested that the actual drive for introducing the composite anchor was not the expanding seaborne trade but rather - the exceeding occurrence of naval warfare and the ever growing demand for suitable, properly furnished and designed marine vessels, both by the seaborne raiders and the Bronze Age Empires. The historical documents of the time refers to "Sea People", "Sea Raiders" and Royal naval power.

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EDITOR'S NOTE

Prof. Avner Raban made a verbal communication and the above is only an abstract.

L'EPAVE GALLO-ROMAIN DE LA PLACE TOLOZAN A LYON (FRANCE)

Introduction

Un important projet immobilier à l'emplacement des 22 et 23 place Tolozan, à Lyon, accompagné d'un parc de stationnement souterrain, nécessita à titre préventif, la réalisation d'une campagne de sondages d'évaluation. Cette opération, conduite sous la direction de Christine Becker (Service municipal d'archéologie de Lyon), révéla l'existence d'un aménagement de berge d'époque moderne (XVIIème siècle), et de niveaux gallo-romains.

A la suite des résultats positifs de cette intervention fut organisée une fouille de sauvetage programmé, également dirigée par C. Becker, qui dura quatre mois (1.12.1989-30.03.1990).

A l'Est de l'aménagement de la berge, au pied de ses fondations, furent découverts les vestiges d'une épave. Celle-ci reposait en partie sur des couches alluviales, et en partie sur un enrochement orienté Nord-Sud.

Les analyses géomorphologiques menées par S. Macé, sous la direction du professeur J.P. Bravard (Université Jean Moulin, Lyon II, département de géographie), tendent à montrer que la berge antique du Rhône devait se situer sensiblement au niveau de l'emplacement de l'aménagement de berge du XVIIème siècle.

C'est donc le long de la berge d'époque gallo-romaine que se trouvait l'épave datée des années 30 après J.C. par la présence de tessons de céramique peinte de type "bol de Roanne" d'une part, par les analyses dendrochronologiques (Archéolabs) et les mesures d'âge au C14 (J.Evin, Centre de Datation par le Radiocarbone, Université Claude Bernard, Lyon 1) d'autre part [1].

Description

Les vestiges de la coque conservés en connexion sur une longueur de 7 m et une largeur de 2,40 m comprenaient les éléments suivants:

1) trois virures de sole (fond plat), en chène, aux bords bien délignés, d'une épaisseur moyenne de 7 cm et d'une largeur de 46 cm pour la virure V3, 50 cm pour la virure V4, et 44 cm environ[2] pour la virure V5.

2) un bordé monoxyle de transition (pièce monoxyle assurant la jonction entre le fond plat et le flanc), en chêne, d'une épaisseur comprise entre 8 et 10 cm. La section de cette pièce (V2) était courbe. Sa plus grande hauteur externe observée était de 47 cm au niveau de la membrure M2.

3) une virure (V1) de 40 cm de large pour une épaisseur moyenne de 7 cm. Cette virure, en résineux, ne se trouvait pas dans sa position d'origine, mais rabattue à 90 degrés vers l'extérieur de la coque, le long du can superieur de bordé monoxyle de transition. L'hypothèse d'une virure de surélévation du bordé de monoxyle de transition, selon un mode d'assemblage non déterminée (par recouvrement comme dans l'épave de Zwammerdam 2, par exemple?), semble la plus vraisemblable. Avec le bordé de surélévation, la hauteur totale externe de la coque serait alors de 87 cm.

   Ces divers éléments longitudinaux de la structure de la coque (virures et bordé monoxyle de transition) étaient juxtaposés à franc-bord.

4) sept fragments de membrures (M1 à M7) d'une largeur moyenne de 20 cm pour une epaisseur comprise entre 8 et 9 cm. L'extrémité supérieure des membrures, mal conservée, ne s'élevait pas jusqu'au can supérieur du bordé monoxyle de transition qu'elles devaient atteindre à l'origine. L'intervalle d'axe en axe entre les membrures était relativement régulier (M2/M3: 58cm; M3/M4: 60cm; M4/M5: 60cm; M5/M6: 60cm; M6/M7: 62cm) à l'exception de l'intervalle entre M2 et M1 (90cm). Précisons toutefois que ce dernier intervalle provenait d'un déplacement de la membrure M1.

L'assemblage entre les virures du fond et le bordé monoxyle de transition d'une part, et les éléments de la membrure d'autre part, était assuré par de gros clous en fer. La tête concrétionnée des clous qui apparaissaient nettement sur la face supérieure des membrures indiquaient que le clouage avait été réalisé à pointe perdue, de l'intérieur vers l'extérieur de la coque.

Il est sûr que la cohésion de la structure architecturale résultait du croisement et de l'assemblage, au moyen d'un clouage dense, des eléments longitudinaux de la coque (virures et bordé monoxyle de transition) aux éléments transversaux (membrures) selon un principe architectural attesté sur de nombreux types de bateaux de rivière à fond plat de l'Europe de l'Ouest[3]. Toutefois ce clouage, dont la fonction d'assemblage était architecturalement déterminante, ne représentait pas le seul mode de liaison présent dans l'épave.

En effet, deux autres types d'assemblage ont été observés très ponctuellement lors de la fouille de l'épave.

Le premier était caractérisé par des mortaises creusées, face à face, dans le can de deux virures adjacentes, mortaises à l'intérieur desquelles avait été chassée une languette en bois non chevillée (par exemple au niveau de la membrure M2, entre le bordé monoxyle de transition et la virure de sole V3, ou au niveau des virures V4 et V5, entre les membrures M1 et M2).

Le second type d'assemblage était constitué par de petits clous, de section carrée, enfoncés en biais à partir de la face interne d'une virure, et qui pénétraient dans le can de la virure adjacente (par exemple le long du can inférieur de la virure VI, ou le can inférieur de la virure V2).

Compte tenu des délais de fouille extrêmement cours imposés par le calendrier du chantier, il n'a malheureusement pas été possible de multiplier les observations de détails et de vérifier si ces deux types d'assemblage se présentaient d'une façon régulière sur l'ensemble des vestiges conservés.

Avant de revenir sur l'analyse et l'interprétation de ces différentes caractéristiques de l'épave, un autre aspect remarquable doit être souligné.

Les virures à franc-bord de cette épave nécessitaient, compte tenu du joint à franc-bord entre les bordages, un calfatage des coutures. L'étude minutieuse menée par le Musée Historique des Tissus de Lyon[4] a mis en évidence la présence de fragments de tissu imprégnés de poix. Ces fragments, disposés entre les éléments prélevés du bordé, provenaient d'un morceau de tissu en laine tissé en armure sergé.

Par ailleurs, l'analyse palynologique d'un prélèvement de ce calfatage a montré que le cortège pollinique mis en évidence pouvait correspondre à l'écologie de la région lyonnaise[5].

Un point important est à souligner. Ce type de calfatage, à base de tissu et de poix, ne correspond nullement aux pratiques et aux matériaux habituels de la construction navale fluviale antique en Europe de l'Ouest. En règle générale, l'étanchéité des joints repose sur des morceaux de mousse maintenus dans les coutures par des baguettes et de multiples petits clous et (ou) agraffes métalliques[6]. Il s'agit même d'une caractéristique majeure de ce type de construction navale de l'arc Alpin, et plus généralement d'ailleurs de l'Europe continentale.

En revanche, l'usage d'un tissu associé à un enduit végétal de protection, et non de calfatage soulignons-le, semble souvent attesté dans la construction navale maritime de l'Antiquité méditerranéenne[7]. Compte tenu du système d'assemblage des bordages des navires antiques de Méditerranée par la biais d'un réseau dense de mortaises, clefs et gournables, le calfatage des coutures n'est pas possible. Par contre, la pratique consistant à enduire de brai l'intérieur de la coque est courante, comme l'est également celle consistant à disposer un tissu imprégné de brai dans les coques à bordé double, le tissu étant alors placé entre le bordé externe et le bordé interne.

Dans cette perspective, le rapprochement entre ces techniques méditerranéennes de tradition maritime et l'épave de la place Tolozan se situe, par conséquent, au niveau des matériaux (tissu et poix), et non au niveau de la technique même (calfatage des joints dans un cas, protection et étanchéité de la surface interne des bordages dans l'autre). Il s'agit, au demeurant, d'une différence essentielle.

Ajoutons, pour clore cette rapide description de l'épave, l'existence de quelques pièces particulières, notamment deux fers plats disposés en étrier de renfort de la virure V2, de part et d'autre du haut de la membrure M2[8].

Analyse et interprétation

Les vestiges de l'épave de Lyon —un fragment de fond plat et de flanc— appartiennent à un bateau de rivière dont l'architecture repose sur une structure de type monoxyle—assemblé, qualifiée, selon les auteurs, de "celtique, romano-cetlique, gallo-romain" ou encore "continentale"[9].

Les caractéristiques architecturales les plus significatives de cette tradition de construcion, quelque soit en l'occurrence son qualificatif, sont de six ordres.

- un bordé monoxyle de transition (avec ou sans bordé de surélévation);
- des virures de sole disposées à franc-bord;
- un assemblage croisé des virures et des membrures;

- un clouage des virures et des membrures au moyen de gros clous en fer dont la pointe est souvent rabattue;
- un calfatage des joints avec de la mousse maintenue par des baguettes, des clous, et (ou) des petites ferrures en forme de cavalier;
- une emplanture transversale de mât aménagée dans une membrure.

Ces six caractéristiques de base sont considérées, généralement, comme révélatrices de pratiques techniques antérieures à la romanisation et particulières aux populations de "l'intérieur", de culture non méditerranéenne.

Plusieurs épaves antiques de bateaux de navigation intérieure répondant à ces caractéristiques de base ont été fouillées et étudiées en Suisse (Bevaix, Yverdon 1 et 2), aux Pays-Bas (Kapel-Avezaath, Zwammerdam 2, 4 et 6, Druten, Woerden), en Belgique (Pommeroeul)[10].

En France, la seule attestation antique connue jusqu'alors était celle d'Abbeville (Somme), qui remonte à 1808[11], et dont la datation gallo-romaine, par la nature de son contexte archéologique, doit être considérée cependant avec une certaine prudence. C'est dire tout l'intérêt presenté par le fragment de bateau de Lyon daté des années 30 après J.-C. Il s'agit, par conséquent, d'une découverte importante pour la connaissance de la batellerie antique de la Gaule.

De plus, cet intérêt est renforcé par certaines caractéristiques que l'on ne retrouve pas dans les autres épaves antiques monoxyles-assemblées fouillées jusqu'à présent.

Tout d'abord, l'épave de Lyon est avec celle de Druten (2ème siècle après J.-C.), aux Pays-Bas, l'une des seules à présenter un bordé monoxyle de transition de section courbe[12].

En second lieu, à l'assemblage traditionnel, pourrait-on dire, des éléments longitudinaux de la coque par des membrures clouée se greffe un second type d'assemblage localisé dans les cans des virures et réalisé au moyen de mortaises et de languettes d'une part, et de petits clous d'autre part.

Dans l'épave de Zwammerdam 6 (150-225 après J.-C.) par exemple, le premier bordage des flancs avait été assemblé au bordé monoxyle de transition par un clouage tangentiel, chaque clou étant enfoncé dans un avant-trou de forme tétra-déique, et également, d'une façon très ponctuelle, par un assemblage par mortaises et tenons[13].

Si le clouage tangentiel n'apparaît pas exceptionnel dans le contexte de la construction navale fluviale gallo-romaine de type "continental", la présence d'assemblage par tenons et mortaises l'est beaucoup plus. Tout aussi peu fréquent est l'emploi de membrures simples à la place de membrures disposées deux par deux.

A cet égard, caractéristiques sont les épaves de Zwamerdam 6 et 2, cette dernière présentant d'évidentes traces d'influence exogène d'origine romaine.

Ajoutons, enfin, à ces caractéristiques particulières le calfatage des bordages de l'épave de Lyon.

La présence dans l'épave de la place Tolozan de ces éléments "non traditionnels", peut étre interprété, à notre avis, de deux points de vues différents. Avant de les discuter, une remarque essentielle doit être faite.

Compte tenu de l'état de conservation trés partielle de l'épave, et du temps réduit d'étude *in situ*, cette interprétation doit être considérée, avec prudence, uniquement comme une hypothèse de recherche.

Examinons le premier niveau d'interprétation, d'ordre strictement technique, en relation avec la construction du bateau. Comme nous l'avons déjà souligné, ce sont les membrures fixées par de gros clous aux éléments longitudinaux (virures de sole et bordé monoxyle de transition) qui étaient déterminantes dans la cohésion et la rigidité de la coque. Dans ces conditions, on peut se demander si les assemblages, structurellement secondaires, par mortaises et languettes d'un côté, et petits clous enfoncés obliquement de l'autre, n'avaient pas, en fait, une fonction d'assemblage purement provisoire, lors de la construction de la coque, avant la mise en place des membrures et leur clouage aux virures et au bordé monoxyle de transition.

Abordons à présent le second niveau d'interprétation, le plus délicat. L'assemblage systématique des bordages à franc-bord, par un réseau de mortaises, languettes et chevilles, représente l'une des caractéristiques majeures de l'architecture navale maritime de l'Antiquité, de tradition spécifiquement méditérranéenne, une architecture dont le mode de construction, de type "bordé premier", est fondamentalement différent de celui observé dans l'épave de Lyon.

Dans cette perspective, ne pourrait-on pas supposer, à titre d'hypothèse de travail, que la présence de l'assemblage secondaire par mortaises et clefs observé dans l'épave de la place Tolozan d'une part, et celle du calfatage à base de tissu et de poix d'autre part, pourrait être les signes d'une éventuelle influence de techniques maritime d'origine méditerranéenne sur des pratiques de construction navale fluviale de tradition régionale et "continentale"?

Si l'hypothèse d'une telle influence nous semble pouvoir être raisonnablement proposée, à titre de direction de recherche, nous ne partageons aucunement, en revanche, les conclusions de M.D. de Weerd[14] qui considère que: "*...the pre-Roman native prototypes of the so called Celtic shipbuilding tradition are virtually non existent. The big Roman planked craft in Central and Western Europe represents a new technology directly imported from the Mediterranean...*"

De notre point de vue, les techniques particulières d'assemblage et de calfatage observées dans l'épave de Lyon doivent être seulement considérées comme d'éventuels apports, secondaires, à une tradition de construction navale fluviale pré-existente à la colonisation romaine, architecturalement et culturellement bien définie.

En conclusion de cette courte étude, nous devons constater que plusieurs questions demeurent encore sans réponse: dimensions d'origine du bateau (longueur et largeur notamment), mode de fixation du bordage de surélévation, organisation de la membre, origine précise de la construction, conditions d'abandon du bateau le long d'une berge.

En dépit de ces interrogations, les vestiges modestes de l'épave de la place Tolozan de Lyon consituent désormais un jalon essentiel pour la connaisance de la batellerie antique de la Gaule dont bien des aspects restent encore à découvrir.

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NOTES

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Lorsque le traitement d'un fragment de l'épave réalisé par les soins de l'Atelier Régional de Conservation Nucléart sera achevé, nous effectuerons une étude complémentaire de l'architecture du chaland de Lyon.

1. Toutes ces informations inédites ont été fournies par Christine Becker à laquelle nous renouvellons tous nos remerciements.
2. Cette dimension doit être considérée avec prudence compte tenu du trés mauvais était de conservation du fragment de virure.
3. Sur ce système, cf. E. Rieth, "La construction navale à fond plat en Europe de l'Ouest", *Ethnologie Française*, XI, I 1981, pp. 47-62. Cf. également, B. Arnold, "The Gallo-Roman boat

of Bevaix and the bottom based construction", dans: *Carval Construction Technique* Vth I.S.B.S.A., Amsterdam, 1988, R. Reinders, K. Paul (éd.), Oxbow Monograph 12, Oxford, 1991, pp. 19-23; du même: *Batellerie gallo-romaine sur le lac de Nauchâtel*, Archéologie Neuchâteloise, 13, Saint-Blaise, Editions du Ruau, 1992, 2 tomes, t.I, pp. 81-91.

4. Etude effectuée par Odile Valansot, Musée Historique des Tissus de Lyon.
5. Analyse effectuée par Denise Iskandar, Archéolabs, réf. ARC 91/R1 025P.
6. Cf. notamment: B. Arnold, "Some remarks on caulking in areas lying northwest of the Alpine arc", *International Journal of Nautical Archaeology*, 6, 4, 1977, pp. 293-29; du même: *Batellerie...*, ouv. cit., t.I, pp. 86-94.
7. P.A. Gianfrotta, P. Pomey, *L'archéologie sous la mer*, Paris, 1980, pp. 262-263.
8. Des traces de concrétions métalliques pouvant correspondre à une pièce comparable ont été observées sur le haut des membrures M3 et M4.
9. Nous préférons la définition plus neutre et strictement technique de construction fluviale monoxyle-assemblée à fond plat. Cf. notre article cité à la note 3.
10. Souligons que des épaves médiévales, répondant aux mèmes caractèristiques de base, ont été fouillées en France, en Allemagne et aux Pays-Bas. Ajoutons que ce type de construction s'est maintenue jusqu'au début du XXème siècle, sur l'Adour par exemple.
11. Cf. B. Arnold, "Les barques celtiques d'Abbeville, Bevaix et Yverdon", *Archëologia*, 118, Mai 1978, pp. 52-59.
12. Type B1 pour l'épave de Lyon selon la typologie établie par E. Kentley et R. Gunaratne; type B2 pour l'épave de Druten (cf. E. Kentley, R. Gunaratne, "The Madel Paruwa-a sewn boat with chine strakes", *International Journal of Nautical Archaeology*, 16, 1, 1978, pp. 35-48, pp. 45-46 pour la typologie des bordés monoxyles de transition).
13. Cf. M. D. de Weerd, "A landlubber's view of shipbuilding procedure in the celtic barges of Zwammerdam, the Netherlands", dans: O. Lixa Filgueiras (éd.), *Local Boats*, Fourth International Symposium on Boat and Ship Archaeology, Porto, 1985, *British Archaeological Reports*, International Series, 438, 1, 1988, pp. 35-51. M. de Weerd écrit (p. 48): "*...in Zwammerdam Barge 6 the vertical parts of the chine-girders are raised with a plank, fastened on edge with iron nails driven obliquely through triangular holes, and —in one or two places— with a mortise-and-tenon joint*".
14. M.D. de Weed s'appuie, en particulier, sur une correspondance qu'il considère comme régulière et significative, entre certaines dimensions (intervalles entre les membrures et longueurs des virures de sole) observées sur les épaves monoxyles-assemblées (celles de Zwammerdam notamment) et les unités de mesures romaines (*pes monetales* spécialement). B. Arnold a émis des réserves, que nous partageons entièrement, sur l'usage de cette argumentation métrologique. Cf. B. Arnold, "Some objections to the link between Gallo-Roman boats and the Roman foot (*pes monetales*)", International Journal of Nautical Archaeology, 19,4 1990, pp. 273-277.

ILLUSTRATIONS

Fig. 1 Plan *in situ* de l'épave (D. Ruff).

Fig. 2 Sections transversales au niveau des membrures M2 et M3 (D. Ruff).

Fig. 3 Restitution de la section transversale au niveau de la membrure M3.

Fig. 4 Vue partielle de l'épave au niveau des membrures M2 et M3 (photo: CNRAS).

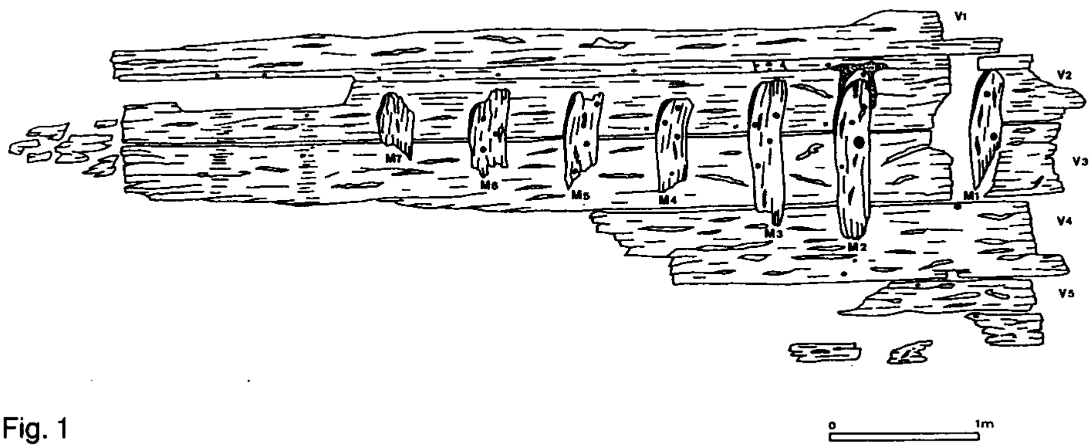

Fig. 1

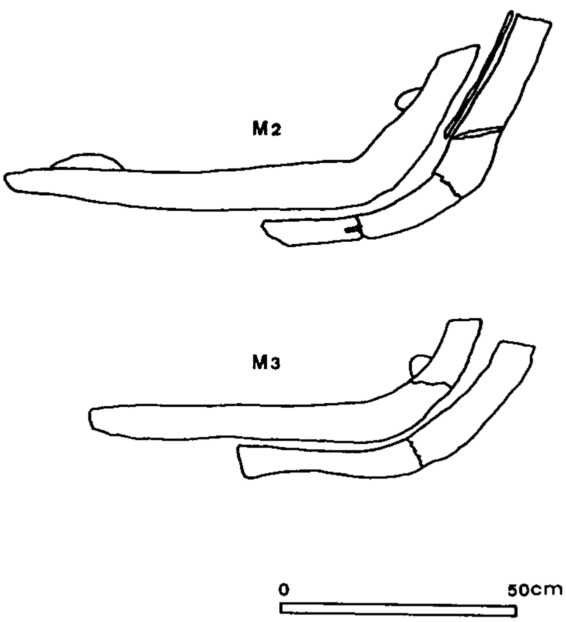

Fig. 2

Fig. 3

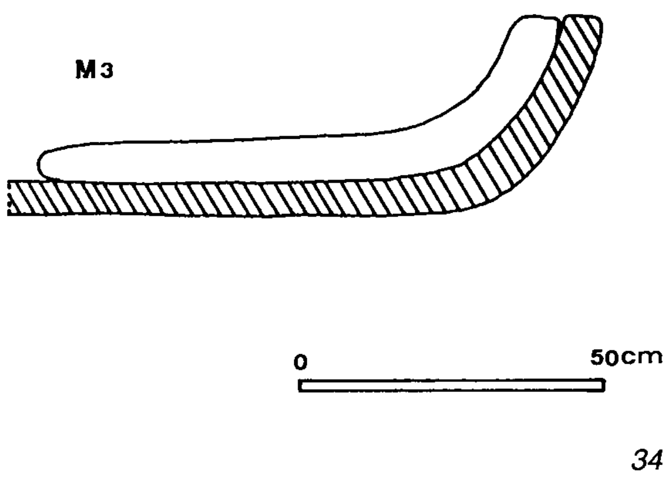

Fig. 4

ΜΕΛΕΤΗ ΚΑΙ ΣΥΜΠΕΡΑΣΜΑΤΑ ΑΠΟ ΠΑΡΑΣΤΑΣΗ ΠΛΟΙΟΥ ΣΕ ΤΟΙΧΟΓΡΑΦΙΑ ΤΟΥ ΑΓΙΟΥ ΝΙΚΟΛΑΟΥ ΦΑΡΚΑΔΟΝΑΣ ΑΡΧΩΝ 17ου ΑΙΩΝΑ

Συνεχίζοντας την έρευνα και τη μελέτη τοιχογραφιών, μεταβυζαντινής τέχνης με παραστάσεις πλοίων που δεν έχουν ακόμη δημοσιευτεί, μετά τις τοιχογραφίες από τα Μοναστήρια των Μετεώρων και της εκκλησίας της Κοίμησης της Θεοτόκου στην Καλαμπάκα, που παρουσιάστηκαν στο III και IV Συμπόσιο Αρχαίας Ναυπηγικής αντίστοιχα, θα παρουσιάσω σήμερα απεικόνιση πλοίου σε τοιχογραφία της εκκλησίας του Αγίου Νικολάου στη Φαρκαδόνα, μικρή πόλη του Νομού Τρικάλων πλησίον της ομώνυμης αρχαίας πόλης της Ιστιαιώτιδας στη Θεσσαλία, που όπως αναφέρει ο Στράβων,[1] βρισκόταν αριστερά στον ποταμό Πηνειό.

Η εκκλησία του Αγίου Νικολάου είναι μονόχωρη Βασιλική που σύμφωνα με την επιγραφή πάνω από την είσοδο της νότιας πλευράς της χτίστηκε το 1640. Εξωτερικά η εκκλησία έχει υποστεί σ' όλες τις όψεις της μεταγενέστερες επισκευές, χωρίς ουσιαστική αλλοίωση της μορφής της. Εσωτερικά είναι κατάγραφη με τοιχογραφίες, η τεχνοτροπία των οποίων εντάσσεται στο κλίμα της μεταβυζαντινής τέχνης[2] που έχει δώσει αρκετά δείγματα στην περιοχή Τρικάλων, όπως στην εκκλησία των Ταξιαρχών στους Ταξιάρχες (1625) και στην Κοίμηση της Θεοτόκου στο Ζάρκο (1621). Ο ανώνυμος καλλιτέχνης έχει σαν πρότυπο τα ζωγραφικά πρότυπα των Μετεωρίτικων Μοναστηριών (Βαρλαάμ, Ρουσάνου, κτλ.) εμπλουτισμένα με πολλά προσωπικά και τοπικά στοιχεία, αλλά και με κάποια λαϊκή νότα, χωρίς αυτό να σημαίνει ότι ξεφεύγει από την παράδοση του 15ου-16ου αιώνα που είναι τόσο έντονη στην περιοχή. Αντίθετα δημιουργεί καλλιτεχνικό σύνολο με ρίζες στην περίοδο αυτή (15ου-16ου αιώνα) και με επιδράσεις στα μετέπειτα ζωγραφικά σύνολα (18ου αιώνα).

Η θάλασσα και η θαλασσινή ζωή δεν είχαν σπουδαία θέση στη βυζαντινή ζωγραφική,[3] αν και τα όρια του Βυζαντίου τα καθόριζε η θάλασσα και οι περίοδοι ευημερίας και κατάπτωσης του είχαν σχέση μ' αυτή.[4] Στις τοιχογραφίες, στις εικόνες και στις μικρογραφίες, η θάλασσα είναι μία βαθυγάλανη επιφάνεια που την αυλακώνουν λευκές σπείρες ή κυματιστές γραμμές, πυκνά και ρυθμικά βαλμένες για να παραστήσουν τον κυματισμό της αφού σε όλες σχεδόν τις σκηνές παρουσιάζεται η επίδραση του Ιησού ή θαλασσινού αγίου για να καταπραΰνει τον κυματισμό της. Τη ζωντανεύουν ψάρια και πλοία όπου το απαιτεί η εικονογραφία της παράστασης. Τα θαλασσινά θέματα είναι λιγοστά παρμένα από την Παλαιά, την Καινή Διαθήκη και τους βίους των αγίων: Η δημιουργία, η Κιβωτός του Νώε, το πέρασμα της Ερυθράς θάλασσας, η θαυμαστή αλιεία, ο Χριστός επιτιμών τους ανέμους, η θάλασσα στη Δευτέρα Παρουσία, τα θαύματα του Αγίου Νικολάου κτλ.[5]

Ζωγραφίζοντας θαύματα στη θάλασσα, οι βυζαντινοί και μεταβυζαντινοί ζωγράφοι δείχνουν κάποια αδιαφορία στην απόδοση της πραγματικότητας και όσον αφορά το πλοίο πάντοτε παρουσιάζεται σε σχήμα απλής βάρκας με πανί και κουπιά.[6] Σε τοιχογραφίες και εικόνες με τη Δευτέρα Παρουσία, μια από τις πιό χαριτωμένες μορφές που ξεκουράζει από τα διάφορα τέρατα, είναι η γυναίκα, προσωποποίηση της θάλασσας.[7] Στα νερά, ανάμεσα σε μεγάλα τέρατα και ψάρια που ξερνούν ανθρώπινα μέλη, στη ράχη ενός τέρατος κάθεται επιβλητικά η ίδια η θάλασσα, νέα και ωραία γυναίκα, συχνά ντυμένη αρχαιόπρεπα, με ένα καράβι στο χέρι που τις πιό πολλές φορές δεν έχει φανταστικό σχήμα, αλλά αποδίδει τύπους καραβιών της εποχής.

Είναι πολύ συνηθισμένο στην εποχή των Παλαιολόγων να ζωγραφίζονται σε μικρότερη ή μεγαλύτερη έκταση η ζωή και τα θαύματα του Αγίου που η εκκλησία είναι αφιερωμένη στη μνήμη του.[8] Δίπλα στις εικόνες του Χριστού και της Παναγίας και της μετωπικής στάσης εικόνες των Αγίων, βρίσκουμε σκηνές με απλούς καθημερινούς ανθρώπους που ξεπηδούν από τα Συναξάρια των Αγίων. Σκηνές που καμμιά φορά δεν έχουν να κάνουν με τα ηρωϊκά κατορθώματα των Αγίων και τα μαρτύρια. Εκπλήσσεται όμως κανείς, όταν, κάνοντας μία πρόχειρη έρευνα στους εικονογραφικούς κύκλους από τους βίους των Αγίων που κοσμούν εκκλησίες και φορητές εικόνες, ανακαλύπτει πως από τους περισσότερο ζωγραφισμένους βίους είναι του Αγίου Νικολάου, παρ' όλο που δεν έχει ούτε μαρτυρικές σκηνές ούτε ασκητικά κατορθώματα.[9]

Τα θέματα των εικονογραφικών κύκλων του βίου του Αγίου Νικολάου που συναντούμε σε πλήθος εκκλησιών αφιερωμένων στη μνήμη του σε όλο το χώρο της Ορθοδοξίας, είναι από τις διηγήσεις του Συμεών του Μεταφραστή, που το κείμενό τους βρίσκεται στο Μηναίο της 6ης Δεκεμβρίου.[10] Μία από τις ωραιότερες παραστάσεις του εικονογραφικού του κύκλου είναι η παράσταση με τον άγιο μέσα σε ένα πλοίο που πλέει με ανοιχτό πανί. Η ταύτιση της σκηνής αυτής δεν είναι εύκολη, γιατί στις διηγήσεις του Μεταφραστή γίνεται πολλές φορές λόγος για τη θαυματουργή επέμβαση του Αγίου σε μεγάλες τρικυμίες που έφερναν σε κίνδυνο τους ναυτικούς.

Η τοιχογραφία με την παράσταση πλοίου στον Άγιο Νικόλαο Φαρκαδόνας βρίσκεται δεξιά από την είσοδο της εκκλησίας στη δυτική πλευρά της, όπου απεικονίζεται η ζωή και τα θαύματα του Αγίου Νικολάου. Παρατηρώντας την τοιχογραφία βλέπουμε πλοίο να πλέει στα φουρτουνιασμένα νερά. Η ταραχή του υγρού στοιχείου και ο έντονος κυματισμός δηλώνονται με έμφαση και διαγράφονται με κύκλους και παράλληλες ευθείες. Το πλοίο κλυδωνίζεται με επικίνδυνο βύθισμα στα τρικυμισμένα νερά της λίμνης που περιζώνεται από γυμνούς βράχους. Δεν υπάρχουν κουπιά ή πηδάλιο. Επίσης δεν διακρίνονται οι σανίδες του περιβλήματος για να χαρακτηρίσουμε το είδος της αρμολογίας του. Διακρίνονται όμως καθαρά η υπερκατασκευή σε σχήμα κάστρου της πρύμνης και η υπερυψωμένη πλώρη. Οι κουπαστές διαγράφονται επίσης καθαρά. Υπάρχει κατάρτι με δύο ξάρτια αριστερά και δεξιά, καθώς και κεραία με τετράγωνο φουσκωμένο από τον άνεμο πανί. Δεξιά στην κεραία φαίνεται η σκότα για τη διεύθυνσή της. Οι λεπτομέρειες του εξαρτισμού του πλοίου είναι σχεδιασμένες με μοναδικό τρόπο που δείχνει πείρα και γνώση.

Πάνω στο κατάστρωμα βρίσκεται ξαπλωμένος νεκρός ναύτης, ενώ στα πρόσωπα των άλλων είναι ζωγραφισμένη θλίψη και απόγνωση. Μπροστά από την πρύμνη ο Άγιος Νικόλαος με άμφια, φαίνεται ότι προσεύχεται για το νεκρό. Δεξιά στην τοιχογραφία διαβάζουμε την επιγραφή: «Ἀνιστῶν τὸν νεκρὸν ἐπὶ τοῦ πλοίου».[11]

Σύμφωνα με το Συναξαριστή, η σκηνή της απεικόνισης αναφέρεται στο ταξίδι του Αγίου Νικολάου με αιγυπτιακό πλοίο στα Ιεροσόλυμα.[12]

Η μορφή του πλοίου και το σχήμα του μας θυμίζουν πλοία της Δύσης και της Βόρειας Ευρώπης του 14ου-15ου αιώνα, όταν τα κάστρα της πρύμνης αποτελούν πλέον ένα μέρος από το κουφάρι του πλοίου.[13] Τέτοιες εικόνες πλοίων προέρχονται από παραστάσεις που διακοσμούν σφραγίδες ναυτικών πόλεων ή τοιχογραφίες εκκλησιών. Παράδειγμα, η παράσταση πλοίου που διακοσμεί τη σφραγίδα της πόλης Danzig από το 1400,[14] η εικόνα πλοίου σε τοιχογραφία της εκκλησίας του Hojby στη Δανία,[15] η εικόνα πλοίου από τη σφραγίδα της πόλης Rye,[16] παράσταση πλοίου στο Froissart's Chronicle[17] και παράσταση πλοίου από γαλλική μινιατούρα.[18] Ακόμη η μορφή του πλοίου μας θυμίζει την καρράκα του Κολόμβου (Ναό όπως την αποκαλούσε ο ίδιος) Σάντα Μαρία.[19]

Ανάλογη απεικόνιση πλοίου έχουμε στο Μοναστήρι Αγίου Νικολάου Αναπαυσά στην τοιχογραφία με θέμα τη Δευτέρα Παρουσία, όταν ο Κύριος θα έλθει να κρίνει ζωντανούς και νεκρούς.[20] Η παράσταση που παρουσιάζει γυναίκα, προσωποποίηση της θάλασσας, να κάθεται πάνω σε θαλάσσιο τέρας και να κρατεί πλοίο, ενώ τριγύρω μεγάλα ψάρια βγάζουν από το στόμα τους ανθρώπινα σώματα, αναφέρεται στην Αποκάλυψη του Ιωάννη.[21] Το πλοίο απεικονίζεται με απλές γραμμές, έχει κυκλικό σχήμα με πρύμνη και πλώρη που προεξέχουν, κατάρτι με τετράγωνο πανί και είναι παρόμοιο με το δυτικό τύπο πλοίου «καρράκα», αν το συγκρίνουμε με σχέδιο εμπορικού πλοίου τύπου καρράκας του φλαμανδού καλλιτέχνη W.A. που χρονολογείται από το 1470.[22]

Τον βορεινό τοίχο του νάρθηκα πάνω από την είσοδο προς τον κυρίως ναό της Μονής Ρουσάνου στα Μετέωρα, καλύπτει η επιβλητική και πολυπρόσωπη σύνθεση της Δευτέρας Παρουσίας, που θυμίζει την προηγούμενη απεικόνιση του Μοναστηριού Αγίου Νικολάου Αναπαυσά Μετεώρων. Και εδώ η γυναίκα, προσωποποίηση της θάλασσας, κάθεται σε θαλάσσιο τέρας που βγάζει από το στόμα του ανθρώπινο σώμα, ενώ στο χέρι της κρατεί πλοίο παρόμοιο με δυτικού τύπου «καρράκα». Οι λεπτομέρειες των ναυπηγικών γραμμών και της μορφής του πλοίου, όπως και του εξαρτισμού του είναι σχεδιασμένες με μοναδικό τρόπο και δείχνουν γνώση και πείρα του ζωγράφου σε ναυτικά και ναυπηγικά θέματα.

Δυτικούς τύπους πλοίων θα παρατηρήσουμε και σε άλλες απεικονίσεις τοιχογραφιών, όπως της Μονής Βαρλαάμ Μετεώρων και της εκκλησίας της Bojana Βουλγαρίας.

Η ολοζώντανη παράσταση της Δευτέρας Παρουσίας στο Μοναστήρι Αγίων Πάντων (Βαρλαάμ) στα Μετέωρα βρίσκεται στον ανατολικό τοίχο του νάρθηκα του καθολικού του Μοναστηριού. Και εδώ η γυναίκα, προσωποποίηση της θάλασσας,[23] που κάθεται επάνω σε θαλάσσιο τέρας, κρατεί στο χέρι της πλοίο, ενώ τριγύρω στη θάλασσα μεγάλα ψάρια βγάζουν από το στόμα τους ανθρώπους. Το πλοίο που απεικονίζεται εδώ έχει φανερά τα χαρακτηριστικά αγγλικού γαλιονιού (Galleon), όπως συμπεραίνεται αν συγκριθεί με σχέδιο του Mathew Baker του 1586 σε χειρόγραφο που βρίσκεται στην Pepysian Library.[24] Αν παρατηρήσουμε τις υπερκατασκευές του πλοίου που απεικονίζεται στην τοιχογραφία και του σχεδίου του αγγλικού γαλιονιού, δεν υπάρχει αμφιβολία ότι ο αγιογράφος έχει επηρεασθεί από δυτικά πρότυπα.

Ιδιαίτερο ενδιαφέρον παρουσιάζει ανάλογος εικονογραφικός τύπος από την εκκλησία Bojana, της Βουλγαρίας. Τμήμα της εκκλησίας αυτής είναι αφιερωμένο στον Άγιο Νικόλαο και προέρχεται από το πρώτο μισό του 11ου αιώνα, με δύο στρώματα τοιχογραφιών, το πρώτο από την ανέγερση του ναού (11ος αιώνας) και το δεύτερο από τον 13ο αιώνα.[25] Μεταξύ των σκηνών με γεγονότα από τη ζωή και τα θαύματα του Αγίου Νικολάου περιλαμβάνεται και η απεικόνιση με θέμα «ο Άγιος Νικόλαος καταπραΰνει με ήρεμες κινήσεις τη θάλασσα και τους σώζει».[26]

Στην παραπάνω σκηνή τα κύματα καταλαμβάνουν μία πλατιά ζώνη στο μπροστινό μέρος της τοιχογραφίας. Στη συνέχεια στο πίσω μέρος το πλοίο και οι ναύτες έχουν σμικρυνθεί προοπτικά. Άξια προσοχής είναι η ιδέα του ζωγράφου να παρουσιάσει τη θάλασσα με τα πιό απλά εκφραστικά μέσα.[27] Η σκηνή περιέχει πολύ ρεαλιστικά μοτίβα επειδή είναι συνδεδεμένη με την καθημερινή ζωή και όχι τόσο επηρεασμένη από την εικονογραφία των ευαγγελικών σκηνών. Η ρεαλιστική απεικόνιση του δυτικού πλοίου (ιταλικού κατά τον Krastju Mijatev)[28], των ναυτών που η στάση τους εκφράζει απόγνωση και των κρεμασμένων από το πλοίο ασπίδων ιπποτών δεν έρχεται σε αντίθεση με τα ιστορικά στοιχεία, σύμφωνα με τα οποία υπήρχαν τέτοια πλοία στα λιμάνια της Μαύρης Θάλασσας.[29]

Στην περίπτωση του πλοίου της Bojana ο ζωγράφος στη θέση της συνηθισμένης σχηματικής των βυζαντινών με τις συμβολικές επινοήσεις τους να παρουσιάζουν ένα πλοίο σαν οποιαδήποτε βάρκα, επιχειρεί να σχεδιάσει ένα αληθινό πλοίο, παρουσιάζοντας ένα πλοίο σταυροφόρων ή γενικώτερα ένα πλοίο δυτικό.[30] Θέλοντας εδώ ο ζωγράφος να δώσει το σχήμα ενός αληθινού πολεμικού πλοίου τοποθετεί κατά μήκος του πύργου της πρύμνης του ασπίδες. Για την εξήγηση του γεγονότος αυτού ας θυμηθούμε αυτό που γράφει ο Viollet-le-Duc: «Όταν οι ιππότες ταξίδευαν στη θάλασσα είχαν τη συνήθεια να αναρτούν τις ασπίδες με το θυρεό τους κατά μήκος του μπροστινού μέρους του πλοίου».[31] Η τοποθέτηση των ασπίδων για το χαρακτηρισμό ενός πλοίου ως πολεμικού, δεν παρουσιάζεται για πρώτη φορά στο πλοίο της τοιχογραφίας της Bojana. Ανάλογες παραστάσεις με τοποθέτηση ασπίδων, με καθαρά στρατιωτικό χαρακτήρα,[32] έχουμε σε πλοία φοινικικά[33], ελληνικά[34], και ρωμαϊκά[35], σε πλοία των Βίκιγκς στην ταπισερί της Bayeux[36] και σε πλοία ζωγραφισμένα σε εκκλησία στο Skamstrup της Δανίας.[37] Ακόμη σε σειρά ιταλικών και γαλλικών ζωγραφιών, ο τρόπος τοποθέτησης των ασπίδων είναι όμοιος με της τοιχογραφίας της Bojana[38] και έχει χαρακτήρα καθαρά διακοσμητικό.[39]

Η τοιχογραφία της Bojana είναι έργο εξάλλου βυζαντικών μεταναστών τεχνιτών, που εισήγαγαν τις αισθητικές αρχές της τέχνης της Κωνσταντινου-

6. André Grabar, *La peinture religieuse en Bulgarie* σελ. 168-169, Paris 1928.
7. Αγάπη Καρακατσάνη, όπ. παρ. σελ. 234. Γεωργίου Α. Σωτηρίου, *Η Χριστιανική και Βυζαντινή εικονογραφία*, περιοδικό «Θεολογία» τεύχος Α΄ Ιανουάριος - Μάρτιος 1955 (Τόμος ΚΣΤ΄) σελ. 11, Εν Αθήναις 1955. Μιχ. Χαρ. Γκητάκου, *Η εν Σαλαμίνι Ιερά Μονή της Φανερωμένης* σελ. 150, Εν Αθήναις 1952.
8. Α. Ξυγγόπουλου, *Οι τοιχογραφίες του Αγίου Νικολάου Ορφανού Θεσσαλονίκης* σελ. 18, Αθήνα 1964.
9. Νίκου Ζία, Η εικονογραφία του βίου Αγίου Νικολάου, Χριστιανικού Συμπόσιου, *Ετήσια έκδοσις Χριστιανικού στοχασμού και τέχνης* (1967) σελ. 253, Βιβλιοπωλείον της Εστίας Ι.Δ. Κολλάρου και Σίας χ.τ.χ.χ.
10. Μηναίον του Δεκεμβρίου σελ. 70-84, *Εκκλησιαστική βιβλιοθήκη «ΦΩΣ»*, Αθήναι 1971.
11. Στην Ερμηνεία της Ζωγραφικής Τέχνης Διονυσίου του εκ Φουρνά (όπ. παρ. σελ. 181) η σκηνή αυτή περιγράφεται όπως παρακάτω: «Ο άγιος ανιστών τον ναύτην εν τω πλοίω: Θάλασσα και εν αυτή καράβι και ο άγιος προσευχόμενος μέσον και εις νεκρός ναύτης έμπροσθεν του κείμενος ύπτιος, και άλλοι ναύται γύρωθεν εξεστηκοί».
12. «...Θέλων ποτέ ο Άγιος να υπάγη εις τα Ιεροσόλυμα ίνα προσκυνήση του Πανάγιου του Κυρίου Τάφου, και δια να εύρη ησυχαστικόν τόπον ίνα μείνη κατά μόνας, εύρε πλοίον Αιγυπτιακόν και εισελθών εις αυτό μετ' άλλων χριστιανών, βλέπει καθ' ύπνον ότι ο Διάβολος ο εχθρός της αληθείας έκοπτε τα εις το κατάρτιον σχοινιά. Εξυπνήσας δε την πρωΐαν λέγει εις τους ναύτας, ότι σήμερον μεγάλη τρικυμία θέλει μας εύρη, διότι είδον εις τον ύπνον μου ότι θα υποφέρωμεν, αλλά μη φοβηθήτε, αλλ' ελπίζετε εις τον Θεόν και αυτός θα μας ελευθερώση εκ του θανάτου. Αφού δε έλεγεν ο Άγιος τους λόγους τούτους, παρευθύς νέφος μέγα και σκοτεινόν παρουσιασθέν, και μετά το νέφος άνεμος και ταραχή της θαλάσσης μεγάλη, ώστε απελπισθέντες άπαντες περιέμενον τον θάνατον, και άπαντες οι εν τω πλοίω ατενίζοντες τον Άγιον παρεκάλουν αυτόν μετά δακρύων, ίνα δεηθή του θεού να καταπαύση ο άνεμος. Σταθείς δε εις προσευχήν ο Άγιος ευθύς ο άνεμος έπαυσεν η θάλασσα ησύχασε και οι εν τω πλοίω εχάρησαν. Εις την ώραν της τρικυμίας ναύτης τις αναβάς εις το κατάρτιον δια να διορθώση τα σχοινία του πανίου, και καταβαίνων, εκ φόβου της τρικυμίας εκρημνίσθη εις το κατάστρωμα του πλοίου και απέθανεν· ο δε Άγιος ιδών ότι εις την κατάπαυσιν του ανέμου εχάρησαν οι εν τω πλοίω, ελυπήθησαν μόνον δια τον θάνατον του ναύτου, δια τούτο προσευχηθείς ο Άγιος ανέστησεν αυτόν ως εξύπνου». *Μέγας Συναξαριστής πάντων των Αγίων των καθ' άπαντα του μήνα Δεκέμβριου εορταζομένων υπό Κωνσταντ. Χρ. Δουκάκη* σελ. 175. Εν Αθήναις 1896.
13. Bjorn Landström, *The Ship* p.77, Allen & Unwin, n.o.d.
14. Bjorn Landström, *The Ship* p.77, Allen & Unwin, n.o.d.
15. Bjorn Landström, *The Ship* p.78, Allen & Unwin, n.o.d.
16. Bjorn Landström, *The Ship* p.78, Allen & Unwin, n.o.d.
17. Bjorn Landström, *The Ship* p.78, Allen & Unwin, n.o.d.
18. Bjorn Landström, *The Ship* p.77, Allen & Unwin, n.o.d.
19. Bjorn Landström, *The Ship* p.102, Allen & Unwin, n.o.d.
20. Ματθαίος, *Ευαγγέλιον* κεφ. 25. Μάρκος, *Ευαγγέλιον* κεφ. 1, 43-44.
21. Ιωάννης, *Αποκάλυψις* κεφ. 20, 13-14.
22. Bjorn Landström, *The Ship* p.102, Allen & Unwin, n.o.d.
23. Βλέπε υποσημείωση 7.
24. Bjorn Landström, *The Ship* p.119-120, Allen & Unwin, n.o.d.
25. Prof. Dr. Krastju Mijatev, Die Wandmalereien in Bojana P.S., Sofia 1961. Για την εκκλησία της Bojana βλέπε: André Grabar, *La peinture Religieuse en Bulgarie (Peintures de Bojana)* p. 117-176, Paris 1928. André Grabar, *Monuments de L'art en Bulgarie Volume I L'Eglise de Bojana* p. 79-81, Sofia 1924. Αρχ. George Stoykov, *Η Εκκλησία της Bojana*, Σόφια 1954 (στη βουλγαρική γλώσσα).

ή πίνακες για δευτερεύουσες συνθέσεις.[44]

δ. Πηγή της έμπνευσης των ζωγράφων στην απόδοση των τύπων των πλοίων αποτέλεσε η προσωπική τους εμπειρία από επισκέψεις διαφόρων τόπων με λιμάνια.[45] Η επικοινωνία και οι μετακινήσεις του,[46] συντελούν στη βαθμιαία δημιουργία ενότητας στην καλαισθησία των Ελλήνων και όλων των Ορθοδόξων λαών. Το γεγονός ότι ιδιαίτερα οι Κρητικοί ζωγράφοι γίνονται γνωστοί σε Ανατολή και Δύση, οφείλεται στη δεξιοτεχνία τους, ο εκλεκτισμός τους όμως είναι προφανής όπως και ο επηρεασμός τους από την ιταλική τέχνη.

ε. Η ύπαρξη όμοιων εικονογραφικών τύπων στις τοιχογραφίες και στις φορητές εικόνες με απεικονίσεις πλοίων, μας κάνει να μην απορρίπτουμε τη χρήση εγχειριδίων (sketch-books) στα οποία τύποι πλοίων και περιγραφές ναυτικών σκηνών είχαν εικονογραφηθεί και περιγραφεί, όπως π.χ. η Ερμηνεία της Ζωγραφικής Τέχνης του Ιερομονάχου Διονυσίου εκ Φουρνά. Η ύπαρξη και η χρήση των ανθιβόλων[47] (αχνάρια) είναι γνωστή από τους αρχαίους για τη ζωγραφική όχι μόνο στους τοίχους, αλλά και σε αγγεία, πινάκια κτλ.[48] Περισσότερο πιθανό φαίνεται οι ζωγράφοι να χρησιμοποίησαν και τα δύο, προσωπική εμπειρία εφόσον συνήθιζαν να ταξιδεύουν από τόπο σε τόπο και τύπους πλοίων και ναυτικές σκηνές, τις περιγραφές των οποίων εύρισκαν σε εγχειρίδια βιβλία (ανθίβολα, sketch-books).

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ΣΗΜΕΙΩΣΕΙΣ

1. Στράβων, Θ. 438.
2. Κατά την τρίτη και τελευταία περίοδο της Κρητικής ζωγραφικής (1630-1700) έχουμε ανάπτυξη των τοπικών ανά την Ελλάδα εργαστηρίων, ενώ κατά την πρώτη περίοδο (1453-1526) η Κρητική Σχολή διαμορφώνεται και κατά τη δεύτερη (1527-1630) εμφανίζεται και κυριαρχεί στην Ηπειρωτική Ελλάδα. Μανόλης Χατζηδάκης, Η μεταβυζαντινή τέχνη (1453-1700) και η ακτινοβολία της, *Ιστορία του Ελληνικού Έθνους* Τόμος Ι σελ. 412, Εκδοτική Αθηνών ΑΕ χ.τ. 1974.
3. Αγάπη Καρακατσάνη, Ναυτικά θέματα στην Μεταβυζαντινή Τέχνη και στην Δυτική Χαρακτική, *Ελληνική Εμπορική Ναυτιλία* σελ. 233-234, Εθνική Τράπεζα της Ελλάδος, χ.τ.χ.χ.
4. Βλέπε: Κ.Α. Αλεξανδρή, *Η θαλασσία δύναμις εις την Ιστορίαν της Βυζαντινής Αυτοκρατορίας*, Αθήναι 1956. Hélène Ahrweiler, *Byzance et la Mer*, Paris 1966.
5. Διονυσίου του εκ Φουρνά, *Ερμηνεία της Ζωγραφικής Τέχνης*, υπό Α. Παπαδοπούλου-Κεραμέως, σελ. 49, 71, 89, 92, 96, 112, 140 και 181, Εν Πετρουπόλει 1909.

πόλεως του 11ου και του 12ου αιώνα. Από την άποψη αυτή οι τοιχογραφίες της Bojana αποτελούν σπάνιο μνημείο γιατί εκεί διαμορφώθηκε η προερχόμενη από την Κωνσταντινούπολη εικονογράφηση της ζωής του Αγίου Νικολάου σε μια ενότητα που δεν συναντιέται σε καμμία άλλη εικονογράφηση της ιστορίας της ζωής του Αγίου.[40]

Ύστερα από τις παραπάνω περιγραφές και συγκρίσεις μπορούμε να καταλήξουμε στα παρακάτω συμπεράσματα:

α. Παρά το γεγονός ότι ζωγραφίζοντας θαύματα στη θάλασσα οι βυζαντινοί και μεταβυζαντινοί ζωγράφοι δείχνουν κάποια αδιαφορία στην απόδοση της πραγματικότητας και όσον αφορά το πλοίο πάντοτε παρουσιάζεται σε σχήμα απλής βάρκας με πανί και κουπιά, εν τούτοις πολλές απεικονίσεις πλοίων στις τοιχογραφίες αυτές παρά το φανταστικό σχήμα και τη μορφή τους, αποδίδουν με απλό τρόπο τύπους πλοίων της εποχής. Παρά τον απλό τρόπο απόδοσης της μορφής του πλοίου, ορισμένα ναυπηγικά στοιχεία, ο εξαρτισμός, τα ιστία κτλ. είναι φανερά και αποδίδονται με μοναδικό τρόπο που δείχνει πείρα και γνώση.

β. Οι παραστάσεις πλοίων δυτικής τέχνης και χαρακτικής σε εκκλησίες όπως ανάγλυφα (Winchester Cathedral) ζωγραφιές (Skamstrup, Hoiby, Kirkehyllinge Δανίας), μωσαϊκά (San Marco Βενετία, San Giovanni Evangelista Ραβέννα, San Apollinario in Classe, St. Peter the Martyre Μιλάνο, St. Peter Ρώμη κτλ.), αφιερώματα (εκκλησία Mataro Βαρκελώνη) κτλ., αλλά και οι παραστάσεις πλοίων βυζαντινής και μεταβυζαντινής τέχνης (τοιχογραφίες, εικόνες, μικρογραφίες κτλ.), με την έρευνα και τη σύγκρισή τους μας βοηθούν ουσιαστικά στη μελέτη των πλοίων της εποχής.

γ. Στις απεικονίσεις πλοίων ο επηρεασμός των βυζαντινών και μεταβυζαντινών ζωγράφων από δυτικά πρότυπα είναι προφανής. Αυτό εξηγείται από τα ταξίδια των ζωγράφων, ιδιαίτερα στη Βενετία.[41] Η καλλιτεχνική αγορά της Βενετίας προσελκύει τους Έλληνες ζωγράφους και άλλοι είναι περαστικοί ενώ μερικοί εγκαθίστανται μόνιμα εκεί.[42] Ακόμη και ο κυριώτερος εκπρόσωπος της Κρητικής Σχολής, ο Θεοφάνης, αν και απομακρύνεται περισσότερο από άμεσες ιταλικές αισθητικές εμπειρίες δεν παύει να χρησιμοποιεί χαλκογραφίες του M. Raimondi, σχέδια του Ραφαέλο ή πίνακες του Bellini.[43] Η Σχολή του Θεοφάνη διατήρησε άμεσες σχέσεις με την ιταλική τέχνη που προδίδουν τα δάνεια από χαλκογραφίες

26. Prof. Dr. Krastju Mijatev, όπ. παρ. σελ. 13. André Grabar, *La Peinture Religieuse en Bulgarie (peintures de Bojana)* p. 168, Paris 1928. André Grabar, *Monuments de L'art Bulgarie*, Volume I L'Eglise de Bojana p. 80, Sofia 1924.
27. Prof. Dr. Krastju Mijatev, όπ. παρ. σελ. 13.
28. Prof. Dr. Krastju Mijatev, όπ. παρ. σελ. 13.
29. Prof. Dr. Krastju Mijatev, όπ. παρ. σελ. 19.
30. André Grabar, La peinture Religieuse en Bulgarie p. 168-169.
31. André Grabar, όπ. παρ. p. 169.
32. André Grabar, όπ. παρ. p. 169.
33. Bjorn Landström, The Ship p.31-32, Allen & Unwin, n.o.d.
34. Βλ. Ιστορία του Ελληνικού Έθνους, τόμος Γ2 σελ. 232-233, Εκδοτική Αθηνών ΑΕ χ.τ.χ.χ.
35. Bjorn Landström, όπ. παρ. p. 45.
36. Bjorn Landström, όπ. παρ. p. 65.
37. Bjorn Landström, όπ. παρ. p. 75.
38. André Grabar, La peinture Religieuse en Bulgarie p. 170.
39. André Grabar, όπ. παρ. p. 169.
40. Prof. Dr. Ktastju Mijatev, όπ. παρ. σελ. 24.
41. Μανόλης Χατζηδάκης, όπ. παρ. σελ. 420-421.
42. Μανόλης Χατζηδάκης, όπ. παρ. σελ. 421.
43. Μανόλης Χατζηδάκης, όπ. παρ. σελ. 422.
44. Μανόλης Χατζηδάκης, όπ. παρ. σελ. 422.
45. Μανόλης Χατζηδάκης, όπ. παρ. σελ. 422-424.
46. Μανόλης Χατζηδάκης, όπ. παρ. σελ. 412.
47. Ανθιβόλιον και ανθίβολον από το αντιβάλλω.
48. Βλέπε: Μιχ. Χαρ. Γκητάκου, *Ο εν Ελαιώνι των Μεγάρων Βυζαντινός Ναός του Σωτήρος Χριστού* σελ. 56, εν Αθήναις 1953. Του ιδίου: *Η εν Σαλαμίνι Ιερά Μονή της Φανερωμένης* σελ. 50-51. Εν Αθήναις 1952. Παντελής Ζωγράφος, οι διάφοροι τρόποι της Βυζαντινής Αγιογραφίας επί τη βάσει της Ερμηνείας των ζωγράφων, *Δελτίον Χριστιανικής Αρχαιολογικής Εταιρείας*, περίοδος Β΄- Τόμος Γ΄ τεύχη Α΄ και Β΄ έτος 1926 σελ. 49-61, Αθήναι 1926. Διονυσίου του εκ Φουρνά, Ερμηνεία της Ζωγραφικής Τέχνης υπό Α. Παπαδοπούλου-Κεραμέως σελ. 7-10, Εν Πετρουπόλει 1909.

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ΦΩΤΟΓΡΑΦΙΕΣ

Fig. 1

Fig. 2

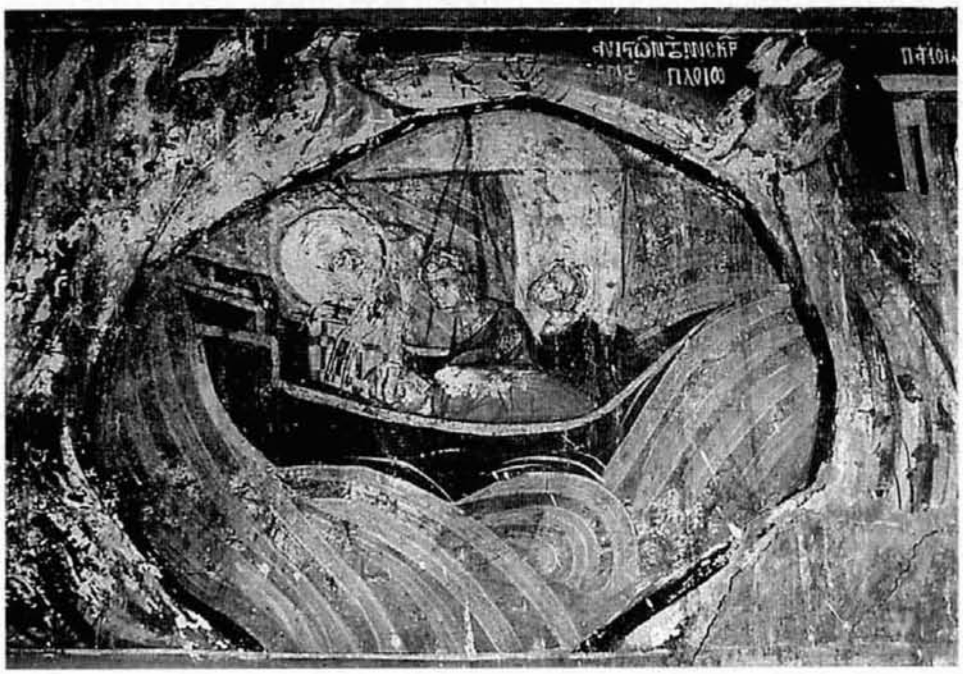


Fig. 3

Fig. 4

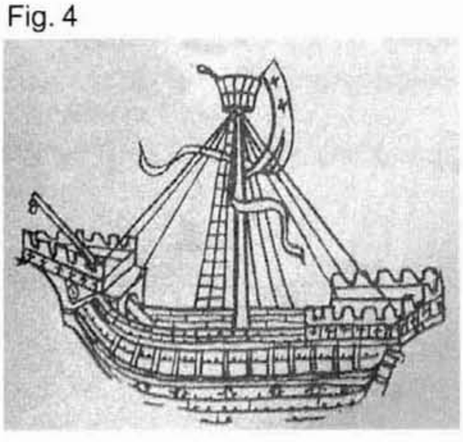
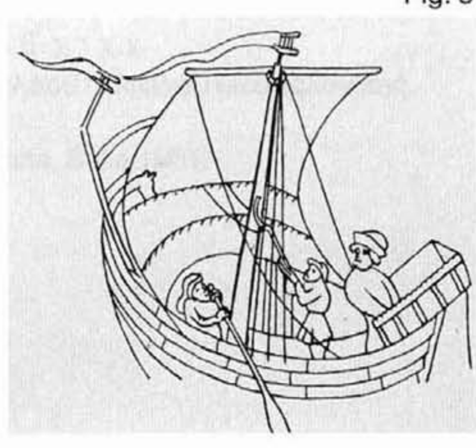


Fig. 5



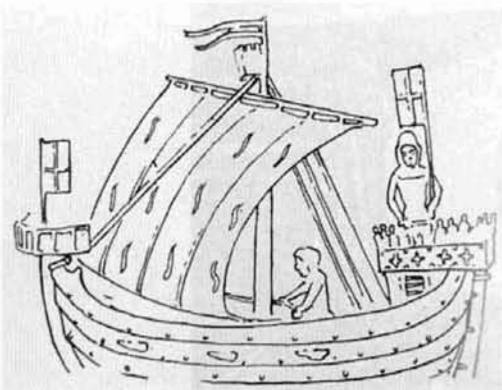


Fig. 6

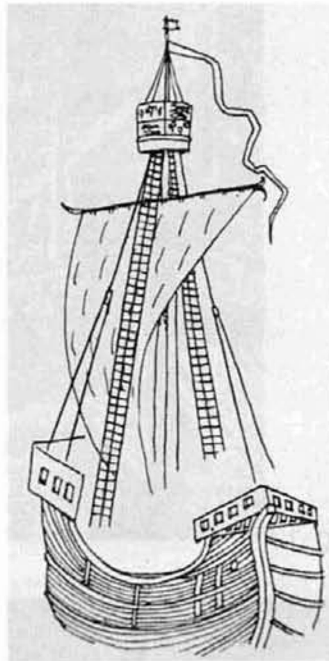


Fig. 7

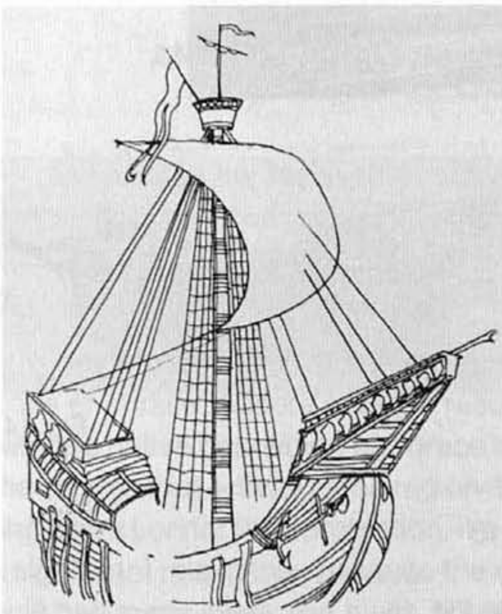


Fig. 8

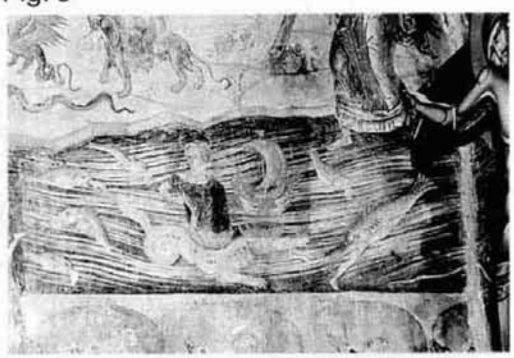


Fig. 9

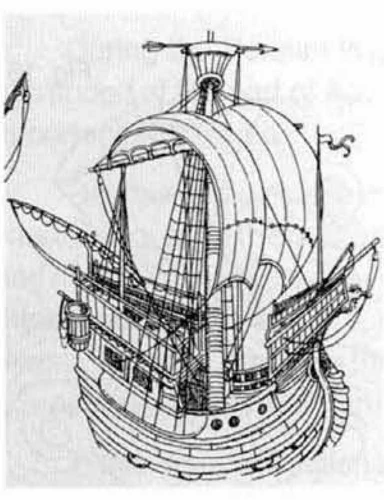


Fig. 10

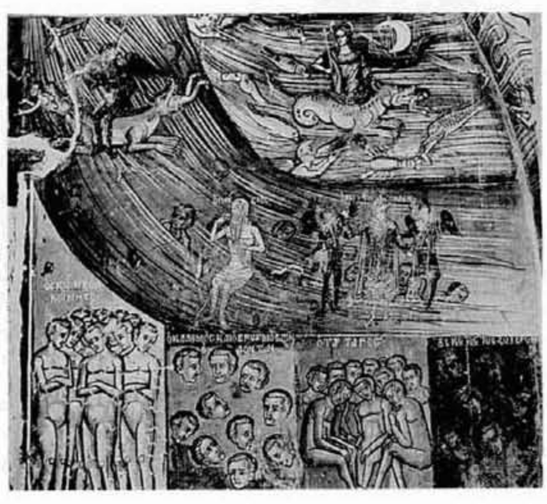


Fig. 11

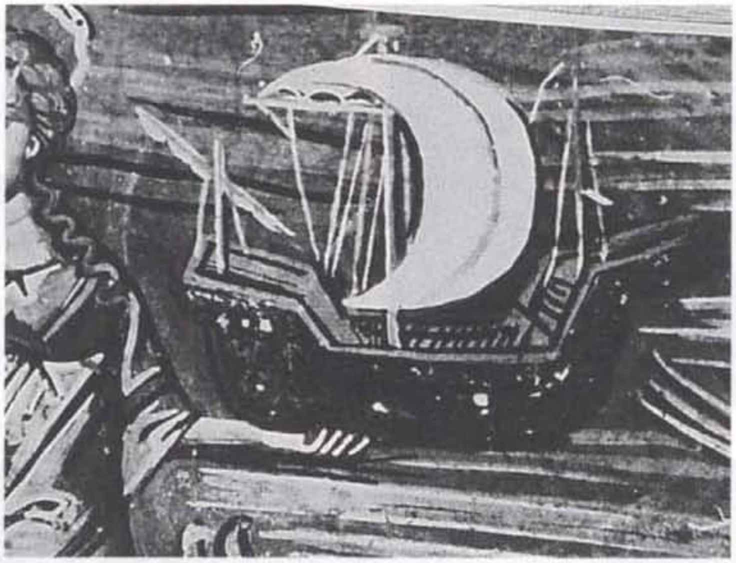


Fig. 12


Fig. 13

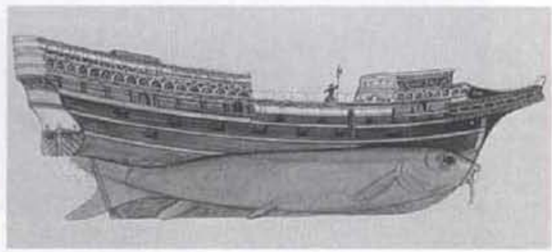


Fig. 14


Fig. 15

Fig. 16


ANCIENT PORTS OF ABDERA IN AEGEAN THRACE

As early as the 7th and 6th centuries BC, the colonists of Thrace created their towns either on slopes close to natural ports either artificially or naturally fortified. Thus between the river Nestos and Evros were founded Abdera[1] and other cities like Dikaia, Maroneia, Orthagoreia, Mesembria, Zoni, Drys and Sali (Fig. 1).

Abdera with Maroneia and Ainos were among the most secure and richest cities of Thrace. Abdera's wealth resulted largely from her commercial relations with the native population of Thrace and with the rest of the world. To increase the commercial activity of the region it was necessary to create a fleet of vessels and also a port for their protection. It's clear that Abdera's coastal location played a significant role in this, because the natural promontory on which the town was built had many inlets and bays. These could be used as harbours for anchored ships.

During the Persian War, Herodotus mentions that the Thracian fleet was surrended at the port of Abdera,a fact that implies this port was one of the most important at the area.[2]

Geomorphological research has proved that the shore line in ancient times was to be found to the north and east of the present line formed by the river Nestos and that the sea frequently invaded the ancient city at the point, where today we think that the colonists first settled.[3] In this area today there is an uncultivated marsh, which is probably the original site of the first port. Present sea level is obviously very different from the ancient one.

In this area,[4] a section of the Northern fortified enclosure,two consecutive constructions of the wall are located.[5] Somenone can see the archaic wall which runs from East towards West in a similar fashion but not exactly parallel to later the wall.

The port was bounded and protected from the north by this particular strech of the wall,[6] which led down to the sea. The presence of the sea[7] here can be shown by the rounded sherds and by the thick layers of sea sand which contains shells, and above all by the layer of rough stones at the level of the foundations, which seem to have started at sea level.

The section that is directed westwards, stops and forms an isolated widerning[8] where it meets the sea. Either this was to combat the waves or to be used as a base for a fort, which would have acted as an observation point for the port.

The case for the presence of the archaic port in this position is substantiated by the discovery of a shipshed,[9] which is constructed at the end of the sixth or at the beginnings of the fifth century, because its layer of destruction contained pottery, mainly pieces of amphoras to the last half of the fifth century BC. It can be considered as one of the older known shipsheds.

This building had a roof of coloured (black or red) clay tiles which fell at the destruction layer. A colonnade was found at the east part of the north side of the shipshed. It was formed by square blocks of poros[10] (as bases of the columns, that today have disappeared –except one).

A solid wall of regular masonry continued at the west end. The present length is at least 30m and the inclination 10°. South of it was found the western part of the enclosure wall, which runs North to South and forms the sea wall[11] that follows the ancient shore line and marks the limits of the sea in the 5th and 4th century BC, when the archaic wall was destroyed possibly by flood and thus abandoned.

A strong wall that was discovered about two hundred meters south of the shipshed, in an excavationof 1965 carried out by Lazaridis,[12] is made up of large granite boulders. This wall seems to have been used as a quay, which might have been connected with the presence on the slope beyond the buildings what with some reservations have been interpreted as a series of shops. The building phases date back to the 5th and 4th century BC.[13]

Further south in the area of the small modern port of the community of Abdera, below the naturally strong hill, there was an artificial port which protected ships from eastern and southern winds (Fig. 2).

The breakwater even though destroyed has preserved up to a point its original shape and perhaps its size (fig.3). The western limit of the port was probably further West and North in the region where today there are alluvia. Its length is approximatelly 180 m. and it runs from East to West.

Underwater excavation on the mole identified two building phases (A, B, Fig. 4). Both of them recognized on the north face of the breakwater, built of enormous granite boulders roughly worked; the older may date to the classical times. It is almost certain that this was used until the Byzantine period with some additional repairs. Two horse-shoe shaped towers meet the southern side of the mole, where it turns to the North at this point.

A third harbor was located at the eastern bay, in the area of Agios Giannis. Here the town's eastern fortification wall runs towards the seashore and forms a semicircular tower, 6 m. in diametre. Of this tower two building phases are also preserved; all the ashlar blocks have collapsed towards the East and South side, possibly from an earthquake. Various axe-shaped tenons (joints) and more architectural details can be seen on the tower stones (Fig. 5).

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NOTES

1. Δ. Λαζαρίδης, Άβδηρα και Δίκαια, *ΑΕΠ*, 1971 και Χ. Κουκούλη, *ΠΑΕ* 1982, 1983,1984, 1987, 1988, 1989, 1990, 1991, 1992.
2. Ηρόδοτος, 6.46.7.
3. Χ. Κουκούλη-Χρυσανθάκη, ΑΕΜΘ, 1987, 409.
4. This excavation belongs to the Archaeological Society of Athens under the direction of Ms. Koukouli-Chrysanthaki.
5. *Έργον* 1989, 101 και *Έργον* 1990, 98-100, εικ. 137.
6. Χ. Κουκούλη, *ΠΑΕ* 1991, σελ. 196, πίν. 119.
7. *Έργον*, 1990, 101.
8. *Έργον*, 1990, 101, εικ. 139.
9. Χ. Κουκούλη, *ΠΑΕ*, 1991, 193-195 και *ΠΑΕ* 1992, 162.
10. *ΠΑΕ* 1992, πίν. 66α, β.
11. Χ. Κουκούλη, *ΠΑΕ*, 1991, 195 πίν. 120 α,β.
12. Δ. Λαζαρίδης, *ΑΔ* 20Β, 1965, 459, πίν. 559.
13. Χ. Κουκούλη-Χ. Σαμίου, *ΠΑΕ* 1989, 226 και *Έργον* 1989, 103.

ILLUSTRATIONS

Fig. 1


Fig. 2

Fig. 3

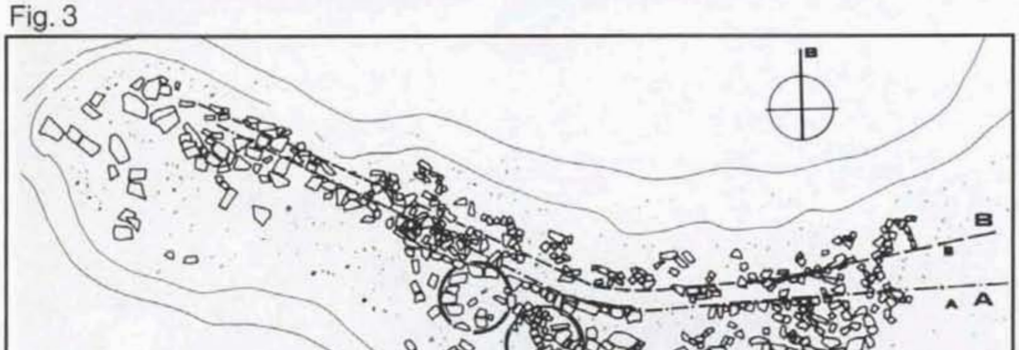

Fig. 4

Fig. 5

A PROPOSAL FOR BRONZE AGE AEGEAN SHIP-SHEDS IN CRETE

The site of Kommos in south-central Crete (fig. 1) has been under archaeological investigation for some 17 years since excavation started in 1976. The American School of Classical Studies at Athens, the Greek Antiquities Service, the University of Toronto and the Royal Ontario Museum are institutions under the auspices of which the work has been carried out[1].

Excavations revealed a Minoan town spread out on a hillside along the shore of the Western Mesara Plain (figs. 1-2). During the Bronze Age it was inhabited from chiefly c. 1900 B.C. to 1250 B.C., that is from Middle Minoan IB through Late Minoan IIIB[2].

South of the area with the houses[3] lies a complex of huge Minoan civic buildings faced by ashlar masonry and orthostate blocks (fig. 3)[4]. The plan of the largest building, which is of Late Minoan I date, has an enormous court surrounded by rooms of various types, indicating that the building was of palatial style. Subsequently, in Late Minoan IIIA2 (during the period 1420/1380 - 1360/1325 B.C.), another structure was built upon its eastern wing. We have called this Building P (fig. 4), and it is on this that we focus on here. Although its plan, to be described, can be compared with plans of other Minoan buildings, its proportions and size are so far unparalleled. As was argued in the past[5], P may have served, at least in part, for the storage of ships during the non-sailing months in the winter. The closest parallels for plan and scale are, interestingly, ship-sheds of the Greco-Roman period. Those, however, were set directly next to the water and used for the storage of warships, especially triremes.

Building P was almost square, about 38.51 m east-west by 39.60 m north-south. The largest LM III building now known, it was of one story only and consisted of at least six broad, roofed galleries facing an open space to the west with no further structure between it and the shoreline[6]. The galleries are usually about 5.60m in width, although the sixth, the last one on the south, is about 5.20 m wide[7]. While open and without doors on the west, the galleries were completely closed at the back, to the east, by a massive monumental ashlar facade with orthostates forming the lower courses (fig. 6). The orthostate facade was of LM I date and was re-used. The long east-west gallery walls were built of masonry stabilized by a massive wooden framework of horizontal, vertical, and perhaps also transverse timbers joined together, as indicated by now empty gaps or chases in the walls. To judge from the masonry found fallen into Gallery 3 (fig. 7), the rooms were at least four meters high. Gallery 3, the only one completely excavated by us, had an earthen floor, blackened in places by burning, with a scattering of cooking wares as well as many fragments of short-necked amphoras which represent the latest use before abandonment. In the southeastern corner was a hearth, and along the southern wall were two ovens of clay, much larger than some of the same phase found in the Minoan houses[8].

Putting aside the matter of the huge scale temporarily, we must note that Minoan storage magazines provide the closest parallel for the plan of the successive, parallel galleries. Typically, these are long, narrow rooms set side by side and usually approached from a corridor that runs at right angles to them. Good examples exist in the Minoan palaces at Knossos and Phaistos (fig. 8)[9]. Those in the West Wing at Knossos are long and narrow and were intended for the storage of large jars or pithoi perhaps containing foodstuffs, in particular oil[10]. When it comes to size, however, those magazines are much smaller than the galleries of Building P. The larger ones at Knossos, for instance, are about two meters wide and nineteen meters long. Such a crucial difference in size is likely to be missed when one compares published plans, which are reproduced at various scales, rather than the buildings themselves.

A closer parallel for Building P is to be found at Nirou Khani, at Ayioi Theodoroi, where Spyridon Marinatos identified possible Bronze Age Minoan ship-sheds (fig. 9; Marinatos 1926: 146). Excavated into the bedrock of a small peninsula is a large rectangular cutting over 46 m long, consisting of three separate parallel spaces ranging from 4.45 to 5.00 m wide (J. Shaw 1990: 425-426). The two on the north are submerged, being at least 1.80 m deep (bedrock is not visible except on the sides of the cutting) and are partially separated by a partition wall of bedrock a meter wide. The local relative sea level must have been considerably lower then than now since Minoan walls are submerged in the immediate area.

Closer in scale and plan to Building P at Kommos, as noted earlier, are Greco-Roman ship-sheds, like those at Apollonia (fig. 8). As Blackman has described them in his fundamental study of Classical ship-sheds, the average size was 37 meters long (dry length), and somewhat less than 6 meters wide (Blackman 1968: 187-188 and 1987: *passim*). Such a measurement corresponds well with P's Gallery 3 (over 37 meters long and 5.60 meters wide). It was largely on the basis of the dimensions of the classical ship-sheds that the *Olympias*, a life size model of a trireme, was recently built. It is 36.8m long and 5.4m wide, with a height of 3.6 m from keel to canopy deck (Coates 1989: 97), with a ratio of width to length of 1:6.8.

Before the discovery of the famous Fleet Fresco from Thera (fig. 10 for a detail), Marinatos estimated that the larger Late Minoan Aegean ships were thirty meters long (1933: 191-192). The larger ships on the fresco itself he later estimated as 33.75 m. long (1974a: 151)[11]. A ship of this length could well be accommodated within P's galleries or, for that matter, within the possible Minoan slips at Nirou Khani.

It is more difficult to estimate the width, or beam, of the large ships in the Theran fresco. The only actual Aegean ship now known is that of the 14th or early 13th century B.C. discovered at Uluburun off the shore of Turkey. The vessel was about 14m long and perhaps 4.5m wide, giving a ratio of width to length of about 1:3.1 (Bass, personal communication, after C. Pulak, of April 1, 1993). On this basis, if the larger Theran ships were over 33 meters in length, they could have been as much as ten meters wide. We know, however, that the Uluburun ship was a merchantman, and like all ships of its kind was made to be broad in order to accommodate cargo. Also, it is reasonable to assume that then, as now, there was a variety of ships that served different purposes. The clearest indication of this is to be found in the Theran fresco where we see small vessels propelled by oars, a ship that may have been a merchantman (the only ship with a sail as well as a possible cargo on deck), as well as the longer ships with their passengers, probably warriors.

Gillmer (1978: 125) conjectured that the longer Theran ships might have had a beam ranging from 3.7m to 4.8m, if they were twenty-four meters long. On the basis of the length suggested by Marinatos (33.75m, above), Gillmer's width range could be proportionately adjusted to 5.20m -6.75m. It is at least possible, therefore, that ships of that length and with medium proportions were set within Building P. These could have been the swiftest Minoan ships, on the analogy of the Greek triremes that were made for speed and that were c. 5.4m wide (as the *Olympias*, above), or less. Better estimates must await further discoveries, hopefully in the form of an actual ship, probably a wreck, in the Aegean. Or again, on the analogy of the slips in the classical ship-sheds, one might discover in Crete buildings with galleries such as those of P with features such as keel marks on the floors, or marine gear such as anchors and tools, that would prove the presence of Aegean Bronze Age ship-sheds, as is being argued here[12].

It is possible, therefore, that the galleries of P could have accommodated very long ships provided that they had the approximate width of the later Greco-Roman triremes. Or, as Maria Shaw proposed earlier (1985: 26), the galleries may have also been designed to contain two or more of the smaller vessels which could have fit easily into the space available. Among the smaller vessels may have been the ships, perhaps warships, shown in the "Shipwreck Scene", also from the fresco in the West House at Thera (Fig. 10; also Doumas 1992: Pl.26).

One apparent problem with the theory of ship-sheds being proposed is that Building P was set back from the shoreline, unlike the classical Greek ship-sheds that were set with sloping access ramps actually leading down below water level. At this point, however, the analogy between the Aegean Bronze Age and Greco-Roman situations no longer applies, for most Aegean Bronze Age harbors are set on relatively open shorelines (e.g. at Kato Zakros in Crete, exposed to an east wind), on either side of a peninsula (e.g. at Hagia Irini on the island of Kea), or leeward of a small offshore island which would partially break the force of the waves (e.g. at Amnisos or Kommos in Crete)[13]. Greco-Roman harbors, on the other hand, such as those at Piraeus, were usually set in small bays, sheltered from the waves, bays that could be narrowed further by piers built out into the water. The result was that the ships and other facilities would be protected from enemy incursions. Also, structures such as quays, storehouses, and ship-sheds could be built at the actual shoreline and would not be endangered by wave action[14].

As to the question of whether weight would present a problem in hauling ships some 150m or so up from the shore, we only have to turn to the transportation of extremely heavy building blocks in architecture, of which we have actual examples. At Kommos itself, the largest orthostate block in the north facade of J/T weighs about 3,150 lbs. At Phaistos the largest block is about 9,850 lbs[15]. In the Treasury of Atreus at Mycenae, the estimated weight of the lintel blocks is some 100 tons[16].

The point here is that while Greco-Roman harbor installations could be built right next to the water or, in the case of the ship-sheds, actually *into* the water, many Bronze Age Aegean installations such as houses, warehouses, or possible ship-sheds, were built sufficiently back from open shorelines so as not to be destroyed by the waves during stormy weather[17]. At Kommos, for instance, the winter waves can now reach some 20-30 meters up on the shore, a vertical distance of some 2-3 meters. Buildings could be constructed, therefore, only inland (east) of that point. On the other hand, protected shores might still be the locations of Aegean ship-sheds, if Maria Shaw's identification of a building with successive, high-celinged rooms shown in the miniature fresco from the West House as a shipshed is correct (Fig. 10, upper left; M.C. Shaw 1985: 23). Indeed, the rooms in the fresco are very similar to the way Building P would have appeared when seen from the west, from the sea (Fig. 5)[18].

As discussed in more detail elsewhere, at Kommos there has been since LM I an increase in local relative sea level of about three meters, and there is evidence to suggest that a substantial part of the change took place between LM IB and LM IIIA2 when Building P was constructed, a period of perhaps seventy years[19]. One of the chief indicators of the time period during which at least some of the change occured is the otherwise unnecessary raising of the floor level within LM I Building J, near the shore, by at least a meter during LM IIIA2 (J. Shaw 1984: 274 n.41; for the date see also J. Shaw and M. Shaw 1993: 187). It was probably after LM I and before LM IIIA2 that the western portion of palatial Building T (Building P's predecessor) was largely destroyed by the sea. This made it possible later for P's galleries, when they were built, to be accessible directly from the seashore without any intervening construction, for there was no further construction there during LM III.

As postulated by Gifford, local relative sea level in the Kommos area continued to rise until it reached its present level, with P's floor presently at +3.30m - +3.60m.[20] During the time that P was being used, therefore, its floor level was at +5.30m - +6.30m. This meant that the building was not threatened by the waves which would have reached then up to at least c. +4.00m. The distance from the building to the sea was about 130 meters, calculated as the distance from the present shoreline (80 meters) plus the 30 to 50 meters to be added when the shoreline was further out. This might seem a long distance to drag ships gradually on rollers or over oiled skids up the some 5-6 vertical meters of incline to the building, but it would have been possible as long as there were sufficient ropes, skids, props and manpower available[21]. A somewhat analogous scene of bringing ships up from the sea is recorded in the *Iliad* (I. 485-486):

> *But when they had come back to the wide camp of the Achaians they hauled the black ship up on the mainland, high up on the sand, and underneath her they fixed the long props*[22].

In our previous publications we have stressed that Kommos, especially after LM I, was increasingly in contact with areas to the east (Cyprus, the Syro-Palestinian coast, and Egypt), our evidence being the foreign pottery discovered on the site. Much of this pottery has recently been published by L. Vance Watrous in *Kommos* III (1992: 149-184). Commercial relations seem to be evident. There are, however, other aspects of Building P to discuss. As we have seen, smaller merchant craft could have been stored there during the winter, non-sailing months, but the longer, sleeker craft may have been stored there as well. It has been argued (Prytulak 1982; Morgan 1988: 117; Doumas 1992: 48-49) that the relaxed passengers in the longer craft in the Theran fresco were probably warriors and it is likely that the ships could have been used for military action. Also, on the basis of the analogy with the later Greek triremes, made for speed and not for carrying cargo, the military aspects of such ships may have been considered to be primary. Indeed, unless Bronze Age Aegean ship-sheds are to be considered exceptions to the rule, ships houses in special buildings have usually been military. One can cite the Greco-Roman ship-sheds themselves or the later Venetian *arsenali* (Papadopoulos (ed.) 1972: Pl. 235 (those at Channia)), covered Royal Navy yards (Coad 1983: 42) or, for that matter, Nazi submarine pens. Would the Minoans of south central Crete have initiated a building as large as Building P for purely commercial reasons? Perhaps, but the effort made may have been more closely connected with military expeditions and/or the defence of the southern coast of Crete.

That security at Kommos was a concern is reflected in the architecture of both the LM I and the LM III Buildings J/T and P. In the case of J/T, only one doorway has been identified in the north facade, which is some 40 meters long and built so solidly as to make it practically impregnable. The entire east facade (Fig. 6) was doorless and similarly built. Both these facades prevented entrance into Building P, leaving the west and south as the only other points of access. On the west, naturally, lay the seashore, while the south area may have been protected by the slope leading up to Building P. Perhaps Kommos repeats what seems to be a pattern of Aegean coastal towns, which although not completely surrounded by a wall, such as at Kea (J. Shaw 1990: 422 [Fig. 2], could have been protected by walls that were simultaneously parts of buildings. Such might be the function of the blue wall in the arrival town in the Fleet Fresco from Thera, which had only one doorway (M. Shaw 1986: Fig. 1 and Pl. 3a); or in the town in the Master impression from Chania which clearly had a fortification wall pierced by two tall and impressive doorways at the two ends (Hallager 1985: Fig. 11); and, finally, the coastal town seen in the rhyton from Mycenae, which has a solid wall on the waterfront and two doorways[23]. The walls discussed were defensible, even if they cannot be called, strictly speaking, "fortification" walls, since some were marked by windows.

At Kommos itself we have now examined the area adjacent to the hillside, but the largely unexplored area to the southwest might well have contained in LM III other installations connected with seafaring, for instance warehouses for trade materials, or buildings for housing ships' gear. Such areas along the shore, including parts of the large space west of Building P, might have been used for ship building, outdoor storage for ships, etc24. It is also possible that during LM I, before part of the shore-side buildings were destroyed by the sea, a functional predecessor to P existed where now there is only sand and consolidated beachrock. Perhaps such a building has a plan similar to that of P, with P being a later version of a known type. It is also reasonable to argue that since Kommos was not the only harbor town of Crete or, for that matter, of the Aegean, that in the future similar structures might be discovered at Amnisos or Katsamba (the harbor towns of Knossos), or at Chania, Malia, Palaikastro, Kato Zakros, or elsewhere. On the Mainland of Greece they might appear in the future along the Mycenaean shoreline of the Argolid, or on the shore near Iolkos, or at Phaleron near Athens, or at Gythion near Sparta, or along the ancient shoreline near Pylos.

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NOTES

1. We are also especially grateful to the Social Science and Research Council of Canada and the Institute for Aegean Prehistory for their invaluable financial support. A number of preliminary excavation reports have appeared over the years in *Hesperia*. The latest (1993) under the joint authorship of Joseph and Maria Shaw provides references to earlier reports.
2. For the pottery see now Betancourt 1990 and Watrous 1992, *passim*).
3. The area will be published as Vol. I, part 2 (in press) in a series being published by Princeton University Press.
4. Above these buildings on the west was built, during Greek times, a rural sanctuary with a long history, beginning C. 1020 B.C. and continuing through early Roman times.
5. The argument was first developed in M. Shaw 1985. See also J. Shaw 1986, 1990, and J. Shaw and M.C. Shaw 1993: 129, 188.

6. During 1993, a pottery kiln was discovered southwest of P's Gallery 6, on an accumulation above the main LMI court. The kiln is LM I date, however, and its upper structure was razed during LM III down to the level planned for P's court.
7. Some time after its construction, Gallery 6 was blocked at its entrance by a north-south retaining wall.
8. A more detailed description of Gallery 3 is in J.W. and M.C. Shaw 1993: 170-177. Hearths and oven are part of a widespread phenomenon during LM III at Kommos, for they appear also in the last phase of houses in the town and south of Building P. A separate study on these hearths discusses the appearance of similar structures on other LM III sites in Crete (M.C. Shaw 1990 *passim*).
9. Identifications and sources for the plans in Fig. 8 are to be found in J. Shaw 1986: 263, and note 95 there.
10. For a discussion of materials possibly stored in Building P, see J. Shaw 1986: 266.
11. By comparison, the ships appear to be smaller than the funerary boat, a millennium older, discovered near the Great Pyramid of Khufu in Egypt. The boat recovered there is 43.4 m long and 5.9 m wide (Jenkins 1980: 108). Of some significance for the main theme in our text is that there were during the Second Millennium B.C. actual storehouses (ship-sheds) for boats in Egypt. The earliest is mentioned in a papyrus in the British Museum (BM 10056, from the time of Tuthmosis III), and concerns Peru-nefer in Lower Egypt where a large sea-going military vessel was stored. A later example (Anastasi IV, 8,4, still New Kingdom) concerns a covered ship-shed for a sacred vessel at Resynu. See Glanville 1933: 37 and Caminos 1954: 159. Here we correct the mistake in J. Shaw 1986: 267 and note 108 there, where only one site is mentioned. We thank Professor Ronald J. Leprohon for bringing this to our attention.
12. Of particular interest is that during 1993 two stone anchors of a composite, perhaps Cypriot, type, were found below the floor of P in an LM IIIA1/LM IIIA2 context, along with sherds of Cypriot, Canaanite, and Egyptian provenience.
13. For Aegean Bronze Age harbors, see J. Shaw 1990: *passim*.
14. For Greco-Roman harbors see J. Shaw 1972: *passim*, and D. Blackman 1982, especially 190-193.
15. For estimates and comparative material see *MAMAT*, p. 44, n.l.
16. Wace 1949: 31.
17. Harbors in the Syro-Palestinian area may have been situated inland near estuaries and marshy areas (Raban 1991: *passim*). In riverine Egypt quays were built along the Nile (Shaw 1990: 429) and large harbors were excavated from the shoreline (Blackman 1982: 92).
18. A building shown near the shore in the miniature painting from Kea might be of the same type as the "shipshed" building from Thera (J. Shaw 1990: Fig. 20), but the painting is fragmentary.
19. J. Gifford in *Kommos I.1* (in press), Chapter 3 and Pl. 3.19 there; J. Shaw 1986: 267 and note 106.
20. There is a slight slope, east down to west, of 0.15 m, from +3.44m down to 3.30m in Gallery 3, the one gallery that has been cleared completely.
21. Concerning the slope, David Blackman (personal communication of June 6 1993) has noted that 5 to 6 meters of vertical distance over 100-200 meters of horizontal distance would produce a nice gradient for ships hauling. 1:20, has notes, is the standard gradient for modern ships; Classical Greek ones tended to be 1:10 or steeper and mechanical aids would have been required. Of some interest is the discovery in Middle Kingdom Mirgissa in the Sudan of a mud-paved road surface over 200 meters long. It had tranverse beams of wood embedded in it, over which ships were drawn in order to avoid different parts of the Second Cataract. The slight gradient was 7: 1000 (Vercoutter 1970: 179, 204).
22. Translation by R. Lattimore, *The Iliad of Homer*, Chicago. 1951.
23. M.C. Shaw 1986: 112. The idea that such walls may be not atypical of coastal towns is discussed in the same article.
24. For a summary of maritime capabilities during the period, as deduced from the Linear B tablets, see Palaima 1991: 308.

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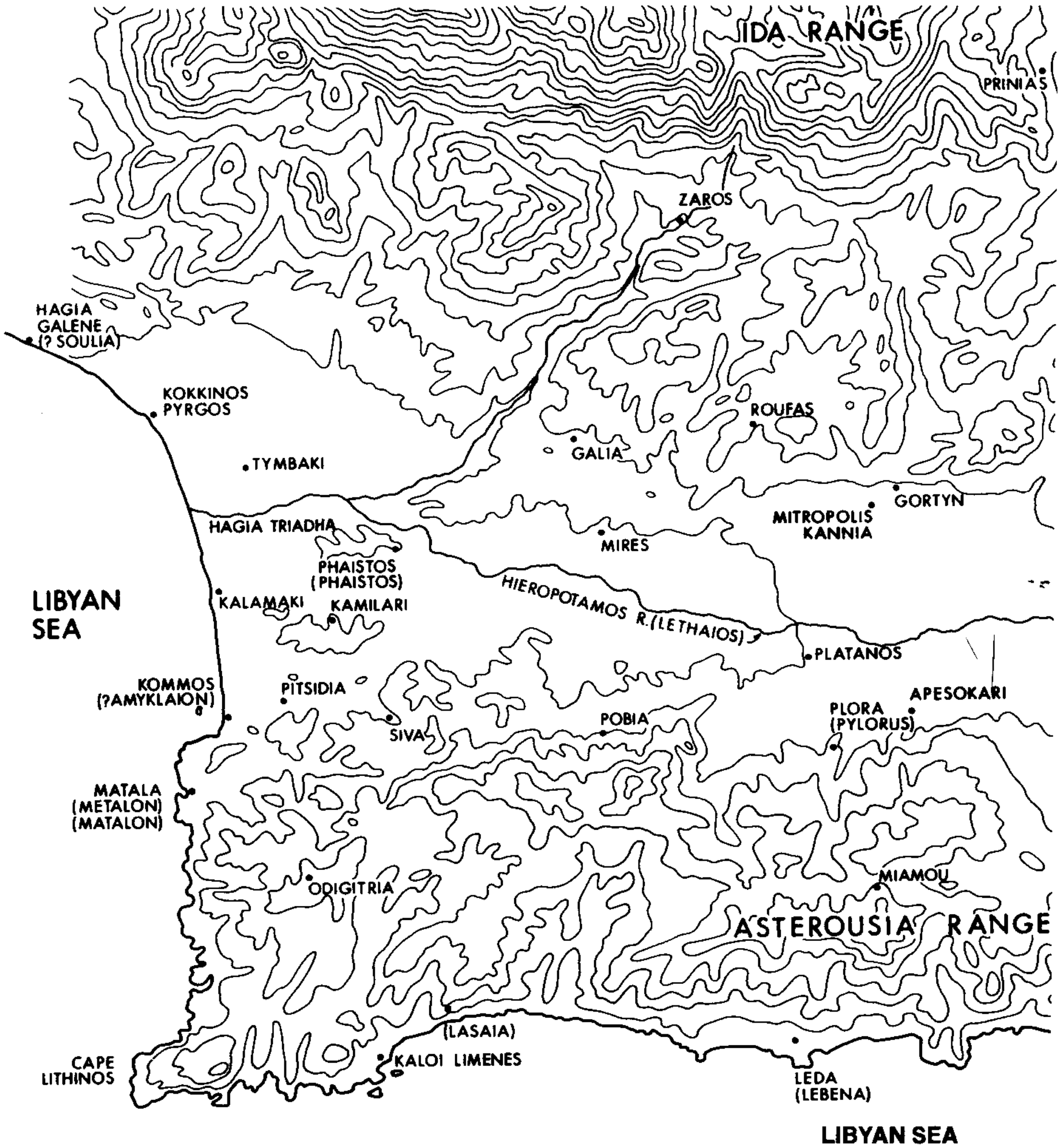

IDA RANGE
PRINIAS
ZAROS
HAGIA
GALENE
(? SOULIA)
KOKKINOS
PYRGOS
TYMBAKI
ROUFAS
GALIA
GORTYN
MITROPOLIS
KANNIA
HAGIA TRIADHA
MIRES
PHAISTOS
(PHAISTOS)
HIEROPOTAMOS R. (LETHAIOS)
LIBYAN
SEA
KALAMAKI
KAMILARI
PLATANOS
KOMMOS
(?AMYKLAION)
PITSIDIA
APESOKARI
PLORA
(PYLORUS)
SIVA
POBIA
MATALA
(METALON)
(MATALON)
ODIGITRIA
MIAMOU
ASTEROUSIA RANGE
(LASAIA)
CAPE
LITHINOS
KALOI LIMENES
LEDA
(LEBENA)
LIBYAN SEA

Fig. 1

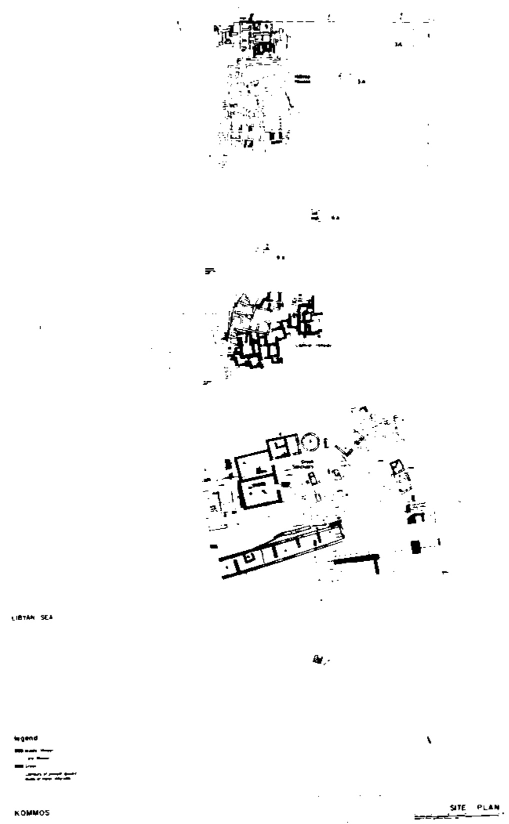
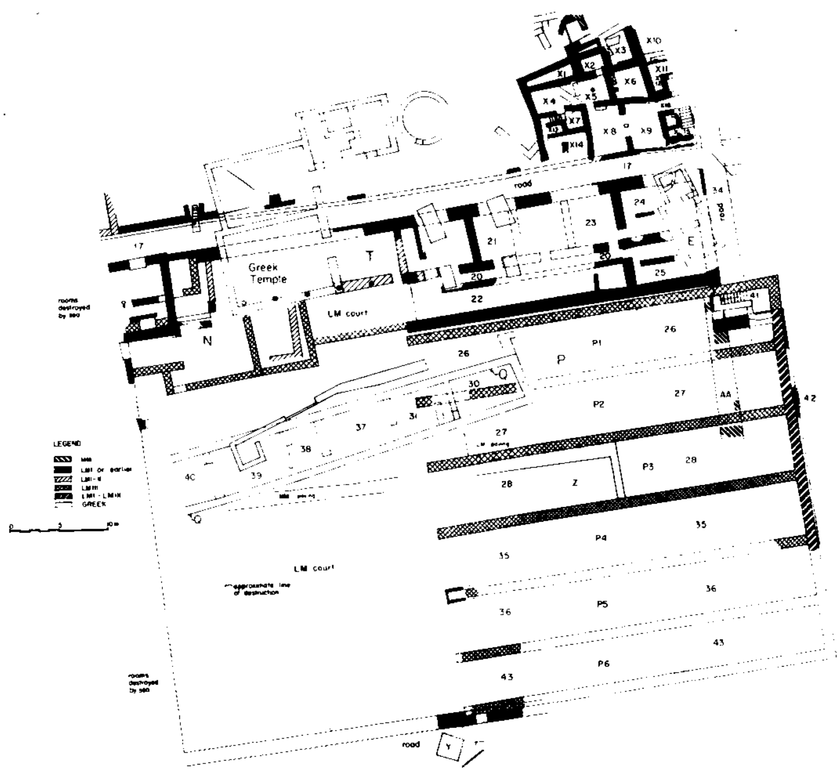

LIBYAN SEA
KOMMOS
SITE PLAN

Fig. 2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Greek Temple
LM court
rooms destroyed by sea
LEGEND
GREEK
LM court
approximate line of destruction
road

Fig. 3

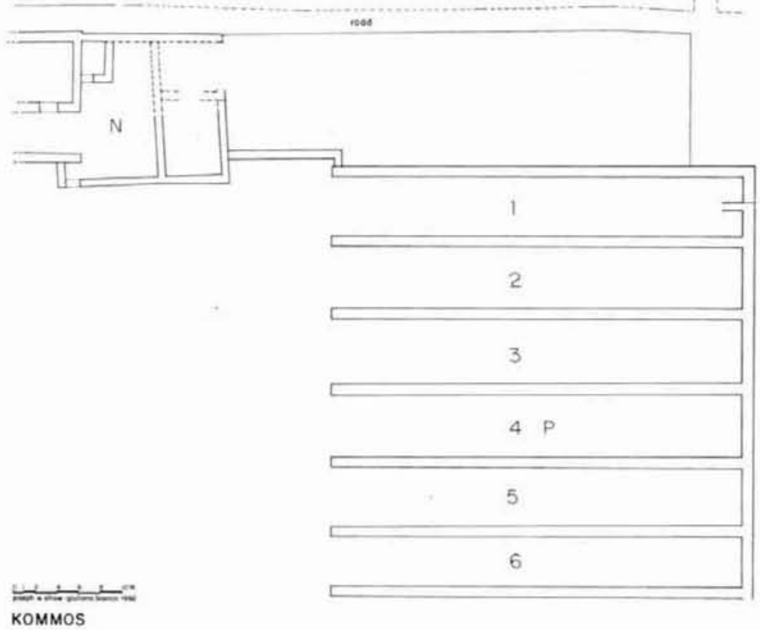

Fig. 4

Fig. 5

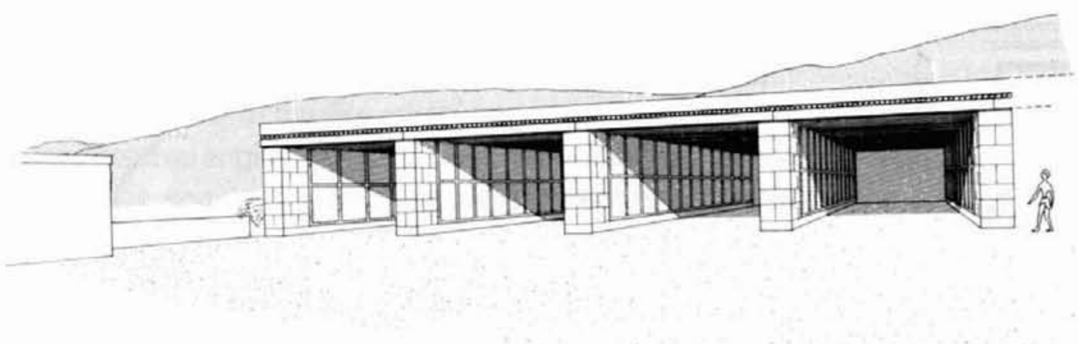

Fig. 6

Fig. 7

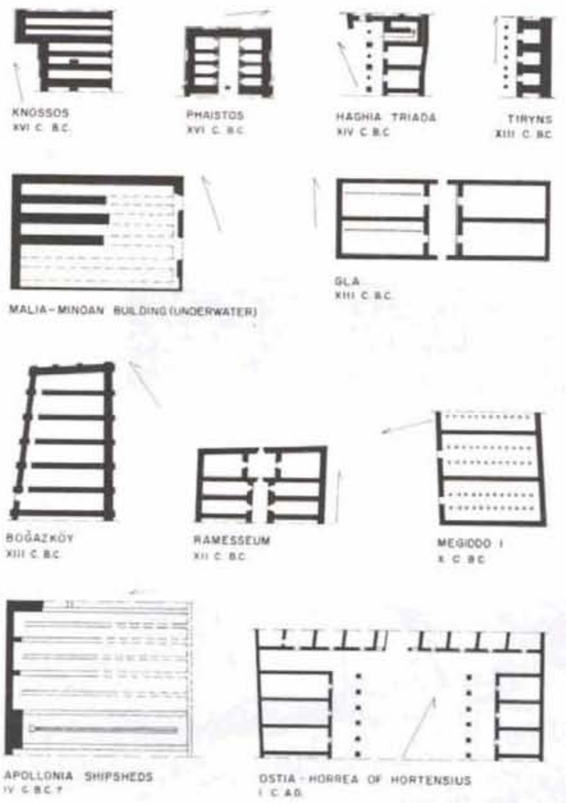

Fig. 8

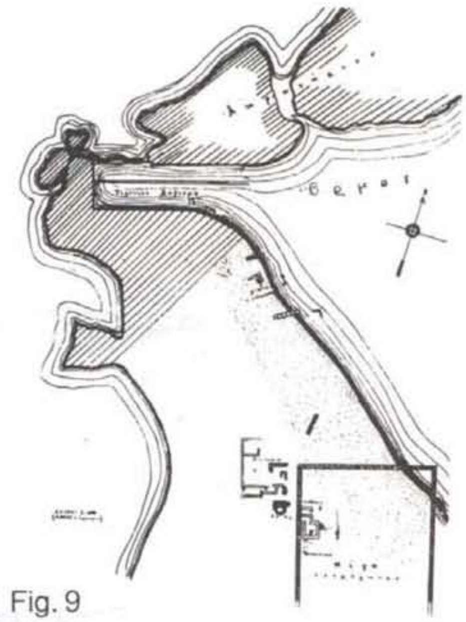

Fig. 9

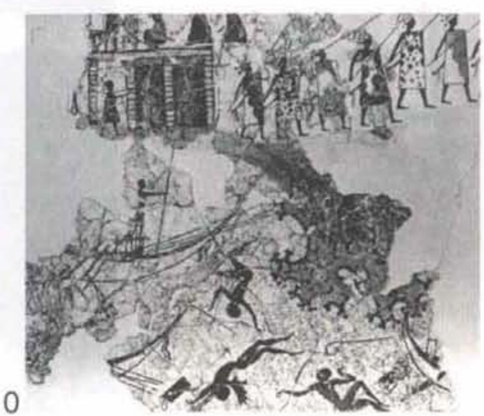

Fig. 10

THE OARAGE OF PHOENICIAN BIREMES

A question of confidence

The Phoenician oared ships of c. 700 BC are known to us because they were depicted in low relief on slabs of limestone in Sennacherib's "Palace without Rival" in Nineveh. These depictions were brought to light by A.H. Layard in 1848, but of the dozen or so of sculpted images of Phoenician oared ships only a fragment of one such ship's depiction still exists, as an exhibit in the British Museum (B.M. 124722). All others seem to have slowly decayed where they had been uncovered, until they were lost entirely. Fortunately, Layard had made sketches -now in the British Museum- of the low relief images, and a number of these drawings were reproduced as engravings in his book "Monuments of Nineveh" (1849). Much later, in 1903-04, some of the now lost low relief representations of ships -already much deteriorated- were photographed by L.W. King (Russell, 1991).

The aim of this communication is to present some conclusions concerning the shape of the hulls of these ships and the seating arrangements for their oarsmen which are based on a close examination of the available iconography. Consequently, the question of the trustworthiness of these pictures of ships is of vital importance for the results of this investigation. Basch (1987), whose work forms the principal basis for the present investigation, was concerned about the same problem. He concluded that the drawings are reasonably reliable, in spite of some departures from the originals due to Layard's tendency to "correct" these, by reducing the number of arms of octopi from nine to eight, or supplying an oar which evidently had not been manned.

That, of course, has no bearing on the question of the reliability of the Assyrian originals. A suggestion that these too merit confidence, is provided by the pictures (Fig. 1) of Assyrian soldiers carrying away statuettes of Phoenician gods (Slabs 1-3, Room LXIV). The latter are all about half the size of the men, which appears to confirm the description by Herodotus (III. 37) of the "Pataïci", images of gods, perhaps related to the Egyptian god Ptah, "which the Phoenicians carried in the prows of their triremes. I will describe it for them who has not seen these figures: it is the likeness of a dwarf". It may be concluded provisionally that these images of Phoenician ships as they have come down to us are at least worthy of serious consideration as primary evidence, but, as Basch remarked earlier and as we shall see further on, occasionally the Assyrian artists followed very peculiar conventions in the representation of reality.

Scrutiny and analysis

The two-banked ships represented in Sennacherib's palace are always seen from the side, which makes it difficult to ascertain what the seating arrangements were for the oarsmen. Salonen (1939) proposed that they were seated side by side, the thalamians under a narrow catwalk over the length of the ship, the zugians in the open in the outrigger shell, a scheme which was worked out somewhat differently by Landström (1961). Basch (1969) presented an alternative, in which the zugians were seated inboard of the thalamians, but at a higher level. In his scheme, all the oars pivoted around working points in the sides of the hull; thus an outrigger was not necessary.

We begin our scrutiny with an examination of the well-known fragment of Slab 11 in Room VIII(w) of Sennacherib's palace (Fig. 2) which is now in the British Museum. The first question, viz. what the level of the deck was on which the soldiers stood, is inspired by the interesting suggestion of Basch (1987) that the lower portion of the bulwarks would in reality have protected the oarsmen, and that the soldiers stood behind the upper portion on a deck between the two. The question of the level of the deck is not easy to answer from the picture itself, because of the peculiar proportions which the Assyrian artists attributed to the human figure. The problem is circumvented by first making a copy of another Assyrian sculpture depicting humans, in this case Aramaic prisoners of war from Slab 10 in Room XXVIII in the palace (B.M. 124956), and subsequently superimposing it on a drawing of the upper structure of the ship (Fig. 3). It may be observed that the parts of these P.O.W.'s above the bulwark correspond closely to those of the soldiers in the ship, and that their feet would have stood on a deck at the level immediately above the heads of the oarsmen. Although there is a certain latitude possible in the relative scale of reproduction of the two sculptures, and therefore of the level of the deck, the finding cannot be reconciled with Basch's suggestion, although it does not invalidate his point about the exposed position of the oarsmen in the reconstitutions of Salonen and Landström.

The second point of investigation concerns the thin horizontal line on the side of the ship depicted in Fig. 2. It appears to have indicated a sharp break in the slope of the side, as when an outrigger had been present. But the unusual working position of the foremost zugian oar would seem to contradict this interpretation. In contrast to all other zugian oars in the ship, this oar did not pivot on the gunwale but in an oarport some distance below it.

The following explanation is based on the assumption of the sides having a considerable amount of tumble-home. At the position of the first oar, the sides of the ship had to turn towards the stem, and so had the gunwale, on which the zugian oars pivoted. On the other hand, there existed a minimum for the distance of the working points of the zugian oars from the centre-line of the ship. If the gunwale was at a distance which was less than this minimum for the position of the foremost zugian oar, that oar might still pivot around a point at that minimum distance on the inward sloping side below the gunwale. The geometry is illustrated in the diagram presented in Fig. 4, in which the minimum distances of the working points of the zugian and thalamian oars are represented by d_{zug} and d_{thal}. This stratagem would have allowed the use of an extra pair of zugian oars. The conclusion is that the unusual oarport of the first oar is indicative of a dividing line on the hull representing the abrupt transition of the side to a pronounced tumble-home, very similar to what is seen in many traditional watercraft in Holland. Tumble-home of the sides is a necessary condition in the explanation. An alternative to it, in which a flaring outrigger is assumed, cannot be made to fit the evidence.

The seating arrangement which gave rise to this peculiar form of the hull is very similar to the one proposed by Basch (1969), with the zugians being seated at a higher level than the thalamians and inward of them. They would have pulled oars which were longer than those of the thalamians, but the length ratio would not have needed to be in excess of the maximum 7 to 6 ratio attested for Renaissance galleys (Anderson, 1962), if the working points of the zugian oars were set back inward relative to those of the thalamian oars. In Fig. 5 it is schematically shown how the resulting seating arrangement might have fitted on board of a bireme of a type which would accord with the side view given in Fig. 2. In the reconstitution it was assumed that the oarsmen sat on long benches in the alongships direction, and that, in order to limit the top-hamper, the deck on which the soldiers stood was as low as possible, i.e. just above the heads of the thalamians. The zugians were seated in a well in the deck; an awning, or perhaps a light deck, might have protected them from the sun and the rain.

But scrutiny of Layard's (1849) engraving of Slab 14 in Room I, which represents oared ships off the Phoenician coast assisting king Luli II's escape from Tyre before Sennacherib's army (Fig. 6), leads to a result which seemingly does not accord with this oarage. In order to discuss this problem methodically, Basch's (1969) system is followed in designating the ships in this picture, i.e. Arabic numerals for the "naval" ships equipped with rams, capital letters for the "civilian" ships.

To begin with, there can be little doubt that ships Nos. 1 and 2 both possessed an outrigger, and not a tumble-home side. For ship No. 1, it is the configuration of the attachment of the outrigger to the stem which cannot be interpreted otherwise. For ship No. 2 the conclusion is based on a detail -see Fig. 6a- showing that the artist presented the position of the hand and the end of the loom as being outside both the outrigger and the main part of the hull. Although the artistic convention of representing the hand handling the oar as being near the thole would nowadays be regarded as highly unrealistic, there can be little doubt of the artist's conception of the upper part of the side of ship No. 2 being a structure outside of the hull proper, i.e. an outrigger.

For the other ships shown in this picture the evidence is not as direct, but nevertheless it should be possible to distinguish "inrigged" oared ships, such as the one depicted in Fig. 2, from "outrigged" ones, by comparing the numbers of zugian and thalamian oars on board of each ship. These numbers will as a rule be different, because the lines close to the centre line of a tapering hull generally turn earlier towards stem and stern than those farther away. The larger the minimum distance of the tholes of a category of oars is from the centre-line of a ship, the greater the number of such oars which can be accommodated. We may expect, therefore, that on board of an inrigged ship the number of oars of the thalamians would exceed that of the zugians, and that in an outrigged ship it would be the other way around.

It is, of course, easy to verify this. The numbers of oars are presented in the accompanying table, as are the numbers of soldiers and women on deck. Added to the data on the ships in Fig. 6 are those of the two other known representations of biremes in which all oars are shown, viz, the one in Fig. 2, and one of a civilian bireme on a fragment of the slab adjacent to that shown in Fig. 6.

It may be noted that for four of the ships the absence of a dividing line on the hull indicates that either it flared outwards or gradually acquired a certain amount of tumble-home above the waterline. The assumption of a flared hull instead of an outrigger would perhaps explain the relatively low number of zugian oars if we would classify the biremes Nos. A and B among those with outriggers, which would make all civilian biremes belong to this class.

Table of numbers of oars, passengers etc. in Phoenician biremes

ship no.	zug.>	thal.	zug.=	thal.	zug.<	thal.	div. line	soldiers + women	hull type
1			4	4			+	4 + 3	o
2	5	4					+	4 + 2	o
3					5	6	-	4 + 0	i
4	5	4					+	4 + 1	o
5					5	6	+	2?+ 0?	i
6			8(+1)	8			+	6?+ 0?	i
A			4	4			-	3 + 3	o?
B			4	4			-	2 + 3	o?
C	5	4					+	3 + 2	o
D	5	4					+	5 + 2	o
E	5	4(-1)					+	4 + 2	o
F	5	4					-	4 + 3	o

Note: No. 6 is the ship from Room VIII (w) in Fig. 2, which was analysed as being inrigged, No. F is a civilian vessel of which the stern is just visible in the lower right-hand corner of Fig. 6, and of which the remaining part was represented on the adjacent slab. The letters "i" and "o" indicate the type of hull, inrigged or outrigged, which is concluded from our analysis. The presence or absence of a dividing line on the hull is indicated by "+" or "-". According to King's photograph, in ship No. E one thalamian oar clearly had not been manned. Layard supplied the missing oar in his drawing.

There would have been depicted then on these slabs, three distinct classes of biremes: 1. naval ships (i.e. equipped with a ram) with outriggers; 2. inrigged naval ships, and 3. outrigged civilian vessels. The oarage of the inrigged naval bireme was already shown schematically in Fig. 5; that of the naval biremes with outriggers is presented in Fig. 7. It may be remarked that for the naval biremes it has been assumed that the deck reached to the sides, both to protect the oarsmen and to allow the soldiers to approach their enemies as closely as possible during a naval fight.

A full-length narrow central catwalk seems out of place in a naval ship, but may well have been present in an outrigged civilian bireme, as schematically shown in Fig. 8. Her deck might have been located at a relatively low level just above the heads of the thalamians, which would explain why the bulwarks of the civilian biremes in Fig. 6 are represented as being lower than those of the naval vessels. The oarsmen in such a ship were seated in a much more exposed position than in her naval counterpart, reflecting the different uses which were made of these ships.

Discussion

The top-hamper for the three classes of biremes as here reconstituted appears to have been very different. If we compare naval and civilian ships, it would seem that the civilian vessels would have been inherently the most stable, and would therefore have carried the smallest amount of ballast, and the largest payload. The ballasting of the warships would have been especially necessary because the situation that all soldiers stood on deck on the same side would have occurred frequently, and even then the ship should have listed only a little to that side. The relatively heavy ballasting of the naval ships allowed them to be equipped with mast and sail. It would have helped too, that the men on deck could be ordered to the luff side. For civilian vessels these possibilities were more remote, which may have been the principal reason why the civilian biremes in Fig. 6 did not carry mast and sail.

There was one bireme among those drawn by Layard (from Slab 12 in Room VIII (w)) which does not fit in our classification; it is shown in Fig. 9. It was a ship fitted with a ram, but which apparently had her bulwarks as low as the civilian biremes in Fig. 6. From the disposition of the oars it would seem probable that the zugian oars were carried on an outrigger. Comparing the ship with the naval vessels shown in Fig. 6, it would seem that if she carried mast and sail, the fore stay would have been visible above the bulwarks, as in the other fighting ships, which is not so. Except for the ram, the ship seems to have possessed all the characteristics of a civilian bireme. Perhaps she was the equivalent of the auxiliary cruiser of our times.

The specific terminology for oarsmen in Phoenician biremes is not known. The terms "zugian" and "thalamian" used here, referred originally to the two lowest banks of oarsmen in Greek triremes. The choice of the terms—alternatively, the names for the two highest banks of oarsmen in the Greek trireme might have been chosen—is based on the idea that the trireme resulted from adding a bank of thranites to the bireme, as held by e.g. Casson (1971), rather than a bank of thalamians, as advocated by Wallinga (1993).

In favour of the latter opinion is the fact that if an outrigger on a ship is shown in Layard's engraving (Fig. 6), both categories of oars are seen to emerge from it, similar to the oars of the two upper banks in the Greek trireme. On the other hand, if we consider how the bireme may have evolved from the monoreme, it seems more probable that that was the result of adding a bank of thalamians to the zugians rather than a bank of thranites.

The odd bireme reconstruction proposed by Salonen and Landström, in which the outer oarsmen would have had a very wet seat in the outrigger shell, is evidently the result of a postulated addition of thranites to the original monoreme. Wallinga (1993) has proposed an improved reconstitution in which the zugians are seated in the hull. The outrigger is supported by timbers on which spray screens are fastened; these are pierced by the thalamian oars. It would seem, however, that the necessary oarports in the screens would have been much larger than indicated in any of the images.

If, on the other hand, the bireme resulted from adding a bank of thalamians -seated at approximately waterline level, with the working points of their oars in the sides- to the bank of zugians in the monoreme, these would have had to shift away from the row of additional oarsmen. That sideways shift would have moved the working points of their oars too, which could have been accomodated by providing either an outrigger (or a flared hull) or tumble-home of the sides, depending on whether the additional thalamians were seated to the inside or the outside of the zugians. In either case, all the oarsmen were seated within the hull, as may be seen in Figs. 5, 7, and 8.

That the outrigger cannot have been a decisive attribute, may be concluded not only from the fact that in three of the eleven biremes depicted on Slabs 14 and 15 in Room I the sides had tumble-home instead, but also from that in three of the others the function of the outrigger was provided by a flared hull.

It may be remarked that the two naval ships numbered 3 and 5 are the only ones on these slabs which pointed towards the shore, and that no women are to be seen on their decks (although this may be an artifact due to damage to the slabs). One could suppose that they were on their way to pick up refugees, but the indication that these naval ships were of exceptional construction compared to the others, viz. with an inrigged hull, suggests a better explanation, viz. that they, as a special class, had been assigned the important task of covering the evacuation of Tyre by the other ships.

The findings on Phoenician biremes have a bearing on the Punic trireme represented by the Erment model of perhaps the 4th century BC, which was fully described by Basch (1987). Its oarage may be derived simply from the reconstituted inrigged Phoenician bireme in Fig. 5, by adding rows of thranites who were seated above the thalamians at deck level. This arrangement is explained more fully in Sleeswyk (1994). Relevant in the present context seems the conclusion that the type of inrigged bireme with a cross-section as presented in Fig. 5, when viewed abeam, would have been indistinguishible from a trireme of the Erment type of which the thranite oars had not been manned. That may frequently have been the case, as Wallinga (1993) has argued.

Acknowledgments

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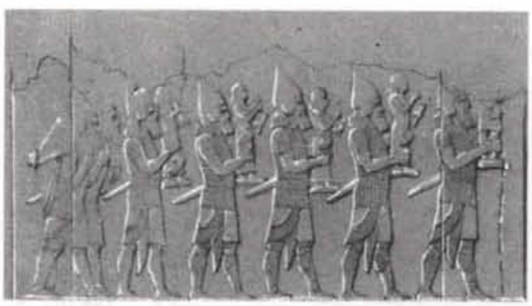
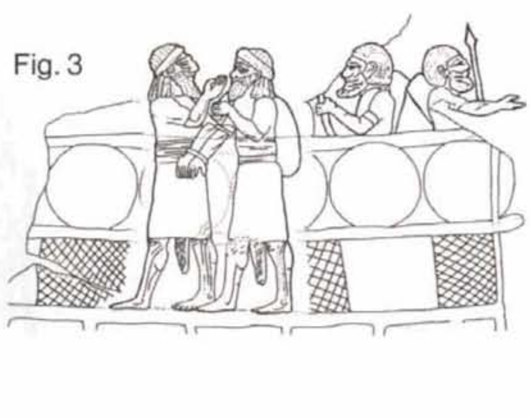


Fig. 1

Fig. 2

Fig. 3



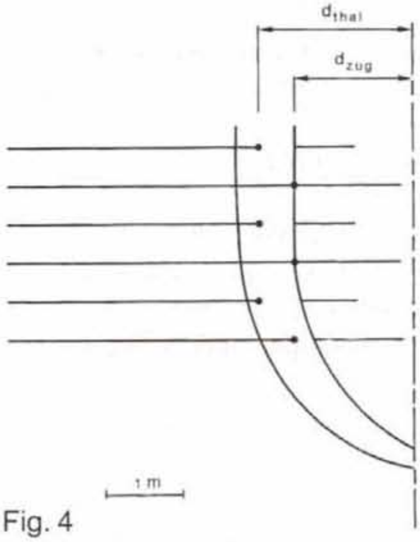


Fig. 4

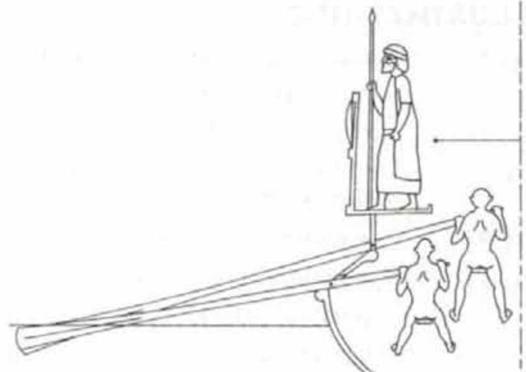


Fig. 5

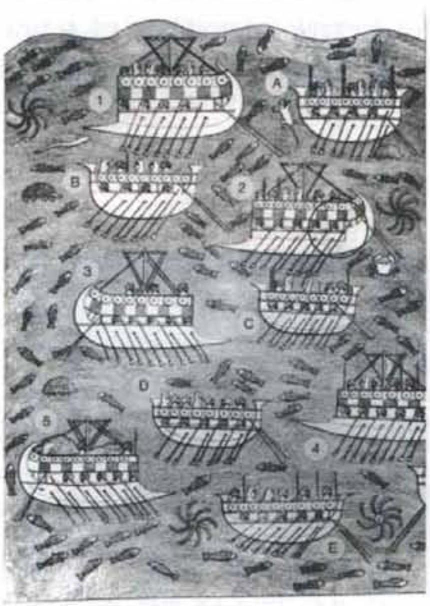


Fig. 6

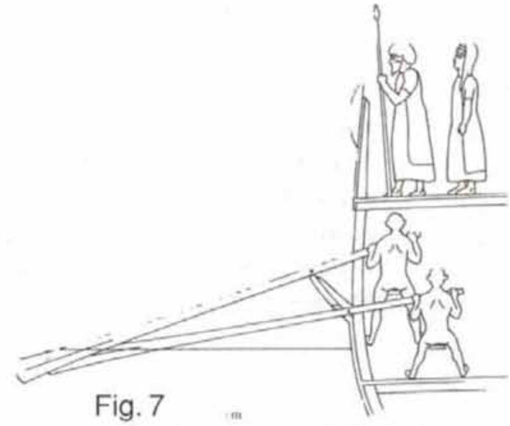


Fig. 7

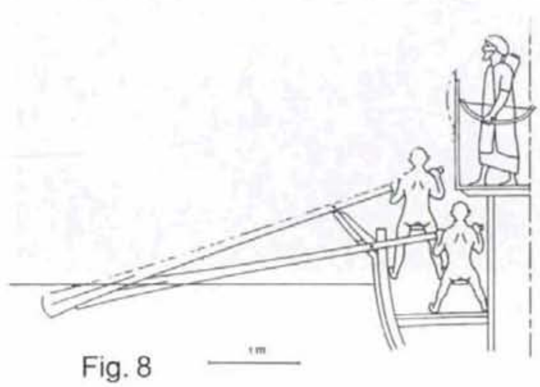


Fig. 8

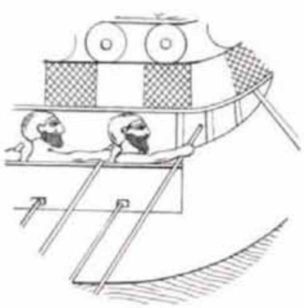


Fig. 6a

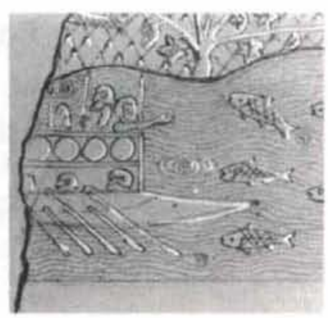


Fig. 9

Η ΝΑΥΤΙΚΗ ΠΑΡΑΔΟΣΗ ΤΩΝ ΑΡΧΑΙΩΝ ΚΕΡΚΥΡΑΙΩΝ ΚΑΙ ΤΟ ΤΕΜΕΝΟΣ ΤΟΥ ΑΛΚΙΝΟΟΥ

Οι Κερκυραίοι, σύμφωνα με τον Θουκυδίδη, θεωρούσαν τον Αλκίνοο και τους Φαίακες προγόνους τους, από τους οποίους κληρονόμησαν τη ναυτική τέχνη. Αφιέρωσαν γι' αυτό ένα από τα δύο λιμάνια της πόλης τους - στο ίδιο όπου πιθανότατα υπήρχε το ναυπηγείο - στον Αλκίνοο, καθώς και ένα τέμενος.

Με την ανακοίνωση αυτή επιχειρούμε να προσεγγίσουμε:

α Την απαρχή, τις όψεις και την εξέλιξη της ναυτικής παράδοσης των Κερκυραίων και

β. Τη σημασία ενός τεμένους για τον Αλκίνοο στο συγκεκριμένο τόπο και στη συγκεκριμένη ιστορική πραγματικότητα.

Κώστας Σουέρεφ
Καθ. Αριστοτελείου Πανεπιστημίου Θεσσαλονίκης

EDITOR'S NOTE

Prof. Costas Soueref made a verbal communication and the above is only an abstract.

ANCIENT SHIP REPAIR

Like watercraft of all periods, ancient ships sometimes collided, ran aground, or suffered the ravages of storms. They fell victim to the various misfortunes of aging wooden hulls such as rot, stress, and shipworm damage. Repairing and rebuilding hulls must have been as demanding an enterprise in antiquity as it is in the modern maritime world. Consequently, this subject is an important part of the analysis of many, if not most, shipwrecks.

Hull repairs can greatly affect the interpretation of a shipwreck. They often represent a variation of the original form of construction. They can reveal alternate solutions to problems and alternate methods of craftsmanship. On occasion, they supply information about the life of the vessel or the experiences of its crew. But repairs are sometimes difficult to recognize, especially in previously unrecorded hull forms; therefore, they pose a threat to the correct reconstruction of a wreck's remains. A few examples of hull repairs are cited below, ranging from simple seepage repairs to a major overhaul. The Kyrenia ship is featured most frequently. It sank late in the fourth century B.C. off the north coast of Cyprus and had undergone a great and interesting variety of repairing and overhauling.[1] It is presently our best example of the many problems that befell ancient merchant ships and the solutions used to overcome them. The Kinneret boat, dating roughly to the beginning of the Christian era, was the recipient of some interesting alterations that may have represented standard practice on the Sea of Galilee at the time.[2] A medieval merchantman that sank about A.D. 1025 at Serçe Limani, Turkey, had planks replaced by more modern and quite different methods than those employed on the Kyrenia ship.[3] These vessels form the basis of our study, although there are occasional references to other ancient hulls.

Keel repairs

The Kyrenia ship had a rockered keel, but this curvature was not originally as pronounced as it was when excavated because the old ship had broken its back at some point in its long life. For unknown reasons, bottom planking seams opened and the keel cracked just aft of the mast step. This was the only ancient separation in the keel, but it was a complete break that had partially washed out in antiquity. The problem was solved by removing the false keel and inserting a wooden block in the bottom of the keel, although it does not appear that much effort had been made to center this insert. The block was only 84.3 cm long and was fastened by three nails as illustrated in Fig. 1. Its 4.8 cm maximum thickness was only about one-fourth the height of the keel; the crack was ignored above the block. The simplicity of this repair and its relative weakness reveals a lot about the role of keels (or at least their perceived role) in shell-built hulls.

After the repair block was inserted, the false keel was reinstalled or, more likely, replaced with a new one. Fig. 1 illustrates a random pattern or square and round pegs in the bottom of the keel that were used to attach false keels. Careful examination of the bottom of the keel led us to the conclusion that the false keel, or portions of it, were replaced at least twice. The extant remains of the false keel revealed it consisted of three pieces of oak (*Quercus cerris L.*) when the ship sank.

Although not necessarily representative of repairs, the use of reworked timbers in hull construction is worthy of mention. One example is in the forward half of the Kinneret boat's keel; apparently it was used previously in a larger vessel or in some form of terrestrial construction. Made from a piece of jujube (*ziziphus spina-christi*), it had the remains of abandoned mortises and tenons in its starboard side. It was joined by a hook scarf to the after half of the keel, which was fashioned from cedar (*Cedrus*). Existing evidence indicates both pieces were part of the original keel of this boat.

Planking repairs

Seams, Patches, and Insets

Whatever caused the Kyrenia ship's keel to crack opened planking seams as well. Strips of lead, underlain with pitch and/or pitch-soaked fabric, were found spanning interior seams and fastened with closely spaced copper tacks (Fig. 2). Most of this parceling was found along the lowest three seams from amidships to the bow. I suspect more of these lead strips were applied to the exterior of the hull as well. They would have been removed when the bow was sheathed in wood and lead (see below).

Lead patches were found in association with the Porticello ship's hull.[4] This vessel, which was at least a half-century older than the Kyrenia ship, was very sparsely preserved. Eight small, rectangular lead patches were among the list of surviving materials. However, these patches were most likely used for scattered points of leakage; the Porticello vessel was not completely sheathed in lead as was the Kyrenia ship.

Where seams rotted or split away, or where alterations required that openings be closed, small wooden insets or pieces of planking (called *graving pieces*) were sometimes inserted. On the Kyrenia ship, a section of the lower edge of strake 12 (the upper wale) apparently broke away when the strake below it was replaced (see below). An intricate wooden patch was inserted to replace the broken section (see Fig. 5). It was held in place by the tenons, tenon pegs, and frames.

On the Herculaneum boat, a 47-cm-long, 7-cm-wide graving piece was inserted into the lower edge of port strake 7 about 70 cm forward of the through-beam (Fig. 3)[5]. A similar inset, but only 32 cm long, was found at the same location on the starboard side. These insets may have been used to close holes that were previously used for a thwart, or other component; the inverted hull did not allow confirmation of interior structure.

Planking Replacement

Several planks and planking strakes were replaced during the lengthy career of the Kyrenia ship. Two methods were used. In the bow, several planking seams on the starboard side and at least one on the port side had decomposed to the extent that at least partial replacement was necessary. In each case, the rotten areas were removed by sawing longitudinally through the strakes on either side of the seam and discarding the material between the cuts (Fig. 4a). Nails were extracted from frames in the areas just exposed. The new strake edges formed by the longitudinal cuts were then tapered so that the distance between inner edges was less than between outer edges (see detail, Fig. 4b). Probably using specially-shaped mortising chisels, shipwrights cut new mortises or extended existing mortises in each of the new standing edges. A new plank was shaped to fit the open area and matching mortises cut into its edges. Along one new seam, mortises were similar to those found elsewhere in the hull. Along the other edge (which edge depended upon hull curvature, strake configuration, etc.), mortise bottoms were met by a rectangular cut in the surface of the new plank (see details, Figs. 4e, f, and g). Rectangular cuttings were always made on the inner planking surfaces except where they coincided with frames, in which case they were cut into exterior surfaces. Standard tenons were next inserted into the standard mortises and the new strake pushed over them until its other seam fitted perfectly (Fig. 4c). Because the new seams flared outward and the tenons were flexible, this was an easy task. Now headed tenons, shaped exactly as the mortises in the unfastened edge, were inserted into the openings and driven home (Fig. 4d). Such tenons are called "patch tenons" because of their distinctive external appearance. The joints were then pegged in the normal manner on each side of the seam; pegs were driven from the interior of the hull except where frames coincided with the joint, in which case they were driven into the exterior plank surface (Figs. 4f and g).

A drill bit could then be inserted into the frame holes where the old nails had been removed and the holes continued through the new planking. New nails were driven from outside and clenched over the frame surfaces as in the original form of construction.

Patch tenons were also found on both sides of the Herculaneum boat. It remains to be determined whether they were used in planking replacement or as part of the original construction. One was found above the seam formed by strakes 3 and 6 on the starboard side, just aft of the bulkhead beneath the steering beam. Three were found in a row at the same location on the port side; they were spaced about 12 cm between centers. Two more were recorded in the port 3/6 seam just forward of the bulkhead (see Fig. 3). They differed from the Kyrenia ship's patch tenons in that the rectangular heads were located externally between the frames.

Side Planking Replacement

The second method of planking renewal was used to replace a complete side strake on the Kyrenia ship. Figure 5 illustrates the method used to replace port strake 11. Evidence suggests this strake had been replaced from stem to stern, since it was configured as illustrated between its limits of survival (forward of the keel/stem scarf to aft of the stern bulkhead).

In this case, it appears the damaged strake was removed so that some or all of the tenons were left projecting from the to top of the main wale.[6] It was an easy process to push the mortises in the bottom of the new strake over them. To secure the upper seam, a rabbet was first cut into the outer surface of the new strake at a distance from the upper seam that was equal to the average mortise depth. Here the mortises were cut so that their bottoms terminated in the rabbet. Thus standard tenons could be pushed upward into the exposed mortises in the rabbet until they were properly seated. Tenons were pegged where possible,[7] frames were renailed as in the bow, and the rabbet was filled with pitch when the task was completed.

In the forward half of the hull, the space between wales was apparently too wide for a single strake. Here a second strake of constant width was placed above the main strake as illustrated in Fig. 5. This double unit was then scarfed diagonally to the single plank in the after part of the hull. The two planks comprising the forward section of strake 11 must have been assembled before they were installed in the hull, since their common seam joints were exactly rectangular. They also were spaced consistently and were in perfect alignment in both directions; in addition, their seam edges were perfectly square. None of these features were recorded elsewhere in the hull, nor would they have been possible without preassembly.

The upper plank of the forward strake held the same sort of rabbet as that found in the after plank and assembly was undoubtedly similar. At the scarf, only the lowest tenons were in place when the forward assembly was installed. The two central tenons were internal patch tenons while the uppermost tenon was inserted through the rabbet.

Repairs on the Galilee

Due to the urgency of its excavation and initial conservation, the Kinneret boat has had only a few hours of preliminary hull study. A thorough analysis of its construction will be possible after conservation is completed about two years hence. Until then, we can only assume that the strange planking patterns we observed were due to repairs or the use of reworked timber. There were signs of seam damage in many areas, some of which were combated by driving staples across the seams to prevent further separation. In at least one instance, a nail was double-clenched across the seam of two inside planks to perform the same task.[8]

At the after end of port strake 4 on the Herculaneum boat, traces of bronze survived in a slight depression to suggest that these were the shafts of a 1.7-cm-wide, 6.7-cm-long staple.

By the medieval period, strake replacement was infinitely easier because of the absence of mortise-and-tenon joints. Fig. 6 shows how several planking runs were altered by the insertion of new planks. These changes were almost certainly required because of damage caused by a combination of teredo infestation and rot.

Frame Alterations

Probable frame replacements or repairs have been reported on several ancient vessels, including renewal of certain floor timbers on the big Madrague de Giens ship.[9]

On the Kinneret boat, several frames looked newer than the others and are assumed to have been replacements. For the most part, the newer frames were nailed to the keel whereas those that appeared older were not fastened centrally. In some cases, futtocks and half-frames were altered or eliminated during these overhauls. However, both original and replacement frames were made from twisted tree branches and did not touch the planking for spans of up to 20 cm.

Several alterations were made to the Kyrenia ship's frames. A floor timber just forward of the keel/stem scarf was replaced during an overhaul of the hull. Unlike the dark worn appearance of all the other floor timbers, frame 52 was still light in color and its chamfered upper edges were hardly worn when it was excavated. It was made differently, too. Original floor timbers had separate chocks fastened to their bottom surfaces over the keel (Fig. 7). The chocks were aligned with mortise-and-tenon joints and fastened with nails. Replacement floor 52 was shaped from a single piece of timber; it was wider than its neighbors and its appearance suggested the work of different carpenters.

Perhaps the need for a larger bilge sump prompted the removal of part of a floor timber just aft of the keel/stem scarf on the Kyrenia ship. This floor timber was sawn through on either side of the keel; the cuts were made above the seams formed by the second and third strakes from the keel. Discolorations of the inner garboard and second strake surfaces revealed that this floor timber once was fabricated just like all the others. So did the plugs that now occupied the abandoned nail holes. These were tapered plugs driven from inside the hull and expanded with small pegs or nail shafts. The sump was not walled or enclosed in any form. This alteration was not especially difficult, since the ship's floor timbers were not attached to the keel and there was no keelson.

A floor timber forward of the sump (and perhaps the one just altered) had rabbets cut into its upper surface to seat the mast step. The mast was stepped between the bilge sump and the crack in the keel when excavated. At some previous time it must have been reversed -i.e., with the step facing aft- and fitted atop the three floor timbers forward of its final location. The surviving unused rabbets were simply abandoned.

Thus the people who repaired the Kyrenia ship's keel and floor timbers made alterations that would have been unacceptable on later vessels whose keels and frames played such a vital role in structural strength. Obviously, ancient shipwrights were more concerned with the integrity of their planking shells.

Ceiling Replacement

Ceiling planking can be the most informative of all hull remains in certain wrecks. It was frequently the recipient of graffiti by stevedores, crews, or builders, as the Greek letters in the Kyrenia ship's hold revealed. Such carved or painted letters and numbers were used most frequently to indicate hold areas or ladening sequences. Because of missing dunnage or abuse caused by cargo movement, ceiling planking frequently required replacement. In many cases the use of reworked planks for ceiling renewal was structurally and economically sound. If such planking came from salvaged vessels, interesting information about other forms of shipbuilding might be available as was the case with some of the Kyrenia ship's ceiling planks.

Directly over the keel centerline, where keelsons would be placed in later periods, short planks (called limber boards) lay athwartship. They were unfastened and were laid in rabbeted longitudinal timbers so that they could be readily removed for access to the limber holes in the floor timbers. All were secondhand planks, most or all of them coming from the exterior planking of at least two smaller vessels. Two examples are shown in Fig. 8. The first represents the seam of a vessel whose two extant frames were spaced 25 cm between centers. The upper plank was 12 cm wide between its two finished edges. Mortises were spaced approximately 16 cm between centers and appear to have been about 7 to 8 cm deep and 4.5 cm wide. The second limber board represents a hull whose joints were larger and spaced much more closely together.

The starboard ceiling planking of the Kyrenia ship was sparsely preserved, but what did survive was made of reclaimed hull planking. Some of it came from a still smaller hull whose edges were aligned with treenails rather than mortise-and-tenon joints.

Sheathing and Caulking

Kyrenia Wood Sheathing

The bow of the Kyrenia ship must have been a constant and expensive problem to its owner. Strakes and frames rotted, seams leaked frequently, and eventually the whole area required a major overhaul. This was when floor timber 52 was replaced and many of the seams were patched internally with lead. But these old, teredo-riddled planks probably needed stability as well as waterproofing. Consequently, the ancient ship carpenters solved the problem in a way that was surprisingly similar to the methods used by colonial American shipwrights —they sheathed the bow with deals (thin planks) of pine.[10] Widths of the deals varied (see

Fig. 9) but all were 1.1 cm thick. Note that they were laid approximately parallel to the sweep of the stem, so that they crossed the bow strakes diagonally. They were fastened to frames and planking simultaneously with copper nails averaging 10 cm in lenght with shafts of 7 mm diameter. Most of these nails were driven alongside original planking nails. Thus the nails were certain to enter frames while the proximity to projecting planking nail heads prevented the sheathing surface from becoming uneven. Some form of caulking material had been spread between the sheathing and planking, but most of it had disappeared and what traces survived could not be analyzed.

Lead Sheathing

Most lead-covered ancient hulls excavated in the Mediterranean were so sheathed when built, but the Kyrenia ship's lead sheathing represented the final major repair to the vessel. We know this because the tack patterns in original hull strakes were identical to those found in new strakes installed just before the lead sheets were applied. No changes had been made to the lead or the hull beneath it after the lead sheathing was applied. By now the entire hull was worm-eaten and leaky and a complete recaulking was necessary. Rotten strakes requiring replacement were inserted by using the described above. Where wood sheathing had to be removed to istall new planks, its edges and ends were feathered to provide a smooth transitional surface for the lead covering to follow.[11] Next a mixture of simply-woven agave leaves and red-brown resinous pitch was spread over nail heads. It was pressed into all openings and spread over the exposed upper and lower wale surfaces. Then large sheets of 1 mm thick lead -1.23 m wide and as much as 2m long within the preserved areas- were applied in the pattern shown in fig. 10.[12] They were held in place by copper tacks with shaft diameters of 5 mm and shaft lengths varying from 1.5 to 2.5 cm. Tack heads were 2 cm in diameter. Lead sheets passed between the keel and false keel. Throughout the hull, these sheets were laid so that they overlapped the ones immediately below or aft of them. The installation is not unlike the application of copper sheathing to sailing ships of the last two centuries.

Conclusions

Many other instances of additions and improvements to existing hulls have been published. Lead patches were fairly common, especially internally. Sometimes several layers of caulking were present, or there was a difference in caulking materials. Such was the case with the Kyrenia ship, which had heavily matted material beneath the sheathing and applications of pitches of different colors.

The Serçe Limani hull appeared to have had a second application of pitch, at least on some areas, and it consisted of a mixture of black pitch and grass. It was applied so generously that where wales protruded, it filled the corners formed by them and regular planking.

One cannot always distinguish remains from original construction. For instance, charred areas on the inside of the Kyrenia ship's wales could be the result of a bending process, an attempt to rid the wood of termites, or something not yet determined. However, the easy sweep of the wales within the preserved areas should not have required heat. None of the charred areas were larger than 30 cm in any direction and they were widely and irregularly scattered. Thus it seems more likely they were to used to eradicate termites or eliminate some other wood condition. Since the charring does not appear on the frames, it probably occurred before the hull was completed.

What this paper is attempting to illustrate is that the remains of most ancient ships have far more to reveal than their original construction features. Vessels that sank soon after their launching, such as the Marsala and Ma'agan Michael wrecks, will seldom have undergone repairs in their short life spans. But most ships did not sail very long before repairs were necessary, even if they were not involved in collisions or groundings. While captains attempted to sail in only the best of weather, damage from violent and unexpected storms was always a possibility. And then there was the susceptibility of wood to fall victim to dry rot, teredo, grain movement, stress, and the dozens of other adversities that Mediterranean seafaring was likely to inflict upon it.

Repairs, if properly analyzed, can reveal important information about voyages, economics, and sometimes political factors. In old ships, original construction and repairs may have been accomplished by different generations of shipbuilders, perhaps revealing changes in techniques and technology. Furthermore, comparative studies of ship repairs from different eras may be as important as the comparisons of their hull's original construction features. The investigation of repairs and overhauls is a developing feature of nautical archaeology that might someday contribute appreciably to a better understanding of ancient shipbuilding and ship maintenance.

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NOTES

1. J. R. Steffy, "The Kyrenia Ship: An Interim Report on its Hull Construction", *American Journal of Archaeology* 89.1 (1985): 71-101.
2. J. R. Steffy, "The Boat: A Preliminary Study of its Construction", in S. Wachsmann (ed.), *The Excavation of an Ancient Boat in the Sea of Galilee (Lake Kinneret)*, Atiqot XIX (English Series), Jerusalem, 1990.
3. J. R. Steffy, "The Reconstruction of the 11th-Century Serçe Liman Vessel", *The International Journal of Nautical Archaeology* 11.1 (1982): 13-34.
4. C. J. Eiseman and B. S. Ridgway, *The Porticello Shipwreck*, College Station, Texas, 1987: 11-16.
5. The Herculaneum boat was destroyed by the eruption of Mt. Vesuvius in A.D. 79, I made only a preliminary study of this charred, overturned hull that was about 9 m long. Confirmation of the exact purpose of the insets and patch tenons will have to await publication of the study done after the hull is cleared of pyroclastic material and conservation coverings. See J. R. Steffy. "The Herculaneum Boat: Preliminary Notes on Hull Details", *American Journal of Archaeology* 89.3 (1985): 519-21.
6. This assumption is made because the tenons and pegs behind frames in the top of the main wale (strake 10) do not appear to have been disturbed. Since tenon pegs did not project entirely through the main wales of the Kyrenia ship and no exterior pegs could be found, retention of at least some of the original mortises and tenons in the top of the main wale seems to have been the shipwright's most practical solution.
7. Some of the tenons may not have been pegged where they coincided with frames, although these upper surfaces were so poorly preserved that it was impossible to confirm the absence of external pegs at all frames. Since several of the toptimbers may have been removed for this replanking process, a process which may also have involved strakes higher in the hull, some details remain unconfirmed.
8. For illustrations of the Kinneret boat's staples, clenched seam nails, and unused mortise-and-tenon joints in the side of the keel, see Steffy, "The Boat:" *Atiqot XIX*, Figs. 5.9 and 5.2.
9. P. Pomey, "Le navire romain de la Madrague de Giens", *Comptes Rendus de L'Académie des Inscriptions* (Jan-Mar, 1982): 133:54.
10. For details on the bow sheathing of a merchant ship excavated in New York City, see Jay P. Rosloff, "The Water Street Ship: Preliminary Analysis of an Eighteenth-Century Merchant Ship's Bow", (M.A. thesis, Texas A&M University, 1986).
11. The sequence of repairs and arguments of it are listed in J. R. Steffy, "The Kyrenia Ship", *AJA* 89.1:98 and 99.
12. The lead was very pure; the analysis of five samples taken at various locations produced results ranging from 99.5 to 99.945% Pb.

ILLUSTRATIONS

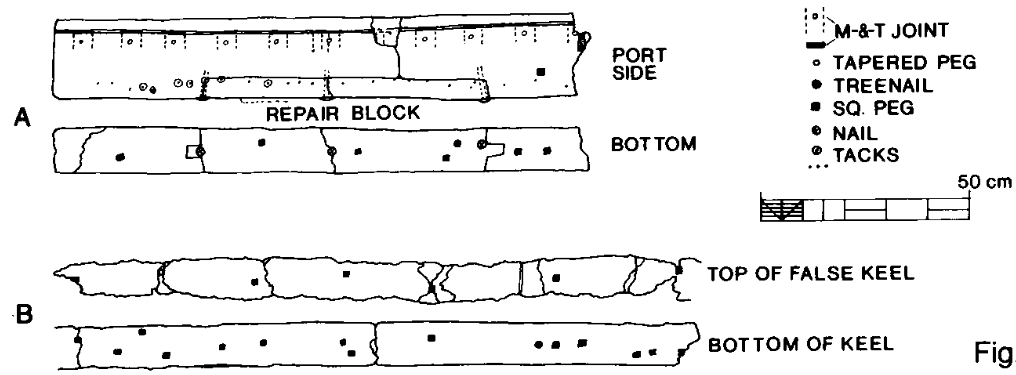


Fig. 1

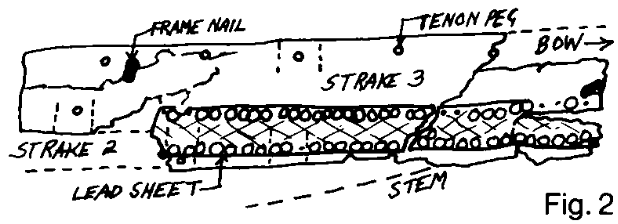


Fig. 2

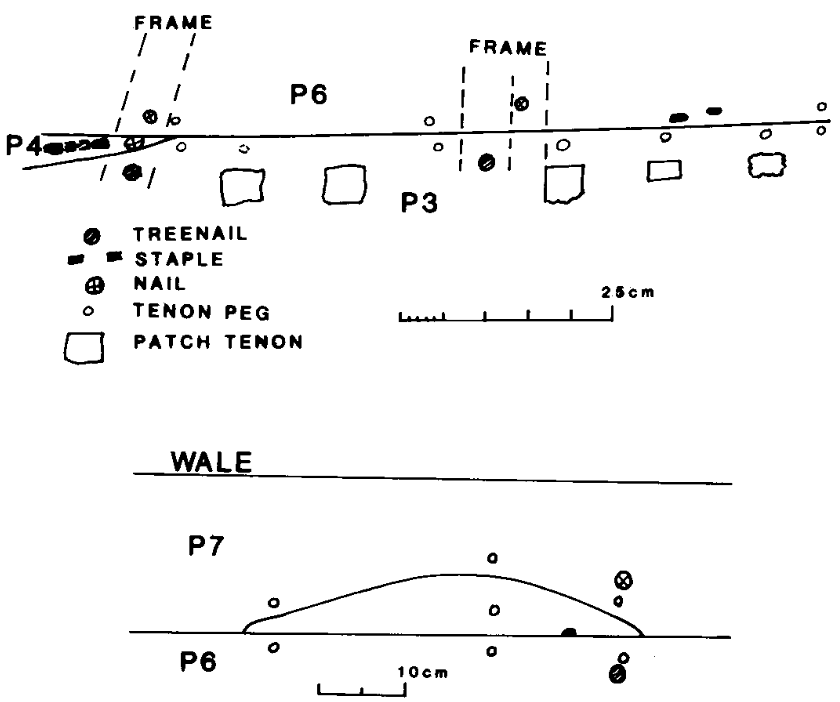


Fig. 3

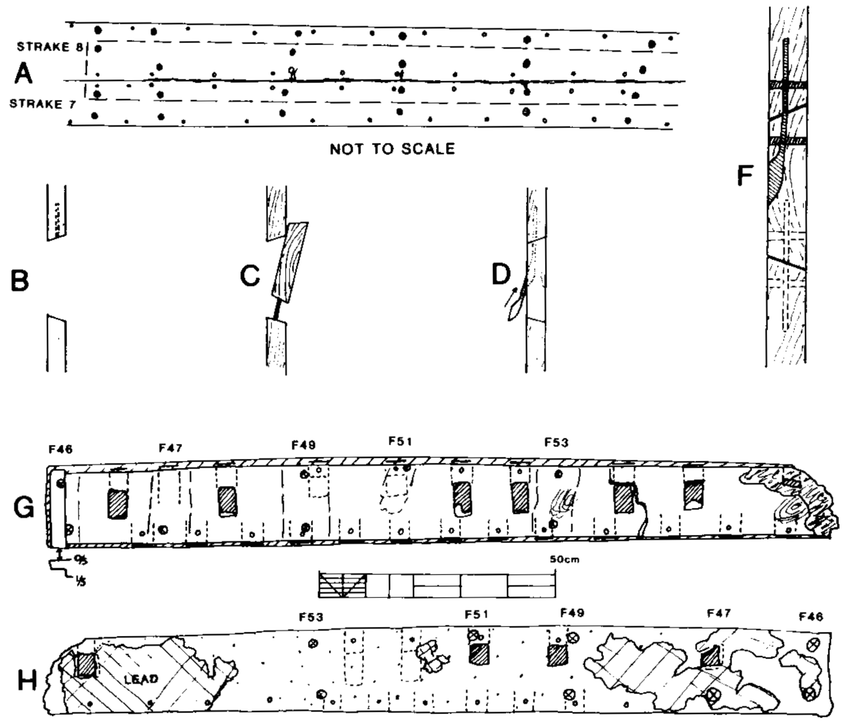


Fig. 4

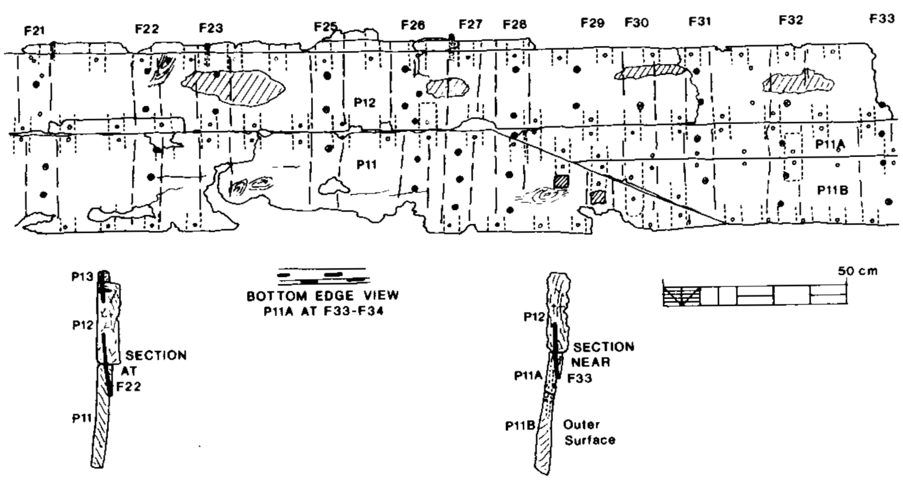


Fig. 5

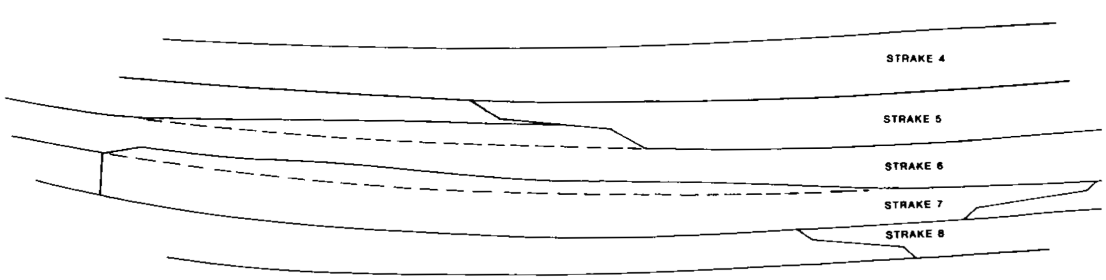


Fig. 6

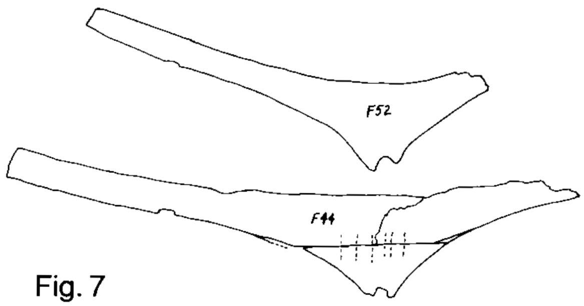
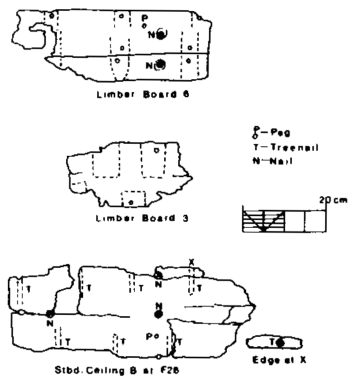


Fig. 7

Fig. 8



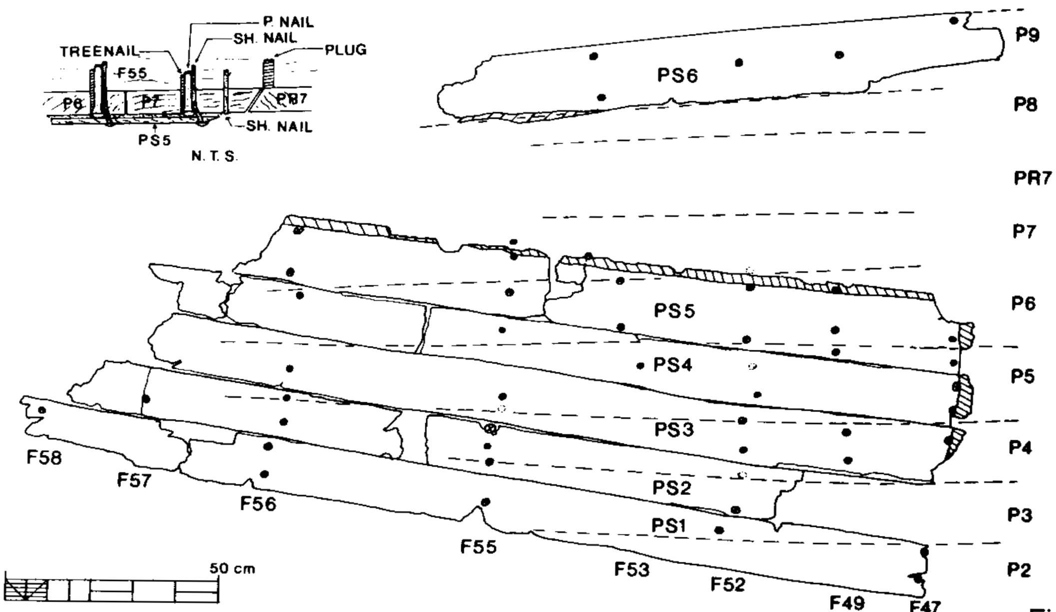


Fig. 9

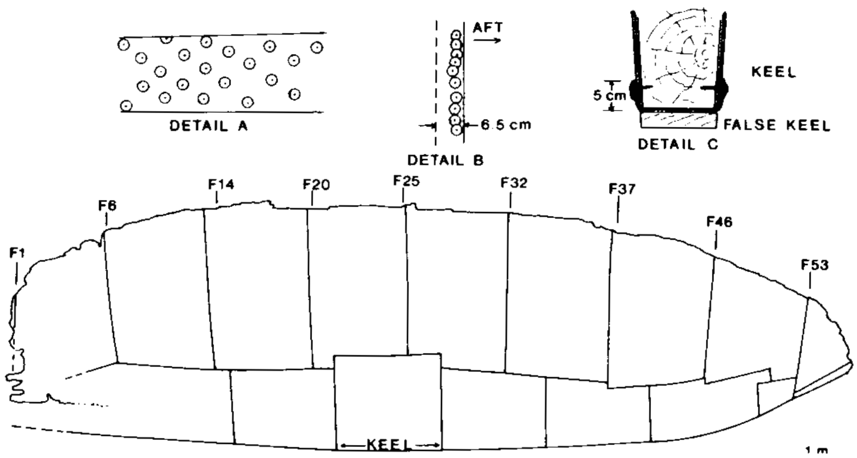


Fig. 10

PHOENICIAN SHIP EQUIPMENT AND FITTINGS

There came Phoenician men, famous seafarers,
gnawers at other men's goods, with countless
pretty things stored in their black ship.
(*Odyssey* 15. 416-416)

Until quite recently, most of what we knew about Phoenician ships came from non-Phoenician sources. The data was primarily found in the writings of their Greek rivals, as well as in the scriptures of their Hebrew allies. Native illustrations of Phoenician vessels, before the Roman era, are confined to those of their warships, while their merchantmen are known only from a handful of depictions in Egyptian, Hebrew, Assyrian and Punic art (Fig. 1-7). Ancient shipwrecks have shed little light on the details of Phoenician vessels. Even the Ma'agan Mikhael shipwreck (Linder 1991), found off the Phoenician littoral itself, may not be that of a Phoenician vessel.

In addition to Graeco-Roman literary sources (Torr 1964; Casson 1971), there are two primary Semitic collections which shed some light on Phoenician nautical matters - namely, the texts from Ugarit (Linder 1970) and the Bible (Stieglitz 1971; Krantz 1982). The documents from Ugarit span the period ca. 1400-1200 BCE, while most Biblical references relate to the 8th-6th centuries BCE. As the subject of the Phoenician men-of-war has been adequately dealt with previously (Basch 1969), I should like to discuss here textual and depicted evidence for the equipment and fittings of the Phoenician merchantmen.

Those meager illustrations of Phoenician trading vessels that we do possess indicate that they may generally be grouped into three types: (I) round sailing ships (Fig. 1, 2, 7), (II) small galleys with figureheads (Fig. 3-5), and (III) merchant galleys (Fig. 6). The terminology of ship types, Canaanite and Egyptian, indicates that already in the late Bronze Age, and probably much earlier, several vessel types were found side by side in the Canaanite (Phoenician) harbors (Sasson 1966; Goedicke 1975; Basch 1978).

The Ugaritic texts, representing the pre-Homeric Canaanite, or Proto-Phoenician traditions, list four terms for ships: *any(t), br, tk, ʿṯkt* (Table 1:1-4). The first term, *any (t)*, was the generic word for "ship", derived from a root ANY "vessel". The other three terms must surely refer to distinct types of ships. The Ugaritic *br* refers to a type of merchantman also well known outside of Ugarit, namely in Egyptian and Greek sources. The word *br* has several meanings in Canaanite, one of which is "grain" (Hebrew ḇār), hence this type may have been commonly used as a coastal grain carrier.

In Egyptian sources, the term *b3-y-r* is always written in so-called group-writing, indicating it is a loanword, presumably from Canaanite sources (Table 1:2). From the report of Wenamun, ca. 1075 BCE, we know that fleets of these Phoenician merchantmen traded regularly in Egyptian ports, and Wenamun himself sailed on such a ship from the Delta to the Lebanon. The name of this vessel was still attested in Classical Greek texts, in the form *bâris* (Torr 1964: 106). By contrast, nothing is known about a ship-type called ʿṯk in Ugaritic. It appears in a context associating it with the *br* ships, hence I tentatively translate the word as "coaster".

The name of the fourth type – *ṯkt* – was previously connected with the Hebrew *śekiyyāh* "boat" and Egyptian *skty* "type of ship", on very dubious linguistic basis. A much better solution is now found in a Sumerian-Eblaite bilingual lexical list (*MEE* 4 [1982] 964), dated to about 2400 BCE. This document provides the vocabulary equation Sumerian MÁ.GUR$_8$ = Eblaite *ZI-GI-tum*, which is to be read *ši-ki-tum* (Table 1:4). It seems likely that this craft was originally, in the Early Bronze Age, a Mesopotamian riverboat, but its Canaanite version of later centuries —if it is indeed to be identified with the Ugaritic *ṯkt* – must have been a seafaring vessel.

The Graeco-Roman texts provide us with very different names of Phoenician merchantmen. This is hardly surprising, since they are dated a full millennium after the Ugaritic texts. These Classical sources speak of five vessel names associated with the Phoenicians: *gaûlos, híppos, kérkouros, kýmbē/kybaía*, and *raphsáth* (Table 1:5-8, 10).

A sixth term is attested as a *hapax legomenon* in the Bible. The term is *dōbrāh* (I Kings 5:23), attested only in the plural, which refers to rafts of lashed conifer longs, supplied to king Solomon by Hiram I of Tyre. The word *dōbrāh* is difficult to explain and I suggest it is a corruption of *rōbdāh*, from the Semitic root RBD "layer, level", which yields a good etymology (Table 1:9). These craft–presumably fitted with a mast and sail– are mentioned in a passage describing their shipment along the coast from the Lebanon to a port at "the Sea of Jaffa". In II *Chronicles* 2:15, a parallel verse to that of I *Kings* 5:23, we encounter the equally obscure synonymous term *raphsōd (āh)*, instead of *dōbrāh* (see Table 1:9-10).

Now the term *raphsōd (āh)* does have an interesting cognate. In the *Ethnika*, by Stephanos of Byzantium (s.v. Hístos), he states that the term *raphsáth*, which I take to be the same as the biblical *raphsōd (āh)*, was a Phoenician word for a type of ship. The biblical evidence is more specific, and indicates that it was a term applied to the Phoenician rafts made of conifer logs.

However, the etymology of *raphsáth/raphsōd (āh)* is also quite obscure and may not even be of Phoenician origin (Stieglitz 1971:87).

TABLE 1 - TYPES OF SHIPS

[Dotted lines indicate a Canaanite term attested in Greek/Latin]

Canaanite	Cognates	Meaning
1. any(t)/a-na-yu	'oniy	ship, fleet
2. br --------------------------	*bâris* b3-y-r (Egyptian)	coaster
3. ᶜtk		coaster (\\br)
4. ṯkt	ṡekiyyãh?	boat
šì-ki-tum	=MÁ.GUR$_8$(Eblaite)	boat
5. *glt	*gaûlos*	freighter
	gullãh	round vessel
6. ?	*híppos*	trader
7. *krkrt ----------------------	*kérkouros*	transport
	kirkarāh	ship!
	GIŠ.MÁ.GUR.GUR	GURGUR-ship
8. qpt ------------------------	kýmbē, kybaía	type of ship
	quppah	vessel
9. *rbdt(?)	dōbrāh (*rōbdāh?)	sailing raft
10. *rpsdt -------------------	*raphsáth*	type of ship
	raphsōd (āh)	sailing raft

The evidence at hand does not permit us to identify with any degree of certainly the illustrations of Phoenician ships with their textual names. Harden (1962: 169), for example, following Barnett (1958), thought that the *gauloi* were the symmetrical merchant galleys (Fig. 6), while Basch (1969: 150) suggested that these vessels are probably the *kerkouroi*. According to Classical texts, they were used for seafaring (e.g., Herodotus 7.97) as well as for river traffic (Arrian, Anabasis 6.2). It is beyond the scope of this paper to endeavor to identify the names of the depicted merchantmen. We can be fairly certain, however, that these Classical names refer to merchantmen, built in a variety of sizes, since the sources distinguish them from the Phoenician warships.

The Phoenician origin of the terms *gaûlos* and *kýmbē, kybaía* seems to me very likely, as both appear to be derived from the names of Phoenician/Canaanite words for vessels, with cognates in other Canaanite languages (Table 1:5,8). The term *kérkouros* may have a Canaanite etymology (Table 1:7), namely, from the root KRKR "round", but a type of ship called *kurkurrum* in Akkadian is attested in Sumero-Akkadian lexical lists of the second millennium BCE (*MSL* 5 [1957] 175). This word is a Sumerian loanword (GIŠ.MÁ.GUR.GUR) in Akkadian, and was presumably a Mesopotamian rivercraft in its original version, as was the MÁ.GUR$_8$ ši-ki-tum/tkt type. The Phoenician term for the type of ship called híppos by the Greeks (Table 1:6) is still unknown.

Turning now from ship types to the parts and fittings, we find that our earliest written evidence for Canaanite/Phoenician ship equipment is to be found in three brief economic documents from Ugarit. The first text (*KTU* 4.689) is a very concise list of the large wooden parts for a ship. The text is written in the cuneiform alphabetic script of Ugarit (Xella 1982). The other two tablets (*PRU* 6.114, 141), appear to be written in Akkadian, but the nautical terms which are listed are Canaanite and not the standard Akkadian words. The Sumerograms, therefore, may also have been read not as Akkadian, but Canaanite ("Peripheral Akkadian"). While the first of our three texts was recognized to be nautical, due primarily to its heading, the other two documents were classified as ordinary economic texts. The new interpretation of these two texts as nautical lists is made here on the basis of both context and the identification of the obscure terms, previously not translated by Nougayrol (1970).

1. *KUT* 4.89

spr. npṣ. any	Document of Ship's Equipment:
tšʿ. mṯṯm	nine oars;
mšlḥ. ḥdṯ	a new yard(?);
------------------	---------------------

w. mṣpt. ḫuk	and a lookout; a railing;
w. trn. w. ḫbl	and a mast; and a *ḫbl*;
w. kpṯ	and a gangway.
------------------	---------------------

2. *PRU* 6.114	
15 GIŠ.MEŠ ÚR.NU	15 beams(?);
11 GIŠ.ÚR.MEŠ	11 frames;
x [... ḫ]*u (?)-ma*.MEŠ *ar-zu*	[2] (...)s of cedar;
17 GIŠ.[..*k]a(?)-na ir-te*	17 ... of ... -wood
ù GIŠ *šá* [...]-*ma*	and of ... wood
ù mi-nu-me-e. MEŠ GIŠ.MEŠ	and other woods;
20 GIŠ. *má-áš-à!-ṭu*	20 oars.
65	(Total): 65 (pieces).

3. *PRU* 6.141	
M. *Bur-qa-nu* DUMU *Ga-ra-bu*[?]	Burqanu bin Garabu:
2 URUDU. *ma-am-ṣa-ar bu-li*	2 cattle cleavers;
2 URUDU. *ḫa-ar-me-ša-tu* GIŠ.MÁ.MEŠ	2 sickles of ships;
4 URUDU. *ul-ma-tu* GAL.MEŠ *šá* GIŠ.MÁ	4 large mallets of a ship;
20 URUDU. *ul-ma-tu* TUR.MEŠ	20 small mallets (of a ship);
--	-----------------------------------
2 *ab-ša-nu* 2 *ku-ú-ša?-t[e*	ropes; 2 hides;

In the first text, *KTU* 4.698, we have a unique list of equipment and fittings for a vessel which was probably a merchant galley, as it was supplied with nine oars. The Hebrew cognates to the Ugaritic words provide the meanings for all of the terms, except for the new word *ḫbl*. This cannot be the word for rope (Xella 1982:34), because the latter is *hbl* in Ugaritic, Canaanite and Arabic (see Table 4:2). The word *mšlḥ*, tentatively translated here as "yard" is another new term, which I connect with Biblical Hebrew word šelaḥ "spear, limb".

The other pieces of equipment listed in this text are the crow's nest (literally "lookout"), railing, mast and gangway. All of these parts are also shown on contemporary and later illustrations of Canaanite merchantmen (see Fig. 1-4). If this ship was propelled by a sail and carried at least nine oars it was evidently a small galley, like the type depicted in Fig. 4. But the text may list only replacement parts for a larger vessel.

Our second text, *PRU* 6.114, enumerates a total of 65 wooden pieces. Here too most items are new terms and the breaks in the tablet further hinder an identification of the equipment. It seems to me, on the basis of the preserved words, that all items listed here are parts for a single vessel. The plural Sumerogram ÚR.MEŠ means "ribs", and thus I have translated it as "frames". The new term ÚR.NU is probably a related form to ÚR, with a nominal suffix. I propose to translate it as "beam", most likely, as suggested by Patrice Pomey (at the Vth Symposium), a reference to the deck beams of the ship. Another possibility is that ÚR.NU is a diminutive term, derived from ÚR "frame". In that case, it would be best interpreted as "futtock", as noted by Fred Hocker (at the Vth Symposium).

This text lists, in addition to these 15 beams and the 11 frames, 2 cedar parts, whose name is only preserved partially, 17 unidentified items made of different woods, and 20 oars. The latter term was read by the original editor as *ma-ás-wa-tu*, a new word which he did not translate (Nougayrol 1970:95). I would suggest to read the word as *má-áš-à!-ṭu* and to equate it with the alphabetic Ugaritic *mṯṯ* "oar" (see Table 3:4).

We should note here that in text *PRU* 6.113 we have listed a shipment of two hundred and twenty oars to the town of Arutu and another two hundred and thirty oars to the town of Ibnaliya (?). The former town is a well known harbor in the kingdom of Ugarit but the latter is unknown. These rather large numbers of oars (*ma-áš-à!-ṭu*) suggest that they were destined for fleets of small galleys, perhaps fishing boats. In this connection, it is very intriguing to find, in text *PRU* 6.150, an entry listing the sum of 20 *kor* (of grain) charged to the town of Arutu for (?) 4 boats.

Our third Ugaritic text listing ship equipment and fittings is *PRU* 6.141. The heading names a certain Burqanu son of Garabu as either recipient, or supplier, of 28 bronze tools as well as 2 ropes and 2 hides. The last two terms listed here are both of Sumerian origin. Akkadian *abšānu*, from Sumerian ÁB.SAG, is known only in literary context (*CAD* A, 65); here we have the first use of this word in an economic document. The term *ku-ú-ša?-t [e* was not translated by Nougayrol (1970:110). I propose to equate it with Sumerian KUŠ = Akkadian *ku-ú-šu* "hide" (*CAD* K, 602).

The bronze tools include two cattle cleavers, two sickles termed "of ships" and two types of mallets "of a ship"—four large and twenty small ones. It is possible that these items constituted the tools and equipment of a single ship's carpenter, but perhaps more likely they were for a small flotilla of vessels. The bearer' s name is also of nautical interest. He was apparently the brother of a man called *Šmlbu bn Grb* "Shumulabi' u son of Garabu", who is listed, in text *UT* 2085 :13, with other individuals as either owners or masters of *ṯkt*-ships.

These three Ugaritic texts provide us with the first solid set of detailed data on the ship equipment and fittings of the vessels, which were the direct ancestors of Phoenician ships in the Iron Age. The analysis of the literary evidence from the later sources indicates that there was much continuity in the nautical terminology, for at least a full millennium, from the Late Bronze Age to the Persian era (about 1550-550 BCE).

In the following three tables, I have attempted to provide a summary of the known terms for Phoenician ship equipment and fittings, as may be gathered from the available Ugaritic, Biblical and Classical sources. Phoenician documents on this subject, dating to the Iron Age, have not come to light thus far. To complete the picture, I also list those parts and fittings illustrated in the depictions of Phoenician merchantmen, but whose names are still unknown:

TABLE 2 - SUPERSTRUCTURE AND RIGGING TERMS

Canaanite	Cognates	Meaning
1. ḫbl		?
2. lbš anyt	lebûšê 'oniyyōt	ship's awnings
TÚG.MEŠ MÁ.MEŠ	ma-áš-ḫa-ṭu-ma [*PRU* 6.126]	ship's awnings
3. mṣpt	miṣpeh	crow's nest
4. mšlh	šelah	yard (?)
5. *mprś	mipraś	sail
6. *qlʿ --------------------	*kella*	sail
	qelaʿ	sail
7. qrš	qereš	cabin
8. trn	tōren	mast
GIŠ.ta-ar-nu [*PRU* 6.15]		mast

DEPICTED

?		braces
?		halyards
?		lifts
?		ratlins
?		shrouds
?		stays

TABLE 3 - HULL AND FITTING TERMS

Canaanite	Cognates	Meaning
1. ḫrk	ḥàrāk	railing
2. kpṯ	kebeš	gangway
3. *lḥtm	lūḥōtāyim	planking
4. mṯṭ	māšoṭ	oar
GIŠ.ma-áš-à!-ṭu		oar
5. *mṯṭ	miššot	rudder
6. ?	?	
GIŠ.ÚR.MEŠ		frames
7. ?	?	
GIŠ.MEŠ.ÚR.NU		beams (futtocks?)

DEPICTED

?		bowsprit
?		bulwarks
?		figurehead
?		stempost
?		sternpost
?		wales

TABLE 4 - HOLD AND EQUIPMENT TERMS

Canaanite	Cognates	Meaning
1. *hlmt	halmût	mallet
URUDU.ul-ma-tu šá GIŠ.MÁ		mallet of ship
2. ḥbl	ḥebel	rope, cable
3. *ḥbl	ḥibbēl	parral
4. *ḥbl gmʾ	ḥebel gomeʾ	papyrus rope
	býblinos hópla	papyrus tackle
5. *ḥbl pṯtm	ḥebel pištim	flaxen rope
	leukolinon (Phoíkikes)	flaxen cable
6. ḫrmṯt	ḥermēš	sickle
URUDU.ḫa-ar-me-ša-tu GIŠ.MÁ.MEŠ		sickle of ships
7. *kn trn	kēn tōren	mast-step
8. *ntl	nētel	ballast

DEPICTED		
?		deck
?		sounding pole
?		water jar

Forty years ago, Armando Cortesao (1956:240) wrote an article on Phoenician nautical science, in which he concluded: "everything points to the fact that the Phoenicians had a nautical science but we do not yet know what it was". We can now say that we do know some aspects of this science from the ancient texts, which supply details about the equipment and fittings of ships. Additional documents, and future discoveries of well-preserved Phoenician shipwrecks, will hopefully provide the necessary evidence for how these parts were actually fitted together.

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ILLUSTRATIONS

Fig. 1 Qenamun Tomb (Thebes #162), c. 1375 BCE (after Davis 1947).

Fig. 2 Judaean tomb (near Lachish, c. 725 BCE (after Naveh 1963).

Fig. 3 Judaean seal, c. 725 BCE (see Avigad 1982).

Fig. 4 Sargon II Palace (Khorsabad), c. 710 BCE (after Torr 1894).

Fig. 5 Carnelian gem (National Maritime Museum, Haifa), Hellenistic? (see Ringel 1984).

Fig. 6 Sennacherib Palace (Nineveh), c. 690 BCE (after Torr 1894).

Fig. 7 Punic tomb (Kef el-Blida), c. 500 BCE (after Ferron 1968).

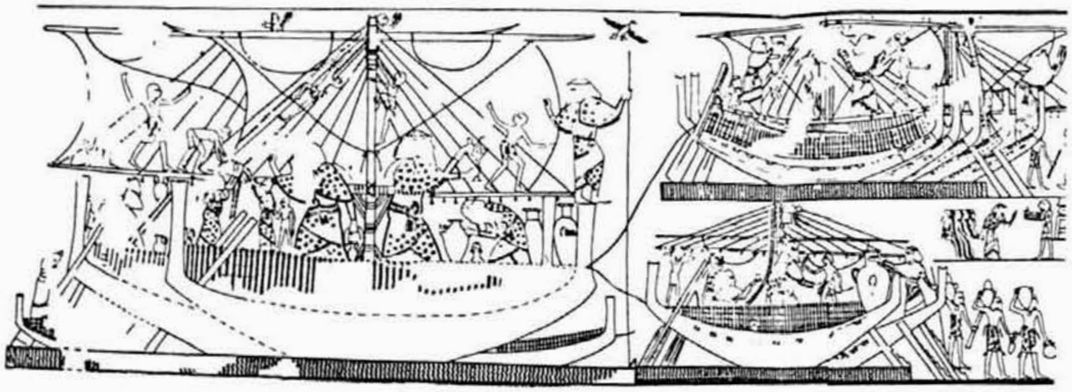


Fig. 1

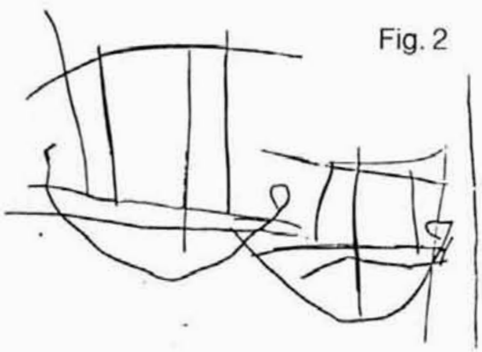
Fig. 2



Fig. 3


Fig. 4


Fig. 5

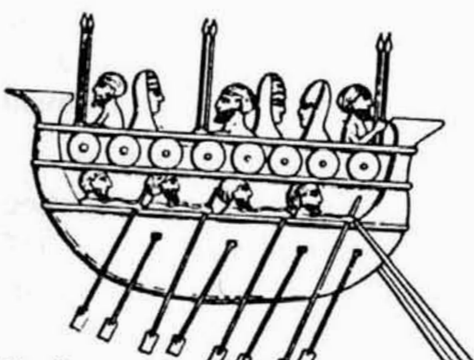


Fig. 6

Fig. 7


SAILING TO WINDWARD IN THE ANCIENT MEDITERRANEAN

If a sizable ship is to be *rowed* against an appreciable wind, it must be specifically designed for rowing: it must be lightly built, with a long, narrow hull. It must obviously have a large rowing crew. Those factors make such a ship unsuitable for bulk cargo compared with a true sailing ship, in which a small crew can move hundreds of tons of cargo in a round, heavily-built, seaworthy hull. I define a true sailing ship as one in which the prudent mariner is willing to go to sea without enough oar power to make headway against an appreciable wind.

If a long narrow hull is to *sail* to windward, there is one simple but essential requirement: the centre of sail area must be well forward (that is, towards the prow). This assumes that the underwater profile of the hull is a horizontal rectangle, or something very like it, an assumption which is true enough of most galleys. A galley will not sail to windward with a single mast, bisecting the sail area, if it is stepped amidships, although that is how most people would instinctively arrange things; and it is the arrangement most often seen in the iconography of ancient ships.

Modern authorities tend to assume that it is the right arrangement for sailing up wind or reaching (sailing with the wind abeam), e.g. Casson (1971: 19): '[the mast] gradually moved aft until, by ca. 1500 B.C., it reached the center of the vessel, where it stayed; the change reflects the Egyptians "increasing ability to sail on winds from other directions than dead aft". Actually, the mast should be more like one third of the ship's length abaft the prow.

Modern yacht designers know this, of course. They find the centre of the underwater profile of the hull, and then put the centre of sail area further forward. The amount they move it forward is called "lead". Most books on the subject recommend a lead of 10% of the boat's waterline length, but more for a long, narrow hull (like a galley's). This means that the centre of sail area should be only a little more than one third of the water- line length abaft a galley's prow. Assuming that the mast bisects the centre of sail area, that gives the best position for stepping the mast. It seems contrary to one's instinct and common sense.

Modern ships have a similar contrary-to-common-sense characteristic: when they are going ahead, the pivot point about which the ship turns when the rudder is used is about one third of the ship's length abaft the prow. That is where the bridge of most modern warships is placed. It is easier for the officer controlling the ship to carry out precise manoeuvres if he is standing at the point about which his ship pivots.

Figure 1 shows the *Argo*, a ship built here in Greece for Tim Severin and his modern quest for the Golden Fleece. She does not have a balanced rig. The mast looks at first as though it is rightly placed, well forward of amidships, but it is not. The ram is part of the underwater profile, and the mast is just about in the middle of it. According to my foregoing theorising, the *Argo* should have an uncontrollable tendency to turn into the wind (to "gripe" is the English nautical term) if she tries to sail with the wind on the beam, because the thrust from the wind in the sail is well abaft the pivot point of the hull when the ship is moving ahead. In his book *The Jason Voyage*, Severin says what actually happened.

Trying to reach the shelter of Sinop harbour under sail, the ship had the wind on the starboard quarter. Then she had to alter course to starboard to make the harbour entrance. Severin pulled back on the tiller of the starboard steering oar, and for a few seconds the *Argo* turned smoothly. "Then, as she swung past a certain critical angle, the tautly filled square sail suddenly took control of the boat: the *Argo* simply went maverick. The sail had more turning power than the single steering oar, and the smooth turn abruptly became a violent right hand swerve" (Severin 1985: 168). The ship was heading for the rocks. The crew got out the oars, but even with the port oarsmen holding water or trying to back while the starboard oarsmen rowed ahead, the ship would not turn back to port. An awning, improvised to form a head sail, saved the day.

A few days later, the *Argo's* doctor made the suggestion that transformed the *Argo* from a galley into a sailing ship. All the stores and all the crew were moved as far aft as possible. "The effect was wonderful. *Argo's* nose lifted a trifle and suddenly she was pointing 15 degrees closer to the wind. "Terrific" exclaimed one of the crew. "No more rowing. We can sail to Georgia" (Severin 1985: 184).

Next, I would like to consider the implications of an *in*ability to sail to windward. Seamen have hardly ever made *long* passages under sail up wind, so what does it matter? For an ocean voyage it has nearly always been possible to chose a route and season to have the prevailing wind abaft the beam. The route between Europe and America is the classic example. In a sailing vessel, you go south until the butter melts, when you pick up the Northeasterly Trade winds in the latitude of the Canary Islands and make the whole voyage, given average luck, with the wind on your starboard quarter. Coming back, you go north up the American coast until you reach the latitude of the Westerlies, and then sail for Europe with the prevailing wind astern.

But even though you are able to cover the long, deep-sea part of the voyage with the wind abaft the beam, you still need the ability to get to windward by one means or another, to keep your ship from wrecking on a lee shore. If you do not have the ability to *sail* up wind, then you must have sufficient oar power. It is not reasonable to go to sea without the ability to get to windward by any means, and simply rely on your anchors to keep you from shipwreck when the wind blows towards a rocky shore, especially in the Mediterranean, where there are generally rocky coasts with poor holding ground, and the wind is fickle and often violent.

Is that really true? Could ancient mariners have travelled the Mediterranean in vessels that were unable to get to windward by any means, oars, paddles or sails? I *think* the answer is no, but it would be interesting to try to do so.

Of course, any vessel can be rowed or paddled in a calm. Right up until the introduction of steam, warships were rowed into action when becalmed. Small craft like ships' boats can be designed to be round and strong and seaworthy, and can still be rowed (as well as sailed) fairly effectively into a considerable wind. But beyond a certain size, it becomes impossible to row a "round ship" (i.e. one designed for strength, seaworthiness and carrying capacity) except in a dead calm. If a *big* vessel is to make any way under oars against any sort of a breeze, she must be designed as a rowing machine, a galley, which is to say too long and too lightly built for seaworthiness or carrying capacity. She must also, obviously, carry a great many oarsmen.

I would, then, define a true sailing ship as one that can make *some* way under sail up wind. I would like to distinguish it as sharply as possible from a galley. The true sailing ship does not need *much* ability to windward –just enough to keep her in deep water when the wind blows towards the shore. As I have mentioned, she would rarely, if ever, make a *long* voyage in the teeth of the wind.

Next, I suggest that in the ancient Mediterranean and elsewhere, *some* maritime people in some eras failed to solve the design problem of sailing to windward, and were stuck with long, narrow, lightly-built hulls designed for rowing; and with a single sail on a mast amidships, a combination that did not readily allow them to sail to windward. It seems to me that Homer's Greek mariners, most of them, were in that situation. Naturally, they tried to sail when they could, but had terrible trouble with the steering (as Severin did) every time they tried to come onto the wind in any sort of breeze. I would cautiously suggest that the Phaeacians who took Odysseus home in a ship that seemed to steer herself, had solved the problem of balancing the sailing rig, so that on most points of sailing the ship, like modern sailing vessels, went well enough without a hand on the tiller.

It could be argued that ancient mariners, using common sense, trial and error, would soon have got the centre of sail area in the right position (far enough forward) for sailing with the wind forward of the beam. I would much dislike being associated with any theory that ancient mariners were stupid. I agree with Cecil Torr, that English 19th century authority on ancient ships, that the ancient Greeks were the cleverest people ever known, though I am not so sure about his idea that their cleverness was caused by eating so much pickled tunny fish (Torr 1918: 114). I do think, however, that a people might go to sea for many generations in a galley that would not sail to windward, before they realised that the centre of sail area ought to be shifted further forward. One could take the view that what the crew of the *Argo* discovered after a few weeks at sea would have been discovered in about the same time-scale by all ancient mariners, but I am inclined to the opposite view. Severin recounts how, before the successful alteration of trim they had tried unsuccessfully and given up; evidently, as he says, having failed to move enough weight far enough aft to alter the under water profile sufficiently. Had it not been for the one man in the crew who had a good grasp of the modern theory of sailing, I think the Argo might have voyaged indefinitely without discovering how to sail to windward. Vikings seem to have had the same problem. Late in the 19th century, the Viking replica Gokstag ship crossed the Atlantic from Europe to America under sail, a swift trouble-free voyage. Of course, most of the way they had the Trade Wind behind them. The ship would not reach or go to windward without a jib or head sail to balance the rig, although nobody believes that Viking ships carried such a sail (Binns 1980: 123). The authentic rig allowed her to make a course in a wind only slightly abaft the beam but not to go to windward.

This limitation on their sailing ability obliged the Vikings to stick to galleys even for their longest voyages. Wonderful though their galleys were, they made a long ocean voyage an adventure for heroes, not a profitable venture for merchants. Perhaps the same situation obtained in Homeric Greece.

Another modern instance is worth considering. Thor Heyerdahl's balsa raft, *Kon-Tiki*, set out from South America into the Pacific with a massive steering oar.

Despite tremendous efforts from the helmsmen, vividly described by Heyerdahl, the raft had an irresistible tendency to head into the wind every time the wind caught her from anywhere near the beam instead of from astern. Heyerdahl and his crew endured this for over forty days, including breakages and repairs of the massive steering oar, before they took the right remedy. They could not easily alter the mast or sail, but they pushed boards down between the balsa logs to form a sort of drop keel or centre-board. They used them towards the stern of the raft, and so shifted the centre of lateral resistance (i.e. the centre of area of the raft's under-water profile) further aft: the same effect as shifting the sail area further forward. Heyerdahl wrote: "We could certainly have continued our voyage by making the steersman pull a centre-board up and down in a chink [between the balsa logs] instead of hauling sideways on the ropes of the steering oar, but we had now grown so accustomed to the steering oar that we just set a general course with the centre-boards and preferred to steer with the oar".

Again, I suggest that some ancient mariners might not have discovered in a lifetime what Heyerdahl "discovered" in "only" 45 days. I do not think this implies stupidity in the ancient mariner. I put "discovered" in inverted commas because in fact Heyerdahl had, as he said, a good knowledge of this centre-board technique, used by Amerindians, before he set out. Without that knowledge, I do not think he or his crew would have worked it out for themselves.

Up to this point I have implied that with a single square sail set on a mast stepped amidships, the centre of sail area would be amidships too, and the ship would therefore not be able to sail with the wind on the beam or forward of the beam. That is not entirely true, as Professor Casson has so clearly shown in his admirable *Ships and Seamanship in the Ancient World* (Casson 1971: 273-7). Several ancient authors describe how the yard could be braced round until it was pretty well fore-and-aft and the part of the sail abaft the mast brailed up. This would have left the centre of sail area well forward, have balanced the rig and allowed sailing to windward. I cautiously suggest that the resulting half-brailed sail would not have been a very efficient rig. I think it may indicate early days in the transition from galleys to true sailing ships in that particular maritime tradition. Another clue to the dating of the first true sailing ships among Greeks is the type of ship called a *holkas*. The written records, and a little of the iconography, suggest that these were fairly big, beamy ships used to carry bulk cargo, especially grain-ships that could probably not make headway under oars against any appreciable breeze. The word *holkas* suggests a vessel that was towed. The English word hulk is probably cognate, and carries the same idea of a vessel not capable of proceeding under her own power. Cargoes of grain might, I believe, have come south from the Bosphoros to Greece in ships unable to make way upwind under their own power—neither by sail nor oar. They could rely on the melteme, a very regular northerly wind in summer, to get them to Cape Sunion, where we know that they were (sometimes if not always) met by oared warships and taken in tow.

I do not pretend that this is the only interpretation of the evidence. One could argue that the *holkas* was able to sail to windward when there was any wind, and needed towing only when becalmed. It would be interesting to attempt some southerly voyages from the Bosphoros in a vessel that would not sail to windward, and see how it worked out.

By the second century B.C. fore-and-aft sails were in use in the Mediterranean (Casson 1971:243-5), and they would certainly have allowed sailing to windward, but they seem to have been confined to craft too small to be called ships. In the first century B.C. we are able to see the first really certain true sailing ships. The Roman Empire relied on grain brought from Egypt in ships that could displace well over a thousand tons, with crews not a tenth of the number that would have been required to row against any appreciable wind, even if the design had allowed the deployment of sufficient oar power. The distinctive feature of the sailing rig of these ships is the artemon, the foremast or bowsprit carrying a second small sail in addition to the mainsail carried on the traditional mast amidships. This gives a balanced sailing rig without the need to brail up part of the mainsail. Such a ship can be steered pretty well (on most points of sailing) by letting one sail draw fully and reducing the effective area of the other.

I wonder how much this sailing rig, so clearly associated with merchant ships, owed to the sailing rig of war galleys. Triremes were provided with a mainsail, set on a mast amidships, but this was left ashore if fighting was expected. They took a small sail into battle, which could be set on a bowsprit or small foremast. It would only have taken the ship downwind, and seems to have been used only by ships trying to get clear from an engagement: warships in action used oars alone. It may well have been the origin of the Roman merchant ship sailing rig. A trireme on passage in a light wind decides, perhaps contrary to standing orders, to set both sails with the ship on a down-wind course. As the wind or the course changes and the wind comes round to the beam, a striking difference would be noticed. There is no need to brail up the after part of the mainsail. The ship is well balanced with the wind abeam and can be controlled with the lightest touch on the steering oar. An efficient sailing rig is born.

I do not suppose the ability to sail to windward was an invention made once and for all and then spread throughout the Mediterranean. On the contrary, I think that in Homeric times, when most of Homer's Greeks could not sail to windward, other seamen could. Thor Heyerdahl's experience in *Kon-Tiki* suggests that reed "boats" and log rafts might well have been sailed upwind if boards were pushed down between the bundles or logs to act as centre-boards. Harry Tzalas has carried out valuable research into voyages by reed boat using paddles. I would very much like to conduct experiments in sailing reed boats, to see how practicable it would be to make way up wind.

The importance of being able to make *some* way up wind under sail is not that it might in theory allow long voyages in the teeth of the wind, but that it allowed ancient mariners to go to sea without oars, and hence allowed shipwrights to build big, strong, beamy ships capable of moving bulk cargo with small crews, and of traversing the oceans of the world. Rome could not have been fed with grain from Egypt if it had had to come in ships capable of rowing up wind, nor would there have been a Roman embassy in Canton if diplomats and merchants had had to come and go by galley. The true sailing ship is one of mankind's greatest technical achievements.

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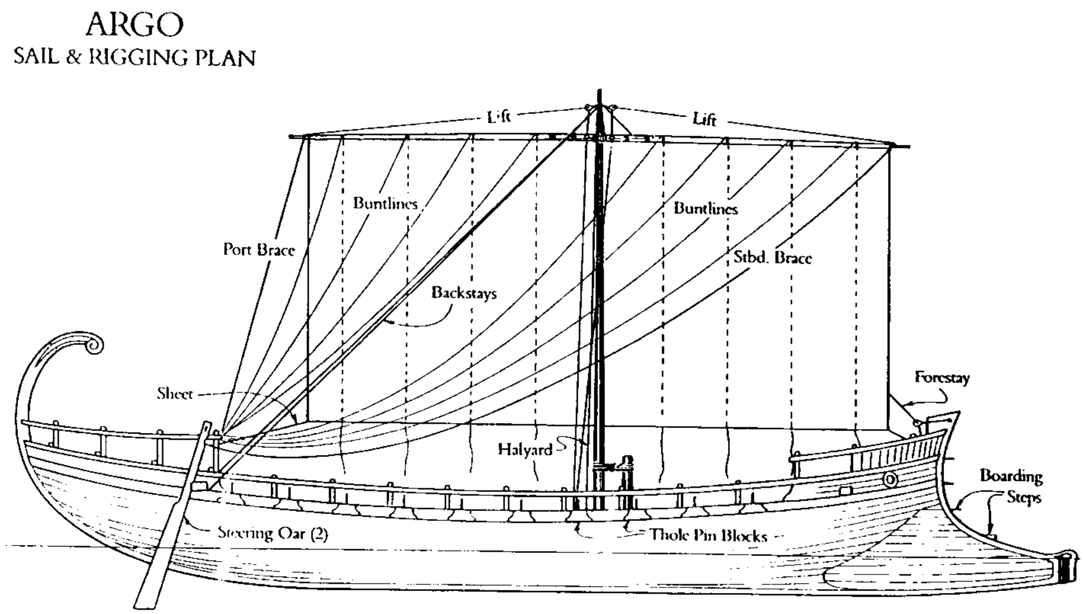
ILLUSTRATION

Fig. 1 (From Severin 1985: 239). ARGO SAIL & RIGGING PLAN.


ARGO
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Halyard
Boarding
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Steering Oar (2)
Thole Pin Blocks

Fig. 1

WERE THE "PYRAMIDAL STONE WEIGHTS" OF ZEA USED AS ANCHORS?

Introduction

In this communication the "pyramidal stone weights" found at the end of the 19th century in or near the port of Zea, Piraeus, will be reconsidered and their original use as anchors will be questioned.

I am well aware that doing so in the presence of Miss Honor Frost, the well-known specialist on stone anchors, and addressing a distinguished audience of scholars in the field of Marine Archaeology certainly implies a great responsibility and any new theory proposing a different use for these "stone weights" cannot be approached lightly.

It is however felt that there is sufficient evidence to assume that these "stone weights" were originally made to be used as weights for permanent moorings, although they may well have been re-used at a later stage as casual anchors or ballast.

Described as "Pyramidal stone anchors", "Trireme anchors", "Anchors of Zea Limani", "Anchors of Passalimani" or simply "Piraeus anchors", these "stone weights" of different sizes, shaped in an approximate pyramidal form with a cut-off apex that leaves a flat top with a vertical piercing running down into the horizontal large round hole, have been generally accepted as ship-anchors. However, in my opinion, no convincing answers have been given to several questions that arise.

Miss Frost who studied in detail these "anchors", remarked on their peculiarities and was the first to note that this is a new phylum.[1]

Let me briefly say for those who may not be familiar with the details, that these "stone weights" were found in the vicinity of the inner port of Passalimani, Piraeus, ancient Zea, probably at the end of the last century.[2] Six are kept in the Hellenic Maritime Museum of Piraeus, at Zea Marina, (Fig. 1) and eleven at the nearby site of the Ancient Theatre adjacent to the Archaeological Museum of Piraeus; a twelfth is exhibited in the museum itself.(Fig. 2)[2]

The "stone weights" of Zea are not unique. Another similar pyramidally shaped "stone" found in the sea, can be seen in the courtyard of the Volos Archaeological Museum, five were found in Magna Graecia,[3] while several "stone weights" of similar shape were excavated at a land site in Cyprus.[4] (Fig. 3)

All these pyramidal stones, except the Cypriot ones, bear light incrustation or abrasive marks that indicate a lengthy presence in the sea.

That the Piraeus "stone weights" come from the ancient port of Zea can be considered a certitude, although the records of both museums give no indication of when, where and how they were found.

It should be remembered that Zea as a port of any importance was totally abandoned for over a thousand years, as after the Antonin period, Piraeus and its three ports (Kantharos, Zea and Mounychia) were totally deserted during mediaeval times.[5] The depopulated town was covered with ruins until the mid-19th century.[6] So we cannot expect light to be shed from any oral tradition when referring to Zea, its port, its shipsheds or the "pyramidal anchors".[7] (Fig. 4)

Some experimental archaeology

The theory that these "stone weights" were used as trieres anchors has puzzled scholars for decades.

So the first question is: How an Athenian trieres could have manoeuvred in the ancient port of Zea (Fig. 5), the present inner harbour of Passalimani, (Fig. 6) and how these "pyramidal anchors" could have been dropped to secure a 37-meter long ship during the hauling-out process required to put it safely dry in the allocated shipshed?

No attempts were made to anchor the trieres "Olympias" in Zea harbor during the experimental voyages using stone-anchors.[8] Obviously any attempt to duplicate manoeuvring in modern Zea would have been impossible for a 37-meter oared ship, because of the nowadays restricted area due to the addition of wharfs and the multitude of yachts congestioning this port.

During the very first sea trials of "KYRENIA II" in 1985 [9], however, we did try to understand experimentally how a ship could use anchors of a shape similar to the "pyramidal stone weights" in today's inner basin of the ancient port of Zea.

"KYRENIA II" is certainly a much smaller vessel than the trieres, being only 15 meters long. We dropped two 40 kilo stone anchors forward, trying to hold the bow while with a rope secured ashore the crew was trying to reverse using four large oars and tie stern to the quay. This was an attempt to duplicate the operation that would have been necessary to bring the ship in a perpendicular position to the axis of an "imaginary" shipshed. With a light breeze blowing we failed in both attempts. For although we had our stern secured by the shore line, the two stone anchors we had dropped could not found an anchoring point and the ship dragged. The action of the oars could not equalize the strength of the wind (4 Beaufort). To avoid collision a conventional iron anchor was dropped and "KYRENIA II" was immobilized. Thus an attempt to use experimentaly two small stone anchors in a port was not conclusive.

Anchor differences

But let us enumerate the differences between the "pyramidal stone weights" and the other known stone anchors.

1. The "pyramidal stone weights" (Fig. 7) are shaped in such a way as to secure their upright position on a semiflat seabottom; the surface of the base being obviously greater than the upper part. This is contrary to the general practice with all stone anchors, which although very different in their shape, size and weight, are always made in such a manner as to tip over one side, thus justifying the homeric name of ευναί, the "lying ones".

2. There is only one horizontal hole in the "pyramidal stone weights", while most stone anchors have an additional and more often two lower perforations for the insertion of wooden sticks giving to the anchor its ability to hold on a sandy or muddy bottom. So deprived of such "arms" these "pyramidal stone weights" would have a very poor hold on the seabed of a port like Zea.

3. The vertical piercing on the cut apex can be found only on these "stone weights". No such piercing exists on any other type of non-pyramidal stone anchor. That elaborate cutting just weakens[10] the upper part of the stone, the lighter and most vulnerable, and does not justify its presence if the stone was to be used as a "conventional" anchor.

4. The lead filling on the tip of the vertical piercing shows the distinct marks of an iron ring. This must have been a "U" shaped ring, as two little hole marks with remains of iron corrosion testify to the existence of such fitting, which in the meantime has disappeared. Such a ring would have been too small and too weak to constitute part of any lifting mechanism.

5. The lead filling as well as the marks of iron corrosion[11] near the top opening of the lead and in some instances on the interior surface of the horizontal hole is a distinct peculiarity of this type of "stone weights" and no parallel has been found on traditional stone anchors. No plausible answer has been given in relation to their proposed use as anchors.

6. It is worth noting that the 18 "pyramidal stone weights" of Zea is the largest concentration of anchor-shaped-stones known to have been found in Greece. All other stone anchors of non-pyramidal shape together do not exceed a dozen pieces.[12]

The fact that Zea was the most important naval port of Athens during the Classical times with a presence of 196 trieres, is not sufficient to justify this unusual "stone anchor" concentration.

7. And a further, crucial question is: Why would a "modern" warship as the trieres, structurally ahead of its time, be equipped with such an anachronistic anchoring device. We know that anchors with wooden shanks and lead stocks were already in use by the 6th c. B.C., gradually replacing stone anchors.

8. It has been further proposed that the shape of these "pyramidal anchors" was designed for space-saving on deck. In fact such "stone weights" need a relatively limited space when placed upright, contrary to the cumbersome anchors with arm and shank held together by a lead collar. (Fig. 8) But the advantages of such a plausible proposition are nullified when it is proposed that a wooden pole passed through the horizontal hole to allow the crew to lift the anchor, while the presence of lead melted in the vertical cut was there to hold secure that wooden arm, preventing it from moving.

To be of any practical use, giving a lifting capability to two men, that wooden pole should have had a length of no less than 1,50 to 2 meters and a diameter of 20 cms, for the larger "grey stone weights" of the Piraeus Archaeological Museum. So the proposed permanent presence of the wooden lifting beam, would render these anchors cumbersome rather than space-saving. It would have been more practical to propose a lifting solution with an adaptable/retractable wooden arm; but then what would be the role of the lead filling?

And a last remark referring to that proposed wooden arm. If such pole was in fact necessary to lift the "anchor" and store it on deck, a beam square in section would perhaps be more practical than a round. This would have permitted a steadier transportation of the stone; but then the perforation in the stone should have been made square and not round.

A proposal for consideration

To the insufficiency of practical answers, I propose that we consider the hypothesis that these "stone weights" were "mooring blocks", being part of a "mechanism" that allowed the trieres to be moored swiftly stern-to the axis of the allocated slipway and hauled-out in the νεώσοικοι of Zea. Using informed guessing —based on my knowledge of today's method of hauling-out the traditional Greek caïques — lets go back in time and imagine the return of 20-25 trieres into their home port of Zea. (Fig. 9)

The vessels would have to enter one at a time through the narrow entrance of the port. Then perhaps two or three vessels would manoeuvre simultaneously, but in different areas of the port to avoid collision. The ancient port of Zea was not much larger in antiquity that the today's inner basin of Passalimani. The manoeuvres should be prompt and well calculated, permitting the mooring and then the hauling-out of each vessel in the quikest possible time, as the following vessel would be standing-by in the outer harbour or temporarily lying alongside a quay waiting its turn to manoeuvre.

Using part of her oars the trieres would move towards the allocated shipshed. When reaching her νεώσοικος she would promptly take a position stern-to-the-axis of the hauling ramp. At that moment, it would be imperative that both ends of the ship be held absolutely perpendicular to the shore. The steering oars would at that time be lifted so not to interfere with the hauling-out. We can assume that the mast would have already been freed from the standing rigging - after storing the sails - and placed in a lying position.

It is very probable that working tenders in the port would be ready, standing-by to assist the ship.[13]

The end approaching the shore, the stern, would have been easily steadied by securing two mooring lines — port and starboard — attached to mooring bits on the vessel while the other ends would be secured to a capstan or other hauling mechanism. At the same time the harbour tender would pass the ends of two mooring lines fixed to a permanent underwater mooring to be picked up by the crew forward. Thus controlling both the stern and the stem by heaving-up the stern ropes and loosening the stem mooring cables, the ship would back towards the shore, sit on a sort of wooden sledge and gently slip on the shipshed ramp. The hauling-out process would start and continue until the vessel would be dry in the νεώσοικος. (Fig. 10)

It is true that we do not have any evidence, literary or archaeological, that a wooden sledge was used for slipping the trieres on the stone ramps. It is however, my belief, that there must have been such a mechanism. Pulling a hull directly on the stone ramp might have damaged the keel, although lubricating the surface of the stone with tallow would have facilitated the process.

I will not enter into the details of the assumed technicalities of how the trieres were hauled-out in their sheds. This point, as far as I know, has not yet been elucidated and the aim of this paper is not to explore this process. But I strongly believe that as in today's traditional Greek boatyards, the trieres were hauled out using a sledge and runners method.

It must be stressed, and this is a very important point, that nowadays while manoeuvring for the hauling-out of any vessel, the most critical moment of the operation is placing and keeping the ship absolutely in a perpendicular position to the yard's shore-line in the axis of the slipway's ramp.

The opening space between the rows of unfluted colums suporting the roof of a Zea (Fig. 11) shipshed is slightly over 6 meters, the trieres having a maximum width amidship of 5,45 mts.[14] Thus there is a very limited space between the sides of the vessel and the stone supports of the roof delimiting the width of the shipshed. The ancient foreman responsible for slipping such a ship was faced with a very delicate manoeuvre requiring great dexterity and presicion. This would have been imposible to perform if the stern of the vessel — the last part of the hull that keeps floating during a hauling operation — could not be secured in an absolute predetermined position. Such precision would not be achieved by dropping one or even two anchors — certainly not anchors of such poor holding capacity as the "pyramidal". But even supposing that such anchors could be made more efficient, a chaotic situation of fouled anchor-lines would have resulted.

But it must also be emphasized that the lauching of a ship is as critical as the hauling-out, in fact it is a more hazardous process. Many more vessels sustained damages during the lauching that when been hauled up, so a secure mooring point must have been essential to hold the ship after floating. The crew needed some time to lower the steering oars, place in position some oars and start moving toward the entrance of the harbour.

Having emphasized the delicate operation of slipping and lauching a long ship as the trieres in and out her shipshed and stressed the obvious necessity of having for each shipshed a permanent mooring, let me now describe the proposed system in which the "pyramidal stone weights" played a predominant role.

Mooring ancient and modern

To understand the ancient system we need to look at the pattern of the present arrangement of mooring blocks laid in the outer yacht marina of Zea, the artificial basin that was built some 35 years ago.

These are large concrete blocks roughly shaped as giant match boxes. Each block has six iron rings, five made to secure heavy iron chains that interlink these blocks and form a heavy underwater mooring pattern, the sixth to secure the chain with the mooring rope (Fig. 12)

I believe that the "pyramidal stone weights" were the predecessors of today's concrete blocks. A heavy chain passed through the large horizontal hole of each pyramidal stone weight. These patterns were placed upright on the seabed forming roughly a horse-shoe following the contour of Zea, at approximately 60 meters from the littoral. (Fig. 13)

Each unperforated side of a stone weight would face the center of the opening of each shipshed, the spacing between the "pyramidal" blocks would have been the width of a shipshed, i.e. circa 6 meters. The chain length between the mooring blocks would have been slightly over 6 meters so as to allow it to lay loose on the seabed. (Fig. 14)

At its lower end the lead in the vertical hole would hold a ring of the heavy chain probably secured to a "U" shaped fitting encased in the lead (Fig. 16). Another similar fitting at the top end of the vertical hole encased in the lead would allow the fixing of a mooring buoy (Fig. 15). This buoy (a large dried pumkin would do) kept vertical by a line above the mooring "stone weight" would indicate to the manoeuvring triere the center of the shipshed width, i.e. the axis of the ramp on which the man responsible for the hauling process would aim to position the vessel and keep it steady until dry on the slip.

This permanent mooring arrangement of ancient Zea would comprise probably some 200 large "pyramidal mooring stone weights" as well as smaller blocks meant to hold this perimeter chain pattern in position on the seabed. One of the problems with the 196 shipsheds of Zea is that in fact they cannot all fit in the limited space of this port[15], so no precise pattern for the mooring can be proposed.

The present modern mooring system of the outer Marina of Zea involves a total of 118 concrete mooring blocks.[16]

The proposed hypothesis can answer some of the questions that have puzzled scholars with Zea's "pyramidal stone weights":

1. The "pyramidal" form is explained for the need of the weight to stand in an up- right position on the even mud-laid sea-bed of Zea.

2. The large circular horizontal hole opened at the higher part of the stone allows the heavy iron chain to pass-though, touch the sea bed and add its weight to the weight of neighbouring "stone weight".

3. The vertical perforation with the lead filling is explained by the need to secure the chain so the spacing between each mooring weight remains unaltered and the underwater pattern remains undisturbed.

4. The marks of an iron "U" shaped ring noted on the top of the lead filling, well distinguishable on some of the Zea "pyramidal stone weights", is explained by the necessity to encase a ring to secure on it the mooring buoy line.

5. The iron rust stains on some of the Zea "pyramidal stone weights" can be attributed to the corrosion of the rusting chain.

6. The irregularities in the perforation of the lateral hole, especially the chipping of the stone at the edges of the hole, may be due to the constant movement of the chain when strained by the ship's manoeuvre.

7. The large concentration of these "stone weights" in a limited area as Zea - the denser to be found in the Mediterranean - can be understood if we consider that they represent only a fraction of the stone weights laid in this port.

The fate of "stone moorings"

To the question of what may have happened to the other hundreds of "pyramidal blocks" of Zea, it should be reminded that this port was used as a military harbour only until 404 BC.[17] After the decline of the Athenian naval power, Zea followed the fate of Piraeus and gradually lost its importance. In 86-85 B.C. after Sula's sack of the town the place was deserted. There was a short renaissance under the Antonins in 175 A.D., but Piraeus suffered destruction by the Goths in 267 A.D. while the coup de grace came from Alaric's hordes in 395 A.D. After this date Piraeus lost all its inhabitants and remained totally deserted during all the post-Roman and mediaeval times. It started regaining its importance only in the middle of the 19th century.

During these 16 centuries of abandonment the port of Zea was gradually silted and those of the "mooring stone weights" that had not been already removed to be used as ballast or occasional anchors by merchant vessels were buried in sand and silt.

It is known that fishermen and seamen in general, often make use of every available weight that can be lashed to a rope, as an additional anchor. But it is well possible that an important number of these "pyramidal stones" are still buried in the mud of Zea. During the last 30 years the port has been dregged only twice and only in limited, selected areas, mainly in the middle of the bay. The mud is in most of the port 1,5 mt thick and according to divers, who often reluctantly dive to unfoul anchors, there are spots with over 2mts of mud. Anchoring is allowed in the inner port as the modern mooring arrangment referred to above cover only the new outer marina.

There has never been an underwater survey or excavation in Zea, mainly because of the extreme pollution of its waters, as sewage outlets from the neighbouring agglomeration end in the port in addition to the discharge of the yachts.

But how can we interpret the presence of a similar "pyramidal stone weight" in the sea of Volos and in the south of Italy. Can we propose that these are "stone weights" that were later reused as ballast or as anchors? I do not see why these "stone weights" would not make as good a ballast as dissimilar millstones.[18]

I mentioned earlier similar "stone weights" found in Cyprus. Indeed I was surprised reading Dr. Sophocles Hadjisavvas' thesis and noting that identical "pyramidal stone weights" were used in antiquity in Cyprus, as "olive oil pressing stone weights".

Except for the lead that does not exist in the Cypriot stones, the form is the same and the large horizontal hole as well as the vertical perforation in the apex are well explained and convincibly documented in the context of the olive oil pressing-mechanism.

Is there any relation between the Zea "mooring stone weights" and the "oil pressing stone weights" found in Cyprus? I would say that in both cases these stones were shaped to stand up-right and were used as weights, for two totally different purposes.

A question asked by Miss Frost several years ago as to the provenance of the different type of limestone used for the Zea "pyramidal" stone weights, has now been answered. The provenance of the stone is indeed important because if it came originally from a far away region the proposed theory in this communication would not be acceptable: it would be difficult to explain why stone had to be imported to make "mooring weights", for Zea. At my request Dr. Stathis Styros of the Institute for Geological and Metallurgical Research of Athens (IΓME), kindly examined all the "pyramidal stone weights" of Zea and declared that they all derive from recent geological formations common to all of Attica as well as the neighbouring island of Aegina and the volcanic region of Methana. The same stone formation is also widely found in most of the Cyclades.

To conclude I propose the hypothesis that the most important of the Greek naval ports of classical times that sheltered the larger part of the most up-to-date fleet of superb warships, the trieres, was equipped not only with splendid support buildings, the σκευοθήκη and the νεόσοικοι, but had a modern, ahead of its time, system for mooring, hauling-out and launching. This was the mooring system of Zea that allowed each trieres to have not only her own shed, her οίκος, but also her pre-arranged anchorage on which the ship could count without running the risk of hazards or errors.

NOTES

1. H. Frost, "Pyramidal" Stone Anchors; an inquiry. *Tropis I, Proceedings of the 1st Symposium on Ship Construction in Antiquity*, Piraeus, 1985, Athens (1989) pp. 97-114. In this article all the Zea "anchors" as well as the one found at Volos, the one of Syracuse and the anchors of Madonnina, Ognina and Taranto are illustrated with photographs of thin-sections of 6 anchors from the Hellenic Maritime Museum of Piraues.
2. No records of the discovery are given in the catalogues of the Hellenic Maritime Museum of Piraeus nor of the Archaeological Museum of Piraeus. Looking at the records of The Port of Piraeus Authority (established in 1933) reporting repeated dredging operations at Zea, I believe that it is during such activities that these stone weights were found.
3. Three from the "Madonnina" wreck at Taranto, one from "Ognina" wreck at Syracuse and one from the island of Limosa, South Sicily.
4. The "stone weights" found in Cyprus, although of very similar shape were used in olive pressing devises. See Sophocles Hadjisavvas, "Olive Oil Processing in Cyprus, from the Bronze Age at the Byzantine Period". *Studies in Mediterranean Archaeology*, Vol XCIX (Doctoral dissertation, Göteborg, 1992).

5. It is only after 1835 that Piraeus was gradually organized as a modern port with a population of 300 people, see P. Matzaroglou, *Piraïko Lefkoma*, (in Greek) p. 41, Athens (1977).
6. Piraeus until the end of the Turkish occupation (1827) had only a dozen inhabitants composed of the monks living in the St. Spiridon monastery, the French vice-consul and a servant, and two customs officials. See Liza Micheli, *Piraeus from Porto Leone to the Manchester of the Orient*, p. 45, Athens (1989); Paraskevas Evangelou, *Piraeus during the 1821 revolution* (in Greek) p. 10; Athens (1977). See also an Engraving by Le Roy showing the a.m. buildings, P. Matzaroglou, *supra cit.* p. 39.
7. Illustration no4 from a 1830 drawing gives a vivid impression of Zea's abandonment.
8. Iron anchors of 19th c. design were used for the seatrials. J.D. Morrison and J.F. Coates "An Athenian trireme reconstructed: The British trials of Olympias, 1987", *BAR Int.* ser. 486 p. 24; and J.F. Coates, S.K. Platis (ed.) *The Trireme Trials 1988, Report of the Anglo-Hellenic Sea Trials of Olympias*, Oxford, Oxbow Books (1990).
9 "KYRENIA II" is the full scale replica of the ancient ship of Kyrenia, built between 1981 and 1984.
10. In fact two of the "stone weights" of the Piraeus Archaeological Museum have their top part missing because that particular vertical piercing weaked the top part of these pieces.
11. Prof. George Varoufakis, a chemist specialized in ancient metallurgy kindly examined at my request, these rust stains and recognized them as iron corrosion.
12. Since making this presentation the number of "pyramidal stone weights" has been increased by 9 new pieces found at Dragonera, Kythera (see Addendum), and 6 more stone anchors were also found at other different underwater sites (Pyrgos Dirou, Sounion, Iria, Alonissos, Sounion).
13. In Roman times we have representations showing such working boats assisting vessels in port.
14. This dimension is based on the trieres "Olympias".
15. The difficulty in accommodating 196 ship-sheds in the limited space of Passalimani lead El. Angelopoulos to suggest that this port does not correspond with ancient Zea; see. El. Angelopoulos, *Περί Πειραιώς και των λιμένων αυτού κατά τους αρχαίους χρόνους*, Athens (1898) pp. 143-150; also Lehmann - Hartleben, *Die antiken Hafenlagen des Mittelmeeres*, Leipzing (1923); and H.N. Ulrichs, "Toporaphie der Häfen von Athen", *Abhandl d. Bayer. Akad.*, t. III, p. 647 (1843); and "*Reisen und Forschungen ....*" t. II. p. 156. W. Judeich in "*Topographie von Athen*, vol. III, ii, 2 p. 375-403 of Iwan von Müller "*Handbuch der Klass. Altertumswissenschaft*, Münich (1905) and 2nd ed. Münich (1931), proposes an arrangement in the northern part of the port where each ship-shed could receive two trieres; there is however no archaeological evidence to support this theory.
16. 7 blocks measure 230cm X 230cm X 125cm and weight 15 tons each.
    50 blocks measure 260cm X 200cm X 100cm and weight 12 tons each.
    61 blocks measure 250cm X 165cm X 100cm and weight 6 tons each.
    A very thick chain of 36mm diameter interlinks all these blocks in an intricate pattern and allows the safe mooring of some 70 large and medium sized yachts ranging from 30 to 75 meters in length and up to a gross tonage of 1000 tons for the larger vessels.
17. By the terms of the capitulation to the Spartans, the walls, the arsenals, as well as the shipsheds of Piraeus were destroyed, while the Athenian fleets was limited to only 12 ships. However the ruins of the νεώσοικοι were still visible at the time of Pausanias in 2nd c. AD. (1.1.2.)
18. The ship of Kyrenia had millstones as ballast.

ILLUSTRATIONS

1. Six anchors of the Hellenic Maritime Museum of Piraeus, Zea. (Drawing by H. Frost).
2. Twelve anchors of the Archaeological Museum of Piraus (Drawing by H. Frost).
3.a Stone weights found in Cyprus, used in olive pressing devices. Some are very similar in shape and bear the same perforations as the Piraeus pyramidal stones.
3. b, c, d Representations showing how these stone weights were used for olive pressing. (Source Sophocles Hadjisavvas; see note no. 4).
4. A view of Zea from a drawing entitled "Phalerean Port" made in 1820. (Photograph courtesy of Prof. Hector Williams).
5. Air photograph of today's inner basin of Zea Marina.
6. Plan of the today's yacht marina of Zea; the inner basin coincides with the ancient port (plan made in 1975 for the Greek National Tourist Organization by R. Kaloridas, K. Koliopoulos, I. Anastopoulos).
7. The "pyramidal stone anchor" of the Volos Museum (Photograph by H. Frost).
8. Reconstruction of an anchor with arms and shank held together by a lead collar (after Banoit).
9. Artist's impression of the ancient port of Zea (Drawing by J.E. Coates).
10. The hauling-out process at the Zea Shipsheds as proposed by the author (The Trieres profile is from a drawing by J.F. Coates, the shipshed after Dragatzes).
11 a, b. The shipsheds at Zea (From Dragatzes, 1886).
12 a. Modern mooring concrete blocks of Zea before being placed on the sea bed (Photograph by the author).
12b. Construction details of the concrete blocks of Zea (Plan by N. Mikedakis).
12c. Plan of the outer basin of Zea Marina showing the modern mooring blocks pattern (Plan by N. Mikedakis).
13. Proposed pattern for the arrangement of the mooring stone weights of ancient Zea (Drawing by the author).
14. Drawing showing the proposed mooring arrangements underwater (Drawing by the author).
15. Details of a mooring stone on the sea bed (Drawing by the author).
16a-c Details of the proposed ring encased in the lead securing the chain.

APPENDIX 1

A question that was asked at the end of my communication was if chains existed during the Greek classical times, as in fact the proposed hypothesis greatly relies on the possibility of using a heavy chain in ancient Zea's "mooring system". I have briefly looked into this matter. It seems that the earliest piece of chain known is from Egypt and was found in the tomb of Khosekhemvi of the IInd dynasty. It is made with circular links of beaten copper wire. There are also iron chains of Roman age with twisted links as well as large circular iron links and long links. (See *Tools and Weapons Collection in University College*, London by W. M. Flinders Petrie (1917).Pl. L I - 225, 226 and pl. L XIV - 51, 56).

We know from literary sources that ports were in antiquity protected by κλεῖθρα which could well mean chains. The port of Zea itself was a κλειστός λιμήν protected by an iron chain.

I am indebted to Mr. Charalambos Kritzas, director of the Epigraphic Museum of Athens for the following quotations:

- Diodorus Siculus. XVIII, 64, 4 (318/17 π.Χ.) Ὁ Νικάνωρ ... λάθρα νυκτὸς ἐξαγαγὼν τοὺς στρατιώτας κατελάβετο τὰ τείχη τοῦ Πειραιέως καὶ τοῦ λιμένος τὰ κλεῖθρα. (Transl. Les Belles Lettres: Nicanor ... fit une sortie nocturne et s'empara des remparts du Pirée ainsi que des estacades qui fermaient l'entrée du port). Transl. Loeb: harbour booms.
- Idem, XVIII, 68, 1: παρέλαβε τὸν Πειραιᾶ καὶ τὰ κλεῖθρα τοῦ λιμένος.

Notes P. Goukowsky in "*Les Belles Lettres*" p. 94, note 1: ... Après Chéronée, Lycurgue s'était soucié de munir les ports d'estacades susceptibles d'en interdire l'accès: cf. F.G. Maier. *Griechische Mauerbauinschriften*, I (1959), no10 (*IG II* ^{2}, 244 décret de 337/6) l. 40 sq. ὅπως δ' ἂν καὶ οἱ λιμένες κλείωνται [κλείθροις ὡς ἀσφαλεστάτοις εἰσενεγκεῖν τοὺς ἀρχιτέκτονας τοὺς πα]ρὰ τῆς πόλεως μισθοφοροῦντας.

Philo Byzantius (end 3rd c. BC.) (In his work "Μηχανική σύνταξις") Synt. Mech. V C 52-62 recommande de munir l'entrée des ports d'estacades à chaînes (ἱμητοῖς κλείθροις).

It can be then said that if chains could be made during the Greek classical time large enough to close a port then chains of a smaller size were available for the underwater mooring systems.

APPENDIX 2

Since presenting this communication 9 stone anchors resembling in shape and size some of the "pyramidal stone weights" of Zea have been found by the Greek archaeologist Dimitris Kourkoumelis at Dragonera islet near Kythera during an excavation of the Hellenic Institute of Marine Archaeology. These "stone weights" have many common characteristics with these of Zea and belong certainly to the same phylum.

- All have a more or less pronounced pyramidal shape.

- They are all made of the same stone as the ones of Zea.

- All 9 have a lead filling in their apex. The missing lead of some of the Zea weights could indicate that they were not removed recently from the sea but remained exposed ashore for a long period. Lead was so important in mediaeval and post-mediaeval Greece that often columns were thrown down for the sole purpose of recuperating the small quantity of lead inserted between the drums.

- At least one of the lead fillings from Dragonera bears the specific mark of an iron ring casing attached to its upper part (see Fig. 5, p.248 in this volume).

- All 9 Dragonera "stone weights" show no sign of rope abrasion at the edges of the horizontal hole, common to the upper hole of all stone anchors.

I have considered at length the 9 "pyramidal "stone weights" of Dragonera, studied their photographs and drawings and discussed their position on the sea bed with the excavator. I tend to believe that these are also "mooring stone weights" removed from a permanent "mooring" that were re-used at a later period, as ballast by a ship that sank off Dragonera islet. This would explain why they were made from the same material as the Zea "pyramidal stone weights".

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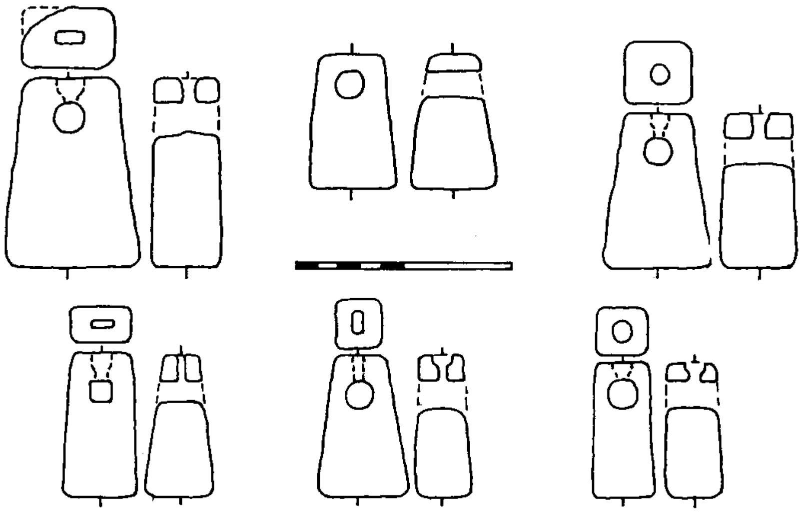


Fig. 1

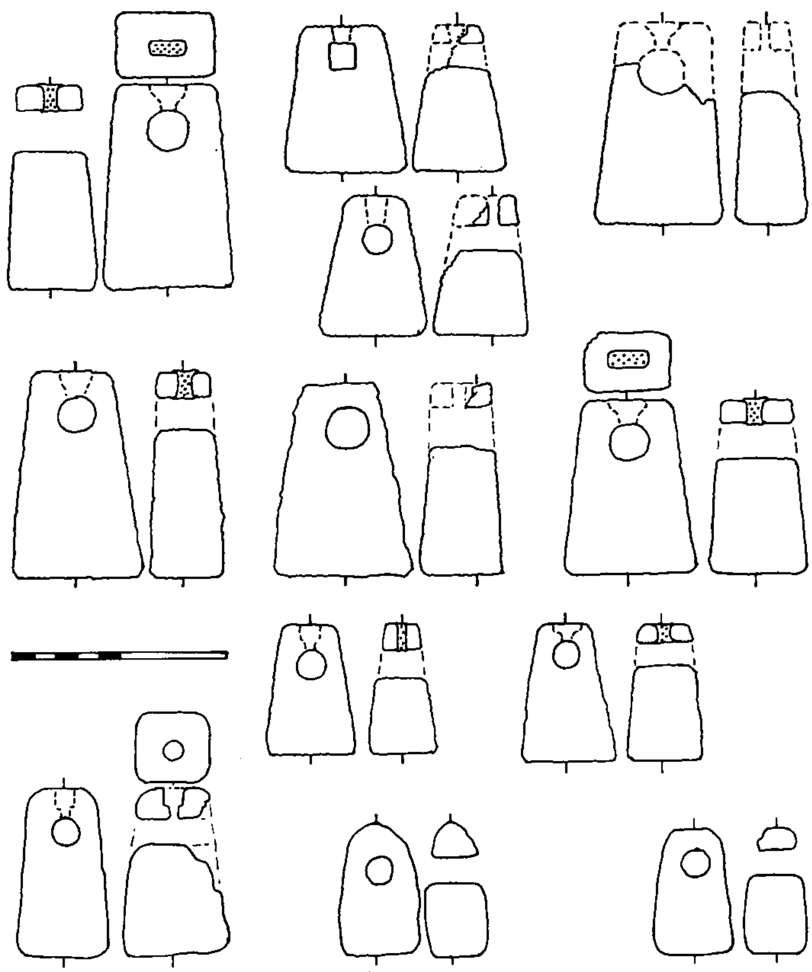


Fig. 2

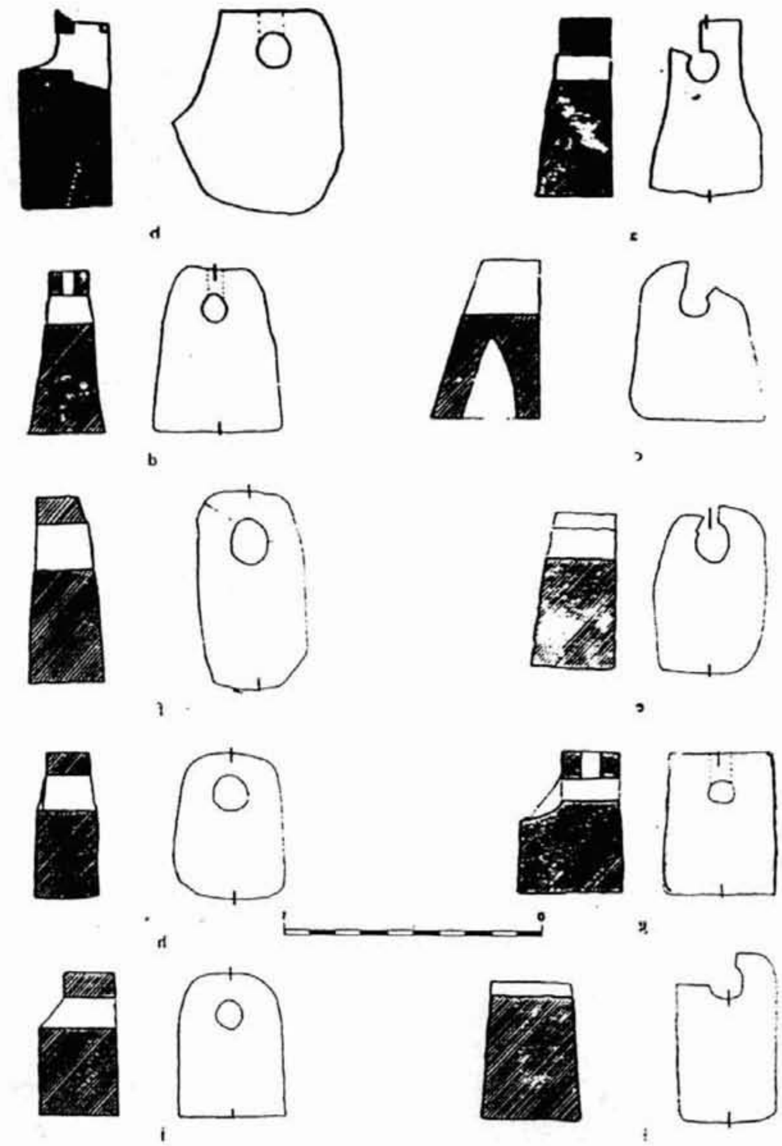


Fig. 3a

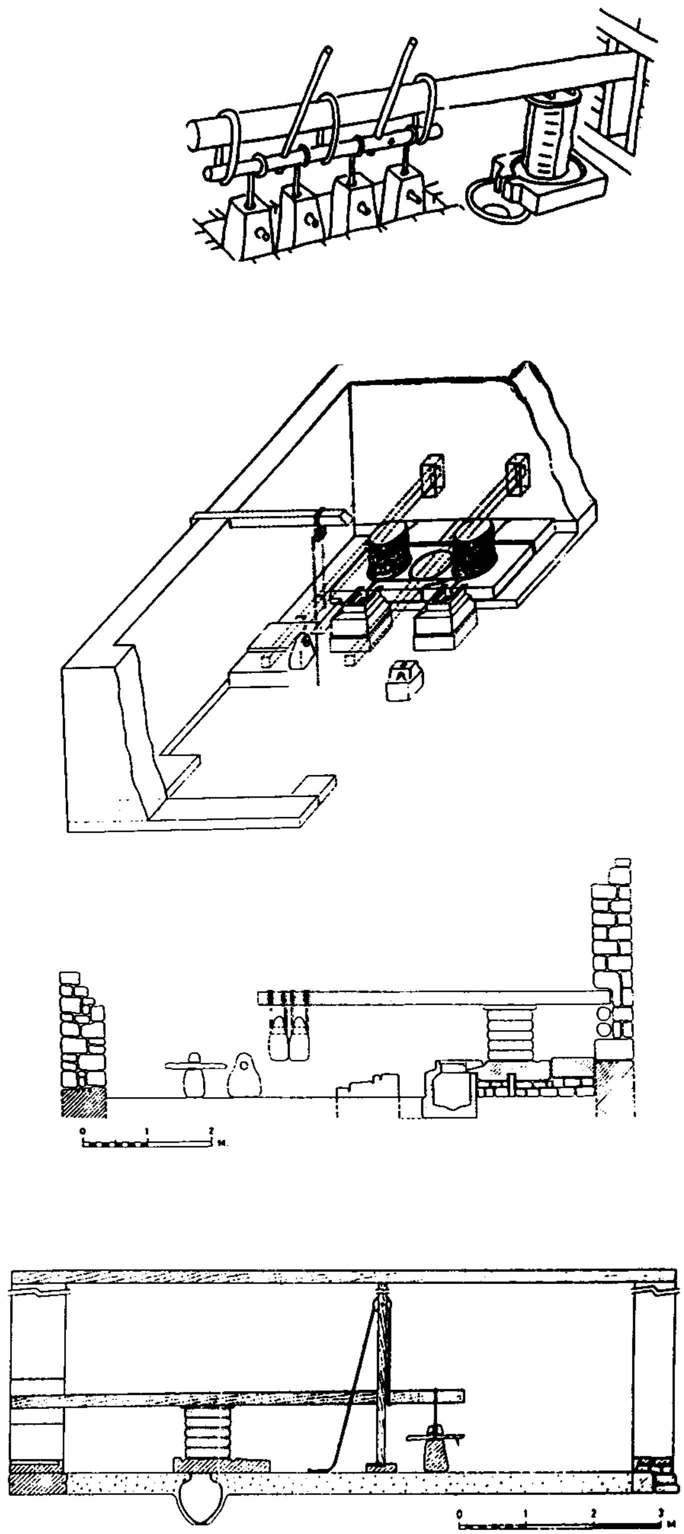


Fig. 3b

Fig. 4

Fig. 5

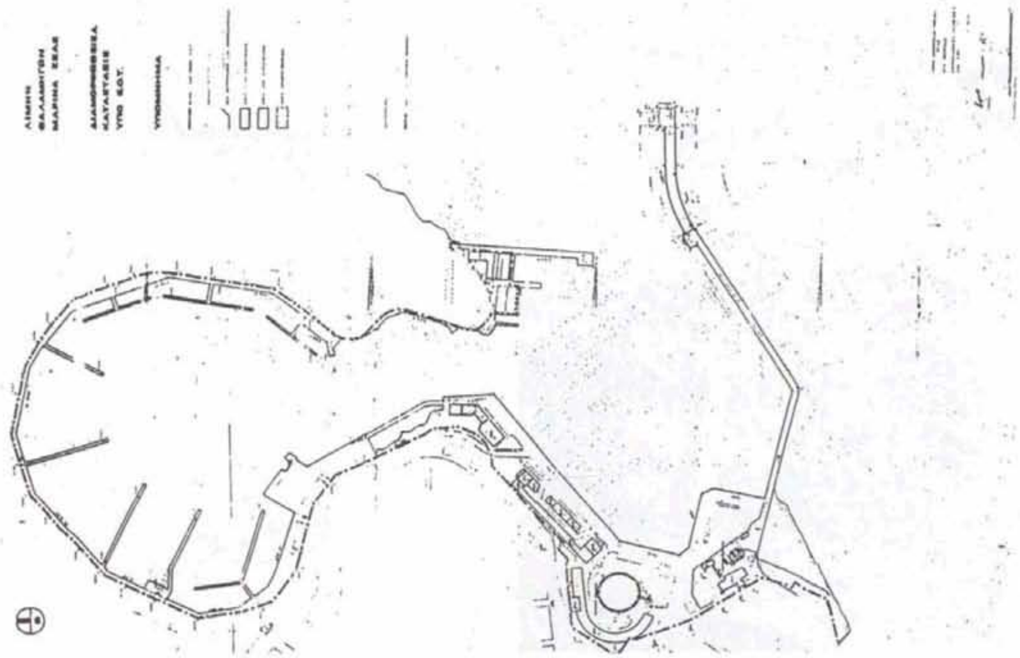


Fig. 6

Fig .7

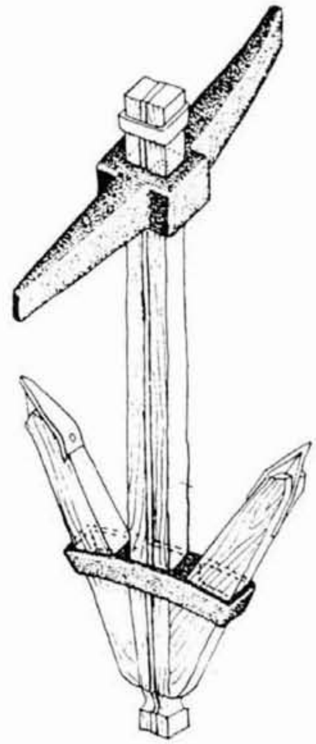


Fig. 8

Fig. 9

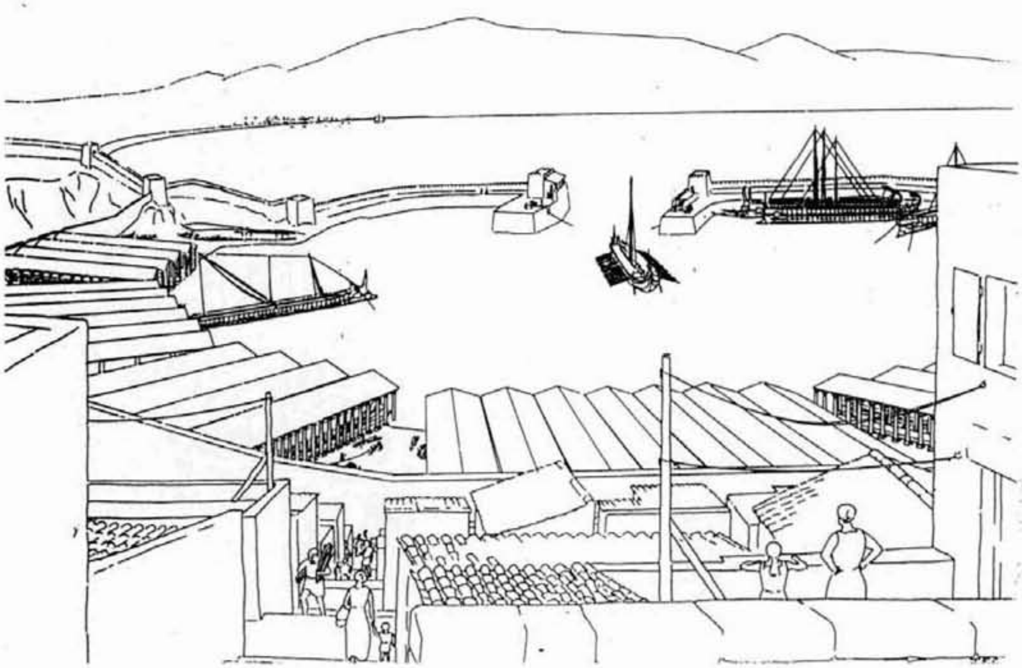


Fig. 10

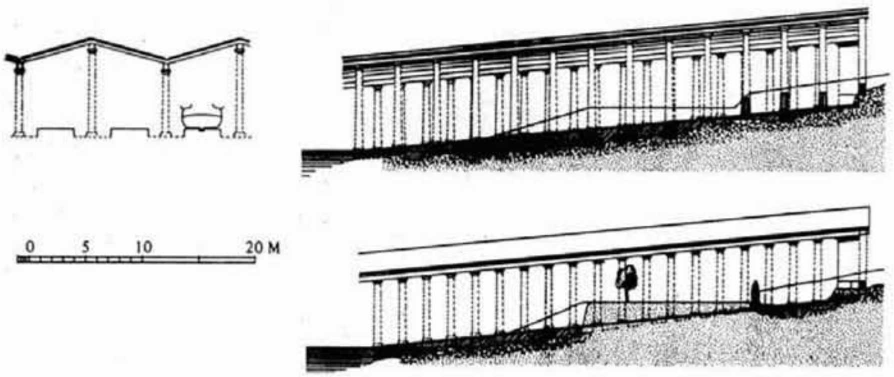


Fig. 11a

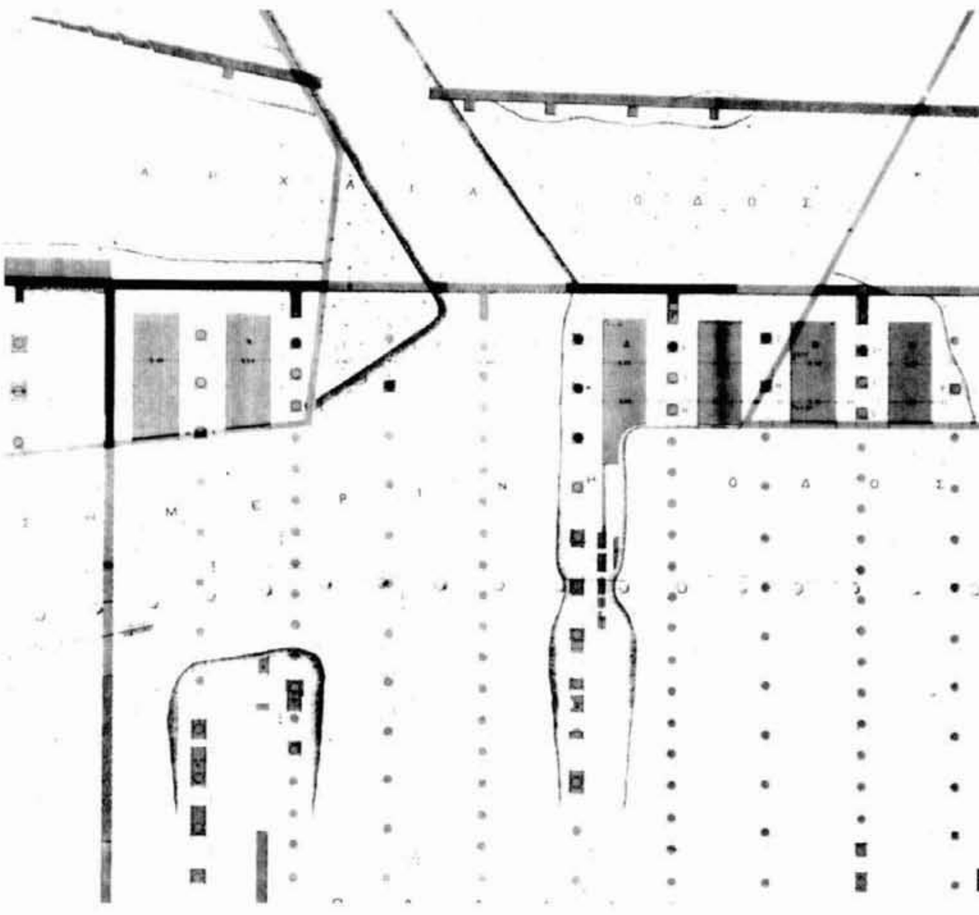


Fig. 11b

Fig. 12a

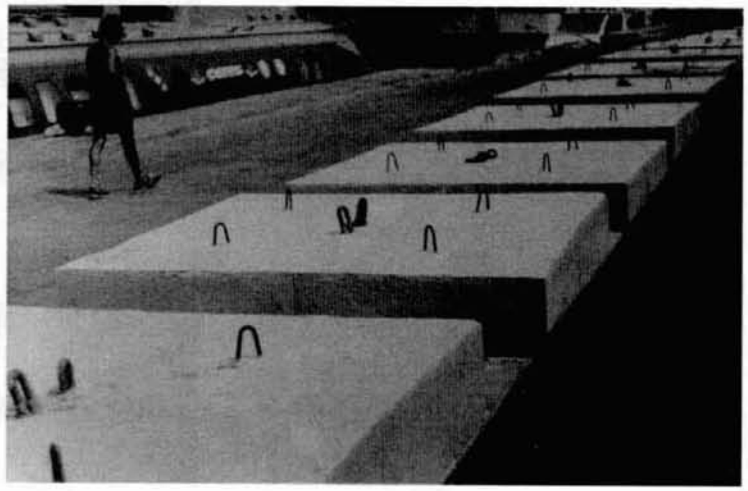


Fig. 12b

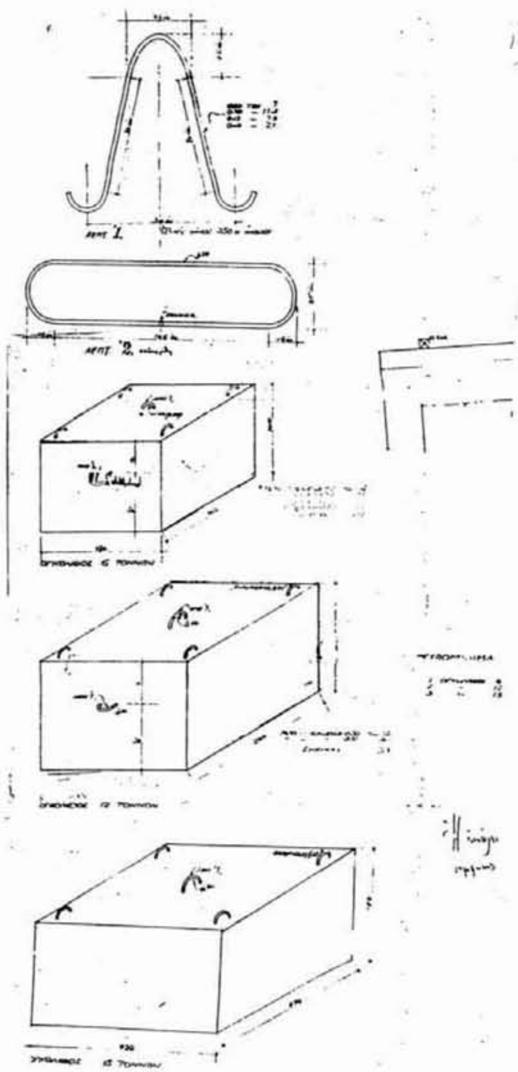
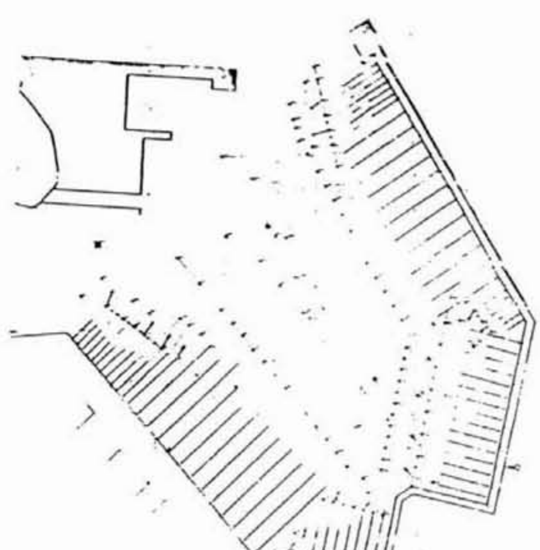


Fig. 12c



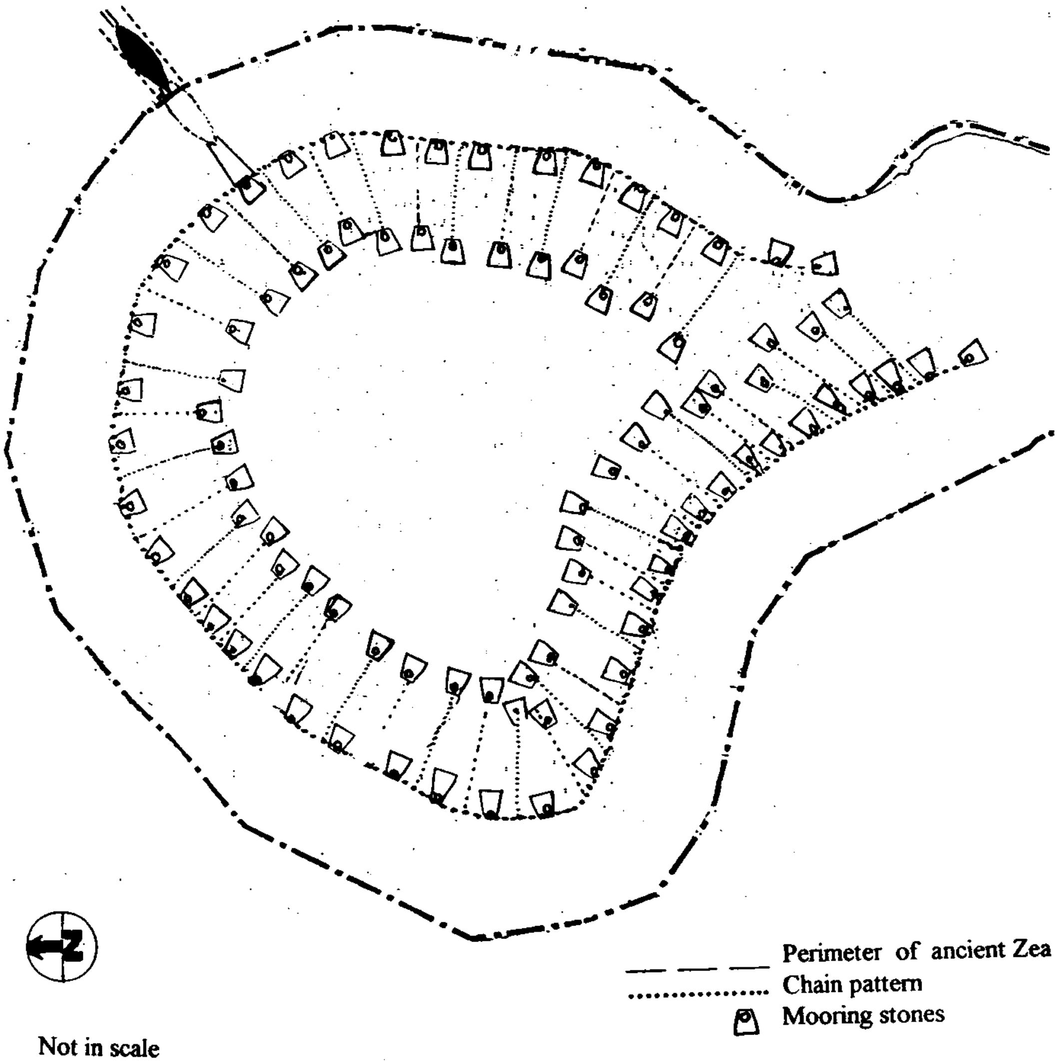

Perimeter of ancient Zea
Chain pattern
Mooring stones
Not in scale

Fig. 13

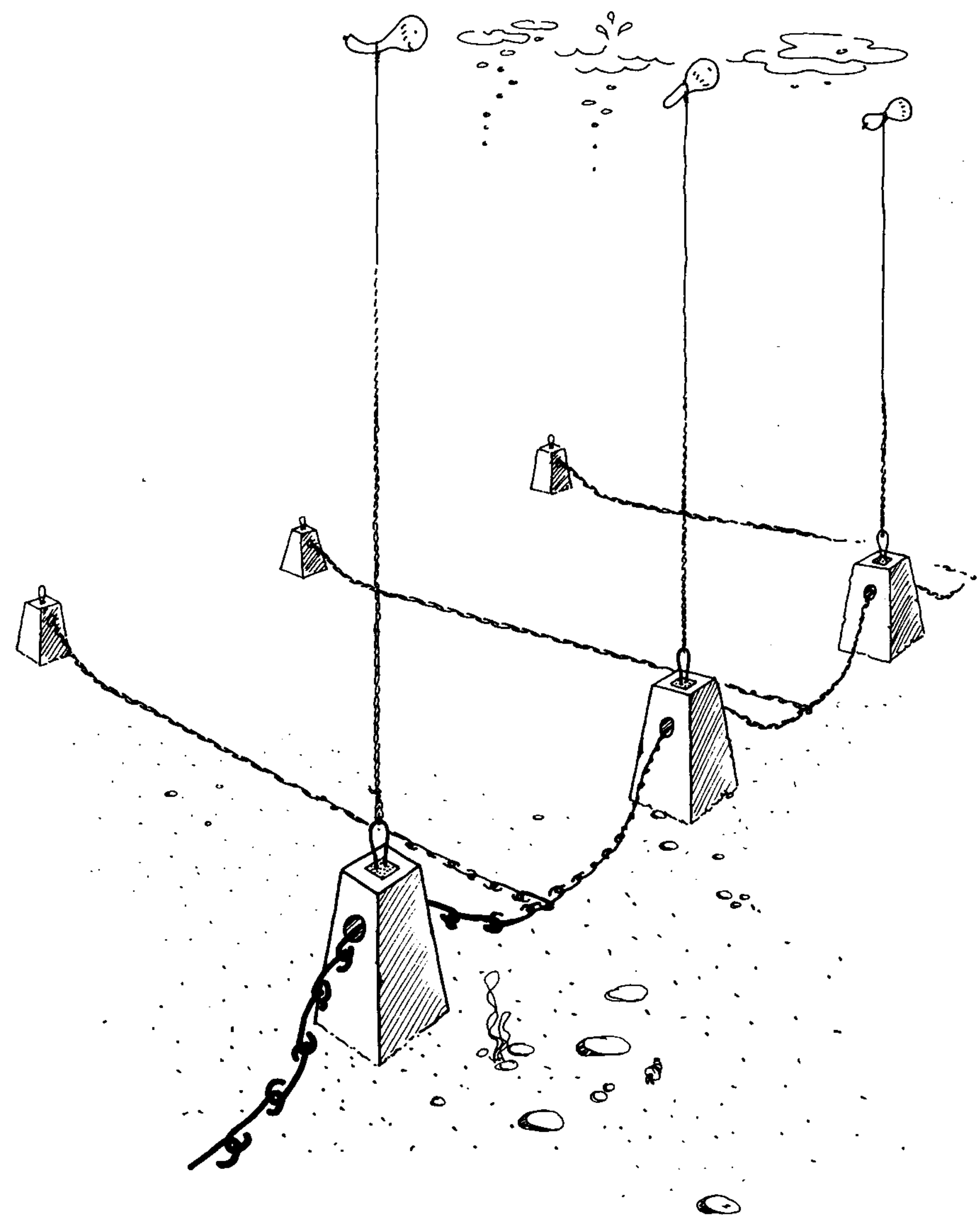


Fig. 14

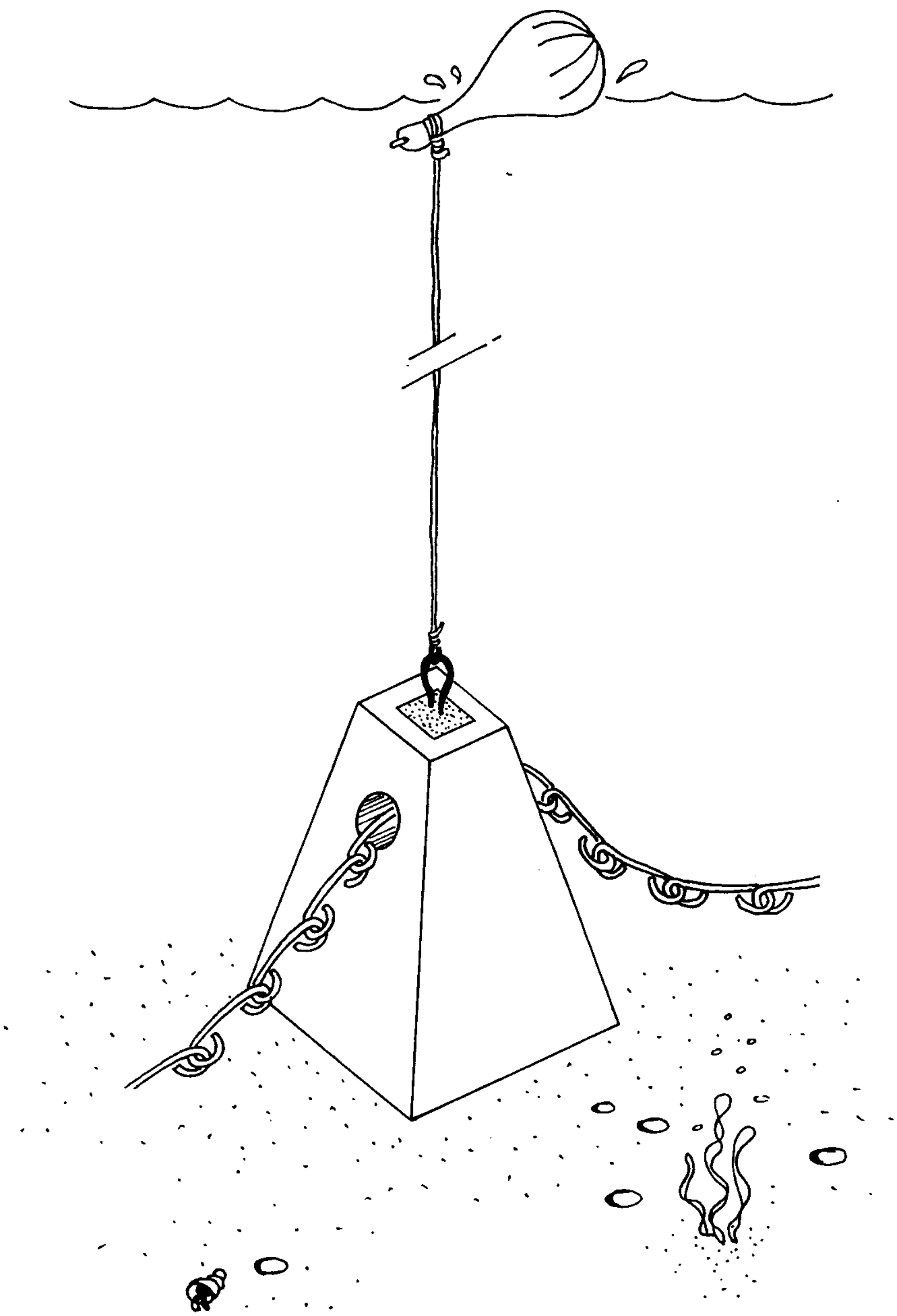


Fig. 15

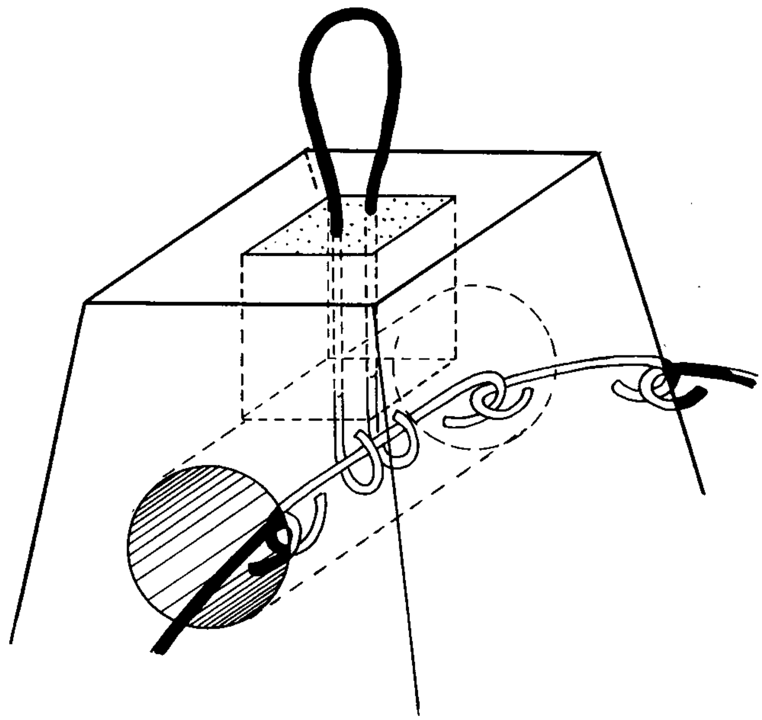


Fig. 16a

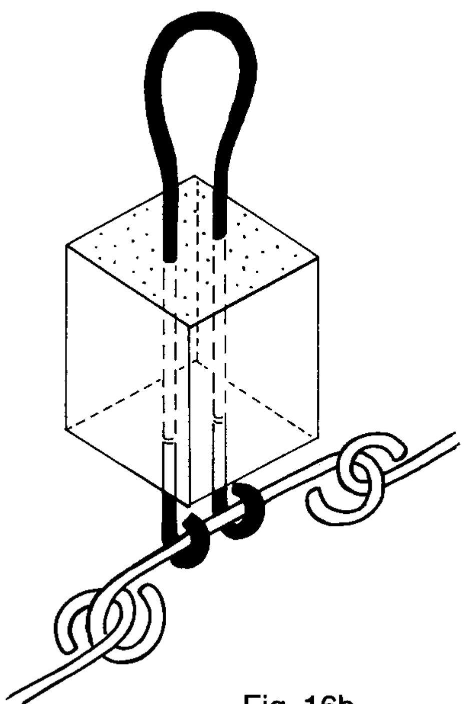


Fig. 16b

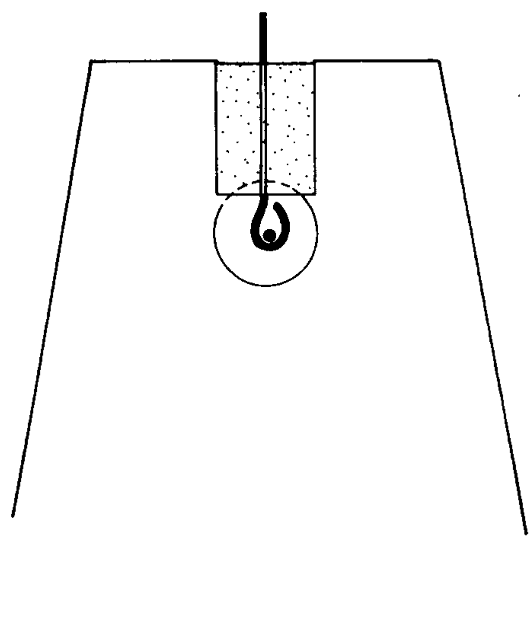


Fig. 16c

ΛΑΤΡΕΙΑ ΤΟΥ ΠΟΣΕΙΔΩΝΑ ΣΤΗΝ ΗΠΕΙΡΟ

Ο Ποσειδών[1], θεός κατεξοχήν της θάλασσας[2], στην ορεινή και μακρινή Ήπειρο δεν λατρεύτηκε με την ιδιότητα αυτή, αλλά ως χθόνιος θεός[3] και ως γαιήοχος, εννοσίγαιος και ενοσίχθων, δηλαδή θεός των Σεισμών[4].

Παράλληλα είχε και μαντικές ιδιότητες[5], όπως προκύπτει από χωρία της Οδύσσειας (λ,118 κε και ψ.256 κε), σύμφωνα με τα οποία υπήρχε Ιερό και Μαντείο του Ποσειδώνα στο εσωτερικό της Ηπείρου[6].

Στόχος μας είναι να σκιαγραφήσουμε τη λατρεία του Ποσειδώνα, με βάση τις φιλολογικές μαρτυρίες, τις επιγραφές και τα αρχαιολογικά δεδομένα και να επισημάνουμε τις θέσεις λατρείας του θεού στην αρχαία Ήπειρο.

Κύριος τόπος λατρείας του Ποσειδώνα ως χθόνιου θεού στην Ήπειρο υπήρξε το Νεκρομαντείο του Αχέροντα, κοντά στη μυκηναϊκή εγκατάσταση της Εφύρας, στις βόρειες όχθες του Αχέροντα ποταμού[7].

Το Ιερό που έφεραν στο φως οι ανασκαφικές έρευνες χρονολογείται στα τέλη του 4ου με αρχές 3ου αι. π.Χ. και αποτελείται από το τέμενος και το κεντρικό οικοδόμημα της λατρείας, καθώς και την υπόγεια αίθουσα, κρύπτη περίκλειστη και χωρίς είσοδο[8]. (πίν.1).

Η μορφή του Ιερού θυμίζει τον ελληνιστικό τύπο ανατολικής καταγωγής του μαυσωλείου με την υπόγεια αίθουσα και το υπέργειο μνημείο[9].

Αν και η παλαιότερη από τον 4ο αι. π.Χ. μορφή του Ιερού δεν είναι γνωστή, είναι όμως δυνατόν να ανασυνθέσουμε την αρχική λατρεία στηριζόμενοι στις φιλολογικές πηγές (Όμηρος, Ηρόδοτος) και τα άλλα αρχαιολογικά ευρήματα, τα οποία χρονολογούνται από την Προϊστορική εποχή[10].

Στη θέση άλλωστε της Εφύρας[11] υπήρξε πιθανόν ανοικτός εγχώριος οικισμός η Κίχυρος, όπως δείχνουν τα όστρακα της τοπικής κεραμεικής της εποχής του χαλκού[12].

Την αρχαιότερη φιλολογική μαρτυρία για τη λατρεία στο Νεκρομαντείο δίδει η Οδύσσεια. Και συγκεκριμένα στο κ,488 κε. η μάγισσα Κίρκη συμβουλεύει τον Οδυσσέα να μεταβεί «εἰς Ἀΐδαο δόμους καί ἐπαινῆς Περσεφονείας» για να πάρει χρησμό από τον τυφλό μάντη Τειρεσία, πως θα γυρίσει στην πατρίδα του, την Ιθάκη[13].

Όπως προκύπτει λοιπόν από τις φιλολογικές μαρτυρίες κύρια θεότητα στο Νεκυομαντείο ήταν η Περσεφόνη[14]. Την άποψη αυτή ενισχύουν και τα πήλινα ειδώλια των αρχαϊκών, των κλασικών και των ελληνιστικών χρόνων που προέρχονται από το Ιερό και εικονίζουν τη θεά του Κάτω Κόσμου με «πόλο» και καλύπτρα[15].

Όσον αφορά το χρόνο που καθιερώθηκε η λατρεία της Περσεφόνης στο Νεκρομαντείο του Αχέροντα οι περισσότεροι μελετητές, όπως οι καθηγητές Hammond[16] και Δάκαρης[17], την ανάγουν στην Προϊστορική εποχή και την θεωρούν ως συνέχεια της λατρείας της Μεγάλης Θεάς που λατρευόταν σε ολόκληρη την Ανατολική Μεσόγειο και τη Δωδώνη.

Στη συνέχεια η Περσεφόνη ή Φερσεφόνη, Προϊστορική θεά της ευφορίας και της βλαστήσεως, της ζωής και του θανάτου, συλλατρεύθηκε στον Αχέροντα με τον Ποσειδώνα-Άδη[18], λατρεία που ήρθε στην Ελλάδα κατά τους Μεσοελλαδικούς χρόνους και στην Ήπειρο γύρω στο 2000π.Χ./1900π.Χ. με την άφιξη των πρώτων ελληνικών φύλων, των Θεσπρωτών.

Αναφορικά με τον Ποσειδώνα και τη σχέση του προς την ευφορία της γης, τα πηγαία ύδατα, τα έγκατα της γης, τον κόσμο των νεκρών και τους σεισμούς ανέπτυξε ο Schachermeyr[19] στο έργο του για «τον Ποσειδώνα και την προέλευση των περί θεών ελληνικών δοξασιών» και υποστήριξε τον παλαιό δεσμό του Ίππιου Ποσειδώνα προς τη Δήμητρα και τις θεότητες του Κάτω Κόσμου.

Τη χθόνια αυτή φύση του θεού στο Νεκυομαντείο του Αχέροντα επιβεβαιώνουν τα σύμβολά του, όπως ο Πήγασος, η τρίαινα, τα οποία απαντούν μαζί με την προτομή της Περσεφόνης στα νομίσματα του 4ου αι.π.Χ. των Ελεατών[20] στη δικαιοδοσία των οποίων υπαγόταν το Ιερό.

Πρόκειται για χάλκινα νομίσματα, διάρκειας 20-30 ετών (360/350-330/325π.Χ), τα οποία προορίζονταν για τις εσωτερικές ανάγκες και περιλάμβαναν πέντε ομάδες[21]. Στην πρώτη ομάδα που χρονολογείται γύρω στο 360-342π.Χ. εικονίζεται στον εμπροσθότυπο φτερωτός Πήγασος προς τα δεξιά και στον οπισθότυπο τρίαινα (πίν. 2), κυνή Άιδου και επιγραφή ΕΛΕΑΙ(ΩΝ) ή ΕΛΕΑΤΑΝ[22].

Στις άλλες ομάδες που χρονολογούνται από το 342-325π.Χ. εικονίζεται στον εμπροσθότυπο κεφαλή Περσεφόνης, ενώ στον οπισθότυπο απαντούν νομισματικά σύμβολα, που συνδέονται με την κυριότερη λατρεία των Θεσπρωτών, της Περσεφόνης και του Άδη, όπως τρικέφαλος Κέρβερος, τον οποίο συνοδεύει η επιγραφή ΕΛΕΑΤΑΝ.

Τα ίδια σύμβολα χρησιμοποίησε και το Κοινό των Θεσπρωτών, το οποίο έκοψε νομίσματα για σύντομο χρονικό διάστημα από το 335-330/325π.Χ με την επιγραφή ΘΕ(ΣΠΡΩΤΩΝ). Η κοπή αυτή επιβεβαιώνει την πολιτική σημασία της Ελέας ως κέντρο Θεσπρωτικό[23].

Ως χθόνιος θεός ο Ποσειδών τιμήθηκε στο ακρωτήριο Ταίναρο, Ποσειδών Ταινάριος, όπως προκύπτει από τις φιλολογικές πηγές και τα αρχαιολογικά ευρήματα. Ο θεός λατρεύτηκε σε τέμενος, όπου υπάρχει σπήλαιο εισόδου στον Κάτω Κόσμο, καθώς και Ψυχοπομπείο, το οποίο σύμφωνα με τις πηγές βρισκόταν σε ακμή κατά τον 7ο αι.π.Χ. (Πλουτ. *Περί των υπό του θείου βραδέως τιμωρουμένων* 17 και Παυσ. 3.25.5). Ωστόσο ο θεός εδώ τιμήθηκε μόνος, αφού δεν υπάρχουν ενδείξεις παρουσίας της Περσεφόνης ή άλλης παρέδρου του Ποσειδώνα[24].

Ανάλογο μαντικό Ιερό στην Ήπειρο αφιερωμένο στον Ποσειδώνα με την ιδιότητα του χθόνιου θεού υπαινίσσονται δύο χωρία της Οδύσσειας (λ.118κε., ψ.215κε). Ο Οδυσσέας σύμφωνα με τη συμβουλή του μάντη Τειρεσία έπρεπε, ύστερα από το φόνο των μνηστήρων, να μεταβεί σε τόπο, όπου οι άνθρωποι δεν γνωρίζουν τη θάλασσα και δεν χρησιμοποιούν αλάτι στην τροφή τους, για να εξιλεώσει με θυσίες τον Ποσειδώνα.

Τη θέση αυτή οι Σχολιαστές του Ομήρου τοποθετούν στα Βούνειμα της Ηπείρου, κοντά στην άγνωστη πόλη Τράμπυα[25] ή στη θέση Κελκέα[26] «ἐν οἷς Ὀδυσσεύς τόν Ποσειδῶνα ἐτίμησε», ενώ παράλληλα δίδουν και όλα τα είδη ζώων, τα οποία ο Οδυσσέας έπρεπε να θυσιάσει, όπως κριό, κάπρο και ταύρο. Έτσι στον Ευστάθιο Σχόλια στην Ομήρου Οδύσσεια λ.στ.120 κε διαβάζουμε:

> *«Βούλεται δὲ ἡ τοῦ Τειρεσίου παραίνεσις λαβεῖν τὸν Ὀδυσσέα κώπην ἐπὶ τοῖς ὤμοις καὶ ὁδεύειν ἕως ἂν εἶς ἄνδρας ἔλθοι μὴ εἰδότας θάλασσαν ἢ ἐμβρωματιζομένους μετὰ ἁλῶν ἢ ἐπιστήμονας νηῶν, ἵνα δηλαδὴ τιμηθῇ Ποσειδῶν ἠπειρώτης ἐν τόποις οἷς οὐ φέρεται αὐτοῦ ὄνομα...*
>
> *οἱ δὲ παλαιοί καί τινων τοπικῶν ὀνομάτων βαρβαροφώνους δούπους ἱστοροῦσι, Βουνίμαν λέγοντές τινὰ ἢ Κελκέαν, ἐν οἷς Ὀδυσσεύς τὸν Ποσειδῶνα ἐτίμησε καὶ ταῦτα μὲν τοιαῦτα»*

Ανάλογη αναφορά έχουμε και στον Στέφανο Βυζάντιο, ο οποίος, αφού τοποθετεί τα Βούνειμα στην Ήπειρο, δίδει και το είδος της θυσίας στο θεό, που πρόκειται για ταύρο.

> *«Βούνειμα, πόλις Ἠπείρου, οὐδετέρως, κτίσμα Ὀδυσσέως, ἣν ἔκτισε πλησίον Τραμπύας, λαβὼν χρησμόν ἐλθεῖν πρὸς ἄνδρας οἵ οὐκ ἴσασι θάλασσαν· βοῦν οὖν θύσας ἔκτισε»*[27].

Είναι γνωστή εξάλλου η ιερότητα του ταύρου στην Ήπειρο και η σύνδεσή του με τον Ποσειδώνα, σύμφωνα με επιγραφικές μαρτυρίες και απεικονίσεις του ταύρου σε αναθηματικές στήλες στο θεό[28]. Οι περισσότερες επιγραφές που αναφέρονται στη λατρεία του Ποσειδώνα στην Ήπειρο χρονολογούνται στον 3ο και 2ο αι. π.Χ. και προέρχονται από περιοχή σεισμοπαθή κοντά στο Τεπελένι. Είναι χαραγμένες σε στήλες, αναθηματικές στο θεό[29] και δύο από αυτές διακοσμούνται με ταύρο, ιερό ζώο του θεού[30]. Η πρώτη στήλη (πίν.3) βρέθηκε στο χωριό Σάλιαρη, ΒΔ από το Τεπελένι[31] και πρόκειται για ασβεστολιθική στήλη, η οποία φέρει ανάγλυφο ταύρο και καταλήγει σε επίκρανο με κυμάτιο. Ο ταύρος δεσπόζει στο κέντρο στραμμένος προς τα αριστερά με ελαφρά κλίση της κεφαλής προς τα εμπρός.

Η επιγραφή, αποτελείται από οκτώ στίχους από τους οποίους οι τρεις είναι χαραγμένοι στην επίστεψη της στήλης, ενώ οι υπόλοιποι φτάνουν μέχρι την παράσταση του ταύρου.

Οι πέντε πρώτοι στίχοι δίδουν τα ονόματα τεσσάρων ανδρών, οι οποίοι μαζί με το Κοινό των Συγγόνων, δηλαδή αυτών που ανήκουν στο ίδιο γένος, ανάθεσαν στον Ποσειδώνα τη στήλη αυτή. Στη συγκεκριμένη στήλη πρόκειται για ένωση των συγγενών[32] σε κοινό προκειμένου να προσφέρουν θυσία στον Ποσειδώνα. Η θυσία στο θεό θα ήταν ο ταύρος ή το πιθανότερο η ανάθεση της στήλης επάνω στην οποία ανάγλυφα δεσπόζει ο ταύρος.

Σχετικά με την ανάγνωση της επιγραφής, η οποία χρονολογείται στον 3ο με αρχές 2ου αι.π.Χ. σύμφωνα με τη μορφή των γραμμάτων, έχουν προταθεί από τους μελετητές διάφορες συμπληρώσεις κυρίως όσον αφορά το πρώτο τμήμα, το οποίο δεν σώζει όλα τα γράμματα: Ο Ευαγγελίδης προτείνει την παρακάτω ανάγνωση[33].

Ονα--ος/Ξένων Λυκίσσο(τ)υ/--Ν(ε)στο σ. Λυ.τα/
Νίκανος/Φιλίσστου/ καὶ τὸ Κοινὸν τῶν /Συγγό/-νων/
Ποσειδῶνι εὐχάν/.

Ο Hammond[34] διαβάζει :

-----χος-----/Ξ(έ)νων Λυκίσσκου/ Νέστος
Λυ(κ)ώτ. / Νίκανος/ Φιλίσστου/ καὶ [τὸ] Κοινὸν
τῶν/Συγγόνων /Ποσειδῶνι εὐχάν/.

Και ο Franke[35]:

[Κλ]εόμαχος Ν[ικάνο]υ/Ξένων Λυκίσσκου/
[Φί]λισστος Λυκώτα/Νίκανος/Φιλίσστου/ καὶ
τὸ Κοινὸν τῶν /Συγγόνων/Ποσειδᾶνι εὐχάν/.

Οι διάφορες αναγνώσεις της επιγραφής που προτείνονται συνοψίζονται στο κριτικό υπόμνημα του SEG ως εξής[36]:

[Κλ]εόμαχος Ν[ικάνο]υ/Ξένων Λυκίσσκου/
[Φί]λισστος Λυκώτα/ Νίκανος / Φιλίσστου/
καὶ τὸ Κοινὸν τῶν συγγόνων /Ποσειδᾶνι εὐχάν/.

Η διαφορετική εξάλλου ανάγνωση της επιγραφής οδήγησε τους μελετητές στη διατύπωση ορισμένων προβληματισμών.

Ενδιαφέρουσα είναι η άποψη του Hammond[37], ο οποίος προτείνει την ανάγνωση Νέστος στην τρίτη σειρά και θεωρεί ότι πρόκειται για τους Νεσταίους, φύλο της βορείου Ηπείρου, το οποίο αναφέρει και ο Απολλώνιος ο Ρόδιος (4.1211).

Μία άλλη παρατήρηση αφορά τόν τόπο από τον οποίο κατάγεται η στήλη και η λατρεία γενικότερα του Ποσειδώνα στην Ήπειρο. Και συγκεκριμένα ο Franke[38] πιστεύει ότι η στήλη προέρχεται από περιοχή κοντά στο Βουθρωτό, όπου υπάρχει λατρεία του θεού, στον Ογχησμό, όπως παραδίδει ο Στράβων (7.7.5). Ο συσχετισμός αυτός τον οδηγεί να δεχτεί ως τόπο προέλευσης της λατρείας του Ποσειδώνα την αντικρυνή Κέρκυρα, όπου ο θεός τιμήθηκε ιδιαίτερα[39].

Ωστόσο, θεωρούμε ως πιθανότερο τόπο προέλευσης της στήλης και της λατρείας του Ποσειδώνα την περιοχή του Τεπελενίου, όπου βρέθηκαν και άλλες στήλες αναθηματικές στο θεό. Οι στήλες αυτές συνδέονται με την ιδιαίτερη λατρεία του Ποσειδώνα εννοσίγαιου και γαιήοχου, θεού των σεισμών, στη σεισμοπαθή περιοχή του Τεπελενίου[40].

Από την ίδια περιοχή και συγκεκριμένα από το Kamcisht βορειοδυτικά του Τεπελενίου προέρχεται δεύτερη στήλη αναθηματική στον Ποσειδώνα[41] (πίν. 4).

Η στήλη δεν σώζεται ολόκληρη και φέρει στην επίστεψη εγχάρακτη επιγραφή ΠΟCCIΔΑΝΙ και ανάγλυφο ταύρο προς τα δεξιά με την κεφαλή ελαφρά προς τα εμπρός. Το ανάγλυφο ορίζουν δεξιά και αριστερά κιονίσκοι και η στήλη σύμφωνα με την μορφή των γραμμάτων χρονολογείται στα ρωμαϊκά χρόνια[42].

Ενδιαφέρουσα είναι η απεικόνιση του ταύρου και σε θραύσμα από τρίτη[43] στήλη που βρέθηκε στην ίδια περιοχή του Τεπελενίου και την οποία ο Hammond συνδέει με τον Ποσειδώνα. Στο υπάρχον τμήμα μπορεί να διακρίνει κανείς βραχύ κέρας άγριου ταύρου και χαραγμένη αναθηματική επιγραφή: Από την ανάγνωση της επιγραφής προκύπτει ότι ο Πραγισσός, γυιός του Νικοδάμου και η γυναίκα του Τιμοδίκα αφιέρωσαν για το γυιό τους τη στήλη αυτή πιθανόν στον Ποσειδώνα.

Πραγισσὸς/Νικοδάμου/Γυνὰ/Τιμο/δίκα/ὑπὲρ/
υἱοῦ/εὐχάν.

Ανάλογη λατρεία είχε ο Ποσειδών και στην Αντιγόνεια[44], όπως μπορούμε να υποθέσουμε από τις επιγραφικές μαρτυρίες και τα άλλα αρχαιολογικά ευρήματα. Από την Yerma[45] που κατέχει τη θέση της αρχαίας Αντιγόνειας προέρχεται ενεπίγραφη στήλη, αναθηματική στον Ποσειδώνα.

Η επιγραφή χαραγμένη σε έξ στίχους χρονολογείται με βάση τη μορφή των γραμμάτων στον 2ο/1ο αι. π.Χ.[46] και είναι η εξής:

Συμ/μαχἶ/ς Ποσι/δᾶνι/εὴχ/άν[47].

Στην Αντιγόνεια βρέθηκε επίσης χάλκινο αγαλματίδιο[48] του δεύτερου μισού του 3ου αι. π.Χ.[49] (πίν.5), το οποίο εικονίζει το θεό γυμνό, όρθιο με υψωμένο το αριστερό χέρι, στο οποίο θα κρατούσε τρίαινα και στο εκτεταμένο δεξιό φιάλη.

Το αγαλματίδιο, μετάπλαση έργου του Λυσίππου, αποδίδει το θεό με τονισμό των μυών και τα σύμβολά του, κυρίως την τρίαινα, τα οποία συνηγορούν ότι πρόκειται για τον Ποσειδώνα[50]. Την ιδιαίτερη λατρεία που γνώρισε ο Ποσειδών στο βόρειο τμήμα της Ηπείρου επιβεβαιώνει ενεπίγραφη στήλη του τέλους του 3ου αι. π.Χ. αναθηματική στον Ποσειδώνα[51] από τη Φοινίκη κέντρο των Χαόνων και έδρα του Κοινού των Ηπειρωτών μετά το 170π.Χ.[52].

Πρόκειται για ορθογώνια ασβεστολιθική στήλη που βρέθηκε στις ανασκαφές της Ακρόπολης της Φοινίκης σε δεύτερη χρήση και σύμφωνα με το περιεχόμενο της επιγραφής είναι απελευθερωτική. Η στήλη είχε ανατεθεί σε ιερό του Ποσειδώνα στη Φοινίκη[53].

Η τελική ανάγνωση της επιγραφής ύστερα από συμπληρώσεις έγινε από τον καθηγητή Cabanes[54] και είναι η παρακάτω:

[Ἀγαθᾶι]τύχα[ι/' στρα]-
[ταγοῦ[ντος Ἀπ[ειρω]-
[τᾶν] Μενάνδρο [υ]
.. ρκατου, προστα-
[τεύοντος Χαόνων]
—
—
—
—
—
—
ἀνέθηκε ἱερόν τῶι Πο-
τειδᾶνι ἀνέφαπτον
[Δ]άζον <τὸν> τὸν δοῦ-
λον. Νίκαρχος Νικομά-
χου Ἀρβαῖος καὶ Νικόμα-
χος καὶ Μνασαρέτα
καὶ Παμφίλα καὶ Ξενο-
τίμα κατὰ τὸν νόμον
μάρτυρες· τῶν ἀρ-
χόντων

Επί στρατηγών των Ηπειρωτών Μενάνδρου ·ρκατου, και του προστάτη των Χαόνων.

....

αφιέρωσε στον Ποσειδώνα τον Δάζο το δούλο του. Ο Νίκαρχος ο γυιός του Νικομάχου, ο Αρβαίος και ο Νικόμαχος και η Μνασαρέτη και η Παμφίλα και η Ξενοτίμα ήταν μάρτυρες σύμφωνα με το νόμο και μάρτυρες των αρχόντων. (προφανώς λείπουν τα ονόματα).

Η στήλη που είχε λαξευθεί στα δύο άκρα φέρει την επιγραφή χωρισμένη σε δύο ενότητες.

Με τη λατρεία του Ποσειδώνα στη Φοινίκη ο Franke[55] συνδέει τα ασημένια νομίσματα του Κοινού των Ηπειρωτών που κόπηκαν γύρω στο 200π.Χ. και συγκεκριμένα τα δίδραχμα, τα οποία φέρουν στον εμπροσθότυπο τις κεφαλές του Δία και της Διώνης και στον οπισθότυπο ταύρο και την τρίαινα (πίν. 6), το σύμβολο του Ποσειδώνα[56]. Στη λατρεία επίσης του Ποσειδώνα ο Franke[57] αποδίδει ναό σε μία άλλη περιοχή κοντά στα Ακροκεραύνια.

Από το ναό σώζεται μόνο ένας κίονας και τα θεμέλιά του, ενώ μία κρήνη που βρίσκεται στην Απολλωνία[58] ο ίδιος ερευνητής θεωρεί ως κρήνη του Ποσειδώνα[59].

Ιδιαίτερο εξάλλου ενδιαφέρον για τη φύση του θεού ο οποίος, όπως είδαμε, λατρεύτηκε κυρίως σε περιοχές του εσωτερικού της Ηπείρου, παρουσιάζει η λατρεία του Ποσειδώνα στην ορεινή Αθαμανία[60].

Σύμφωνα με επιγραφή που βρέθηκε στην Κέρκυρα[61] και αφορά συνθήκη καθορισμού των συνόρων ανάμεσα στην Αθαμανία και σε άλλη περιοχή που δυστυχώς δεν σώζεται, ο θεός λατρευόταν στην Αθαμανία, όπου υπήρχε ιερό του Ποσειδώνα. Η επιγραφή με βάση τη μορφή των γραμμάτων χρονολογείται στις αρχές του 2ου αι. π.Χ. γύρω στο 180 π.Χ. Η ανάγνωσή της είναι η εξής:

> [Ἀ]θαμάνων περὶ--/καταβάντων τᾶι Πε--/
> εἰς ὁμόλογον καὶ ἀπὸ τᾶς.../--ἐξ ἂν ὁρίζειν τὰς
> κώμας-/βολὰ λίθων καὶ ἱερὸν Ποσειδᾶ[νος]-/
> -το ὅτι Ποσειδᾶνός ἐστι πρι]--]--ο τον
> βουνὸν ἄνω καθὼς---- καθ' ἄκρον ἐπὶ τὸν
> με--/--τέρμονα εἶμεν--).

Παρά τις διαφορετικές απόψεις που διατυπώθηκαν σχετικά με την προέλευση της λατρείας του Ποσειδώνα στην περιοχή, εάν δηλαδή η λατρεία οφείλεται στη γειτνίαση με την Θεσσαλία, όπου ο θεός τιμήθηκε ιδιαίτερα[62] ή στην επίδραση της Κορίνθου[63], μέσω των κορινθιακών αποικιών της Ηπείρου, είναι ορθότερο νομίζω να θεωρήσουμε τη λατρεία Ηπειρωτική. Και μάλιστα να την συνδέσουμε με τη λατρεία του θεού στην υπόλοιπη Ήπειρο, όπου λατρεύτηκε ως χθόνιος, εννοσίγαιος, γαιήοχος και ενοσίχθων θεός. Παράλληλα ο Στράβων (7.5.8 και 7.7.5) περιγράφοντας τις ακτές της Ηπείρου αναφέρει ακρωτήριο Ποσείδιο απέναντι από το βόρειο μέρος της Κερκύρας μετά τον Ογχησμό[64].

Για τη θέση «Ποσείδιον ἄκρον» γίνεται μνεία και στα *Γεωγραφικά* του Πτολεμαίου[65], ο οποίος την τοποθετεί στην περιοχή των Θεσπρωτών «Ποσείδιον ἄκρον Βουθρωτόν κόλπος».

Δεν είναι όμως βέβαιο ποιά λατρεία εκπροσωπεί εδώ ο θεός, αφού το Ιερό του βρίσκεται πολύ κοντά στη θάλασσα. Στο σημείο όμως αυτό πρέπει να αναφέρουμε έναν άλλο θεό, που θεωρούσαν προστάτη της Ναυσιπλοΐας στη γειτονική περιοχή Βουθρωτό[66].

Πρόκειται για τη λατρεία του Δία Κασσίου, όπως προκύπτει από αναθηματική επιγραφή του 2ου αι. π.Χ. χαραγμένη σε κιονίσκο[67], στον οποίο απεικονίζεται πλοίο, το οποίο ο αναθέτης ευχόμενος στον Δία Κάσσιο για τον καλό πλούν, θα το αφιερώσει χρυσό στο θεό.

Με μια άλλη ιδιότητα, δηλαδή ως γενάρχης ή επώνυμος πόλεων λατρεύτηκε ο Ποσειδών στο Δυρράχιο (Επίδαμνο) κορινθιακή αποικία, στις ακτές της Αδριατικής. Σύμφωνα με τον Σχολιαστή των Γεωργικών του Βεργιλίου (Σέρβιος Georg. I 12) υπήρχε έθιμο ένα τέθριππο να βυθίζεται στη θάλασσα προς τιμή του Ποσειδώνα[68].

Παράλληλα σε ασημένια νομίσματα[69] του Δυρραχίου του 300 π.Χ., (πίν.7), τα οποία φέρουν στον εμπροσθότυπο Πήγασο και το αρχικό της πόλης Δ, απαντούν στον οπισθότυπο μαζί με την κεφαλή της Αθηνάς Χαλινίτιδας διάφορα σύμβολα, ανάμεσα στα οποία και το δελφίνι, σύμβολο του Ποσειδώνα· πιθανόν ένας υπαινιγμός της λατρείας του θεού και στην περιοχή αυτή.

Τέλος, σε άλλους λόγους που δεν συνδέονται με τη λατρεία του Ποσειδώνα στην Ήπειρο, θα αναζητήσουμε τη λατρεία του θεού στη Νικόπολη, την πόλη που ο Οκταβιανός Αύγουστος ίδρυσε το 31 π.Χ. για να διαιωνίσει τη νίκη του στο Άκτιο[70].

Σύμφωνα με τις φιλολογικές, τις επιγραφικές μαρτυρίες και τα αρχαιολογικά ευρήματα η λατρεία του Ποσειδώνα στη Νικόπολη πρέπει να αποδοθεί στον Αύγουστο και την πολιτική του.

Ο Ποσειδών, μαζί με τον Απόλλωνα και τον Άρη υπήρξε από τους συντελεστές της ναυτικής νίκης του Ακτίου, και όπως προκύπτει από τις φιλολογικές, τις επιγραφικές μαρτυρίες και τα αρχαιολογικά δεδομένα τιμήθηκε ιδιαίτερα στη Νικόπολη[71].

Και συγκεκριμένα, όπως αναφέρει ο Σουητώνιος (Augustus 18.3) και πληροφορεί αναθηματική επιγραφή[72] ο Οκταβιανός αφιέρωσε τα λάφυρα από τη νίκη του στο Άκτιο προς τιμή του Ποσειδώνα[73] και του Άρη.

Παράλληλα το ύψωμα, βόρεια από το χωριό Σμυρτούλα που ταυτίζεται με το στρατηγείο του πριν τη ναυμαχία[74] αφιέρωσε στον Απόλλωνα μετά τη νίκη (Στραβ. 7.7.6) και κατασκεύασε το «μνημείο νίκης» που κόσμησε με τα λάφυρα, τα έμβολα των εχθρικών πλοίων, άγαλμα του Απόλλωνα και άλλα αφιερώματα (Δίων, Κάσσιος 51.1.3, Σουητ. Aug. 96.2). Τα λείψανα του μνημείου είναι ορατά στη νότια πλευρά, όπου παρατηρούνται αγκυρόσχημα λαξεύματα[75].

Στον ίδιο λόφο βρέθηκε το μεγαλύτερο μέρος της αναθηματικής επιγραφής, την οποία ο Οκταβιανός ανάρτησε στο μνημείο το 29 π.Χ. προς τιμή του Ποσειδώνα και του Άρη[76] (πίν.8 α-β).

Οι τελευταίες συμπληρώσεις της επιγραφής που προτείνονται από τους James Oliver[77] και J. Carter[78] είναι οι εξής:

A. Oliver.
Nep]tuno[·et Ma]rt[i·. Imp·Caesa]r+Div[i·Juli·]F+Vict[oriam·
con]sec[utus.bell]o+Qvod+pro[-re-pu]blic[a·]ges[si]t+in+hac+reg[ion[
cons]vl[·quinctum·i]mperat[or-se]ptim/um+pace[·]part[a+terra[·
marique·c]astra[ex-Quibu[·s·eqr] essu[-est·spoli]is[·/
ormat]A+[dedicavit

B. Carter
Nep]tuno[·et Ma]rt[i·Imp·Caesa]r+Div[i·Juli·]F+Vict[oriam·
ma]rit[imam-consecutus·bell]o+Quod+pro[-re-pu]blic[a]
+ges[si]t+in+hac+reg·ion[e+c]astra[-ex-] Quibu[s-ad-hostem./
in]seq[uenbum·egr·]essu[s-est-spoli]is-[orna+]a+[dedicavit·
cons]vl[-quinctum-i]mperat[or-se]ptimum+pace[-]partaterra[-marique

Η επιγραφή επιβεβαιώνει εξάλλου τη μαρτυρία του Σουητωνίου (Augustus 18.9) ότι δηλαδή τα λάφυρα αφιερώθηκαν στον Ποσειδώνα και τον Άρη. Στηριζόμενος μάλιστα στη μαρτυρία του Σουητωνίου ο Φιλαδελφεύς[79] απόδωσε αρχιτεκτονικά μέλη κορινθιακού ρυθμού που υπήρχαν στο ύψωμα «Μιχαλίτσι», σε ναό αφιερωμένο στον Ποσειδώνα και τον Άρη.

Την άποψη αυτή ως γνωστό δεν δέχτηκαν ο Ρωμαίος[80] και η νεότερη έρευνα[81]. Και συγκεκριμένα η Μ. Οικονομίδου[82] με βάση τις νομισματικές κοπές συμπεραίνει ότι στην εποχή του Οκταβιανού δεν υπήρχε ναός στον ιερό λόφο, αλλά ιερό υπαίθριο (τέμενος) και ότι αργότερα, πιθανότατα στην εποχή του Σεπτιμίου Σευήρου ανεγέρθηκε ο ναός που απεικονίζεται σε τέσσερα νομίσματα της Νικόπολης[83].

Ωστόσο η έρευνα προς το παρόν δεν μπορεί να δώσει απάντηση στο εξίσου σημαντικό ερώτημα, σε ποιόν δηλαδή από τους τρεις θεούς, τον Απόλλωνα, τον Ποσειδώνα ή τον Άρη ήταν αφιερωμένος ο ναός[84].

Παρά τη σύγχυση των πηγών και την έλλειψη επαρκών αρχαιολογικών δεδομένων προκύπτει κυρίως από τον Δίωνα Κάσσιο ότι στον ιερό λόφο υπήρξε κρηπίδωμα για την τοποθέτηση των λαφύρων και Ιερό τέμενος αφιερωμένο στον Απόλλωνα (Στραβ. 7.7.6).

Παράλληλα στον ιερό λόφο τιμήθηκαν και οι δύο άλλοι συντελεστές της ναυτικής νίκης του Ακτίου, ο Ποσειδών και ο Άρης[85] σύμφωνα με το χωρίο του

Σουητωνίου και την αναθηματική επιγραφή. Εξάλλου ο Δίων Κάσσιος (51.19.2) αναφέρει ότι και στη Ρώμη ο Αύγουστος κόσμησε «την κρηπίδα του «Ιουλιείου ηρώου» με τα έμβολα των εχθρικών πλοίων.

Είναι φυσικό τα επιδεικτικά λάφυρα του θριάμβου να μη κρύβονταν σε εσωτερικό χώρο[86].

Μία άλλη μαρτυρία για τη λατρεία του Ποσειδώνα στη Νικόπολη είναι τα νομίσματα. Ο Ποσειδών, όπως και ο Απόλλων, απεικονίστηκε από την αρχή μέχρι το τέλος της λειτουργίας του νομισματοκοπείου της πόλης, αλλά σε σχετικά λίγες σειρές[87].

Στα αυτόνομα[88] ο Ποσειδών εικονίζεται όρθιος στον οπισθότυπο γυμνός, κρατώντας τα κυριότερα σύμβολά του δελφίνι και τρίαινα (πίν.9), ενώ τον εμπροσθότυπο κοσμεί προτομή πυργοστεφής και φτερωτή της πόλης και επιγραφή CEBACTOY ΚΤΙΣΜΑ. Με τα ίδια σύμβολα ο θεός εικονίζεται στα νομίσματα εποχής Καρακάλλα, που φέρουν την επιγραφή [IEPAC NIKO]ΠΟΛΕΩΣ[89], όπως και σε κοπές του Γαλλιηνού[90] και της Σαλωνείνας[91].

Αν και ο Ποσειδών, λατρεύτηκε σε πολλές πόλεις της Ηπείρου και της Αιτωλίας[92], η λατρεία του όμως δεν μεταφέρθηκε από τις περιοικίδες πόλεις στη Νικόπολη, όπως έγινε με πολλές άλλες λατρείες[93] που απαντούν στη Νικόπολη. Είναι φυσικό, όπως μαρτυρούν οι φιλολογικές πηγές και βεβαιώνουν τα αρχαιολογικά ευρήματα, η λατρεία του Ποσειδώνα να οφείλεται στον Αύγουστο[94] και την πολιτική του. Την άποψη αυτή ενισχύει και η αντίστοιχη λατρεία του θεού στη Ρώμη, όπου τιμάται επίσης με τον Απόλλωνα και τον Άρη, λατρείες που ο ίδιος ο Οκταβιανός καθιέρωσε[95].

Από τη σύνθεση των δεδομένων μπορούμε να προβούμε στις εξής παρατηρήσεις αναφορικά με τη λατρεία του Ποσειδώνα στην Ήπειρο.

Η λατρεία του Ποσειδώνα επικεντρώνεται κυρίως στο εσωτερικό της Ηπείρου, σε περιοχή σεισμοπαθή, όπως είναι το Τεπελένι, πράγμα που υπαγορεύει και τη φύση του θεού, ως εννοσίγαιου και ενοσίχθου, δηλαδή θεού των σεισμών και οδηγεί στην υπόθεση ότι πρόκειται για μια εγχώρια λατρεία.

Αν και τα μέχρι σήμερα γνωστά αρχαιολογικά ευρήματα που συνδέονται με τη λατρεία του Ποσειδώνα στην Ήπειρο είναι περιορισμένης διάρκειας και χρονολογούνται από τον 4ο αι. π.Χ. μέχρι τα Ρωμαϊκά χρόνια, η φύση του θεού και η λατρεία του στο Νεκρομαντείο του Αχέροντα ανάγουν τη λατρεία στην Προϊστορική εποχή και συγκεκριμένα γύρω στο 2000 π.Χ. με την άφιξη των πρώτων Ελλήνων στην Ήπειρο, των Θεσπρωτών.

Πρόκειται για τη χθόνια λατρεία του Ίππιου-Ποσειδώνα, ο οποίος συλλατρεύτηκε με την άνασσα του Κάτω Κόσμου, την Περσεφόνη. Στο συσχετισμό αυτό οδηγούν νεότερα αρχαιολογικά ευρήματα, κυρίως τα σύμβολα που απαντούν στις νομισματικές κοπές των Ελεατών και των Θεσπρωτών.

Μία άλλη διαπίστωση αφορά τη σπουδαιότητα της λατρείας του Ποσειδώνα στην Ήπειρο. Σύμφωνα με τις επιγραφικές μαρτυρίες η λατρεία πρέπει να ήταν σημαντική και μάλιστα στην Αθαμανία ο Ποσειδών ήταν μία από τις κύριες θεότητες, αφού το Ιερό του αναφέρεται σε επίσημο έγγραφο που αφορά συνθήκη καθορισμού συνόρων ανάμεσα στην Αθαμανία και άλλη άγνωστη περιοχή.

Στην ίδια υπόθεση εξάλλου οδηγούν και οι επιγραφικές μαρτυρίες από άλλες περιοχές της Ηπείρου, όπως τη Φοινίκη, όπου σύμφωνα με το απελευθερωτικό ψήφισμα, γίνεται ανάθεση του δούλου σε ιερό του Ποσειδώνα, ενώ οι επιγραφές από το Τεπελένι συνηγορούν για μία άλλη ιδιότητα του θεού, εκείνη του προστάτη του γένους.

Με ανάλογο τρόπο ο Ποσειδών λατρεύτηκε πιθανόν στο Δυρράχιο, αφού ο γυιός του ήταν ο επώνυμος και γενάρχης της πόλης.

Παράλληλα οι φιλολογικές μαρτυρίες και ο Σχολιαστής του Ομήρου δίδουν μία άλλη διάσταση της λατρείας του Ποσειδώνα τη μαντική και προσθέτουν ένα άλλο μαντικό κέντρο στο εσωτερικό της Ηπείρου.

Τέλος, σε άλλους λόγους θα αναζητήσουμε τη λατρεία του Ποσειδώνα στη Νικόπολη και θα την συνδέσουμε με τον Οκταβιανό Αύγουστο, αφού ο θεός μαζί με τον Απόλλωνα και τον Άρη, υπήρξαν από τους συντελεστές της ναυτικής νίκης του Ακτίου.

Χρυσούλα Τζουβάρα-Σούλη
Πανεπιστήμιο Ιωαννίνων

ΣΗΜΕΙΩΣΕΙΣ

* Στο κείμενο χρησιμοποιούνται συντομογραφίες του DAI, Archäologische Anzeiger 1992, σ. 743-749.

1. Το όνομα είναι σύνθετο από το *Ποτει* δηλ. κύριος και το *δα*· η ετυμολογία όμως παραμένει ασαφής· αν και ορισμένοι ερευνητές το συνέδεσαν με τη γη και θεωρούν τον Ποσειδώνα κύριο της Γης. Σχετικά βλ. W.Burkert, *Greek Religion*, Cambridge Massachusetts 1985, σ.136 κε με την παλαιότερη βιβλιογραφία.
Για την ετυμολογία της λέξης βλ. H. Frisk, "Griechisches Etymologisches Wörterbuch" B.II, Heidelberg 1970, σ.583-584, στη λ. «Ποσειδῶν» και για τη σύνδεση του Ποσειδώνα με τη γη P.Kretschmer Glotta I (1909), σ. 27 κε.

2. Στο έπος ο Ποσειδών αναφέρεται ως θεός της θάλασσας *Ομ. Ιλ.* Ο, στ.186-193, *Ιλ.* Ν, στ. 17-31, *Οδυσ.* ε, στ. 282-381. Σχετικά βλ. και W. Burkert, *ό.π.* σ. 136 κε.
3. Για την ιδιότητα αυτή του Ποσειδώνα γενικά U.V. Wilamovitz-Moellendorft, *Der Glaube der Hellenen I*, σ. 211-214, RE XXII, I, στ. 451-454 (E.Wüst), F. Schachermeyr, *Poseidon und die Entstehung des griechischen Götterglaubens*, 1950, σ. 13-19, L. Malten, "Das Pferd im Totenglauben", *JdI* 29(1914), σ. 179-255 και W.Burkert, *ό.π.*, σ. 138 και σημ. 37 με τη σχετική βιβλιογραφία. Πρβλ. Nilsson, *GGRrRI*, σ. 450, ο οποίος τον θεωρεί «θεό των υδάτων».
4. W.K.C.Guthrie, *The Greeks and their Gods*, London 1950 (1962), σ. 95 και W.Burkert, *ό.π.*, σ. 137 κε. με σχετικές αναφορές για την ετυμολογία της λέξης γαιήοχος και για τους τόπους, όπου ο Ποσειδών λατρεύτηκε ως θεός των σεισμών.
5. Για τις μαντικές ιδιότητες του θεού γενικά, αφού μάλιστα θεωρούνταν και αρχικός κύριος των Δελφών Βλ. *RE* IVA στ. 2045 κε (F. Bölte), *Παυσ.* 10.5.6, 10.24.4. Willamovitz-*Moellondorf, ό.π.*, σ. 213, G. Daux, *BCH* 92(1968), σ. 540-549, W. Burkert, *Homo Necans: the anthropology of ancient Greek Sacrificial ritual and myth*, Berkeley 1983, σ. 134 σημ. 221 και για το ψυχοπομπείο στο Ταίναρο *Πλουτ.* Περί των υπό του θείου βραδέως τιμωρουμένων 560e. Βλ.και Ν. Παπαχατζή «Ποσειδών Ταινάριος» *ΑΕφημ.* 1976,σ. 102-125 και W.Burkert, *Greek Religion, ό.π.*, σ.139.
6. Οδυσ. λ, στ. 119-134, Βλ. και W. Burkert, *ό.π.*, σ. 139 και σημ. 43. Για τον Οδυσσέα και τους Θεσπρωτούς βλ. E. Schwartz, *Die Odyssee*, 1924, σ. 140-143 και 183-194.
7. Για το Ιερό και Μαντείο του Άδη που έφεραν στο φως οι ανασκαφές της Αρχαιολογικής Εταιρείας υπό τη διεύθυνση του καθηγητή Σ. Δάκαρη, βλ. Σ. Δάκαρη, *Πρακτ.* 1958, σ. 107-113, (1960), σ. 114-127, (1961), σ. 108-119, (1963), σ. 89-92, (1964), σ. 44-53, (1975), σ. 145-146, (1976), σ. 146-152, (1977), Α, σ. 140-141. Το *Έργον* 1958, σ. 93-103, (1960), σ. 102-110, (1961), σ. 118-125, (1963), σ. 57-64, (1964), σ. 51-64, (1975), σ. 82-88, (1976), σ. 80-88, (1990), σ. 73 κε. (1991), σ. 58-62, Σ. Δάκαρη, *Θεσπρωτία, Αρχαίες Ελληνικές Πόλεις* 15, Αθήνα 1972, σ. 67, 81, 119 και 179-180, του ίδιου, *Το Νεκρομαντείο του Αχέροντα*, Αθήνα 1993.
8. Για το οικοδόμημα της λατρείας βλ. παραπάνω σημ. 7.
9. Για την αρχιτεκτονική του ιερού βλ. σημ.7.
10. Σχετικά Χρ. Τζουβάρα-Σούλη, *Η λατρεία των γυναικείων θεοτήτων εις την Αρχαίαν Ήπειρον*, Ιωάννινα 1979, σ. 104 κε. και για τα προϊστορικά ευρήματα Σ. Δάκαρη, *Πρακτ.* 1958, σ. 111, (1963), σ. 91-92, (1964), σ. 53, Θεσπρωτία, *ό.π.*, σ.63, N.G.L. Hammond, *Epirus*, σ. 314, 319-320, Θ. Παπαδόπουλου, «Η Εποχή του Χαλκού στην Ήπειρο», *Δωδώνη* τ. Ε΄ (1976), σ. 277, 285 και 306. Το *Έργον* 1976, σ. 84-85, (1977), σ. 68-69.
11. Για τις ανασκαφές στην Εφύρα Σ. Δάκαρη, *Πρακτ.* 1958, σ. 108 κε., *Το Έργον* 1958, σ. 96-97, εικ. 100-101, (1975), σ. 89-90, (1976), σ. 87-88, Σ. Δάκαρη, *Θεσπρωτία, ό.π.*, σ. 62-63, Θ. Παπαδόπουλου, *Πρακτ.* 1978, σ. 107, (1983), σ. 81-82, *Το Έργον* 1978, σ. 35-36, (1979), σ. 16, (1980), σ. 18, (1981), σ. 33-34, (1982), σ. 30, (1983), σ. 43-45, (1984), σ. 45-46, (1986), σ. 83-84, (1987), σ. 70-71.
12. Σ. Δάκαρη, *Πρακτ.* 1958, σ. 111, *Το Έργον* 1958, σ. 96 κε., (1963), σ. 62, (1975), σ. 88-90, Σ. Δάκαρη, *Θεσπρωτία, ό.π.*, σ.63, N.G.L. Hammond, *Epirus, ό.π.*, σ. 702.
13. Σ. Δάκαρη, *Πρακτ.* 1960, σ. 121 κε., του ίδιου, «Οδύσσεια και Ήπειρος», *Πρακτικά Δ' Συνεδρίου για την Οδύσσεια*, Ιθάκη 1986, σ. 152 κε.
14. Για τη λατρεία της Περσεφόνης στο Νεκρομαντείο του Αχέροντα Χρ. Τζουβάρα-Σούλη, *ό.π.* σ. 99 κε., με την παλαιότερη βιβλιογραφία.
15. Για τα ειδώλια Σ. Δάκαρη, *Πρακτ.* 1964, σ. 53 σημ. 2, του ίδιου, *Αρχαιότητες Ηπείρου. Το Νεκρομαντείο του Αχέροντος, Εφύρα-Πανδοσία-Κασσώπη*, Αθήναι 1972, σ. 20, *Το Έργον* 1964, σ. 54-55, εικ. 59, Σ. Δάκαρη, *ΑΔελτ.* 19 (1964) *Χρον.* Β3, σ. 310, πίν. 349 γ. Βλ. και Τζουβάρα-Σούλη, *ό.π.*, σ. 103 κε.
16. N.G.L. Hammond, *Epirus, ό.π.*, σ. 396 σημ. 4.
17. Σ. Δάκαρη, *Θεσπρωτία, ό.π.*, σ. 67.

18. Σχετικά Σ. Δάκαρη, *Θεσπρωτία, ό.π.*, σ. 116, 117 §337, S. Dakaris, "Cassopaia", σ. 30-31 §109 βλ. και Σ. Δάκαρη «Επιτύμβιος Στήλη (ή περί Δρυολατρείας)», *Χαριστήριον εις Αναστάσιον Κ. Ορλάνδον, τ. Δ'*, Αθήναι 1967, σ. 369, 394, βλ. και S.I.Dakaris, "Mesopotamo", *ΕΑΑ*, Suppl. 1970, σ. 474-477.
19. Fr. Schachermeyr, *Poseidon und die Entstehung des griechischen Götterglaubens*, Bonn 1950, σ. 15 κε. Σχετικά και W. Guthrie, *The Greeks, and their Gods*, London 1962, σ. 94 κε., Σ. Δάκαρη, *Επιτύμβιος Στήλη, Χαριστήριον εις Α. Ορλάνδον, ό.π.*, σ. 390 κε., E. Simon, *Die Götter der Griechen, ό.π.*, σ. 91 κε., Ν. Παπαχατζή «Ποσειδών Ταινάριος» *ΑΕφημ.* 1976, σ. 113 κε. και W. Burkert, *Greek Religion, ό.π.*, σ. 130 κε.
20. Το όνομα Ελέα βεβαιώνεται από την αρχαία παράδοση από επιγραφές και τα νομίσματα της Ελέας και των Ελεατών. Κατά τον Ψευδο-Σκύλακα (*Περίπλους* 30), όρμος της Αμμουδιάς είναι το λιμάνι Ελέα. Η πόλη πρέπει να αναζητηθεί ασφαλώς στην Ελεάτιδα της Θεσπρωτίας δηλαδή στην περιοχή της Κερέντζας-Αμμουδιάς και Παραμυθιάς, όπου εκτεταμένα ερείπια. Για την πόλη, σημερινή Βέλιανη, η οποία υπήρξε πιθανότατα πολιτικό κέντρο των Θεσπρωτών Σ. Δάκαρη, *Θεσπρωτία, ό.π.*, σ.37-39.
21. Για τα νομίσματα P.Gardner, *BMC*, Thessaly to Aetolia, Bologna 1963, σ. 100, πίν. 18 (αρ.10-12), B. Head, *Historia Nummorum*, Oxford 1911, σ. 321 και P. Franke, *Die antiken Münzen von Epirus*, Wiesbaden 1961, σ. 40 κε., 300 κε., βλ. και N.G.L.Hammond, *Epirus, ό.π.*, σ. 546 κε., Σ. Δάκαρη, *Θεσπρωτία, ό.π.*, σ. 116-117.
22. Σχετικά P.Franke, *ό.π.*, σ. 40-41, 300 κε., πίν. 3V1-5, R1-6, ο οποίος αποδίδει την απεικόνιση του Πηγάσου σε άλλους λόγους και θεωρεί την Ελέα αποικία των Κορινθίων.
23. Για τις άλλες νομισματικές κοπές των Ελεατών και των Θεσπρωτών P.Franke, *ό.π.*, σ. 40-41, 44-46 κε., 48 κε., 51 και σ. 300 κε., πίν. 3-4. Βλ. και Σ. Δάκαρη, *Θεσπρωτία, ό.π.*, σ. 39 §106.
24. Γενικά για τη λατρεία του Ταινάριου Ποσειδώνα Ν.Δ. Παπαχατζή, «Ποσειδών Ταινάριος», *ΑΕφημ.* 1976, σ. 102 κε.
25. *Απολλοδ. Επιτομή* 7.34, *Στεφ. Βυζ.* στη λ. Βούνειμα Ευστάθιος, Σχόλ. στην *Ομήρου Οδύσσεια* λ. στ.125, σ.402 και A. Hartmann, *Untersuchungen über die Sagen vom Tod des Odysseus*, München 1917, σ. 91-93 σημ. 101 και R. Merkelbach, *Untersuchungen zur Odyssee*, München 1969, σ. 225.
26. *Σχόλια Ομήρου Οδυσ.* λ. στ.121 κε., Ευστάθιος 1675, 35 και RE, Suppl. V, στ. 453 (Bürchner). Για τη θέση βλ. Χρ. Τζουβάρα-Σούλη, *ό.π.*, σ. 31-32.
27. Για τον ταύρο ιερό ζώο του Ποσειδώνα γενικά βλ. Fr. Schachermeyr, *Poseidon und die Entstehung des griechischen Götterglaubens*, Bonn 1950, σ. 20, 22, 33, 39, 41 και για την N.G.L. Hammond, *Epirus, ό.π.*, σ. 41. 28. Για τις στήλες βλ. N.G.L.Hammond, *Epirus, ό.π.*, σ. 735 κε., και P.Franke, *ό.π.*, σ. 290 κε.
29. N.G.L. Hammond, *Epirus, ό.π.*, σ. 734-735, αρ. 6 Βλ. και A. Woodhead, *SEG* 24(1969), σ. 167 αρ. 472.
30. Για τον ταύρο ως ιερό ζώο του Ποσειδώνα βλ. παραπάνω σημ. 27.
31. Σχετικά Δ. Ευαγγελίδη, «Αι Αρχαιότητες και τα βυζαντινά μνημεία της ΒΔ Ηπείρου», *Νέος Ελληνομνήμων* 10(1913), σ. 287-288, του ίδιου, «Επιγραφαί εξ Ηπείρου», *ΑΕφημ.* 1914, σ. 232 κε., *Bull. Epigr.* 1915, σ. 483. Σχετικά βλ. και P. Franke, *ό.π.*, σ. 292,πίν. 57 (1), N.G.L. Hammond, *Epirus*, σ. 738κε., αρ. 24, A. Woodhead, *SEG* 24(1969), σ. 166 αρ. 470 και τελευταία Β. Κοντορίνη, «Δημοσιευμένες ελληνικές επιγραφές του Μουσείου Ιωαννίνων», *Δωδώνη*, 16 (1987), Αφιέρωμα στον καθηγητή Στ. Ι. Παπαδόπουλο, σ. 625.
32. Δ. Ευαγγελίδου, «Επιγραφαί εξ Ηπείρου», *ΑΕφημ.* 1914, σ. 233-234, ο οποίος αναφέρει και άλλα οικογενειακά κοινά ή συγγενών κοινά από άλλες περιοχές και κυρίως από τη Μ. Ασία.
33. Σχετικά Δ. Ευαγγελίδου, *ό.π.*, σ. 233.
34. N.G.L. Hammond, *Epirus, ό.π.*, σ. 738.
35. P.Franke, *ό.π.*, σ. 292.

36. A. Woodhead, *SEG* 24 (1969), σ. 167 αρ. 474.
37. N.G.L. Hammond, *Epirus, ό.π.*, σ. 738.
38. P. Franke, *ό.π.*, σ. 292.
39. Για τη λατρεία του Ποσειδώνα στην Κέρκυρα βλ. *Οδυσ.* ζ, 262 κε., όπου αναφέρεται ιερό του θεού στην Κέρκυρα και στις η, 54 κε., και ζ, 7-11 επιβεβαιώνεται η σπουδαιότητα της λατρείας, αφού ο θεός υπήρξε πατέρας του οικιστή της νήσου. Βλ. σχετικά και Π. Καλλιγά, «Κέρκυρα, Αποικισμός και Έπος», *Annuario* 60(1982), Roma 1984, σ. 61-62, 64.
   Ο Ποσειδών επίσης εικονίζεται στις χάλκινες κοπές των ελληνιστικών χρόνων της νήσου με τα σπουδαιότερα σύμβολά του. P. Gardner, *BMC*, Thessaly to Aetolia, σ. 144 αρ. 469, σ. 147 αρ. 508, σ. 151 αρ. 548, σ. 152 αρ. 551-556 και αρ. 561-562 και για τις κοπές των ρωμαϊκών Χρόνων, σ. 156 αρ. 609-613, σ. 157 αρ. 614-624. Βλ. και Collection R.H. Evelpidis *SNG* Grèce, Macédoine-Thessalie-Illyrie-Épire-Corcyre, London 1975, σ. L111 αρ. 1984κε και αρ.1998-2000.
40. Για τις ιδιότητες αυτές του θεού βλ. παραπάνω σημ. 3-4 και για τις στήλες N.G.L. Hammond, *Epirus, ό.π.*, σ. 734-735 αρ. 6 και σ. 741 αρ. 35.
41. Για τη στήλη N.G.L. Hammond, *ό.π.*, σ. 734-735 αρ.6 και A.Woodhead, *SEG* 24 (1969), σ. 167 αρ. 472.
42. N.G.L. Hammond, *Epirus, ό.π.*, σ. 735, όπου δέχεται τη γραφή με τα δύο σ, αφού ανάλογη γραφή απαντά και σε άλλες Ηπειρωτικές επιγραφές. Πρβλ. τη γραφή ΠΟCΕΙΔΑΝΙ που προτάθηκε από άλλους μελετητές.
43. Η στήλη βρέθηκε στο σπίτι του Αλ. Παπαϊωάννου στην Πολίτσανη, αλλά προέρχεται από τη Leshnjë, εντοιχισμένη σε εκκλησία. Ο πρώτος εντοπισμός της στήλης και τα πρώτα σχέδια έγιναν από τον S.S. Clarke το 1923 από τον οποίο ο Hammond παίρνει τις σχετικές πληροφορίες βλ. *Epirus, ό.π.*, σ.740-741 αρ.35.
44. Για την Αντιγόνεια N.G.L. Hammond, *Epirus, ό.π.*, σ. 209 κε., του ίδιου "Antigonea in Epirus", *JRS* 1971 σ. 112-115, Dh. Budina "Antigonée" Iliria II (1972), σ. 269-348 και τελευταία G. Koch, *Albanien*, Köln 1989, σ. 19, 22, 249, 258, 289, 307.
45. Η ταύτιση της Yerma με την αρχαία Αντιγόνεια έγινε από Αλβανούς αρχαιολόγους κατά τη διάρκεια των ανασκαφικών ερευνών στα τείχη της, από όπου προέρχονται χάλκινοι αναθηματικοί δίσκοι με την επιγραφή ΑΝΤΙΓΟ/ΝΕΩΝ. Σχετικά βλ. N.G.L. Hammond, "Antigonea in Epirus", *JRS* (1971), σ. 112 κε. Βλ. επίσης και P.R. Franke, "Albanien im Altertum" *Antike Welt* 14 (1983), Sondernummer, σ. 30 κε., P. Cabanes, *RA* 1986, F1, σ. 117 κε.
46. Την επιγραφή αντέγραψε ο Clark βλ. σχετικά N.G.L. Hammond, *Epirus, ό.π.*, σ. 741, αρ. 39, εικ. 33.
47. Για τη χρονολόγηση A.Woodhead, *SEG* 24 (1969), σ. 166 αρ. 470.
48. Για το αγαλματίδιο που βρίσκεται στο Αρχαιολογικό Μουσείο των Τιράνων με αριθμό ευρετηρίου *NHM* 1239. Βλ. Bh. Budina "Antigonée", *Iliria* II (1972), σ. 335 εικ. 51, M. Korkuti κ.ά., *Shquiperia Arkeologjile*, Tirana 1971, εικ. 61, P. R. Franke, *Antike Welt* 14 (1983), *ό.π.*, σ. 31 εικ. 42 και N. Ceka, *Albanien, Schätze aus dem Land der Skipetaren*, Mainz am Rhein 1988, σ. 339 αρ. 315.
49. Για τη χρονολόγηση βλ. N. Ceka, *ό.π.*, σ. 339 αρ. 315.
50. Ο N.Ceka, ό.π., σ.339 αρ.315 επισημαίνει την εγχώρια προέλευση του αγαλματιδίου.
51. Για τη στήλη L.M. Ugolini, "L'Acropoli di Fenice", *Albania Antica* II(1932), σ. 147-148, αρ. 1, εικ. 80, A.N. Oikonomides, *Athene* 23 (4) (1963), σ. 37, αρ. 8, A. Woodhead, *SEG* 23 (1968), σ. 164, αρ. 478 και P. Cabanes, *L'Épire de la Mort de Pyrrhos à la Conquête Romaine*, Paris 1976, σ. 569 κε., αρ. 47.
52. Για τη Φοινίκη γενικά βλ. Χρ. Τζουβάρα-Σούλη, *Η λατρεία των γυναικείων θεοτήτων εις την αρχαίαν Ήπειρον, ό.π.*, σ. 137 και σημ. 102 με την παλαιότερη βιβλιογραφία συγκεντρωμένη. Βλ. και τελευταία G. Koch, *Albanien, ό.π.*, σ. 18 κε., 33 κε., 251, 262 κε., 264, 266, 277, 280, 307.
53. Σχετικά βλ. και P.Franke, *Die antiken Münzen von Epirus, ό.π.*, σ.292 και P.Cabanes, *ό.π.*, σ. 569 κε., αρ. 47.

54. P.Cabanes, *ό.π.*, σ. 569 κε. αρ. 47.
55. P.Franke, *ό.π.*, σ. 292
56. P.Franke, *ό.π.*, σ. 161 κε και σ. 292 πίν. 17 (R. 5, 6), πίν, 18(R. 6, 10) και πίν. 57, 3.
57. P.Franke, "Albanien im Altertum", *Antike Welt* 14 (1983), Sondernummer, σ. 52, εικ. 105.
58. Για την Απολλωνία βλ. Χρ. Τζουβάρα-Σούλη, *ό.π.*, σ. 140 και σημ. 114 με συγκεντρωμένη την παλαιότερη βιβλιογραφία. Βλ. και G. Koch, *Albanien, ό.π.*, σ. 17 κε., 20 κε., 24 κε., 29 κε., 32 κε., 130 κε., 151κε., 215 κε., 217-232, 304, 306.
59. Για την κρήνη P. Franke, *ό.π.*, εικ. 105.
60. Για την Αθαμανία P.Franke, *Die antiken Münzen von Epirus, ό.π.*, σ. 18 κε, με την παλαιότερη βιβλιογραφία, N.G.L. Hammond, *Epirus, ό.π.*, σ. 656 κε. Βλ. τελευταία Χρ. Τζουβάρα-Σούλη, «Λατρείες στην Αθαμανία», *Ηπειρ. Χρον.* σε εκτύπωση.
61. *IGIX*, 1,690=*SGDI* 3204. Βλ. και P. Franke, *Die antiken Münzen von Epirus, ό.π.*, σ. 22 σημ. 52 και σ. 293.
62. Σχετικά L. R. Farnell, *The Cults of the Greek States* IV(1907), σ. 1 κε., M. P. Nilsson, *GGrRI*^{2}, σ. 446. Βλ. και P. Philippson, *Thessalische Mythologie* 1934, σ. 374 κε., και P. Franke, *Die antiken Münzen von Epirus, ό.π.*, σ. 293.
63. Την άποψη αυτή διατύπωσε ο Franke, *ό.π.*, σ. 293.
64. N.G.L. Hammond, *Epirus*, σ. 445, 450, 474 και 678.
65. Για την ύπαρξη ναού στον Ποσειδώνα από τον οποίο σώζονται τα θεμέλια και ένας κίονας βλ. P. Franke, "Albanien im Altertum", *ό.π.*, σ. 52 και για τη θέση Ποσείδιον *Cl. Ptolemaei Geographia* I-III, Hildesheim 1966 (έκδ. Nobbe), σ. 202, στ. 8-9.
66. Για το Βουθρωτό Χρ. Τζουβάρα-Σούλη, *Η λατρεία των γυναικείων θεοτήτων εις την αρχαίαν Ήπειρον, ό.π.*, σ. 135-136 σημ. 96 με την παλαιότερη βιβλιογραφία. Βλ. και G. Koch, *ό.π.*, σ. 267 κε.
67. Για την επιγραφή A. de Franciscis, *RendAcc Napoli* 21 (1941), σ. 275-290 και *REG* 57 (1944), σ. 213, *SEG* 23 (1968), σ. 163 αρ. 447 και για τη λατρεία του Δία Κάσσιου στην Κασσιόπη Κ. Κώστογλου-Δεσπίνη, *AAA* IV(1971), σ. 202 κε.
68. G.Thlo-H.Hagen, *Servii Grammatici qui feruntur in Vergilii Carmina Commentarii*, εκ. Georg Olms Hildesheim 1961 II (2), σ. 133-134 και O.Gruppe, *Griechische Mythologie und Religion*, München 1906, σ. 308, σημ. 6 *RE*, XXXII, 1 (1953), στ. 514.
69. Για τα ασημένια νομίσματα του Δυρραχίου του 3ου αι. π.Χ. με Πήγασο στον εμπροσθότυπο και το Δ αρχικό της πόλης και Αθηνά Χαλινίτιδα στον οπισθότυπο με σύμβολο του Ποσειδώνα βλ. B.V. Head, "Catalogue of Greek Coins, Corinth, Colonies of Corinth etc", Bologna 1963, σ. 101, πίν. 26 (αρ. 7).
70. Για το συνοικισμό της Νικόπολης O. Kahrstedt, "Diea Territorien von Patrai und Nikopolis in der Kaiserzeit", *Historia* 1(1950), σ. 544 κε., G. W. Bwersock, *Augustus and the Greek World*, Oxford 1966, σ. 93 κε., όπου τονίζεται και η ελληνικότητα της πόλης. D. Kienast, *Augustus, Prinzeps und Monarch*, Darmstadt 1982, σ. 373 και σημ. 25 και Χρ. Τζουβάρα-Σούλη, «Λατρείες στη Νικόπολη», *Νικόπολις Α΄, Πρακτικά του Πρώτου Διεθνούς Συμποσίου για τη Νικόπολη* (23-29 Σεπτεμβρίου 1984), Πρέβεζα 1987, σ. 169 και σημ. 1-2 με συγκεντρωμένες τις διάφορες απόψεις.
71. Για τους θεούς του Ακτίου J.Gagé "Actiaca", *Mélanges d'Archéologie et d'Histoire* 53 (1936), σ. 58.
72. Για την επιγραφή Α. Φιλαδελφέα, *Πρακτ.* 1913, σ. 83-91, του ίδιου, *ΑΕφημ.* 1913, σ. 235, Α. Ρωμαίου, *ΑΔελτ.* 9 (1924-25), Παράρτ. 1-4, J. Gagé, "Actiaca", *ό.π.*, σ. 98-100, J. H. Oliver, "Octavian's Inscription at Nicopolis", *AJPh* 90 (1969), σ. 178-182, J. M. Carter, A new fragment of Octavian's Incription at Nicopolis", *Zeitschrift für Papyrologie und Epigraphik* 24 (1977), σ. 227-230.
73. Για τη λατρεία του Ποσειδώνα στη Νικόπολη Χρ. Τζουβάρα-Σούλη, «Λατρείες στη Νικόπολη», *Πρακτικά του Α΄Διεθνούς Συμποσίου για τη Νικόπολη* (23-29 Σεπτεμβρίου 1984), Πρέβεζα 1987, σ. 178-179.

74. Σχετικά *Δίων Κάσσιος* 50.1.2.3. Βλ. και Α. Φιλαδελφέα, «Ανασκαφαί Νικοπόλεως», *ΑΕφημ.* 1913, σ. 235, του ίδιου *Πρακτ.* 1913, σ. 86-87 και J. Gagé,"Actiaca", *ό.π.*, σ. 53-54, J. H. Oliver, "Octavian's Inscription at Nicopolis", *AJPh* 1969, σ. 178.
75. Σχετικά Φ. Πέτσα, «Ανασκαφή Ρωμαϊκής Νικοπόλεως», *Πρακτ.* (1974), σ. 84, πίν. 63β και 64 α-β. Για το τέμενος του Απόλλωνα βλ. και D.Kienast, *Augustus Prinzeps und Monarch*, Darmstadt 1982, σ. 373 και σημ. 25, Χρ. Τζουβάρα-Σούλη, *ό.π.*, σ. 171 κε. και W. M. Murray-Ph.M.Petsas, "Octavian's Campsite memorial for the Actian War", *Transactions of the American Philosophical Society* 79 (1989), σ. 4 και 85 κε.
76. Για την επιγραφή βλ. παραπάνω σημ. 72.
77. J. Oliver, "Octavian's Inscription at Nicopolis", *AJPh* 90(1969), σ. 178-182.
78. J.M.Carter, "A new fragment of Octavian's Inscription at Nicopolis", *Zeitschrift für Papyrologie und Epigraphik* 24(1977), σ. 227-230.
79. *Πρακτ.* 1913, σ. 83-91, εικ. 3-4, του ίδιου, *ΑΕφημ.* 1913, σ. 235.
80. *ΑΔελτ.* 9 (1924-1925), *Πρακτ.* σ. 1-4.
81. Σχετικά Χρ. Τζουβάρα-Σούλη, «Λατρείες στη Νικόπολη», *ό.π.*, σ. 172 με όλες τις απόψεις των ερευνητών.
82. *Η Νομισματοκοπία της Νικοπόλεως*, Αθήναι 1975, σ. 56-58.
83. Για τα νομίσματα, Μ. Οικονομίδου, *ό.π.*, σ. 56, 57, 102, πίν. 27 (αρ. 20) και σ. 128 (πίν. 42) αρ. 176 α, β.
84. Σχετικά Μ. Οικονομίδου, *ό.π.*, σ. 52 και Χρ. Τζουβάρα-Σούλη, «Λατρείες στη Νικόπολη», *ό.π.*, σ. 773.
85. Σχετικά Χρ. Τζουβάρα-Σούλη, *ό.π.*, σ. 173.
86. Κ. Ρωμαίου. *ΑΔελτ.* 9 (1924-1925), *Παραρτ.* σ. 3.
87. Μ. Οικονομίδου, *ό.π.*, σ. 47.
88. Μ. Οικονομίδου, *ό.π.*, σ. 64 πίν. 1 (αρ.1α).
89. Μ. Οικονομίδου, *ό.π.*, σ. 118, πίν. 36β (αρ. 81).
90. Μ. Οικονομίδου, *ό.π.*, σ. 155, 158-159, πίν. 58 (αρ. 2β-3), πίν. 59, αρ. 28β-39 πίν. 60 αρ.39-40.
91. Μ. Οικονομίδου, *ό.π.*, σ. 165, πίν. 64 (αρ. 95).
92. Για τη λατρεία του Ποσειδώνα στην Αιτωλία W. Woodhouse, *Aetolia*, Oxford 1897, σ. 313, Κ. Στεργιόπουλου, *Η αρχαία Αιτωλία*, Αθήναι 1939, σ. 100 και 115.
93. Για τη μεταφορά λατρειών από τις περιοικίδες πόλεις *Στραβ.* 7.7.6, 10.2.2, *Παυσ.* 5.23.3, *Ελλην. Ανθολ.* 9.553 στη Νικόπολη βλ. και Μ. Οικονομίδου, *ό.π.*, σ. 8 και 47. Βλ. σχετικά και W.Hoepfner, "Nikopolis zur Stadtgründung des Augustus", *Πρακτικά του Α΄ Διεθνούς Συμποσίου για τη Νικόπολη*, *ό.π.*, σ. 129-133 ο οποίος αποδίδει την καταστροφή της Κασσώπης στον Οκταβιανό Αύγουστο και αναφέρει ότι πιθανόν και ολόκληρο το ναό της Αφροδίτης μετέφεραν οι Ρωμαίοι στη Νικόπολη. Διεξοδικά για το θέμα της μεταφοράς λατρειών από τις περιοικίδες πόλεις Χρ. Τζουβάρα-Σούλη, «Λατρείες στη Νικόπολη», *Πρακτικά του Α΄ Διεθνούς Συμποσίου για τη Νικόπολη*, *ό.π.*, σ. 169.
94. Ανάλογη άποψη είχε διατυπώσει πρώτος ο Franke, στο *Die antiken Münzen von Epirus*, *ό.π.*, σ. 293 και για τη σχέση του Οκταβιανού με τον Ποσειδώνα C. H. V. Sutherland, "Octavian's gold and silver Coinage from c.32 to 27 B.C.", *Quaderno Ticinesi* (1976), σ. 150 κε.
95. J. Gagé, "Actiaca", *ό.π.*, σ. 58 κε., Βλ. και R. M. Ogilvie, *The Romans and their Gods*, London 1969, σ. 115.

ΦΩΤΟΓΡΑΦΙΕΣ

Φωτ. 1 Κάτοψη του Νεκυομαντείου του Αχέροντα.

Φωτ. 2 Χάλκινο νόμισμα των ετών 360-342 π.Χ. με φτερωτό Πήγασο στον εμπροσθότυπο και στον οπισθότυπο τρίαινα και επιγραφή ΕΛΕΑΙ(ΩΝ).

Φωτ. 3 Ασβεστολιθική ενεπίγραφη στήλη του 3ου/2ου αι. π.Χ., αναθηματική στον Ποσειδώνα από τη Σάλιαρη, κοντά στο Τεπελένι.

Φωτ. 4 Απότμημα ασβεστολιθικής ενεπίγραφης στήλης των ρωμαϊκών χρόνων, αναθηματικής στον Ποσειδώνα από το Kamcisht κοντά στο Τεπελένι.

Φωτ. 5 Χάλκινο αγαλματίδιο του Ποσειδώνα του β΄ μισού του 3ου αι. π.Χ. από την Αντιγόνεια.

Φωτ. 6 Ασημένιο δίδραχμο του Κοινού των Ηπειρωτών ±200 π.Χ. με Δία και Διώνη στον εμπροσθότυπο και στον οπισθότυπο ταύρο μέσα σε στεφάνι βαλανιδιάς και τρίαινα κάτω από αυτό.

Φωτ. 7 Ασημένιος στατήρ Δυρραχίου του 3ου αι. π.Χ. με Πήγασο στον εμπροσθότυπο και το αρχικό της πόλης Δ και στον οπισθότυπο κεφαλή Αθηνάς Χαλινίτιδας και δελφίνι.

Φωτ. 8 α-β Αναθηματική επιγραφή στον Ποσειδώνα και τον Άρη του 29 π.Χ., στο μνημείο Νίκης του Οκταβιανού στη Νικόπολη.

Φωτ. 9 Χάλκινο νόμισμα Νικοπόλεως 28 π.Χ. με Ποσειδώνα στον οπισθότυπο με τα σύμβολά του τρίαινα και δελφίνι, την επιγραφή ΣΕΒΑCΤΟΥ ΚΤΙCΜΑ και προτομή της πόλης στον εμπροσθότυπο.

ABSTRACT

THE CULT OF POSEIDON IN EPIRUS

From the above evidence we can make the following comments in reference to the cult of Poseidon in Epirus.

The cult of Poseidon is focused mainly on the mainland of Epirus at an area which has suffered a lot from earthquakes like Tepeleni. This is related to the god's nature which is indicated by epithets like εvvοσίγαιος, ενοσίχθων and leads to the assumption that we have to do with a local cult.

According to philological and archaeological evidence Poseidon was worshipped together with the Persephone at the Nekyomanteion of Acheron already from the Prehistoric period.

As we can conclude from the epigraphical evidence of Athamania and Phoenice the cult of Poseidon in Epirus was very important. Especially the inscriptions from Tepeleni give another characteristic of the god namely that of the protector of the race.

In addition, philological evidence present Poseidon as an oracular god.

Finally, we should explain the cult of Poseidon at Nicopolis by other reasons and we should connect it to Octavius Augustus, since the god has been considered one of the basic contributors to the naval victory in Actium.

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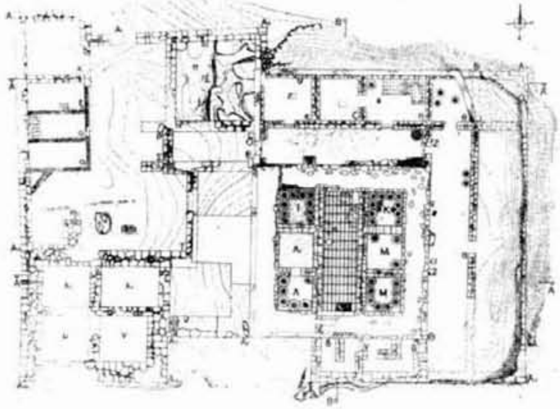

Fig. 1

Fig. 2

Fig. 3

Fig. 4

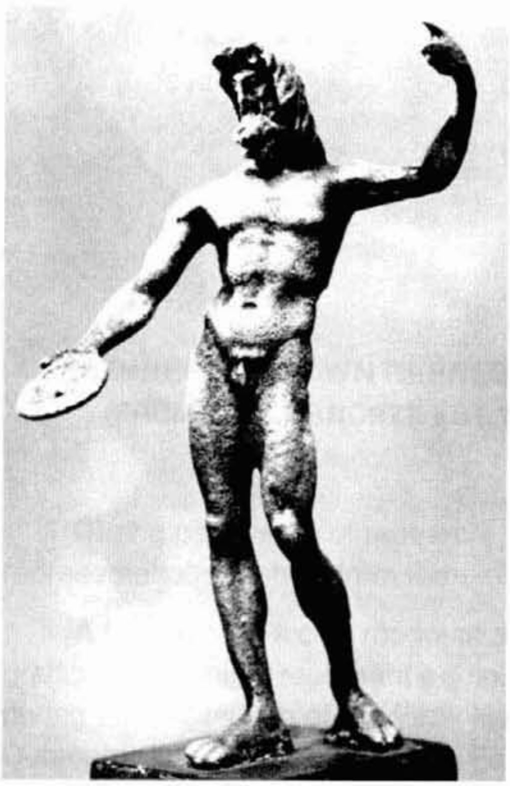

Fig. 5

Fig. 6

Fig. 7

Fig. 8

Fig. 8α

Fig. 9

THREE UNKNOWN REPRESENTATIONS OF ANCIENT SHIPS
(FROM EARLY BRONZE AGE TO THE LATE GEOMETRIC PERIOD)

During past years of research, I collected and studied three unpublished representations of ships from three different excavations in Greece:

A fragment of a clay model of a ship, found at Ayia Marina in Spetses, a graffito, which might represent a ship, on the inside of a jug handle found in 1992 during the excavation of the Early Helladic cargo at Dokos and a part of a Late Geometric krater from Merenda in East Attica.

To the above, I must add a Late Neolithic pithos sherd with a possible ship representation in relief from the Ayio Gala cave, in Chios.

Although I will not present my subject in chronological order, I am saving the latest, the Late Geometric krater, for the end; Lucien Basch will add his further comments on the boats depicted on that piece, based on photographs and information that I communicated to him. All of us, myself included, will eagerly await this great authority on ancient ship iconography to reveal his thoughts concerning the boat depiction in question.

I would like to thank most warmly the former director of the Second Department of Prehistoric and Classical Antiquities, Dr Vassilios Petrakos for granting me permission to study and present the krater from Merenda, now on display in the Museum of Vravron. I would like also to thank Mrs. Maria Theohari for granting me permission to present the ship model fragment from Ayia Marina in Spetses. For the same reason I thank the Second Department of Byzantine Antiquities and especially Mrs. Charis Koilakou, former curator at the Museum of Spetses.

Finally, I am grateful to Professor Nota Kourou for her observations concerning the dating and style of the Merenda krater and to Miss Roxani Margariti, archaeologist, for her support to the editing of this paper.

A fragment of an Early Helladic II clay boat model from Ayia Marina, Spetses (Fig. 1).

This fragment of a clay model comes from the EH settlement site of Ayia Marina in Spetses. It was found during the 1970 excavation directed by Prof. Dimitrios Theocharis. I would like to note that the existence of this prehistoric site was brought to the attention of Theocharis by researcher and journalist Adonis Kyrou, and the finds are on display in the Museum of Spetses[1]. The fragment to be discussed here is part of a base and upcurving end of a clay vessel. The base is U-shaped in section; the upcurving edge is V-shaped in section (the piece is broken both at its top and at its base). I believe that the piece is part of a boat model. It compares well with the stern of the clay boat model from Palaikastro in display at the Herakleion Museum (Fig. 2). The uprising part is now broken but it must have extended upwards to form a high end or sternpost.

In my opinion, the Ayia Marina model represents the well-known Aegean boat type of the Early Bronze Age with high stern horizontal low bow and often a waterline forefoot[2]. The hypothetical reconstruction of the Ayia Marina model relates to the Palaikastron model as well as the so-called "frying-pan" boats (Fig. 3).

A graffito on a jug handle from the EH cargo of Dokos (Fig. 4).

Among our finds of the 1992 season at the underwater site off Dokos[3], was part of a broad strap handle, most likely of a jug. Such handles are common in the assemblage that constitutes the EH II cargo at Dokos.

What distinguishes the particular handle is an incised representation on its interior surface (that is, the surface of the handle that faced the body of the vessel). The location and rough execution of the incision suggest that the potter made it before attaching the handle and firing the vessel. But why did the potter choose to depict his subject on a spot where none would have noticed it? Surely he did not have in mind the archaeologists who eventually found the piece detached from the body, after the vessel broke in the shipwreck.

The potter must have made the incision, either on a whim, simply because he found pleasure in representing a subject that caught his eye, or as a rough draft of a decorative design that he intended for the exterior of some other pot. Examples of incised representations are common on EH and EC pottery. But what did the potter want to depict here?

The graffito comprises two main horizontal elements and a few verticals. The two horizontal lines, combined with some of the vertical ones, may represent an EH ship seen in profile. If that is the case, notice the low bow and the angular midship part of the boat; both features are clearly depicted in contrast with the high stern which is not as discernible.

Of the vertical elements, most prominent is a V-shaped incision that may represent animal horns, the closest parallel being the rock carving at "Korphi t' Aroniou", in Naxos[4] (Fig. 5). The other vertical lines may be very schematic human figures, with which the author intended to fill in the composition.

The interpretation of the graffito as a rough draft of an EH ship representation finds support in the existence of ship incised on EH and EC pottery and on rocks. Prominent among those, is the series of incised ship representations on the "frying-pans" of Syros (Fig. 3).

The closest parallel that I was able to find is the depiction of an EH ship, incised, on a handle of a vessel from Orchomenos[5] (Fig. 6); in this case, it is the exterior face of the handle that bears the representation. Here too, the vertical elements defy interpretation.

A Late Neolithic pithos sherd with a possible ship representation in relief from the Ayio Gala cave in Chios (Fig. 7).

The cave site of Ayio Gala in Chios has yielded a long stratigraphic sequence, spanning from the Early Neolithic to Bronze Age. In 1938 the site's upper cave was excavated under the direction of Edith Eccles. The finds of that season where initially stored in the Museum of Chios but were removed during the War; as a result, the artefacts got mixed up and their stratigrapic associations were lost.

To quote from Sinclair Hood's study of this material: "A number of fragments of pithoi were decorated with ribs in relief. Rims with a rib below them have Early Neolithic parallels on the Greek mainland. Relief decoration is the commonest on large storage jars or pithoi. Designs seem to have been almost entirely confined to combinations of horizontal, vertical or diagonal ribs. The unstratified fragment 307 has an elaborate design in relief, however, vaguely suggestive of three figures upright in a boat. The clay is coarse gritty brown to red brown. The surface is purplish brown, rough and unburnished. The elaborate relief decoration reminds the types of decorated sherds of pithoi in Agora, which are assigned to the Late Neolithic (4000-3000 BC)".[6]

Despite the fragmentary state of the sherd and the schematic nature of the representation I am convinced that we may be dealing with the depiction of a boat.

If this interpretation is valid, then we are looking at one of the earliest seagoing boat representations in the Aegean, perhaps contemporary with or older than boat depiction on Gerzean pottery and rock graffiti in Egypt.

Note the horizontal rib which curves upwards at one end; both its horizontal and its vertical parts end at the broken edges of the sherd. If this rib represents a boat, then standing in it are three figures, almost complete. The three figures are seen in profile unlike a figure in frontal view on a different sherd from the same site.

The composition recalls representations of boats with one high end (the stern) and may constitute an immediate ancestor of the boat in the third millennium rock carving at "Korphi t' Aroniou", in Naxos (Fig. 5). The affinities between the two images are not limited to the boat type depicted, but include the figures in the boat.

The find of such an early boat depiction in Chios should not come as a surprise; we should see it within the context of a vigorous culture with its roots already in the seventh millennium and with representative sites on Chios itself (Ayio Gala, Emporio) as well as in the wider area of the Northeastern Aegean.

The ships on the Late Geometric Krater from Merenda (East Attica) (Fig. 8, 9).

On display at the Museum of Vravron are a large fragment (No 1492) and a smaller sherd of a Geometric krater from the site of Merenda (ancient *Μυρρινοῦς*) in Eastern Attica[7]. The find was probably excavated in 1968 and, unfortunately, the excavation notebooks contain no relevant information. Its type and size, however, suggest that this pedestalled krater served as a grave marker in the geometric cemetery of Merenda. The large fragment (48x68 cm), (Fig. 8a) preserves part from the low rim and of the body as well as a stirrup handle. The small sherd (Fig. 8b) comprised part of the rim on upper body.

The painted decoration includes linear and floral motives as well as figured representations. These, feature a horse and bird metope and a chariot procession frieze. In addition, below the two archs of the handle are two long ships drawn in profile. The three rows of zigzag above the ships are a common decorative design on Geometric pottery. Overall, the krater combines early traits (such as the low rim and the decorative scheme at handle level with metope and meanders, that derive from the Middle geometric times) with latter characteristics; the chariot procession excludes a MG date. The workshop that produced this piece must be Attic but not Athenian; leaf designs at the rim do not appear on Athenian kraters. This hitherto unknown workshop compares in general style with the well known LG I workshops but exhibits finer drawing and distinct iconography and decoration.

To sum up, the Merenda krater appears to be a LG Ia work from Eastern Attica. The painter used traditional MG II devices as well as contemporary LG Ia elements in the design. Let's now look at the ships:

The Merenda krater is one of the three examples of Geometric pottery with ship representations below the handle; the other two are a Protogeometric krater in the Museum of Bodrum (Bodrum No 4)[8] and a Late Geometric I Attic krater in the Louvre (Louvre A517)[9]. The ships on the Merenda krater about 10,8 cm in length, are neatly inserted in the two spaces below the stirrup handle. I will call the ship on the left Ship A (Fig. 9a) and the one on the right Ship B (Fig. 9b).

Both vessels are warships with a long slightly upturning waterline ram. Despite slight differences, they obviously are both examples of the same ship type.

The keel is a straight timber for most of its length and curves upwards at the stern. Ship A features a medium-sized afterdeck significantly larger than that of Ship B. Perhaps the painter allowed space for painting in the large steering oar that we see on Ship B. Both ships have raised foredecks of the ikria type. Projecting beyond the stern are the ends of three battens or struts than reinforce the foredeck. Ship B has similar projections at the stern indicating similar reinforcement of the afterdeck. The thole-pins that project above the sheer line are clearly depicted on both ships, seventeen on Ship A and nineteen on Ship B (the thole-pins of Ship B are smaller in size and thus more numerous despite the equal length of the two vessels).

The steering oar of ship B is impressive in size and is depicted in some detail; its long blade, shaft and tiller are all discernible. The ships have horn ornaments at both ends. The horn at the bow curves gracefully and seems to be a continuation of the stem. On the contrary, the stern horns do not follow the curvature of the post but appear to be mounted onto it.

In both depiction, basic elements are drawn in thick dark lines. The hulls are also painted in dark brown but the color has faded to mere traces in some areas.

Below some of the thole-pins we discern dark dots in a more or less straight line on the hull. These should not be misinterpreted as oarports that would identify the ships as dieres. In fact the dots are the thick trace left by the paint brush at the end of the straight line that represents each thole-pin (similar thick paint spots appear on other parts of the krater).

Besides, the technique of representing openings in Geometric Art involved leaving spaces of the appropriate shape blank, as opposed to painting them in. Paintings of dieres from that period exhibit this device; the Merenda ships themselves exemplify the principle in the way the ikria are represented (with gaps in the "fencing"). Ship B is better preserved and illustrates structural elements at the bow. The artist seems to have been aware of the joint between keel, ram and stem; each timber is rendered with a different brushstroke. A curved line (R) represents the bulging of the hull foreword, just abaft the point where the hood ends of the strakes fit onto the stem (Fig. 9c). Similar rendition of the planking at the bow is observed on the well-known Attic krater of the Royal Ontario Museum, Toronto[10].

Ram and keel were part of the same straight timber, while the stem was fitted onto the afterend of the ram.

The triangular space defined by the keel, stem and curved line of the planking would be filled in with deadwood.

The ships of Merenda find no exact parallel in contemporary LG Ia. They appear in realistic perspective, as seen from the side. It is a rare view that sets the depiction apart from representations by the Dipylon school.

The closest known parallel appears on the geometric krater Louvre A522 (Fig. 10)[11]. The Merenda ships, however, lack rowers, oars and mast and sail. The painter omitted all movable elements that would encumber the picture and thus emphasized the hulls with their thole-pins, and, in the case of ship B, the steering oar.

The slight, inward curvature at the top of the stern (a feature probably designed to provide some shelter for the helmsman) finds a parallel in the ships of the Attic krater in the New York Metropolitan Museum[12].

I will now conclude my comments on the Merenda ships. Assuming that thole-pins are extensions of frames, I would identify the ships as moneres (single-banked vessels) with about 20 rowers per side and without an outrigger (parexiressia).

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NOTES

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10. op. cit., Basch 184-187, fig. 388A.
11. op. cit., Basch 175, fig. 362.
12. op. cit., Basch 178-179, fig. 374.

ILLUSTRATIONS

Fig. 1a

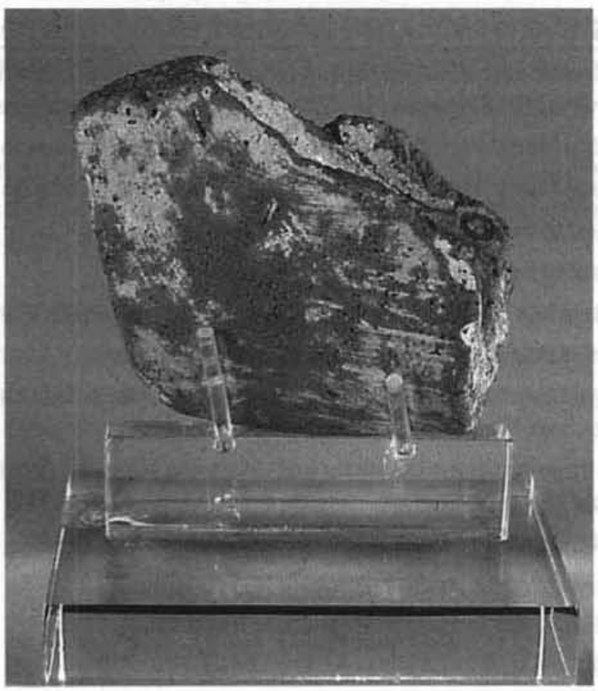
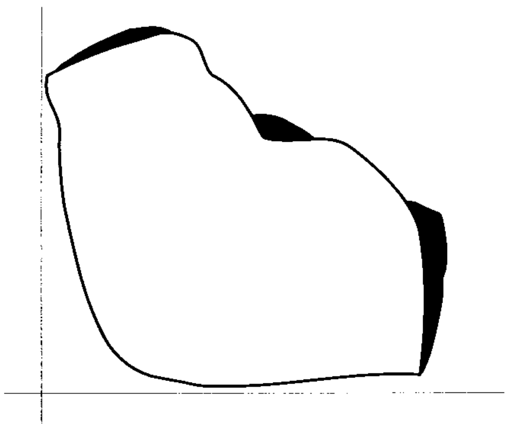
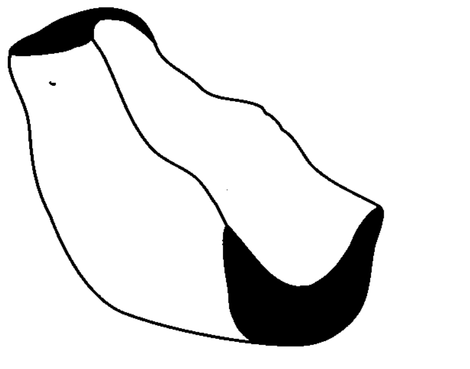


Fig. 1b



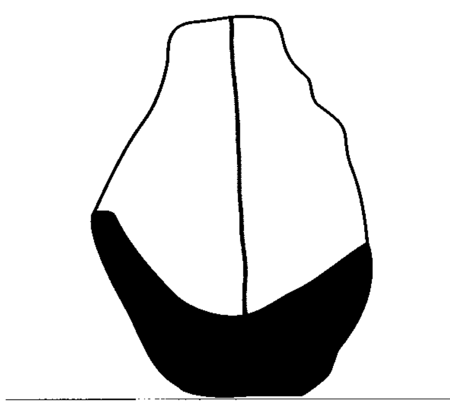
Part of a Early Helladic ship model from terracota
Ayia Marina, island of Spetses
Now at the Spetses Archaeological Musuem

Side view



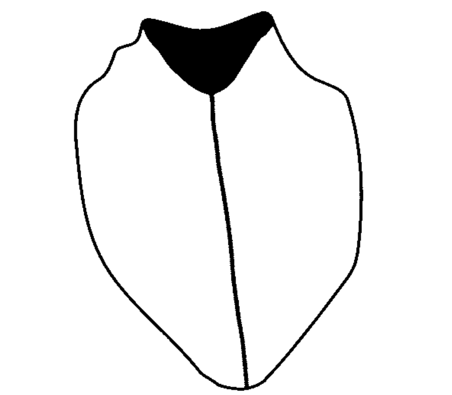
Part of a Early Helladic ship model from terracota
Ayia Marina, island of Spetses
Now at the Spetses Archaeological Musuem

3/4 view



Part of a Early Helladic ship model from terracota
Ayia Marina, island of Spetses
Now at the Spetses Archaeological Musuem

Cross section



Part of a Early Helladic ship model from terracota
Ayia Marina, island of Spetses
Now at the Spetses Archaeological Musuem

Front view

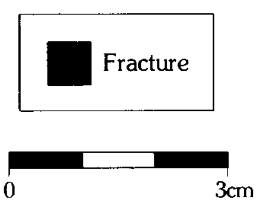
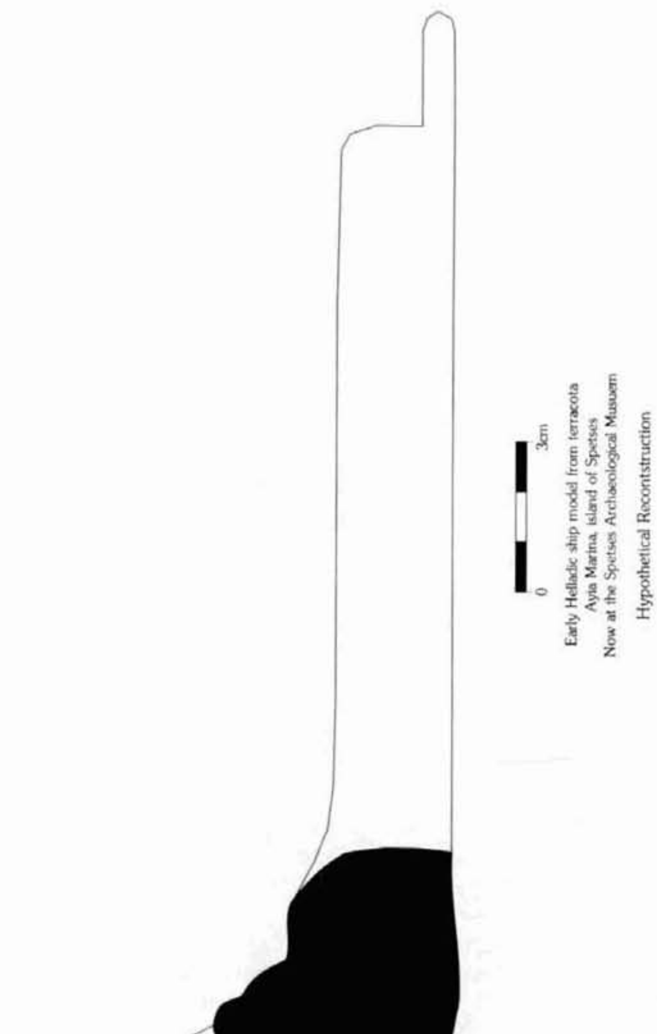


Fig.1c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Early Helladic ship model from terracota
Ayia Marina, island of Spetses
Now at the Spetses Archaeological Musuem
Hypothetical Reconststruction

Fig. 1d

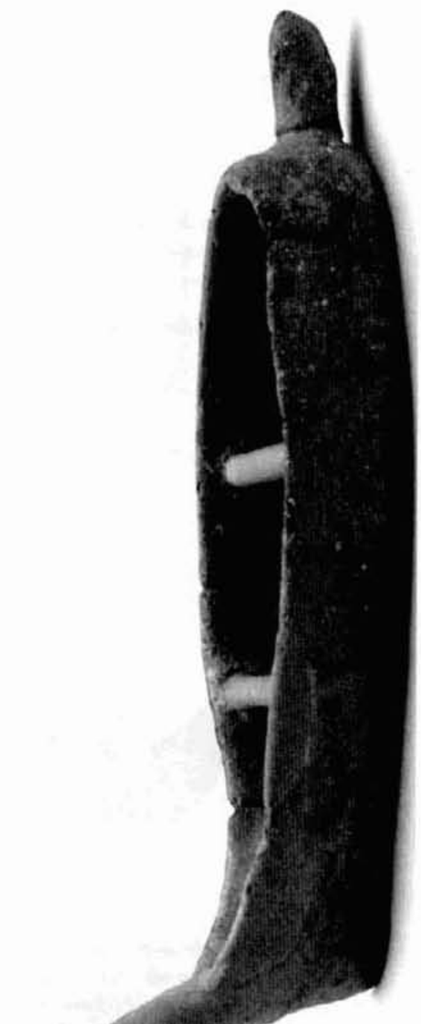


Fig. 2

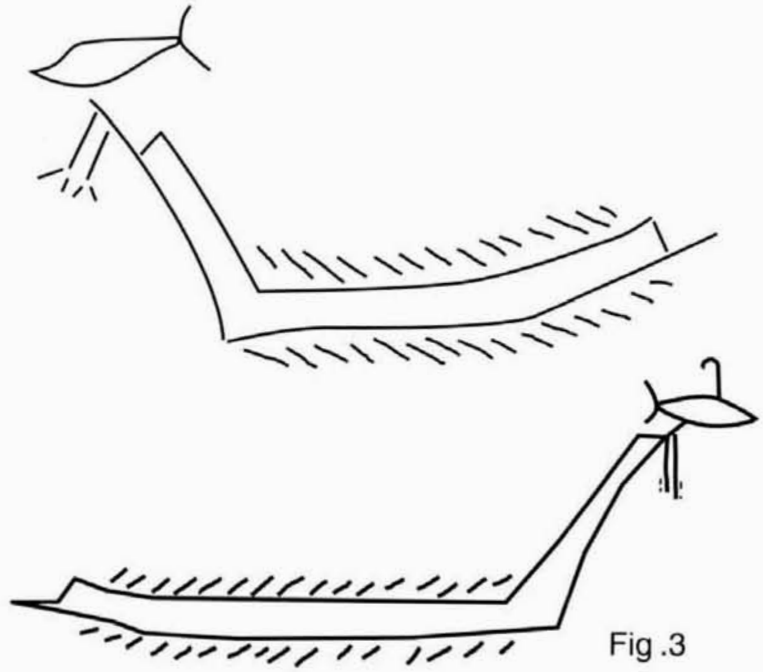
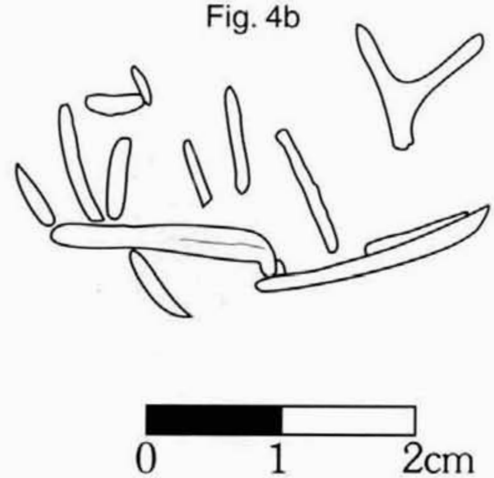


Fig .3

Fig. 4a

Fig. 4b



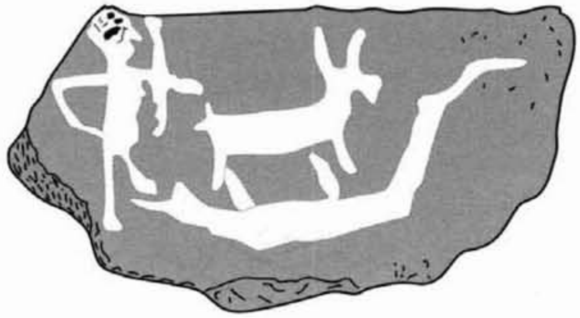
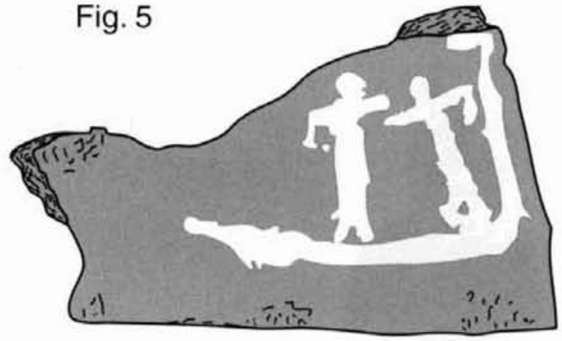


Fig. 5



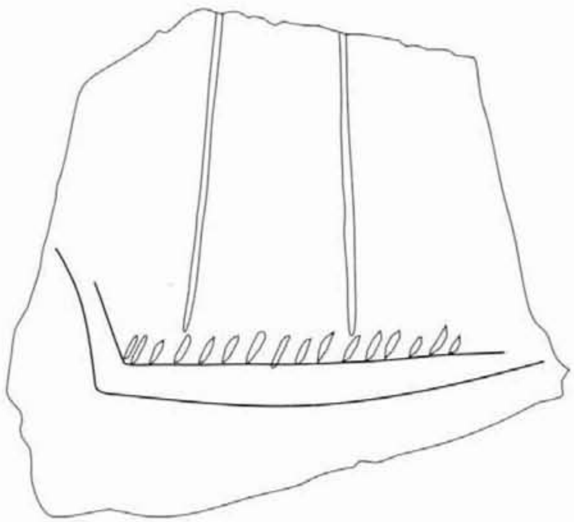


Fig. 6

Fig. 7

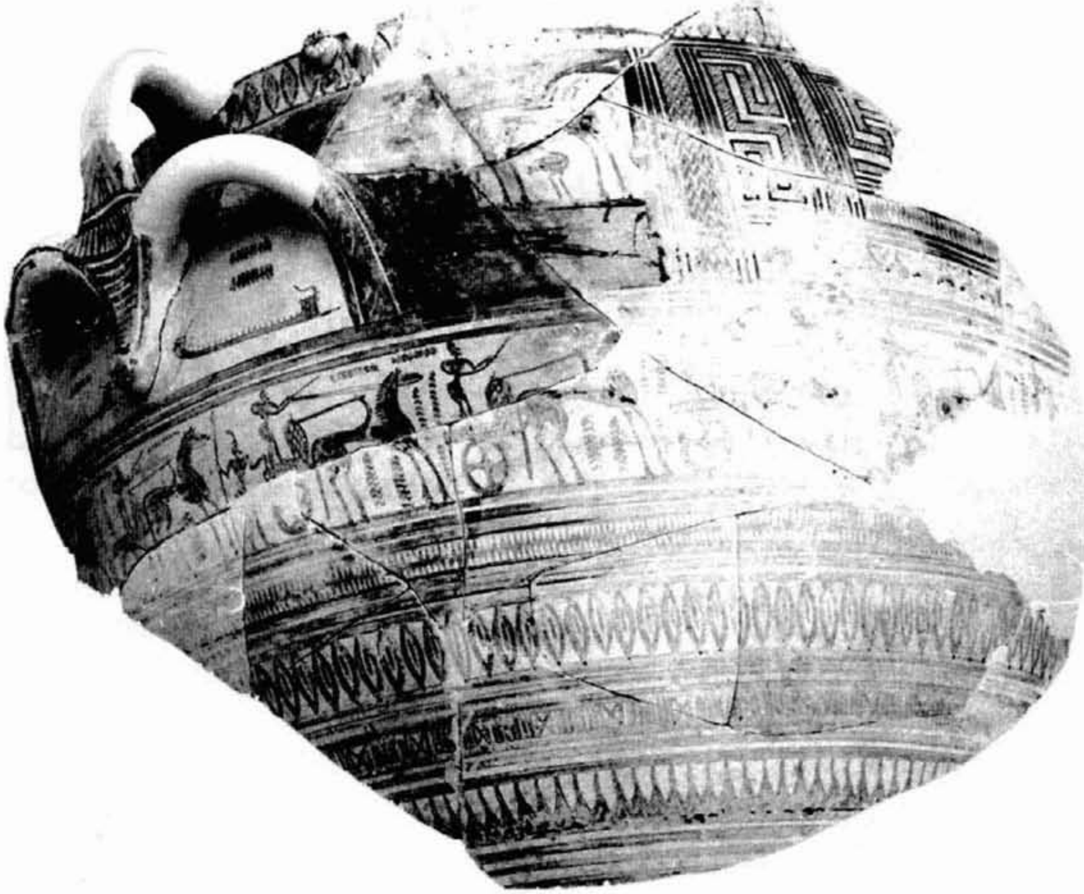


Fig. 8a

Fig. 8b

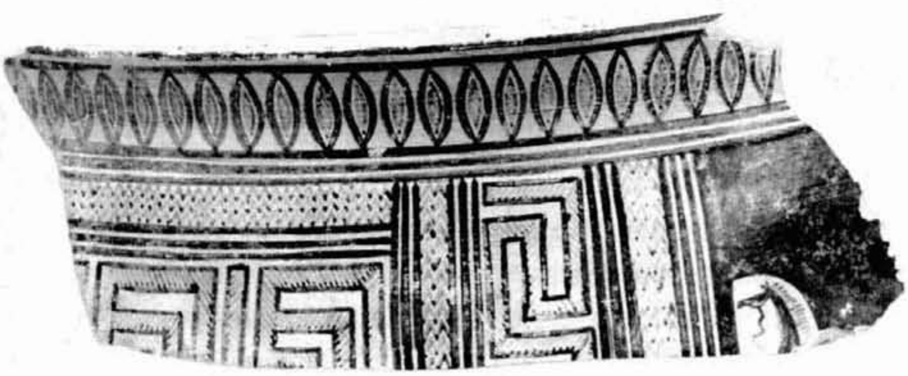


Fig. 9a

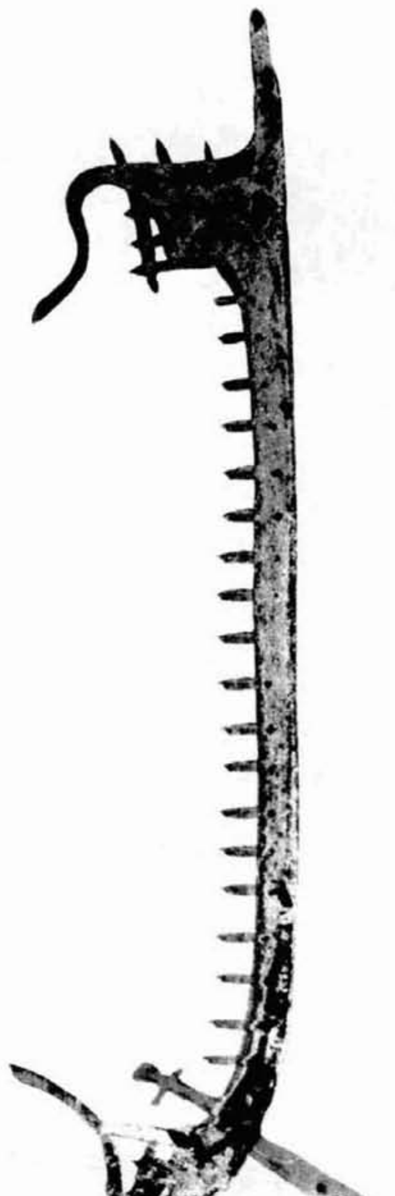


Fig. 9b

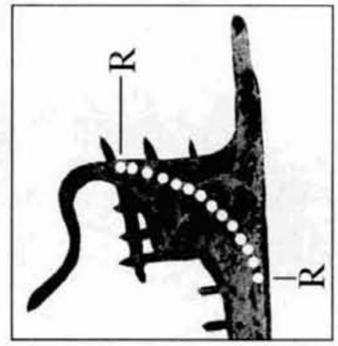


Fig. 9c

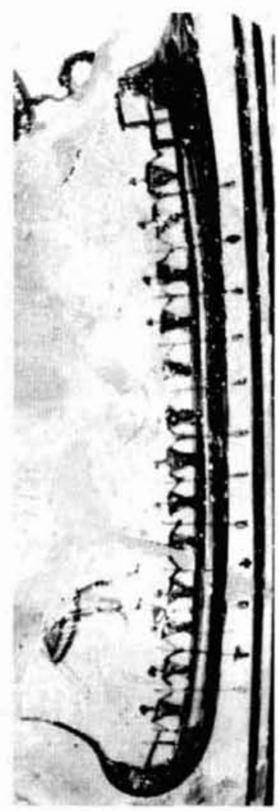


Fig. 10

THE PYLOS ROWER TABLETS RECONSIDERED

The decipherment of the Linear B script by Michael Ventris and John Chadwick opened a door to new dimensions of understanding of the Mycenaean world.[1] It now became home not just to the archaeologist, but also to the linguist and epigrapher.

The known corpus of Linear B documents consists primarily of inventories, receipts and other forms of lists kept by the scribes of the palace bureaucracies. Some of these documents deal with subjects relevant to seafaring.[2] No truly historical texts have been found, however, nor any tablets bearing poetry of a Homeric nature. Notwithstanding the problems presented by the nature of the material, Mycenaeao-logists studing aspects of the Linear B texts have been able to contribute much to our understanding of Mycenaean life and palace administration.

One of the two largest known caches of Linear B tablets was uncovered by Blegen during his excavations at Ano Englianos, the site of the palace of the kingdom of Pylos (Fig. 1).[3] Somewhat serendipitously, Linear B tablets —the first ever recovered from a Greek mainland site— were discovered on the first day of Blegen's excavation there.[4] One of the trenches crossed the archive rooms where over 600 tablets and tablet fragments were found.[5]

Linear B tablets were meant for short term use; they were not baked after being inscribed nor do any year-dates appear on them.[6] These considerations indicate that most, if not all, of the tablets were prepared during the last year in which the palace functioned. Thus, these documents may reasonably be considered to accurately reflect the situation at Pylos immediately prior to the palace's destruction.

From the inception of research on the Pylian documents, there were those scholars who sensed that some of these tablets suggested the existence of a state of emergency. Those who held this view —such as Ventris, Chadwick, Palmer and Baumbach— pointed to several considerations:[7]

- "Thus the watchers are guarding the coast" reads the title of PY An 657.[8] This is the lead document of a set, known as the *o-ka* ("Command" or "military detachment") tablets, which contain lists of men who apparently were assigned to guard the coast.[9] The consideration that it was considered worthwhile to exert this effort implies an awareness - perceived or real - that enemy forces might try to approach the kingdom by ship.
- Bronze, apparently taken from temple coffers, had been collected for the purpose of forging arrowheads and spear points (Jn 829).[10]
- In PY Tn 316 men and women, referred to as *po-re-na*, are dedicated, along with metal vessels, to several gods and goddesses.[11] These *po-re-na* have been interpreted as victims of human sacrifice, perhaps carried out under exceptional circumstance.[12]
- PY An 1, An 610 and An 724 are known collectively as the "Rower Tablets", due to the appearance of the word meaning "rowers" (*e-re-ta*) in each of their headings.[13] All three tablets were written by the master scribe, termed Pylos Hand 1, who was also the author of the *o-ka* tablets.[14]

The Rower Tablets

PY An 1 records thirty rowers, taken from five settlements. The title of this small tablet reads: "Rowers to go to Pleuron."[15] All the settlements from which the men are taken fall within the palatial territories of Pylos.

The crew count is interesting. Homer mentions twenty-oared ships and fifty-oared penteconters, but he does not refer to triaconters; according to Herodotus, however, thirty-oared ships were employed in the early colonization of Thera.[16]

PY An 610, although damaged, appears to be a list of men called up to serve as rowers.[17] A total of 569 men are listed on its undamaged parts. It is clear, however, that some of the numbers are missing and Chadwick reconstructs an original total of approximately 600 men.[18] This contingent would have been sufficient to crew a fleet of thirty twenty-oared ships, twenty triaconters or twelve penteconters.[19]

In PY An 610 the men are identified, for the most part, according to their settlements. In two cases, however, groups of 40 and 20 men are brought by two notables: *E-ke-ra$_2$-wo* and *We-da-ne-u*. The former may have been the ruler of Pylos;[20] the latter appears elsewhere in the documents as the owner of slaves and sheep, and also may have owned lands where flax was cultivated.[21]

Killen has pointed to a specific system of draft in use in both An 1 and An 610.[22] Four sites –*ro-o-wa, ri-jo, te-ta-ra-ne* and *a-po-ne-wa* appear in the same order in both An 1 and An 610, indicating an immediate relationship between these two documents. The number of rowers taken from the settlements in An 1 is proportional to those taken from the same settlements in An 610 at an approximate ration of 1:5. Thus, it appears that each settlement contributed rowers based on a proportional evaluation of its reserve duty requirements.

While PY An 1 and PY An 610 apparently enumerate oarsmen that are available for service aboard ships, the third and last document of this group, PY An 724, is a list of oarsmen missing from the muster.[23] It is damaged in some places and there are many erasures at line ends.[24] On the verso of the tablet, the scribe (?) drew a graffito of a ship or a boat.[25] We know what normative Mycenaean seacraft looked like;[26] interestingly, this graffito does not conform to those standards. Perhaps the scribe was employing here a representation of a ship from his Linear B ideographic repertory, one that was derived from a ship type that was no longer in common use in Mycenaean nautical activity.[27]

The vessel has a crescentic hull with a semi-circular construction located amidships and bough-like items extending from the ship's right extremity (bow?). The central structure is suggestive of those appearing on seven vessels depicted on a Middle Helladic jug from Argos;[28] the boughs are reminiscent of devices at the prows of Minoan cultic boats.[29] While the Argos vessels are shown under either oar on paddle, the An 724 graffito lacks any visible form of locomotion.

Interpreting the Rower Tablets

Unless we assume that raising a fleet that required 600 rowers was a normal occurrence at Pylos, the Rower Tablets strongly imply that something out of the ordinary—something exceptional—was taking place at Pylos just prior to its destruction. This impression is further strengthened by the considerations previously outlined.

But for what purpose were the oarsmen drafted? Why did the Pylian high command need a fleet in the first place?

Let us assume for the moment that the Rower Tablets do indeed indicate a state of crisis Pylos in anticipation of a danger approaching from the sea—a view held by some, but certainly not by all Linear B scholars. Tha large numbers of men listed in PY An 610 has been interpreted by some scholars as evidence for the mustering of Pylian war fleet.

Of course, rowers were indeed often needed for war fleets composed of swift galleys, employed in marine battles and other military missions. Such a fleet almost inevitably brings to mind thoughts of Troy, Salamis and Actium —of sea battles and piracy.

The equation of "oared ships" with "war ships" seems so obvious that little, if any, consideration in the past has been given to alternative motives for the massing of rowers —or paddlers— in the Pylos Rower Tablets. Looking at the Pylos Rower Tablets from the vantage point of a *nautical* archaeologist, however, I wish to pose two elementary questions that seem never to have been asked in regard to these enigmatic documents:

- What possible reasons are there for the massing of oared ships?
- And, of these reasons, which one tallies best with the archaeological evidence from Pylos?

Assuming solely a military rational —whether of an offensive or a defensive nature— for the mustering of this Pylian fleet is undoubtedly a *limiting* view of past nautical realities when oared ships were used for a variety of purposes. Indeed, there are at least four other fleet actions, documented in antiquity, that would have required the call-up of large numbers of rowers/paddlers:

Suppose that one wanted to move something heavy —extremely heavy— by ship. One would require many oarsmen to row the boats required to move the barge on which the object lay. Thus, Hatshepsut, to judge from her relief at Deir el Bahri, required about a thousand oarsmen to row the tow-boats the pull her Brobrignagian obelisk barge from Aswan to Karnak.[30]

Cultic festivals in which ships were rowed or paddled would also have required many hands to man them.[31] This is just as true for the colorful dragon boat races that take place today, as it was in seventeenth-century BC Thera.[32]

Oared ships also served as merchant ship, as for example the fleet that Hatshepsut sent to Punt.[33] Herodotus emphasizes that the Iron Age Phocaeans used penteconters in their voyages of exploration and trade.[34] Such trading fleets too would have required numerous oarsmen.[35]

Galleys were also used in antiquity for expeditions of colonization, as well as for mass forced migrations when insurmountable forces threatened. In classical times, penteconters were employed to transport entire populations and their moveables. Perhaps the most informative example for this phenomenon is Herodotus' description of the Phocaean escape from Ionia before the advancing Persian army:[36]

> *"... the Phocaeans launched their fifty-oared ships, placed in them their children and women and all movable goods, besides the statues from the temples and all things therein dedicated save bronze or stonework or painting, and then themselves embarked and set sail for Chios; and the Persians took Phocaea, thus left uninhabited."*

The Assyrian king Sennacherib describes a similar waterborne flight, this time from the viewpoint of the invader:[37]

> *"And Lulî, king of Sidon, was afraid to fight me (lit. feared my battle) and fled to ladnana (Cyprus), which is in the midst of the sea, and (there) sought a refuge. In that land, in terror of the weapons of Assur, my lord, he died."*

At Nineveh, Sennacherib's artists recorded Luli escaping Tyre by ship before the Assyrian king's assault (Fig. 2). Luli's fleet consists of warships with waterline rams, as well as round merchant galleys or transports. The heads of both men and women refugees peeking out from above the screens surrounding the ship's decks indicate that both types of ships were used in this waterborne escape.[38]

Which of the above explanations best fits the evidence at Pylos? We can probably safely drop the scenario of a fleet of tow ships à la Hatshepsut. Such a situation would have been unlikely at Pylos and can, therefore, be ignored. That the lists may pertain to the muster for a race or procession is, however, admittedly a possibility, particularly considering the cultic affinities of the ship graffito on PY An 724. Similarly, the raising of oarsmen for a Mycenaean trading mission is not impossible, although if we assume a potentially dangerous situation at home, one wonders how inclined those in power at Pylos would have been to part with men and ships which probably would have been deemed essential to the welfare and safety of the kingdom.[39]

I believe that PY An 610 and PY An 724 may record preparations for a shipborne emigration - at least of certain higher echelons of the Pylian kingdom's population - to escape from an impending overwhelming attack.

Now, *most of* the oarsmen of PY An 610 are classified as "settlers" (*ki-ti-ta*), "new settlers" (*me-ta-ki-ti-ta*), "immigrants" (*po-si-ke-te-re*) or by an unidentified term (*po-ku-ta*).[40] One of the absent men in PY An 724 is described as a "settler who is obligated to row".[41] Such terms could make sense if the documents are concerned with an act of migratory colonization in which the rowers who are manning the fleet are also among those migrating to a new location.

Palaima, emphasizing the similarities between PY An 1 and Ugaritic text KTU 4.40, limits the significance of the land-holding terms in the Rower Tablets to the implication that "on the individual level, their [the rowers] service was obligatory in return for the use of land granted to them by the palace center of by or through the local community".[42]

As Killen notes, however, the significance of this Ugaritic text itself is uncertain. It might equally refer to normal maritime activities or to a proportional military draft of oarsmen for the nautical defense of Ugarit or its allies. Thus, although these documents from Ugarit and Pylos indicate a similar system of proportional call-up prevalent in the two kingdoms, it is imperative to remember that this only informs us as to how the men were called to service, but not *why* they were called up.

Let us examine this question from the perspective of archaeology. What might we expect to find at Pylos assuming a scenario in which it had been abandoned by its inhabitants, escaping by ship, as opposed to the traditional scenario in which the palace was destroyed by external enemies who then pillaged it? I believe that we might reasonably expect the following manifestations of material culture:

- As no struggle would have taken place there, we would not expect to find any human remains.
- The migrants would have taken their most valuable possessions with them, as well as those items and livestock most needed to begin life in a new location.
- As the abandonment was to be permanent, we would not expect to find hoards or caches of metal valuables hidden with the intention of returning and retrieving them.
- The fleeing population would have been forced to leave behind less intrinsically valuable items due to what undoubtedly would have been a severe lack of space on board the transports.
- Finally, we should not be surprised to find a "scorched earth policy". The departing people of Pylos might have had the predilection to destroy as much as possible of whatever they were forced to leave behind in order to prevent if from being of use to the invaders. The invaders —if and when they did arrive— would have found the palace abandoned, empty of valuables, and perhaps even burnt to the ground.

How then does this model reflect the archaeological evidence as revealed in Blegen's extensive excavation of the palace at Ano Englianos?

Despite the massive excavations at Pylos, and the many skeletal remains retrieved there, not a single human bone was identified. And, Ano Englianos was not immediately inhabited after the destruction of the palace.[43] This precludes an interpretation of new settlers at Ano Englianos removing the decaying bodies of the previous inhabitants.

This led Blegen to conclude that the people of the palace and city of Pylos had escaped.[44] The interpretation that I propose here takes Blegen's conclusion one step farther by suggesting that the "escape", which is evident in the archaeological record, was a well organized one.

The PYT a series inventories numerous valuable metal and stone vessels and inlaid furniture.[45] Despite the thoroughness of his excavation, however, Blegen did not uncover a single metal vessel in the entire palace. Indeed, anyone visiting the site museum at Khora, soon realizes that the totality of the metal "valuables" from the palace are few and fragmentary.[46] They are displayed on two small pallets.

Of course, it is possible to argue that methodical pillagers made a clean sweep of things during and after the "conflict", but such a scenario does not give sufficient consideration to the fact that strata at other sites that have ended in fire and destruction and, presumably have been pillaged in the process, will normally still contain some valuables. Pillagers are not infallible.

No hoards were uncovered at Pylos, even though metal hoards —at least some of which must have been interred for safekeeping with the intention of later recovery— are a particularly common feature of thirteenth-twelfth century BC Mycenaean/Achaean sites.[47]

The palace at Pylos was destroyed in a huge conflagration. The majority of artifacts recovered consists of large quantities of pottery, abandoned in mint condition in the palace pantries. These vases, which had been stacked neatly according to type, collapsed in groups as the fire that swept the palace burnt away the wooden shelves on which they had been stored. This is also in keeping with a theory of abandonment. Ceramics, easily made from local clay at virtually any given destination, are unlikely to have been allotted valuable —and limited— shipboard space.

Any one of these phenomena by itself would be a curiosity. Taken together, they support the inference that Pylos was not destroyed from without, but rather abandoned in an organized manner by its Mycenaean inhabitants.

Conclusions

In conclusion, a scenario of organized abandonment fits the archaeological evidence from Ano Englianos remarkably well. The ease with which the later Phoceans took to their ships and left their homeland behind to escape certain defeat at the hands of the Persians suggests that they were not the first in the Aegean world to choose this option in times of crisis. Indeed, this interpretation might aid in explaining the psychological and administrative mechanisms at work behind the phenomenon of mass sea-borne Aegean migrations and relocations to the eastern Mediterranean at the end of the Late Bronze Age as the Mycenaean collapsed. Of this world, Pylos might be considered a microcosm.

Furthermore, this interpretation of the Rower Tablets as representing bureaucratic documents relating to the nautical movement of population also fits comfortably into what we know of the Mycenean world somewhat earlier, during the fourteenth and the thirteenth centuries BC, when Mycenaean colonies —carrying the weight of their cultural influence with them— were established on Aegean islands as well as along the coast of Asia Minor. Then, with the fragmentation of their world at the end fo the thirteenth century BC, Mycenaeans fled their cities, establishing numerous colonies and settlements abroad.

It is not an unreasonable assumption, given what we do know of Mycenaean society, that the earlier expansion was orchestrated to a large degree —if not entirely— by established Mycenaean palaces. And to do so required a degree of organization. By the end of the Late Bronze Age, Mycenaean palace bureaucracies must have been adept at organizing expeditions of colonization. Such experience would have served well, and come naturally, should the migratory abandonment of a home state have been necessitated.

Similarly, in a very real sense, the overseas expansion of the bearers of the Late Helladic IIIC 1b pottery in Cyprus, Syria and Israel simply were doing what came natural to them. These "northwesterners", who were to reach and settle in Cyprus, Syria and Israel —whether for the short-term, or for the long— during the upheavals of the twelfth-century BC, must have originally left from somewhere. Such a departure assumes a certain amount of organization and preparation. Thus, the Pylos Rower Tablets may reflect one form of preparation —palace oriented and therefore highly structured— for such sea-borne relocation.

Given the estimated population of Pylos, the fleet recorded on PY An 610 (and PY An 724), assuming that both documents are referring to the same fleet) probably would have been only one of many (and perhaps the last?) such expedition required to transport even a small segment of the people of Pylos —together with their servants, their belongings and their livestock— to the new location.

Something obviously must have happened. The population estimate for the subsequent Late Helladic IIIC period appears to have dropped to about a tenth of the population that existed during the Late Helladic IIIB.[48] But perhaps the most intriguing question that would arise if the people of Pylos abandoned —and perhaps torched— their own palace, before sailing off into the horizon is this: Where did they go?

I submit the above interpretation as a *working hypothesis* to be examined by scholars against the archaeological and linguistic evidence. If this interpretation does have merit, however, it would have a truly profound influence on our understanding of the other Linear B documents found at Pylos, for how likely would it then be that, of all the tablets recovered from Pylos, only these three reflect the organization of a Mycenaean evacuation? This would require a reevaluation of the entire Pylos archives in light of an abandonment theory.

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NOTES

1. Ventris and Chadwick 1973; Chadwick 1976. On the decipherment of Linear B, see Chadwick 1958A: 12-21.
2. Most recently Palaima (1991) has collected the relevant materials.
3. The name of Pylos (*Pu-ro*) appears on over fifty tablets from Ano Englianos, thus confirming the site's identification (Ventris and Chadwick 1973: 1410142; Blegen and Rawson 1966A: 419; Chadwick 1976: 40). For transcriptions of the Linear B tablets from Pylos see Bennett and Olivier 1973.
4. Blegen and Rawson 1966A: 5-6; Mc Donald 1967: 234.
5. Ventris and Chadwick 1973: 14. For a discussion of the site locations of Linear B texts found outside of the Archive complex at Pylos see Palaima 1988: 135-169.
6. Ventris and Chadwick 1973: 144; Chadwick 1973: 407; 1976: 18, 27.
7. Ventris and Chadwick 1973: 183-185, 357-358; Chadwick 1973: 414, 427-430; 1976: 173-179; 1987 B; Palmer 1956; 1963: 103-110, 147-163; 1965: 143-154; Baumbach 1983.
8. Ventris and Chadwick 1973: 189; Palmer 1956; 1963: 147-155; Bennett and Olivier 1973: 53;
9. Ventris and Chadwick 1973: 184-185, 188-194; Mühlestein 1956; Chadwick 1973: 127-430; 1976: 175-177.

10. Ventris and Chadwick 1973: 157-158; Palmer 1963: 281-284; Bennet and Olivier 1973: 175; Chadwick 1973: 511-513; 1976: 141-142.
11. Ventris and Chadwick1973: 184-189; Palmer 1963: 261-268; Bennett and Oliver 1973: 233-234; Chadwick 1973: 458-462; 1976:89-92, 179, 192.
12. Chadwick 1976: 91-92. Even if the interpretation of human sacrifice is correct, Buck (1989) suggests that human sacrifice might have been a regular, institutionalized, act for which men and women were kept in readiness. If this is correct, as I believe to be the case, then this would weaken the argument for the proposed sacrifice taking place under exceptional circumstances. See Wachsmann, in press.
13. Lindgren 1973 (I): 163-164; (II): 49-50.
14. Palaima 1991: 286. On the scribes of Pylos see Palaima 1988. A conservative estimate of the identifiable scribes on the Pylos tablets their number at thirty-two (172).
15. Ventris and Chadwick 1973: 185-186; Palmer 1963: 129-130; Bennett and Olivier 1973: 43; Chadwick 1973: 430-431.
16. Casson 1971: 44-45.
17. Ventris and Chadwick 1973: 186-187; Palmer 1963: 130-131; Bennett and Olivier 1973: 50; Chadwick 1973: 431; 1987B: 75-79; Palaima 1991: 285-287.
18. Chadwick 1987B: 77.
19. References to the number of ships in fleets appear in several tablets from Ugarit: 150 ships from Ugarit in KTU 2.47, as well as twenty and seven enemy (Sea Peoples) ships respectively in RS 20.18 and RS 20.238 (Van Soldt and Hoftijzer, in press).
20. Ventris and Chadwick 1973: 265; Chadwick 1976: 71; Lindgren 1973 (I): 46; (II): 50, 84, 135, 150, 153-155, 187, 197, 209.
21. Ventris and Chadwick 1973: 186-187, 200, 279; Lindgren 1973 (I): 127-128; (II): 37-38, 50-51, 84, 134-136, 152, 154, 161-162, 179, 185-188, 197, 210.
22. Killen 1983.
23. Ventris and Chadwick 1973: 187-188; Palmer 1963: 130-132; Bennett and Olivier 1973: 54; Chadwick 1973: 431-432; 1987B: 79-81; Perpillou 1968.
24. Chadwick 1987B: 79.
25. Palaima 1991: fig. LXIII:b; Wachsmann, in press.
26. Basch 1987: 140-154; Waschmann 1995: 25-29.
27. Personal communication from T.G. Palaima. Compare Palaima 1991: 286, fig. LXIII: a.
28. Protonotariou-Deilaki 1987: 126 figs. 1-4.
29. *PM IV*: 950 fig. 917, 952 figs. 919-920.
30. Naville 1908: 2-5, pls. CLIII-CLIV; Landström 1971: 130-131 fig. 383.
31. On boat races in Classical times see Gardiner 1891A: 1891B: Harris 1972: 126-132.
32. On dragon boats and the races in which they are employed see Bishop 1938: 415-424, pls. II-III, figs. 4-6; Worcester 1956; 1971: 256-257, 459-461, 530-535; Spencer 1976: 74, pl. 18; Smith 1992A; 1992B. On boat races at Thera see Marinatos 1974: 51 fig. 6, color pl. 9; Casson 1975; Wachsmann 1980; Doumas 1992: 68-79, 81, 83.
33. Naville 1898: pls. LXXII-LXXIV.
34. Herodotus I:163.
35. See most recently Casson's (1995) discussion on the use of galleys for merchantile activity throughout antiquity.
36. Herodotus I: 164. Translation by A.D. Godley from *Herodotus* I. (Loeb Classical Library). London 1975.
37. *ARAB* II: no. 326. See also nos. 239 and 309.
38. Barnett 1969: pl. I: 1.
39. Consider the lament of the king of Ugarit in RS 20.238 in finding his kingdom attacked by seafaring marauders while his own fleet is located far afield, in the Lukka lands (van Soldt and Hoftijzer, in press).

40. Chadwick 1873: 431; Palmer 1963: 90-91, 131, 136-137; Palaima 1991: 286. See Lingren 1973 on: *ki-ti-ta* (I): 170-171; (II): 82-83; *me-ta-ki-ti-ta* (I): 174; (II): 82, 97; *po-si-ke-te-re* (I): 180; (II): 124; *po-ku-ta* (I): 179; (II): 118-119.
41. Ventris and Chadwick 1973: 188; Chadwick 1973: 431. Palaima (1991: 286) translates this term (*ki-ti-ta o-pe-ro-ta e-re-e*) as "landholder who owes service as a rower".
42. Palaima 1991: 286. On KTU 4.40 see now van Soldt and Hoftijzer, in press.
43. This is true irrespective of the date assigned to the palace's destruction. Blegen dated the site's destruction to the end of the Late Helladic IIIB, just when Late Helladic IIIC pottery was coming into use (Blegen and Rawson 1966A: 421). More recently, Popham (1991) has proposed an early date within the Late Helladic IIIB for the end of Mycenaean Pylos based on the site's enigmatic lack of fortifications and has suggested a Proto-Geometric date for the ceramics that Blegen found there and assigned to the Late Helladic IIIC period. Griebel and Nelson (1993) note the existence of a significant Geometric inhabitation at Pylos.
44. Blegen and Rawson 1966A: 424.
45. Ventris and Chadwick 1973: 332-348; Palmer 1963: 338-365; Bennett and Olivier 1973: 230-231.
46. The metal artifacts found during the excavations of the palace are relatively few and, for the most part, fragmentary; they appear among the plates of small finds in Blegen and Rawson 1966B: pls. 261-317.
47. Knapp, Muhly and Muhly 1988 and additional bibliography there.
48. Chadwick 1976: 177-178.

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ILLUSTRATIONS

Fig. 1 The archive rooms (7 and 8) at Pylos.
Photo: S. Wachsmann.

Fig. 2 Luli, the king of Sidon, escapes from Tyre with his family and retinue in a fleet consisting of both oared "round" merchant ships and war galleys as Sennacherib advances on the city. Note that both types of ship carry male and female evacuees. From the palace of Sennacherib at Nineveh circa 690 BC.
From Barnett 1969: pl. I: 1.

Fig. 1

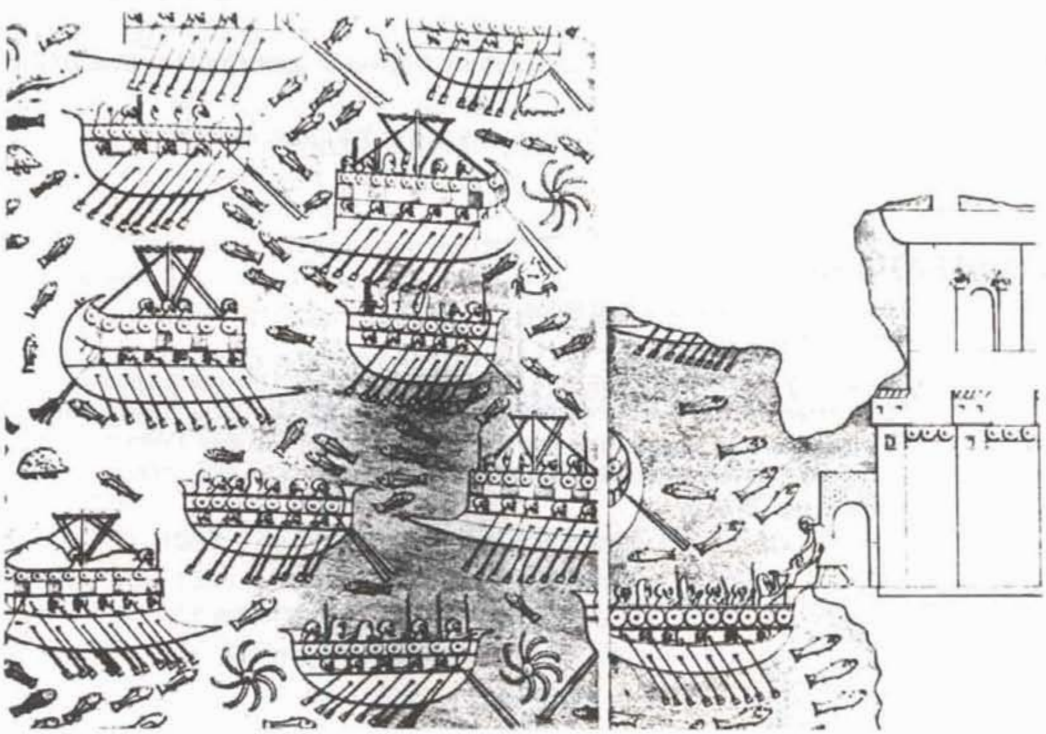

Fig. 2

DECKED VESSELS IN EARLY GREEK SHIP ARCHITECTURE*

Introduction

Writing the history of ancient Aegean ship construction involves the creation of a narrative founded on the available evidence. It is largely representational. Whereas physical remains, if present, contribute towards reconstructing single instances, or detailing specific constructional features, images provide, by virtue of their relative bulk, the data for tracing the evolution. Individual moments contrast with general tendencies—if, as rarely is the case, wrecks can be compared directly with images. For the earliest phases, the material is exclusively pictorial: there are no wrecks in the Aegean datable to the Bronze and early Iron Ages which have provided sufficient remains to permit a reconstruction.[1]

However, pictures are not perfect. Any narrative based on imagery must face the nature of the evidence. On the one hand, it is dependent on the vagaries of fashion: certain ship types gained the favor of the artist and the patron, others were never or rarely depicted.[2] On the other, it is tributary to the filters of conservation: statistical analysis will document the material available at a given moment, not the original state.[3] Finally, the resulting narrative is generated from the interaction between the originating artist and the interpreting beholder. It would, thus, be justified to surmise that the study of early Aegean ship architecture, as witnessed in the scholarly literature, has faced the theoretical and methodological issues involved, and established an interpretative framework within which to approach the data.

This is not the case.[4]

The study of ship representations has not evolved with the advances in theory and method evident in the analysis of ancient imagery in general. It has remained, by virtue of the source for its raw material, bound to tradition, eschewing the questing and questioning nature of Archaeology particular to the post-1968 schools.[5] Yet there is much to gain from a more theoretical approach, particularly in terms of a more exact charting of the interpretative acts undertaken by the specialist.

Reading images is an act of decoding, assuming the presence of an originating creator, the ensuing representation and a receiving beholder, united by an intellectual process. The mechanics of this transmission is very rarely made transparent. Behind the gnomic approach prevalent in the literature lies both time-consuming analysis and flashes of brilliant insight, yet this work remains beyond reconstruction for the reader.

The present paper attempts to initiate a dialogue on the theoretical and methodological requirements of a transparent treatment of the representational evidence for early Greek ship architecture. It will adopt the author's elsewhere documented stance regarding the reliability of the evidence –essentially an on-face-value acceptation of each document within the framework of a cluster-approach– in preference to examining each image in terms of its individual reliability.[6] It will strive to problematize the narrative it generates in the belief that greater self-awareness contributes to understanding how and why interpretations are created.

So as to achieve this goal, it is necessary to:

(1) explicit the theoretical framework within which the endeavor is undertaken;

(2) formulate hypotheses to be tested against material from the time period of immediate concern, but also against material from other phases of the development of shipbuilding in an attempt to gauge their universal value;

(3) document the tools created for questioning the data;

(4) evidence the systematical application of identical procedures over a range of individual representations.

The theoretical framework

The two salient features of the early Greek representational data relevant to the ship architecture of the Bronze, Geometric, and early Archaic Ages are linearity and profile view. This combination creates a major problem for the beholder: whereas the longitudinal outline of the hull and its superstructure can be reconstituted through reference to several indentical or sufficiently similar instances, the third dimension, and with it all constructional details which are reduced to single lines in the side view, are lost. The deck is the prime example of an important structural element dissappearing when depicted in profile. To further the identification of hulls partially or fully decked, it is necessary to recognize relevant indicators, and learn to translate their testimony into the third dimension. Such an undertaking can only bear fruit through an interplay of method and data, whereby it is imperative to recognize that the resulting narrative will depend on both the method and how the data are handled –whence the need for transparency.

A deck is defined as a horizontal surface covering part or all of the hull to a variable extent from post to post and gunwale to gunwale. It may be found at the bow, the stern or at the center, longitudinally along the gunwales, or down the centerline. The bow and/or stern quarterdeck can be combined with the central or lateral longitudinal deck. Finally, it may also be a watertight deck with a hatch permitting access below.

To recognize these various configurations, it is necessary to formulate a criterion: if elements of the superstructure, or members of the crew are positioned in such a manner as to necessitate an extensive flat surface, it may be postulated that the hull was decked at this point. It is important to stress that the presence of elements in need of support by a plane at one point of the hull need not imply a continuation to another point. Nor are there, in hypothetical terms, any automatic combinations: if a stern quarterdeck can be identified, it does not permit the *a priori* reconstruction of a bow quarterdeck, or a longitudinal deck.

The appeal to permanent structural or momentary human indicators, when applied to the database, faces the relative penury of either element. The human figure is rare in connection with vessels, and when present, frequently restricted to the helmsman, and/or the heads of the rowers, as well as the occasional passenger.

Thus the cluster approach in itself raises the issue of comprehensiveness: it is argued that the members of a cluster will answer collectively to a number of interpretative statements constituting the basis for a classification as a single type. This procedure assumes similarities in primary features, not merely in secondary traits. In a database constituted by profile views the diagnostic elements must be sought among those which can be easily detected, given the mode of depiction. This would entirely exclude the deck, yet, if present, it constitutes a major characteristic of the hull. If one, or possibly several, but not all, members can be identified as decked, it could be postulated that more than these instances within the cluster population are to be understood as decked, or even that the type is decked by definition. The problem is not easily solved. It depends on the attitude taken to the following queries:

(1) the percentage of cluster members exhibiting the same trait necessary for it to be considered dominant and interpreted into the typological make-up of the individuals who do not answer unambiguously to the suggested description;

(2) the effects of a shared idiom;

(3) the role of the deck in the clustering process;

(4) the relevance of an evolutionary stance on the overall image, and the effect it will have on the treatment of individual representations.

These four issues cannot be discussed in rigorous separation since intimately related. They all play an important role in how the beholder perceives the cluster, its population, the manner in which the individual images are rendered, and the proportion of decked hulls, if present. Given that the recognition of a deck depends on the presence of external indicators, the deck cannot be deemed a primary feature in the clustering process –despite the important differences between a covered (even partially) and an open hull.[7] Yet when a cluster is placed in the development of earlier Aegean ship building, its technical environment may suggest a general reading as decked, if some members exhibit the prerequisite traits, and if the deck is part of the vocabulary of the shipwright at that time. The manner in which the ship is depicted may prove related to certain structural characteristics if sufficient individuals share both structures and idiom.

These considerations, which will be expanded upon below with reference to specific depictions, suggest a tripartite interpretative construct –in conjunction with the key terms cluster, evolution, and idiom– modulating the certainty with which a vessel can be spoken of as being decked:

(1) reliable inanimate or animate indicators suggest that the hull is decked, partially or more extensively;

(2) potential indicators are evident, but exact statements cannot be formulated;

(3) reference to kindred images, in the absence of clear indications, suggest that the hull may be decked.

Bow and stern quarterdecks

The quarterdeck is the earliest attested form of partially covered hull in the Aegean.[8] Such a construction is implied at the stern on the large ships on the Akrotiri wallpainting to support the *ikrion* and the helmsman, the alternative, attachment to, and balancing on, thwarts being unlikely.[9] These same ships, in the form in which they are depicted in the so-called "Battle Scene", appear, at first glance, to have a bow quarterdeck upon which is fastened the balustraded "fighting platform" or forecastle.[10] This need, however, not be so.

If compared with the forecastle of the LH IIIC Tragana ship (Fig. 1),[11] it will be noted that the Akrotiri "fighting platform" is a mobile addition (as the ships in the "Procession Scene" —identical in terms of hull construction except for this feature— indicate) which does not need a deck by definition: it may have been included in the construction which was fastened to crossbeams or thwarts. The Tragana ship illustrates the subsequent stage, the incorporation into the bow morphology of a raised forecastle, necessitating a redesign of the stem,[12] but not, by definition, a deck at gunwale level.

Contrasting the Tragana bow with that of LG ships (Fig. 7) indicates both the close relationship between the Akrotiri and the Tragana ships in terms of this feature, and the intermediary position of the latter in the development towards the evolved forecastle. On the Iron Age vessels the quarterdeck is fully integrated with the bow morphology, with access to the quarterdeck gained by a ladder.[13] Little change beyond the addition of sidescreens at the bow can be noted in the images of the 7th and 6th centuries.[14]

The stern quarterdeck, rare in the Bronze Age except for on the Akrotiri ships (and the aftercastle on the Tragana and large Pyrgos Livanaton [Fig. 3] ships), is clearly attested to in the LG period by the position of the helmsman.[15] It frequently is part of the longitudinal deck. In the 7th and 6th centuries, the helmsman is depicted raised above the rowers, whether the vessel is decked or not.[16]

Longitudinal decks

Of far greater interest is the longitudinal deck—yet it is also far more difficult to recognize. No Aegean ships are, for obvious reasons of stability in a maritime environment, depicted with the cabins known from Egypt.[17] The deck becomes apparent only if there is movement upon it —that is, movement necessating a larger support than that provided by the thwarts or a central runway. Yet when questioning the data, three problems arise: distinguishing lateral decks from a central deck, mistaking a central runway for a deck, and creating a deck where only thwarts or a railing existed. Moreover, extrapolation from one member of a cluster to another, devoid of the necessary indicators, does not automatically follow.

In clusters that adhere more loosely to a common mastertype, such as the LH III type best represented by the Skyros ship, a general similarity in lines need not imply identity in details.[18] It is here suggested that the Enkomi ships are surely longitudinally decked, although it must remain open whether the entire hull was covered.[19] Similarly, the large Pyrgos Livanaton ship (Fig.3), by virtue of the warriors, but also of the suggested rowing gallery with the substantial beam above it, can be read as decked, either centrally or laterally.[20] The small Pyrgos vessel (Fig.2) appears to be decked, although the beam is absent.[21] The Skyros ship exhibits no clear evidence for a deck, given the method employed.[22]

Rare are the cases so clearly decked as the ships on the MG II Metropolitan krater (Fig. 5):[23] the deck is raised upon struts above the railing and the tholes, and supports a number of warriors, including one seated on deck and dangling his feet into an uncovered section. Whether central or lateral must remain open.

LG I ships are two-leveled, as argued by the author at the Tropis IV symposion, and decked (Fig.7).[24] Attempts to read them as depicting both the port and the starbord sides, the one above the other, are considered methodologically flawed, and are therefore rejected.[25] The available representations[26] indicate that the deck did not cover the entire width of the hull since warriors could stand on the lower thwart or runway and rise above the deck.[27] The deck was sufficiently raised to allow rowers to be seated below,[28] suggesting that LG I vessels were longitudinally decked laterally, not centrally (see discussion below).[29]

If the LG II sherds from the Akropolis,[30] and the EPA sherd from Phaleron[31] are related to the Dipylon vessels, a deck should be postulated, since these craft appear to depict an evolution of the earlier ships. The sidescreens, for the protection of the rowers, gain their full sense if the rowers were seated relatively close to them —again arguing for a lateral longitudinal deck.

Although the necessary criteria are not present, it is possible to attach the Toronto bowl to this group by virtue of the clear similarities to the ships on the three sherds.[32] In doing so it must be underlined that the proof for a deck is provided by the Dipylon vessels, and that any mention of a deck on the other four is an extrapolation. Two levels do not, as illustrated by the 6th c. *dieres*, demand a decked construction.[33]

A further extrapolation would allow arguing for a deck on the Toumba Tomb 61 MG I craft (Fig. 4),[34] by reference to the pictorial similiarties to two vessels which bracket it chronologically, the 300 year older Pyrgos Livanaton ship (Fig. 3), and the 100 year younger Dipylon type (Fig. 7). All three are characterized by the substantial beam, variously indicated in each case,[35] above the rowers. This would place the

Toumba ship, with the Metropolitan krater vessels (Fig. 5), in the evolution towards the second level with rowers on deck.

The LG II Katsaros sherds from Argos depicts rowers seated on stools on the line upon which stands the horse.[36] In reference to the criteria employed this would indicate a deck,[37] but whether a single-level (as the Metropolitan craft) or a two-leveled ship (as the Dipylon vessels) rowed from the upper level alone is depicted remains unknown. It is interesting to note that such stools have been postulated for the rowers of the upper level on the Dipylon ships.[38]

At this point the problems begin. Method, since it is an externally imposed tool employed by the beholder to order the evidence, is not always as accommodating as the ancient artist. The Eleusis 741 skyphos (Fig. 6)[39] depicts figures floating above the hull –the presence of a deck cannot be ascertained, although it should be noted that the warriors on the other side of the vase are also weightless, as is the warrior to the left of the bow.[40] The tholes above the horizontal line suggests that it is the gunwale.[41]

When contrasted with the Eleusis vessel, the Copenhagen oinochoe exhibits certain similarities:[42] the vessel is rendered by a thick line attached to a thin one by oblique struts –essentially the approach taken on the Eleusis cup, yet tholes are not depicted; upon the upper line sits the helmsman, and stand two warriors. Since this line also represents the gunwale, a reading as runway rather than deck cannot be excluded.[43] Comparing the Copenhagen oinochoe with the University of Tasmania cup[44] suggests that, on the latter, the small figures in the rooms below the line upon which is seated the lower torso with dangling legs are rowers– thus possibly signifying a decked craft.[45]

The ship on the Sounion plaque (Fig.8)[46] has, in the literature, been treated both as decked and open.[47] The double horizontal line above the hull, if read as a rail, necessitates arguing that the legs of the hoplites disappear into the hull. A reading as deck, upon which stand small men behind large shields, butts against the absence of similar stunted hoplites in EPA pottery,[48] but it should be noted that most figurative vases of the period are decorated with larger compositions. The stunted hoplite is known from EC aryballoi, but these are up to 150 years later, and therefore cannot have a direct bearing on the present problem.[49]

Four EPA sherds, contemporary with the Sounion plaque, are of interest. Whereas the three Agora sherds[50] cannot be securely related to the Sounion plaque in terms of the ship type represented, the Akropolis fragment (Fig.9)[51] appears to depict a very similar stern. Despite severe damage, the sherd retains one crucial element: in the position occupied by the sternmost hoplite on the Sounion plaque, there stands a small full-length figure. The size-relationship helmsman/standing crewmember is comparable to that of helmsman/hoplite, suggesting that the hoplites are depicted in their entirety. Either the stern quarterdeck extends as far as the standing man but no longer. Or the line beginning at the uprights, in an analogous relationship to the balustrade as the contentious lines on the Sounion plaque, is a longitudinal deck. It is, however, not possible to determine the height of the putative deck above the hull, and thereby venture to suggest whether the vessel is centrally or laterally decked. The problems involved in interpreting the Sounion plaque require a separate study –the suggestion that a decked hull is intended remains problematic.

The somewhat later ivory plaque from the Artemis Orthia sanctuary in Sparta does not contradict a reading as a decked hull for the Sounion vessel.[52] The shields are not held by hoplites on a deck, but attached to the rail above the gunwale. The heads appearing above must be those of the rowers, although their bodies do not continue between the rail and the hull. The two men manipulating the rigging stand either on thwarts or on a central runway.[53]

Both ships on the Aristonothos krater (Figs 10-11),[54] although very different in type, are decked, if the criteria employed are valid.[55] Two approaches to the deck, known from other images, are employed. On the left ship (Fig. 10), the deck is shown above the heads of the rowers, with the absence of struts explained by a desire for clarity –as on some of the Dipylon ships.[56] On the right ship (Fig. 11), the rowers are absent, permitting the addition of the struts. Whereas the left ship can be recognized as a decked *moneres* with the oars passing through ports –an innovation– the ship on the right does not follow established patterns. Similarities with the stern of the Sounion vessel (Fig. 8), with the bow of some Etruscan craft, can be noted; again further study is required.

In the 6th c., the deck disappears –or so the method employed suggests.[57] The Nikosthenic kylix Louvre F 123 is representative of the open-hulled *moneres* which dominates the material.[58] When a crew is depicted, which is rarely, it is shown standing on a central runway, as on the British Museum kylix B 436, an open *dieres*.[59]

Discussion

Two important issues rise from the above:

(1) the use of arguments from idiom and evolution;

(2) the distinction between a central or a lateral deck.

Extrapolation by bracketing on the basis of idiom and evolution, as was attempted above for the Toumba Tomb 61 craft, assumes a common pictorial language remaining, beyond dialectal variation, largely unchanged over long periods of time. To a certain extent such an assumption can be supported by the evidence: there is sufficient similarity in the means employed by Mycenaean and Geometric artists to render the longship of their time. This becomes particularly evident through the rereading of the Geometric corpus as employing a profile view only.

Nonetheless, problems arise. By reference to the criteria employed, there can be little doubt that the large Pyrgos Livanaton vessel (Fig. 3) is decked, and substantially so. Its smaller sistership (Fig. 2), although the horizontal line does not attain a comparable thickness, is likewise decked, the line serving as base for two warriors. It is likely that the struts supporting the deck have been suppressed and replaced by the oblique oarlines. The vessel would, then, in terms of the midship section at least, present itself very much like the Tragana ship (Fig. 1): a thick line representing the hull itself, and a thinner line joined to it by short vertical strokes. On its own, the Tragana ship, through the absence of figures on the latter line, appears to be undecked, the images depicting a massive keel, frames, and the gunwale, in the "x-ray" approach.

The right ship on the Aristonothos krater (Fig. 11), ignoring the morphological differences and interpretation of the bow, and concentrating on the midship section, witnesses to a similar treatment, although the lower line is appreciably thicker, and clearly represents the entire hull, from keel to gunwale. The thin line on struts renders, by virtue of the warriors (the warrior at the bow attests in favor of them standing on the line, not of disappearing behind it), a deck of unknown extension, but sufficient to serve as a fighting platform.

The much earlier Eleusis 741 vessel (Fig. 6) sheds a different light on the problem. The thicker line does not appear to render the hull in its entirety: the thin line is clearly the gunwale with tholes, the oblique strokes again being the frames, and not fulfilling a merely decorative purpose.[60] The largely contemporary ships on the cup NM 18471 are of the same type.[61] Here the frames and tholes form single lines. Tholes are exceedingly rare in Bronze Age ship images and appear on none of the larger oared vessels of the Mycenaean period.[62] Therefore they cannot be reconstituted to the Tragana vessel (Fig. 1), leaving the problem unresolved as to whether it is open or decked.[63]

Likewise problematic remains the Gazi ship:[64] the vessel is rendered by three parallel horizontal lines, a thicker one running from the sternpost out into the bow projection, and two thinner. They are joined by vertical strokes from the thick "keelline" to the uppermost thin line –they do not continue up into the triangle below the furled sail, this area being filled by an independent set of lines. Whether the middle horizontal line represents the gunwale or a wale cannot be ascertained.[65] If the former obtained, the upper line would by necessity be that of a raised deck, although the triangular area renders the presence of a human indicator impossible.

Finally, despite the obvious morphological differences, the LG I Warsawa 142172 krater fragments[66] exhibit a number of conceptual parallels to the Tragana ship. The amidship section of the hull is depicted by a thick horizontal line with a thinner one above it; at the junction with bow and stern, the hull gains in mass (the raised castles on the Mycenaean ship) before sweeping into the posts. The thin line on the Iron Age vessel is not a deck, as indicated by the figures standing behind it,[67] and by the sistership on the krater Louvre A522.[68] It is likely that vertical strokes need to be reconstituted to complete the image of a ship in the "x-ray" manner.[69]

The second issue, whether a central deck can be distinguished from a lateral one in a profile view, goes to the heart of the modern understanding of ancient ship building. A clear indication that the deck does not stretch unbroken from gunwale to gunwale is provided only by the Dipylon ships, as well as for the much later *trieres*, at least in the *Olympias* reconstruction.[70] Within an evolutionary scheme, provided with the two datum points just mentioned, it is possible to argue that between the two, and probably before the first, a laterally discontinuous deck may be assumed. This would imply that the longitudinal deck consisted of two parts, one along each gunwale, thereby imposing such a configuration on, for example, the Metropolitan MG II craft (Fig.5).

Such an implication needs to be confronted with a putative reconstruction of the path taken from the open hull to the decked variant. Although it cannot be proven by reference to actual representations to the effect, it is quite possible that the earliest form of platform in the central section of the hull was the runway, permitting safe passage between bow and stern. Raising the runway above the heads of the rowers would create something of a prototype to a longitudinal deck, albeit rather too narrow to serve as a fighting platform —assuming a elongated shape for a galley propeled by a large complement of oarsmen.[71] It would also require transformation into a *de facto* laterally continuous deck to accommodate a second level of rowers.

As was stressed above in connection with the EPA Sounion plaque and the Akropolis sherd (Figs 8-9), the distance between the putative deck and the gunwale on the image need not render a precise relationship, but merely indicate that the one is higher than the other.

If the suggestion made in connection with the LG II Akropolis and Phaleron sherds depicting craft with the rowers protected behind leather or wicker screens, that maximum protection would result when the rower sat as close as the gear-ratio permits, is acceptable, a deck running along the gunwale would ensue. Such a configuration would require raising the deck above the heads of the rowers (which is not obligatory for a raised runway-type deck down the centerline of the hull), yet allowing open space for raising and lowering of the mast. Not until the lower level of rowers worked their oars through ports would such a design become really effective in terms of stability.[72]

If the present author opts for the lateral longitudinal deck as the path to decked craft in general, it is done in full cognizance of how such a choice was operated. It does not exclude a development from the raised runway, but considers this latter option, primarily due to the problem facing operations involving the mast, as an evolutionary dead-end. Moreover, there exists a very real necessity of naval architects attempting reconstructions –at least on paper– to test the various possible configurations.[73]

Conclusions

Three strains in early Greek longship architecture thus appear with tolerable clarity in the evidence:

(1) the single-leveled, open hull, invented in LH IIIB (Fig. 1) and continuing through-out Geometric and Archaic times;

(2) the single-leveled, decked hull, introduced in LH IIIC (Figs 2-3) and continuing at least into the 7th c. with the Sounion (Fig.8) and Aristonothos vessels (Figs 10-11);

(3) the double-leveled, decked hull, of the LG IA period (Fig. 7), continuing into the 7th c.

A number of observations may conclude the present discussion. Statistically, decked hulls are rare in the database since the criteria deemed necessary to recognize their presence are seldom filled. The line to be read as a deck must be shown functioning in some capacity congruent with such a function. Representations which depict the deck as a separate line from both gunwale and thwart have a greater chance at passing through the filter. It is quite possible that further examples lurk in the evidence, but they cannot be recognized as such.

By working from clusters downwards to individual documents, and applying the lessons learnt while analysing the former, it is occasionally possible to formulate speculative statements concerning craft which do not clearly designate themselves as decked by the cues which the method has specified as valid. Comparisons in terms of idiom, within an evolutionary conception of early Aegean ship architecture, reveals interesting correlations across time which may contribute to the examination.

In the Bronze Age, longitudinally decked vessels appear only in two contexts, the Enkomi amphoroid krater, and the two sherds from Pyrgos Livanaton (Figs 2-3). The main Mycenaean type, best represented by the Tragana ship (Fig. 1), is not decked, yet it is this shape, with the bow projection, which will evolve into the decked Toumba ship in MG times (Fig. 4).

A comparison between the documents assigned to the two types which cluster around, respectively, the Skyros and the Tragana ships, suggests that the Mycenaeans developed two different variants of the same basic longship concept for distinct tasks. The one (the Skyros cluster), without the bow projection but decked, was employed as cargo carrier, but also as a fighting platform, should the need arise. The second (the Tragana cluster), with the bow projection which was to evolve –much later– into the ram and undecked, functioned as the swift counterpart for rapid deployment.[74] The Geometric data indicate that this dichotomy was retained.[75]

Unless the almost total lack of ship images on vases after the end of the Black-Figure style hides important evidence, the appearance of single- and double-leveled decked craft is essentially an 8th and 7th c. phenomenon. If this is so, then the deck may have some connection with the search for speed and ramming-strength which eventually led to the *trieres*, as a first step towards adding a further level of rowers, and providing structural rigidity.

This development, in its earliest phase, would have proceeded from the advent of the deck raised above the rowers (the Pyrgos, Toumba, and Metropolitan ships Figs 2-3, 4-5) to the placing of rowers on it (the Dipylon ships Fig. 7) to the addition of protective screens (the Akropolis sherd cf. n 30). The crucial step, placing the lower banks in the hull, rowing through ports, was taken in a second phase in the 7th c., and led to the open *dieres*, the deck no longer necessary.

The decked, single-leveled ship appears to have retained favor for its ability to carry troops and function as a fighting platform. This is suggested by the two ships on the 7th c. Aristonothos krater (Figs 10-11), perhaps also the Sounion and Akropolis ships, as well as the less certain 8th c. instances of the Copenhagen oinochoe and the University of Tasmania cup.

Such would be the conclusion to a first attempt to apply specific criteria to the data. There is much uncertainty, and the historical reconstruction is speculative. But by asking the question, one possible development from open single-level to closed multi-level hulls becomes apparent.[76] Moreover, it illustrates how the rereading of the LG material proposed in Tropis IV places the Dipylon ship into an evolution from *moneres* to *dieres* to *trieres*. If one accepts the *Olympias* reconstruction, then, so this paper contends, such a Late Geometric decked dieres constitutes a crucial step.

Michael Wedde
Loutropyrgos
Nea Peramos

NOTES

* The author is grateful to Mrs Ethel Wedde for comments and criticism on the text, and to Mr Harry E. Tzalas for the opportunity to speak. The present paper constitutes a preliminary formulation; a more substantial treatment awaits the maturation of the ideas herewithin contained.
Periodicals are abbreviated as laid out in *American Journal of Archaeology* 90, 1986, 384-394, and 92, 1988, 629-630, with the exception of *MarM (Mariner's Mirror)*.
Further abbreviations used:
BM British Museum, London
CMS Corpus der minoischen und mykenischen Siegel
NM National Archaeological Museum, Athens.
Chronological terms are abbreviated as follows: MH, LH (Middle, Late Helladic), LM (Late Minoan), MG, LG (Middle, Late Geometric), EPA (Early Proto Attic), EC (Early Corinthian).

1. For Bronze Age wrecks in the Aegean, cf. Parker 1992, catalogue numbers 208, 362, 544, 1193.
2. Small craft, throughout history, and merchantmen, when the type is developed, are rarely illustrated. On the latter, cf. Ericsson 1984.
3. Absences in the database are a major issue very rarely considered; for attempts, cf. Wedde 1991A, 1996.
4. This holds true of the basic bibliography: Basch 1987, Casson 1971, Gray 1974, Kirk 1949, Köster 1923, Morrison/Williams 1968, Williams 1949-50, 1958.
5. It is not the purpose of the present paper, or the author's efforts in general, to denigrate the work done in the field, but to attempt an application of clearly formulated methods within a specific theoretical stance and specified framing assumptions to a familiar database in the hope of learning more about how ships were constructed in the earlier periods of Aegean history.
   This necessitates a critical confrontation with the bibliography.

6. Cf. Wedde forthc.: Chapter One.
7. The exclusion of the deck as a primary typological feature is valid only in terms of the problems involved in the identification of decked craft in the representational data.
8. Abstraction must be made of the Egyptian material due to the entirely different conditions governing the navigation to which Nilotic craft were subjected. Egyptian shipbuilding is essentially riverine, subsequently adapted to a maritime environment. Decks were adopted early due to the nature of Egyptian ship design which did not provide a hold for goods.
9. Marinatos 1974:col.pl.9. Cf. also the seal Basch 1987:100 C2.
10. Marinatos 1974:col.pl.7.
11. Basch 1987:142 fig.298. On this ship, cf. Korres 1985.
12. A relationship of causality (desire for forecastle enforcing a redesign) is not implied. The factors leading to the radical change in the bow design were certainly more complex.
13. Cf., for instance, Louvre A528 (Basch 1987:166 fig. 336).
14. For the 7th c.: *id.*:193 figs 407-409; 6th c.: *id.*:207 fig.428, 209-210 fig.434A-E, 211 fig.438.
15. *Id.*:171-173 figs 350, 352, 355, 357.
16. For instance, *id.*:184 fig. 388, 202-203 figs 421, 424, 205 fig. 425, 207-208 fig. 428A-E, 208, fig. 430, 210 fig. 435, 211 fig. 437 etc. The helmsman is frequently enclosed within a railing or a screen.
17. The awning on the Akrotiri ships (Marinatos 1974:col.pl.9) do not require decking: the occupants are seated on the thwarts. The near identical feature on the ships of the MH Kolonna krater from Aigina (Siedentopf 1991:frontisp., pls 35-37) is to be interpreted in the same manner. The reading of Basch 1986:424 (support for lances) constitutes the secondary function as indicated by the Akrotiri vessels.
18. On the Skyros cluster, cf. Wedde forthc.:Section 2.9.
19. Basch 1987:148 fig. 311.
20. Dakoronia 1987:122 fig. 2. Considered decked, *id.*:119, 120.
21. *Id.*:fig.1. Considered decked, *id.*:118.
22. Basch 1987:142 fig. 295. Marinatos 1933:194 reads two fragmentary LM III sealings from Knossos (Basch 1987:103 F2, 104 F3) as decked craft. The curious Agia Triada model (Johnston 1985:25 BA 15) has what appears to be a deck below the thwarts (Marinatos 1933:195).
23. *Id.*:178 fig. 374. On the date, the author follows Coldstream 1968:23, 26, 349. Cf. Wedde 1991B:n75. Kirk 1949:99 and Casson 1971:52 see a decked craft, contrary to Morrison/Williams 1968:31 and Basch 1987: 178-179.
24. Wedde 1991B, forthc.:Section 5.7. Casson 1971:51, 55, Kirk 1949:100-108, Köster 1923:87-88, Pernice 1892:293-294, Tzahou-Alexandri 1987:341 understand the Dipylon ships as decked, Basch 1987:163-169, Gray 1974:84-90, Höckmann 1985:43, Morrison/Williams 1968:15-17 as undecked.
25. A short account of the author's stance is given in Wedde 1991B, summarized in *id.* 1996:145-147, and *id.*:forthc.: the traditional view postulating a combination of profile and plan views, and, therefore, reading the Dipylon ships as single-level ignores substantial evidence which undermines the foundation for such a conception (treatment of chariots, biers, shrouds). A major methodological, historiographical, and interpretational study is in preparation.
26. Usefully and comprehensible illustrated by Basch 1987:166-175.
27. *Id.*:166 figs 333-335.
28. *Id.*:172-173 figs 354-359.
29. A deck is indicated by *id.*:166-167 figs 336-337, 172 fig.356, possibly also by 173 fig.357.
30. *Id.*:182-183 figs 384-385.
31. *Id.*:183 fig.386.
32. *Id.*:184 figs 387-388. Cf. Tzahou-Alexandri 1987:343.
33. Basch 1987:208 fig. 429, 222 fig. 463, 226 fig. 470B, 238 figs 498, 499, 240 figs 501-504. Possibly also 211 figs 437, 438, 227 fig.472.

34. Kalligas 1987:83 fig.1.
35. Pyrgos: two thin parallel horizontal lines with semi-circles attached to and filling the distance between them; Toumba: three thin parallel horizontal lines; Dipylon: three parallel horizontal lines, the central substantially thicker.
36. Tzahou-Alexandri 1987:360-361 figs 23-24.
37. *Id.*:339.
38. Köster 1923:92. Casson 1971:83 and n33 derives θρανίτης from θρῆνυς (stool), Wallinga 1993:44 and n40 from θρᾶνος (bench).
39. Basch 1987:177 fig.372. For the date, Transitional MG II/LG I, cf. Coldstream 1968:22. Cf. Wedde 1991B:nn75-76.
40. The Eleusis vessel raises the specter of artists adding warriors to any craft, whether decked or not. Although major incongruencies may be ruled out through reference to the contextual beholder's ability to read the image far better than the modern scholar, it should be underlined that the interpretative process is always at mercy to the vagaries of the individual artist. This fact renders it imperative that all statements be placed within the larger framework of clusters and evolution, and not refer to single instances.
41. Kirk 1949:96-97 considers the Eleusis ship, along with the two Anavyssos vessels (Basch 1987:176 figs 368-369) as decked. Casson 1971:52 concurs on the Eleusis craft. Morrison/Williams 1968:32 and Basch 1987:175-176 make no mention of a deck.
42. *Id.*:177 fig.373.
43. Not decked: Morrison/Williams 1968:33.
44. Basch 1987: 171 fig.371.
45. Hood 1967:84 reads an upper and lower deck (i.e. a two-level, decked craft).
46. Basch 1987:202 fig.421.
47. Decked: Kirk 1949:119, Delivorrias 1987:165 nr 62. Not decked: Morrison/Williams 1968:73-74 Arch 2, Basch 1987:202-203.
48. Greenhalgh 1973:50 fig.35, 58 fig.37, 70 fig.43, 72 fig.44. The second and third examples depict large shields. Generally, the shield covers the body from the shoulder to the knees, as on Buschor 1969:30-31 figs 34-36, 56 fig.62, 60 fig.66, 71 fig.78. On the ship to the right on the Aristonothos krater, the warriors carry shields comparable to those of the Sounion soldiers in the reading proposed here.
49. Cf., for example, Thessaloniki 1988:cat.nr 155.
50. Basch 1987:203 figs 422, 423, Brann 1962:pl.22.383. The first sherd lacks the rails, thus being irrelevant. The second places rowers at the railing, showing no traces of being decked. The third is broken at the crucial point, but depicts a row of hoplites with their shields immediately above the rail, as on the Sounion plaque.
51. Basch 1987:203 fig.424.
52. *Id.*:241 figs 506-508.
53. Kirk 1949:121-122 suggests a deck on a higher level, and claims that "this ship looks unusually seaworthy".
54. Basch 1987:233 fig. 482.
55. Cf. Kirk 1949:121, Morrison/Coates 1986:25 (but contrast 27), 28. Morrison/Williams 1968:80-81 see neither as decked, Basch 1987:233 the right ship as decked, the left as undecked, but his arguments should be contrasted with *id.*:171.
56. *Id.*:172-173 figs 354-359.
57. The disappearance of the deck from *moneres* and *dieres* in the 6th c. is probably connected with the appearance of the *trieres* (the date constitutes too large an issue to be adequately treated here), which superceeded the smaller vessels in their purely military function. Cf., however, the "Argo" on the metope from the Sikyonian Treasury at Delphi (Basch 1987:240 fig. 501): Orpheus and Littos stand on a deck (as suggested by Themelis 1981:32) which stretches into the area occupied by the rowers. On this vessel, cf. Salviat 1984 (although the question of a deck is not raised).

58. Basch 1987:227 fig. 472.
59. *Id.*:221 fig.461.
60. *Id.*:175 (Eleusis 741), 176 (Copenhagen 1628) argues for a mere (and unlikely) decorative function for the lines.
61. *Id.*:176 fig.368; not lost, as Tzahou-Alexandri 1987:353 fig.4 and Tzahou-Alexandri/Spathari 1987:79 nr 42 (exhibited) indicate.
62. The sherd from Phylakopi NM 12099 (Atkinson *et al.*1904:pl.XXXII.12) indicates the crew by vertical strokes, whereas the sherd Akropolis AP2655 has incompletely drawn frames. The author is grateful for access to the drawings of Dr P.A.Mountjoy for these two documents.
63. Kirk 1949:118, 116 considers it, and the Phylakopi ships (Basch 1987:147 fig.307) decked (cf. also Marinatos 1933:194), although thereby contradicting his statement (p.117) that the Enkomi ships are the sole decked ships of the Bronze Age. Morrison/Williams 1968:8 reject a reading as decked for the Tragana ship.
64. Basch 1987:145 fig.303.
65. Depictions of recognizable wales are exceedingly rare, when not non-existant, in the Bronze Age ship imagery of the Aegean.
66. *Id.*: 174 fig. 360.
67. Cf. also the Louvre fragment A536 (*id.*:fig.363, incomplete illustration).
68. *Id.*:175 fig. 362.
69. It must remain entirely open whether the same argument can be applied to the Skyros ship to read the second line as a gunwale with omitted struts, or even a deck, the latter on the strength of the decked Enkomi and Pyrgos Livanaton ships which form the bulk of the cluster to which the Skyros ship belongs.
70. Thoukydides I.14.3, Ploutarkhos, *Life of Kimon* 12.2.
71. The effect could gradually resemble some modern reconstructions offered for the ships of King Luli, cf. Landström 1961:32-33. That particular reconstruction for the Luli ships (and that of A.Salonen, cf. Basch 1987:317 fig.667) is rejected by Basch 1987:318 fig.671, A.Sleeswyk this volume.
72. This does not occur until the ships of King Luli, c.700 BC. The author would argue that the Phoenicians improved upon a Greek design, thus endowing multiple level ships with serious viability.
73. Further decked craft: Basch 1987:182 fig. 382, 164 fig. 328, 227 fig. 473, 248 fig. 524, 249 fig. 526, 411 figs 878, 879.
74. An attempt to place the development of the Mycenaean ship into its historical context is being prepared by the author. Cf. also Wedde 1996.
75. The same dichotomy can be observed in King Luli's fleet: Basch 1987:313-314, figs 659-660.
76. Cf. Casson 1971:53-57, Coates 1987:111-113.

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ILLUSTRATIONS

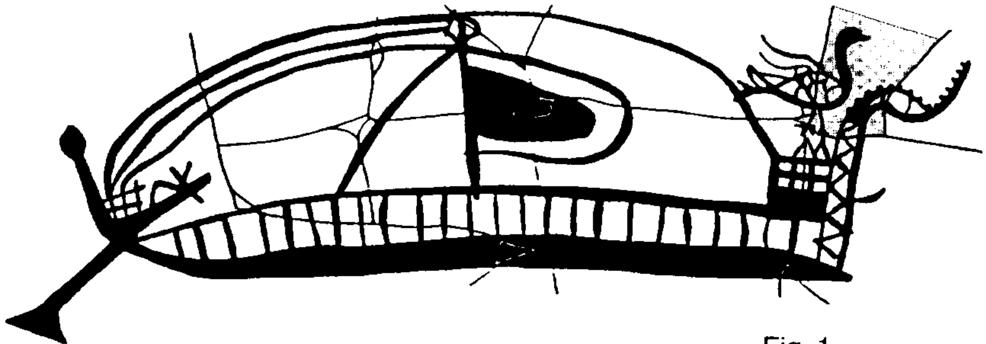


Fig. 1

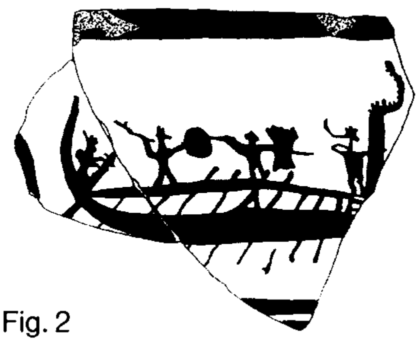


Fig. 2

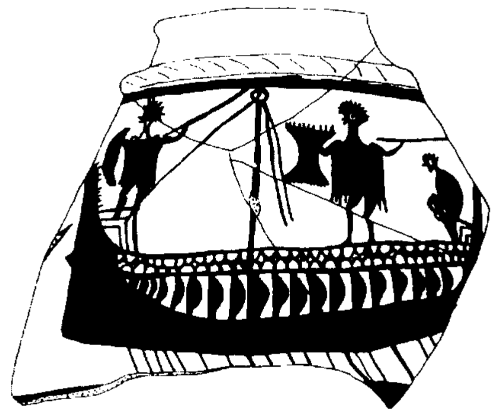
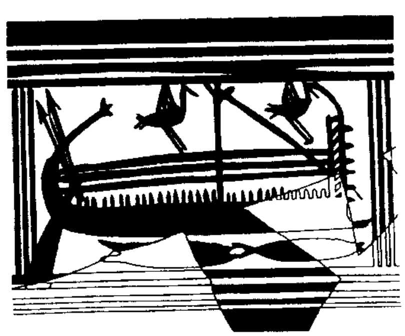


Fig. 3



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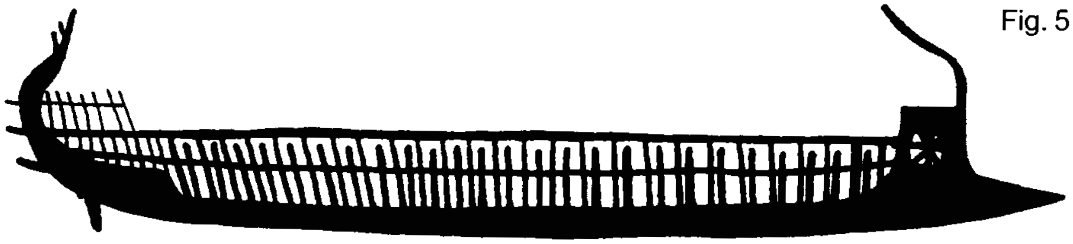

Fig. 5

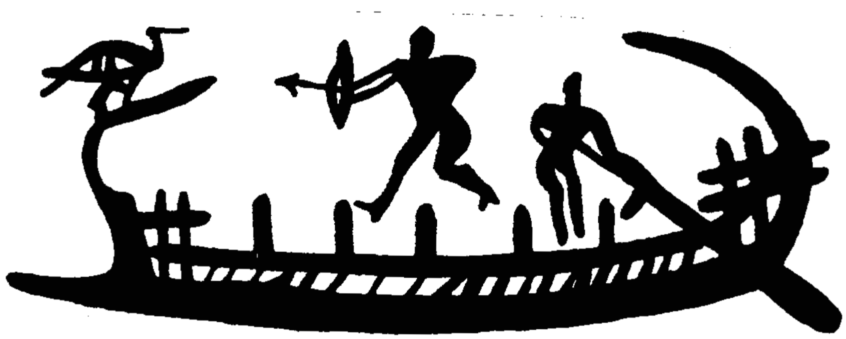

Fig. 6

Fig. 7

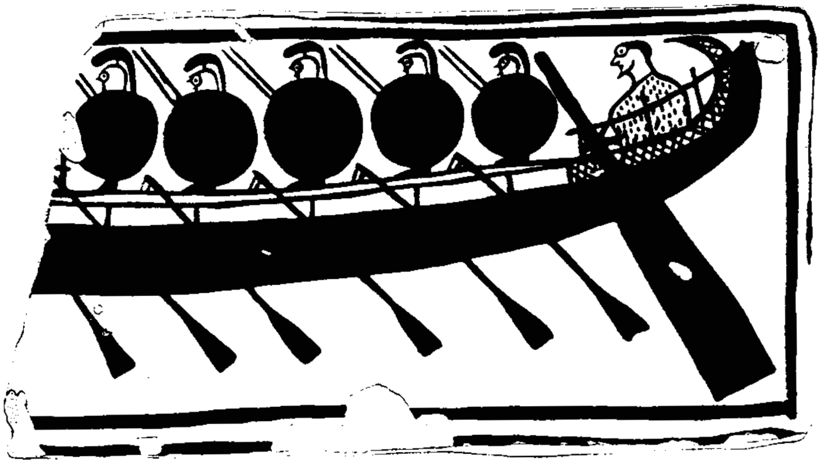

Fig. 8

Fig. 9

Fig. 10 Fig. 11